

FIRST EDITION • 2027

THE IR Table BOOK

A VISUAL GUIDE TO
INTERVENTIONAL RADIOLOGY
DEVICES AND EQUIPMENT

OSAHON OBANOR



RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

ABOUT THIS BOOK

**There is a particular kind of quiet
at the start of a rotation.**

**You are learning the room while the room is
already moving.**

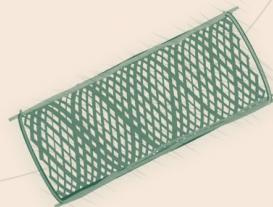
Names arrive quickly. A tray opens. Someone asks for a wire, a catheter, a sheath. The work is precise, collaborative, and often generous—but the first time through, the visual language can feel like a private one.

The IR Table Book is an attempt to make that language easier to enter. It gathers the objects learners are likely to meet and gives each one enough shape to become familiar: a silhouette, a connection, a job, a useful distinction. Not to turn observation into expertise, but to give observation somewhere to land.

Every device is pictured – 171 of them across 18 sections, organized by device family rather than by procedure, and sequenced from foundational to specialized.

Each entry answers the same five questions: what it is, how to recognize it, what it is used for, where you will meet it, and the one distinction worth remembering.

Written for students, residents, technologists, and nurses meeting the IR table for the first time.



The IR Table Book

A Visual Guide to Interventional Radiology Devices and Equipment

Authors

Osahon Obanor ¹

Hamed Alattar, MD ²

Jamaal Benjamin, MD, PhD ²

¹ University of Texas Southwestern Medical School, Dallas, TX, USA

² Division of Vascular and Interventional Radiology, Department of Radiology, University of Texas Southwestern Medical Center, Dallas, TX, USA

Corresponding Author

Osahon O. Obanor

University of Texas Southwestern Medical School

Dallas, TX, USA

Email: osahon.obanor@utsouthwestern.edu

CONTINUE BEYOND THE PAGE

Companion Resources

Access the book's digital resources and help evaluate its educational impact.

OFFICIAL WEBSITE

The IR Table Book

<https://irtablebook.com>

The online companion to The IR Table Book is a searchable, interactive reference for interventional radiology devices and equipment. The website also offers the free PDF edition and an Anki study deck for download.



SCAN TO VISIT

SUPPORT THE RESEARCH

Help Evaluate The IR Table Book

The IR Table Book is free to use. If it supports your learning, please consider completing the REDCap survey(s) below. Your participation will help evaluate the book's impact on device fluency and guide the continued development of this educational resource.

Begin with the pre-assessment and complete the post-assessment after using the book. You are welcome to share feedback at any time!

BEFORE YOU BEGIN



Pre-Assessment

ANYTIME



Comments & Feedback

AFTER USING THE BOOK



Post-Assessment

Contents

FRONT MATTER

Medical Disclaimer.....	ii
Scope and Intended Audience	iii
Editorial Standard	iv
Device Category Taxonomy.....	v
Acknowledgments	vi

ORIENTATION

How to Use This Book During an IR Rotation	vii
How to Read IR Device Labels	viii
Common IR Device Pathways	ix

DEVICE SECTIONS

1. Access	1
2. Wires	6
3. Sheaths & Dilators.....	11
4. Diagnostic Catheters.....	15
5. Microcatheters, Microwires & Crossing Systems.....	21
6. Contrast & Table Setup.....	25
7. Embolics	30
8. Balloons.....	36
9. Stents & Stent Grafts.....	41
10. Thrombectomy & Lysis	45
11. Embolic Protection, Retrieval & IVC Filters.....	49
12. Drains & Enteral Access	53
13. Biliary & Genitourinary	58
14. Central Venous Access	64
15. Image-Guided Biopsy, Ablation & Augmentation	69
16. AV Dialysis Access.....	74
17. TIPS & Portal Hypertension	78
18. Closure, Hemostasis & Securement.....	81

APPENDICES

A · Device Inventory	87
B · Image Sources & Attribution	95

Medical Disclaimer

© 2027 Osahon Obonor. Original text, selection, arrangement, organization, and other project-owned material are protected by applicable law. Third-party images, product names, trademarks, and proprietary materials remain the property of their respective owners.

This book is an educational reference intended to support device recognition, equipment orientation, and fluency at the procedural table. It is not intended to guide device selection, procedural planning, or clinical decision-making. It does not constitute manufacturer instructions for use, a procedural protocol, institutional policy, or a substitute for qualified clinical supervision.

Learners must follow device-specific instructions for use, institutional policies, supervising clinician guidance, and applicable safety standards. Device names, models, packaging, appearance, labeling, color, availability, and institutional preferences may vary by manufacturer, product line, supply chain, and local practice. This guide is not exhaustive and reflects a curated selection of devices chosen for learner-focused recognition and orientation.

Dedication and Epigraph

For the learner at the table, where recognition becomes orientation and orientation becomes participation.

One device at a time.

Preface

Entering the interventional radiology suite as an early learner often means encountering a table filled with devices that appear similar until someone teaches the learner how to see them. The IR Table Book was created to make these devices more recognizable, memorable, and clinically meaningful.

Its purpose is to transform unfamiliar equipment into a structured visual language that helps learners follow cases, ask more precise questions, and connect each device with its procedural function. A learner who can identify a device, place it within its broader category, recognize the context in which it is commonly used, and distinguish it from similar-appearing tools is better prepared to participate meaningfully in supervised learning. The goal is not merely to name equipment, but to understand how each device contributes to the sequence and objectives of a procedure.

This book is not intended to replace supervision, institutional protocols, or manufacturer instructions. Rather, it is designed to make the procedural table more intelligible by helping new learners recognize common devices and follow the progression of a case.

Scope and Intended Audience

This book focuses on interventional radiology devices and related equipment, including access and navigation systems, contrast and table components, therapeutic devices, drainage and enteral access, biliary and genitourinary systems, central venous access, biopsy and ablation equipment, retrieval systems, dialysis access, portal hypertension tools, and closure, hemostasis, and securement supplies. It is a curated educational guide rather than a comprehensive catalog of all interventional radiology devices or manufacturer-specific product lines.

The central educational objective is device fluency rather than procedural independence. The primary audience includes medical students, PGY-1 residents, diagnostic radiology residents rotating through interventional radiology, early integrated interventional radiology residents, technologists and nurses who are new to the IR table, and other learners who would benefit from a structured visual guide to device recognition.

How to Use This Manual

Before a case, review the relevant section's orientation page and device entries to anticipate what may appear on the table. Each section begins with an overview of common measurements, table cues, compatibility considerations, and beginner pitfalls. Key sizing conventions, including French size, gauge, wire diameter, millimeters, and centimeters, are introduced on these pages and reinforced throughout the corresponding device entries. The objective is to provide enough familiarity that the table begins to feel recognizable, organized, and easier to follow.

During supervised learning, use the book as an orientation aid rather than a reference to consult during critical procedural moments. Its purpose is to help learners identify what appears on the table, understand its function, and connect each device with the stage and objective of the procedure in which it appears.

After the case, revisit unfamiliar devices. Compare visually similar tools, note the procedural context in which each appeared, and relate device function to the sequence and objectives of the procedure.

Editorial Standard

The central editorial standard is visual and functional fidelity. Each device entry should help the learner answer five questions: *What is this? How do I recognize it? What is it used for? Where am I likely to encounter it? What key distinction should I remember?*

The writing should be concise, clinical, learner-focused, and accurate. It should avoid informal commentary, ambiguous descriptions, unnecessary technical detail, and unsupported claims. The book should function as a practical field guide while maintaining the precision and polish expected of a faculty-reviewed educational resource.

Book Architecture

Each device entry is organized around the device name and category, followed by three recurring learning panels: VISUAL RECOGNITION, USE & PROCEDURAL CONTEXT, and KEY DISTINCTIONS. Visual Recognition identifies the features that help a learner recognize the device on the table. Use & Procedural Context explains its core function and common clinical settings. Key Distinctions highlights the functional, sizing, compatibility, or recognition feature that most clearly separates it from similar tools. Together, the panels prioritize rapid recognition and clinically meaningful orientation rather than exhaustive technical specifications.

The book is sequenced as a progression rather than an alphabetical catalog. It begins with foundational access, wire, sheath, catheter, and table systems; moves through major therapeutic device families; then applies those concepts in common clinical domains. Integrated workflows such as AV dialysis access and TIPS appear near the end. The final section, Closure, Hemostasis & Securement, completes the procedural arc with access-site completion, bleeding control, device securement, and site protection.

Photo and Diagram Logic

Photographs of actual devices are preferred when the primary educational objective is recognition at the procedural table. Diagrams are used when device configuration, catheter course, internal structure, deployment mechanics, or geometry is more instructive than a standard product photograph.

Device labels may include generic names, commonly used table terminology, and manufacturer-associated product names when these improve recognition. Trademarks and proprietary names remain the property of their respective owners, and the inclusion of a commercial product does not imply endorsement.

Device Category Taxonomy

The taxonomy is organized primarily by device family and table function, with selected anatomy-specific or workflow-specific sections used when devices are most meaningfully learned in clinical context. Each device is placed where its recognition, functional role, and procedural context are most useful to the learner; cross-references may be used when a device spans more than one domain.

NO.	CATEGORY	EDUCATIONAL FOCUS
01	Access	Entry needles, blades, access kits, and basic instruments used to establish controlled access to vessels, ducts, collections, and soft tissues.
02	Wires	Access, exchange, support, navigation, and microwire platforms that guide device movement and help maintain procedural position.
03	Sheaths & Dilators	Introducer sheaths, guiding sheaths, peel-away sheaths, valves, dilators, and support systems used to maintain access and deliver devices.
04	Diagnostic Catheters	Simple-angle, visceral, arch-selective, reverse-curve, and flush catheters used to navigate anatomy, direct wires, inject contrast, and define vascular or luminal targets.
05	Microcatheters, Microwires & Crossing Systems	Low-profile catheter, microwire, support, crossing, and re-entry systems used for superselective navigation, distal access, lesion crossing, embolic delivery, and fine procedural control.
06	Contrast & Table Setup	Contrast delivery, flush, stopcock, manifold, pressure, connector, and injector components that organize table workflow, maintain line control, and support imaging.
07	Embolics	Coils, plugs, particles, microspheres, liquid embolics, sclerosants, radioembolic agents, and temporary materials used for targeted occlusion, flow modification, or therapy delivery.
08	Balloons	Angioplasty, occlusion, cutting, drug-coated, lithotripsy, and compliant balloon systems, plus related inflation and plaque-modification tools, used for dilation, flow control, lesion preparation, or device molding.
09	Stents & Stent Grafts	Bare, covered, drug-eluting, peripheral, venous, biliary, portal, and enteral stent platforms used to scaffold, seal, exclude, or maintain luminal patency.
10	Thrombectomy & Lysis	Aspiration, mechanical thrombectomy, rheolytic, and lytic-delivery systems used to remove, disrupt, aspirate, or dissolve thrombus.
11	Embolic Protection, Retrieval & IVC Filters	Distal embolic-protection filters, snares, baskets, forceps, IVC filters, delivery systems, and retrieval sheaths used for intraprocedural embolic protection, foreign-body capture, IVC filter placement, and filter retrieval.
12	Drains & Enteral Access	Drainage catheters, locking pigtailed, pleural and peritoneal drainage systems, gastrostomy and gastrojejunostomy devices, gastropexy anchors, and collection accessories used for fluid evacuation or enteral access.
13	Biliary & Genitourinary	Biliary, gallbladder, renal, ureteral, and bladder access, drainage, dilation, stenting, exchange, and tract-management systems used across hepatobiliary and urinary interventions.
14	Central Venous Access	PICC, midline, non-tunneled and tunneled central catheters, dialysis catheters, implanted ports, and related access components used for durable or temporary venous access.
15	Image-Guided Biopsy, Ablation & Augmentation	Coaxial introducers, core and aspiration needles, transjugular and bone biopsy systems, fiducial markers, ablation probes, protective adjuncts, and vertebral augmentation platforms used for image-guided tissue diagnosis, targeting, ablation, and fracture stabilization.
16	AV Dialysis Access	Fistulography, angioplasty, thrombectomy, stent-graft, and circuit-management tools used to evaluate, maintain, or salvage arteriovenous fistulas and grafts.
17	TIPS & Portal Hypertension	Portal access, pressure measurement, TIPS creation and revision, variceal embolization or obliteration, tamponade, and reconstruction tools used in portal hypertensive intervention.
18	Closure, Hemostasis & Securement	Compression, suture-mediated, plug-based, topical hemostatic, suturing, securement, dressing, cap, and connection supplies used to complete access sites, control bleeding, secure indwelling devices, and protect procedural sites.

Acknowledgments

This project is shaped by the IR faculty, fellows, residents, nurses, technologists, and staff whose teaching, patience, and example help learners understand not only what is on the table, but why each device matters. I also acknowledge the patients whose care provides the setting for this learning. Their trust reinforces the responsibility to approach every procedure with preparation, humility, and respect.

Much of procedural education happens through observation, repetition, correction, and small moments of explanation during real clinical work. This manual was built from the learner's perspective, but it reflects the procedural teams who make IR education possible.

Image Credits and Attribution Note

Images are included to support educational device recognition. Appendix B documents the source, product identification, and suggested credit line for each panel so readers can trace the provenance of the visual material.

Source information and credit lines are provided for transparent attribution. Commercial and institutional names identify sources, products, or affiliations only and do not imply endorsement.

ORIENTATION PAGES

How to Use This Book During an IR Rotation

Orientation purpose: Use this manual to build visual and functional fluency at the IR table. The book contains 171 curated device entries organized across 18 sections. The goal is to recognize device families, understand the procedural role and context of each tool, and distinguish visually or functionally similar devices without treating the book as a procedural protocol, instructions for use (IFU), or independent device-selection guide.

Use the Three-Panel Lens

Panel	Question to answer	How to use it
VISUAL RECOGNITION	What am I looking at?	Identify the physical cues that distinguish the device on the table or in its packaging.
USE & PROCEDURAL CONTEXT	What does it do, and where will I see it?	Connect the device to its core function and the kinds of cases in which it commonly appears.
KEY DISTINCTIONS	What most clearly distinguishes it from similar devices?	Focus on the sizing, compatibility, mechanism, configuration, or recognition feature that separates it from similar tools.

Case-Based Use

Case phase	Learner task
Before the case	Review the relevant section orientation page and a small number of likely device panels. Anticipate device families rather than individual brands.
At the table	Identify the device family first, then the specific device. Ask what role it is playing now: access, navigation, support, exchange, delivery, treatment, drainage, retrieval, closure, or securement.
During the case	Follow the sequence of device functions. Notice when access is preserved, when the platform changes, and when a device is exchanged for a more supportive or more specialized system.
After the case	Revisit unfamiliar devices while the sequence is still fresh. Compare them with the nearest look-alike entry and connect each one to the stage where it appeared.

Common Table Language

What you may hear	Learner translation
"Get access."	Create controlled entry into the target vessel, duct, collection, organ, or space.
"Hold the wire."	Maintain wire position so the pathway is not lost while another device is removed, exchanged, or advanced.
"Upsize."	Exchange to a larger-caliber or more supportive access platform because the next device requires it.
"Select it." / "Superselect."	Use catheter and guidewire geometry to enter the intended branch; superselection implies a smaller, more distal, or more selective target.
"Do a run."	Inject contrast and acquire an angiographic or fluoroscopic run to assess anatomy, flow, device position, or treatment effect.
"Deploy it."	Release an implant or occlusion device such as a coil, plug, stent, filter, or closure system.
Guardrails	Use the book for orientation, not procedural instruction. Follow supervising clinicians, institutional policy, and device-specific instructions for use (IFU). Do not infer interchangeability from appearance. Similar-looking devices may differ in size, platform, compatibility, mechanism, or intended use. Do not consult the book during critical procedural moments. Review before or after the case, when doing so will not distract from the immediate responsibilities of the procedural team.

ORIENTATION PAGES

How to Read IR Device Labels

Orientation purpose: Device labels combine several measurement systems with compatibility, delivery, and safety information. Read the package as a system: identify the device family, decode the dimensions, confirm the wire and access platform, then check working length, functional segment, and labeled limits.

Device Label Decoder

Label cue	What it usually means	Why it matters
Device name and family	Generic device class and, when applicable, a proprietary product name.	Confirms what you are reading before interpreting size or compatibility.
French (Fr / F)	Nominal outer diameter for many catheters, sheaths, drains, and lines; 1 Fr corresponds to approximately 0.33 mm.	Larger French number generally means a larger-profile device; exact compatibility remains device-specific.
Gauge (G)	Needle gauge.	Higher gauge number corresponds to a smaller needle diameter.
0.035, 0.018, or 0.014 in	Guidewire diameter in inches.	Defines the wire platform with which the device is designed to work.
Millimeter (mm)	Commonly treatment diameter and working length for balloons, stents, and other therapeutic devices.	Describes the treatment segment rather than overall catheter length.
Centimeter (cm)	Overall or working length of a guidewire, catheter, sheath, probe, or delivery system.	Determines reach and whether an exchange can be completed while position is maintained.
Sheath or guide requirement	Minimum delivery or access platform listed by the manufacturer.	Confirms whether the current access system can accept and deliver the device.
Functional segment	Side-hole zone, infusion length, balloon length, covered segment, active tip, or treatment zone.	Identifies the portion that actually performs the intended task.
Labeled limits	Pressure rating, solvent compatibility, power-injection status, MR safety information, sterility, lot number, and expiration date.	Prevents use outside stated device constraints and preserves traceability.

Interpret the Numbers in Context

Example	How to read it
“6F × 55 cm sheath”	6F is the labeled sheath size; 55 cm is the shaft length.
“0.035 in compatible”	The device is intended to work on a 0.035-inch guidewire platform.
“6 mm × 40 mm balloon”	6 mm is the balloon diameter; 40 mm is the balloon working length.
“Requires 7F sheath”	The delivery system needs an access platform that meets the labeled requirement; this does not describe target-vessel diameter.
Read in Order	1. Device family. What is the system? 2. Treatment dimensions. What part of the device is being sized? 3. Wire platform. What guidewire is required? 4. Access requirement. What sheath or guide is required? 5. Length and functional segment. Can it reach, and where does it work? 6. Special limits. What pressure, solvent, sterility, or device-specific restrictions apply?
Do Not Confuse	Sizing systems are not interchangeable. Larger French numbers indicate larger nominal device size, while higher gauge numbers indicate smaller needles. Trademark status is not a device category. A proprietary product name may identify a specific implementation of a broader generic device family. Appearance is not compatibility. Use manufacturer-labeled wire, sheath, pressure, and material requirements rather than inferring compatibility from visual similarity.

ORIENTATION PAGES

Common IR Device Pathways

Orientation purpose: There is no universal procedural sequence, but most IR cases can be understood by following recurring device functions. Use the framework below to orient yourself to what has already been accomplished, what must be preserved, and what the next device is expected to do.

Universal Functional Sequence

1. Access	2. Preserve Access	3. Establish Platform	4. Reach / Position	5. Perform Primary Task	6. Finish
Create controlled entry into the target.	Maintain a safe pathway during exchanges.	Build the working access needed for the case.	Navigate or position the working device at the target.	Image, sample, drain, retrieve, reconstruct, or treat.	Confirm the endpoint, remove or secure devices, and complete the site.

Transcatheter Vascular Intervention

Stage	Typical devices	What the learner should notice
Access	Access needle; micropuncture set; vascular introducer sheath	How the vessel is entered and what establishes the first stable working platform.
Navigation	0.035-inch guidewire; diagnostic catheter; guiding catheter	How wire behavior and catheter geometry move the system from access site to target.
Distal and crossing work	Microguidewire; coaxial or torqueable microcatheter; crossing support catheter	When the system becomes smaller, more distal, or more supportive.
Primary therapy	Embolic; balloon; stent or stent-graft; thrombectomy or retrieval device	Which mechanism is accomplishing the therapeutic objective.
Completion	Completion angiography or endpoint assessment; closure, hemostasis, or compression	How the operator confirms the result and completes the access site.

Percutaneous Drainage & Tract Intervention

Stage	Typical devices	What the learner should notice
Target access	Chiba needle; spinal needle; Yueh system; trocar drainage system	Whether access is fine-needle, wire-guided, needle-over-catheter, or direct trocar.
Pathway control	0.018- or 0.035-inch guidewire; coaxial transitional access set	What preserves access while the tract is prepared or the device is exchanged.
Tract preparation	Serial tract dilators; sheath	How the tract is enlarged or stabilized for the definitive catheter.
Definitive device	Drainage catheter; percutaneous nephrostomy catheter; biliary drainage catheter; enteral tube	What remains in the patient and where its functional segment must sit.
External configuration and securement	Connector, cap, securement device, dressing, or drainage setup	How the indwelling device is made usable and protected after placement.
Key Principle	Follow function before specific device name. A device may perform more than one stage, and some procedures skip stages entirely. The most useful question is: what job must be accomplished next?	

ORIENTATION PAGES

Common IR Device Pathways

Orientation purpose: Several sections in this book are intentionally workflow-based because their devices are most meaningful when learned as an integrated sequence. The examples below show how foundational devices from earlier sections combine into common IR workflows.

Central Venous Access

Access	Prepare the path	Place the device	Confirm & secure
Micropuncture access and guidewire control	Dilator, Peel-Away® sheath introducer, tunneler, or port-pocket preparation	PICC, nontunneled central venous catheter, tunneled catheter, hemodialysis catheter, or implanted venous access port	Confirm tip position and function; secure, cap, close, and dress the site

Image-Guided Biopsy, Ablation & Augmentation

Target & access	Working device	Primary task	Endpoint & site
Plan trajectory and establish coaxial, FNA, bone, or transjugular access	Core biopsy needle, automated core biopsy device, ablation probe or electrode, or protective displacement system	Acquire tissue, place a fiducial, or deliver thermal therapy	Assess specimen or treatment endpoint, then complete the tract and skin site

AV Dialysis Access

Define the circuit	Treat stenosis	Manage thrombus	Preserve the circuit
Access sheath, contrast, guidewires, and fistulography define inflow, conduit, and outflow	PTA or ultra-high-pressure balloon addresses resistant stenosis	Rotational thrombectomy, Fogarty arterial embolectomy catheter, or other clot-management strategy	Stent-graft or additional intervention treats selected residual or recurrent problems

TIPS & Portal Hypertension

Portal access	Measure and define	Create or modify shunt	Alternative flow control
The TIPS portal access system establishes the transhepatic portal pathway	Pressure transduction and angiography define the hemodynamic and anatomic problem	Balloon dilation and TIPS stent-graft create or revise the shunt	BRTD occlusion balloon and embolic systems may be used in selected variceal obliteration workflows
Key Principle	Integrated workflows repeatedly reuse the same foundational families: access needles, guidewires, sheaths, catheters, contrast systems, balloons, stents, embolics, and closure tools. Workflow-based sections therefore emphasize only the systems distinctive enough to warrant separate orientation.		

ORIENTATION PAGES

Access

Orientation purpose: Access devices establish the first controlled entry into a vessel, duct, collecting system, collection, organ, or soft-tissue target. Focus on how the target is entered, what preserves the pathway after puncture, and whether the operator is transitioning to a wire-guided platform or placing a catheter directly.

Key Principle

Access is a functional stage, not a synonym for vascular access. The same entry principles recur across drainage, biliary and genitourinary intervention, central venous access, biopsy, and ablation.

Three Common Access Patterns

Pattern	Typical sequence	Recognition concept
Micropuncture access	21-gauge micropuncture access needle; 0.018-inch guidewire; micropuncture introducer sheath; transition to a 0.035-inch platform	Starts small, then converts to the larger working platform needed for the procedure.
Direct 0.035-inch access	18-gauge access needle; 0.035-inch guidewire; sheath, dilator, catheter, or drain	Creates the standard working-wire platform directly when a micropuncture transition is unnecessary.
Direct catheter access	Trocar drainage catheter system or Yueh needle-catheter system advanced directly to the target	The puncture assembly and catheter are linked, reducing or eliminating the usual wire-exchange sequence.

What You Will See in This Section

Family	Representative entries	What to notice
Standard and fine access needles	18-gauge access needle; 21-gauge micropuncture access needle; Chiba needle; spinal needle	Caliber, length, stiffness, stylet configuration, and the wire platform that follows.
Access transition system	Micropuncture set	The coordinated needle, 0.018-inch guidewire, dilator, and small sheath used to reach a 0.035-inch platform.
Skin and tissue instruments	No. 11 scalpel blade; hemostatic forceps	These prepare or manipulate the superficial tract but do not themselves establish target access.
Direct-access systems	Trocar drainage catheter system; Yueh needle-catheter system	Whether the catheter advances with the puncture assembly or remains after the needle is removed.
Do Not Confuse	Micropuncture and Seldinger are not competing concepts. Micropuncture describes a small-caliber access platform; Seldinger describes wire-guided device placement. A skin nick is not target access. The No. 11 blade creates a controlled superficial opening after access has been established. Needle caliber predicts the compatible wire platform. A 21-gauge micropuncture needle accepts a 0.018-inch guidewire; an 18-gauge access needle can directly accept a 0.035-inch guidewire.	

1. ACCESS



Device Index

CHAPTER 01

Foundational entry and wire pathways

01-01

18-gauge access needle

01-02

21-gauge micropuncture access needle

01-03

Chiba needle

01-04

Hemostatic forceps (Kelly and Mosquito)

01-05

Micropuncture set

01-06

No. 11 scalpel blade

01-07

Spinal needle

01-08

Trocar drainage catheter system

01-09

Yueh needle-catheter system

01

ACCESS

RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

1. ACCESS

01-01 18-gauge access needle

Standard access needle



VISUAL RECOGNITION

Large-bore 18-gauge metal access needle with a broad hub and rigid shaft; configurations may include a removable obturator or stylet and an echogenic tip. The shaft is visibly larger than that of a 21-gauge micropuncture needle.

USE & PROCEDURAL CONTEXT

Percutaneous entry into tissue or a vessel wall when direct placement of a 0.035- or 0.038-inch working guidewire is planned. Common contexts include arterial or venous access and selected drainage or large-catheter procedures when a micropuncture sequence is not needed.

KEY DISTINCTIONS

Unlike a 21-gauge micropuncture needle, an 18-gauge access needle directly accepts a 0.035- or 0.038-inch working guidewire. This shortens the access sequence but creates a larger initial puncture.

01-02 21-gauge micropuncture access needle

Micropuncture access needle



VISUAL RECOGNITION

Slender 21-gauge introducer needle, visibly finer than an 18-gauge access needle and typically paired with a 0.018-inch guidewire as part of a micropuncture kit.

USE & PROCEDURAL CONTEXT

Creates the initial small-caliber puncture for vascular or selected nonvascular access. A 0.018-inch wire passes through the needle; the coaxial introducer/dilator then enables exchange to a 0.035- or 0.038-inch working guidewire. Common contexts include arterial or venous access, central lines, ports, nephrostomy, and biliary access.

KEY DISTINCTIONS

The 21-gauge needle starts a 0.018-inch micropuncture pathway rather than accepting a full-size working guidewire directly. It is one component of, not synonymous with, the complete micropuncture set.

01-03 Chiba needle

Fine percutaneous needle



VISUAL RECOGNITION

Long, slender fine-caliber needle with a removable stylet and a sharp Chiba bevel; many models include depth markings or an echogenic tip. Gauge and length vary by configuration.

USE & PROCEDURAL CONTEXT

Used under ultrasound or fluoroscopy for fine percutaneous targeting, aspiration, or initial access to small or deep structures, including bile ducts, the renal collecting system, and focal soft-tissue lesions. Some access configurations permit placement of a 0.018-inch guidewire after the stylet is removed.

KEY DISTINCTIONS

The Chiba designation describes a fine-needle type rather than one fixed gauge or length. Compared with a routine short access needle, Chiba needles are typically longer and finer and are selected for precise deep-target access or aspiration.

01-04 Hemostatic forceps (Kelly and Mosquito)

Locking surgical clamps



VISUAL RECOGNITION

Finger-ring clamps with a box lock and ratcheted handle, available straight or curved. Kelly forceps are usually longer, with jaws serrated only on the distal half; Halsted Mosquito forceps are smaller and finer, with fully serrated jaws.

USE & PROCEDURAL CONTEXT

General-purpose locking clamps used to grasp tissue, control small vessels, and perform blunt spreading or dissection during ports, tunneled lines, drains, and other access procedures.

KEY DISTINCTIONS

Kelly and Mosquito forceps share a ratcheted locking-clamp design, but Kelly forceps are larger, with serrations limited to the distal half of the jaws, whereas Mosquito forceps are smaller and fully serrated for finer control.

1. ACCESS

01-05 Micropuncture set

Access transition set



VISUAL RECOGNITION

Tray containing a fine 21-gauge needle, 0.018-inch guidewire, coaxial dilator, and small sheath; exact components vary by kit.

USE & PROCEDURAL CONTEXT

Bundled kit that uses a fine 21-gauge needle and 0.018-inch wire to establish access before transitioning to a 0.035- or 0.038-inch working guidewire and compatible sheath. Typical contexts include vascular access, ports, dialysis catheters, fistulograms, nephrostomy, and biliary drainage.

KEY DISTINCTIONS

The micropuncture set is a complete transition pathway rather than a single access device, combining the 21-gauge needle, 0.018-inch guidewire, transitional dilator, and small sheath needed to reach a larger working platform.

01-06 No. 11 scalpel blade

Skin-nick blade



VISUAL RECOGNITION

Small, pointed triangular No. 11 blade with a straight cutting edge; typically mounted on a handle for a controlled skin nick.

USE & PROCEDURAL CONTEXT

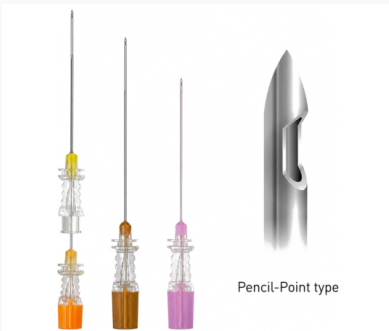
Creates a small skin nick at the access site to facilitate passage of a sheath, drain, catheter, or tunneler after wire access. Typical contexts include percutaneous procedures requiring a larger access device.

KEY DISTINCTIONS

The No. 11 blade enlarges the superficial skin entry only; it is used after access is secured and should not be confused with the needle that establishes target entry.

01-07 Spinal needle

Long stylet needle



Pencil-Point type

VISUAL RECOGNITION

Long, thin needle with a matched removable stylet and either a cutting bevel or pencil-point tip, depending on design; typically much longer than a short access needle.

USE & PROCEDURAL CONTEXT

Long stylet needle for reaching deep or neuraxial targets and delivering anesthetic or contrast through a narrow path. Typical contexts include lumbar puncture, myelography, neuraxial anesthesia, MSK and arthrogram injections, pain procedures, and CT-guided deep access.

KEY DISTINCTIONS

Its long, narrow, stylet shaft reaches deep or neuraxial targets; tip geometry may be pencil-point or cutting, depending on the intended use.

01-08 Trocar drainage catheter system

One-step drainage system



VISUAL RECOGNITION

Drainage catheter advanced over a stiff, sharp trocar stylet, forming a coaxial puncture-and-catheter assembly rather than a staged needle-wire-dilator sequence.

USE & PROCEDURAL CONTEXT

Trocar drainage system that advances a catheter over its sharp stylet into a selected, readily accessible fluid collection, avoiding a separate wire-and-dilator sequence. Typical contexts include superficial abscesses, pleural fluid, and other accessible collections.

KEY DISTINCTIONS

Unlike a Seldinger system, the trocar catheter advances directly with its sharp inner stylet, avoiding a separate guidewire and serial exchange steps; it is generally reserved for selected, readily accessible targets.

1. ACCESS

01-09

Yueh needle-catheter system

Needle-over-catheter access



VISUAL RECOGNITION

Fine inner needle nested within a flexible outer catheter; after puncture, the needle is removed while the soft catheter remains at the target. Yueh configurations may include distal sideports and a straight or pigtail catheter.

USE & PROCEDURAL CONTEXT

Needle-over-catheter system for percutaneous fluid aspiration or selected limited drainage; the catheter remains at the target after the needle is removed, preserving access during aspiration. Typical contexts include paracentesis for ascites, thoracentesis for pleural fluid, small abscesses, and cysts.

KEY DISTINCTIONS

The outer catheter remains at the target after the inner needle is removed, allowing aspiration or limited drainage through a soft catheter. This differs from a standard needle-wire sequence, in which the needle is removed and only the guidewire remains.

ORIENTATION PAGES

Wires

Orientation purpose: Guidewires are rails, steering tools, exchange platforms, and support systems. Begin by identifying guidewire diameter, then assess tip geometry, coating or surface behavior, stiffness, and length to understand its role in the case.

Key Principle

Wire selection is a balance between navigation and support. A wire that is excellent for atraumatic steering may not provide the rail required for the next device.

Read the Wire in Five Dimensions

Platform. 0.014-, 0.018-, and 0.035-inch diameters determine what devices can track over the wire.

Tip geometry. J-tip, angled, curved, straight, floppy, and shapeable tips behave differently during access, selection, and crossing.

Coating and surface. Hydrophilic coatings reduce friction and improve trackability but still require controlled handling.

Stiffness. Floppy working wires are more forgiving; stiff and extra-stiff wires create a stronger rail for dilation, delivery, or large-bore systems.

Length. Exchange-length wires preserve distal position while one device is removed and another is advanced.

How the Wire Families Fit Together

Family and examples	Typical role	Key distinction
0.014-inch peripheral guidewire	Low-profile peripheral crossing and device delivery	Smallest platform in this section; used with compatible low-profile devices.
0.018-inch micropuncture guidewire	Initial access after a 21-gauge micropuncture needle	Short, delicate access wire used to transition to a working platform.
0.018-inch peripheral guidewire	Peripheral crossing and support	A working interventional platform, not merely a micropuncture access wire.
0.035-inch working guidewires	Bentson, J-tip, hydrophilic, and Rosen guidewires for access, navigation, exchange, or selective work	Distal geometry, stiffness, and coating alter navigation, support, and tissue interaction.
Amplatz stiff guidewire	Support for dilation, drains, sheaths, and larger devices	Stiffer rail with less forgiving behavior than a floppy working wire.
Lunderquist® Extra-Stiff Wire Guide	Maximum support for large-bore and aortic systems	Very rigid support wire used when device delivery demands an exceptionally stable rail.
Do Not Confuse	0.018-inch does not identify one wire type. The micropuncture wire and peripheral 0.018-inch working wire share diameter but serve different roles. Hydrophilic does not mean inherently safer. Low friction improves navigation but does not replace controlled technique. Support is not navigation. The procedure may intentionally exchange from a steerable wire to a stiffer rail once the target has been reached.	



Device Index

CHAPTER 02
Navigation, support, and exchange platforms

02-01	0.014-inch peripheral guidewire	02-02	0.018-inch micropuncture guidewire
02-03	0.018-inch peripheral guidewire	02-04	0.035-inch Bentson guidewire
02-05	0.035-inch hydrophilic guidewire	02-06	0.035-inch J-tip guidewire
02-07	0.035-inch Rosen guidewire	02-08	Amplatz stiff guidewire
02-09	Lunderquist® Extra-Stiff Wire Guide		

02

2. WIRES

02-01 0.014-inch peripheral guidewire

Low-profile peripheral wire



VISUAL RECOGNITION

Very low-profile 0.014-inch peripheral guidewire, typically steerable with a shapeable distal tip and available in long working lengths.

USE & PROCEDURAL CONTEXT

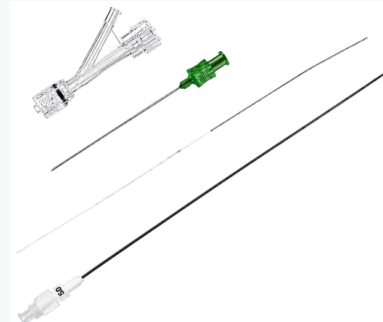
Supports lesion crossing, distal navigation, and delivery of compatible 0.014-inch devices, particularly in infrapopliteal, pedal, and other small-vessel peripheral arterial interventions.

KEY DISTINCTIONS

Compared with 0.018- and 0.035-inch peripheral guidewires, its low profile improves access to small distal vessels but provides less shaft support.

02-02 0.018-inch micropuncture guidewire

Micropuncture guidewire



VISUAL RECOGNITION

Very fine 0.018-inch guidewire, often supplied with a micropuncture set and visibly smaller than a 0.035- or 0.038-inch working guidewire; the distal segment is flexible and atraumatic.

USE & PROCEDURAL CONTEXT

An initial 0.018-inch wire passes through a 21-gauge micropuncture needle to secure access before exchange to a 0.035- or 0.038-inch working wire. Typical contexts include arterial or venous access, ports, dialysis access, fistulograms, nephrostomy, and biliary access.

KEY DISTINCTIONS

This is the initial micropuncture wire, not the definitive 0.035- or 0.038-inch working rail; its small caliber bridges the 21-gauge puncture to a coaxial dilator or transitional sheath.

02-03 0.018-inch peripheral guidewire

Intermediate-profile peripheral wire



VISUAL RECOGNITION

0.018-inch low-profile peripheral guidewire with a steerable, shapeable distal tip and more shaft support than a 0.014-inch wire.

USE & PROCEDURAL CONTEXT

Provides a low-profile but more supportive working platform for crossing stenoses and delivering compatible balloons, stents, and support catheters in peripheral arterial and venous interventions.

KEY DISTINCTIONS

The 0.018-inch peripheral platform occupies the middle ground between 0.014- and 0.035-inch systems, balancing low-profile device compatibility with greater support than a 0.014-inch guidewire.

02-04 0.035-inch Bentson guidewire

Floppy-tip working wire



VISUAL RECOGNITION

Standard 0.035-inch guidewire with a soft, floppy tip, usually coiled in a hoop dispenser.

USE & PROCEDURAL CONTEXT

General-purpose 0.035-inch guidewire with an atraumatic, floppy distal segment for initial access and routine catheter or sheath exchanges. Typical contexts include diagnostic angiography, venous access, drain placement, nephrostomy, and biliary drainage.

KEY DISTINCTIONS

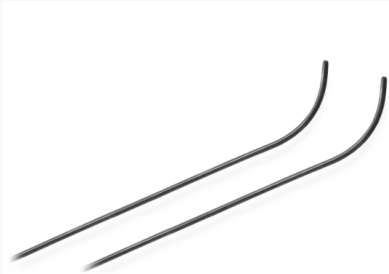
The long floppy distal segment favors atraumatic routine access and exchange, distinguishing the Bentson from stiffer support guidewires used as delivery rails.

2. WIRES

02-05

0.035-inch hydrophilic guidewire

Hydrophilic navigation wire



VISUAL RECOGNITION

0.035-inch guidewire with a lubricious hydrophilic coating and a flexible, atraumatic distal segment; straight- and angled-tip variants are common.

USE & PROCEDURAL CONTEXT

Used to navigate tortuous anatomy, direct catheters, and cross stenoses or obstructed ducts and ureters in vascular, biliary, genitourinary, and drainage procedures.

KEY DISTINCTIONS

Hydrophilic coating lowers friction and improves trackability but can reduce tactile feedback; this is a navigation wire, not a substitute for a stiff exchange rail.

02-06

0.035-inch J-tip guidewire

Atraumatic venous wire



VISUAL RECOGNITION

Standard 0.035-inch guidewire with a fixed, rounded J-shaped distal tip that is visually distinct from straight or angled-tip working guidewires.

USE & PROCEDURAL CONTEXT

Provides atraumatic guidewire access for routine venous procedures, particularly central venous catheter placement, implanted ports, tunneled dialysis catheters, and other situations where a rounded leading tip is preferred.

KEY DISTINCTIONS

The fixed J-shaped tip is the defining feature, providing a rounded atraumatic leading edge that differs from the straight or angled tips used for active steering and lesion crossing.

02-07

0.035-inch Rosen guidewire

Curved-tip support wire



VISUAL RECOGNITION

0.035-inch exchange/support guidewire with a curved atraumatic distal tip and a relatively supportive shaft.

USE & PROCEDURAL CONTEXT

Commonly used to preserve vascular or visceral access during catheter, sheath, or drain exchanges when more support is needed than a floppy working wire provides.

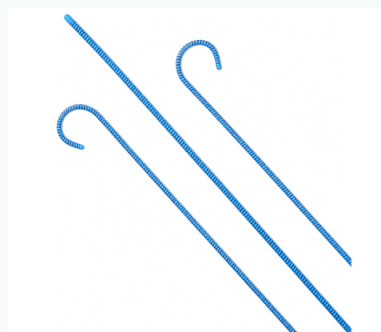
KEY DISTINCTIONS

The Rosen combines an atraumatic curved distal tip with a more supportive shaft, providing a steadier exchange rail than a Bentson while remaining less rigid than extra-stiff delivery guidewires.

02-08

Amplatz stiff guidewire

Stiff support wire



VISUAL RECOGNITION

Stiff 0.035-inch support guidewire with a short floppy distal segment and a noticeably more rigid shaft than routine floppy working guidewires.

USE & PROCEDURAL CONTEXT

Stiff 0.035-inch support guidewire that provides a stable rail for tract dilation and advancement of sheaths, drains, or large catheters. Typical procedural contexts include tunneled dialysis catheters, drains, nephrostomy, venous access, and stent or large-bore sheath delivery.

KEY DISTINCTIONS

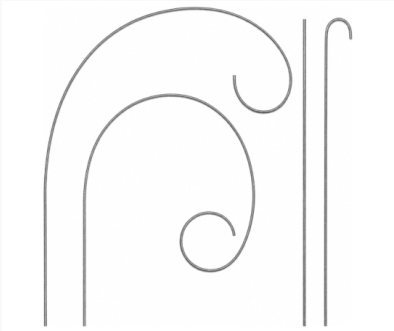
Compared with a Bentson-type working guidewire, the Amplatz provides substantially greater shaft support for dilation and device delivery while retaining a short flexible distal segment.

2. WIRES

02-09

Lunderquist® Extra-Stiff Wire Guide

Extra-stiff rail wire



VISUAL RECOGNITION

Extra-stiff 0.035-inch guidewire with a rigid, rod-like shaft and a short flexible distal segment; straight, curved, and double-curved configurations are available.

USE & PROCEDURAL CONTEXT

Very stiff fixed-core rail wire used to straighten tortuosity and support large-bore sheaths and endograft delivery. Typical contexts include EVAR/TEVAR, complex large-bore venous interventions, and other procedures requiring maximal rail support.

KEY DISTINCTIONS

Its exceptionally rigid shaft provides a stable delivery rail for large-bore devices, with substantially less flexibility than Amplatz or Bentson working guidewires.

ORIENTATION PAGES

Sheaths & Dilators

Orientation purpose: Sheaths and dilators create, enlarge, and maintain the working pathway through which other devices are introduced. The key distinction is between the component that remains as the working channel and the temporary components or accessories that establish, enlarge, or control that channel.

Key Principle

The sheath is the working conduit. The dilator helps establish that conduit and is generally removed once the sheath is positioned.

Anatomy of the Working Platform

Component	Function	What to notice
Sheath shaft	Maintains a channel from the access site toward the target.	Length, caliber, kink resistance, and whether support is local or extends closer to the target.
Hub and valve	Provides proximal device entry while limiting blood loss or fluid leakage.	Integrated valve versus a separate rotating hemostatic valve.
Sidearm	Supports flushing, aspiration, pressure monitoring, or selected injection.	Where the flush or pressure circuit enters the system.
Inner dilator	Provides a tapered transition over the wire during insertion.	It is an insertion component rather than the definitive working conduit.

Families in This Section

Family	Core use
Micropuncture introducer sheath	Preserves small-caliber initial access and supports transition to a larger wire or sheath.
Vascular introducer sheath	Workhorse access platform for routine diagnostic and interventional devices.
Long guiding sheath	Extends support closer to the target for more stable device delivery.
Large-bore vascular sheath	Provides the access profile required for thrombectomy systems and aortic or large venous devices.
Peel-Away® Sheath Introducer	Peels or splits away around a catheter that must remain in place after delivery.
Serial tract dilators	Enlarge a soft-tissue tract stepwise before a larger drain, catheter, or sheath.
Rotating hemostatic valve	Seals around a wire or catheter while allowing controlled movement through the system.
Watch For	What stays in? The sheath generally remains as the working conduit; the insertion dilator is removed after placement. What must pass next? The downstream device explains why sheath size, length, and support matter. Is the platform changing? Upsizing or moving to a longer guiding sheath usually signals a change in device profile, target, or support requirement.



Device Index

CHAPTER 03

Tract preparation and procedural access

03-01	Large-bore vascular sheath	03-02	Long guiding sheath
03-03	Micropuncture introducer sheath	03-04	Peel-Away® Sheath Introducer
03-05	Rotating hemostatic valve	03-06	Serial tract dilators
03-07	Vascular introducer sheath		

03

SHEATHS & DILATORS
RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

3. SHEATHS & DILATORS

03-01 Large-bore vascular sheath

Large-bore introducer



VISUAL RECOGNITION

Very large-caliber vascular sheath with a robust hemostatic hub and a long tapered dilator, visually scaled for large-profile delivery systems rather than routine diagnostic access.

USE & PROCEDURAL CONTEXT

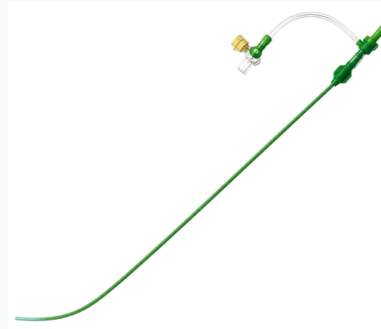
Large-diameter introducer for delivering large-profile systems such as pulmonary embolism (PE) or venous thrombectomy devices, venous stents, and endografts. Typical contexts include PE and ilio caval thrombectomy, EVAR/TEVAR, and other large-bore venous interventions.

KEY DISTINCTIONS

The defining distinction is delivery profile: this sheath is sized for large-bore thrombectomy, venous stenting, or endograft systems rather than routine diagnostic or small-device access.

03-02 Long guiding sheath

Deep-support guiding sheath



VISUAL RECOGNITION

Long reinforced sheath with a tapered dilator, radiopaque distal marker, and hemostatic hub; many versions have braided or kink-resistant construction.

USE & PROCEDURAL CONTEXT

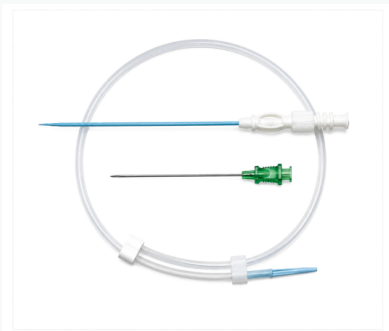
Provides stable deep access and longitudinal support for device delivery during peripheral arterial, venous, dialysis-access, biliary, and genitourinary interventions, especially when the sheath tip must extend closer to the target.

KEY DISTINCTIONS

A long guiding sheath extends support closer to the target than a standard introducer sheath; Destination® and Flexor® Ansel systems are representative examples of this deeper supportive platform.

03-03 Micropuncture introducer sheath

Transitional introducer sheath



VISUAL RECOGNITION

Short small-caliber sheath from the micropuncture kit, advanced over the 0.018-inch guidewire.

USE & PROCEDURAL CONTEXT

Preserves the initial micropuncture tract after 0.018-inch guidewire access and supports controlled upsizing to a larger guidewire or sheath. Typical contexts include vascular access, tunneled dialysis catheters, ports, fistulograms, and biliary or genitourinary access.

KEY DISTINCTIONS

This sheath is a transitional access component rather than the final working platform, preserving the initial 0.018-inch micropuncture pathway while enabling conversion to a larger guidewire or sheath.

03-04 Peel-Away® Sheath Introducer

Peel-away catheter introducer



VISUAL RECOGNITION

Peel-Away® sheath introducer with two winged tabs that split it lengthwise as it is withdrawn.

USE & PROCEDURAL CONTEXT

Peel-Away® introducer that delivers a catheter, then peels apart and is removed without disturbing it. Typical contexts include tunneled dialysis catheters, implanted ports, and tunneled central venous catheters.

KEY DISTINCTIONS

Unlike a conventional introducer sheath that is withdrawn intact, the Peel-Away® sheath separates longitudinally around the definitive catheter so the catheter can remain undisturbed.

3. SHEATHS & DILATORS

03-05 Rotating hemostatic valve

Inline hemostatic valve



VISUAL RECOGNITION

Straight adapter with a screw-down compression cap, often with a sidearm, that tightens around the shaft.

USE & PROCEDURAL CONTEXT

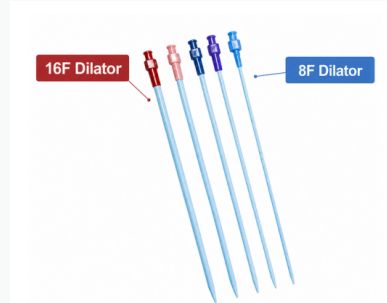
Creates an adjustable hemostatic seal around a guidewire or catheter while preserving the ability to advance, withdraw, and rotate the device. It is commonly incorporated into angiography, embolization, venous intervention, and sheath-based workflows.

KEY DISTINCTIONS

The compression cap seals around a guidewire or catheter while still permitting controlled translation and rotation, distinguishing it from a simple stopcock that redirects fluid flow between ports.

03-06 Serial tract dilators

Graduated tract dilators



VISUAL RECOGNITION

Graduated set of tapered tract dilators in sequentially increasing French sizes, usually arranged together so the progressive step-up in diameter is immediately apparent.

USE & PROCEDURAL CONTEXT

Sequentially enlarges a soft-tissue tract over a guidewire before placement of a larger catheter, drain, or sheath. Typical procedural contexts include drainage, tunneled dialysis catheter placement, nephrostomy, and large-bore venous access.

KEY DISTINCTIONS

Serial dilators are temporary tract-enlargement tools used sequentially over a guidewire; unlike a sheath or drain, they are removed after the desired tract diameter is established.

03-07 Vascular introducer sheath

Standard access sheath



VISUAL RECOGNITION

Typically short vascular sheath with a hemostatic valve, sidearm, and tapered inner dilator; available in multiple French sizes.

USE & PROCEDURAL CONTEXT

Establishes and preserves arterial or venous access for angiography and intervention, with sheath size selected to accommodate the planned catheter or device.

KEY DISTINCTIONS

The vascular introducer sheath is typically a short working-access platform; unlike a long guiding sheath, it is not intended to provide extended distal support near the treatment target.

ORIENTATION PAGES

Diagnostic Catheters

Orientation purpose: Diagnostic catheters use distal geometry, shaft behavior, and side-hole configuration to select anatomy, direct guidewires, and inject contrast. Learn the curve family first, then distinguish individual shapes by reach, target orientation, and whether the catheter is selective or flush.

Key Principle

Catheter shape is functional. A curve exists to engage, redirect, reform, brace against the vessel wall, or distribute contrast in a particular way.

Read the Geometry Before the Name

Geometry or family	Representative entries	Primary idea
Simple angled	Berenstein; Kumpe	Direct a wire or catheter into a branch or target pathway with a short angled tip.
Cobra and downgoing	Cobra 1; Cobra 2; Renal double curve (RDC)	Engage aortic branches with caudal or specifically oriented origins.
Supported visceral	Mikaelsson; Shepherd hook	Use compound or hooked geometry to engage and stabilize at visceral ostia.
Arch-selective	Headhunter 1; Vertebral	Engage vertebral, subclavian, and other arch-branch origins.
Reverse curve	Simmons 1; Simmons 2; Simmons 3; SOS Omni®	Reform a secondary curve to reach branch origins that resist a simple angled approach.
Multipurpose	Multipurpose angiographic catheter	Provide a general-use curve when more specialized geometry is unnecessary.
Pigtail flush	Flush pigtail angiographic catheter	Distribute contrast broadly through a looped, multi-side-hole distal segment.
Curved flush	Omni Flush catheter	Combine broad side-hole contrast delivery with a curve suited to aortic-bifurcation work.

Then Ask What Job the Catheter Is Doing

Selection. Engaging a branch vessel, ostium, duct, ureter, or target lumen.

Wire direction. Pointing the guidewire toward the desired branch or across a difficult angle.

Ostial stability. Using a secondary curve or opposing-wall contact to help the tip remain engaged.

Arch selection. Targeting vertebral, subclavian, and other branch-vessel origins.

Visceral selection. Engaging mesenteric, renal, or other abdominal branch targets with dedicated geometry.

Flush imaging. Distributing a larger contrast bolus across a broad vascular territory.

Do Not Confuse

Selective and flush catheters are not equivalent. A selective shape targets a branch; a flush catheter distributes contrast broadly.

Omni Flush and SOS Omni® are different. Omni Flush is a side-hole flush catheter; SOS Omni® is an end-hole selective reverse-curve catheter.

Similar curves are not interchangeable. Access route, side holes, coating, shaft support, and exact geometry change catheter behavior.

4. DIAGNOSTIC CATHETERS



Device Index

CHAPTER 04

Selective navigation and angiography

04-01

Berenstein catheter

04-02

Cobra 1 catheter

04-03

Cobra 2 catheter

04-04

Flush pigtail angiographic catheter

04-05

Headhunter 1 catheter

04-06

Kumpe catheter

04-07

Mikaelsson catheter

04-08

Multipurpose angiographic catheter

04-09

Omni Flush catheter

04-10

Renal double curve (RDC) catheter

04-11

Shepherd hook catheter

04-12

Simmons 1 catheter

04-13

Simmons 2 catheter

04-14

Simmons 3 catheter

04-15

SOS Omni® catheter

04-16

Vertebral catheter

04

DIAGNOSTIC CATHETERS

RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

4. DIAGNOSTIC CATHETERS

04-01 Berenstein catheter

Angled selective catheter



VISUAL RECOGNITION

Typically 4- or 5-F catheter with a short, gently angled tip, similar in use to a Kumpe.

USE & PROCEDURAL CONTEXT

Single gentle angled-tip catheter for selecting branch vessels and directing wires in vascular and nonvascular anatomy. Typical procedural contexts include selective vascular access, biliary/GU wire direction, and general angiography.

KEY DISTINCTIONS

The Berenstein's short, gentle angled tip provides general branch selection and guidewire direction without the larger reverse curves or specialized visceral hooks of more complex catheter shapes.

04-02 Cobra 1 catheter

Visceral selective catheter



VISUAL RECOGNITION

Pre-shaped catheter with a Cobra-family downgoing hook and a shallower, less pronounced secondary curve than a Cobra 2.

USE & PROCEDURAL CONTEXT

Selects aortic branch vessels with caudal or oblique origins, including celiac, mesenteric, renal, adrenal, and other visceral branches. Typical contexts include visceral angiography, embolization, and venous sampling.

KEY DISTINCTIONS

The Cobra 1 is the smaller, shallower member of the Cobra family; compared with a Cobra 2, it offers less hook depth and reach while retaining direct downgoing selection.

04-03 Cobra 2 catheter

Visceral selective catheter



VISUAL RECOGNITION

Pre-shaped diagnostic catheter with the characteristic Cobra 2 distal configuration, including a hooked downgoing curve that reforms after the guidewire is withdrawn.

USE & PROCEDURAL CONTEXT

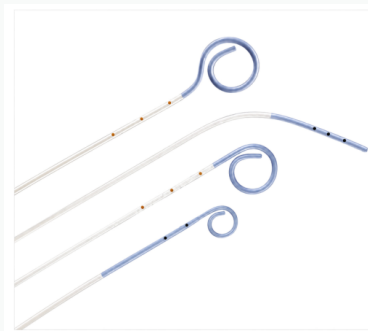
Downgoing-curve catheter for selecting aortic visceral branches, including the celiac, superior mesenteric (SMA), and renal arteries. Typical contexts include GI bleeding, trauma angiography, and visceral embolization.

KEY DISTINCTIONS

The Cobra 2 is defined by its downgoing hooked geometry for visceral branch engagement, in contrast to simple angled catheters used primarily for general wire direction.

04-04 Flush pigtail angiographic catheter

High-flow flush catheter



VISUAL RECOGNITION

Angiographic catheter with a curled pigtail distal tip and multiple side holes distributed near the loop, distinguishing it from end-hole selective catheters.

USE & PROCEDURAL CONTEXT

High-flow flush catheter for aortography and venography; multiple side holes disperse contrast and reduce focal jetting. Typical contexts include aortography, pelvic angiography, cavography, and venography.

KEY DISTINCTIONS

Unlike a selective end-hole catheter, the pigtail's multiple side holes distribute contrast broadly rather than directing a single focal jet.

4. DIAGNOSTIC CATHETERS

04-05 Headhunter 1 catheter

Arch-branch catheter



VISUAL RECOGNITION

Pre-shaped catheter with the characteristic Headhunter 1 distal hook, a compact angled configuration designed to engage branch-vessel ostia.

USE & PROCEDURAL CONTEXT

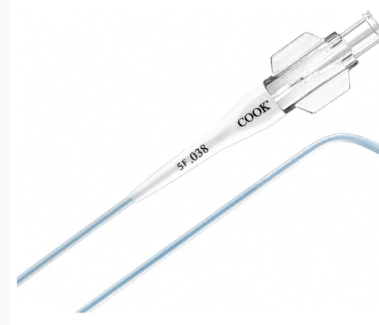
Angled hunting curve for selecting aortic arch branches, the subclavian artery, and similar takeoffs. Typical procedural contexts include aortic arch and upper-extremity angiography, with occasional visceral selection.

KEY DISTINCTIONS

The compact H1 hook is the defining geometry, favoring engagement of arch branches, subclavian origins, and similar takeoffs rather than broad flush injection or reverse-curve selection.

04-06 Kumpe catheter

Versatile angled catheter



VISUAL RECOGNITION

Simple single angled-tip (KMP) catheter, one of the most broadly used shapes in IR.

USE & PROCEDURAL CONTEXT

Versatile angled-tip catheter for vessel selection, wire direction, crossing, and exchanges in vascular and nonvascular procedures. Typical contexts include angiography, drain placement, genitourinary (GU) and biliary access, fistulograms, and venous interventions.

KEY DISTINCTIONS

The Kumpe combines a simple angled distal geometry with broad versatility for selection, guidewire direction, crossing, and exchange across both vascular and nonvascular workflows.

04-07 Mikaelsson catheter

Supported visceral catheter



VISUAL RECOGNITION

Compound selective catheter with a short distal hook and a prominent posterior-facing secondary bulge that braces against the opposite aortic wall.

USE & PROCEDURAL CONTEXT

Used to select small aortic branch ostia, particularly bronchial, celiac, superior mesenteric, and inferior mesenteric vessels, during diagnostic angiography and embolization.

KEY DISTINCTIONS

The posterior secondary curve provides counterforce that helps keep the tip seated in a small ostium; unlike a Simmons catheter, it does not depend on a broad reverse-curve loop.

04-08 Multipurpose angiographic catheter

General diagnostic catheter



VISUAL RECOGNITION

Relatively simple angiographic catheter with a gentle distal curve and a single end-hole, lacking the more complex hooks or reverse curves of specialized selective catheters.

USE & PROCEDURAL CONTEXT

Simple gently curved catheter for general diagnostic catheterization, contrast injection, and branch selection when an elaborate shape is unnecessary. Typical procedural contexts include broad vascular and nonvascular diagnostic use.

KEY DISTINCTIONS

Its gentle curve and end-hole design make the multipurpose catheter a generalist option when a dedicated visceral, reverse-curve, or flush geometry is unnecessary.

4. DIAGNOSTIC CATHETERS

04-09 Omni Flush catheter

Curved flush catheter



VISUAL RECOGNITION

Curved multi-side-hole flush catheter with a compact looped distal tip and a short return segment beside the shaft, rather than a pigtail coil.

USE & PROCEDURAL CONTEXT

Performs flush aortography and bilateral lower-extremity runoff imaging and can facilitate contralateral iliac selection after crossing the aortic bifurcation.

KEY DISTINCTIONS

Omni Flush is a flush catheter for broad contrast delivery and bifurcation work; do not confuse it with the end-hole SOS Omni® selective reverse-curve catheter.

04-10 Renal double curve (RDC) catheter

Renal-selective catheter



VISUAL RECOGNITION

Pre-shaped catheter with a compound renal double-curve configuration, producing a recognizable two-curve distal profile rather than a simple single-angle tip.

USE & PROCEDURAL CONTEXT

Pre-shaped double-curve catheter for engaging downgoing renal artery origins and similar ostia. Typical procedural contexts include renal angiography and intervention, as well as visceral selection.

KEY DISTINCTIONS

The compound RDC geometry is specifically shaped to engage downgoing renal artery origins and similar ostia, distinguishing it from simple angled or reverse-curve catheters.

04-11 Shepherd hook catheter

Visceral hook catheter



VISUAL RECOGNITION

Pre-shaped catheter with a tight shepherd's-crook bend and a short inward-facing distal tip.

USE & PROCEDURAL CONTEXT

Engages sharply downward or angulated aortic branch origins, including selected celiac, mesenteric, renal, and other visceral ostia, for angiography and embolization.

KEY DISTINCTIONS

Its compact hook engages steep takeoffs directly; unlike Simmons and SOS catheters, it does not require a broad secondary reverse curve to obtain reach.

04-12 Simmons 1 catheter

Small reverse-curve catheter



VISUAL RECOGNITION

Reverse-curve catheter with the most compact secondary loop in the Simmons family; the shape reforms in the aorta or aortic arch before selection.

USE & PROCEDURAL CONTEXT

Selects arch, visceral, renal, and mesenteric branch origins when a simple angled catheter lacks the required reach or approach angle.

KEY DISTINCTIONS

Simmons 1 provides the least reach and smallest reforming loop of the common Simmons 1–3 series; Simmons 2 and 3 progressively enlarge the secondary curve.

4. DIAGNOSTIC CATHETERS

04-13 Simmons 2 catheter

Reverse-curve catheter



VISUAL RECOGNITION

Reverse-curve catheter with a larger secondary loop than a Simmons 1; after reforming in the aortic arch, the distal hook engages branch ostia.

USE & PROCEDURAL CONTEXT

Mid-size reverse-curve catheter providing more reach than a Simmons 1 for arch and visceral branch selection. Typical contexts include arch angiography, visceral angiography, and difficult branch selection.

KEY DISTINCTIONS

The Simmons 2 uses a larger secondary reverse curve than a Simmons 1, providing additional reach when branch origins cannot be engaged with simpler catheter shapes.

04-14 Simmons 3 catheter

Large reverse-curve catheter



VISUAL RECOGNITION

Reverse-curve catheter with a larger, deeper secondary loop than a Simmons 2 after reformation.

USE & PROCEDURAL CONTEXT

Provides extended reach for difficult arch and visceral branch origins, including celiac, mesenteric, and renal targets, when smaller Simmons curves are insufficient.

KEY DISTINCTIONS

Simmons 3 offers the greatest reach of the common Simmons 1–3 set but requires more space to reform; curve number reflects geometry, not catheter size alone.

04-15 SOS Omni® catheter

Reverse-curve visceral catheter



VISUAL RECOGNITION

Pre-shaped diagnostic catheter with the distinctive SOS Omni® reverse-curve configuration, recognizable by its broad secondary curve and hooked distal geometry.

USE & PROCEDURAL CONTEXT

Provides reverse-curve visceral branch selection during diagnostic angiography and embolization. Typical contexts include gastrointestinal bleeding, trauma, and other visceral arterial procedures requiring reliable engagement of branch origins.

KEY DISTINCTIONS

Its broad reverse-curve geometry is designed to reform and hook visceral branch origins, distinguishing it from simpler single-angle or multipurpose diagnostic catheters.

04-16 Vertebral catheter

Arch-branch selective catheter



VISUAL RECOGNITION

Slender catheter with a gentle distal bend and short angled tip, creating a more gradual profile than a Headhunter hook.

USE & PROCEDURAL CONTEXT

Selects vertebral, subclavian, and other arch branches and is also used for uterine, visceral, and venous branch navigation.

KEY DISTINCTIONS

The Vertebral curve is gentle and directional without a large secondary loop; it is less hook-like than Headhunter and less complex than Simmons or SOS shapes.

ORIENTATION PAGES

Microcatheters, Microwires & Crossing Systems

Orientation purpose: Low-profile systems extend a larger base catheter or sheath into smaller, more distal, more tortuous anatomy or across challenging lesions. The central concept is nesting: each component must be compatible with the component inside it, the base system behind it, and the payload or therapy it is expected to deliver.

Key Principle

Compatibility must be continuous from the base sheath or guiding catheter through the microcatheter, microguidewire, crossing device, and intended distal payload.

The Nested Low-Profile System

Base platform	Working catheter	Wire or crossing tool	Distal task
Guiding catheter or sheath	Coaxial or torqueable microcatheter	Microguidewire	Superselective imaging or embolic delivery
Guiding catheter or sheath	Crossing support catheter	0.014-, 0.018-, or compatible working guidewire	Support a difficult stenosis or chronic occlusion crossing
Guiding catheter or sheath	CTO re-entry device	System-specific wire or re-entry component	Return from a subintimal plane to the distal true lumen
Base catheter or sheath	Balloon-occlusion microcatheter	Compatible microguidewire	Distal delivery with temporary flow control

Compatibility Checklist

Check	Why it matters
Wire platform	The wire must fit and function within the selected catheter or crossing system.
Inner diameter	Determines which wires, coils, particles, or other payloads can pass.
Working length	The low-profile catheter must extend beyond the base system and still reach the target.
Pressure and solvent compatibility	Liquid embolics, dimethyl sulfoxide (DMSO), and high-pressure injection require specifically compatible systems.
Dead space	Internal volume matters when flushing and delivering small-volume embolics precisely.
Tip control	Torqueable or balloon-occlusion designs add steering or flow-control capability beyond a basic coaxial microcatheter.
Do Not Confuse	Microguidewire and 0.018-inch peripheral wire are not the same concept. Diameter alone does not establish device class, length, tip design, or intended use. A crossing support catheter is not interchangeable with an embolization microcatheter. Its primary job is lesion support, wire exchange, or crossing assistance rather than distal embolic delivery. A CTO re-entry device has a specific rescue role. It is designed to redirect the pathway back into the true lumen after subintimal passage.



Device Index

CHAPTER 05

Low-profile navigation and lesion crossing

05-01	Balloon-occlusion microcatheter	05-02	Chronic total occlusion (CTO) re-entry device
05-03	Coaxial microcatheter	05-04	Crossing support catheter
05-05	Microguidewire	05-06	Torqueable microcatheter

05

MICROCATHETERS, MICROWIRES & CROSSING SYSTEMS
RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

5. MICROCATHETERS, MICROWIRES & CROSSING SYSTEMS

05-01

Balloon-occlusion microcatheter

Balloon microcatheter



VISUAL RECOGNITION

Low-profile microcatheter with an integrated compliant distal balloon for temporary occlusion and flow control.

USE & PROCEDURAL CONTEXT

Provides temporary balloon occlusion at the microcatheter tip for balloon-assisted embolization, pressure-directed embolic delivery, and selective flow modulation in complex vascular territories.

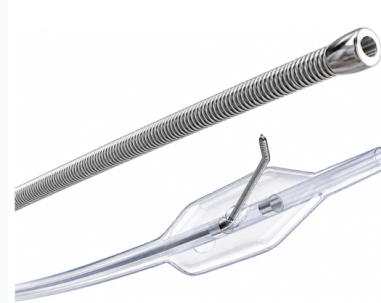
KEY DISTINCTIONS

The device combines distal microcatheter access with temporary balloon occlusion; individual systems differ in balloon geometry, lumen configuration, and compatible embolic platforms.

05-02

Chronic total occlusion (CTO) re-entry device

True-lumen re-entry device



VISUAL RECOGNITION

Catheter with a side-exit port and an advanceable re-entry needle or curved cannula, used under orthogonal fluoroscopy.

USE & PROCEDURAL CONTEXT

Dedicated catheter that, after subintimal passage around a chronic total occlusion, directs a needle or wire from the subintimal space back into the true lumen distal to the blockage. Typical procedural contexts include femoropopliteal and iliac chronic total occlusions when the wire tracks subintimally.

KEY DISTINCTIONS

The defining feature is a side-exit re-entry mechanism that directs a needle or guidewire from a subintimal track back into the distal true lumen after CTO crossing.

05-03

Coaxial microcatheter

Coaxial microcatheter



VISUAL RECOGNITION

Fine catheter run through a base catheter, paired with a rotating hemostatic adapter and microwire.

USE & PROCEDURAL CONTEXT

General coaxial microcatheter for reaching distal vessels for superselective angiography or embolic delivery. Typical contexts include gastrointestinal (GI), uterine, prostate, tumor, and trauma embolization.

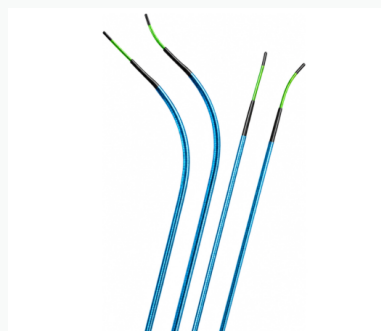
KEY DISTINCTIONS

The coaxial microcatheter is a distal delivery platform for superselection, angiography, and embolic delivery through a larger base catheter, rather than a lesion-crossing support catheter built primarily for pushability.

05-04

Crossing support catheter

Low-profile support catheter



VISUAL RECOGNITION

Thin, kink-resistant catheter compatible with 0.014- to 0.035-inch guidewires, with a tapered, often hydrophilic tip, tracked over the working wire.

USE & PROCEDURAL CONTEXT

Low-profile support catheter advanced over a guidewire to add pushability, protect the wire, and help cross tight, calcified, or chronically occluded segments. Typical procedural contexts include peripheral chronic total occlusions, tortuous or calcified lesions, and difficult wire crossings.

KEY DISTINCTIONS

A crossing support catheter adds pushability and wire support across difficult lesions while also permitting wire exchange or selective injection, unlike a microcatheter used primarily for distal embolic delivery.

5. MICROCATETERS, MICROWIRES & CROSSING SYSTEMS

05-05

Microguidewire

Shapeable microguidewire



VISUAL RECOGNITION

Very fine, torqueable microguidewire with a shapeable distal tip, sized for passage through a compatible microcatheter and visibly smaller than standard 0.035-inch guidewires.

USE & PROCEDURAL CONTEXT

Provides fine distal navigation through a compatible microcatheter for superselective catheterization and small-vessel angiography, particularly when a low-profile, shapeable guidewire is required to enter tortuous or angled branches.

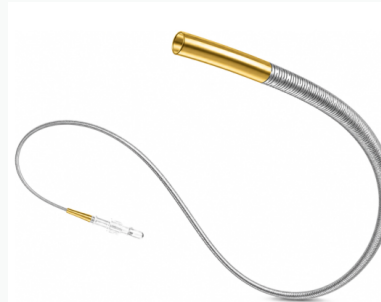
KEY DISTINCTIONS

The microguidewire is designed for distal navigation through a microcatheter and typically prioritizes steerability and trackability over the broad device support of a standard 0.035-inch access or exchange wire.

05-06

Torqueable microcatheter

Torqueable microcatheter



VISUAL RECOGNITION

Low-profile microcatheter with a torque-responsive, often pre-angled distal tip and a proximal torque-control element that allows deliberate rotational steering.

USE & PROCEDURAL CONTEXT

Provides rotationally responsive distal navigation for superselective catheterization when fixed-tip microcatheters are difficult to direct. Typical contexts include gastrointestinal, pelvic, hepatic, and tumor embolization.

KEY DISTINCTIONS

The defining feature is torque transmission to the distal tip, allowing deliberate rotational branch selection beyond what a fixed-shape coaxial microcatheter can provide.

ORIENTATION PAGES

Contrast & Table Setup

Orientation purpose: These devices organize contrast delivery, flushing, pressure transmission, and fluid routing across the sterile field. The most useful approach is to trace where fluid or pressure originates, which component controls it, and where the pathway ultimately terminates.

Key Principle

Table-side fluid and pressure tubing form functional circuits. Manifolds, stopcocks, connectors, injectors, pressure bags, and transducers control flow, pressure, sterility, routing, and measurement.

Core Table Circuits and Delivery Pathways

Circuit	Core components	What it accomplishes
Injection and flush	Hand-injection contrast syringe; contrast power injector; power-injector tubing; angiographic manifold; three-way stopcock; Luer-lock connector; pressure infusion bag	Routes contrast and flush through the catheter or sheath while maintaining a controlled sterile connection.
Pressure measurement	Pressure infusion bag; pressure transducer system; stopcocks; fluid-filled tubing; catheter or sheath	Transmits intravascular pressure to the transducer while preserving a flush pathway and reference level.
Alternative contrast	CO ₂ angiography delivery system	Provides a dedicated controlled gas-delivery pathway for selected angiographic applications.

Follow the Path

Component	Ask yourself
Angiographic manifold	Which ports connect to contrast, flush, pressure, and waste, and which pathway is currently open?
Three-way stopcock	Which port is closed, and what route will fluid follow when the handle is turned?
Luer-lock connector	Is the connection secure and appropriate for the intended pressure and fluid pathway?
Power injector and tubing	Is every component in the connected pathway labeled for the intended injection pressure?
Pressure transducer system	Which catheter or sheath is transmitting the pressure, and where is the transducer referenced?
Learner Focus	Name the circuit before the component. Ask whether the team is injecting, flushing, aspirating, measuring pressure, redirecting fluid, or discarding waste. Do not infer pressure capability from appearance. Power injection and pressure ratings are labeled device properties. Do not treat CO₂ as ordinary syringe contrast. It requires a dedicated controlled delivery system and a different imaging appearance.

6. CONTRAST & TABLE SETUP

	Device Index	CHAPTER 06 Contrast delivery, flushing, and pressure systems
--	---------------------	--

06-01	Angiographic manifold	06-02	CO ₂ angiography delivery system
06-03	Contrast power injector	06-04	Hand-injection contrast syringe
06-05	Luer-lock connector	06-06	Power-injector tubing
06-07	Pressure infusion bag	06-08	Pressure transducer system
06-09	Three-way stopcock		

06

6. CONTRAST & TABLE SETUP

06-01 Angiographic manifold

Multi-port angiographic manifold



VISUAL RECOGNITION

Compact inline plastic manifold with multiple ports and color-coded or directional stopcock levers, creating a central control block for several connected fluid pathways.

USE & PROCEDURAL CONTEXT

Multi-port control center for switching among contrast, flush, and pressure monitoring without breaking the sterile circuit during angiography. Typical procedural contexts include diagnostic angiography, venography, and arterial interventions.

KEY DISTINCTIONS

A manifold consolidates several fluid pathways into one controllable hub, allowing repeated switching among contrast, flush, pressure, and waste without repeatedly disconnecting the sterile circuit.

06-02 CO₂ angiography delivery system

Negative-contrast delivery system



VISUAL RECOGNITION

Dedicated closed CO₂ delivery setup, typically consisting of a purpose-built injector or controlled syringe-and-tubing system rather than a conventional iodinated-contrast syringe alone.

USE & PROCEDURAL CONTEXT

Non-nephrotoxic, non-allergenic gas injected as a negative contrast agent that displaces blood to opacify vessels, used when iodinated contrast is undesirable or contraindicated. Typical procedural contexts include angiography or intervention when iodinated contrast is undesirable, including renal insufficiency or severe contrast allergy, as well as venography and endoleak evaluation.

KEY DISTINCTIONS

CO₂ is a negative contrast agent, so the angiographic column appears lucent rather than radiopaque; the dedicated delivery system is therefore distinct from standard iodinated-contrast injection equipment.

06-03 Contrast power injector

Automated contrast injector



VISUAL RECOGNITION

Programmable injector with a powered syringe or reservoir, pressure controls, and connection to high-pressure tubing.

USE & PROCEDURAL CONTEXT

Delivers programmable, reproducible contrast volumes and flow rates through compatible high-pressure tubing and catheters for angiography, venography, and selected fluoroscopic or cross-sectional injections.

KEY DISTINCTIONS

Unlike hand injection, a power injector delivers programmed flow and volume under defined pressure limits; the catheter and tubing must be rated for the intended high-pressure injection.

06-04 Hand-injection contrast syringe

Hand-injection syringe



VISUAL RECOGNITION

Labeled syringe of contrast, kept visually distinct from saline on the table.

USE & PROCEDURAL CONTEXT

Hand-injects iodinated contrast through catheters, sheaths, drains, or biliary/urinary tubes for real-time fluoroscopic imaging. Typical procedural contexts include angiography, venography, drain checks, nephrostograms, and cholangiograms.

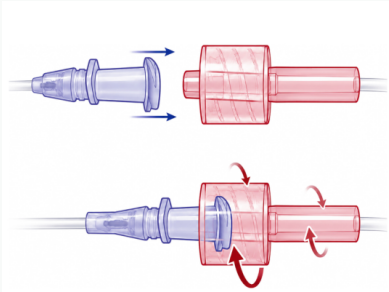
KEY DISTINCTIONS

Hand injection gives the operator immediate tactile and fluoroscopic control over a small contrast bolus, unlike a power injector that delivers a programmed volume and flow rate.

6. CONTRAST & TABLE SETUP

06-05 Luer-lock connector

Locking fluid connector



VISUAL RECOGNITION

Small threaded male-and-female Luer fitting at a syringe, tubing, stopcock, or catheter junction; the interlocking threads distinguish it from a simple slip connection.

USE & PROCEDURAL CONTEXT

Threaded fitting that secures fluid connections and reduces inadvertent separation during injection. Typical procedural contexts include syringes, tubing, stopcocks, manifolds, drains, and catheters across the IR table.

KEY DISTINCTIONS

The threaded lock is the critical distinction: it helps prevent inadvertent separation under pressure, unlike a nonlocking slip-fit junction.

06-06 Power-injector tubing

High-pressure injector tubing



VISUAL RECOGNITION

Pressure-rated connector tubing linking the power-injector head to the catheter or manifold, typically longer and more robust than routine low-pressure extension tubing.

USE & PROCEDURAL CONTEXT

Connects the contrast power injector to a compatible catheter or manifold and transmits automated high-pressure contrast injections. Typical contexts include angiography, venography, and selected CT-guided injections.

KEY DISTINCTIONS

Power-injector tubing is specifically pressure-rated for automated contrast delivery; routine extension tubing should not be assumed to tolerate the same injection pressures.

06-07 Pressure infusion bag

Pressurized flush bag



VISUAL RECOGNITION

Inflatable cuff around a saline bag with a hand-pump bulb and gauge.

USE & PROCEDURAL CONTEXT

Pressurized bag that maintains continuous flush through sheaths, catheters, or pressure-monitoring lines to keep them clot-free. Typical procedural contexts include angiography, embolization, and arterial or venous interventions.

KEY DISTINCTIONS

The pressure infusion bag provides sustained pressurization of a fluid bag for continuous flush, not the brief high-flow bolus generated by a contrast power injector.

06-08 Pressure transducer system

Invasive pressure-monitoring system



VISUAL RECOGNITION

Fluid-filled pressure tubing connected to a disposable transducer, stopcocks, flush system, and monitor.

USE & PROCEDURAL CONTEXT

Converts fluid pressure within a catheter or vascular line into a continuously displayed waveform and numeric pressure measurement. It is used during portal, venous, arterial, and other hemodynamic assessments, including TIPS workflows.

KEY DISTINCTIONS

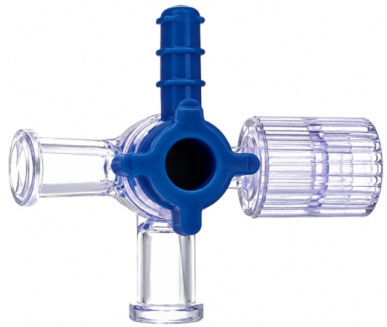
The transducer is the measuring component and must be leveled and zeroed correctly; the pressure infusion bag only maintains the continuous flush and does not itself generate the pressure reading.

6. CONTRAST & TABLE SETUP

06-09

Three-way stopcock

Three-port flow valve



VISUAL RECOGNITION

Small three-port valve with a rotating selector handle; the handle position provides the principal visual clue to which fluid pathway is closed.

USE & PROCEDURAL CONTEXT

Three-port valve that directs flow among syringe, catheter, and tubing for injection, flushing, aspiration, or pressure measurement. Typical procedural contexts include contrast and saline injection, flushing, aspiration, and pressure transduction.

KEY DISTINCTIONS

The selector handle determines which port is closed, making orientation of the handle the critical operational distinction from a simple fixed connector.

ORIENTATION PAGES

Embolics

Orientation purpose: Embolic agents and occlusion devices intentionally alter blood flow, occlude abnormal channels, or deliver locoregional therapy. Begin by identifying the embolic family, then determine how it is prepared, what catheter or delivery system it requires, and whether the intended effect is temporary, permanent, mechanical, chemical, or radiotherapeutic.

Key Principle

Embolic families are defined by mechanism and delivery behavior, not by proprietary product name alone.

Core Embolic Families

Family	Entries in this section	Recognition logic
Mechanical	Embolization coils; vascular plug	Discrete implanted devices that create focal or segmental occlusion.
Particulate	Calibrated embolic microspheres; drug-eluting embolic microspheres; PVA particles	Vials or syringes labeled by micrometer size range, delivered distally through a compatible catheter.
Liquid and adhesive	n-Butyl cyanoacrylate (n-BCA) liquid embolic; Onyx™ liquid embolic system	Liquids that form an occlusive cast or adhesive polymer and require material-specific preparation and catheter compatibility.
Sclerosant	Absolute ethanol; sodium tetradecyl sulfate	Chemical agents used to injure endothelium or lining surfaces and promote sclerosis.
Temporary	Absorbable gelatin sponge embolic	Resorbable material prepared as pledgets, slurry, or another delivery form.
Radioembolization workflow	Technetium-99m MAA; yttrium-90 radioembolization microspheres	MAA models distribution during mapping; Y-90 microspheres deliver therapeutic radiation.
Carrier and radiopaque adjunct	Ethiodized oil (LIPIODOL®)	Viscous radiopaque oil used as a carrier or imaging component in selected embolization and lymphatic workflows.

Before Delivery, Read the System

Particle size. Usually reported in micrometers and helps explain expected distal penetration.

Coil or plug dimensions. Describe the implant used to anchor or fill the target segment.

Catheter compatibility. Inner diameter, pressure rating, solvent compatibility, and dead space determine compatibility with the intended embolic.

Preparation. Adhesives, liquid embolics, sclerosants, and particulate suspensions have different mixing, flushing, and handling requirements.

Endpoint. The intended endpoint may be proximal occlusion, distal bed embolization, flow reduction, sclerosis, or radiotherapeutic delivery.

Do Not Confuse

MAA is a mapping agent, not Y-90 therapy. Both belong to the radioembolization workflow but perform different jobs.

Particles are not mechanical implants. Microspheres and PVA embolize a vascular bed; coils and plugs occupy a defined vessel segment.

Temporary and permanent are different treatment concepts. Material behavior and intended duration of occlusion matter.

7. EMBOLICS

	Device Index	CHAPTER 07 <i>Occlusion agents and locoregional delivery</i>
--	---------------------	--

07-01	Absolute ethanol	07-02	Absorbable gelatin sponge embolic
07-03	Calibrated embolic microspheres	07-04	Drug-eluting embolic microspheres
07-05	Embolization coils (pushable and detachable)	07-06	Ethiodized oil (LIPIODOL®)
07-07	n-Butyl cyanoacrylate (n-BCA) liquid embolic	07-08	Onyx™ liquid embolic system
07-09	Polyvinyl alcohol (PVA) particles	07-10	Sodium tetradecyl sulfate sclerosant
07-11	Technetium-99m MAA	07-12	Vascular plug
07-13	Yttrium-90 radioembolization microspheres		

07

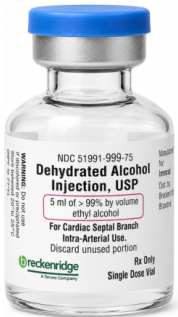
EMBOLICS

RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

7. EMBOLICS

07-01 Absolute ethanol

Liquid sclerosant



VISUAL RECOGNITION

Clear, colorless dehydrated alcohol supplied in a vial or syringe; the liquid itself has few distinctive visual features, so recognition depends heavily on labeling and procedural context.

USE & PROCEDURAL CONTEXT

Acts as a potent liquid sclerosant that produces permanent endothelial injury and target obliteration. Typical procedural contexts include treatment of venous and lymphatic malformations and selected ablation or sclerosis applications.

KEY DISTINCTIONS

Ethanol is a liquid sclerosant that produces permanent endothelial injury rather than mechanical occlusion with a coil, plug, or particulate embolic.

07-02 Absorbable gelatin sponge embolic

Temporary gelatin embolic



VISUAL RECOGNITION

Soft absorbable gelatin sponge supplied as sheets, blocks, or hand-cut pledgets that can be fragmented or prepared into a slurry before embolic delivery.

USE & PROCEDURAL CONTEXT

Provides absorbable particulate or pledget embolization for temporary mechanical occlusion. Typical contexts include control of bleeding, preoperative embolization, and selected trauma procedures in which permanent occlusion is not required.

KEY DISTINCTIONS

Gelatin sponge is absorbable and generally used for temporary embolic effect, distinguishing it from permanent particles, coils, plugs, and liquid embolic agents.

07-03 Calibrated embolic microspheres

Calibrated embolic microspheres



VISUAL RECOGNITION

Pre-filled vial or syringe of uniform microspheres suspended in fluid, labeled by micron size range (e.g., 100-300, 300-500 μ m).

USE & PROCEDURAL CONTEXT

Calibrated, non-resorbable microspheres for predictable distal embolization at a selected arteriolar level. Typical procedural contexts include UFE, PAE, hypervascular tumor embolization, and control of hypervascular bleeding.

KEY DISTINCTIONS

Calibrated microspheres are manufactured in defined, relatively uniform size ranges, unlike irregular PVA particles, allowing more predictable selection of the intended distal embolization level.

07-04 Drug-eluting embolic microspheres

Chemoembolic microspheres



VISUAL RECOGNITION

Vial or syringe containing calibrated embolic microspheres that have been loaded with chemotherapy, usually prepared as a suspension immediately before transarterial delivery.

USE & PROCEDURAL CONTEXT

Calibrated beads that lodge in tumor-feeding arteries while eluting loaded chemotherapy (chemoembolization). Typical procedural contexts include transarterial chemoembolization (TACE) of liver tumors.

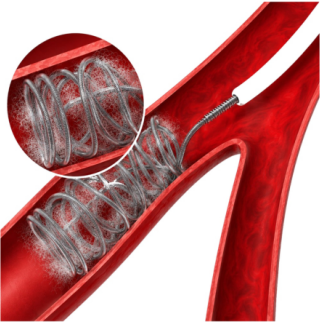
KEY DISTINCTIONS

These are calibrated microspheres that also serve as a chemotherapy-delivery platform, combining particulate embolization with local drug elution rather than functioning as inert particles alone.

7. EMBOLICS

07-05 Embolization coils (pushable and detachable)

Pushable and detachable coils



VISUAL RECOGNITION

Metallic coils delivered through a catheter or microcatheter; pushable coils are advanced irreversibly, whereas detachable coils remain connected until intentional release.

USE & PROCEDURAL CONTEXT

Provides focal or segmental mechanical occlusion using pushable or detachable coils. Typical applications include vessel sacrifice, pseudoaneurysm or aneurysm embolization, bleeding control, variceal or collateral embolization, and other targeted occlusion tasks.

KEY DISTINCTIONS

Pushable coils are advanced irreversibly once released from the delivery catheter, whereas detachable coils permit controlled positioning and potential repositioning before final detachment.

07-06 Ethiodized oil (LIPIODOL®)

Radiopaque carrier oil



VISUAL RECOGNITION

Viscous, oily, highly radiopaque contrast medium supplied in a glass vial; its dense appearance and syrup-like handling distinguish it from standard aqueous contrast.

USE & PROCEDURAL CONTEXT

Radiopaque oil that serves as a TACE drug carrier and marker and as a lymphangiographic contrast for mapping or sealing leaks. Typical procedural contexts include TACE, glue-embolic mixtures, and lymphangiography.

KEY DISTINCTIONS

LIPIODOL® functions as a radiopaque oily carrier or lymphangiographic contrast rather than as a conventional water-soluble angiographic contrast agent or a stand-alone particulate embolic.

07-07 n-Butyl cyanoacrylate (n-BCA) liquid embolic

Adhesive liquid embolic



VISUAL RECOGNITION

Small glue vial mixed with Lipiodol to set polymerization time and add radiopacity.

USE & PROCEDURAL CONTEXT

Adhesive glue that polymerizes on blood or tissue contact for rapid permanent occlusion when mixed with ethiodized oil. Typical procedural contexts include bleeding, pseudoaneurysm, AVM, lymphatic leak, and varices.

KEY DISTINCTIONS

n-BCA is an adhesive liquid embolic that polymerizes rapidly on contact with blood or tissue, distinguishing it from nonadhesive liquid systems that form a cohesive cast more gradually.

07-08 Onyx™ liquid embolic system

Cohesive liquid embolic



VISUAL RECOGNITION

Black tantalum-loaded liquid in a vial requiring a DMSO-compatible microcatheter and shaking before use.

USE & PROCEDURAL CONTEXT

Provides controlled delivery of a nonadhesive liquid embolic that forms a cohesive cast within the target. Typical contexts include arteriovenous malformations, endoleaks, and other complex embolization procedures requiring slow, deliberate injection.

KEY DISTINCTIONS

Onyx™ is nonadhesive and forms a cohesive cast during controlled injection, distinguishing it from rapidly polymerizing adhesive agents such as n-BCA.

7. EMBOLICS

07-09 Polyvinyl alcohol (PVA) particles

Particulate embolic



VISUAL RECOGNITION

Vial or syringe containing small, irregular PVA particles labeled by micron-size range, with a visibly less uniform particulate appearance than calibrated microspheres.

USE & PROCEDURAL CONTEXT

Provides permanent distal arterial-bed embolization with irregular polyvinyl alcohol particles. Typical applications include tumor embolization, uterine artery embolization, and prostate artery embolization.

KEY DISTINCTIONS

PVA particles are irregular in shape and size compared with calibrated microspheres, making particle morphology a key distinction even when both are supplied by micron-size range.

07-11 Technetium-99m MAA

Radioembolization mapping agent



VISUAL RECOGNITION

Radiopharmaceutical preparation delivered through the microcatheter at the intended treatment position, with subsequent assessment performed by nuclear-medicine imaging rather than fluoroscopy alone.

USE & PROCEDURAL CONTEXT

Radiolabeled macroaggregated albumin injected during the planning angiogram to simulate microsphere distribution and quantify the lung shunt fraction before Y-90 radioembolization. Typical procedural contexts include pre-Y-90 mapping and work-up to assess hepatopulmonary shunting and extrahepatic deposition.

KEY DISTINCTIONS

Technetium-99m MAA is a mapping agent rather than the therapeutic radioembolic itself; its distribution is evaluated with nuclear-medicine imaging before Yttrium-90 treatment.

07-10 Sodium tetradecyl sulfate sclerosant

Detergent sclerosant



VISUAL RECOGNITION

Clear sclerosant supplied in a vial or syringe and often converted into an opaque-appearing foam when mixed with air or CO₂ for delivery.

USE & PROCEDURAL CONTEXT

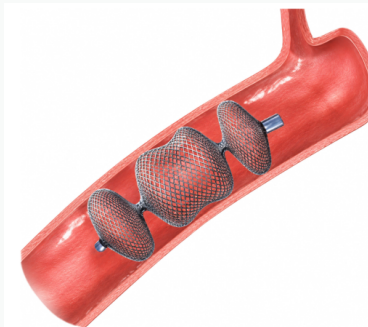
Detergent sclerosant (STS), often foamed, for treating venous malformations and varices. Typical procedural contexts include venous malformations, varicose veins, and pelvic venous disorders.

KEY DISTINCTIONS

STS is a detergent sclerosant rather than a mechanical embolic; it may be delivered as liquid or prepared foam depending on the target venous or malformation workflow.

07-12 Vascular plug

Vessel occlusion plug



VISUAL RECOGNITION

Self-expanding detachable occlusion device composed of nitinol mesh or a nitinol framework with an occlusive membrane, delivered through a catheter or sheath.

USE & PROCEDURAL CONTEXT

Provides controlled mechanical vessel occlusion using self-expanding plug devices. Typical applications include vessel sacrifice, shunt or collateral occlusion, pulmonary arteriovenous malformation treatment, and other medium- or small-vessel embolization tasks.

KEY DISTINCTIONS

A vascular plug provides focal mechanical occlusion with a single self-expanding implant; larger Amplatzer™ plugs and microcatheter-deliverable MVP™ plugs represent different delivery scales within the same concept.

7. EMBOLICS

07-13

Yttrium-90 radioembolization microspheres

Radioembolic microspheres



VISUAL RECOGNITION

Shielded vial handled with radiation precautions; delivered through a microcatheter via a dedicated administration set.

USE & PROCEDURAL CONTEXT

Micron-sized glass or resin spheres loaded with the beta-emitter yttrium-90. Typical procedural contexts include hepatocellular carcinoma and hepatic metastases; radiation lobectomy or segmentectomy.

KEY DISTINCTIONS

Yttrium-90 microspheres are the therapeutic radioembolization payload, unlike technetium-99m MAA, which is used beforehand to simulate distribution and assess shunting.

ORIENTATION PAGES

Balloons

Orientation purpose: This section combines angioplasty and flow-control balloons with related lesion-modification technology. Read each balloon by treatment dimensions, compliance, pressure behavior, wire platform, shaft length, and sheath requirement before focusing on its specialty mechanism.

Key Principle

Balloon diameter and working length describe the treatment segment. Shaft length, wire platform, sheath requirement, nominal pressure, and rated burst pressure describe the delivery system and inflation behavior.

Balloon Families by Job

Family	Primary job	Recognition clue
PTA balloon catheter	Workhorse dilation of a stenosis or narrowed segment	Cylindrical treatment segment with labeled diameter and working length.
High-pressure angioplasty balloon	Dilation of resistant or fibrotic stenosis	Higher pressure ratings on the package; relatively noncompliant behavior.
Cutting/scoring angioplasty balloon	Controlled lesion modification before or during dilation	Blades or scoring elements integrated with the balloon.
Drug-coated angioplasty balloon	Dilation plus local antiproliferative drug delivery	Drug-coated treatment surface with preparation requirements.
Intravascular lithotripsy (IVL) catheter	Calcium modification using acoustic pressure waves	Balloon catheter connected to a dedicated lithotripsy generator or console.
Occlusion balloon catheter	Temporary flow arrest	Compliant balloon used for occlusion rather than angioplasty.
Compliant aortic molding balloon catheter	Endograft apposition or large-vessel molding	Large compliant balloon used with aortic stent-graft systems.

Related Devices in This Section

Device	Why it belongs here
Balloon inflation device	Provides controlled inflation, deflation, and pressure monitoring for angioplasty balloons and balloon-expandable implants.
Peripheral atherectomy device	Performs plaque modification or debulking as another lesion-preparation strategy before or alongside angioplasty.
Do Not Confuse	Balloon size is not sheath size. The delivery profile and wire platform are separate labeled requirements. Occlusion is not dilation. A compliant occlusion balloon is intended to control flow, not remodel a stenosis. Atherectomy is not a balloon technology. It is grouped here because it occupies the same lesion-modification phase as angioplasty in many peripheral interventions.

8. BALLOONS



Device Index

CHAPTER 08

Angioplasty, flow control, and lesion modification

08-01

Balloon inflation device

08-02

Compliant aortic molding balloon catheter

08-03

Cutting/scoring angioplasty balloon

08-04

Drug-coated angioplasty balloon

08-05

High-pressure angioplasty balloon

08-06

Intravascular lithotripsy (IVL) catheter

08-07

Occlusion balloon catheter

08-08

PTA balloon catheter

08-09

Peripheral atherectomy device

08

BALLOONS

RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

8. BALLOONS

o8-01 Balloon inflation device

Balloon inflation system



VISUAL RECOGNITION

Large threaded syringe with a pressure gauge and locking mechanism, connected to the balloon inflation port.

USE & PROCEDURAL CONTEXT

Syringe-and-manometer device that inflates and deflates angioplasty balloons to a precise, monitored pressure and holds the inflation hands-free. Typical procedural contexts include balloon angioplasty and balloon-expandable stent deployment.

KEY DISTINCTIONS

The inflation device controls balloon pressure with a threaded syringe and manometer; it is the pressure-generating accessory, not the treatment balloon itself.

o8-02 Compliant aortic molding balloon catheter

Aortic molding balloon



VISUAL RECOGNITION

Very large-diameter compliant balloon mounted on a long, stiff aortic-length catheter shaft, substantially larger than routine peripheral angioplasty balloons.

USE & PROCEDURAL CONTEXT

Large compliant aortic balloon for molding endografts or achieving temporary aortic occlusion and control. Typical procedural contexts include EVAR/TEVAR molding, aortic injury, and large-vessel occlusion.

KEY DISTINCTIONS

Its large compliant balloon is intended for aortic endograft molding or temporary aortic occlusion, not the focal high-pressure dilation performed by a routine angioplasty balloon.

o8-03 Cutting/scoring angioplasty balloon

Lesion-modifying balloon



VISUAL RECOGNITION

Angioplasty balloon with longitudinal cutting or scoring elements mounted along the balloon surface, creating visible linear structures not present on a standard PTA balloon.

USE & PROCEDURAL CONTEXT

Combines angioplasty with focal cutting or scoring elements to modify resistant fibrotic stenoses during inflation. Typical applications include difficult dialysis-access stenoses and other lesions that do not respond adequately to conventional balloon dilation.

KEY DISTINCTIONS

Cutting or scoring elements mechanically modify resistant fibrotic tissue during balloon inflation, distinguishing these devices from a standard smooth-surface PTA balloon.

o8-04 Drug-coated angioplasty balloon

Antiproliferative angioplasty balloon



VISUAL RECOGNITION

Balloon with a drug-carrier coating, handled to limit drug loss before inflation.

USE & PROCEDURAL CONTEXT

Angioplasty balloon coated with an antiproliferative drug (for example, paclitaxel) to dilate while reducing restenosis. Typical procedural contexts include PAD, dialysis-access stenosis, and restenosis-prone lesions.

KEY DISTINCTIONS

The antiproliferative coating distinguishes this device from a conventional PTA balloon: the balloon still performs dilation but also transfers drug to the treated vessel segment.

8. BALLOONS

o8-05 High-pressure angioplasty balloon

Noncompliant angioplasty balloon



VISUAL RECOGNITION

Non-compliant angioplasty balloon identified primarily by package labeling that specifies a high rated burst pressure; visually, it may otherwise resemble a conventional PTA balloon.

USE & PROCEDURAL CONTEXT

Non-compliant balloon rated for high inflation pressures to dilate resistant venous or arterial stenoses. Typical procedural contexts include dialysis-access stenosis, central venous stenosis, and resistant PAD lesions.

KEY DISTINCTIONS

The key distinction is pressure capability rather than appearance: high-pressure balloons are selected for resistant stenoses and are identified by their higher labeled inflation limits.

o8-06 Intravascular lithotripsy (IVL) catheter

Intravascular lithotripsy catheter



VISUAL RECOGNITION

Balloon catheter connected to a dedicated lithotripsy generator or console, with the treatment balloon forming the distal energy-delivery segment.

USE & PROCEDURAL CONTEXT

Uses a balloon-based intravascular lithotripsy platform to deliver acoustic pulses that fracture vascular calcium before low-pressure dilation or stenting, without relying on thermal energy. Typical applications include heavily calcified peripheral arterial and iliofemoral disease.

KEY DISTINCTIONS

IVL couples balloon positioning with acoustic energy delivery to fracture vascular calcium, a different lesion-modification mechanism from high-pressure dilation, cutting/scoring balloons, or atherectomy.

o8-07 Occlusion balloon catheter

Flow-arrest balloon



VISUAL RECOGNITION

Catheter with a low-pressure compliant balloon for flow arrest rather than dilation.

USE & PROCEDURAL CONTEXT

Compliant balloon that temporarily blocks a vessel, duct, or shunt during injection, embolization, or bleeding control. Typical procedural contexts include embolization, balloon-occluded retrograde transvenous obliteration (BRTO), venography, and biliary or genitourinary (GU) occlusion studies.

KEY DISTINCTIONS

This balloon is intended for temporary flow arrest rather than luminal dilation; its compliant, low-pressure behavior distinguishes it from a noncompliant angioplasty balloon.

o8-08 PTA balloon catheter

General-purpose angioplasty balloon



VISUAL RECOGNITION

Cylindrical balloon on a shaft with radiopaque marker bands at its shoulders.

USE & PROCEDURAL CONTEXT

Workhorse angioplasty balloon inflated to a rated diameter to dilate a stenosis in a vessel, dialysis access, bile duct, or ureter. Typical procedural contexts include peripheral and dialysis-access angioplasty, and dilation of biliary or ureteral strictures.

KEY DISTINCTIONS

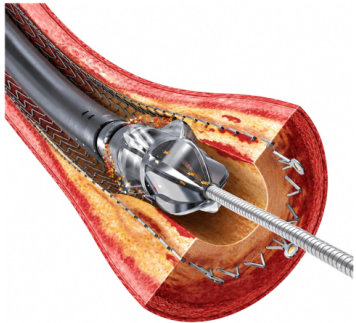
The PTA balloon is the workhorse dilation platform: balloon diameter and working length define the treatment segment, while a separate inflation device controls pressure.

8. BALLOONS

o8-09

Peripheral atherectomy device

Plaque-modification device



VISUAL RECOGNITION

Powered catheter driven by a console, often with a collection chamber (directional) or an eccentric abrasive crown (orbital).

USE & PROCEDURAL CONTEXT

Catheter that mechanically removes or modifies plaque, by directional cutting, rotational or orbital sanding, or laser, to debulk stenoses and improve balloon and stent results. Typical procedural contexts include calcified or diffuse peripheral arterial disease, especially femoropopliteal and infrapopliteal lesions.

KEY DISTINCTIONS

Atherectomy modifies or removes plaque through a powered mechanical mechanism before or alongside balloon and stent therapy, rather than treating the lesion by dilation alone.

ORIENTATION PAGES

Stents & Stent Grafts

Orientation purpose: Stents and stent-grafts are implanted scaffolds used to maintain patency, provide radial support, line or seal a lumen, or reconstruct a vascular segment. Separate the implant from the delivery system: implant dimensions, expansion mechanism, and covering describe the scaffold; wire, sheath, shaft, and deployment controls describe how it reaches the target.

Key Principle

Implant size and delivery-system profile are different specifications. Never infer the required sheath or wire from the stent diameter alone.

Major Implant Families

Family	Functional emphasis	What to watch for
Balloon-expandable stent	Precise deployment and high radial force	Stent is mounted on a balloon and expands where the balloon is inflated.
Balloon-expandable covered stent	Precise scaffold plus sealing or exclusion	Balloon-mounted stent with graft covering.
Self-expanding bare-metal stent	Flexible scaffold that expands from a constrained delivery system	Nitinol or similar self-expanding structure with device-specific conformability and potential foreshortening.
Self-expanding stent-graft	Flexible scaffold plus lining or exclusion	Self-expanding framework with graft material.
Dedicated venous stent system	Venous reconstruction with high radial-force and conformability requirements	Venous-specific delivery and implant geometry.
Drug-eluting peripheral arterial stent	Scaffold plus antiproliferative drug delivery	Peripheral arterial stent with an antiproliferative drug coating or drug-delivery labeling.
Interwoven nitinol stent	High flexibility and fracture resistance	Characteristic interwoven wire architecture.
Endovascular aortic stent-graft system	Modular aortic reconstruction or exclusion	Large delivery system with main body, limbs, extensions, and radiopaque deployment markers.

Read the Implant and Delivery System Separately

Implant questions	Delivery questions
Covered or uncovered? Self-expanding or balloon-expandable? What are the expanded diameter and implant length?	What wire platform, sheath profile, working length, and deployment controls are required?
Does the design conform, foreshorten, interweave, or form part of a modular system?	Where are the radiopaque markers, and how is release or balloon expansion controlled?
Do Not Confuse	Stent length is not delivery-system length. One describes the implant; the other determines procedural reach. Covered and uncovered stents are not interchangeable. Covering adds a lining or seal but also changes branch-vessel considerations and delivery profile. Aortic endografts are systems, not single stents. They may include a main body, limbs, cuffs, extensions, and dedicated large-bore delivery components.



Device Index

CHAPTER 09
Endoluminal support, exclusion, and repair

09-01	Balloon-expandable covered stent	09-02	Balloon-expandable stent
09-03	Dedicated venous stent system	09-04	Drug-eluting peripheral arterial stent
09-05	Endovascular aortic stent-graft system	09-06	Interwoven nitinol stent
09-07	Self-expanding bare-metal stent	09-08	Self-expanding stent-graft

09

STENTS & STENT GRAFTS
RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

9. STENTS & STENT GRAFTS

09-01 Balloon-expandable covered stent

Covered balloon-mounted stent



VISUAL RECOGNITION

Fabric-covered stent crimped on a balloon, expanded to a precise diameter at deployment.

USE & PROCEDURAL CONTEXT

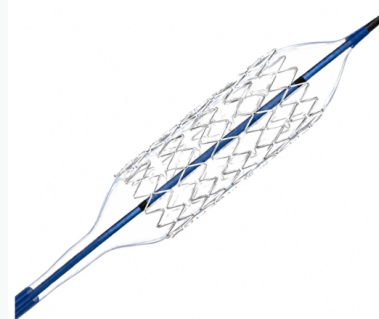
Balloon-mounted stent lined with graft material such as ePTFE. Typical procedural contexts include iliac occlusive disease, aortoiliac reconstruction, and sealing vessel injury or aneurysm.

KEY DISTINCTIONS

This device combines the positional precision of balloon expansion with a graft covering that seals as well as scaffolds, distinguishing it from an uncovered balloon-expandable stent.

09-02 Balloon-expandable stent

Balloon-mounted stent



VISUAL RECOGNITION

Stent mounted on a balloon with radiopaque markers; deploys exactly where inflated.

USE & PROCEDURAL CONTEXT

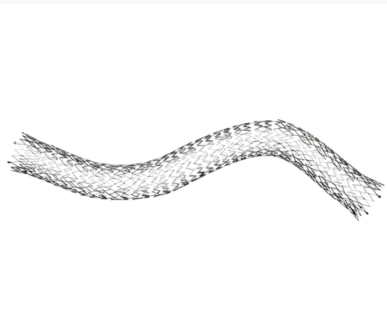
Stent crimped on a balloon for precise, high-radial-force placement at focal or ostial lesions. Typical procedural contexts include ostial renal or visceral, iliac, and other focal stenoses.

KEY DISTINCTIONS

Balloon expansion provides precise deployment and high radial force at a defined location, unlike self-expanding stents that enlarge after release from a constrained delivery system.

09-03 Dedicated venous stent system

Venous stent system



VISUAL RECOGNITION

Large-diameter self-expanding nitinol stent system engineered for venous anatomy, with a delivery catheter and radiopaque markers.

USE & PROCEDURAL CONTEXT

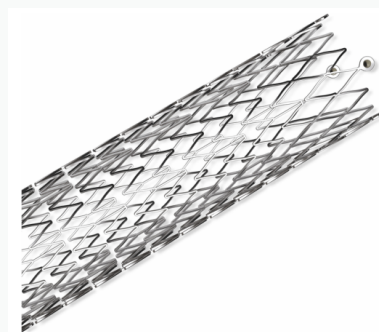
Provides purpose-built venous scaffolding after recanalization and angioplasty of symptomatic ilio caval, iliofemoral, or other central venous stenoses and occlusions, where venous-specific radial support and conformability are required.

KEY DISTINCTIONS

Dedicated venous stents are designed around the large caliber, flexibility, and compressive environment of the venous system rather than the lesion characteristics of routine peripheral arterial stenting.

09-04 Drug-eluting peripheral arterial stent

Drug-eluting peripheral stent



VISUAL RECOGNITION

Self-expanding nitinol peripheral stent mounted on an over-the-wire delivery catheter and specifically labeled as drug-eluting rather than as a conventional bare-metal platform.

USE & PROCEDURAL CONTEXT

Self-expanding peripheral stent coated with an antiproliferative drug (for example, paclitaxel). Typical procedural contexts include femoropopliteal disease and other peripheral lesions at high restenosis risk.

KEY DISTINCTIONS

The stent combines permanent scaffolding with an antiproliferative drug coating intended to reduce restenosis, distinguishing it from an otherwise similar bare self-expanding peripheral stent.

9. STENTS & STENT GRAFTS

09-05 Endovascular aortic stent-graft system

Modular aortic stent-graft system



VISUAL RECOGNITION

Modular fabric-covered stent-graft system delivered through large-bore sheaths, typically comprising a main body with iliac or thoracic extensions and radiopaque deployment markers.

USE & PROCEDURAL CONTEXT

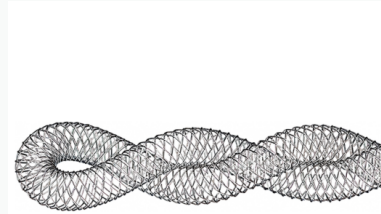
Used for endovascular repair of aortic aneurysm, dissection, rupture, and selected traumatic or other aortic pathology in EVAR or TEVAR.

KEY DISTINCTIONS

An aortic stent-graft is a modular reconstructive system with main-body and limb components, not simply a focal covered stent placed across a short lesion.

09-06 Interwoven nitinol stent

Interwoven nitinol stent



VISUAL RECOGNITION

Self-expanding nitinol stent with a distinctive interwoven, basket-weave wire architecture rather than the more uniform laser-cut pattern of many conventional nitinol stents.

USE & PROCEDURAL CONTEXT

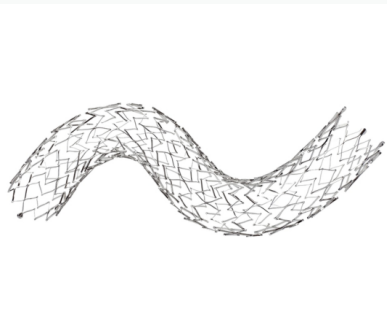
Woven nitinol stent with high radial strength and fracture resistance for mobile, compressive vessels. Typical procedural contexts include femoropopliteal disease, especially flexion zones.

KEY DISTINCTIONS

The interwoven nitinol architecture is the defining feature, providing a woven rather than conventional laser-cut scaffold for mobile or compressive vascular segments.

09-07 Self-expanding bare-metal stent

Self-expanding bare stent



VISUAL RECOGNITION

Uncovered self-expanding wire-mesh stent, usually nitinol, with open metallic struts and no fabric or graft lining visible between the struts.

USE & PROCEDURAL CONTEXT

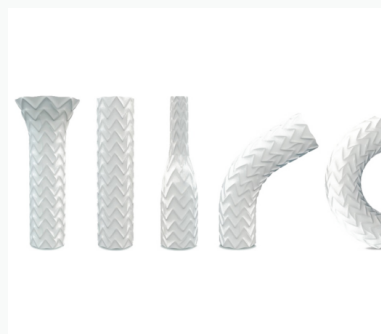
Uncovered (bare-metal) self-expanding vascular stent that scaffolds a vessel open after angioplasty or recanalization, allowing tissue to grow through its open struts. Typical procedural contexts include iliac, femoropopliteal, and central venous stenting, including maintenance of patency after dilation or thrombectomy.

KEY DISTINCTIONS

The uncovered nitinol lattice permits tissue and branch interaction through open struts and self-expands after sheath withdrawal, unlike covered stent-grafts or balloon-expandable platforms.

09-08 Self-expanding stent-graft

Self-expanding covered stent



VISUAL RECOGNITION

Self-expanding stent lined with PTFE or other graft material, giving the implant a continuous covered wall rather than the open lattice of a bare-metal stent.

USE & PROCEDURAL CONTEXT

Fabric-lined stent that maintains lumen patency while sealing rupture, pseudoaneurysm, fistula, or perforation. Typical procedural contexts include arterial injury, dialysis-access rupture, pseudoaneurysm, and iliac disease.

KEY DISTINCTIONS

The graft lining is the defining feature: it creates a covered conduit capable of sealing or relining a vessel rather than merely scaffolding the lumen with open metal struts.

ORIENTATION PAGES

Thrombectomy & Lysis

Orientation purpose: Clot-management systems remove, aspirate, disrupt, or dissolve thrombus using distinctly different mechanisms. Start by identifying the treatment strategy, then look for the access profile, aspiration source, retrieval element, console, infusion segment, or thrombolytic agent that makes that strategy recognizable.

Key Principle

"Thrombectomy" is not one mechanism. Aspiration, mechanical extraction, rheolytic thrombectomy, catheter-directed lysis, and ultrasound-assisted lysis have different table setups and device clues.

Mechanism First

Strategy	Entries in this section	Recognition clue
Aspiration thrombectomy	Indigo® aspiration system; FlowTrieve® thrombectomy system	Large-lumen aspiration catheter with dedicated tubing, syringe, pump, or aspiration source.
Mechanical extraction	ClotTrieve® thrombectomy system	Mechanical coring and collection components designed to remove thrombus without relying primarily on lytic infusion.
Rheolytic thrombectomy	AngioJet™ rheolytic thrombectomy system	Console-driven catheter with system-specific pump and tubing.
Catheter-directed lysis	Multi-side-hole thrombolysis catheter; Alteplase (tPA) thrombolytic agent	Defined side-hole infusion segment plus thrombolytic medication and infusion setup.
Ultrasound-assisted lysis	EKOS™ Endovascular System	Infusion catheter plus ultrasonic core and dedicated control unit.

What to Notice in the Setup

Access profile. Large-bore aspiration or mechanical systems may require sheath upsizing and a more supportive wire.

Working length and target territory. Pulmonary, ilioacaval, peripheral, and dialysis clot systems differ in reach and scale.

Aspiration pathway. Catheter lumen, tubing, syringe, pump, and collection components identify how suction is generated.

Infusion segment. On a lysis catheter, treatment length describes the side-hole segment through which thrombolytic is infused and is not the same as overall catheter length.

Adjunctive treatment. Balloon angioplasty or stenting may appear after clot removal when stenosis or an underlying lesion remains.

Do Not Confuse

tPA is a thrombolytic agent, not a thrombectomy catheter. The medication may be delivered through a standard or ultrasound-assisted infusion system.

Aspiration and mechanical extraction are different. Both remove clot, but the device mechanism and table setup differ.

Clot removal may not be the final step. The underlying stenosis or structural problem often determines what device appears next.

	Device Index	CHAPTER 10 Mechanical extraction, aspiration, and thrombolysis
--	---------------------	--

10-01	Alteplase (tPA) thrombolytic agent	10-02	AngioJet™ rheolytic thrombectomy system
10-03	ClotTriever® thrombectomy system	10-04	EKOS™ Endovascular System
10-05	FlowTriever® thrombectomy system	10-06	Indigo® aspiration system
10-07	Multi-side-hole thrombolysis catheter		

10

10. THROMBECTOMY & LYSIS

10-01

Alteplase (tPA) thrombolytic agent

Fibrinolytic agent



VISUAL RECOGNITION

Reconstituted tPA vial or syringe instilled into the catheter lumen or lytic infusion circuit.

USE & PROCEDURAL CONTEXT

Provides fibrinolytic therapy by converting plasminogen to plasmin and promoting clot dissolution. In IR, alteplase is used for catheter clotting and catheter-directed thrombolysis of dialysis-access, venous, and selected arterial thromboses.

KEY DISTINCTIONS

Alteplase is a thrombolytic medication rather than a mechanical thrombectomy device; it may be infused through a catheter or used to declog an access device when pharmacologic fibrinolysis is intended.

10-02

AngioJet™ rheolytic thrombectomy system

Rheolytic thrombectomy system



VISUAL RECOGNITION

Console-driven thrombectomy catheter connected to a dedicated pump and tubing circuit, creating a recognizable system-level setup rather than a stand-alone aspiration catheter.

USE & PROCEDURAL CONTEXT

Rheolytic thrombectomy that uses high-velocity saline jets to macerate and aspirate clot, with an optional power-pulse lytic mode. Typical procedural contexts include dialysis-access thrombosis, DVT, and peripheral arterial thrombosis.

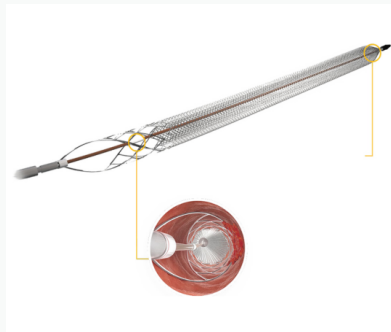
KEY DISTINCTIONS

AngioJet™ uses a rheolytic mechanism with high-velocity saline jets and aspiration, distinguishing it from simple aspiration catheters, mechanical retrieval systems, and infusion-only thrombolysis.

10-03

ClotTriever® thrombectomy system

Mechanical venous thrombectomy system



VISUAL RECOGNITION

Large-bore venous thrombectomy platform with a coring or collection element and collection bag or sheath designed for single-session mechanical thrombus extraction.

USE & PROCEDURAL CONTEXT

Used primarily for iliofemoral and ilioacaval deep venous thrombosis when substantial clot burden is targeted for mechanical removal without prolonged thrombolysis.

KEY DISTINCTIONS

ClotTriever® mechanically engages and extracts venous thrombus through a large-bore system rather than relying on aspiration alone or prolonged thrombolytic infusion.

10-04

EKOS™ Endovascular System

Ultrasound-assisted lysis system



VISUAL RECOGNITION

Infusion catheter with an ultrasonic core and treatment-zone markers, connected to a control unit.

USE & PROCEDURAL CONTEXT

Combines catheter-directed thrombolytic infusion with ultrasound energy delivered along the treatment segment. Typical applications include pulmonary embolism, deep venous thrombosis, and selected arterial thrombolysis workflows.

KEY DISTINCTIONS

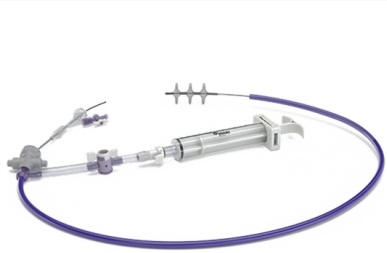
EKOS™ adds ultrasound energy to catheter-directed thrombolytic infusion, distinguishing it from a standard multi-side-hole lysis catheter that relies on infusion alone.

10. THROMBECTOMY & LYSIS

10-05

FlowTriever® thrombectomy system

Large-bore aspiration thrombectomy system



VISUAL RECOGNITION

Large aspiration catheter with self-expanding nitinol mesh disks and a large aspiration syringe.

USE & PROCEDURAL CONTEXT

Large-bore mechanical aspiration and retrieval system for removing central thrombus, especially PE, without thrombolytics. Typical procedural contexts include pulmonary embolism, ilio caval thrombosis, and large venous thrombus.

KEY DISTINCTIONS

FlowTriever® is designed around large-bore aspiration with dedicated mechanical retrieval components for central thrombus, distinguishing it from smaller peripheral aspiration systems or lytic catheters.

10-06

Indigo® aspiration system

Aspiration thrombectomy system



VISUAL RECOGNITION

Family of size-labeled CAT aspiration catheters paired with the Penumbra aspiration engine and separator.

USE & PROCEDURAL CONTEXT

Continuous-aspiration thrombectomy platform available across catheter sizes and territories. Typical procedural contexts include peripheral arterial and venous thrombosis and selected pulmonary embolism.

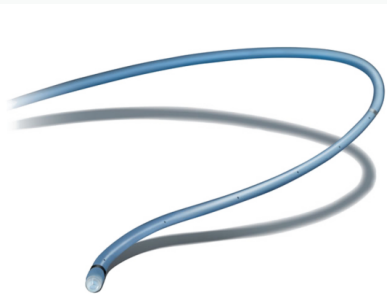
KEY DISTINCTIONS

Indigo® is a continuous aspiration platform offered across multiple catheter sizes and vascular territories, distinguishing it from a single fixed-profile thrombectomy catheter.

10-07

Multi-side-hole thrombolysis catheter

Lytic infusion catheter



VISUAL RECOGNITION

Long infusion catheter with radiopaque markers bracketing a defined multi-side-hole treatment segment, allowing the active infusion length to be distinguished from total catheter length.

USE & PROCEDURAL CONTEXT

Multi-side-hole infusion catheter for catheter-directed thrombolysis along a defined treatment segment. Typical procedural contexts include DVT, arterial occlusion, and graft or fistula thrombosis.

KEY DISTINCTIONS

The radiopaque markers define the active multi-side-hole infusion segment, which must not be confused with the catheter's total shaft length or with a simple end-hole infusion catheter.

ORIENTATION PAGES

Embolic Protection, Retrieval & IVC Filters

Orientation purpose: Retrieval systems capture, ensnare, grasp, contain, or remove intravascular foreign bodies and inferior vena cava (IVC) filters. Learn the relationship between the target object, the capture device, and the sheath that contains or extracts it.

Key Principle

Successful retrieval is a geometry problem: the operator must gain control of the object, align it with the access route, and bring it safely into a sheath or retrieval system.

Retrieval Tools

Device family	How it captures	Typical recognition clue
Endovascular loop snare	Loops around a free end, hook, shaft, or object	Wire loop emerging from a catheter or sheath; loop diameter is a key package specification.
Endovascular retrieval basket	Opens a wire cage around an object	Expandable basket geometry designed to contain or engage a target.
Endovascular retrieval forceps	Directly grasps or dissects an embedded object	Forceps jaws delivered through a compatible sheath; often used when simple snaring is insufficient.

IVC Filter Systems

Entry	Role	Do not confuse
IVC filter	Implanted caval device intended to capture embolizing thrombus from the lower venous circulation.	The filter itself is the implant, not the introducer or retrieval hardware.
IVC filter delivery system	Introduces and deploys the filter at the intended caval location.	Delivery sheath and pusher are used for placement, not later retrieval.
IVC filter retrieval sheath	Provides the working sheath that captures or collapses a retrievable filter during removal.	Retrieval systems may require snares, forceps, or other adjuncts depending on filter position and embedment.

What to Watch For on the Table

Capture geometry. Is the operator looping, containing, or grasping the target?

Sheath relationship. What sheath will receive the object once control is obtained?

Target orientation. Does the object have a free end or retrieval hook, or is an advanced retrieval strategy needed?

Placement versus retrieval. Filter insertion and filter removal use different systems even though both may involve a sheath and catheter.

Learner Focus

Name the capture mechanism first. Snare, basket, and forceps are not interchangeable labels.

Look for the receiving sheath. Retrieval is not complete until the target can be controlled and contained for safe extraction.



Device Index

CHAPTER 11

Capture, retrieval, and embolic protection

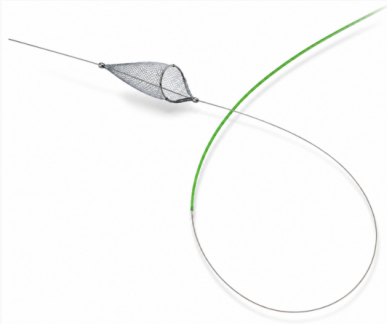
11-01	Distal embolic protection device	11-02	Endovascular loop snare
11-03	Endovascular retrieval basket	11-04	Endovascular retrieval forceps
11-05	IVC filter	11-06	IVC filter delivery system
11-07	IVC filter retrieval sheath		

11. EMBOLIC PROTECTION, RETRIEVAL & IVC FILTERS

11-01

Distal embolic protection device

SpiderFX™ embolic protection filter



VISUAL RECOGNITION

Guidewire-based system with a collapsible conical braided-nitinol filter, radiopaque mouth loop and markers, and delivery/recovery catheters; the filter remains apposed to the vessel wall while maintaining flow.

USE & PROCEDURAL CONTEXT

Deployed distal to a target lesion to contain and remove embolic debris released during selected atherectomy, angioplasty, or stenting procedures. Typical contexts include carotid, lower-extremity arterial, and saphenous-vein-graft intervention.

KEY DISTINCTIONS

Unlike an IVC filter, it provides temporary intraprocedural protection and is retrieved with captured debris at procedure end; unlike a retrieval basket, it is positioned before treatment and functions as the working guidewire.

11-02

Endovascular loop snare

Retrieval snare



VISUAL RECOGNITION

Single- or multi-loop (e.g., gooseneck) snare deployed from a catheter, the loop perpendicular to the shaft.

USE & PROCEDURAL CONTEXT

Loop snare that lassos and retrieves wires, catheter fragments, or filter hooks and assists through-and-through and body-floss maneuvers. Typical procedural contexts include foreign-body and filter retrieval, catheter-fragment capture, and complex access.

KEY DISTINCTIONS

The loop snare captures a target by encircling and cinching around it, making it the workhorse retrieval tool for free ends, foreign bodies, and devices that can be engaged within a loop.

11-03

Endovascular retrieval basket

Retrieval basket



VISUAL RECOGNITION

Collapsible multi-wire basket that opens into a cage to surround the object.

USE & PROCEDURAL CONTEXT

Wire basket opened around a stone or foreign body to entrap and withdraw it; some baskets can also fragment or reposition the object. Typical procedural contexts include biliary and urinary stone retrieval and vascular or ductal foreign-body capture.

KEY DISTINCTIONS

The retrieval basket surrounds a target within an expandable wire cage, contrasting with a loop snare that captures by cinching and forceps that retrieve by direct grasping.

11-04

Endovascular retrieval forceps

Retrieval forceps



VISUAL RECOGNITION

Long flexible forceps with grasping jaws that can be advanced through a sheath to engage intravascular foreign material.

USE & PROCEDURAL CONTEXT

Used for advanced retrieval of fractured catheters, embedded filter components, foreign bodies, and devices that cannot be captured with a standard snare.

KEY DISTINCTIONS

Forceps provide direct mechanical grasping rather than loop or basket capture; device variants differ in jaw design and working length according to the retrieval target and access route.

11. EMBOLIC PROTECTION, RETRIEVAL & IVC FILTERS

11-05 IVC filter

Caval embolism filter



VISUAL RECOGNITION

Cone-, umbrella-, or tulip-shaped metal filter with anchoring legs, seen in the infrarenal IVC.

USE & PROCEDURAL CONTEXT

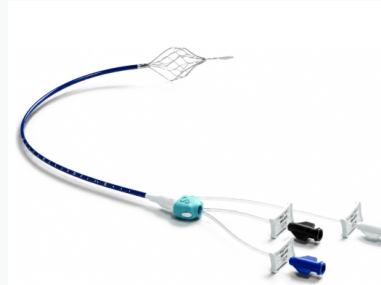
Caval filter deployed to trap lower-extremity emboli and reduce pulmonary embolism when anticoagulation is contraindicated, has failed, or must be interrupted. Typical procedural contexts include PE prophylaxis in patients who cannot be anticoagulated; retrievable-filter placement and later removal.

KEY DISTINCTIONS

The IVC filter is the implanted thromboembolic-protection device itself; it should be distinguished from the dedicated delivery system used for deployment and the retrieval sheath used for removal.

11-06 IVC filter delivery system

Filter delivery system



VISUAL RECOGNITION

Preloaded filter within a delivery sheath or catheter, with deployment markers and a pusher or release mechanism.

USE & PROCEDURAL CONTEXT

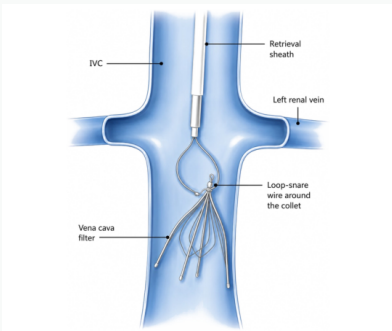
Used to position and deploy an inferior vena cava filter at the planned caval level after venographic or cross-sectional assessment.

KEY DISTINCTIONS

The delivery system controls filter orientation and release during implantation, whereas the retrieval sheath is a separate coaxial system used later to collapse and remove a retrievable filter.

11-07 IVC filter retrieval sheath

Filter retrieval sheath



VISUAL RECOGNITION

Wide, often reinforced sheath designed to advance over and collapse the filter after hook engagement.

USE & PROCEDURAL CONTEXT

Provides the coaxial working channel through which a retrievable IVC filter is captured and withdrawn from the venous system. It is used for routine retrieval and selected more complex tilted or long-dwell filter removals.

KEY DISTINCTIONS

The retrieval sheath provides coaxial support and ultimately contains the captured filter during removal; it is distinct from the original deployment system.

ORIENTATION PAGES

Drains & Enteral Access

Orientation purpose: This section includes catheters that remain in a collection or body cavity for drainage and tubes that provide enteral access. Access technique is covered elsewhere; here, focus on retention geometry, functional side holes or lumens, the external connection, and where the definitive device is intended to terminate.

Key Principle

The visible tip is not always the functional segment. For drainage catheters, side-hole position and retention mechanism matter; for enteral tubes, lumen destination and internal retention matter.

Drainage Catheter Families

Family	Retention and function	Key distinction
Locking pigtail drainage catheter	Pigtail loop is cinched or locked to resist dislodgement; side holes drain the target cavity.	Locking hub or string mechanism distinguishes it from a nonlocking pigtail.
Nonlocking pigtail drainage catheter	Curved pigtail configuration without a locking hub mechanism.	Similar distal geometry but different retention method.
Malecot drainage catheter	Winged or mushroom-like distal configuration provides retention and a broad drainage channel.	Retention geometry is fundamentally different from a pigtail loop.
Small-bore pigtail thoracostomy catheter	Pigtail catheter positioned in the pleural space for air or fluid drainage.	Recognize the pleural application and external drainage connection.
Thoracentesis and paracentesis catheter	Catheter-over-needle system for single-session aspiration rather than long-term indwelling drainage.	Temporary aspiration system rather than a retained drain.
Tunneled pleural/peritoneal drain	Cuffed, tunneled catheter for intermittent long-term drainage.	Tunneling, cuff, and dedicated external valve distinguish it from temporary drains.

Enteral Access

Device	Core concept	Recognition clue
Gastrostomy (G) tube	Terminates in the stomach for feeding, hydration, medication delivery, or decompression.	Single gastric destination with internal retention balloon or other retention element.
Gastrojejunostomy (GJ) tube	Provides a gastric port and a longer jejunal limb for post-pyloric feeding.	Separate gastric and jejunal lumens; longer catheter extending beyond the pylorus.
Gastropexy T-fasteners	Anchor the stomach to the abdominal wall during percutaneous gastrostomy or GJ placement.	Small T-bar anchors attached to sutures around the access site.
Do Not Confuse	Locking and nonlocking pigtails are not identical. The retention mechanism changes how the catheter is secured internally. G tube and GJ tube have different destinations. A GJ tube includes a jejunal limb; a G tube does not. Thoracentesis/paracentesis catheters are not long-term drains. They are generally intended for a single-session drainage or aspiration episode rather than chronic indwelling use.	

	Device Index	CHAPTER 12 <i>Percutaneous drainage and enteral support</i>
--	---------------------	---

12-01	Gastrojejunostomy (GJ) tube	12-02	Gastropexy T-fasteners
12-03	Gastrostomy (G) tube	12-04	Locking pigtail drainage catheter
12-05	Malecot drainage catheter	12-06	Nonlocking pigtail drainage catheter
12-07	Small-bore pigtail thoracostomy catheter	12-08	Thoracentesis and paracentesis catheter
12-09	Tunneled pleural/peritoneal drain		

12

12. DRAINS & ENTERAL ACCESS

12-01

Gastrojejunostomy (GJ) tube

Post-pyloric feeding tube



VISUAL RECOGNITION

Long enteral tube with separate gastric and jejunal ports, extending beyond the stomach so the distal limb can terminate in the proximal jejunum.

USE & PROCEDURAL CONTEXT

Tube entering the stomach with its tip advanced through the pylorus into the jejunum, delivering post-pyloric feeds while allowing simultaneous gastric decompression. Typical procedural contexts include aspiration risk, gastroparesis, and gastric-outlet obstruction requiring post-pyloric feeding.

KEY DISTINCTIONS

A GJ tube provides separate gastric and jejunal access, with the feeding limb extending beyond the pylorus; this distinguishes it from a gastrostomy tube that terminates in the stomach.

12-02

Gastropexy T-fasteners

Stomach-wall anchors



VISUAL RECOGNITION

Small metal T-bar anchors on sutures, deployed in a triangle around the planned gastrostomy site.

USE & PROCEDURAL CONTEXT

Suture anchors deployed through the abdominal wall to tack the stomach against it, securing apposition during and after percutaneous gastrostomy. Typical procedural contexts include percutaneous gastrostomy and gastrojejunostomy placement.

KEY DISTINCTIONS

T-fasteners are anchoring devices rather than feeding tubes; they temporarily secure stomach-to-abdominal-wall apposition around the intended gastrostomy access site.

12-03

Gastrostomy (G) tube

Gastric feeding tube



VISUAL RECOGNITION

Catheter exiting the epigastric wall into the stomach, with an internal retention balloon or loop and an external bumper.

USE & PROCEDURAL CONTEXT

Percutaneously placed tube into the stomach for long-term enteral feeding, hydration, or decompression, secured by a retention balloon or pigtail after gastropexy. Typical procedural contexts include dysphagia, head-and-neck or esophageal cancer, neurologic impairment, and failed endoscopic (PEG) placement.

KEY DISTINCTIONS

A gastrostomy tube terminates in the stomach and is retained by an internal balloon or loop, unlike a GJ tube whose distal feeding limb continues into the jejunum.

12-04

Locking pigtail drainage catheter

Locking drainage catheter



VISUAL RECOGNITION

Pigtail catheter with a locking suture at the hub that draws the loop shut; the taut string is visible at the hub.

USE & PROCEDURAL CONTEXT

Drainage catheter whose distal pigtail is cinched into a closed loop by an internal string, mechanically anchoring it in a cavity to resist inadvertent dislodgement. Typical procedural contexts include abscesses, seromas, bilomas, urinomas, and hematomas where secure retention is essential.

KEY DISTINCTIONS

The locking pigtail is mechanically cinched into a closed retention loop, distinguishing it from a nonlocking pigtail whose curved configuration is not secured by a locking string.

12. DRAINS & ENTERAL ACCESS

12-05

Malecot drainage catheter

Winged drainage catheter



VISUAL RECOGNITION

Catheter ending in flared, wing-like (mushroom or batwing) flanges rather than a pigtail loop.

USE & PROCEDURAL CONTEXT

Large-bore catheter with soft splayed wings at the tip that expand within a cavity to retain the drain and keep a wide, non-clogging channel for thick or particulate fluid. Typical procedural contexts include viscous or debris-laden collections, large abscesses, gastrostomy/cecostomy, and selected GU drainage.

KEY DISTINCTIONS

The Malecot uses soft flared wings for retention and a broad drainage channel, distinguishing it from a pigtail catheter that relies on a curled distal loop.

12-06

Nonlocking pigtail drainage catheter

Nonlocking drainage catheter



VISUAL RECOGNITION

Flexible drainage catheter with a distal pigtail loop that remains formed by catheter memory rather than an active locking string.

USE & PROCEDURAL CONTEXT

Used for drainage of fluid collections when pigtail retention is desired but a locking mechanism is unnecessary or not part of the selected system.

KEY DISTINCTIONS

Unlike a locking pigtail catheter, the distal loop is not cinched at the hub and therefore depends on its preformed pigtail shape rather than a locking string for retention.

12-07

Small-bore pigtail thoracostomy catheter

Small-bore chest drain



VISUAL RECOGNITION

Locking pigtail catheter in the pleural space connected to a water-seal or suction drainage system.

USE & PROCEDURAL CONTEXT

Small-bore locking pigtail placed into the pleural space to evacuate air or fluid, offering a less invasive alternative to a large surgical chest tube. Typical procedural contexts include pneumothorax, simple or malignant pleural effusion, and empyema.

KEY DISTINCTIONS

This is a small-bore pleural drainage catheter designed for ongoing thoracic drainage, unlike a thoracentesis catheter intended primarily for one-time aspiration.

12-08

Thoracentesis and paracentesis catheter

Single-use aspiration catheter



VISUAL RECOGNITION

Thin catheter loaded on a needle, connected via a stopcock and tubing to vacuum bottles or a drainage bag.

USE & PROCEDURAL CONTEXT

Single-use catheter-over-needle kit for one-time image-guided aspiration of pleural fluid or ascites for diagnosis or symptom relief. Typical procedural contexts include diagnostic or therapeutic thoracentesis and paracentesis.

KEY DISTINCTIONS

The catheter-over-needle design supports temporary aspiration of pleural or peritoneal fluid rather than long-term indwelling drainage with a locking pigtail or tunneled catheter.

12. DRAINS & ENTERAL ACCESS

12-09

Tunneled pleural/peritoneal drain

Tunneled home drainage catheter



VISUAL RECOGNITION

Silicone catheter with a subcutaneous cuff and a valved end that connects to a vacuum drainage bottle (PleurX/Aspira).

USE & PROCEDURAL CONTEXT

Provides durable, intermittent outpatient drainage of recurrent pleural or peritoneal fluid through a cuffed subcutaneously tunneled catheter. Typical contexts include recurrent malignant pleural effusion and refractory malignant ascites.

KEY DISTINCTIONS

The subcutaneous tunnel, cuff, and valved external end distinguish this catheter from temporary percutaneous drains and support repeated outpatient drainage of recurrent fluid.

ORIENTATION PAGES

Biliary & Genitourinary

Orientation purpose: Biliary and genitourinary interventions are grouped because both rely on recurring percutaneous device concepts: fine access, wire preservation, tract preparation, internal or external drainage, exchange, dilation, stenting, and catheter positioning across an obstruction. Learn the shared device logic while keeping the anatomy and endpoints distinct.

Key Principle

The shared question is: where does the catheter or stent begin, what segment does it cross, and where does it terminate? That determines whether the system is external, internal-external, or fully internal.

Shared Percutaneous Framework

Stage	Biliary examples	Genitourinary examples
Access and transition	Coaxial transitional access set; biliary access sheath	Coaxial transitional access set; ureteral access catheter
Drainage	External biliary drainage catheter; internal-external biliary drainage catheter; percutaneous cholecystostomy catheter	Percutaneous nephrostomy catheter; nephroureteral catheter; suprapubic cystostomy catheter
Dilation and diagnostic work	Biliary angioplasty balloon catheter; biliary occlusion balloon catheter; biliary cytology brush; biliary stone retrieval basket	Ureteral access catheter and guidewire platform may support crossing, opacification, or exchange
Internal stenting	Covered or uncovered self-expanding metal biliary stent	Double-J ureteral stent

High-Yield Distinctions

Pair	What separates them
External biliary drain vs internal-external biliary drain	External drainage terminates above the obstruction and exits to the skin; internal-external drainage crosses the obstruction and extends into bowel while preserving external access.
Nephrostomy vs nephroureteral catheter	A nephrostomy drains the collecting system externally; a nephroureteral catheter traverses the ureter and extends toward or into the bladder.
Double-J stent vs nephroureteral catheter	A Double-J stent is entirely internal with curls in the renal pelvis and bladder; a nephroureteral catheter retains an external component.
Covered vs uncovered biliary stent	Covered stents add a lining that can resist tissue ingrowth or seal a leak; uncovered stents preserve open mesh across side branches.
Biliary occlusion balloon vs angioplasty balloon	The occlusion balloon temporarily blocks flow for imaging or control; the angioplasty balloon dilates a narrowed duct or tract.
Learner Focus	Trace the catheter or stent course. Follow the pathway from skin entry through the organ or ductal system, across any obstruction, to the final catheter or stent endpoint. Identify what remains external. A skin exit, drainage limb, cap, or bag changes how the device functions after the procedure. Do not collapse biliary and GU anatomy into one category. They share device logic, but their anatomy, device configuration, and treatment endpoints remain distinct.

13. BILIARY & GENITOURINARY



Device Index

CHAPTER 13

Ductal and collecting-system intervention

13-01

Biliary access sheath

13-02

Biliary angioplasty balloon catheter

13-03

Biliary cytology brush

13-04

Biliary occlusion balloon catheter

13-05

Biliary stone retrieval basket

13-06

Coaxial transitional access set

13-07

Covered self-expanding metal biliary stent

13-08

Double-J ureteral stent

13-09

External biliary drainage catheter

13-10

Internal-external biliary drainage catheter

13-11

Nephroureteral catheter

13-12

Percutaneous cholecystostomy catheter

13-13

Percutaneous nephrostomy catheter

13-14

Suprapubic cystostomy catheter

13-15

Uncovered self-expanding metal biliary stent

13-16

Ureteral access catheter

13

BILIARY & GENITOURINARY

RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

13. BILIARY & GENITOURINARY

13-01

Biliary access sheath

Transhepatic working sheath



VISUAL RECOGNITION

Longer sheath crossing the liver capsule into the ductal system, usually with a radiopaque tip marker.

USE & PROCEDURAL CONTEXT

Working sheath seated transhepatically into the bile ducts to maintain a stable channel for cholangiography, dilation, biopsy, stenting, or drain exchange while protecting the parenchymal tract. Typical procedural contexts include biliary obstruction and stricture work, drain up-sizing, and multi-step biliary interventions.

KEY DISTINCTIONS

The biliary access sheath is a stable transhepatic working channel for repeated ductal intervention, rather than the definitive drainage catheter that remains for ongoing bile diversion.

13-02

Biliary angioplasty balloon catheter

Ductal dilation balloon



VISUAL RECOGNITION

Moderate-length balloon on a catheter shaft, inflated within the transhepatic tract or across a ductal narrowing.

USE & PROCEDURAL CONTEXT

Angioplasty-type balloon inflated to dilate the parenchymal tract or predilate a ductal or anastomotic stricture so a larger drain or stent can pass. Typical procedural contexts include biliary drain placement and exchange and benign or anastomotic stricture dilation.

KEY DISTINCTIONS

This balloon is used within the biliary tract or access tract for dilation, so its role is mechanical enlargement rather than temporary occlusion for cholangiography.

13-03

Biliary cytology brush

Cytology brush



VISUAL RECOGNITION

Bristled brush tip that extends from a protective sheath once positioned across the stricture.

USE & PROCEDURAL CONTEXT

Sheathed cytology brush advanced over a wire and scrubbed across a biliary stricture to abrade cells for cytologic diagnosis of malignancy. Typical procedural contexts include indeterminate or suspected malignant biliary strictures during drainage or cholangiography.

KEY DISTINCTIONS

The protective sheath contains the brush during navigation and exposes the bristles only across the target stricture, distinguishing the sampling device from a balloon or drainage catheter.

13-04

Biliary occlusion balloon catheter

Biliary occlusion balloon



VISUAL RECOGNITION

Small occlusion balloon on a catheter, inflated in the duct during contrast injection.

USE & PROCEDURAL CONTEXT

Compliant balloon inflated within the duct to block flow and force contrast to opacify the entire biliary tree for leak, stricture, or anatomy assessment. Typical procedural contexts include biliary leak localization, stricture mapping, and post-surgical ductal anatomy.

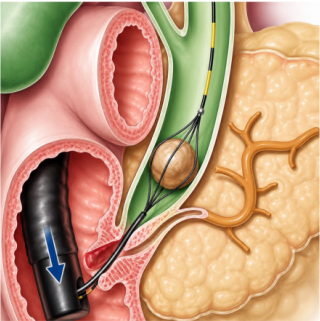
KEY DISTINCTIONS

Its purpose is temporary ductal occlusion during contrast injection, not stricture dilation; the inflated balloon redirects contrast to improve cholangiographic opacification.

13. BILIARY & GENITOURINARY

13-05 Biliary stone retrieval basket

Stone retrieval basket



VISUAL RECOGNITION

Collapsible four- to six-wire basket that opens into a spherical cage inside the duct.

USE & PROCEDURAL CONTEXT

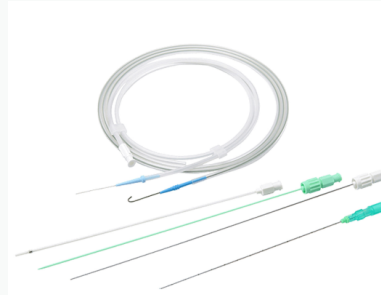
Wire basket opened within the duct to snare, extract, or push biliary stones and debris toward the bowel, clearing the biliary tree. Typical procedural contexts include retained or recurrent common-duct stones and percutaneous biliary stone clearance.

KEY DISTINCTIONS

The collapsible wire basket captures or repositions intraductal stones and debris, distinguishing it from balloons used for dilation or occlusion and from brushes used for cytology.

13-06 Coaxial transitional access set

Transitional access set



VISUAL RECOGNITION

Small-caliber access kit containing a fine needle, 0.018-inch guidewire, and coaxial transitional dilator or cannula that accepts a 0.035-inch guidewire.

USE & PROCEDURAL CONTEXT

Provides atraumatic small-target percutaneous access by converting a fine needle and 0.018-inch guidewire entry into a larger working platform for subsequent biliary, genitourinary, or other tract-based intervention.

KEY DISTINCTIONS

The defining role is platform conversion: a fine 0.018-inch access pathway is enlarged to accept a 0.035-inch guidewire and subsequent working devices.

13-07 Covered self-expanding metal biliary stent

Covered biliary SEMS



VISUAL RECOGNITION

Self-expanding metal stent with a continuous covering on a biliary delivery catheter.

USE & PROCEDURAL CONTEXT

Fabric- or polymer-covered self-expanding metal stent that relieves obstruction or seals a leak while its lining resists tumor and tissue ingrowth to prolong patency. Typical procedural contexts include malignant biliary obstruction, biliary leak or fistula, and selected refractory strictures.

KEY DISTINCTIONS

The continuous covering blocks tissue ingrowth and creates a lined conduit, distinguishing this stent from an uncovered biliary stent with open metal mesh.

13-08 Double-J ureteral stent

Internal ureteral stent



VISUAL RECOGNITION

Soft polymer stent with a J or pigtail curl at each end, spanning the ureter.

USE & PROCEDURAL CONTEXT

Provides completely internal ureteral drainage across obstruction, stricture, stones, or a recently treated segment by spanning the renal pelvis to the bladder without an external catheter limb.

KEY DISTINCTIONS

The two curled ends anchor the stent internally in the renal pelvis and bladder, allowing completely internal urinary drainage without an external catheter limb.

13. BILIARY & GENITOURINARY

13-09

External biliary drainage catheter

External biliary drain



VISUAL RECOGNITION

Pigtail with side holes proximal to the obstruction only, draining out the skin to a bag.

USE & PROCEDURAL CONTEXT

Locking pigtail parked above an obstruction to divert bile to an external bag when the stricture cannot be crossed or internal drainage is contraindicated. Typical procedural contexts include obstructive jaundice, cholangitis, and initial drainage when the obstruction cannot be crossed.

KEY DISTINCTIONS

Its drainage side holes remain proximal to the obstruction and communicate only with the external system, distinguishing it from an internal-external catheter that traverses into the bowel.

13-10

Internal-external biliary drainage catheter

Internal-external biliary drain



VISUAL RECOGNITION

Catheter with side holes above and below the block, looping from the skin through the duct into the bowel.

USE & PROCEDURAL CONTEXT

Long multi-sidehole catheter crossing the obstruction into the duodenum, draining bile internally while a capped external limb preserves access for flushing and exchange. Typical procedural contexts include malignant obstruction, benign stricture, cholangitis, and routine drain exchanges.

KEY DISTINCTIONS

This catheter crosses the obstruction into the duodenum and has side holes on both sides of the narrowing, permitting internal drainage while retaining external access for management.

13-11

Nephroureteral catheter

Nephroureteral drain



VISUAL RECOGNITION

Long catheter traversing the renal collecting system and ureter into the bladder, with an external segment available for drainage, flushing, exchange, or capping.

USE & PROCEDURAL CONTEXT

Used to maintain antegrade urinary drainage across ureteral obstruction, injury, or stricture and during staged conversion between external and internal drainage.

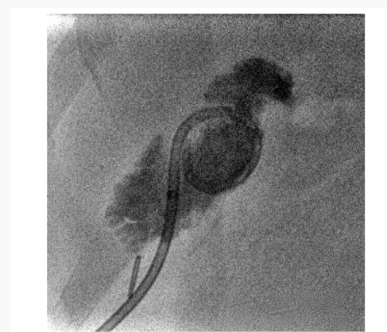
KEY DISTINCTIONS

A nephroureteral catheter spans the renal collecting system, ureter, and bladder while preserving percutaneous access, unlike a Double-J stent that is entirely internal.

13-12

Percutaneous cholecystostomy catheter

Gallbladder drainage catheter



VISUAL RECOGNITION

Locking pigtail catheter seated in the gallbladder lumen, draining bile externally to a bag.

USE & PROCEDURAL CONTEXT

Locking pigtail placed transhepatically or transperitoneally into the gallbladder to decompress and drain it when surgery is not immediately safe. Typical procedural contexts include acute calculous or acalculous cholecystitis in poor surgical candidates and critically ill patients.

KEY DISTINCTIONS

The catheter terminates as a locking pigtail within the gallbladder for decompression, distinguishing it from biliary drainage catheters positioned within the intrahepatic or extrahepatic ducts.

13. BILIARY & GENITOURINARY

13-13

Percutaneous nephrostomy catheter

External renal drain



VISUAL RECOGNITION

External drainage catheter, commonly a locking pigtail, positioned within the renal collecting system and connected to a urine drainage bag.

USE & PROCEDURAL CONTEXT

Provides external drainage of the renal collecting system for obstructive uropathy, infected obstruction, urinary diversion, urine leak management, and antegrade access for subsequent genitourinary intervention.

KEY DISTINCTIONS

A nephrostomy catheter terminates in the renal collecting system and drains externally, unlike a nephroureteral catheter that continues through the ureter into the bladder.

13-14

Suprapubic cystostomy catheter

Suprapubic bladder catheter



VISUAL RECOGNITION

Percutaneous drainage catheter exiting through the lower anterior abdominal wall and entering the bladder directly, bypassing the urethral route.

USE & PROCEDURAL CONTEXT

Percutaneous bladder catheter placed through the lower abdominal wall for urinary drainage when the urethral route is unsuitable or must be bypassed. Typical procedural contexts include urinary retention with urethral obstruction or injury and long-term bladder drainage.

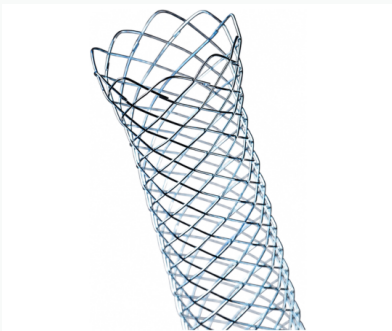
KEY DISTINCTIONS

The catheter reaches the bladder directly through the suprapubic abdominal wall, bypassing the urethra and distinguishing it from transurethral bladder drainage.

13-15

Uncovered self-expanding metal biliary stent

Uncovered biliary SEMS



VISUAL RECOGNITION

Uncovered self-expanding metal biliary stent on a dedicated delivery catheter, with an open metallic mesh rather than a continuous fabric or polymer lining.

USE & PROCEDURAL CONTEXT

Provides self-expanding metallic biliary scaffolding without a covering, most often for malignant biliary obstruction, including hilar disease in which continued drainage through side branches is important.

KEY DISTINCTIONS

The open metallic mesh permits drainage through the stent interstices and preserves side-branch communication, distinguishing it from a continuously covered biliary stent.

13-16

Ureteral access catheter

Ureteral access catheter



VISUAL RECOGNITION

Long, fine-caliber catheter designed to traverse the ureteral lumen, with a low-profile shaft suited to antegrade or retrograde urinary access.

USE & PROCEDURAL CONTEXT

Catheter advanced within the ureter for access, retrograde or antegrade contrast injection, or to help cross a narrowed segment. Typical procedural contexts include nephroureteral procedures, ureteral opacification, and obstruction crossing.

KEY DISTINCTIONS

This is a low-profile ureteral working catheter for access and contrast injection, not a retention stent intended to remain across the ureter after the procedure.

ORIENTATION PAGES

Central Venous Access

Orientation purpose: Central venous access devices differ by insertion site, catheter length, tip location, tunneling, cuffing, lumen size, intended duration, and whether the access is external or fully implanted. Start by identifying where the catheter enters the body and where its tip is intended to terminate.

Key Principle

Do not classify central venous devices by appearance alone. Route, tip position, tunneling, cuffing, lumen configuration, and access method are the defining features.

Core Device Families

Family	External configuration	High-yield distinction
Midline catheter	External catheter from an upper-extremity vein	Tip remains in a peripheral vein and does not terminate in the central venous circulation.
Peripherally inserted central catheter (PICC)	External catheter from an upper-extremity vein	Inserted peripherally but advanced to a central venous tip location.
Nontunneled central venous catheter	External catheter at the venous access site	Short-term central access without a subcutaneous tunnel or cuff.
Nontunneled hemodialysis catheter	Large-bore external central catheter	Large lumens and dialysis-specific flow requirements distinguish it from a standard CVC.
Tunneled small-bore central venous catheter	External catheter after a subcutaneous tunnel	Tunnel and cuff support longer-term access while maintaining an external hub.
Tunneled hemodialysis catheter	Large-bore external catheter after a subcutaneous tunnel	Dialysis flow profile plus tunnel and cuff for longer-term hemodialysis access.
Implanted venous access port	No external catheter between uses	Reservoir is implanted under the skin and accessed with a noncoring Huber needle.

Placement Components

Device	Role
Subcutaneous catheter tunneler	Creates the subcutaneous path for a tunneled catheter between venotomy and skin exit site.
Noncoring port access needle (Huber needle)	Accesses an implanted port reservoir without coring the septum.
Do Not Confuse	Midline vs PICC. Both enter through an upper-extremity vein, but only the PICC terminates centrally. Port vs tunneled external catheter. A port is completely implanted between uses; tunneled catheters retain an external segment. Dialysis catheter vs standard CVC. Dialysis catheters are designed for high-flow extracorporeal circulation and have different caliber and lumen requirements.

14. CENTRAL VENOUS ACCESS



Device Index

CHAPTER 14

Infusion, dialysis, and long-term venous access

14-01

Implanted venous access port

14-02

Midline catheter

14-03

Noncoring port access needle (Huber needle)

14-04

Nontunneled central venous catheter

14-05

Nontunneled hemodialysis catheter

14-06

Peripherally inserted central catheter (PICC)

14-07

Subcutaneous catheter tunneler

14-08

Tunneled hemodialysis catheter

14-09

Tunneled small-bore central venous catheter

14

CENTRAL VENOUS ACCESS

RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

14. CENTRAL VENOUS ACCESS

14-01

Implanted venous access port

Implanted infusion port



VISUAL RECOGNITION

Subcutaneous reservoir with a palpable raised septum joined to a central catheter; nothing exits the skin.

USE & PROCEDURAL CONTEXT

Fully implanted reservoir-and-catheter system accessed intermittently by needle through intact skin, giving durable, low-maintenance venous access with minimal body-image impact. Typical procedural contexts include cyclical chemotherapy, long-term intermittent infusions, and frequent blood sampling.

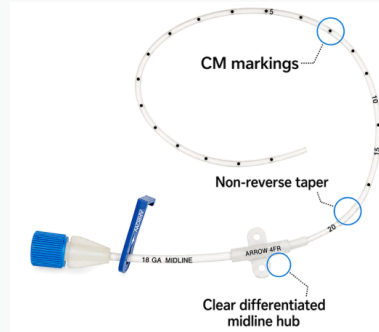
KEY DISTINCTIONS

The reservoir and catheter are completely implanted beneath the skin and accessed intermittently with a noncoring needle, unlike external tunneled or peripherally inserted catheters.

14-02

Midline catheter

Extended peripheral catheter



VISUAL RECOGNITION

Peripheral upper-extremity catheter with an external arm hub and a tip that terminates in the upper arm or axillary region rather than at the central cavoatrial junction.

USE & PROCEDURAL CONTEXT

Peripheral catheter whose tip remains in an upper-arm or axillary vein, short of the central venous system, for intermediate-duration therapy without a true central line. Typical procedural contexts include one-to-four weeks of compatible IV antibiotics or fluids not requiring a central tip.

KEY DISTINCTIONS

A midline remains a peripheral access device because its tip does not terminate centrally; this is the key distinction from a PICC despite a similar upper-extremity insertion site.

14-03

Noncoring port access needle (Huber needle)

Noncoring port needle



VISUAL RECOGNITION

Right-angle (90°) or straight needle with a back-angled, noncoring bevel, often with attached tubing.

USE & PROCEDURAL CONTEXT

Provides repeated percutaneous access to an implanted venous port without coring the silicone septum. Typical contexts include port access and de-access, port checks, chemotherapy administration, and blood sampling.

KEY DISTINCTIONS

The noncoring bevel parts the silicone septum rather than removing a core of material, preserving the port for repeated access and distinguishing this needle from a conventional hypodermic needle.

14-04

Nontunneled central venous catheter

Short-term central catheter



VISUAL RECOGNITION

Short central venous catheter inserted directly from the skin into a central vein, commonly with two or three lumens and no subcutaneous cuff or tunnel.

USE & PROCEDURAL CONTEXT

Provides temporary central venous access for medication delivery, hemodynamic monitoring, resuscitation, and other short-term inpatient needs when a tunneled or implanted device is unnecessary.

KEY DISTINCTIONS

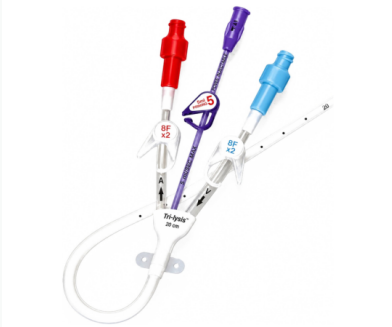
The catheter exits directly at the venipuncture site and lacks a subcutaneous tunnel or cuff, distinguishing nontunneled central access from tunneled long-term devices.

14. CENTRAL VENOUS ACCESS

14-05

Nontunneled hemodialysis catheter

Short-term dialysis catheter



VISUAL RECOGNITION

Large-bore nontunneled catheter with two dialysis lumens; some models add a third infusion lumen and may be labeled power-injectable.

USE & PROCEDURAL CONTEXT

Nontunneled large-bore catheter for short-term hemodialysis, typically with two dialysis lumens; some models add a third infusion lumen and may be power-injectable. Typical procedural contexts include acute or temporary dialysis access, typically via the internal jugular vein.

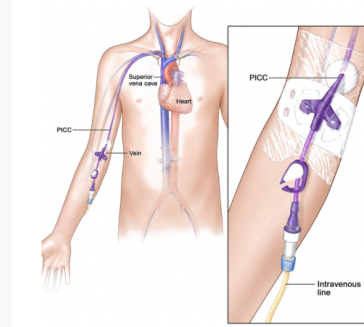
KEY DISTINCTIONS

This is a temporary high-flow dialysis catheter placed without a subcutaneous tunnel or cuff; some variants add an additional infusion lumen beyond the two primary dialysis lumens.

14-06

Peripherally inserted central catheter (PICC)

PICC



VISUAL RECOGNITION

Long, thin catheter entering a basilic or brachial vein with an external arm hub and securement.

USE & PROCEDURAL CONTEXT

Long, small-caliber catheter placed from an arm vein with its tip at the cavoatrial junction, giving central access for weeks to months from a peripheral site. Typical procedural contexts include extended antibiotics, chemotherapy, and selected home TPN.

KEY DISTINCTIONS

A PICC enters through an upper-extremity peripheral vein but terminates centrally, distinguishing it from a midline catheter whose tip remains in the peripheral venous system.

14-07

Subcutaneous catheter tunneler

Catheter tunneling tool



VISUAL RECOGNITION

Stiff metal or plastic rod with a bullet tip and a coupling that grips the catheter end.

USE & PROCEDURAL CONTEXT

Creates the subcutaneous tract through which a tunneled catheter is drawn from the venotomy to a separate skin exit site. Typical contexts include tunneled dialysis catheters, tunneled small-bore lines, and implanted port catheters.

KEY DISTINCTIONS

The tunneler creates the subcutaneous course that separates the venotomy from the external exit or pocket, distinguishing it from the catheter that ultimately occupies that tract.

14-08

Tunneled hemodialysis catheter

Tunneled dialysis catheter



VISUAL RECOGNITION

Large-bore tunneled catheter with two lumens and a subcutaneous cuff; staggered or stepped tips.

USE & PROCEDURAL CONTEXT

Cuffed, tunneled dual-lumen catheter for long-term hemodialysis, delivering high flow through separate arterial and venous lumens. Typical procedural contexts include long-term tunneled dialysis access when a fistula or graft is not yet usable.

KEY DISTINCTIONS

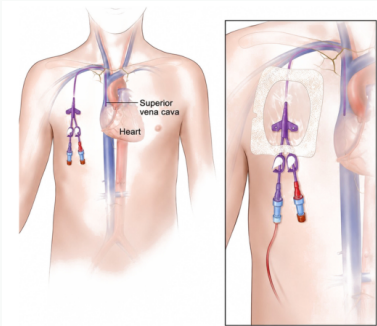
The subcutaneous tunnel and cuff support durable high-flow dialysis access, distinguishing this catheter from a nontunneled dialysis catheter intended for shorter-term use.

14. CENTRAL VENOUS ACCESS

14-09

Tunneled small-bore central venous catheter

Tunneled small-bore line



VISUAL RECOGNITION

Small-bore central venous catheter routed through a subcutaneous tunnel, typically with an external hub and a cuff for tissue ingrowth.

USE & PROCEDURAL CONTEXT

Provides durable small-bore central venous access for long-term antibiotics, infusion therapy, parenteral nutrition, and other chronic venous-access needs when a port or dialysis catheter is not the intended device.

KEY DISTINCTIONS

The defining distinction is durable infusion access through a tunneled small-bore catheter, not the large dual-lumen profile required for high-flow hemodialysis.

ORIENTATION PAGES

Image-Guided Biopsy, Ablation & Augmentation

Orientation purpose: Biopsy and ablation share a percutaneous targeting workflow but have different endpoints. Biopsy systems obtain tissue or place markers; ablation systems deliver energy to a defined treatment zone. Learn which component establishes access, which component performs the primary task, and which adjunct protects nearby structures.

Key Principle

Separate the access pathway from the working device. A coaxial introducer creates a repeatable route; the biopsy needle or ablation probe performs the diagnostic or therapeutic task.

Biopsy & Targeting Devices

Family	Primary role	Key distinction
Coaxial biopsy introducer needle	Establishes a stable percutaneous route to the target	Allows repeated sampling through one access path without repuncturing the skin and deep tissues each time.
Core biopsy needle	Cuts a cylindrical tissue core	Sampling needle itself; often used with an automated core biopsy device.
Automated core biopsy device	Provides the spring-loaded firing mechanism for core sampling	The reusable or disposable firing mechanism is distinct from the sampling needle itself.
Fine-needle aspiration (FNA) needle	Obtains cells or fluid through a smaller needle	Cytologic or aspirational sampling rather than a core specimen.
Bone access and biopsy system	Provides rigid osseous access and sampling	Designed to traverse cortical bone and may include manual or powered components.
Transjugular liver biopsy set	Obtains liver tissue through a transvenous route	Uses a dedicated venous sheath and biopsy system rather than a percutaneous transhepatic needle path.
Fiducial marker	Creates a radiopaque localization target	Implanted marker, not a biopsy or ablation device.

Ablation & Protective Adjuncts

Device	Energy or function	Recognition concept
Microwave ablation antenna	Microwave energy	Needle-like antenna connected to a microwave generator.
Cryoablation probe	Freezing	Probe connected to a cryoablation console; multiple probes may be used to shape the ice-ball treatment zone.
Radiofrequency ablation electrode	Radiofrequency energy	Electrode connected to a radiofrequency generator, with return-path or dispersive components depending on the system.
Protective displacement system	Hydrodissection or pneumodissection	Needle or catheter with a fluid or gas delivery setup used to displace vulnerable structures away from the treatment zone.

Do Not Confuse

Coaxial introducer vs biopsy needle. The introducer creates the pathway; the sampling needle passes through it.
Biopsy vs ablation endpoint. Biopsy obtains tissue; ablation creates a treatment zone.
Protective displacement is an adjunct. It changes the relationship between the target and adjacent structures rather than directly treating the lesion.

15. IMAGE-GUIDED BIOPSY, ABLATION & AUGMENTATION



Device Index

CHAPTER 15

Tissue diagnosis and image-guided therapy

15-01

Automated core biopsy device

15-02

Bone access and biopsy system

15-03

Coaxial biopsy introducer needle

15-04

Core biopsy needle

15-05

Cryoablation probe

15-06

Fiducial marker

15-07

Fine-needle aspiration (FNA) needle

15-08

Microwave ablation antenna

15-09

Protective displacement system

15-10

Radiofrequency ablation electrode

15-11

Transjugular liver biopsy set

15-12

Vertebral augmentation/kyphoplasty system

15

IMAGE-GUIDED BIOPSY, ABLATION & AUGMENTATION

RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

15. IMAGE-GUIDED BIOPSY, ABLATION & AUGMENTATION

15-01

Automated core biopsy device

Automated core biopsy system



VISUAL RECOGNITION

Reusable or disposable spring-loaded handle cocked before firing, paired with a side-notch core needle.

USE & PROCEDURAL CONTEXT

Spring-loaded gun that fires an inner notched needle and outer cutting cannula in rapid succession to capture a uniform tissue core with a preset throw length. Typical procedural contexts include core biopsy of solid organs and masses, liver, kidney, lymph node, and soft tissue.

KEY DISTINCTIONS

The automated device is the spring-loaded firing mechanism, whereas the core biopsy needle is the tissue-cutting component that passes through or attaches to that mechanism.

15-02

Bone access and biopsy system

Bone biopsy system



VISUAL RECOGNITION

Rigid trocar-style bone access needle or powered drilling system with a cannula and specimen-cutting components for cortical penetration and osseous sampling.

USE & PROCEDURAL CONTEXT

Used for image-guided biopsy of bone lesions and for establishing osseous access when dense cortex makes standard soft-tissue biopsy systems unsuitable.

KEY DISTINCTIONS

Bone access systems are substantially stiffer and more robust than soft-tissue biopsy needles; manual Jamshidi®-type and powered OnControl®-type systems represent different approaches to the same osseous-access task.

15-03

Coaxial biopsy introducer needle

Coaxial introducer needle



VISUAL RECOGNITION

Outer cannula left indwelling while the core or FNA needle passes coaxially through its lumen.

USE & PROCEDURAL CONTEXT

Outer guiding cannula placed once to the lesion edge, through which multiple passes are taken from a single skin puncture, improving safety and yield. Typical procedural contexts include lung, liver, kidney, lymph node, adrenal, and soft-tissue biopsy.

KEY DISTINCTIONS

The outer coaxial introducer remains at the lesion margin while multiple sampling passes are performed through it, preserving a single access tract rather than repeatedly repuncturing the skin and target path.

15-04

Core biopsy needle

Side-notch cutting needle



VISUAL RECOGNITION

Needle with a visible specimen notch near the tip, loaded into a biopsy gun.

USE & PROCEDURAL CONTEXT

Obtains intact tissue cores for histopathologic diagnosis using a cutting needle with a specimen notch. Typical targets include solid organs, lymph nodes, soft-tissue masses, kidney, liver, and lung lesions.

KEY DISTINCTIONS

The core biopsy needle is the tissue-cutting component that captures an intact histologic specimen, whereas the automated biopsy device is the firing mechanism that drives the needle.

15. IMAGE-GUIDED BIOPSY, ABLATION & AUGMENTATION

15-05

Cryoablation probe

Iceball ablation probe



VISUAL RECOGNITION

Rigid percutaneous needle-probe connected proximally to dedicated gas lines; the distal active segment is the portion around which the treatment iceball develops.

USE & PROCEDURAL CONTEXT

Needle-probe that rapidly expands argon at its tip (Joule-Thomson effect) to grow a lethal, CT/US-visible iceball, then thaws with helium. Typical procedural contexts include renal masses, lung and bone tumors, soft-tissue tumors, and pain palliation.

KEY DISTINCTIONS

The defining procedural clue is formation of an image-visible iceball around the probe tip, distinguishing cryoablation from heat-based probe systems in this section.

15-06

Fiducial marker

Radiopaque targeting markers



VISUAL RECOGNITION

Tiny gold cylinders or coils preloaded in a needle, deployed through a coaxial introducer.

USE & PROCEDURAL CONTEXT

Small radiopaque seeds implanted in or near a tumor under image guidance to provide targets for stereotactic radiotherapy tracking or surgical localization. Typical procedural contexts include SBRT planning for lung, liver, pancreatic, and prostate tumors.

KEY DISTINCTIONS

Fiducials are implanted radiopaque reference markers rather than biopsy or ablation devices; their purpose is to provide a stable localization target for subsequent image-guided therapy or surgery.

15-07

Fine-needle aspiration (FNA) needle

Cytology aspiration needle



VISUAL RECOGNITION

Very fine 22- to 25-gauge aspiration needle used with a syringe or aspiration handle, with a substantially smaller caliber than a core biopsy needle.

USE & PROCEDURAL CONTEXT

Obtains cellular material for cytologic evaluation using a very fine aspiration needle rather than a core-cutting system. Typical targets include thyroid nodules, lymph nodes, cystic lesions, and selected masses.

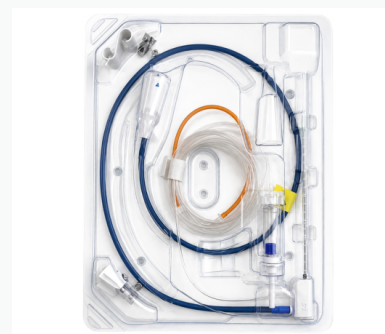
KEY DISTINCTIONS

FNA retrieves cellular material for cytologic evaluation through a very fine needle, distinguishing it from core biopsy, which removes an intact tissue cylinder for histology.

15-08

Microwave ablation antenna

Microwave ablation antenna



VISUAL RECOGNITION

Rigid antenna with a coaxial cable to a microwave generator, often with a shaft-cooling jacket.

USE & PROCEDURAL CONTEXT

Antenna that radiates microwave energy to agitate water molecules and heat tissue to coagulative necrosis, giving fast, large, high-temperature zones less prone to heat-sink than RF. Typical procedural contexts include liver, kidney, lung, adrenal, bone, and soft-tissue tumor ablation.

KEY DISTINCTIONS

Microwave ablation delivers electromagnetic energy through an antenna to create thermal coagulation, distinguishing it from radiofrequency electrodes and cryoablation probes that use different energy mechanisms.

15. IMAGE-GUIDED BIOPSY, ABLATION & AUGMENTATION

15-09

Protective displacement system

Protective displacement system



VISUAL RECOGNITION

Needle or small catheter connected to fluid or gas delivery tubing and positioned between the ablation target and a vulnerable adjacent structure.

USE & PROCEDURAL CONTEXT

Creates temporary protective separation between an ablation target and adjacent vulnerable structures by instilling fluid for hydrodissection or gas for pneumodissection during thermal ablation.

KEY DISTINCTIONS

The system's purpose is protective tissue displacement rather than ablation itself; hydrodissection uses fluid and pneumodissection uses gas to create temporary separation from vulnerable structures.

15-10

Radiofrequency ablation electrode

RF ablation electrode



VISUAL RECOGNITION

RF probe or tined electrode wired to a generator and paired with skin grounding pads.

USE & PROCEDURAL CONTEXT

Electrode that passes alternating current into tissue, generating resistive heat that coagulates the target. Typical procedural contexts include liver, kidney, and bone tumors, osteoid osteoma, and pain procedures.

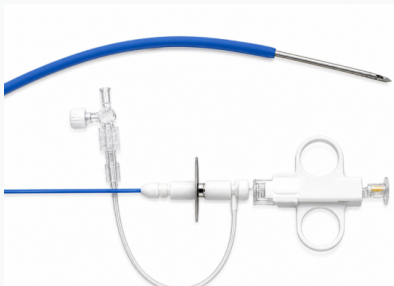
KEY DISTINCTIONS

Radiofrequency electrodes deliver electrical energy through the treatment probe; deployable tines or internal cooling may differentiate individual systems from simple straight electrodes.

15-11

Transjugular liver biopsy set

Transvenous liver biopsy set



VISUAL RECOGNITION

Long coaxial sheath and cannula with a curved metal stiffener and a spring-loaded core-biopsy needle (e.g., Quick-Core).

USE & PROCEDURAL CONTEXT

System advanced from the jugular vein through a hepatic vein to biopsy the liver from within the vein, avoiding capsular puncture when bleeding risk is high. Typical procedural contexts include liver biopsy in coagulopathy, thrombocytopenia, or massive ascites; often combined with pressure measurement.

KEY DISTINCTIONS

The transjugular set obtains liver tissue from within a hepatic vein, avoiding a direct percutaneous liver tract and distinguishing it from standard percutaneous biopsy systems.

15-12

Vertebral augmentation/kyphoplasty system

Kyphon™ balloon and cement-delivery platform



VISUAL RECOGNITION

Platform components include bone-access cannulas, inflatable bone tamps, and a pistol-grip cement-delivery system with clear tubing and cartridge; the pictured Kyphon™ CDS is the cement-delivery component.

USE & PROCEDURAL CONTEXT

Provides percutaneous vertebral-body access, cavity creation with an inflatable bone tamp during balloon kyphoplasty, and controlled radiopaque PMMA cement delivery to stabilize selected painful pathologic vertebral compression fractures.

KEY DISTINCTIONS

Balloon kyphoplasty inflates and removes an intraosseous balloon before cement deposition; vertebroplasty places cement without balloon cavity creation. Both differ from bone biopsy, which primarily obtains tissue rather than stabilizing a fracture.

ORIENTATION PAGES

AV Dialysis Access

Orientation purpose: Arteriovenous (AV) dialysis interventions are integrated circuit procedures. The dedicated devices in this section are best understood in relation to three recurring problems: stenosis, thrombus, and structural failure. Foundational wires, catheters, contrast systems, and standard balloons are taught in earlier sections and are intentionally not duplicated here.

Key Principle

Treat the access as a circuit. Inflow, anastomosis, conduit, cannulation zone, and venous outflow can each create a different device problem and a different treatment sequence.

Dedicated Devices in This Section

Device	Role in the circuit	Recognition focus
AV dialysis access sheath	Working access platform for fistulography, declog, angioplasty, and device delivery	Short vascular sheath positioned directly in the AV access circuit.
Ultra-high-pressure balloon catheter	Dilation of resistant, fibrotic dialysis-access stenoses	Very high pressure rating distinguishes it from a routine PTA balloon.
Rotational mechanical thrombectomy device	Macerates or removes thrombus within the access circuit	Rotational drive mechanism with system-specific catheter or basket components.
Fogarty® arterial embolectomy catheter	Sweeps thrombus, including the arterial plug thrombus, from the arterial limb	Small compliant balloon designed for clot sweep rather than angioplasty.
AV dialysis access stent-graft	Treats selected recurrent stenosis, rupture, or other structural problems	Covered self-expanding implant used within the dialysis circuit.

A Common Declog Logic

1. Define	2. Restore flow	3. Treat the lesion	4. Confirm
Access the circuit and image inflow, conduit, and outflow.	Use thrombectomy, aspiration, lysis, or balloon-sweep strategies as appropriate.	Identify and treat the underlying stenosis or structural abnormality with angioplasty or selected stent-graft placement.	Repeat fistulography or angiographic assessment and evaluate circuit patency and the procedural endpoint.
Do Not Confuse	Fogarty balloon vs angioplasty balloon. The Fogarty is used to sweep clot; the PTA or ultra-high-pressure balloon is used to dilate stenosis. Dialysis thrombectomy vs large-bore venous thrombectomy. They share clot-removal principles but operate in different anatomic circuits and device scales. Thrombus is often secondary to an underlying lesion. The stenosis or structural abnormality associated with access failure may determine the definitive therapy.		

	Device Index	CHAPTER 16 Circuit access, maintenance, and thrombectomy
--	---------------------	--

16-01	AV dialysis access sheath	16-02	AV dialysis access stent-graft
16-03	Fogarty® arterial embolectomy catheter	16-04	Rotational mechanical thrombectomy device
16-05	Ultra-high-pressure balloon catheter		

16. AV DIALYSIS ACCESS

16-01 AV dialysis access sheath

Dialysis working sheath



VISUAL RECOGNITION

Short introducer sheath entering the access circuit, sometimes directed toward the outflow.

USE & PROCEDURAL CONTEXT

Short sheath cannulating the fistula or graft to inject contrast and provide a working channel for angioplasty, thrombectomy, or stenting. Typical procedural contexts include fistulography, fistuloplasty, and AV graft declot.

KEY DISTINCTIONS

The sheath serves both as a contrast-access point for fistulography and as a working channel for subsequent intervention within the AV dialysis circuit.

16-02 AV dialysis access stent-graft

Dialysis stent-graft



VISUAL RECOGNITION

Self-expanding stent-graft lined with graft material such as ePTFE, producing a covered tubular appearance rather than an open bare-metal mesh.

USE & PROCEDURAL CONTEXT

Fabric-covered self-expanding stent-graft that lines and seals a vessel segment, excluding a stenosis or defect rather than merely scaffolding it. Typical procedural contexts include dialysis-access outflow stenoses and venous lesions when a covered device is selected for added sealing and scaffolding.

KEY DISTINCTIONS

The graft lining creates a covered conduit within the dialysis circuit, distinguishing a stent-graft from an uncovered bare-metal stent and allowing both scaffolding and sealing.

16-03 Fogarty® arterial embolectomy catheter

Clot-sweep balloon



VISUAL RECOGNITION

Thin catheter with a compliant distal balloon and a proximal inflation port, designed to pass through a vessel or access circuit.

USE & PROCEDURAL CONTEXT

Used during AV dialysis-access declot and selected peripheral embolectomy to sweep residual thrombus or an arterial plug after mechanical thrombectomy.

KEY DISTINCTIONS

The balloon is inflated distal to thrombus and withdrawn as a sweep device; unlike an angioplasty balloon, it is not intended for sustained high-pressure dilation of a stenosis.

16-04 Rotational mechanical thrombectomy device

Dialysis thrombectomy device



VISUAL RECOGNITION

Powered or hand-driven catheter with a rotating wire, basket, or macerating element designed to disrupt thrombus within an AV graft or fistula.

USE & PROCEDURAL CONTEXT

Mechanically disrupts and clears thrombus from an AV graft or fistula during dialysis-access declot procedures, typically before angioplasty or other treatment of the underlying stenosis.

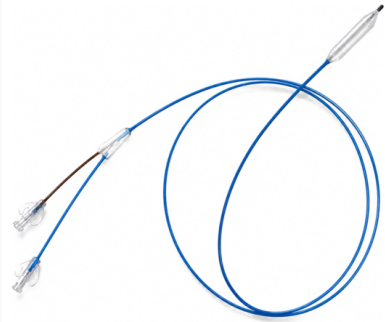
KEY DISTINCTIONS

Cleaner® and Trerotola® systems use different rotating elements but share the same core principle of mechanically disrupting thrombus within the dialysis access circuit.

16-05

Ultra-high-pressure balloon catheter

Resistant-lesion angioplasty balloon



VISUAL RECOGNITION

Angioplasty balloon identified by labeling that specifies an exceptionally high rated burst pressure, often approximately 30 atm or greater.

USE & PROCEDURAL CONTEXT

Provides very high-pressure noncompliant dilation for resistant fibrotic dialysis-access and outflow stenoses that do not yield to standard or high-pressure angioplasty balloons.

KEY DISTINCTIONS

Its defining feature is an exceptionally high labeled pressure capability for resistant stenoses, exceeding the pressure range of routine PTA and standard high-pressure balloons.

ORIENTATION PAGES

TIPS & Portal Hypertension

Orientation purpose: This section contains the device systems distinctive enough to merit separate treatment in transjugular intrahepatic portosystemic shunt (TIPS) creation and other portal hypertensive interventions. Most of a TIPS or variceal obliteration case still relies on foundational devices taught earlier: venous access, guidewires, diagnostic catheters, balloons, stents, embolics, and closure equipment.

Key Principle

TIPS is an integrated hemodynamic workflow. Follow the sequence from hepatic venous access to portal puncture, pressure assessment, shunt creation or revision, and post-treatment reassessment.

Four Distinctive Systems

Device	Role	What makes it distinctive
TIPS portal access system	Creates the controlled transhepatic pathway from hepatic vein toward the portal venous system	Curved sheath/cannula and dedicated puncture needle assembled specifically for portal access.
Portal pressure transduction system	Measures venous and portal pressures through a fluid-filled catheter or sheath circuit	Pressure tubing, transducer, stopcocks, flush source, and monitor form a measurement system rather than a single catheter.
TIPS stent-graft	Creates or revises the portosystemic shunt	Dedicated covered stent-graft design intended for the TIPS tract.
BRT0 occlusion balloon catheter	Temporarily occludes a venous outflow pathway during balloon-occluded retrograde transvenous obliteration (BRT0) and related variceal obliteration workflows	Compliant occlusion balloon used for flow control, not angioplasty.

TIPS Workflow Orientation

Stage	What to look for
Portal access	Dedicated TIPS access system appears after hepatic venous catheterization.
Hemodynamics and anatomy	Pressure transduction and portal venography establish the hemodynamic and anatomic baseline.
Tract preparation	Guidewires and balloon dilation prepare the shunt tract for the implant.
Shunt reconstruction	TIPS stent-graft bridges portal and hepatic venous systems.
Reassessment and adjuncts	Repeat pressure measurement, venography, and embolic treatment may follow depending on the objective.
Do Not Confuse	Portal access system vs TIPS stent-graft. One creates the transhepatic pathway; the other is the definitive implant. Pressure transduction vs angiography. One measures hemodynamics; the other depicts anatomy and flow. BRT0 balloon vs angioplasty balloon. The BRT0 balloon provides temporary venous occlusion and flow control rather than dilation.



Device Index

CHAPTER 17

Portal decompression and variceal intervention

17-01	BRT0 occlusion balloon catheter	17-02	Portal pressure transduction system
17-03	TIPS portal access system	17-04	TIPS stent-graft

17. TIPS & PORTAL HYPERTENSION

17-01

BRTO occlusion balloon catheter

BRTO occlusion balloon



VISUAL RECOGNITION

Balloon-tipped catheter positioned in the portosystemic shunt outflow, with a compliant distal balloon that is inflated during sclerosant instillation.

USE & PROCEDURAL CONTEXT

Compliant balloon inflated in the gastroduodenal shunt to block outflow so injected sclerosant dwells within and obliterates gastric varices during balloon-occluded retrograde transvenous obliteration. Typical procedural contexts include BRTO for gastric varices and management of portosystemic shunts.

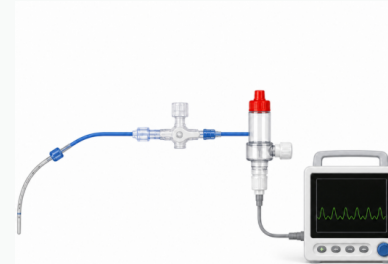
KEY DISTINCTIONS

The balloon's role is prolonged shunt-outflow occlusion so sclerosant can dwell within the target variceal complex, rather than angioplasty or short-duration diagnostic flow arrest.

17-02

Portal pressure transduction system

Portal pressure monitoring system



VISUAL RECOGNITION

Fluid-filled catheter and pressure-transducer setup connected to a monitor, with stopcocks and a pressurized flush line.

USE & PROCEDURAL CONTEXT

Measures portal, hepatic venous, and systemic venous pressures and pressure gradients during TIPS creation, TIPS revision, and other portal-hypertension assessments using a fluid-filled catheter and transducer setup.

KEY DISTINCTIONS

This is a hemodynamic measurement setup rather than a unique catheter shape; accurate values depend on correct leveling, zeroing, and an intact fluid-filled pressure circuit.

17-03

TIPS portal access system

Transjugular portal access system



VISUAL RECOGNITION

Long curved transjugular sheath and cannula system containing a dedicated portal-puncture needle for directing a controlled pass from a hepatic vein toward the portal vein.

USE & PROCEDURAL CONTEXT

Creates controlled transhepatic portal venous access from a transjugular hepatic-vein approach during TIPS creation and selected advanced portal interventions.

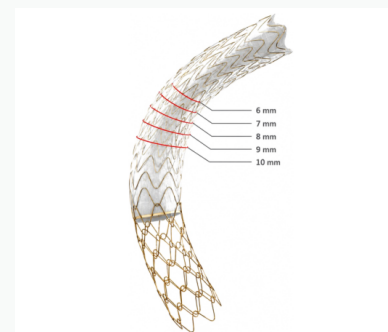
KEY DISTINCTIONS

The TIPS access system integrates the curved working sheath or cannula with a dedicated portal-puncture needle; Colapinto and Rösch-Uchida-type configurations are representative variants.

17-04

TIPS stent-graft

Dedicated TIPS endoprosthesis



VISUAL RECOGNITION

Hybrid stent with a PTFE-covered hepatic portion and an uncovered portal end.

USE & PROCEDURAL CONTEXT

Dedicated TIPS endoprosthesis (Gore) with a covered shunt segment and a bare portal-vein segment for durable shunt patency. Typical procedural contexts include TIPS creation and revision.

KEY DISTINCTIONS

The hybrid implant combines a covered shunt segment with an uncovered portal-vein end, a configuration specifically designed for TIPS rather than general peripheral stent-graft use.

ORIENTATION PAGES

Closure, Hemostasis & Securement

Orientation purpose: The final section completes the procedural workflow. It includes devices that close vascular access, control bleeding, approximate skin, secure an indwelling catheter, cap a lumen, or protect a completed site. These are different endpoints and should not be treated as interchangeable forms of “closure.”

Key Principle

First identify the endpoint that must be completed: the vascular access site, tissue tract, skin, indwelling catheter, or dressing. The correct device family follows from that endpoint.

Four Completion Functions

Function	Entries in this section	What they accomplish
Vascular access closure and compression	ANGIO-SEAL® vascular closure device; Perclose ProGlide™ closure system; extravascular sealant closure device; external mechanical compression device; TR BAND® radial compression device	Close or compress an arterial access site using plug/anchor, suture, extravascular sealant, or external compression mechanisms.
Hemostasis	Topical hemostatic agent; pressure dressing; thrombin injection	Promote local bleeding control at an access site, tissue surface, or pseudoaneurysm.
Skin closure	Suture materials; cyanoacrylate topical skin adhesive; Steri-Strip™ skin closures	Approximate superficial tissue or skin after device removal or tract completion.
Indwelling-device securement and protection	Sutureless catheter securement device; needleless catheter connector and cap; chlorhexidine-impregnated transparent dressing; transparent film dressing	Stabilize, cap, protect, and maintain a catheter or tube that remains in the patient.

High-Yield Distinctions

Do not confuse	Key distinction
Vascular closure device vs skin closure	A vascular closure system addresses the arteriotomy or access tract; skin adhesive or sutures address the superficial skin layer.
Compression vs implanted closure	TR BAND® and external compression systems apply pressure from outside; ANGIO-SEAL® and ProGlide™ use an implanted or suture-mediated mechanism at the access site.
Securement vs dressing	A securement device limits catheter movement; a dressing protects the exit site and may provide antimicrobial coverage.
Connector or cap vs securement	A needleless connector or cap controls lumen access but does not mechanically anchor the catheter to the skin.
Thrombin injection vs routine access-site closure	Ultrasound-guided thrombin is a targeted treatment for selected pseudoaneurysms rather than a routine closure method after every arterial puncture.
Final Learner Focus	Complete the case conceptually. Ask what remains in the patient, which access site requires closure or hemostasis, what bleeding must be controlled, and which site requires securement or protection. Use mechanism-based language. Compression, plug/anchor, suture-mediated closure, sealant, topical hemostasis, skin closure, and catheter securement are separate concepts. The taxonomy ends here intentionally. Closure, hemostasis, and securement are the final device functions that complete the procedural workflow.

18. CLOSURE, HEMOSTASIS & SECUREMENT



Device Index

CHAPTER 18

Access-site closure and device stabilization

18-01

ANGIO-SEAL® vascular closure device

18-02

Chlorhexidine-impregnated dressing

18-03

Cyanoacrylate topical skin adhesive

18-04

External mechanical compression device

18-05

Extravascular sealant closure device

18-06

Large-bore femoral vascular closure device

18-07

Needleless catheter connector and cap

18-08

Perclose ProGlide™ closure system

18-09

Pressure dressing

18-10

Steri-Strip™ skin closures

18-11

Suture materials

18-12

Sutureless catheter securement device

18-13

Thrombin injection

18-14

Topical hemostatic agent

18-15

TR BAND® radial compression device

18-16

Transparent film dressing

18

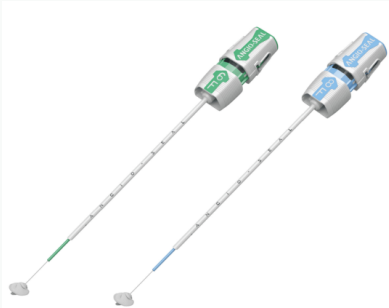
CLOSURE, HEMOSTASIS & SECUREMENT

RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

18. CLOSURE, HEMOSTASIS & SECUREMENT

18-01 ANGIO-SEAL® vascular closure device

Collagen-plug closure device



VISUAL RECOGNITION

Kit with an intravascular anchor, collagen plug, resorbable suture, and removable tamper tube; only the anchor, plug, and suture remain implanted.

USE & PROCEDURAL CONTEXT

Bioabsorbable closure that sandwiches the femoral arteriotomy between an intra-arterial anchor and an extravascular collagen plug, cinched by a self-tightening suture for rapid hemostasis. Typical procedural contexts include hemostasis after diagnostic angiography and femoral arterial interventions.

KEY DISTINCTIONS

ANGIO-SEAL® achieves femoral hemostasis by sandwiching the arteriotomy between an intravascular anchor and an extravascular collagen plug, unlike suture-mediated or fully extravascular sealant systems.

18-02 Chlorhexidine-impregnated dressing

Antimicrobial transparent dressing



VISUAL RECOGNITION

Clear adhesive film dressing with an integrated chlorhexidine gel pad positioned over the catheter insertion site.

USE & PROCEDURAL CONTEXT

Provides both catheter-site coverage and continuous local chlorhexidine exposure while preserving direct visualization of the insertion site. Typical applications include central venous catheters, PICCs, and dialysis catheters.

KEY DISTINCTIONS

The integrated chlorhexidine component distinguishes this dressing from a standard transparent film, combining continuous local antimicrobial coverage with direct visualization of the insertion site.

18-03 Cyanoacrylate topical skin adhesive

Topical skin adhesive



VISUAL RECOGNITION

Single-use applicator containing a medical-grade cyanoacrylate that polymerizes into a thin glossy film over approximated skin edges.

USE & PROCEDURAL CONTEXT

Provides superficial skin-edge approximation or reinforcement for small procedural incisions, port sites, and selected puncture sites by polymerizing into a protective topical adhesive film.

KEY DISTINCTIONS

Cyanoacrylate adhesive closes or reinforces superficial skin edges by forming a polymerized surface film, rather than approximating tissue with buried suture or a mechanical closure device.

18-04 External mechanical compression device

Mechanical compression system



VISUAL RECOGNITION

External groin hemostasis device that concentrates adjustable pressure over an access site using a pneumatic dome, compression pad, or inflatable focal element.

USE & PROCEDURAL CONTEXT

Provides sustained external compression after arterial or venous sheath removal and can serve as rescue hemostasis when prolonged manual compression is undesirable or impractical.

KEY DISTINCTIONS

External compression achieves hemostasis without leaving an implanted closure component; FemoStop® and SAFEGUARD® represent different device designs within this surface-compression category.

18. CLOSURE, HEMOSTASIS & SECUREMENT

18-05 Extravascular sealant closure device

Sealant-based vascular closure device



VISUAL RECOGNITION

Femoral vascular closure system that delivers a bioresorbable sealant outside the vessel at the arteriotomy while avoiding an intraluminal anchor.

USE & PROCEDURAL CONTEXT

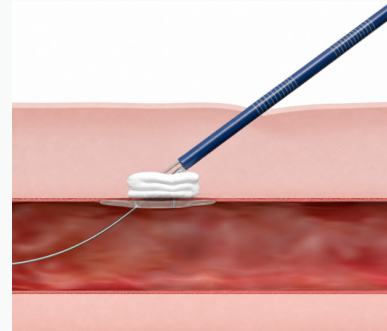
Provides percutaneous femoral access-site hemostasis by depositing a bioresorbable sealant outside the vessel after compatible diagnostic or interventional procedures.

KEY DISTINCTIONS

The bioresorbable sealant remains outside the vessel, distinguishing this mechanism from suture-mediated closure and from systems that use an intravascular anchor.

18-06 Large-bore femoral vascular closure device

MANTA® collagen-based closure system



VISUAL RECOGNITION

Depth-locator and delivery system with a bioresorbable intraluminal anchor, extravascular bovine-collagen plug, connecting suture, sliding suture knot, and radiopaque lock.

USE & PROCEDURAL CONTEXT

Closes compatible common femoral arterial access sites after 10–20 Fr endovascular devices or 12–25 Fr outer-diameter sheaths, including selected EVAR, TEVAR, and structural-heart procedures, using a single postprocedure biomechanical closure device.

KEY DISTINCTIONS

Unlike suture-mediated preclosure, MANTA® is deployed after the large-bore procedure; unlike standard ANGIO-SEAL® systems, it is purpose-designed for substantially larger femoral arteriotomies.

18-07 Needleless catheter connector and cap

Catheter connector and cap



VISUAL RECOGNITION

Small valve or cap attached to a catheter hub to create a closed needleless access point for injection, aspiration, or flushing.

USE & PROCEDURAL CONTEXT

Used on central venous catheters, PICCs, ports, drains, and other access devices that require repeated connection while maintaining a closed system.

KEY DISTINCTIONS

This is a hub-access accessory that creates a closed needleless connection for injection, aspiration, or flushing; it does not secure the catheter to skin or close the insertion site.

18-08 Perclose ProGlide™ closure system

Suture-mediated closure system



VISUAL RECOGNITION

Handled device with plunger and foot that delivers a knotted polypropylene suture.

USE & PROCEDURAL CONTEXT

Suture-mediated closure that pre-deploys a polypropylene stitch at the arteriotomy; one or two devices in pre-close technique can close large-bore access percutaneously. Typical procedural contexts include percutaneous EVAR/TEVAR pre-close and standard femoral arterial closure.

KEY DISTINCTIONS

Perclose ProGlide™ closes the arteriotomy with a predeployed polypropylene suture, distinguishing it from anchor-collagen, extravascular sealant, and external-compression closure mechanisms.

18. CLOSURE, HEMOSTASIS & SECUREMENT

18-09 Pressure dressing

Compressive dressing



VISUAL RECOGNITION

Layered dressing composed of folded gauze or other compressive material secured beneath a taut adhesive over-dressing to maintain focal surface pressure.

USE & PROCEDURAL CONTEXT

Provides sustained superficial compression over an access, biopsy, or drain-removal site to support hemostasis and limit postprocedural bleeding or hematoma formation.

KEY DISTINCTIONS

A pressure dressing provides sustained external surface compression after the procedure; it is supportive hemostasis rather than an implanted vascular closure device.

18-10 Steri-Strip™ skin closures

Adhesive skin closures



VISUAL RECOGNITION

Narrow reinforced adhesive strips applied perpendicular to a superficial incision or skin opening.

USE & PROCEDURAL CONTEXT

Approximate and reinforce small port incisions, skin nicks, and biopsy sites, either alone or as an adjunct after deeper closure.

KEY DISTINCTIONS

Steri-Strip™ closures approximate low-tension superficial skin edges with adhesive strips, distinguishing them from liquid skin adhesive and from sutures used for deeper or higher-tension closure.

18-11 Suture materials

Common closure and securement sutures



VISUAL RECOGNITION

Sterile absorbable or nonabsorbable sutures supplied as monofilament or braided strands with attached needles; common materials include polyglactin, poliglecaprone, polydioxanone, polypropylene, nylon, silk, and chromic gut.

USE & PROCEDURAL CONTEXT

Provides material for skin and subcutaneous closure, port-pocket closure, and drain or catheter securement. Selection depends on absorbability, tissue layer, handling characteristics, tensile requirements, and intended duration.

KEY DISTINCTIONS

Suture selection depends on absorbability, filament structure, tissue layer, tensile needs, handling, and intended duration; the educational focus is material class rather than memorization of individual brands.

18-12 Sutureless catheter securement device

Sutureless securement platform



VISUAL RECOGNITION

Adhesive skin-mounted securement platform that grips or clips the external catheter or tubing without a fixation suture.

USE & PROCEDURAL CONTEXT

Used to stabilize PICCs, drains, nephrostomy or biliary catheters, urinary catheters, and other external devices while reducing traction at the insertion site.

KEY DISTINCTIONS

Sutureless securement devices stabilize an external catheter by adhesive straps or molded retainers instead of fixation sutures; Grip-Lok®-type and StatLock®-type systems use different attachment designs.

18. CLOSURE, HEMOSTASIS & SECUREMENT

18-13 Thrombin injection

Pseudoaneurysm thrombin therapy



VISUAL RECOGNITION

Thrombin preparation drawn into a small syringe for direct ultrasound-guided sac injection, typically paired with a fine needle and real-time imaging.

USE & PROCEDURAL CONTEXT

Ultrasound-guided injection of thrombin into a pseudoaneurysm sac to trigger immediate localized clotting and obliterate the cavity without surgery. Typical procedural contexts include femoral and other access-site pseudoaneurysms.

KEY DISTINCTIONS

Thrombin injection treats the pseudoaneurysm sac by inducing immediate localized thrombosis under ultrasound guidance, rather than closing the original arteriotomy with a mechanical access-site device.

18-15 TR BAND® radial compression device

Radial compression band



VISUAL RECOGNITION

Clear plastic wrist band with an inflatable bladder and a syringe fill port.

USE & PROCEDURAL CONTEXT

Provides adjustable pneumatic compression of the radial access site after transradial angiography or intervention, allowing the degree of compression to be titrated during postprocedural hemostasis.

KEY DISTINCTIONS

TR BAND® provides adjustable radial-artery compression through an inflatable wrist bladder, allowing titrated post-access hemostasis rather than fixed adhesive or groin compression.

18-14 Topical hemostatic agent

Topical hemostatic material



VISUAL RECOGNITION

Absorbable topical material such as oxidized regenerated cellulose or gelatin placed directly on a low-pressure bleeding surface to support clot formation.

USE & PROCEDURAL CONTEXT

Provides focal local hemostatic support for superficial soft-tissue, port-pocket, tract, or operative-site oozing by applying an absorbable material directly to the bleeding surface.

KEY DISTINCTIONS

Topical hemostatic agents act locally at the tissue surface rather than within a vessel; this distinguishes them from intravascular embolics and from mechanical access-site closure systems.

18-16 Transparent film dressing

Transparent film dressing



VISUAL RECOGNITION

Clear semipermeable adhesive film placed over an access, catheter, drain, or incision site while leaving the underlying skin visible.

USE & PROCEDURAL CONTEXT

Provides a clear semipermeable protective barrier over access sites, catheter or drain insertion sites, and small incisions while allowing direct visual inspection of the underlying skin.

KEY DISTINCTIONS

A standard transparent film provides coverage and site visualization without an integrated antimicrobial gel pad, distinguishing it from a chlorhexidine-impregnated transparent dressing.

Device Inventory

A quick-reference inventory of all 171 devices in the First Edition, grouped by section and listed in panel order. Use the panel number to match each device to its full panel. Page directs you to the device panel, not the chapter orientation or Device Index.

171 DEVICES · 18 SECTIONS

PANEL	DEVICE	PAGE
01. Access		
01-01	18-gauge access needle	3
01-02	21-gauge micropuncture access needle	3
01-03	Chiba needle	3
01-04	Hemostatic forceps (Kelly and Mosquito)	3
01-05	Micropuncture set	4
01-06	No. 11 scalpel blade	4
01-07	Spinal needle	4
01-08	Trocar drainage catheter system	4
01-09	Yueh needle-catheter system	5
02. Wires		
02-01	0.014-inch peripheral guidewire	8
02-02	0.018-inch micropuncture guidewire	8
02-03	0.018-inch peripheral guidewire	8
02-04	0.035-inch Bentson guidewire	8
02-05	0.035-inch hydrophilic guidewire	9
02-06	0.035-inch J-tip guidewire	9
02-07	0.035-inch Rosen guidewire	9
02-08	Amplatz stiff guidewire	9
02-09	Lunderquist® Extra-Stiff Wire Guide	10
03. Sheaths & Dilators		
03-01	Large-bore vascular sheath	13
03-02	Long guiding sheath	13
03-03	Micropuncture introducer sheath	13
03-04	Peel-Away® Sheath Introducer	13

PANEL	DEVICE	PAGE
03-05	Rotating hemostatic valve	14
03-06	Serial tract dilators	14
03-07	Vascular introducer sheath	14
04. Diagnostic Catheters		
04-01	Berenstein catheter	17
04-02	Cobra 1 catheter	17
04-03	Cobra 2 catheter	17
04-04	Flush pigtail angiographic catheter	17
04-05	Headhunter 1 catheter	18
04-06	Kumpe catheter	18
04-07	Mikaelsson catheter	18
04-08	Multipurpose angiographic catheter	18
04-09	Omni Flush catheter	19
04-10	Renal double curve (RDC) catheter	19
04-11	Shepherd hook catheter	19
04-12	Simmons 1 catheter	19
04-13	Simmons 2 catheter	20
04-14	Simmons 3 catheter	20
04-15	SOS Omni® catheter	20
04-16	Vertebral catheter	20
05. Microcatheters, Microwires & Crossing Systems		
05-01	Balloon-occlusion microcatheter	23
05-02	Chronic total occlusion (CTO) re-entry device	23
05-03	Coaxial microcatheter	23
05-04	Crossing support catheter	23
05-05	Microguidewire	24
05-06	Torqueable microcatheter	24
06. Contrast & Table Setup		
06-01	Angiographic manifold	27

PANEL	DEVICE	PAGE
06-02	CO ₂ angiography delivery system	27
06-03	Contrast power injector	27
06-04	Hand-injection contrast syringe	27
06-05	Luer-lock connector	28
06-06	Power-injector tubing	28
06-07	Pressure infusion bag	28
06-08	Pressure transducer system	28
06-09	Three-way stopcock	29
07. Embolics		
07-01	Absolute ethanol	32
07-02	Absorbable gelatin sponge embolic	32
07-03	Calibrated embolic microspheres	32
07-04	Drug-eluting embolic microspheres	32
07-05	Embolization coils (pushable and detachable)	33
07-06	Ethiodized oil (LIPIODOL®)	33
07-07	n-Butyl cyanoacrylate (n-BCA) liquid embolic	33
07-08	Onyx™ liquid embolic system	33
07-09	Polyvinyl alcohol (PVA) particles	34
07-10	Sodium tetradecyl sulfate sclerosant	34
07-11	Technetium-99m MAA	34
07-12	Vascular plug	34
07-13	Yttrium-90 radioembolization microspheres	35
08. Balloons		
08-01	Balloon inflation device	38
08-02	Compliant aortic molding balloon catheter	38
08-03	Cutting/scoring angioplasty balloon	38
08-04	Drug-coated angioplasty balloon	38
08-05	High-pressure angioplasty balloon	39
08-06	Intravascular lithotripsy (IVL) catheter	39

PANEL	DEVICE	PAGE
08-07	Occlusion balloon catheter	39
08-08	PTA balloon catheter	39
08-09	Peripheral atherectomy device	40
09. Stents & Stent Grafts		
09-01	Balloon-expandable covered stent	43
09-02	Balloon-expandable stent	43
09-03	Dedicated venous stent system	43
09-04	Drug-eluting peripheral arterial stent	43
09-05	Endovascular aortic stent-graft system	44
09-06	Interwoven nitinol stent	44
09-07	Self-expanding bare-metal stent	44
09-08	Self-expanding stent-graft	44
10. Thrombectomy & Lysis		
10-01	Alteplase (tPA) thrombolytic agent	47
10-02	AngioJet™ rheolytic thrombectomy system	47
10-03	ClotTriever® thrombectomy system	47
10-04	EKOS™ Endovascular System	47
10-05	FlowTriever® thrombectomy system	48
10-06	Indigo® aspiration system	48
10-07	Multi-side-hole thrombolysis catheter	48
11. Embolic Protection, Retrieval & IVC Filters		
11-01	Distal embolic protection device	51
11-02	Endovascular loop snare	51
11-03	Endovascular retrieval basket	51
11-04	Endovascular retrieval forceps	51
11-05	IVC filter	52
11-06	IVC filter delivery system	52
11-07	IVC filter retrieval sheath	52

PANEL	DEVICE	PAGE
12. Drains & Enteral Access		
12-01	Gastrojejunostomy (GJ) tube	55
12-02	Gastropexy T-fasteners	55
12-03	Gastrostomy (G) tube	55
12-04	Locking pigtail drainage catheter	55
12-05	Malecot drainage catheter	56
12-06	Nonlocking pigtail drainage catheter	56
12-07	Small-bore pigtail thoracostomy catheter	56
12-08	Thoracentesis and paracentesis catheter	56
12-09	Tunneled pleural/peritoneal drain	57
13. Biliary & Genitourinary		
13-01	Biliary access sheath	60
13-02	Biliary angioplasty balloon catheter	60
13-03	Biliary cytology brush	60
13-04	Biliary occlusion balloon catheter	60
13-05	Biliary stone retrieval basket	61
13-06	Coaxial transitional access set	61
13-07	Covered self-expanding metal biliary stent	61
13-08	Double-J ureteral stent	61
13-09	External biliary drainage catheter	62
13-10	Internal-external biliary drainage catheter	62
13-11	Nephroureteral catheter	62
13-12	Percutaneous cholecystostomy catheter	62
13-13	Percutaneous nephrostomy catheter	63
13-14	Suprapubic cystostomy catheter	63
13-15	Uncovered self-expanding metal biliary stent	63
13-16	Ureteral access catheter	63
14. Central Venous Access		
14-01	Implanted venous access port	66

PANEL	DEVICE	PAGE
14-02	Midline catheter	66
14-03	Noncoring port access needle (Huber needle)	66
14-04	Nontunneled central venous catheter	66
14-05	Nontunneled hemodialysis catheter	67
14-06	Peripherally inserted central catheter (PICC)	67
14-07	Subcutaneous catheter tunneler	67
14-08	Tunneled hemodialysis catheter	67
14-09	Tunneled small-bore central venous catheter	68
15. Image-Guided Biopsy, Ablation & Augmentation		
15-01	Automated core biopsy device	71
15-02	Bone access and biopsy system	71
15-03	Coaxial biopsy introducer needle	71
15-04	Core biopsy needle	71
15-05	Cryoablation probe	72
15-06	Fiducial marker	72
15-07	Fine-needle aspiration (FNA) needle	72
15-08	Microwave ablation antenna	72
15-09	Protective displacement system	73
15-10	Radiofrequency ablation electrode	73
15-11	Transjugular liver biopsy set	73
15-12	Vertebral augmentation/kyphoplasty system	73
16. AV Dialysis Access		
16-01	AV dialysis access sheath	76
16-02	AV dialysis access stent-graft	76
16-03	Fogarty® arterial embolectomy catheter	76
16-04	Rotational mechanical thrombectomy device	76
16-05	Ultra-high-pressure balloon catheter	77
17. TIPS & Portal Hypertension		
17-01	BRTO occlusion balloon catheter	80

PANEL	DEVICE	PAGE
17-02	Portal pressure transduction system	80
17-03	TIPS portal access system	80
17-04	TIPS stent-graft	80
18. Closure, Hemostasis & Securement		
18-01	ANGIO-SEAL® vascular closure device	83
18-02	Chlorhexidine-impregnated dressing	83
18-03	Cyanoacrylate topical skin adhesive	83
18-04	External mechanical compression device	83
18-05	Extravascular sealant closure device	84
18-06	Large-bore femoral vascular closure device	84
18-07	Needleless catheter connector and cap	84
18-08	Perclose ProGlide™ closure system	84
18-09	Pressure dressing	85
18-10	Steri-Strip™ skin closures	85
18-11	Suture materials	85
18-12	Sutureless catheter securement device	85
18-13	Thrombin injection	86
18-14	Topical hemostatic agent	86
18-15	TR BAND® radial compression device	86
18-16	Transparent film dressing	86