

Vascular Ultrasound Vocabulary Reference

Part 6: Miscellaneous | Chapters 24–28

Kupinski, *Diagnostic Medical Sonography: The Vascular System*, 3rd Ed.

An In-Depth Review by Dr. Alice Matthews

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Chapter 24: Intraoperative Duplex Sonography

Term	Definition	Analogy / Example
Completion Study	An ultrasound examination performed at the end of a surgical procedure to verify that the reconstruction is technically satisfactory.	Like a final inspection before shipping--you verify the job is done right before closing up.
Intimal Flap	A piece of the inner vessel wall that has lifted or torn during surgery, visible as a linear structure within the lumen.	Like wallpaper that's peeling--the inner layer has separated from the wall and may need repair.
Intraoperative Duplex Ultrasound	Ultrasound imaging performed during surgery to immediately assess the technical success of vascular procedures before the patient leaves the operating room.	Like quality control on an assembly line--checking your work before it leaves the factory lets you fix problems immediately.
Normal Intraoperative Criteria	For carotid endarterectomy: PSV <130 cm/s, EDV <50 cm/s, no visible defects. For bypass grafts: PSV <200 cm/s, Vr <2.0.	Like the passing grade on a test--if the numbers are below these thresholds and nothing looks wrong, the surgery is successful.
Residual Stenosis	Narrowing remaining after a surgical procedure (e.g., carotid endarterectomy) that may require immediate revision.	Like not quite finishing the job--some blockage remains despite the surgery.
Retained Valve	A venous valve leaflet that was incompletely removed during in situ bypass surgery, potentially causing stenosis.	Like leaving a gate partially closed--the valve should have been destroyed but wasn't.
Revision	Surgical correction of a technical defect identified during intraoperative ultrasound.	Like fixing a mistake before it causes problems--immediate correction prevents later failure.
Technical Defect	An abnormality in a surgical reconstruction detected by intraoperative ultrasound, such as residual plaque, intimal flap, or stenosis.	Like finding a flaw in your work--something that needs to be fixed before the job is complete.

Chapter 25: Central Vascular Access Device Placement

Term	Definition	Analogy / Example
Air Embolism	Entry of air into the venous system through an open catheter or needle, potentially causing serious complications.	Like a bubble in an IV line--air entering the bloodstream can be dangerous.
Arterial Puncture	Accidental puncture of an artery during attempted venous access. Ultrasound guidance reduces this risk.	Like hitting the wrong pipe--you aimed for the vein but hit the artery instead.
Atriocaval Junction	The junction of the superior vena cava and right atrium--the ideal location for central catheter tips.	Like the optimal parking spot--the best place for the catheter tip because blood flow is highest here.

Term	Definition	Analogy / Example
Catheter Fracture	Breaking of a catheter, often due to pinch-off syndrome or material fatigue. May result in catheter embolism.	Like a pipe cracking from stress--the catheter breaks and pieces can travel.
Catheter Malposition	Incorrect placement of a catheter tip (e.g., in the wrong vein or not advanced far enough).	Like parking in the wrong spot--the catheter isn't where it should be.
Catheter Occlusion	Blockage of a catheter lumen by thrombus or precipitated medications.	Like a clogged straw--the catheter won't draw blood or allow infusion.
Catheter-Related Infection	Infection associated with a vascular access device, often originating at the skin entry site.	Like bacteria hitchhiking on the catheter--infection travels along the device into the bloodstream.
Central Venous Catheter (CVC)	A catheter placed into a large central vein (internal jugular, subclavian, or femoral) with the tip in the SVC or IVC.	Like plugging directly into the main line--accesses a large central vein for high-volume treatments.
Femoral Vein Access	Cannulation of the common femoral vein in the groin, typically reserved for emergencies or when other sites unavailable.	Like the backup entrance--used when other options are gone, but higher infection risk.
Fibrin Sheath	A layer of fibrin that forms around a catheter, potentially causing dysfunction or occlusion.	Like scar tissue coating the catheter--the body's natural response to a foreign object.
Implanted Port	A vascular access device with a reservoir surgically placed under the skin, accessed by needle puncture through the skin.	Like a buried treasure chest--the port sits under the skin and is accessed only when needed by poking through the skin.
Internal Jugular Vein (IJV) Access	Cannulation of the internal jugular vein in the neck, the most common site for central venous access.	Like accessing the main highway through the neck--the IJV is a large, accessible vein.
Non-Tunneled Catheter	A catheter placed directly into a vein without a subcutaneous tunnel. Used for short-term access.	Like plugging directly in without protection--simpler but higher infection risk for longer use.
Peripherally Inserted Central Catheter (PICC)	A long, thin catheter inserted into a peripheral arm vein (basilic, brachial, or cephalic) and advanced so the tip sits in the distal SVC.	Like threading a straw from the arm to the heart--a long catheter that starts in the arm but ends near the heart.
Pinch-Off Syndrome	Compression of a subclavian catheter between the clavicle and first rib, causing catheter fracture or obstruction.	Like a hose getting pinched between two rocks--the catheter is crushed by the bones.
Pneumothorax	A complication of central line placement where air enters the pleural space, causing lung collapse. More common with subclavian approach.	Like a balloon deflating--air gets between the lung and chest wall, causing the lung to collapse.
Subclavian Vein Access	Cannulation of the subclavian vein under the clavicle, commonly used for tunneled catheters and ports.	Like going in under the collarbone--a common approach for long-term access devices.
Tunneled Catheter	A central venous catheter that travels under the skin between the entry site and the vein puncture site, reducing infection risk.	Like a subway going underground--the catheter tunnels beneath the skin before entering the vein, creating a barrier against bacteria.
Ultrasound-Guided Venipuncture	Use of real-time ultrasound to guide needle placement into a vein, now the standard of care for central access.	Like using a GPS instead of guessing--ultrasound shows exactly where to aim the needle.
Vascular Access Device (VAD)	Any catheter or device placed into a vein to provide venous access for infusion therapy, blood sampling, or other treatments.	Like installing a port for deliveries--the device provides a reliable way to get medications into the bloodstream.

Term	Definition	Analogy / Example
Vein Compressibility	The ability of a vein to collapse with transducer pressure, indicating patency. Non-compressibility suggests thrombosis.	Like squeezing a water balloon versus a rock--healthy veins squish; clotted ones don't.
Vessel Depth	The distance from the skin surface to the target vessel, an important factor in catheter selection and approach.	Like measuring how deep to dig--knowing the depth helps choose the right needle length.

Chapter 26: Hemodialysis Access Grafts and Fistulae

Term	Definition	Analogy / Example
Access Aneurysm	Dilation of the vein in a dialysis access due to repeated needle sticks and high pressure.	Like a weak spot bulging from repeated use--the vein wall stretches from years of needle punctures.
Access Flow Volume	The volume of blood flowing through a dialysis access per minute. Normal is 600-1200 mL/min. <600 mL/min suggests stenosis.	Like measuring gallons per minute through a pipe--too little flow means there's a blockage somewhere.
Access Pseudoaneurysm	A contained rupture of the access wall, usually from needle trauma, creating a pulsatile mass.	Like a blood-filled balloon on the side of the access--a hole in the wall lets blood pool outside.
Access Stenosis	Narrowing within a dialysis access, typically at the anastomosis or in the outflow vein. Causes decreased flow and risk of thrombosis.	Like a kink in the hose--narrowing reduces flow and threatens the access.
Access Surveillance	Regular monitoring of dialysis access flow and appearance to detect problems before failure.	Like regular inspections to prevent breakdown--catching stenosis before it causes thrombosis.
Access Thrombosis	Complete occlusion of a dialysis access by clot. Usually results from untreated stenosis.	Like the access completely closing--if stenosis isn't fixed, the access clots off.
Arteriovenous Fistula (AVF)	A surgical connection between an artery and vein using the patient's own vessels. The preferred type of dialysis access due to best longevity.	Like connecting a high-pressure pipe to a low-pressure one--the vein enlarges from arterial pressure, becoming suitable for dialysis needles.
Arteriovenous Graft (AVG)	A synthetic tube connecting an artery and vein for dialysis access when native vessels are inadequate.	Like installing a bridge between artery and vein--artificial material creates the connection.
Brachio basilic Fistula	An AVF between the brachial artery and basilic vein in the upper arm. Requires transposition (moving the vein more superficially).	Like moving a deeper vein closer to the surface--the basilic vein needs to be repositioned for easy needle access.
Brachiocephalic Fistula	An AVF between the brachial artery and cephalic vein at the elbow. Common when wrist fistula fails or isn't possible.	Like using the elbow vessels--a good second option when the wrist location won't work.
Fistula Maturation	The process by which an AVF becomes large enough and has adequate blood flow for dialysis use, typically taking 6-12 weeks.	Like training a vein to handle high pressure--the fistula needs time to grow big and strong enough for needles.
Hemodialysis	A treatment for kidney failure that filters waste from the blood using a dialysis machine. Requires reliable vascular access.	Like an artificial kidney outside the body--the machine cleans the blood when kidneys can't.

Term	Definition	Analogy / Example
High-Output Heart Failure	Heart failure caused by excessive blood flow through a dialysis access, typically when flow exceeds 2 L/min.	Like the heart working overtime--the fistula returns so much blood that the heart can't keep up.
Infiltration	Leakage of dialysis needle into surrounding tissue, causing swelling and pain. May require access rest.	Like missing the vein--the needle goes through the access, causing fluid to leak into tissue.
Maturation Criteria	Requirements for fistula use: vein diameter ≥ 6 mm, flow ≥ 600 mL/min, depth < 6 mm from skin surface.	Like the minimum requirements for graduation--the fistula must be big enough, flowing enough, and shallow enough to use.
Percutaneous Balloon Angioplasty	Treatment of access stenosis by inflating a balloon inside the narrowing to stretch it open.	Like using a balloon to push open a narrowed section--opens the access without surgery.
Radiocephalic Fistula (Brescia-Cimino)	An AVF between the radial artery and cephalic vein at the wrist. The first-choice location for dialysis access.	Like connecting the wrist vessels--the original and still preferred fistula type.
Recirculation	Return of dialyzed blood to the dialysis machine without passing through the body, reducing dialysis efficiency.	Like short-circuiting the system--cleaned blood goes right back to the machine instead of the body.
Steal Syndrome	Ischemia (lack of blood flow) in the hand caused by too much blood being diverted through the dialysis access.	Like stealing blood from the hand--the fistula takes so much flow that the hand starves.
Thrombectomy	Removal of clot from a thrombosed dialysis access, using mechanical devices or thrombolytic medications.	Like cleaning out a clogged pipe--removes the clot to restore flow.

Chapter 27: Vascular Applications of Ultrasound Contrast Agents

Term	Definition	Analogy / Example
Contrast-Enhanced Ultrasound (CEUS)	Ultrasound imaging using contrast agents to improve visualization of blood flow and tissue perfusion.	Like turning on the lights in a dark room--contrast makes blood flow visible where it was hard to see.
Endoleak Detection with Contrast	Use of CEUS to detect and characterize endoleaks after EVAR that may be missed on standard color Doppler.	Like using a highlighter to find hidden leaks--contrast reveals blood flow into the aneurysm sac.
Flash-Replenishment Technique	A method where high-power ultrasound destroys bubbles, then low-power imaging watches them refill, quantifying perfusion.	Like clearing the field then watching repopulation--destroy all bubbles, then time how fast blood brings new ones.
Harmonic Imaging	An ultrasound technique that detects the harmonic frequencies produced by oscillating microbubbles, improving contrast detection.	Like listening for echoes of the echoes--harmonics help separate bubble signals from tissue.
Low Mechanical Index (MI)	Low acoustic power settings used during contrast imaging to avoid destroying microbubbles.	Like using a gentle touch--too much sound energy pops the bubbles.
Microbubbles	Tiny gas-filled bubbles (1-8 microns) stabilized by a shell, used as ultrasound contrast agents. Small enough to pass through capillaries.	Like millions of tiny mirrors floating in the blood--each bubble reflects sound waves.

Term	Definition	Analogy / Example
Off-Label Use	Use of contrast agents for applications not specifically approved by regulatory agencies (common in the US for non-cardiac uses).	Like using a medication for something other than its official purpose--doctors can prescribe it, but it's not the approved indication.
Real-Time Contrast Imaging	Continuous ultrasound imaging during contrast injection, allowing observation of blood flow dynamics.	Like watching a movie instead of a snapshot--see how contrast flows in real-time.
Tumor Perfusion	Assessment of blood flow in tumors using contrast agents to characterize lesions and monitor treatment response.	Like watching how a tumor drinks blood--contrast shows how much blood flows through a mass.
Ultrasound Contrast Agents (UCAs)	Microbubble solutions injected intravenously to enhance ultrasound imaging. Bubbles are smaller than red blood cells and reflect sound strongly.	Like adding reflective glitter to the bloodstream--the bubbles light up on ultrasound, showing blood flow clearly.

Chapter 28: Quality Assurance Statistics

Term	Definition	Analogy / Example
Accuracy	The overall proportion of correct test results. (True positives + True negatives) / Total tests.	Like the overall batting average--how often is the test right, whether positive or negative?
Confidence Interval	A range of values likely to contain the true value, typically reported as 95% CI.	Like the margin of error--the true answer is probably somewhere in this range.
Cutoff Value	The threshold value used to distinguish normal from abnormal test results.	Like the passing grade on a test--the number that separates normal from abnormal.
False Negative	A test result indicating no disease when disease is actually present.	Like missing the problem--the test says everything is fine, but it isn't.
False Positive	A test result indicating disease when disease is actually absent.	Like a false alarm--the test says there's a problem, but there isn't.
Gold Standard	The reference test or method considered the definitive diagnosis against which other tests are compared.	Like the final authority--the best available method to determine the truth.
Interobserver Variability	Differences in test interpretation between different observers (sonographers, radiologists).	Like two people reading the same book differently--would two sonographers get the same result?
Intraobserver Variability	Differences in test interpretation by the same observer at different times.	Like the same person getting different results on different days--would you agree with yourself?
Kappa Statistic	A measure of agreement between observers that accounts for chance agreement. Values >0.8 indicate excellent agreement.	Like measuring how much people agree beyond random chance--accounts for the fact that some agreement is coincidental.
Negative Predictive Value (NPV)	The probability that a negative test result indicates absence of disease. True negatives / (True negatives + False negatives).	Like how much you can trust a negative result--when the test says normal, how often is it right?
Positive Predictive Value (PPV)	The probability that a positive test result indicates true disease. True positives / (True positives + False positives).	Like how much you can trust a positive result--when the test says disease, how often is it right?

Term	Definition	Analogy / Example
Prevalence	The proportion of a population that has the disease at a given time. Affects predictive values.	Like how common the disease is--if everyone has it, a positive test is more likely to be right.
Quality Assurance (QA)	Systematic monitoring and evaluation of laboratory performance to ensure high-quality patient care.	Like a report card for the lab--regular checks to make sure everything is working properly.
ROC Curve (Receiver Operating Characteristic)	A graph plotting sensitivity vs. (1 - specificity) at various threshold values, used to determine optimal cutoff values.	Like a tool to find the best threshold--helps choose the velocity value that best separates normal from abnormal.
Sensitivity	The ability of a test to correctly identify disease when disease is present. True positives / (True positives + False negatives).	Like catching all the guilty people--of all the people who actually have disease, what percentage did the test find?
Specificity	The ability of a test to correctly identify absence of disease when disease is absent. True negatives / (True negatives + False positives).	Like not accusing innocent people--of all the people who don't have disease, what percentage did the test correctly say were normal?
Statistical Significance	A result unlikely to have occurred by chance, typically defined as $p < 0.05$.	Like strong enough evidence to believe it's real--not just a coincidence.
True Negative	A test result correctly indicating no disease when disease is absent.	Like correctly clearing an innocent person--the test was right to say normal.
True Positive	A test result correctly indicating disease when disease is present.	Like catching the bad guy--the test correctly identified the problem.
Validation Study	A study comparing a new test or criteria against a gold standard to determine accuracy.	Like proving a new test works--comparing it against the known truth.

Quick Reference: Dialysis Access Types

Type	Description	Advantages
AVF	Artery connected directly to native vein	Best longevity, lowest infection risk
AVG	Synthetic tube connecting artery to vein	Ready sooner than AVF, usable when veins inadequate
Catheter	Tunneled or non-tunneled central line	Immediate use, but higher infection risk

Quick Reference: Dialysis Access Surveillance Parameters

Parameter	Normal	Abnormal (Action Needed)
Access flow	600-1200 mL/min	<600 mL/min
Vein diameter	≥ 6 mm	<6 mm
Depth from skin	<6 mm	>6 mm
Stenosis velocity	<400 cm/s	>400-600 cm/s

Quick Reference: Statistical Formulas

Measure	Formula
Sensitivity	$TP / (TP + FN)$
Specificity	$TN / (TN + FP)$
PPV	$TP / (TP + FP)$
NPV	$TN / (TN + FN)$
Accuracy	$(TP + TN) / \text{Total}$

Quick Reference: Kappa Interpretation

Kappa Value	Agreement Level
<0.20	Poor
0.21–0.40	Fair
0.41–0.60	Moderate
0.61–0.80	Good
0.81–1.00	Excellent

TP = True Positive, TN = True Negative, FP = False Positive, FN = False Negative

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