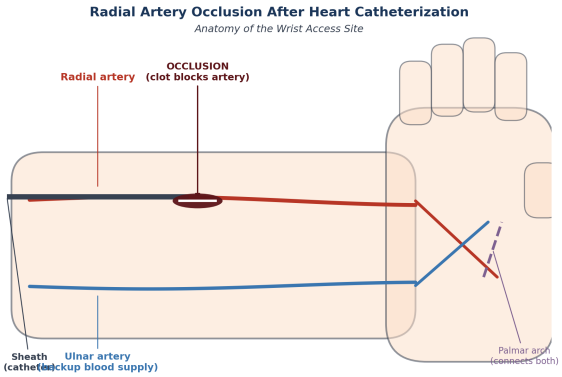
Radial Artery Occlusion After Heart Catheterization

When the Wrist Artery Closes After Your Procedure

Know the Risks. Recognize Symptoms. Heal Safely at Home.



Online: https://go.riasalimd.com/rao-guide

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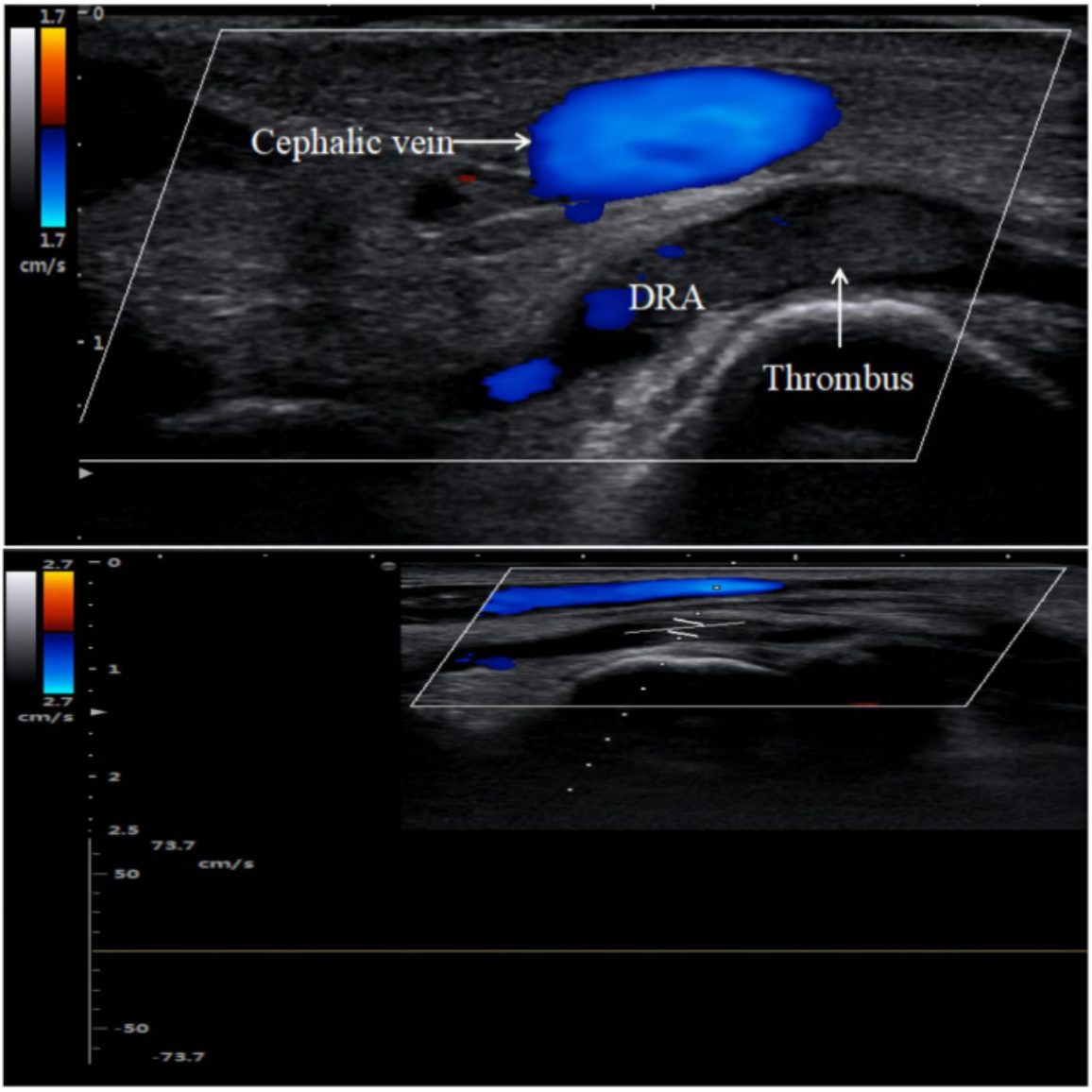
Names & Terms You Will Hear

Term	Meaning
Radial Artery Occlusion (RAO)	The formal name — the radial artery at your wrist has closed off after catheterization
Radial artery thrombosis	A blood clot formed inside the radial artery after the sheath was removed
Transradial access complication	Broad term for any problem at the wrist entry site used during your heart cath
Radial artery spasm	The artery temporarily squeezes shut around the sheath — not the same as occlusion, but a major risk factor for it
Patent hemostasis	The technique of applying just enough compression to stop bleeding while keeping blood flowing through the artery — the key to preventing RAO
Barbeau test	A pulse-oximetry test on the thumb to check whether your ulnar artery provides adequate backup blood supply to the hand
Ulnar artery	The companion artery on the other side of the wrist — provides collateral blood flow to the hand if the radial artery closes
Palmar arch	A loop of arteries in the palm connecting the radial and ulnar arteries — the natural bridge that protects the hand if RAO occurs

Radial Artery Occlusion After Heart Catheterization?

- During a wrist-access (transradial) heart cath, a thin plastic tube (sheath) goes into the wrist artery to reach the heart. After the cath, the sheath is removed and the wrist is pressed to stop bleeding.
- Radial artery occlusion (RAO) is a clot that forms in the wrist artery after the sheath is taken out, sealing the artery shut. It happens in about 1–5% of cases without prevention steps — less than 1% with modern technique.
- Most people never notice it. The hand has a backup artery — the ulnar artery and palmar arch take over. Most patients with RAO have no symptoms at all.
- RAO is found by the Barbeau test (a clip on the thumb checks blood flow while the wrist is pressed) or by a wrist ultrasound at follow-up.
- It matters because the wrist artery is needed for future caths and for bypass surgery (CABG) that uses it as a graft. A blocked artery cannot be used again.
- Radial artery spasm is not the same as occlusion. Spasm is the artery squeezing tight around the sheath during the cath. It is short-lived and treated on the table with drugs (verapamil, nitroglycerin) given through the sheath. Even so, spasm hurts the artery lining. That damage can cause a clot after the sheath is out — so spasm is a key risk factor for RAO.



A real wrist ultrasound showing RAO. Color Doppler (top) marks the distal radial artery (DRA) and the thrombus (clot) blocking it, next to the still-open cephalic vein. The bottom panel shows a flat spectral waveform — no pulsing blood flow — confirming the artery is occluded. This is the same kind of scan used at your follow-up visit. Image: Chen et al., Frontiers in Cardiovascular Medicine 2022 (CC BY 4.0).

Why It Matters

- The wrist artery is the preferred entry site for most heart caths. It has fewer bleeding problems than the groin and lets you walk out the same day.
- If RAO is permanent on one wrist, that artery cannot be used for future caths. If both wrists are blocked, only the groin remains — which has higher bleeding risk.
- The radial artery is also used as a bypass graft in CABG surgery. If it is blocked, it cannot be harvested. This limits your options if you ever need bypass surgery.
- In about 1–2 per 1,000 patients, the backup artery (ulnar) is too small to take over (Barbeau Type D). In those patients, RAO can cut blood flow to the hand — a medical emergency.
- Early treatment can reopen the artery in many cases. Acting within 24–48 hours gives the best chance. Waiting reduces how well the artery heals.

Risk Factors

Some patients are more likely to develop this condition. Knowing your risk helps your care team take extra precautions.

Risk Factor	Why It Increases Risk
Female sex	Women tend to have smaller wrist arteries. A bigger sheath in a smaller artery causes more wall injury.
Small body size / low BMI	Linked to narrower wrist arteries no matter the sex.
Diabetes mellitus	Diabetes impairs small artery function and healing. It raises clot risk after artery injury.
Peripheral artery disease (PAD)	Existing artery narrowing makes the wrist artery even smaller before the sheath goes in.
Multiple needle sticks	Each stick harms the artery wall. More sticks means more damage and higher clot risk.
Large sheath size (6F, 7F vs 4F slender)	Bigger sheaths stretch the artery wall more, causing more injury and higher clot risk after the cath.
Prolonged or too-tight wrist compression	Cuts off blood flow during bandaging. Blood sits still in the artery and a clot forms. This is the most common preventable cause of RAO.
Too little blood thinner during the procedure	Heparin (UFH) under 5,000 units lets tiny clots form around the sheath while it is in place.
Radial artery spasm during the procedure	Spasm squeezes the sheath and scrapes the inner artery lining. After the sheath is out, the scraped lining triggers a clot. Spasm is treated on the table with verapamil or nitroglycerin given through the sheath.
Radial artery calcification	Hard, stiff arteries do not stretch as easily. They are more prone to wall injury from the sheath.
Prior wrist-access procedures on the same side	Repeated use causes scar buildup and slowly narrows the artery over time.

Treatment Options

- Patent hemostasis — the most important first step. After the sheath is out, the TR Band is inflated just enough to stop bleeding while keeping blood flowing. Your nurse checks thumb color or runs a Barbeau test. Too tight causes RAO. Too loose causes bleeding.
- Ulnar assist: your nurse briefly presses the ulnar artery (inner wrist side). This pushes blood through the palm and into the wrist artery. The PROPHET-II trial showed this step cuts RAO from ~9% to ~4%. It is done before you leave the cath lab.
- Rivaroxaban 15 mg once daily for 30 days. This is the only drug proven in a randomized trial to help reopen a blocked wrist artery (JAMA Intern Med 2021). Take it with your largest meal each day. Your doctor will check if your bleeding risk allows it.
- Steroid pack (methylprednisolone): a 6-day taper of oral steroids. It cuts swelling and pain at the wrist site. Most useful when the wrist is very swollen or sore past 48 hours. It does not thin the blood.
- NSAIDs: ibuprofen 400–600 mg three times a day with food, or naproxen 250–500 mg twice a day. These cut swelling and pain. Avoid them if you have kidney disease, stomach ulcers, or are on blood thinners.
- Topical diclofenac gel: a non-steroidal gel rubbed on the wrist 2–3 times a day. A good choice if you cannot take oral NSAIDs.
- Watch and wait: most painless RAOs heal on their own within 30 days when patent hemostasis was done. A wrist ultrasound at 30 days checks the result. No drug is needed if the hand gets good blood flow.
- Wrist elevation, cool packs, and gentle movement. See the Comfort Measures section below for the full step-by-step plan.

Comfort Measures at Home (No Medication Needed)

These simple steps support healing and ease symptoms. Use them alongside any medication your doctor prescribes.

- Keep the wrist above heart level for the first 24–48 hours. Prop it on a pillow when sitting or sleeping. This cuts swelling at the wrist site.
- Apply a cool pack to the wrist. Wrap a gel ice pack or bag of frozen peas in a cloth — never put ice directly on skin. Hold it there 15–20 minutes, 3–4 times in the first 24 hours. Do not use heat in the first 24 hours.
- Keep the bandage clean and loose. A light gauze wrap is fine for the first 24 hours. Do not wrap tightly. The firm compression was done in the cath lab. The home wrap is just for protection.
- Remove the wrist band when told — usually 2–4 hours after you get home. Check that your thumb is pink and warm. If it turns white, blue, or goes numb, go to the ER right away.
- Do not wear a watch, bracelet, or any band on that wrist for at least one full week after the procedure.
- The morning after the cath, make a fist and open your hand 10–15 times every few hours. This simple move keeps blood flowing and keeps the artery from stiffening.
- From day 2 on, gently bend the wrist up and down 5–10 times daily. No heavy use — do not push heavy doors, lift bags, or lean on that wrist.
- When typing or driving, keep the wrist flat and neutral. Do not rest your body weight on the wrist bone.
- After 48 hours, switch to warmth. A warm (not hot) pack for 15 minutes twice a day helps the artery open up.
- Do not smoke. Nicotine causes artery spasm — the opposite of what a healing wrist artery needs.

Risks, Benefits, and Alternatives

Every choice has trade-offs. Use this table to start the shared decision conversation.

Option	Risks	Benefits	Alternatives
Patent hemostasis + observation	No drug side effects. Requires correct TR Band use. Over-inflation by the nurse can cause RAO.	Prevents RAO from starting. Also helps the artery reopen on its own if RAO has already occurred. The safest, best-proven first step.	Watch-and-wait without patent hemostasis (higher RAO rate); blood thinners if the artery does not reopen.
Rivaroxaban 15 mg daily x 30 days	Higher bleeding risk: bruising, stomach bleed, rarely brain bleed. Avoid if you have active bleeding, severe kidney disease (CrCl < 15), or recent major surgery.	The only drug proven in a randomized trial to reopen a blocked wrist artery. Recanalization rate at 30 days is much better than aspirin alone.	Aspirin 100 mg daily (lower success rate, less bleeding risk); watch-and-wait alone (20–40% heal on their own).
Steroid pack (methylprednisolone)	May raise blood sugar briefly — watch closely if you have diabetes. May cause mild insomnia or stomach upset if not taken with food. Short course — side effects stop in days.	Cuts wrist swelling and pain fast. Does not thin the blood or affect whether the artery reopens. Helps with comfort.	NSAIDs (less anti-swelling power); topical diclofenac gel; cool packs and elevation.
NSAIDs (ibuprofen or naproxen)	May irritate the stomach, stress the kidneys, or cause fluid buildup. Do not combine with blood thinners without asking your doctor.	Cuts wrist pain and swelling. Available without a prescription, low cost, and well-tolerated for short use.	Steroid pack; topical diclofenac gel; acetaminophen for pain (no anti-swelling effect); cool compresses.

Common Misconceptions

Myth	Reality
If my wrist artery closes I will lose my hand.	Almost never. The backup artery (ulnar) and palmar arch supply the hand in over 99% of people. Hand ischemia is rare — less than 0.2% of RAO cases. The Barbeau test checks this before you leave.
Radial artery spasm and occlusion are the same thing.	They are different. Spasm is the live artery squeezing tight around the sheath. It is short-lived and treated on the table with drugs. Occlusion is a clot that blocks the artery after the sheath is out. Spasm raises the risk of occlusion by damaging the artery lining.
The wrist band should be as tight as possible to stop bleeding.	Too-tight compression is the most common preventable cause of RAO. The right method — patent hemostasis — uses just enough pressure to stop bleeding while keeping blood flowing. Your thumb should stay pink and warm.
If it does not hurt, the artery is fine.	RAO is usually painless. Most patients with a blocked wrist artery feel nothing. Pain is not a reliable sign. Only a Barbeau test or ultrasound can tell for sure.
I can use my wrist normally as soon as I get home.	For the first 24–48 hours: no lifting over 5 lbs, no firm gripping, no leaning on that wrist. Gentle finger and wrist moves are fine — heavy use is not.
A steroid pack will thin my blood.	No. Steroids cut swelling. They do not affect how blood clots. If your doctor gives you both a steroid pack and rivaroxaban, the two drugs have different jobs and are safe to use together.
If the artery closes, it is blocked forever.	Many blocked wrist arteries reopen on their own within 30 days, especially when patent hemostasis was done and rivaroxaban is started early. A 30-day ultrasound tells us if the artery has healed.

Myth	Reality
Once the artery heals, I can use the same wrist for my next cath.	Usually yes, but the artery should be checked by ultrasound first. Using a wrist that was once blocked carries higher risk of closing again and scarring.

Possible Complications

Knowing what can go wrong helps you spot problems early. Most complications are uncommon, especially with treatment.

Where / What	What Can Happen
Permanent wrist artery blockage	If the artery does not reopen, future wrist-access caths on that side are not possible. The next cath would need the other wrist or the groin.
Hand ischemia (low blood flow to the hand)	Happens when the backup artery (ulnar) is too small to take over. Rare — less than 0.2% of RAO cases. The Barbeau test checks this before you go home. Needs urgent care from a vascular specialist.
Hematoma (blood pool at the wrist)	Common and usually harmless. A firm, tender lump at the puncture site is normal for 1–2 weeks. A fast-growing lump needs prompt evaluation.
Compartment syndrome	A large blood pool builds up extreme pressure in the forearm. Very rare. Signs: severe tightening pain, rock-hard forearm, fingers losing feeling. Needs emergency surgery.
Access-site infection	Rare. Signs: redness spreading up the forearm, pus, fever. Treated with antibiotics. Drainage is rarely needed.
Pseudoaneurysm	A pulsing pocket of blood forms at the puncture site. Feels like a throbbing lump. Confirmed by ultrasound. Treated with ultrasound-guided compression or a thrombin shot. Surgery is rarely needed.

Points to Know

If you remember nothing else, remember these key points.

- Watch your thumb after the wrist band goes on: pink and warm is good. White, blue, or numb — tell your nurse right away.
- Keep the wrist raised above heart level and use cool packs for the first 24 hours.
- No tight watches, bracelets, or bands on that wrist for one full week.
- If rivaroxaban is prescribed, take it with your biggest meal every day for the full 30 days. Missed doses lower the chance the artery reopens.
- If a steroid pack is prescribed, take it with food and finish the whole taper. Do not stop early, even if you feel better.
- Starting the day after the cath, gently make a fist and open your hand. Bend and flex the wrist. These simple moves keep blood flowing and help healing.
- A wrist ultrasound at 30 days confirms whether the artery has reopened.
- Tell every future heart doctor, heart surgeon, or anesthesiologist that you had a wrist-access cath on this side — especially before any bypass surgery.

When to Call Us - and When to Call 911

If you are not sure, call. We would rather hear from you twice than miss a real problem.

- Hand or fingers turn cold, white, or blue after you get home — call 911 or go to the ER right away (possible hand ischemia).
- Fingers feel numb or tingly and it does not stop in 10 minutes — call us today.
- Wrist swelling is growing fast, or a firm lump is forming at the puncture site — call us today (possible blood collection).
- Redness, warmth, or red streaks spreading up the forearm, or fever — call us (signs of infection).
- Severe wrist pain that keeps getting worse over hours, with a tight or shiny forearm — go to the ER (rare compartment syndrome).
- Any unusual bleeding while on rivaroxaban: blood in stool or urine, vomiting blood, coughing blood, or a sudden bad headache — call us or go to the ER right away.
- You are not sure if the wrist band is too tight or your thumb looks off — call us. We would rather check than miss a problem.
- Wrist pain is not getting better or is worse at 48–72 hours — call the office. A steroid pack or drug change may help.

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Trusted Resources

The links below are the trusted resources Dr. Ali used to write this guide and that he recommends you visit for more information. Each is a clickable link in the digital version and a Short.io tracked URL on the printed version.

- AHA Scientific Statement — Transradial Arterial Access (Circulation 2021) - AHA best practices for radial access, anticoagulation, and RAO prevention.
- Mayo Clinic — Cardiac Catheterization - Plain-language overview of what happens during a heart catheterization.
- PROPHET-II Trial Summary — Ulnar Artery Compression for RAO Prevention - Evidence basis for the ulnar assist protocol done in the cath lab.
- RIVAROXABAN FOR RAO Trial (JAMA Intern Med 2021) - The randomized trial proving rivaroxaban 15 mg daily improves recanalization.

Sources Used to Build This Guide

Every recommendation in this guide is grounded in one or more of the studies, guidelines, or trusted resources below. Short links are tracked so Dr. Ali can see which references patients are reading; nothing personally identifying is captured.

- Rashid M et al. Incidence and Predictors of Radial Artery Occlusion After Transradial Coronary Angiography and Intervention (Circ Cardiovasc Interv 2016) *[Systematic Review]*
  Pooled incidence data; identifies patient and procedural risk factors including sheath size, anticoagulation dose, and compression technique.
- Bernat I et al. RIVAROXABAN FOR RADIAL ARTERY OCCLUSION — Effect of Rivaroxaban vs Aspirin on RAO After Transradial Catheterization (JAMA Intern Med 2021) *[Randomized Controlled Trial]*
  Primary evidence basis for recommending rivaroxaban 15 mg daily × 30 days to improve radial artery recanalization rate after RAO.
- Pancholy SB et al. Prevention of Radial Artery Occlusion — Patent Hemostasis Evaluation Trial (PROPHET) (Catheter Cardiovasc Interv 2008) *[Randomized Controlled Trial]*
  Seminal patent hemostasis trial showing that maintaining flow through the radial artery during compression reduces RAO from 12% to 5%.
- Pancholy SB et al. PROPHET-II — Ulnar Artery Compression to Restore Radial Artery Flow After Transradial Catheterization (JACC Cardiovasc Interv 2015) *[Randomized Controlled Trial]*
  Showed ipsilateral ulnar artery compression immediately post-procedure reduces RAO rate from 9% to 4% — basis for ulnar assist protocol.
- Kiemeneij F. Left Distal Transradial Access in the Anatomical Snuffbox for Coronary Angiography (EuroIntervention 2017) *[Cohort Study]*
  Describes distal radial (snuffbox) approach with lower RAO risk compared to conventional wrist access; relevant for future-access preservation.
- Barbeau GR et al. Evaluation of the Ulnopalmar Arterial Arches with Pulse Oximetry and Plethysmography — Modification of the Allen's Test (Am Heart J 2004) *[Prospective Study]*
  Defines the Barbeau test classification used before and after radial catheterization to assess collateral flow adequacy.
- Sciahbasi A et al. — Radial Artery Spasm: Pathophysiology, Prevention, and Treatment (Interv Cardiol Clin 2019) *[Review]*
  Mechanism of radial spasm as a risk factor for RAO; evidence base for intra-arterial vasodilator cocktails (verapamil, nitroglycerin).
- Bertrand OF et al. Intra-arterial Spasmolytic Agents for Prevention of Radial Artery Spasm (Can J Cardiol 2014) *[Clinical Trial]*
  Evidence for verapamil + nitroglycerin intra-arterial cocktail in reducing spasm and, by extension, post-procedure RAO.
- Mehta SR et al. Radial versus Femoral Access for Coronary Angiography and Intervention in Patients with NSTEMI (RIVAL Trial, Lancet 2011) *[Randomized Controlled Trial]*
  Documents overall safety profile of transradial access versus femoral; provides context for why radial artery patency is worth preserving.
- Caputo RP et al. Transradial Arterial Access for Coronary and Peripheral Vascular Procedures — AHA Scientific Statement (Circulation 2021) *[Guideline / Scientific Statement]*

AHA-endorsed best practices including anticoagulation dosing, sheath sizing, and patent hemostasis to minimize RAO risk.

- Mayo Clinic — Cardiac Catheterization Patient Information *[Patient Education]*
  Plain-language procedural overview to align terminology with what patients commonly encounter.

About This Guide

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Reviewer note: Reviewed against Mayo Clinic cardiac catheterization page, AHA transradial access scientific statement (2021), and PROPHET/PROPHET-II trial summaries. Ours adds: dedicated spasm vs occlusion distinction, risk-factor table, non-pharmacological comfort protocol, rivaroxaban recanalization evidence, and patent hemostasis explainer.

Disclaimer

This guide is for educational purposes only and does not replace medical advice from your physician. Recommendations may not apply to every patient. Always follow the specific instructions of Dr. Ali and your care team. In an emergency call 911 or go to the nearest emergency department.

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