REAL BLEED™

WELCOME TO THE REAL BLEED™ EXPERIENCE.

Real tissue.
Active bleeding simulation.
A hands-on challenge at every station.

Practice suturing, vessel repair and defect closure on perfused harvested tissue. Seal the model, assess the result, and introduce the next training challenge.



Illustrated kit overview; not an assembly map.

1 PUMP
Shared circulation

4 STATIONS
Four specimens

2 CONNECTIONS
Per specimen

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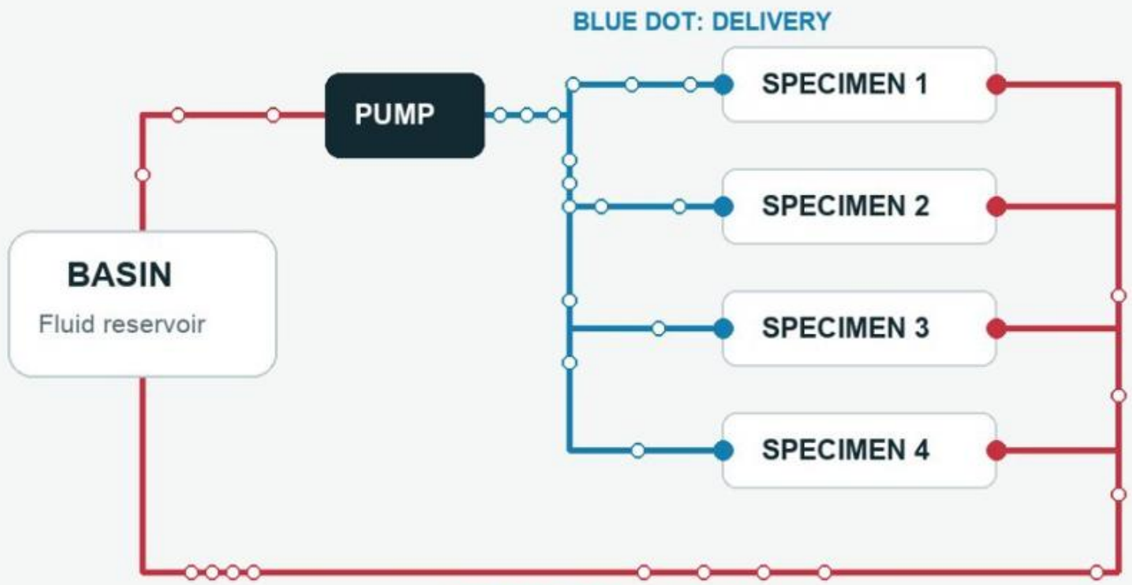
FOLLOW THE FLOW.

Blue-dot connections deliver fluid. Red-dot connections return fluid to the basin.

REAL BLEED / FOLLOW THE FLOW

One pump. Four specimens. Continuous return to the basin.



Functional schematic, not a physical assembly map. Motion is illustrative; speed is not calibrated.
Colors indicate connector markings. Both lines carry the same simulation fluid.

MATCH THE CONNECTIONS

At the pump: connect the male end of the basin tubing assembly to the red female connection. Connect the delivery pack's blue-dot male end to the blue female connection.

At each station: connect one red-dot female return end and one blue-dot female delivery end to the two gray traction needles.

CONTROL THE BLUE LINES

Integrated clamps stop flow to unused stations or redirect flow toward an active station. Pressure depends on the configuration and how well models are sealed.

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FROM SETUP TO SIMULATION.

Six setup stages. Watch the manufacturer's setup video before assembly and retain the full instructions.

01 Arrange the stations

Set out pads, trays and towels. Secure the specimens and place the basin centrally so tubing reaches every station.

02 Prepare the basin

Fill the basin halfway with water and add food coloring. Position tubing splints in the basin with their ends outside.

03 Route delivery and return

Connect red and blue assemblies at the pump. Lay out one red-dot return end and one blue-dot delivery end at every station.

04 Secure traction needles

Identify entry and exit points. Position supplied needles as shown in the setup video. Slide a zip tie under the vessel, hand-tighten it over the needle, then cross-clamp the tie with hemostats.

05 Connect and briefly test

Connect blue delivery and red return to the two gray needles. Briefly switch on the pump to confirm fluid reaches the model. This does not establish a fully sealed circuit.

06 Close defects and reassess

Close openings with vascular sinches, suture ties, zip ties and appropriate training techniques. Recheck under flow. Smaller leaks may appear as pressure rises.

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KNOW THE KIT. BUILD THE LAB.

Components, flow control and the learning experience.



Illustrated station detail; component positions vary.

Pump + basin

Drive circulation and hold fluid.

Red-dot / blue-dot tubing

Return and delivery pathways.

Traction needles

Provide specimen entry and exit points.

Seal and secure

V-shaped vascular sinches seal holes. Hemostats, sutures, ties and zip ties support closure and connection security.

MAKE THE REPAIR THE CHALLENGE

Practice branch ligation, suturing, patch repair and bypass exercises. Partners can alternate creating controlled defects and repairing them in timed scenarios. Run the pump when testing or simulating bleeding; it may remain off during repairs. Major defects divert fluid into the tray, removing it from the recirculating loop.

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TRAIN. ASSESS. REPAIR.

Illustrative training scenes.







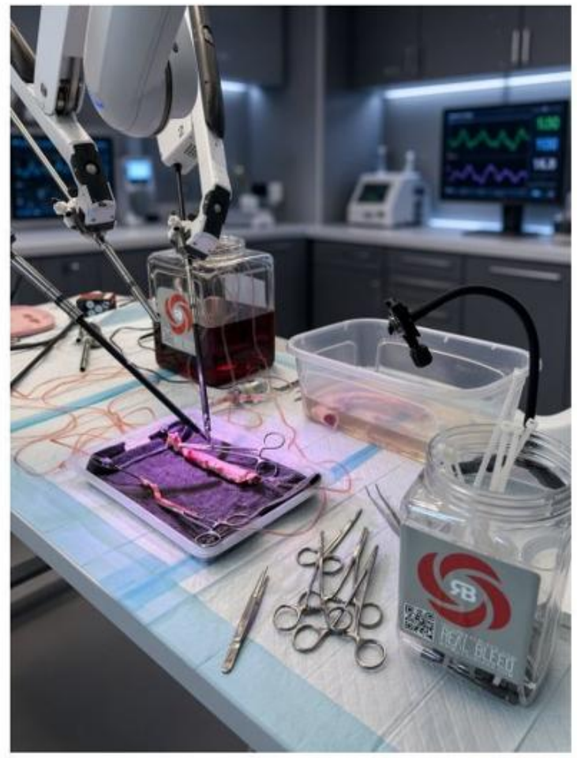

Illustration: not all depicted equipment is included in the kit.

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READY FOR YOUR NEXT LAB.

From setup to after-use care, keep the REAL BLEED™ instructions at hand.

PREPARE THE WORKSPACE

Trays, pads, towels, scissors, pick-ups and an extension cord are listed in the kit instructions. Add grafts, micro sutures and other scenario-specific materials as needed.

AFTER THE SESSION

Flush the pump after use. The instructions then call for disconnecting it from the tubing and running it for 2-3 seconds to clear standing fluid. Follow the complete handling and disposal instructions.

TRAINING USE ONLY

Not for human use. Wear appropriate PPE, including eye protection. Handle sharps carefully. Monitor system pressure and tubing for leaks. The instructions specify single-use disposal when real blood is used.

USE THE SPECIFIED COMPONENTS

Use only REAL BLEED™-provided needles. Refer to the complete instructions for setup, operation and disposal. Illustrations are explanatory, not calibrated engineering drawings.

Plan your next REAL BLEED™ lab.

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PROCEDURE SIMULATIONS

21 illustrated workshops. Select a procedure to open its full simulation.

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Bowel Injury Repair and Anastomosis

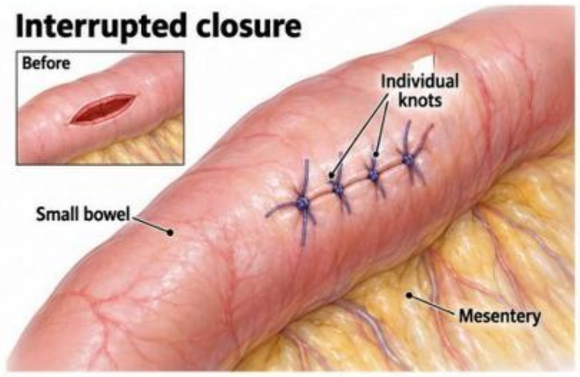
General surgery | 120-minute faculty-led lab | Suturing and leak assessment using an aortic tissue surrogate

PREPARE / 15 MIN One compact aortic segment; no added vessel or patch. Reserve separate left and right sidewall sites and a central join. Keep enough room for clamps and sutures, plus tubing slack for approximation. Both cannulas stay attached. Stop flow during open-tissue work.

READ THE IMAGES Bowel anatomy above; aortic surrogate below. Suturing practice, not bowel physiology.

01 Interrupted closure

INDIVIDUAL SUTURES / 20 MIN



ONE CONNECTED AORTA / THREE REPAIR SITES

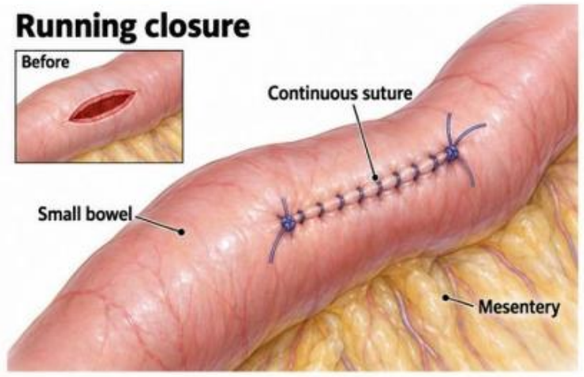


Compact working sites / previous repairs retained

Clinical: Repair a selected small bowel opening with interrupted sutures.
Rehearse: Close a small left-side opening on the aortic surrogate using separate knots.
Check: Inspect edge apposition, knot security and tissue handling without narrowing the lumen.

02 Running closure

CONTINUOUS SUTURE / 25 MIN



ONE CONNECTED AORTA / THREE REPAIR SITES

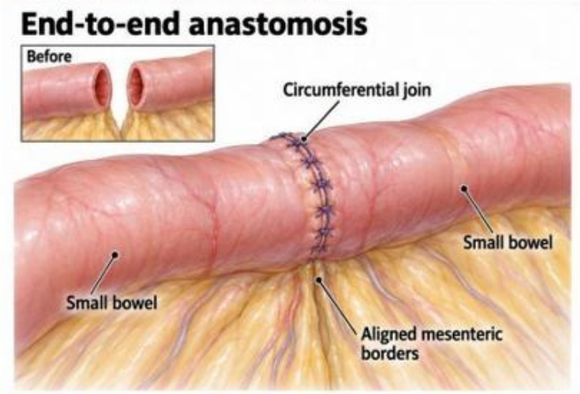


Compact working sites / previous repairs retained

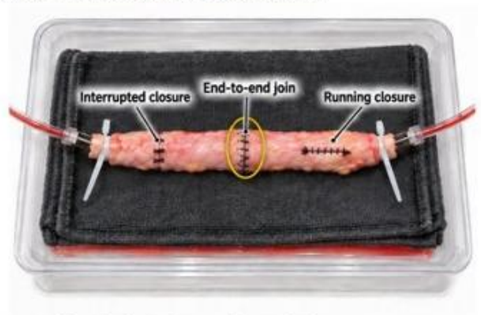
Clinical: Practice continuous enterotomy closure under faculty guidance.
Rehearse: Close a separate right-side opening with a running suture. Retain the first repair.
Check: Maintain even tension and secure endpoints; inspect for gaps or tissue gathering.

03 End-to-end join

SHORT SEGMENT RESECTION / 25 MIN



ONE CONNECTED AORTA / THREE REPAIR SITES

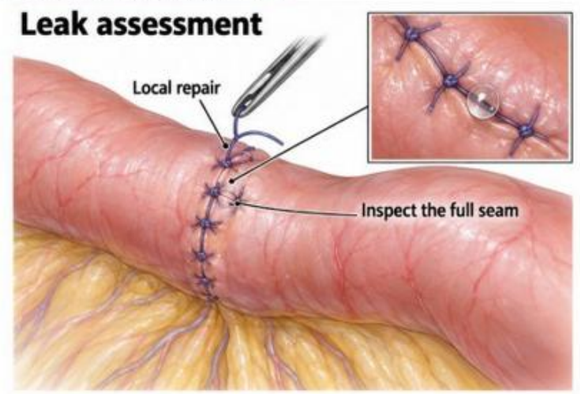


Compact working sites / previous repairs retained

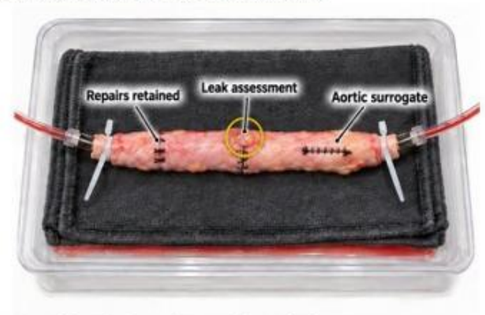
Clinical: Align bowel ends for a tension-free anastomosis.
Rehearse: Remove a minimal central aortic segment and reconnect the ends, retaining both sidewall repairs.
Check: Inspect the posterior wall, lumen and alignment. Avoid twist or back-wall capture.

04 Assess and revise

THREE-SITE LEAK CHECK / 15 MIN



ONE CONNECTED AORTA / THREE REPAIR SITES



Compact working sites / previous repairs retained

Clinical: Inspect the completed bowel repair and address a focal defect.
Rehearse: Introduce test fluid at a faculty-validated setting. Locate leaks, stop flow, repair and retest.
Check: Assess all three sites. A bench leak check does not establish bowel viability or healing.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Reassess the interrupted closure, running closure and central join. Find a focal leak, stop flow, correct it and retest. Record suture quality, tissue handling, revisions and completion time. **Target:** three intact repairs without visible leakage at the agreed bench setting. Do not infer a clinical pressure threshold.

YOUR REAL BLEED™ SETUP

Photo at left: your original station. One aorta stays connected throughout. Separate working sites preserve earlier repairs while adding practice. Use the minimum workable tissue length and leave slack for the central join. No carotid, patch or extra conduit is required for this version.

WHAT THE MODEL REPRESENTS

The aorta is a suturing surrogate: it does not reproduce bowel layers, mesentery, perfusion or healing. Fluid passes through its lumen for leak practice; this is not bowel perfusion. Actual intestinal tissue would add handling realism but needs a separately validated leak-test setup.

Educational concept for faculty review. AI-generated illustrations are not operative photographs or calibrated drawings. Faculty select the bowel technique and validate the surrogate setup and test settings. Follow the Real Bleed™ IFU. This workshop practices local suturing skills; it is not a complete bowel surgery protocol.

Sources: Bowel technique Real Bleed™
One page / 17 x 11 in / Bowel Repair / Version 01

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Bypass + patch. Every connection counts.

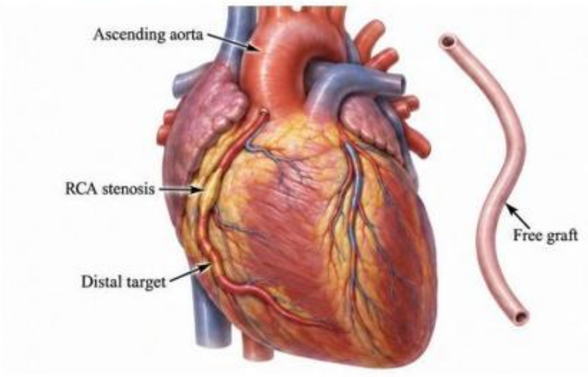
Combined bypass and patch reconstruction skills | 120-minute faculty-led lab | Experienced residents, fellows and surgeons

PREPARE / 15 MIN One aorta + two carotids + a suitable spare tissue patch. Keep both aortic cannulas attached. Faculty attach the target return to the right aorta and close its other end before the lab. Reserve target length for the Step 4 patch. Pump off during open suturing.

READ THE IMAGES Clinical anatomy above; proposed bench exercise below. Gold rings mark the current join.

01 Plan the bypass

ORIENT GRAFT AND TARGET / 15 MIN



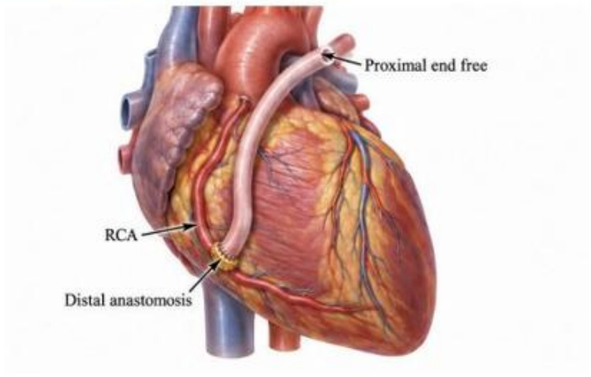
CONNECTED AORTA / CAROTID GRAFT + TARGET

Two learner joins; target return prepared by faculty

Connect: Plan a free graft from ascending aorta to right coronary artery beyond stenosis.
Rehearse: Position the graft between the aorta and smaller carotid target. Mark both sidewall openings.
Check: Adequate length, no twist or tension; identify heel and toe.

02 Distal coronary join

SMALL-VESSEL ANASTOMOSIS / 25 MIN



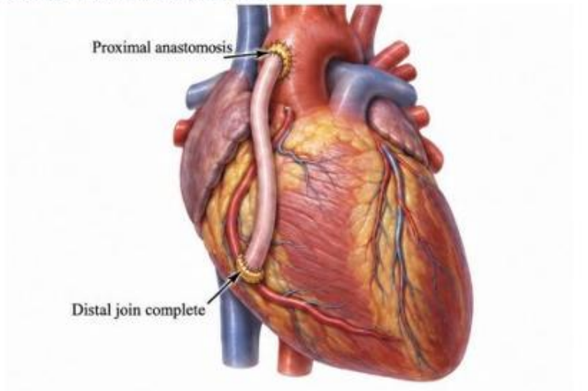
CONNECTED AORTA / CAROTID GRAFT + TARGET

Two learner joins; target return prepared by faculty

Connect: Graft end-to-side to coronary artery beyond the narrowing.
Rehearse: Sew the graft end into the side of the carotid target. The proximal graft end remains free.
Check: Fine bites, open lumen, no back-wall capture. Pump stays off.

03 Proximal aortic join

AORTIC ANASTOMOSIS / 25 MIN



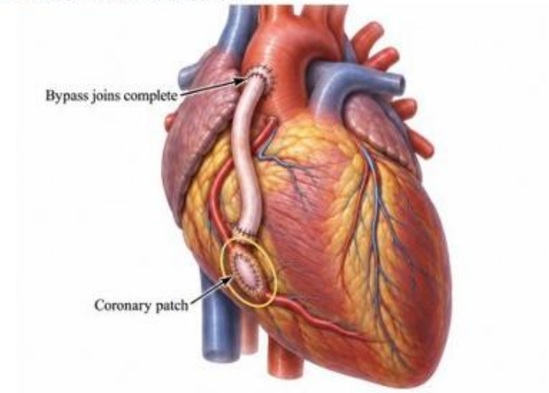
CONNECTED AORTA / CAROTID GRAFT + TARGET

Two learner joins; target return prepared by faculty

Connect: Free graft end-to-side to ascending aorta.
Rehearse: Sew the remaining graft end into the left aortic opening. The distal join is already complete.
Check: Secure heel and toe; preserve graft lie and both lumens. Both cannulas remain attached.

04 Add the patch

TARGET-VESSEL PATCH / 20 MIN



SAME BYPASS / PATCH THE TARGET CAROTID

Both bypass joins remain intact

Connect: Patch reconstruction is a selected coronary adjunct, not a routine CABG step.
Rehearse: With pump off, open the target carotid lengthwise beyond the distal join. Fit and suture a tissue patch.
Check: Preserve both bypass joins, lumen and patch tips. Keep the aorta connected.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Find leakage, stop flow, repair and retest. Record completion time, leak sites and repairs; inspect lumens after testing. **Target:** two open bypass joins and a sealed patch perimeter at the agreed setting. Through-flow testing needs a bench-validated method because the main aorta can bypass the loop.

YOUR REAL BLEED™ SETUP

Photo at left: your connected station. The aorta remains intact and cannulated throughout. Two carotids permit a smaller distal target and a separate graft. One long carotid may supply both segments if length allows. Reserve a suitable patch offcut before mounting. Faculty prepare the target return before the lab.

WHAT THE MODEL REPRESENTS

Carotids represent graft and coronary target; target return to aorta is bench plumbing. Caliber and wall properties differ from coronary tissue. The model does not reproduce myocardial perfusion or a beating heart. Patch-last is a workshop sequence, not a prescribed operative order.

Educational concept for faculty review. Clinical and bench illustrations are AI-generated from anatomical descriptions and your equipment photographs; not operative photos. Follow the Real Bleed IFU. Proposed bench setup requires validation. RCA = right coronary artery.

Sources: CABG overview Patch evidence

One page / 17 × 11 in / Bypass + patch / Revision 01

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Bypass + two patches. Every stitch counts.

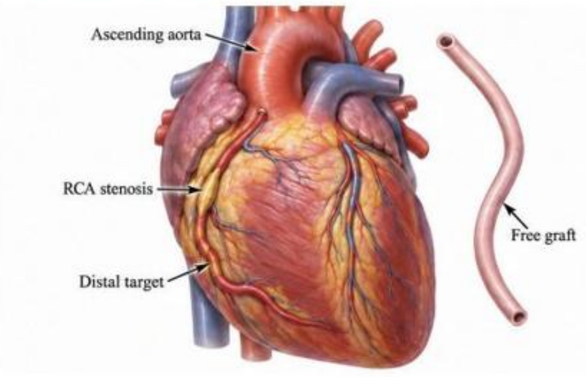
Combined bypass and patch reconstruction skills | 140-minute faculty-led lab | Experienced residents, fellows and surgeons

PREPARE / 15 MIN One aorta + two carotids + two suitable spare tissue patches. Keep both aortic cannulas attached. Faculty attach the target return to the right aorta and close its other end before the lab. Reserve clear target and aortic wall areas for both patches. Pump off during open suturing.

READ THE IMAGES Clinical anatomy above; proposed bench exercise below. Gold rings mark the current join.

01 Plan the bypass

ORIENT GRAFT AND TARGET / 15 MIN



CONNECTED AORTA / CAROTID GRAFT + TARGET

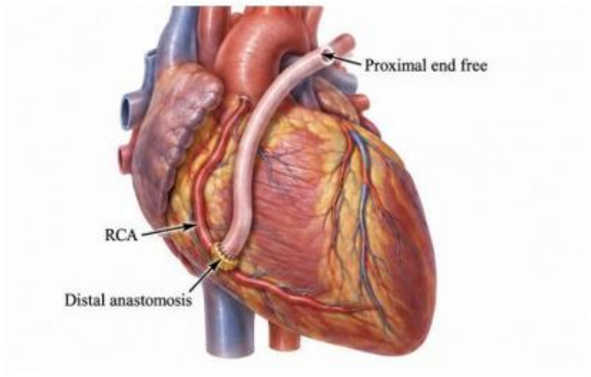


Two learner joins; target return prepared by faculty

Connect: Plan a free graft from ascending aorta to right coronary artery beyond stenosis.
Rehearse: Position the graft between the aorta and smaller carotid target. Mark both sidewall openings.
Check: Adequate length, no twist or tension; identify heel and toe.

02 Distal coronary join

SMALL-VESSEL ANASTOMOSIS / 25 MIN



CONNECTED AORTA / CAROTID GRAFT + TARGET

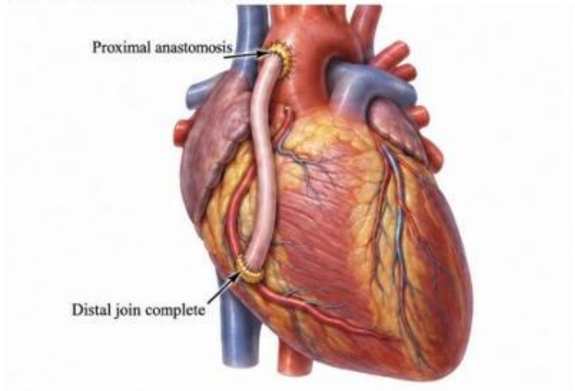


Two learner joins; target return prepared by faculty

Connect: Graft end-to-side to coronary artery beyond the narrowing.
Rehearse: Sew the graft end into the side of the carotid target. The proximal graft end remains free.
Check: Fine bites, open lumen, no back-wall capture. Pump stays off.

03 Proximal aortic join

AORTIC ANASTOMOSIS / 25 MIN



CONNECTED AORTA / CAROTID GRAFT + TARGET

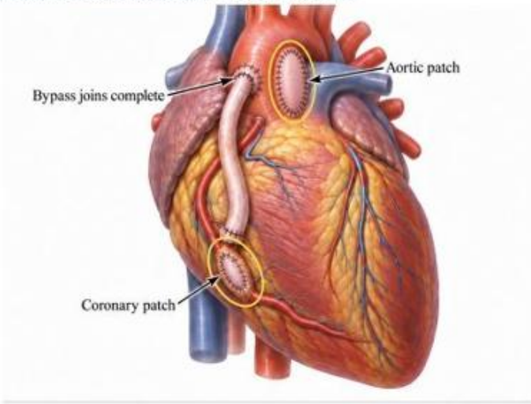


Two learner joins; target return prepared by faculty

Connect: Free graft end-to-side to ascending aorta.
Rehearse: Sew the remaining graft end into the left aortic opening. The distal join is already complete.
Check: Secure heel and toe; preserve graft lie and both lumens. Both cannulas remain attached.

04 Add both patches

CAROTID + LARGER AORTIC PATCH / 40 MIN



SAME BYPASS / SMALL + LARGE PATCH



Both bypass joins and both patches remain visible

Connect: Two patch-reconstruction skills; not a routine CABG sequence.
Rehearse: Pump off. Patch the target carotid, then a separate, larger opening in the main aorta.
Check: Keep both patches clear of joins and cannulas. Preserve lumens; inspect both perimeters.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Find leakage, stop flow, repair and retest. Record completion time, leak sites and repairs; inspect lumens after testing. **Target:** two open bypass joins and two sealed patch perimeters at the agreed setting. Through-flow testing needs a bench-validated method because the main aorta can bypass the loop.

YOUR REAL BLEED™ SETUP

Photo at left: your connected station. The aorta stays connected throughout. Two carotids permit a smaller distal target and a separate graft. One long carotid may supply both segments if length allows. Reserve two suitably sized patch offcuts before mounting. Faculty prepare the target return before the lab.

WHAT THE MODEL REPRESENTS

Carotids represent graft and coronary target; target return to aorta is bench plumbing. Caliber and wall properties differ from coronary tissue. The model does not reproduce myocardial perfusion or a beating heart. Combined coronary and aortic patches are a skills extension, not a routine CABG sequence.

Educational concept for faculty review. Clinical and bench illustrations are AI-generated from anatomical descriptions and your equipment photographs; not operative photos. Follow the Real Bleed IFU. Proposed bench setup requires validation. RCA = right coronary artery.

Sources: CABG overview Patch evidence

One page / 17 × 11 in / Bypass + two patches / Revision 01

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Carotid patch. Every stitch counts.

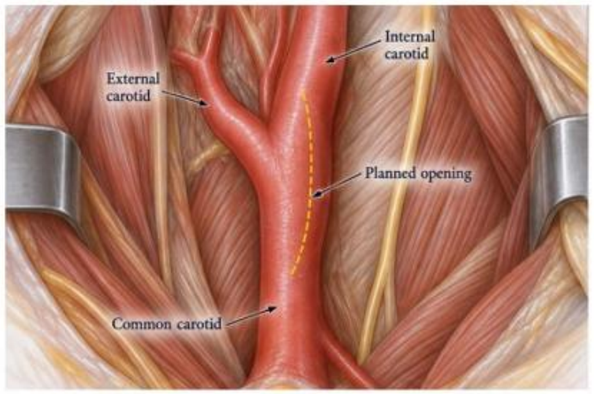
Carotid patch angioplasty: reconstruction skills | 120-minute faculty-led lab | Experienced residents, fellows and surgeons

PREPARE / 15 MIN One connected aorta + one carotid loop + a suitable vessel-tissue offcut for the patch. Faculty prepare both end-to-side loop attachments before the lab. Preserve patch tissue before mounting, or use a separate offcut. Keep both aortic cannulas attached.

READ THE IMAGES Clinical anatomy above; proposed bench exercise below. Gold rings mark the current join.

01 Plan the patch

ORIENT THE RECONSTRUCTION / 15 MIN



CONNECTED AORTA / PATCH THE CAROTID LOOP

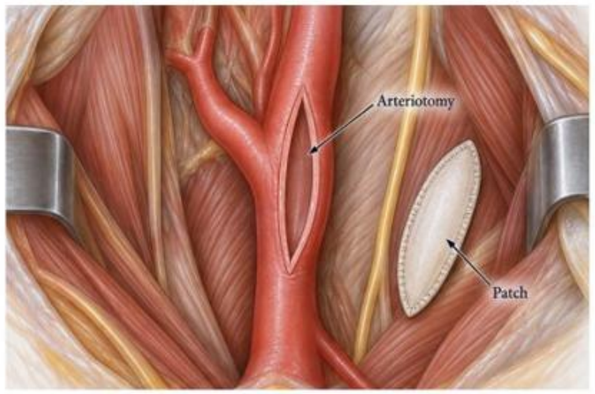


Loop attachments remain intact throughout

Connect: Identify the common and internal carotid reconstruction line.
Rehearse: Mark a longitudinal opening on the attached carotid loop. Select a suitable tissue offcut for the patch.
Check: Leave room for suturing and control. Pump off before opening the vessel.

02 Open and size

ARTERIOTOMY AND PATCH FIT / 20 MIN



CONNECTED AORTA / PATCH THE CAROTID LOOP

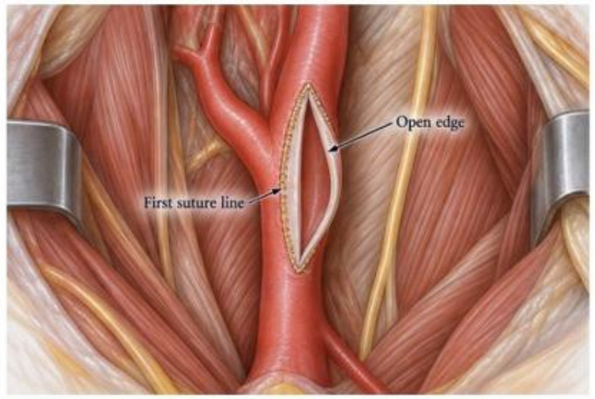


Loop attachments remain intact throughout

Connect: Match the patch to the longitudinal arteriotomy.
Rehearse: Open the marked carotid segment lengthwise; shape the offcut to cover it without tension.
Check: Identify both tips and long edges. Preserve the lumen; avoid an oversized bulge.

03 Sew the first edge

FIRST SUTURE LINE / 25 MIN



CONNECTED AORTA / PATCH THE CAROTID LOOP

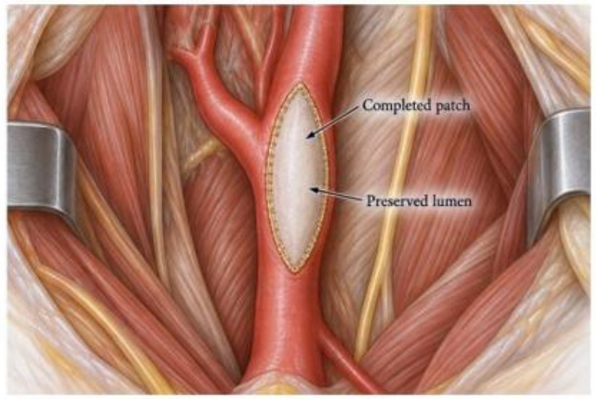


Loop attachments remain intact throughout

Connect: Secure a patch tip and advance along one long edge.
Rehearse: Approximate patch to carotid wall with controlled bites. Leave the opposite edge open for inspection.
Check: Even spacing, sound edge purchase, no back-wall capture. Pump stays off.

04 Complete the patch

SECOND EDGE AND FINAL INSPECTION / 25 MIN



CONNECTED AORTA / PATCH THE CAROTID LOOP



Loop attachments remain intact throughout

Connect: Complete the opposite edge and remaining tip.
Rehearse: Close the patch perimeter on the same attached loop; inspect before fluid testing.
Check: Smooth transition at both tips, no narrowing or gaps. Both aortic connections remain attached.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Find leakage, stop flow, repair and retest. Record completion time, leak sites and repairs; inspect lumens after testing. **Target:** an open patched lumen with no visible leakage at the agreed setting. Through-flow testing needs a bench-validated method because the main aorta can bypass the loop.

YOUR REAL BLEED™ SETUP

Photo at left: your connected station. The aorta remains intact and cannulated throughout. The carotid loop supplies the patch task. Both loop attachments are faculty preparation. Use a suitable spare tissue offcut; do not shorten the mounted aorta or disturb its end connections.

WHAT THE MODEL REPRESENTS

This lab rehearses patch reconstruction, not plaque removal or a complete carotid endarterectomy. A straight carotid specimen does not reproduce the bifurcation. A tissue offcut is a training patch, not a clinical material recommendation.

Educational concept for faculty review. Clinical and bench illustrations are AI-generated from anatomical descriptions and your equipment photographs; not operative photos. Follow the Real Bleed™ IFU. Proposed bench setup requires validation. Clinical vascular-control devices omitted for clarity.

Sources: ESVS guideline Real Bleed™
One page / 17 × 11 in / Carotid patch / Revision 01

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Coronary bypass. Every connection counts.

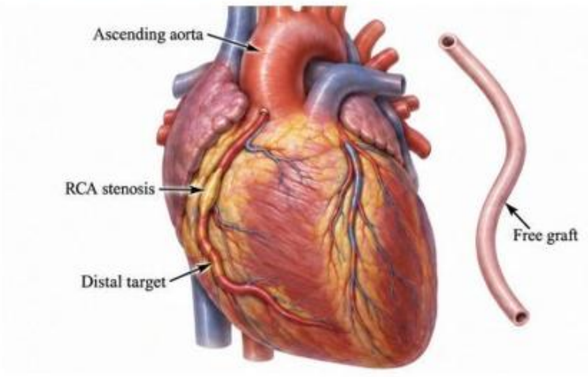
Free aortocoronary graft: distal-first sequence | 120-minute faculty-led lab | Experienced residents, fellows and surgeons

PREPARE / 15 MIN One aorta + two carotids: one graft and one coronary target. Keep both aortic cannulas attached. Faculty attach the target return to the right aorta and close its other end before the lab. Two learner joins complete the bypass. Pump off during open suturing.

READ THE IMAGES Clinical anatomy above; proposed bench exercise below. Gold rings mark the current join.

01 Plan the bypass

ORIENT GRAFT AND TARGET / 15 MIN



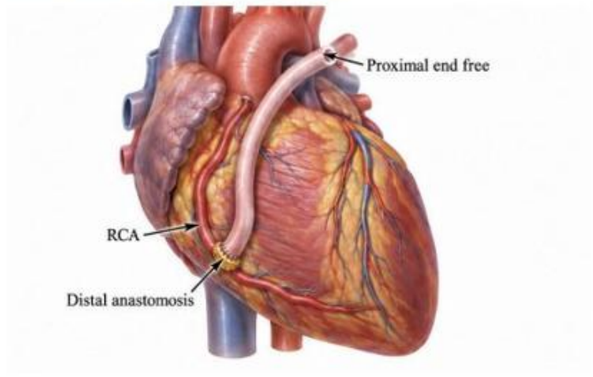
CONNECTED AORTA / CAROTID GRAFT + TARGET

Two learner joins; target return prepared by faculty

Connect: Plan a free graft from ascending aorta to right coronary artery beyond stenosis.
Rehearse: Position the graft between the aorta and smaller carotid target. Mark both sidewall openings.
Check: Adequate length, no twist or tension; identify heel and toe.

02 Distal coronary join

SMALL-VESSEL ANASTOMOSIS / 25 MIN



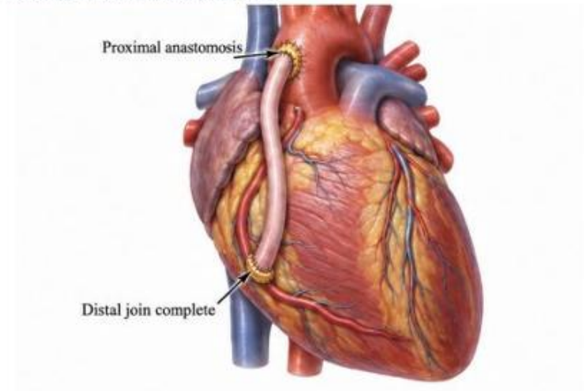
CONNECTED AORTA / CAROTID GRAFT + TARGET

Two learner joins; target return prepared by faculty

Connect: Graft end-to-side to coronary artery beyond the narrowing.
Rehearse: Sew the graft end into the side of the carotid target. The proximal graft end remains free.
Check: Fine bites, open lumen, no back-wall capture. Pump stays off.

03 Proximal aortic join

AORTIC ANASTOMOSIS / 25 MIN



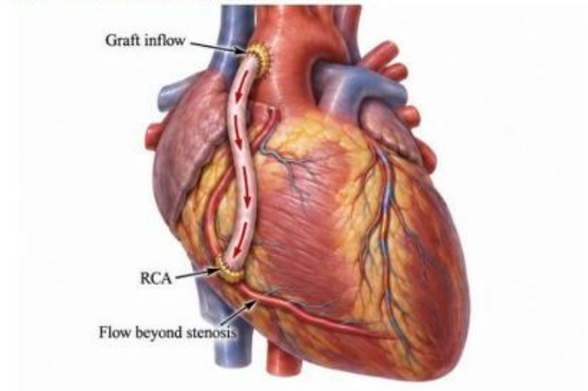
CONNECTED AORTA / CAROTID GRAFT + TARGET

Two learner joins; target return prepared by faculty

Connect: Free graft end-to-side to ascending aorta.
Rehearse: Sew the remaining graft end into the left aortic opening. The distal join is already complete.
Check: Secure heel and toe; preserve graft lie and both lumens. Both cannulas remain attached.

04 Assess graft flow

CHECK BOTH ANASTOMOSES / 20 MIN



CONNECTED AORTA / CAROTID GRAFT + TARGET

Two learner joins; target return prepared by faculty

Connect: Assess graft inflow and coronary supply beyond stenosis.
Rehearse: Test the completed route using a bench-validated, device-compatible method.
Check: Filling alone does not prove through-flow. Inspect both learner joins; stop flow before repair.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Find leakage, stop flow, repair and retest. Record completion time, leak sites and repairs; inspect lumens after testing. **Target:** two open end-to-side joins with no visible leakage at the agreed setting. Through-flow testing needs a bench-validated method because the main aorta can bypass the loop.

YOUR REAL BLEED™ SETUP

Photo at left: your connected station. The aorta remains intact and cannulated throughout. Two carotids permit a smaller distal target and a separate graft. One long carotid may supply both segments if length allows. The right target-to-aorta join is prepared before the timed lab.

WHAT THE MODEL REPRESENTS

Carotids represent graft and coronary target; target return to aorta is bench plumbing. Caliber and wall properties differ from coronary tissue. The model does not reproduce myocardial perfusion or a beating heart. This free-graft example is not a LIMA-to-LAD exercise.

Educational concept for faculty review. Clinical and bench illustrations are AI-generated from anatomical descriptions and your equipment photographs; not operative photos. Follow the Real Bleed IFU. Proposed bench setup requires validation. RCA = right coronary artery.

Sources: CABG overview Real Bleed™
One page / 17 × 11 in / CABG / Revision 01

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Femoral-Popliteal Bypass

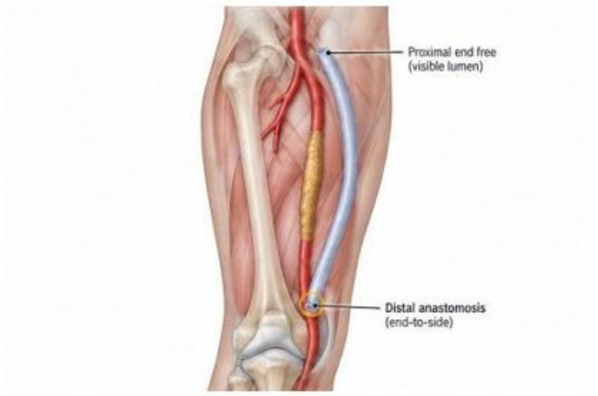
Femoral-popliteal bypass: tissue + synthetic graft practice | 135-minute faculty-led lab | Experienced residents, fellows and surgeons

PREPARE / 15 MIN One connected aorta + three short carotid pieces (one graft, two targets) + one short ePTFE piece. Use one carotid specimen if usable length permits. Place tissue practice above and synthetic practice below. Faculty prepare both target returns and tie their free ends. Pump off for open suturing.

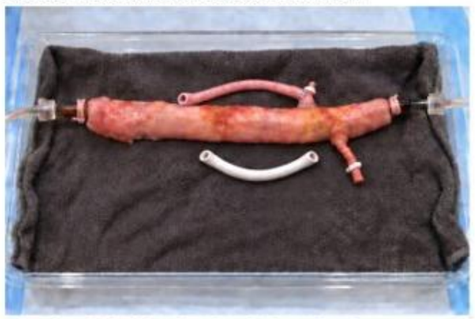
READ THE IMAGES Clinical joins above; bench progression below. Both exercises stay on the same connected aorta.

01 Tissue: distal join

CAROTID TO CAROTID / 25 MIN



ONE CONNECTED AORTA / TWO COMPACT EXERCISES

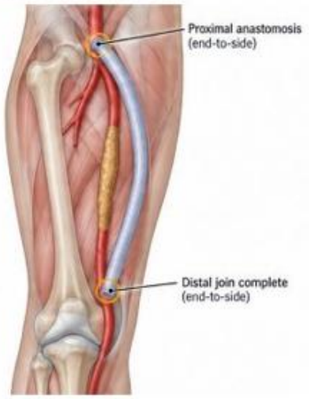


Tissue above / synthetic below / previous joins retained

Connect: Graft end-to-side to popliteal outflow.
Rehearse: On the upper side, sew the short tissue graft into its carotid target. Leave the inflow end free.
Check: Preserve lumen and tissue edges. The synthetic exercise waits on the opposite side.

02 Tissue: inflow join

CAROTID TO AORTA / 25 MIN



ONE CONNECTED AORTA / TWO COMPACT EXERCISES



Tissue above / synthetic below / previous joins retained

Connect: Graft end-to-side to femoral inflow.
Rehearse: Attach the free tissue graft end to the nearby aorta. The first bypass is complete.
Check: Leave both tissue joins in place. Keep enough space for clamps and the next exercise.

03 Synthetic: distal

ePTFE TO CAROTID / 25 MIN



ONE CONNECTED AORTA / TWO COMPACT EXERCISES



Tissue above / synthetic below / previous joins retained

Connect: Synthetic graft to popliteal outflow.
Rehearse: On the opposite side, sew a short ePTFE piece into its own carotid target. Leave inflow free.
Check: Compare material handling. Preserve the completed tissue bypass above.

04 Synthetic: inflow

ePTFE TO AORTA / 25 MIN



ONE CONNECTED AORTA / TWO COMPACT EXERCISES



Tissue above / synthetic below / previous joins retained

Connect: Synthetic graft to femoral inflow.
Rehearse: Attach the free ePTFE end to the nearby aorta. Four learner joins are now complete.
Check: Compare both circuits and inspect seams before testing. Both original cannulas stay attached.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Find leakage, stop flow, repair and retest. Record completion time, leak sites and repairs; inspect lumens after testing. **Target:** four open learner end-to-side joins with no visible leakage at the agreed setting. Through-flow testing needs a bench-validated method because the main aorta can bypass both loops.

YOUR REAL BLEED™ SETUP

Photo at left: your connected station. Tissue bypass on one side; synthetic bypass on the other. Three short carotid pieces serve as one tissue graft and two targets. Cut from one specimen if practical. Keep segments short with enough clamp and suture access.

WHAT THE MODEL REPRESENTS

Two practice circuits compare tissue and synthetic handling on one aorta. Four learner joins plus two faculty-prepared returns. The paired loops are bench exercises, not a clinical double bypass. Match graft caliber to the actual targets; preserve both completed exercises.

Educational concept for faculty review. Clinical and bench illustrations are AI-generated from anatomical descriptions and your equipment photographs; not operative photos. Follow Real Bleed™ and graft IFUs. Proposed bench setup requires validation. SFA = superficial femoral artery.

Sources: Prosthetic bypass Real Bleed™
One page / 17 × 11 in / Fem-pop / Combined practice / Revision 06

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Free-Flap Vascular Anastomosis

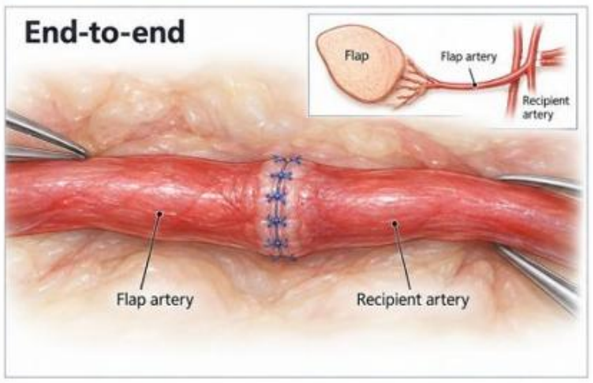
Plastic surgery, ENT and maxillofacial reconstruction | 120-minute faculty-led lab | Anastomosis skills using tissue surrogates

PREPARE / 15 MIN One connected aorta + four short carotid pieces: three form the upper arch; one forms the lower arch. Faculty attach the two upper outer ends and lower left end. Select a modest upper-right caliber mismatch. Use one specimen if suitable. Leave working joins open; pump off during suturing.

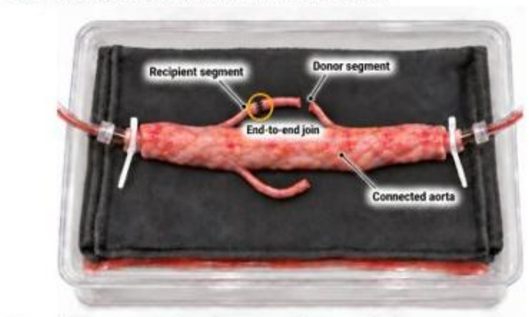
READ THE IMAGES Clinical connection examples above; cumulative bench practice below. The model teaches geometry, not flap physiology.

01 End-to-end join

MATCHED CAROTID ENDS / 25 MIN



ONE CONNECTED AORTA / THREE WORKING JOINS

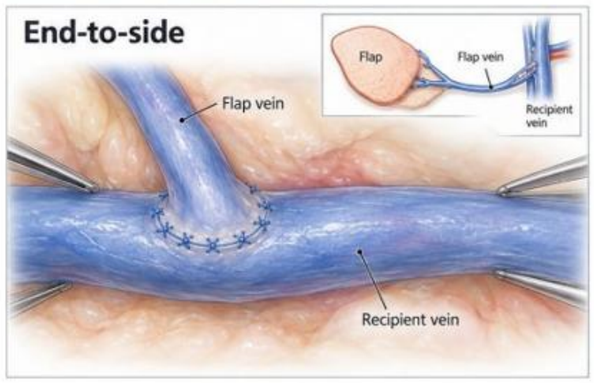


Short tissue segments / previous connections retained

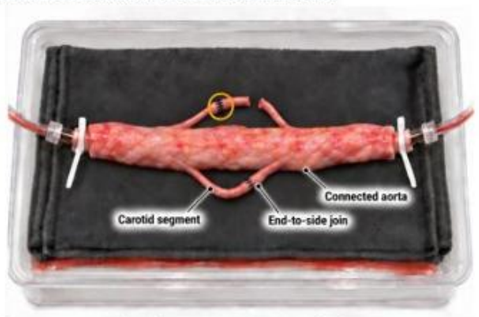
Connect: Flap artery to recipient artery.
Rehearse: Join the matched ends at the upper-left working site. Keep the upper-right ends free.
Check: Align the lumen and avoid twist or back-wall capture. Both aortic cannulas stay attached.

02 End-to-side join

CAROTID END TO AORTIC SIDE / 25 MIN



ONE CONNECTED AORTA / THREE WORKING JOINS

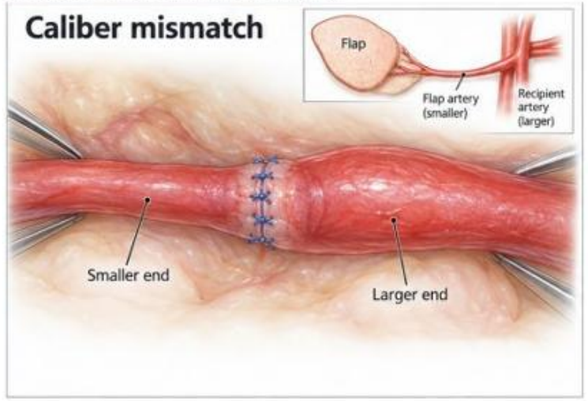


Short tissue segments / previous connections retained

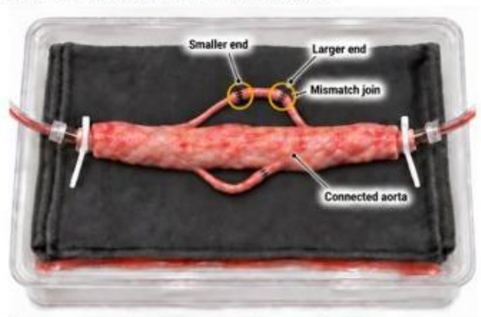
Connect: Flap vein to recipient vein sidewall.
Rehearse: Join the lower arch free end to the aorta. This is a geometry surrogate using arterial tissue.
Check: Preserve heel, toe and parent lumen. Keep the upper end-to-end repair intact.

03 Caliber mismatch

UNEQUAL SHORT TISSUE ENDS / 25 MIN



ONE CONNECTED AORTA / THREE WORKING JOINS

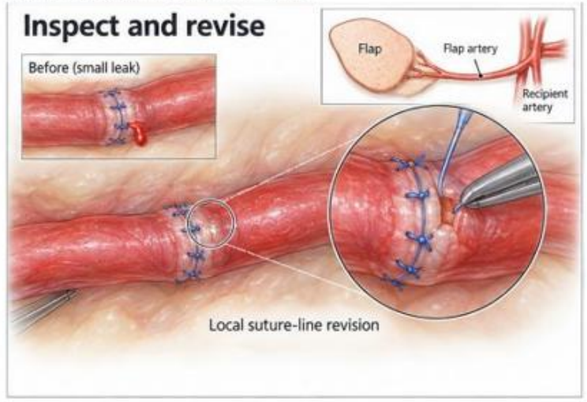


Short tissue segments / previous connections retained

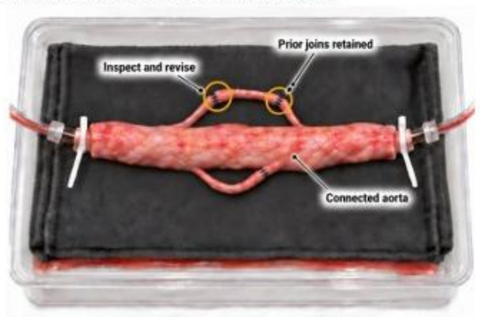
Connect: Accommodate unequal vessel calibers.
Rehearse: Complete the upper-right end-to-end join using faculty-selected, modestly unequal ends.
Check: Inspect suture distribution, lumen and tension. Do not stretch tissue to force a match.

04 Inspect and revise

LOCAL LEAK ASSESSMENT / 15 MIN



ONE CONNECTED AORTA / THREE WORKING JOINS



Short tissue segments / previous connections retained

Connect: Assess completed anastomoses.
Rehearse: Test all three joins; stop flow and revise a localized leak or faculty-marked weak point.
Check: Retest and preserve prior work. Bench filling does not establish flap viability or through-flow.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Reassess the matched end-to-end, end-to-side and mismatch joins. Identify leakage, stop flow, correct and retest. Record suture quality, revisions and completion time. **Target:** three intact learner anastomoses at the agreed setting. Use a bench-validated test for loop through-flow; filling alone is insufficient.

YOUR REAL BLEED™ SETUP

Photo at left: your original station. The aorta remains connected. Four short carotid pieces provide three learner joins and revision practice; faculty prepare three attachment joins. Use minimum workable lengths with clamp access. Source extra tissue only if needed for caliber selection.

WHAT THE MODEL REPRESENTS

Carotid and aorta teach connection geometry at available tissue scale. They do not reproduce tiny flap vessels or venous wall behavior. True microsurgical training requires appropriately small vessels and magnification. The paired arches are bench circuits, not a perfused tissue flap.

Educational concept for faculty review. Clinical and bench illustrations are AI-generated from anatomical descriptions and your equipment photographs; not operative photos. Follow the Real Bleed IFU. Proposed bench setup requires validation. Faculty select the mismatch exercise to suit actual tissue; illustrations are not calibrated dimensional drawings.

Sources: Flap anastomosis Real Bleed™
One page / 17 × 11 in / Free-Flap Anastomosis / Version 01

REAL BLEED™ SYSTEM | PATENT PENDING

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Kidney transplant. Every connection counts.

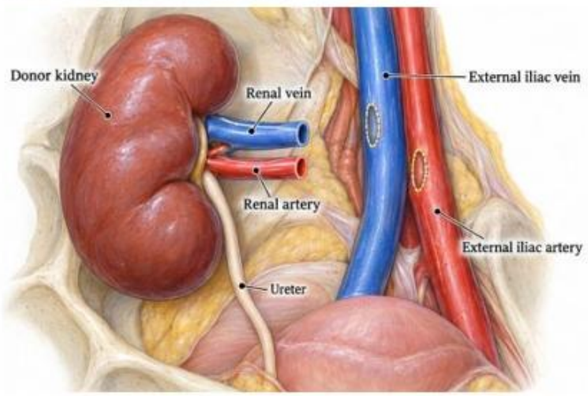
Vascular reconstruction: vein-first sequence | 120-minute faculty-led lab | Experienced residents, fellows and surgeons

PREPARE / 15 MIN One aorta + one carotid. Keep both aortic cannulas attached; arrange the carotid as a broad loop. Its right end is the venous task and its left end the arterial task. Both are sewn end-to-side into the aorta. Pump off during open reconstruction.

READ THE IMAGES Clinical anatomy above; proposed bench exercise below. Gold rings mark the current join.

01 Position the graft

PLAN THE CONNECTIONS / 15 MIN



ONE AORTA + ONE CAROTID / SAME CONNECTIONS

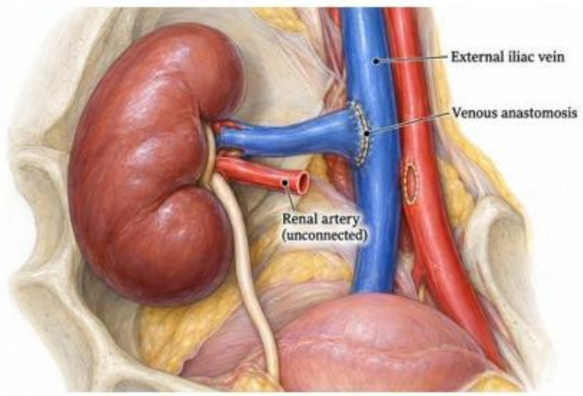


Left join: arterial task | Right join: venous task

Connect: Plan donor renal vein to iliac vein and donor renal artery to iliac artery.
Rehearse: Mark two sidewall sites on the intact aorta. Lay out the carotid loop with enough length for two end-to-side joins.
Check: Identify heel and toe; avoid tension or kinking. Both loop ends remain free.

02 Renal vein

VENOUS ANASTOMOSIS / 25 MIN



ONE AORTA + ONE CAROTID / SAME CONNECTIONS

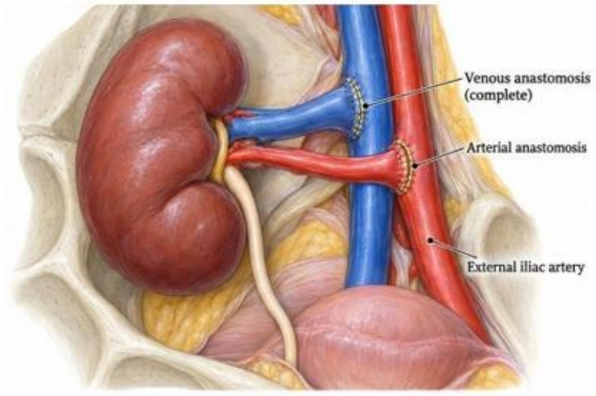


Left join: arterial task | Right join: venous task

Connect: Donor renal vein end-to-side to recipient external iliac vein.
Rehearse: Sew the right carotid end into the right aortic opening; complete the posterior and anterior walls.
Check: Open lumen; no back-wall capture. Left end remains free; pump stays off.

03 Renal artery

ARTERIAL ANASTOMOSIS / 25 MIN



ONE AORTA + ONE CAROTID / SAME CONNECTIONS

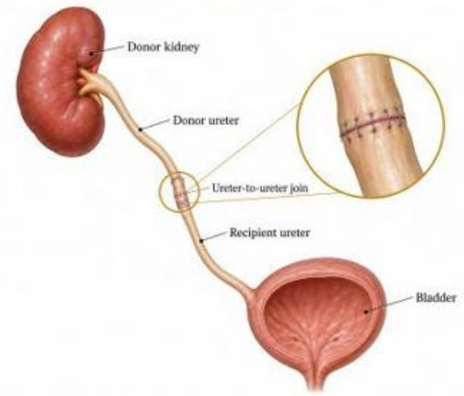


Left join: arterial task | Right join: venous task

Connect: Donor renal artery end-to-side to recipient external iliac artery.
Rehearse: Sew the remaining left carotid end into the left aortic opening, completing the loop.
Check: Even bites, secure heel and toe, no narrowing. Both learner joins now share the connected aorta.

04 Ureteric suturing

URETER-TO-URETER EXERCISE / 20 MIN



SAME CAROTID / NEW URETERIC SUTURING TASK



Divide midpoint, then rejoin end-to-end

Connect: Donor ureter to recipient ureter.
Rehearse: Assess vascular joins, then stop the pump. Divide and rejoin the carotid midpoint end-to-end; keep the aorta connected.
Check: Alignment and an open lumen. Carotid serves as a ureter-to-ureter suturing surrogate.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Find leakage, stop flow, repair and retest. Record completion time, leak sites and repairs; inspect lumens after testing. **Target:** two open end-to-side joins with no visible leakage at the agreed setting. Through-flow testing needs a bench-validated method because the main aorta can bypass the loop.

YOUR REAL BLEED™ SETUP

Photo at left: your connected station. The aorta remains intact and cannulated throughout. One carotid supplies both end-to-side tasks; no extra graft is required. Select enough length for an untwisted loop, clamp access and repair reserve.

WHAT THE MODEL REPRESENTS

Clinically, artery and vein are separate vessels. Here, two sites on one aorta represent those recipient targets. The carotid loop is a suturing and leak-test surrogate, not kidney microcirculation or venous physiology. Ureteric implantation is outside this vascular lab.

Educational concept for faculty review. Clinical and bench illustrations are AI-generated from anatomical descriptions and your equipment photographs; not operative photos. Follow the Real Bleed™ IFU. Proposed bench setup requires validation. Ureter shown for orientation only.

Sources: EAU guideline Real Bleed™
One page / 17 × 11 in / Kidney / Revision 01

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Leg bypass. Every connection counts.

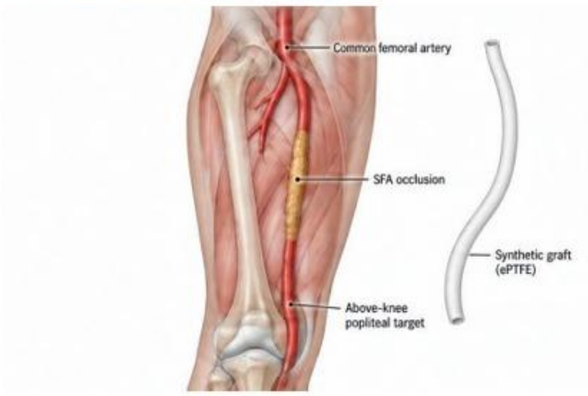
Femoral-popliteal bypass: above-knee target / synthetic graft exercise | 120-minute faculty-led lab | Experienced residents, fellows and surgeons

PREPARE / 15 MIN One connected aorta + one short carotid target + one short ePTFE graft segment. Match graft caliber to the target; keep both working sites close together. Faculty prepare the target return and close its free end. Retain clamp and suture access. Pump off during open suturing.

READ THE IMAGES Clinical anatomy above; proposed bench exercise below. Each bench image shows the next stage of reconstruction.

01 Plan the bypass

ORIENT INFLOW AND OUTFLOW / 15 MIN



CONNECTED AORTA / SYNTHETIC GRAFT + CAROTID



Short ePTFE segment / two graft-to-tissue joins

Connect: Plan common femoral inflow to above-knee popliteal outflow beyond the blockage.
Rehearse: Position a short synthetic graft beside the carotid target; keep both working sites close together.
Check: Match graft caliber to the tissue target. Use only enough length for clamps and tension-free joins.

02 Distal popliteal join

SMALLER-TARGET ANASTOMOSIS / 25 MIN



CONNECTED AORTA / SYNTHETIC GRAFT + CAROTID

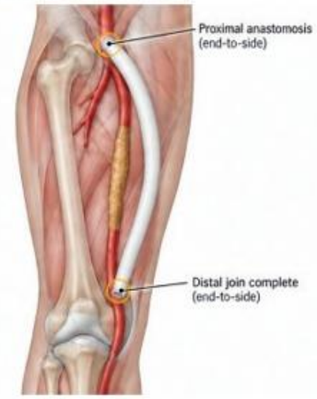


Short ePTFE segment / two graft-to-tissue joins

Connect: Graft end-to-side to popliteal artery beyond the blockage.
Rehearse: Sew the ePTFE end into the carotid target sidewall. Leave the proximal graft end free.
Check: Compare needle passage through graft and tissue. Protect tissue edges and avoid back-wall capture.

03 Proximal femoral join

INFLOW ANASTOMOSIS / 25 MIN



CONNECTED AORTA / SYNTHETIC GRAFT + CAROTID



Short ePTFE segment / two graft-to-tissue joins

Connect: Graft end-to-side to common femoral artery.
Rehearse: Sew the free synthetic end into the nearby aortic opening; the distal join is complete.
Check: Control suture tension across graft and tissue. Preserve the lumen; both cannulas stay attached.

04 Assess bypass flow

CHECK INFLOW AND OUTFLOW / 20 MIN



CONNECTED AORTA / SYNTHETIC GRAFT + CAROTID



Short ePTFE segment / two graft-to-tissue joins

Connect: Assess bypass flow and distal arterial supply.
Rehearse: Test the completed bench route using a validated, device-compatible method.
Check: Inspect graft-to-tissue seams and needle holes. Filling alone does not prove through-flow; stop before repair.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Find leakage, stop flow, repair and retest. Record completion time, leak sites and repairs; inspect lumens after testing. **Target:** two open end-to-side joins with no visible leakage at the agreed setting. Through-flow testing needs a bench-validated method because the main aorta can bypass the loop.

YOUR REAL BLEED™ SETUP

Photo at left: your connected station. Keep the aorta cannulated. A short synthetic segment replaces the tissue graft; only a short carotid target is needed. Place joins close together to conserve material while retaining clamp access and a tension-free connection.

WHAT THE MODEL REPRESENTS

This version rehearses synthetic-to-tissue joins: ePTFE to carotid target, then ePTFE to aortic inflow. Full bypass length is shown above only. The target return is bench plumbing. Select graft size and handling by specimen caliber and the graft manufacturer instructions.

Educational concept for faculty review. Clinical and bench illustrations are AI-generated from anatomical descriptions and your equipment photographs; not operative photos. Follow Real Bleed™ and graft IFUs. Proposed bench setup requires validation. SFA = superficial femoral artery.

Sources: Prosthetic bypass Real Bleed™
One page / 17 × 11 in / Fem-pop / Synthetic graft / Revision 05

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Leg bypass. Every connection counts.

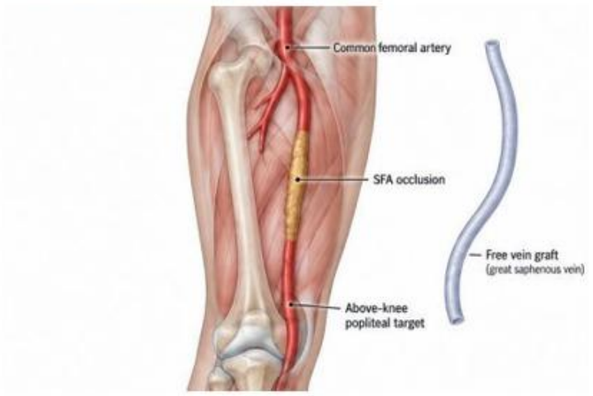
Femoral-popliteal bypass: above-knee target / distal-first exercise | 120-minute faculty-led lab | Experienced residents, fellows and surgeons

PREPARE / 15 MIN One connected aorta + two short carotid segments, taken from one carotid when usable length permits. Place the working joins close together; retain only enough tissue for clamping and suturing without tension. Faculty prepare the target return and close its free end. Pump off during open suturing.

READ THE IMAGES Clinical anatomy above; proposed bench exercise below. Each bench image shows the next stage of reconstruction.

01 Plan the bypass

ORIENT INFLOW AND OUTFLOW / 15 MIN



CONNECTED AORTA / CAROTID GRAFT + TARGET



Short segments / local joins / original cannulas retained

Connect: Plan common femoral inflow to above-knee popliteal outflow beyond the blockage.
Rehearse: Position a short carotid graft beside a short carotid target; keep both working sites close together.
Check: Use realistic vessel diameters and minimum workable length, with room to clamp and suture.

02 Distal popliteal join

SMALLER-TARGET ANASTOMOSIS / 25 MIN



CONNECTED AORTA / CAROTID GRAFT + TARGET

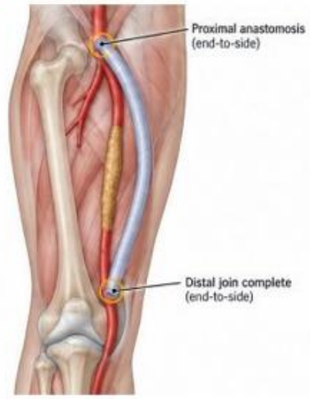


Short segments / local joins / original cannulas retained

Connect: Graft end-to-side to popliteal artery beyond the blockage.
Rehearse: Sew the graft into the carotid target sidewall. Leave the proximal graft end free.
Check: Secure heel and toe; preserve the lumen and avoid back-wall capture. Pump off.

03 Proximal femoral join

INFLOW ANASTOMOSIS / 25 MIN



CONNECTED AORTA / CAROTID GRAFT + TARGET



Short segments / local joins / original cannulas retained

Connect: Graft end-to-side to common femoral artery.
Rehearse: Sew the free graft end into the nearby aortic opening; the distal join is complete.
Check: Confirm graft lie and open lumens. Both original aortic cannulas stay attached.

04 Assess bypass flow

CHECK INFLOW AND OUTFLOW / 20 MIN



CONNECTED AORTA / CAROTID GRAFT + TARGET



Short segments / local joins / original cannulas retained

Connect: Assess bypass flow and distal arterial supply.
Rehearse: Test the completed bench route using a validated, device-compatible method.
Check: Filling alone does not prove through-flow. Inspect both learner joins; stop flow before repair.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Find leakage, stop flow, repair and retest. Record completion time, leak sites and repairs; inspect lumens after testing. **Target:** two open end-to-side joins with no visible leakage at the agreed setting. Through-flow testing needs a bench-validated method because the main aorta can bypass the loop.

YOUR REAL BLEED™ SETUP

Photo at left: your connected station. Keep the aorta cannulated. Cut a short graft and short target from one carotid when usable length allows. Keep the sites close together to reduce tissue use. Retain enough length for clamps, suturing and a tension-free connection.

WHAT THE MODEL REPRESENTS

The model focuses on the two anastomoses: aorta as femoral inflow; short carotid segments as graft and popliteal target. Full clinical bypass length is shown above only. Target return is bench plumbing. Select tissue by actual caliber; diagrams do not specify measured dimensions.

Educational concept for faculty review. Clinical and bench illustrations are AI-generated from anatomical descriptions and your equipment photographs; not operative photos. Follow the Real Bleed IFU. Proposed bench setup requires validation. SFA = superficial femoral artery.

Sources: Bypass overview Real Bleed™
One page / 17 × 11 in / Fem-pop / Compact revision 04

REAL BLEED™ SYSTEM | PATENT PENDING

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Liver transplant. Every connection counts.

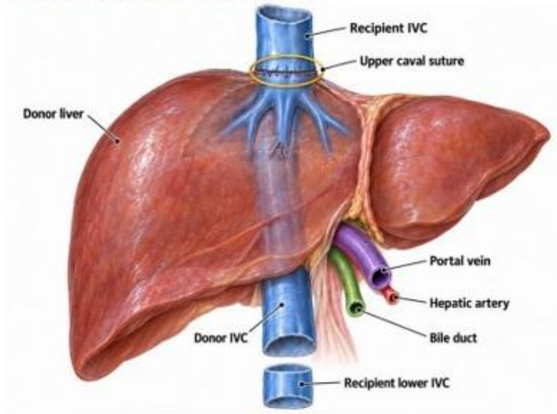
Conventional bicaval reconstruction | 120-minute faculty-led lab | Experienced residents, fellows and surgeons

PREPARE / 15 MIN Keep the aorta connected at both ends. Before the lab, prepare two carotid loops with end-to-side attachments to the aorta. Use one aorta + two carotids, or divide one sufficiently long carotid into two loops. Mark the four reconstruction sites.

READ THE IMAGES Clinical anatomy above; proposed bench exercise below. Gold rings mark the current join.

01 Suprahepatic cava

UPPER CAVAL ANASTOMOSIS / 20 MIN



Upper loop: portal task

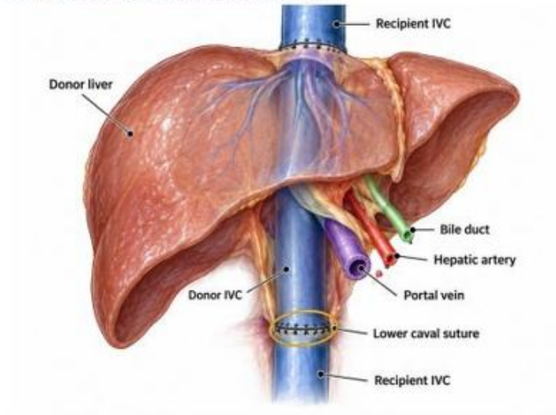


Lower loop: hepatic-artery task

Connect: Recipient upper IVC to donor upper IVC.
Rehearse: Join the right end of the central aortic donor segment to the recipient end. Both original cannulas stay attached.
Check: Complete the back and front walls; avoid back-wall capture. Pump off while cuts remain open.

02 Infrahepatic cava

LOWER CAVAL ANASTOMOSIS / 20 MIN



Upper loop: portal task

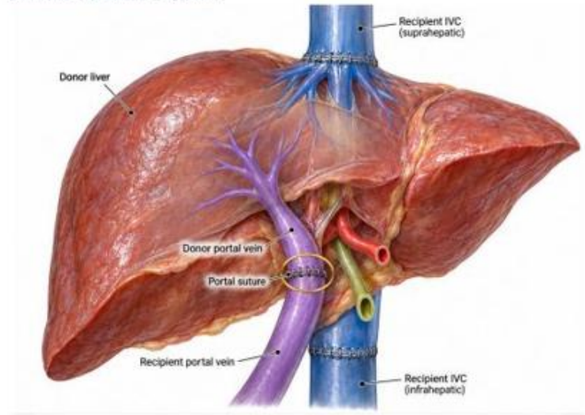


Lower loop: hepatic-artery task

Connect: Donor lower IVC to recipient lower IVC.
Rehearse: Join the left end of the same donor segment. Both caval joins are now complete; the carotid loops remain attached.
Check: Before testing the aorta, control both limbs of each unfinished loop to prevent forward and back bleeding.

03 Portal vein

PORTAL INFLOW / 20 MIN



Upper loop: portal task

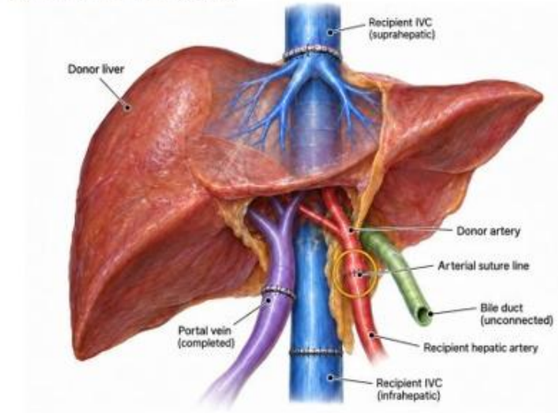


Lower loop: hepatic-artery task

Connect: Recipient portal vein to donor portal vein.
Rehearse: Join the divided upper carotid loop end-to-end. Its end-to-side attachments supply the portal-task vessel from the connected aorta.
Check: Preserve the lumen and alignment. Keep both limbs of the unfinished lower loop controlled.

04 Hepatic artery

ARTERIAL INFLOW / 25 MIN



Upper loop: portal task



Lower loop: hepatic-artery task

Connect: Recipient hepatic artery to donor arterial inflow.
Rehearse: Join the divided lower carotid loop end-to-end, with magnification as needed. All four learner joins are now complete.
Check: Fine suture control, no twist or narrowing. Test each completed route separately.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Test the completed assembly using a faculty-validated, device-compatible setup. Assess each branch separately: filling alone does not prove through-flow. Find leaks, stop flow, repair and retest. **Target:** open, aligned joins with no visible leakage. Both aortic cannulas remain attached throughout.

YOUR REAL BLEED™ SETUP

Photo at left: your actual connected station. Four end-to-side anchors prepare the two loops; four end-to-end joins are the learner tasks. Two carotids preserve working length and clamp access. Faculty preparation is additional to the 120-minute lab.

WHAT THE MODEL REPRESENTS

Aorta represents cava; carotid loops represent portal and arterial suturing tasks. Their side-to-aorta anchors are bench supply/return connections, not transplant anatomy. This model does not reproduce venous compliance or liver microcirculation. Bench validation is required.

Educational concept for faculty review. Clinical and bench illustrations are AI-generated from anatomical descriptions and your equipment photographs; not operative photos. Follow the Real Bleed™ IFU. IVC = inferior vena cava. Bile duct shown for orientation only.

Sources: Transplant technique Real Bleed™
One page / 17 × 11 in / Connected-vessel revision

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Open Bladder Cystotomy Repair

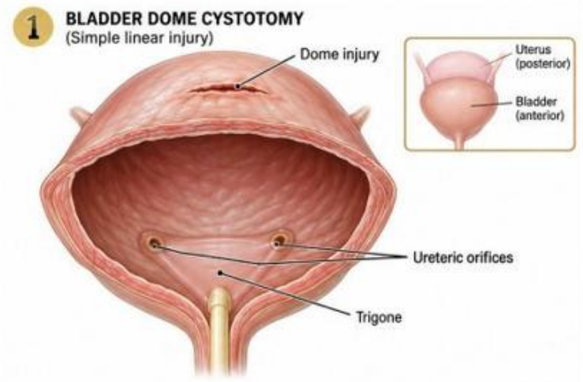
OB/GYN | 120-minute faculty-led lab | Simple dome injury: closure, reinforcement and leak assessment

PREPARE / 15 MIN One short aortic segment with a small central sidewall incision. Retain both original cannulas and tubing connections. Faculty validate tissue suitability and an IFU-compatible, gentle filling method before use. Pump off during suturing; no clinical bladder fill volume is applied to this small surrogate.

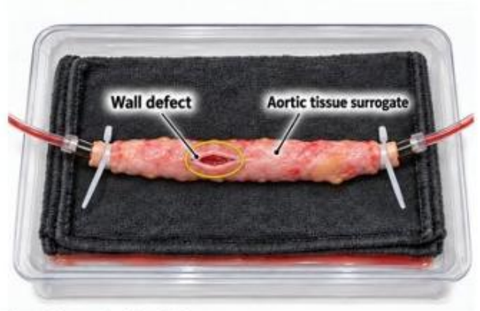
READ THE IMAGES Bladder cutaway above; tissue model below. The cutaway is not an additional injury.

01 Assess the injury

DOME DEFECT / 20 MIN



CONNECTED TISSUE / BLADDER-WALL SURROGATE

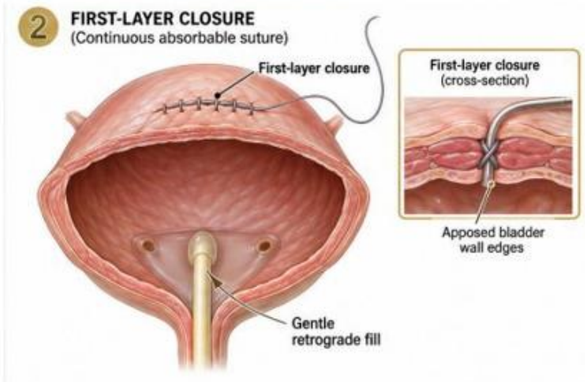


Short tissue / layered sidewall closure

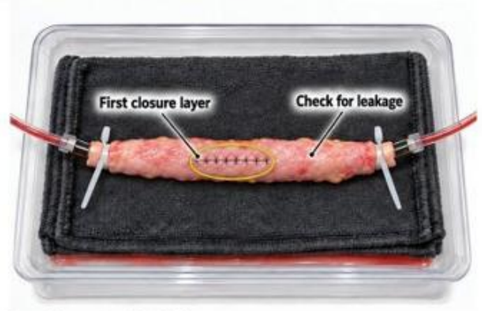
Clinical: Define the injury and its relationship to the trigone and ureteric orifices.
Rehearse: Inspect a small sidewall defect in the tissue surrogate.
Check: Identify both edges and the opposite wall. This scenario excludes trigonal or ureteric injury.

02 First-layer closure

APPOSITION AND LEAK CHECK / 25 MIN



CONNECTED TISSUE / BLADDER-WALL SURROGATE

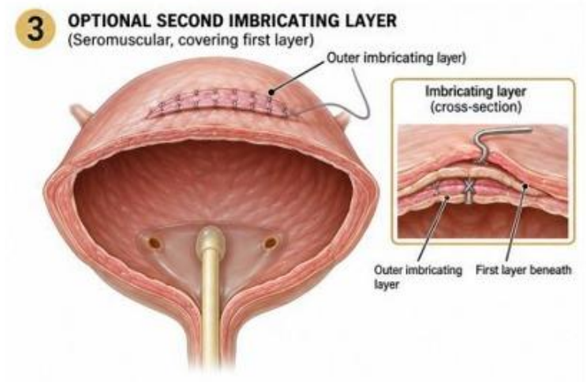


Short tissue / layered sidewall closure

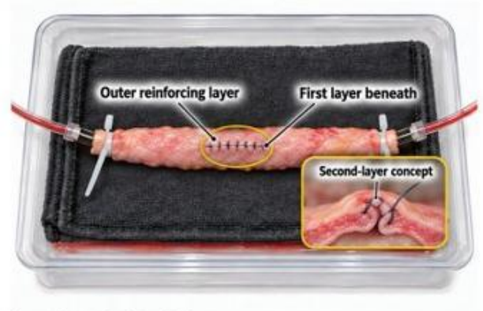
Clinical: Approximate viable bladder edges with absorbable suture; check the first layer by gentle filling.
Rehearse: Close the defect, then assess for leakage.
Check: Avoid gaps and opposite-wall capture. Stop filling and correct any visible leak.

03 Reinforce closure

SECOND-LAYER PRACTICE / 25 MIN



CONNECTED TISSUE / BLADDER-WALL SURROGATE

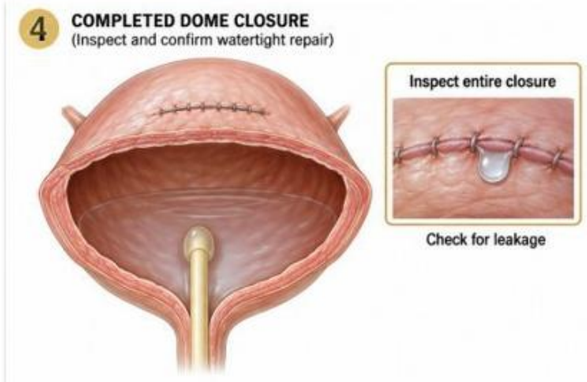


Short tissue / layered sidewall closure

Clinical: When selected, an outer imbricating layer covers the first closure.
Rehearse: Practice an outer reinforcing layer if tissue thickness permits.
Check: Avoid tissue tearing or excessive tension. Aortic layers do not reproduce bladder layers.

04 Test and revise

FINAL LEAK ASSESSMENT / 15 MIN



CONNECTED TISSUE / BLADDER-WALL SURROGATE



Short tissue / layered sidewall closure

Clinical: Reassess the whole repair and plan postoperative bladder drainage.
Rehearse: Gently fill using the validated bench method. Locate leakage, stop, revise and recheck.
Check: Record test conditions; a dry seam alone does not establish clinical healing.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Inspect the entire closure and demonstrate a controlled leak check. Stop filling before revision, then reassess. Record edge apposition, tissue handling, test conditions and revisions. **Target:** a leak-free closure at the agreed bench setting. Clinical watertightness, drainage and follow-up require separate assessment.

YOUR REAL BLEED™ SETUP

Photo at left: your original station. A short aortic segment stays connected at both ends on the dark towel in the clear tray. The exercise uses one sidewall defect, without a graft or extra vessel. Faculty must validate filling and drainage; do not force fluid into a closed, pressurized circuit.

WHAT THE MODEL REPRESENTS

Aorta is a suturing surrogate, not bladder tissue: compliance, layers and capacity differ. This sheet demonstrates two-layer practice; a watertight single-layer closure may also be appropriate clinically. The model does not simulate ureteric orifices, trigone, catheter drainage or healing.

Faculty-led educational concept. AI illustrations are not operative photographs or calibrated drawings. Validate tissue and test settings against the Real Bleed™ IFU. Simple open dome-repair skills only; complex injury management and postoperative care are outside this workshop.

Sources: EAU / repair Real Bleed™
One page / 17 x 11 in / Cystotomy / V01

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Open Tubal Ligation

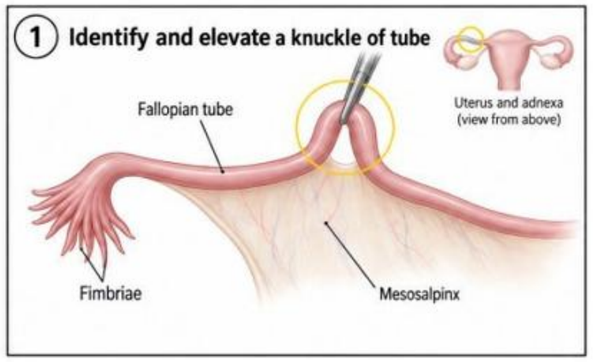
Modified Pomeroy Technique | 120-minute faculty-led lab | Carotid-only tissue simulation

PREPARE / 15 MIN One short carotid segment only, with enough slack to raise a small central loop. Keep both ends secured to the original tubing in the clear tray. Faculty select tissue and ligatures. Keep the pump off throughout this ligation exercise; the lumen will be intentionally occluded.

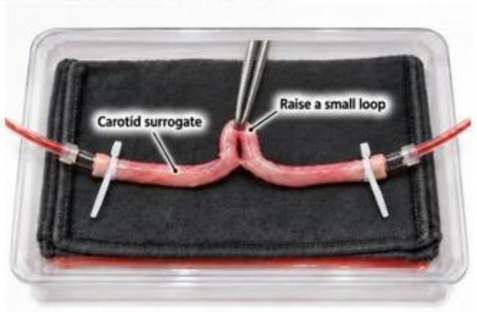
READ THE IMAGES Tubal anatomy above; carotid surrogate below. One side shown; clinical treatment is bilateral.

01 Identify and lift

ORIENTATION / 20 MIN



CAROTID ONLY / TUBAL TISSUE SURROGATE

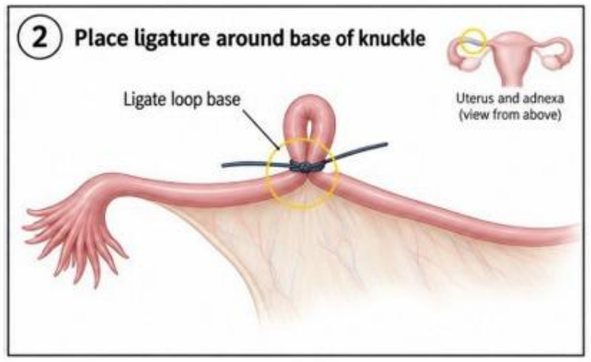


Short segment / original two tubing connections

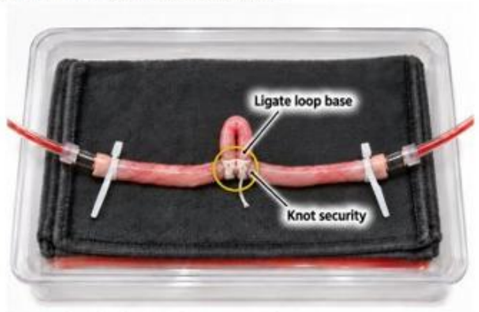
Clinical: Confirm the fallopian tube by tracing it to the fimbriae; identify the mesosalpinx.
Rehearse: Gently raise a small knuckle in the carotid midpoint.
Check: Use minimal tissue length with enough slack for atraumatic handling and a secure tie.

02 Ligate the loop

KNOT SECURITY / 25 MIN



CAROTID ONLY / TUBAL TISSUE SURROGATE

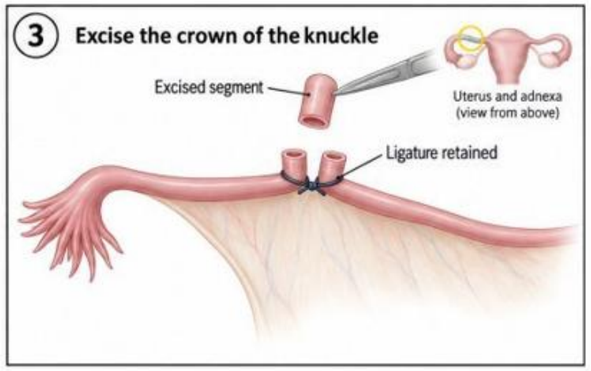


Short segment / original two tubing connections

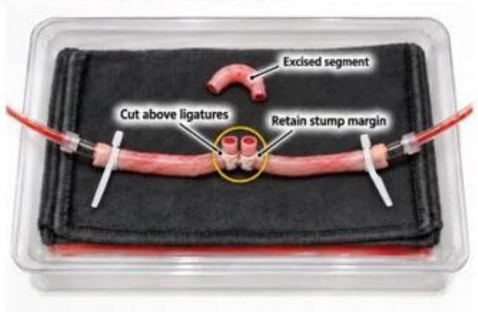
Clinical: Secure the elevated loop base using the faculty-selected modified Pomeroy variant.
Rehearse: Place ligatures around the two legs at the base.
Check: Confirm secure knots and controlled tissue compression without cutting through the surrogate.

03 Excise segment

CONTROLLED DIVISION / 25 MIN



CAROTID ONLY / TUBAL TISSUE SURROGATE

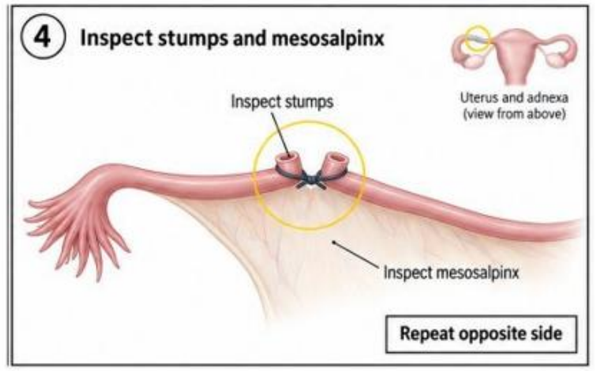


Short segment / original two tubing connections

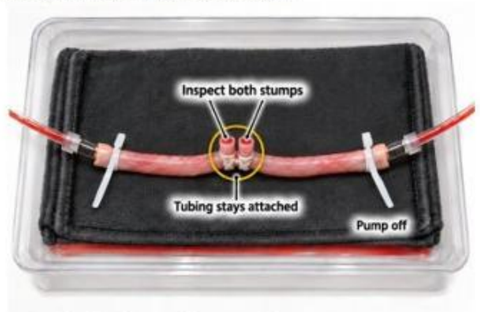
Clinical: Excise the loop segment above the ligature, retaining an adequate stump margin.
Rehearse: Remove the small carotid crown; retain the specimen.
Check: Preserve the ties and inspect both residual stumps. Do not reconnect the divided ends.

04 Inspect and review

COMPLETION CHECK / 15 MIN

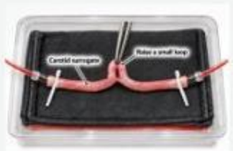


CAROTID ONLY / TUBAL TISSUE SURROGATE



Short segment / original two tubing connections

Clinical: Inspect stumps and mesosalpinx for bleeding; repeat on the opposite tube.
Rehearse: Review both carotid stumps, knot security and the specimen with the pump off.
Check: This single segment models one side. It cannot establish clinical contraceptive effectiveness.



05 INSPECT. REVIEW. REPEAT.

FINAL CHALLENGE / 20 MIN

With the pump off, review tissue handling, loop selection, knot security, retained stump margins and specimen retrieval. Explain the clinical bilateral check. **Target:** secure ligatures and controlled division with minimal tissue use. Additional practice uses another short carotid segment if available; no aorta is required.

YOUR REAL BLEED™ SETUP

Carotid only. One short segment rests on the dark towel inside the clear tray, with both cannula connections retained. Allow only enough slack for the central knuckle and instrument access. After ligation, the circuit is intentionally blocked: do not run the pump against the occluded vessel.

WHAT THE MODEL REPRESENTS

Carotid is a handling and knot-tying surrogate, not fallopian tissue. It lacks fimbriae, mesosalpinx and tubal wall structure. Fluid inside a carotid does not represent tubal blood supply. No powered seal test is required. The exercise does not simulate healing or predict sterilization success.

Faculty-led educational concept. AI-generated anatomy and model illustrations are not calibrated drawings. Faculty confirm the selected ligation variant and tissue suitability. Open partial salpingectomy training only; clinical consent, counseling and complete patient care are outside this skills sheet.

Source: GLOWM Real Bleed™
One page / 17 x 11 in / Tubal ligation / V01

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Open Abdominal Aortic Aneurysm Repair

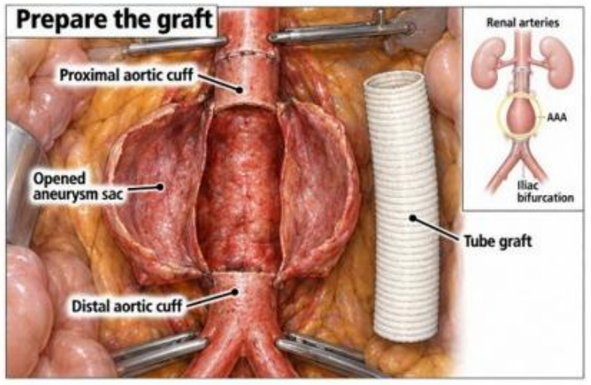
Tube Graft Reconstruction | 120-minute faculty-led lab | Two graft-to-aorta anastomoses on one connected model

PREPARE / 15 MIN One aorta + one short synthetic tube graft. Preserve both original cannulas. Faculty prepare a short central gap, leaving only enough native cuff for clamping and suturing. Match graft caliber to the tissue. Keep the pump off while either end is open.

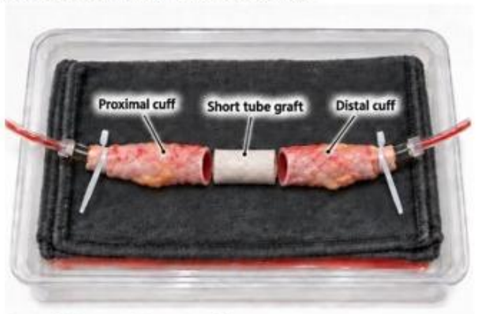
READ THE IMAGES Open repair above; compact bench model below. Gold highlights identify the joins.

01 Prepare the graft

CUFFS AND ALIGNMENT / 20 MIN



CONNECTED AORTA / SHORT SYNTHETIC GRAFT

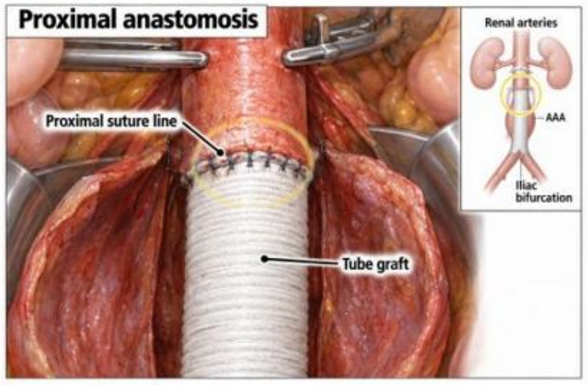


Two native cuffs / two graft-to-aorta joins

Clinical: Identify the proximal and distal cuffs within the opened aneurysm sac.
Rehearse: Align a short tube graft between the connected aortic ends.
Check: Match caliber; allow access to both suture lines without unnecessary tissue length.

02 Proximal join

FIRST ANASTOMOSIS / 25 MIN



CONNECTED AORTA / SHORT SYNTHETIC GRAFT

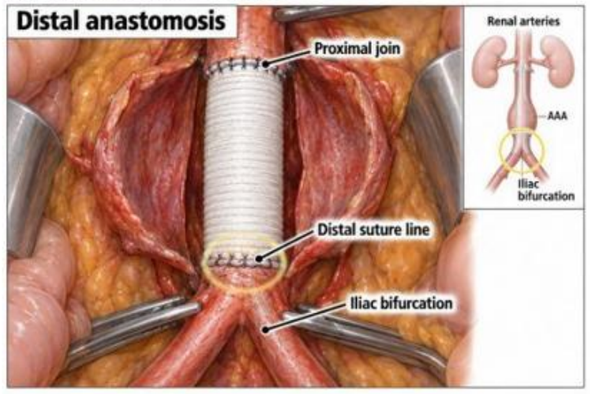


Two native cuffs / two graft-to-aorta joins

Clinical: Join the graft to the proximal aortic cuff.
Rehearse: Complete the left graft-to-aorta anastomosis; the right end remains open.
Check: Inspect posterior-wall apposition and stitch spacing. Avoid catching the opposite wall. Keep flow off.

03 Distal join

SECOND ANASTOMOSIS / 25 MIN



CONNECTED AORTA / SHORT SYNTHETIC GRAFT

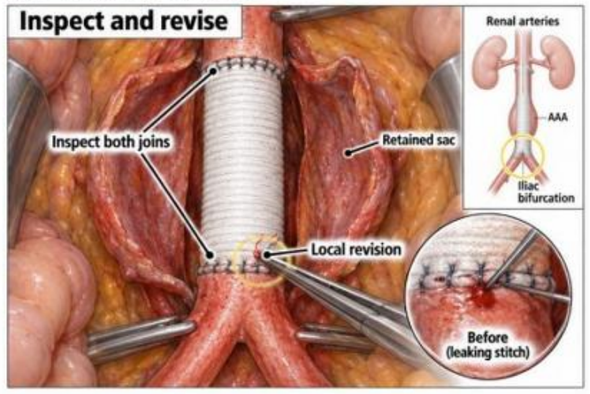


Two native cuffs / two graft-to-aorta joins

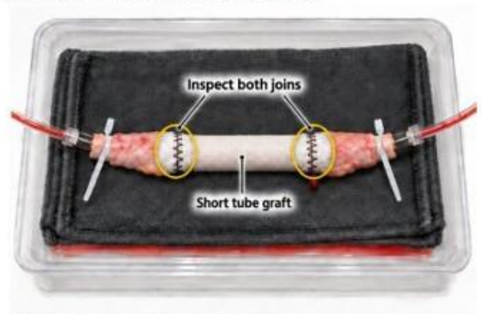
Clinical: Join the graft to the distal aortic cuff above the bifurcation.
Rehearse: Complete the right join while retaining the proximal repair.
Check: Inspect both interfaces for gaps, narrowing, tension and twist. Avoid graft kinking.

04 Test and revise

BOTH SUTURE LINES / 15 MIN



CONNECTED AORTA / SHORT SYNTHETIC GRAFT



Two native cuffs / two graft-to-aorta joins

Clinical: Assess hemostasis and distal perfusion before closure.
Rehearse: Test at a faculty-validated setting. Locate leakage, stop flow, revise and retest.
Check: Review both joins and outlet flow; a dry seam alone does not establish an unobstructed lumen.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Inspect both anastomoses, identify a focal leak, stop flow, revise and retest. Record tissue handling, posterior-wall apposition, graft alignment, revisions and completion time. **Target:** two intact joins with unobstructed outlet flow at the agreed bench setting. Preserve the original cannula connections throughout.

YOUR REAL BLEED™ SETUP

Photo at left: your original station. Both aortic ends remain attached to the original tubing. A compact synthetic tube replaces a short central segment. The clear tray, dark towel and two external connections stay in place. Use the shortest workable cuffs and graft; no carotid is needed.

WHAT THE MODEL REPRESENTS

The model rehearses two graft-to-aorta joins. It does not reproduce aneurysm wall behavior, lumbar backbleeding, clamp physiology or renal ischemia. Clinical repair retains the opened aneurysm sac for graft coverage. Bench interposition is a simplified skills exercise, not the full operation.

Educational concept for faculty review. AI-generated illustrations are not operative photographs or calibrated drawings. Faculty validate tissue, graft compatibility and test settings; follow the Real Bleed IFU. This workshop addresses open tube-graft anastomoses, not full aneurysm management.

Source: Open AAA Real Bleed™
One page / 17 x 11 in / Open AAA / Version 01

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Open Arteriovenous Fistula Creation for Hemodialysis

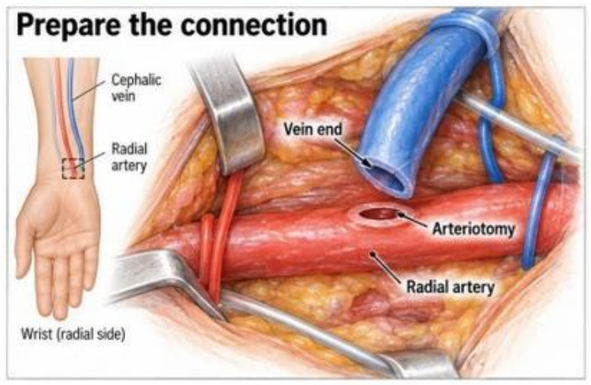
Open vascular surgery | 120-minute faculty-led lab | Radiocephalic fistula connection geometry using tissue surrogates

PREPARE / 15 MIN One connected aorta + one short carotid. Faculty sew the right end into the aorta as a return; leave the left end for the learner. Keep the original two tubing connections. Use minimum workable length and leave room to inspect the join. Pump off while the connection is open.

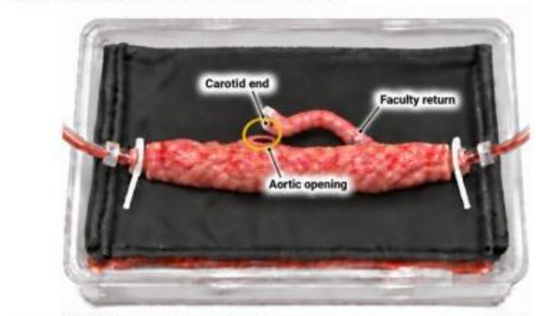
READ THE IMAGES Open wrist anatomy above; bench below. Faculty return is simulation plumbing.

01 Prepare the join

ORIENTATION AND APPOSITION / 20 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

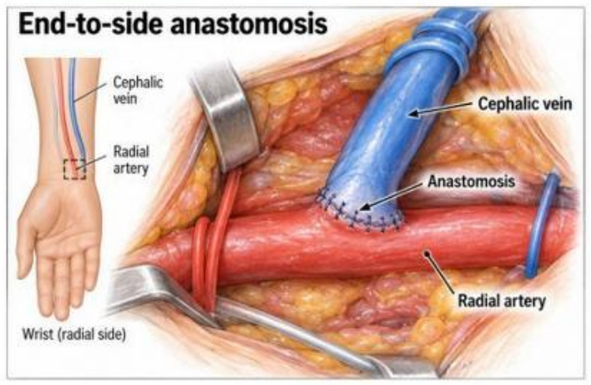


Short tissue / learner join and faculty return

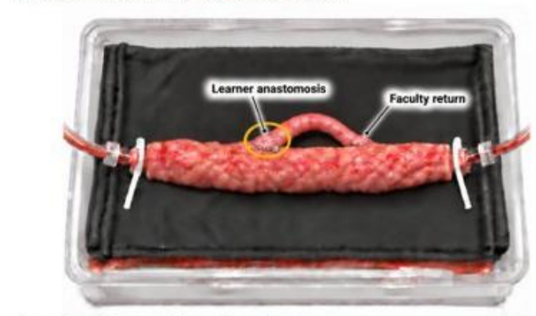
Clinical: Orient the cephalic vein end to the radial artery sidewall in an open exposure.
Rehearse: Align the free carotid end with the aortic opening.
Check: Identify heel and toe; avoid twist or tension. The faculty return remains attached.

02 End-to-side join

VEIN-TO-ARTERY GEOMETRY / 25 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

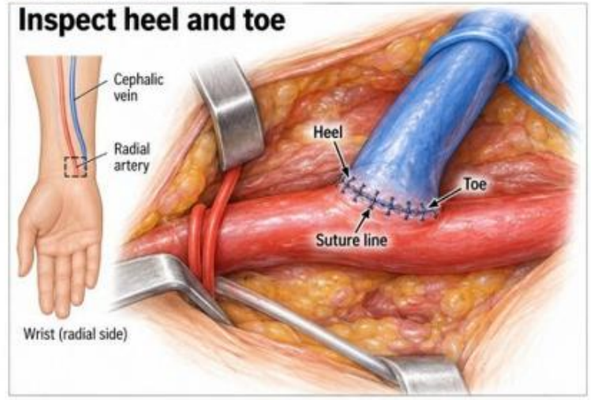


Short tissue / learner join and faculty return

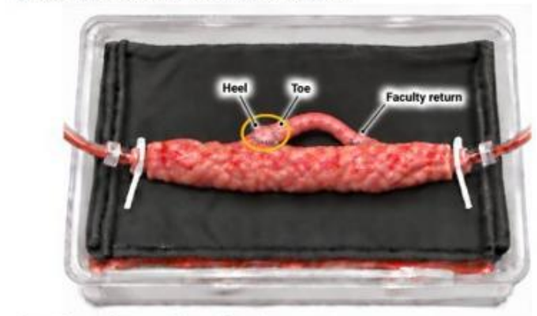
Clinical: Create the surgical fistula anastomosis.
Rehearse: Sew the carotid end to the aortic sidewall, completing the short loop.
Check: Maintain edge apposition, consistent suture spacing and lumen access. Avoid capturing the back wall.

03 Inspect heel and toe

ANASTOMOSIS REVIEW / 25 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

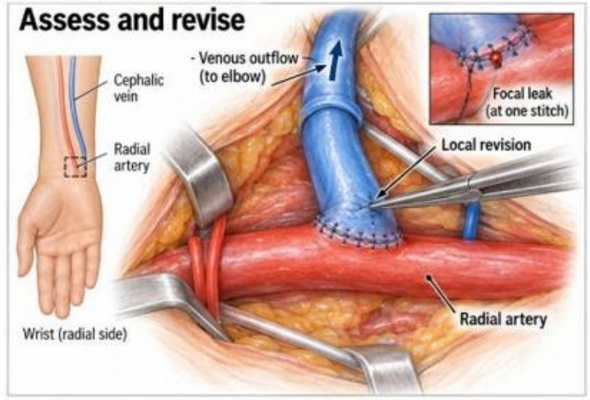


Short tissue / learner join and faculty return

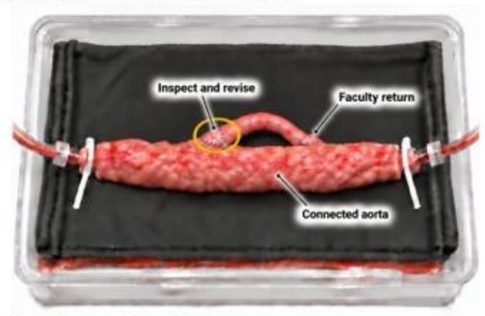
Clinical: Inspect the full anastomotic perimeter and vessel orientation.
Rehearse: Review the learner join, including heel, toe and posterior suture line.
Check: Look for gaps, narrowing, tension and distortion. Correct defects while preserving the connection.

04 Test and revise

LEAK ASSESSMENT / 15 MIN



CONNECTED AORTA / SHORT CAROTID LOOP



Short tissue / learner join and faculty return

Clinical: Assess the fistula and distal hand perfusion.
Rehearse: Test the join at a faculty-validated setting; locate leakage, stop flow, revise and retest.
Check: Loop filling alone does not prove through-flow. The model cannot assess hand perfusion or maturation.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Inspect the complete learner anastomosis, identify a focal leak, stop flow, revise and retest. Record heel and toe alignment, suture quality, revisions and completion time. **Target:** an intact learner join at the agreed bench setting. Assess loop through-flow by a separately validated method; filling alone is insufficient.

YOUR REAL BLEED™ SETUP

Photo at left: your original station. The aorta stays connected at both ends. One short carotid forms the loop: one faculty-prepared return and one learner end-to-side join. The clear tray, dark towel and original two external tubing connections stay in place. No additional conduit is required.

WHAT THE MODEL REPRESENTS

Carotid stands in for vein and aorta for artery at available tissue scale. The return join is bench plumbing; a clinical fistula drains into the venous system. Arterial tissue cannot reproduce venous wall behavior. The model does not simulate fistula maturation, clinical thrill, steal or dialysis performance.

Educational concept for faculty review. AI-generated illustrations are not operative photographs or calibrated drawings. Faculty validate tissue, anastomosis geometry and test settings; follow the Real Bleed™ IFU. This workshop teaches an open surgical join, not complete access planning, patient selection or postoperative care.

Sources: SVS access Real Bleed™
One page / 17 x 11 in / Open AVF / Version 01

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Open Brachial Artery Injury Repair

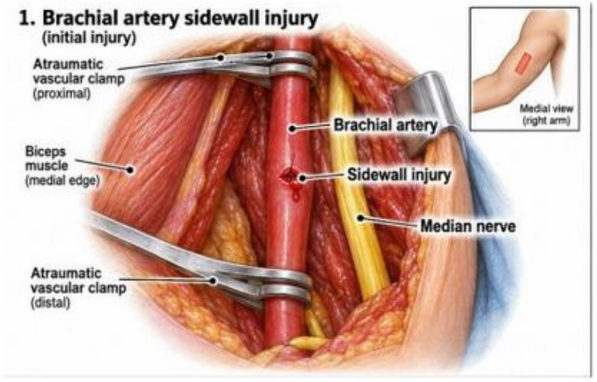
Open trauma surgery | 120-minute faculty-led lab | Sidewall and end-to-end repair on one short carotid loop

PREPARE / 15 MIN One connected aorta + one short carotid. Faculty attach both carotid ends to the aortic sidewall, forming a compact loop with room for two repairs and local control. Retain the original two external tubes. Validate loop flow before the lab; keep the pump off for open-vessel work.

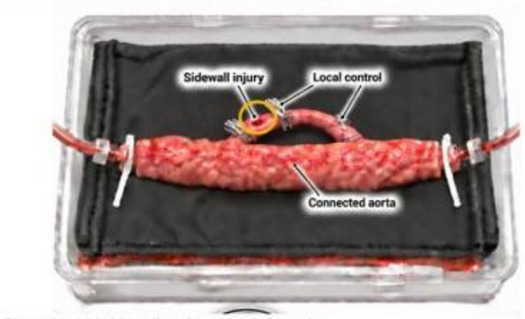
READ THE IMAGES Open arm anatomy above; bench below. Step 3 adds a separate training injury.

01 Control bleeding

SIDEWALL INJURY / 20 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

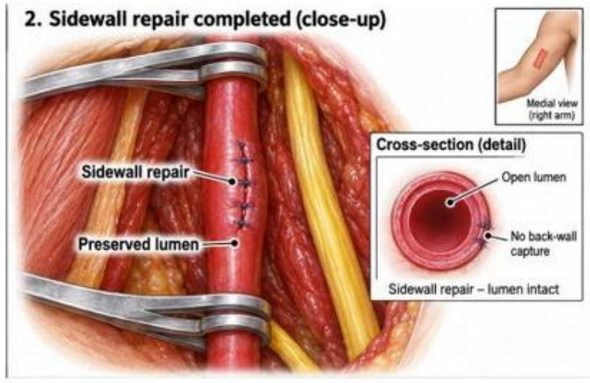


Short tissue / sidewall and end-to-end repair

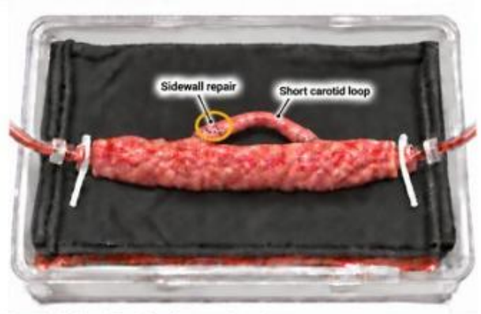
Clinical: Expose the injured artery, protect the adjacent median nerve and establish vascular control.
Rehearse: Control a small carotid sidewall injury.
Check: Handle tissue gently; isolate the training site without disturbing either loop attachment.

02 Repair sidewall

PRIMARY REPAIR / 25 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

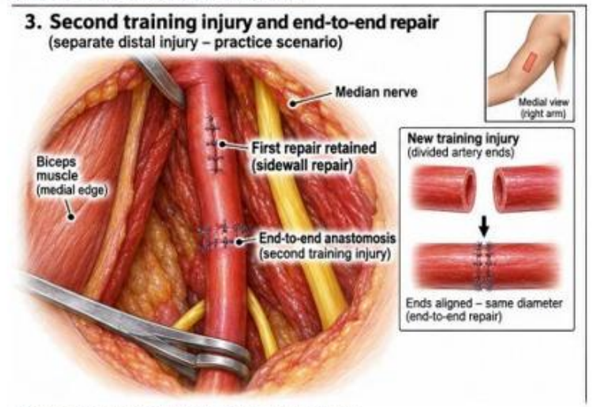


Short tissue / sidewall and end-to-end repair

Clinical: Close a suitable small arterial defect without narrowing the lumen.
Rehearse: Repair the sidewall injury on the short carotid loop.
Check: Inspect edge apposition, stitch spacing and lumen preservation. Avoid capturing the opposite wall.

03 End-to-end join

SECOND TRAINING INJURY / 25 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

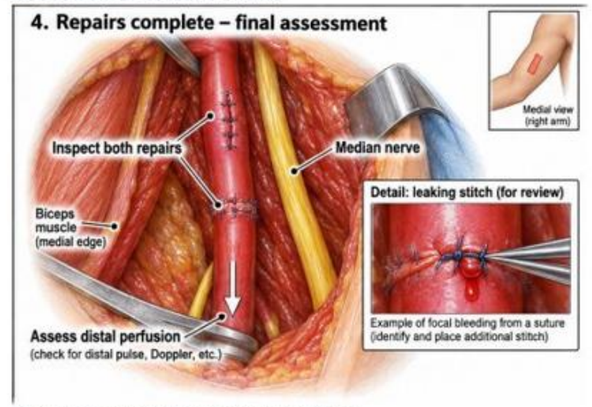


Short tissue / sidewall and end-to-end repair

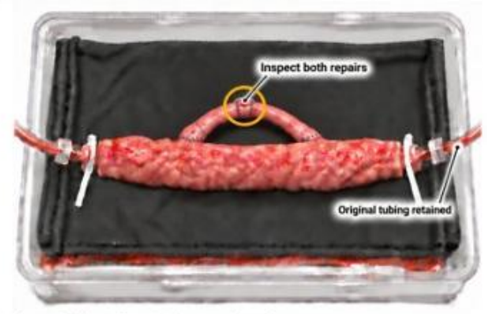
Clinical: A suitable transection may permit a tension-free end-to-end repair.
Rehearse: With flow off, divide a separate site at the loop apex and rejoin it; retain the first repair.
Check: Align the ends without twist or tension. Inspect the posterior suture line.

04 Test and revise

ASSESS BOTH REPAIRS / 15 MIN

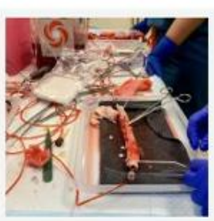


CONNECTED AORTA / SHORT CAROTID LOOP



Short tissue / sidewall and end-to-end repair

Clinical: Assess hemostasis and distal limb perfusion.
Rehearse: Test both repairs at a faculty-validated setting. Stop flow before revision, then retest.
Check: Inspect for leaks and narrowing. Main-aorta flow or loop filling alone does not prove loop through-flow.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Inspect the sidewall repair and the separate end-to-end join. Identify a focal leak, stop flow, revise and retest. Record tissue handling, apposition, alignment, revisions and completion time. **Target:** two intact repairs at the agreed bench setting, with loop through-flow assessed by a separately validated method.

YOUR REAL BLEED™ SETUP

Photo at left: your original station. The aorta remains cannulated at both ends. One short carotid forms a loop with two faculty-prepared end-to-side attachments. Learners perform two repairs on the loop body. Retain the clear tray, dark towel and original two external tubes; no additional graft is required.

WHAT THE MODEL REPRESENTS

Carotid represents the injured brachial artery at available tissue scale. Its attachments to the aorta are simulation plumbing. The second injury adds practice; it is not a routine clinical step. The model does not reproduce nerve injury, fracture stabilization, distal limb perfusion or compartment syndrome.

Educational concept for faculty review. AI-generated illustrations are not operative photographs or calibrated drawings. Faculty validate tissue, repair suitability and test settings; follow the Real Bleed IFU. This is an open vascular repair skills lab, not complete limb-trauma management.

Source: AO Trauma Real Bleed™
One page / 17 x 11 in / Brachial repair / V01

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Portal Vein Reconstruction

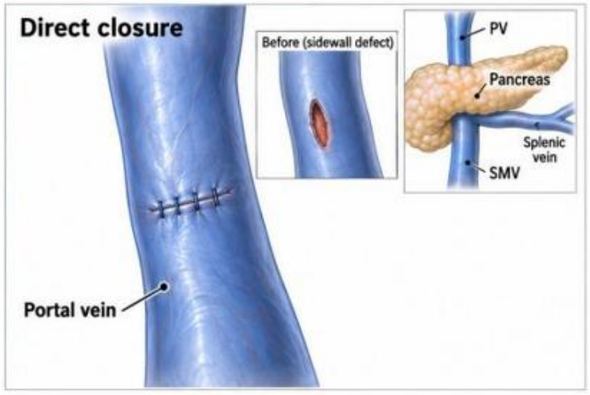
During pancreatic surgery | 120-minute faculty-led lab | Three repairs on one connected aorta

PREPARE / 15 MIN One compact aortic segment + a small tissue patch from a suitable offcut. Reserve three separate working sites: left direct closure, right patch, central end-to-end join. Leave clamp access and tubing slack. Keep both cannulas attached; stop flow during open-vessel work.

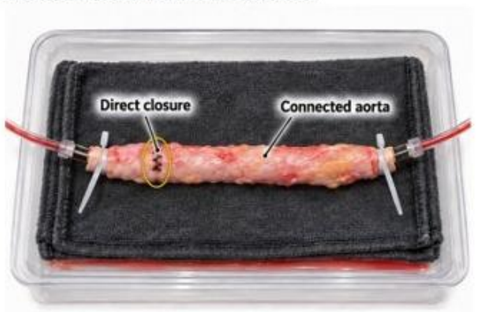
READ THE IMAGES Clinical repair options above; cumulative bench exercises below. PV = portal vein; SMV = superior mesenteric vein.

01 Direct closure

SMALL SIDEWALL DEFECT / 20 MIN



ONE CONNECTED AORTA / THREE REPAIR SITES

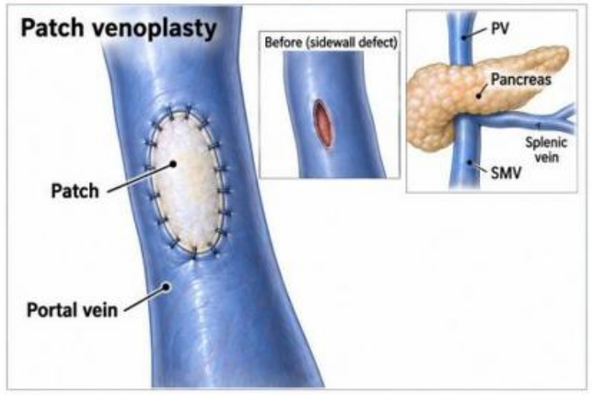


Compact working sites / previous repairs retained

Clinical: Direct repair after limited tangential vein resection.
Rehearse: Close a small left-side defect on the connected aorta. Faculty select a closure that preserves the lumen.
Check: Inspect edge alignment, narrowing and leakage before the next exercise.

02 Patch repair

SIDEWALL RECONSTRUCTION / 25 MIN



ONE CONNECTED AORTA / THREE REPAIR SITES

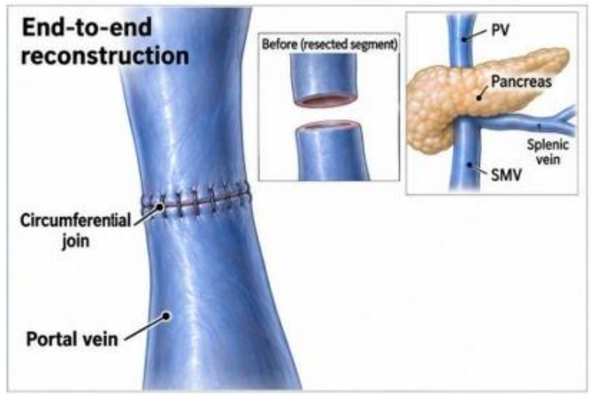


Compact working sites / previous repairs retained

Clinical: Patch venoplasty for a larger sidewall defect.
Rehearse: Fit a small tissue patch to a separate right-side defect. Preserve the first repair.
Check: Inspect the full patch margin, corner apposition and lumen contour.

03 End-to-end join

SHORT SEGMENT RESECTION / 25 MIN



ONE CONNECTED AORTA / THREE REPAIR SITES

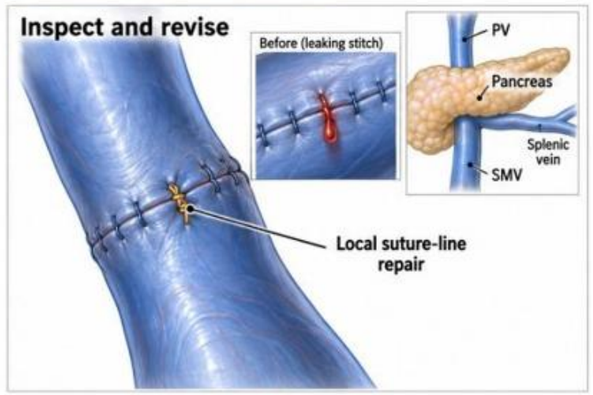


Compact working sites / previous repairs retained

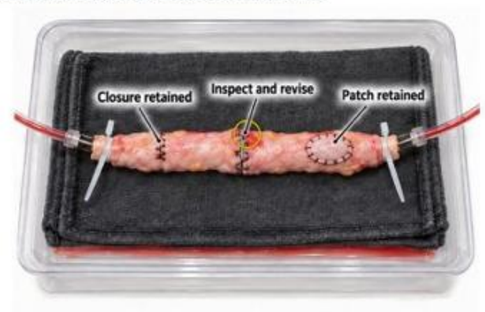
Clinical: Primary reconstruction after short segmental vein resection.
Rehearse: Remove a minimal central segment and reconnect the ends. Keep both earlier repairs intact.
Check: Use available slack for a tension-free join; inspect the posterior wall and lumen.

04 Inspect and revise

THREE-SITE FLOW ASSESSMENT / 15 MIN



ONE CONNECTED AORTA / THREE REPAIR SITES



Compact working sites / previous repairs retained

Clinical: Assess completed reconstruction and address focal leakage.
Rehearse: Test all three sites with simulated flow. Stop flow, revise a local leak and retest.
Check: Inspect each seam and downstream flow. A leak-free seam alone does not prove patency.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Reassess the direct closure, patch margin and central end-to-end join. Identify a focal leak, stop flow, repair and retest. Record repair quality, revisions and completion time. **Target:** all three sites intact at the faculty-selected setting, with downstream flow assessed using a validated bench method.

YOUR REAL BLEED™ SETUP

Photo at left: your original station. One aorta stays cannulated throughout. A small patch adds a second repair; the central join adds a third. Use only the tissue length needed for separate sites, clamp access and tension-free approximation. Tubing must allow the ends to move together.

WHAT THE MODEL REPRESENTS

Aortic tissue stands in for the portal vein; wall behavior and flow differ. These are separate clinical repair options combined on one bench model for practice, not three routine repairs in one patient. Clinical choice depends on the defect and anatomy. This lab excludes pancreatic resection and tumor decisions.

Educational concept for faculty review. Clinical and bench illustrations are AI-generated, not operative photographs or calibrated drawings. Follow the Real Bleed IFU; faculty must validate the bench setup and choose suitable tissue, defect sizes and flow settings. The aorta models local reconstruction geometry, not portal venous physiology.

Sources: PV reconstruction Real Bleed™
One page / 17 x 11 in / Portal Vein / Version 01

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Pulmonary Artery Injury Repair During Lung Resection

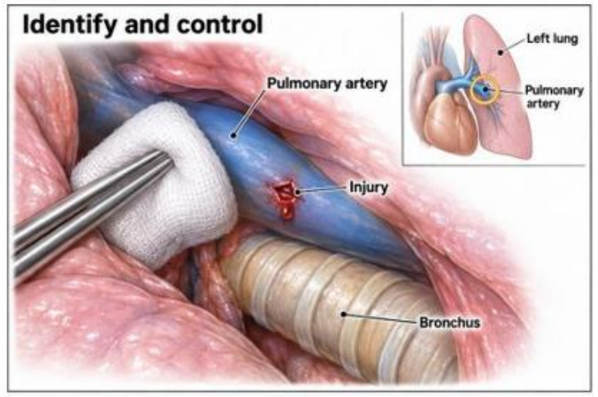
Thoracic surgery | 120-minute faculty-led lab | Direct repair and patch reconstruction on one short carotid loop

PREPARE / 15 MIN One connected aorta + one short carotid loop + a small tissue patch from a suitable offcut. Faculty sew both loop ends end-to-side into the aorta. Retain the original two tubing connections. Reserve separate direct-repair and patch sites; stop flow during open-vessel work.

READ THE IMAGES Clinical repair options above; cumulative practice on the connected model below.

01 Identify and control

INJURY RECOGNITION / 20 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

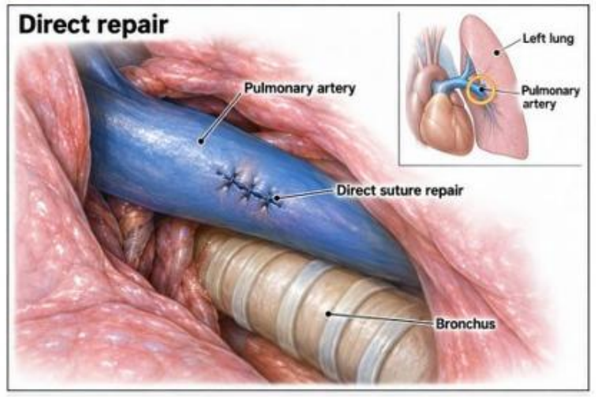


Compact working sites / previous repairs retained

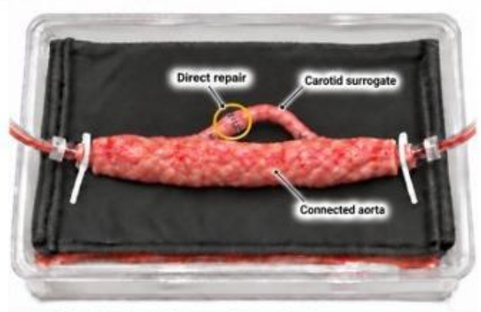
Clinical: Recognize pulmonary artery injury and establish temporary control and visibility.
Rehearse: Locate a small loop sidewall injury and practice gentle local compression.
Check: Communicate the bleeding site and escalation plan. Preserve both aortic connections.

02 Direct repair

SMALL SIDEWALL DEFECT / 25 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

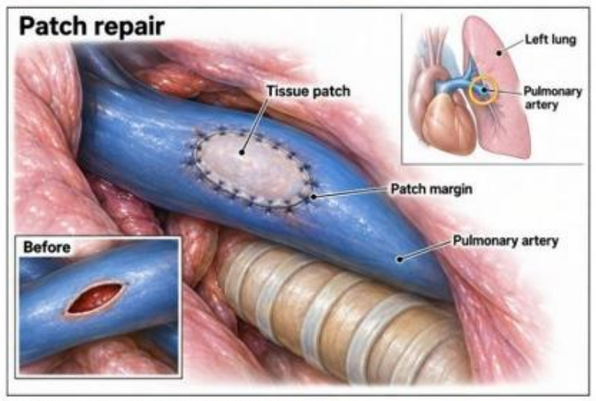


Compact working sites / previous repairs retained

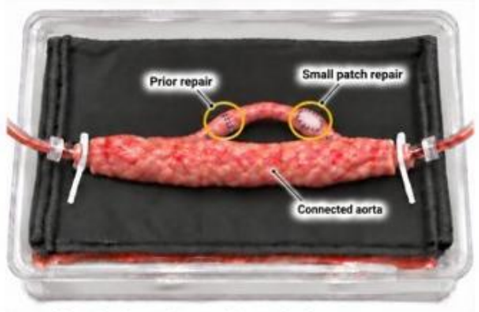
Clinical: Direct suture repair of a suitable limited defect.
Rehearse: Close the small left-side loop injury while retaining a separate right-side working site.
Check: Inspect edge apposition, tissue handling and lumen narrowing before the patch exercise.

03 Patch repair

LOCAL PATCH RECONSTRUCTION / 25 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

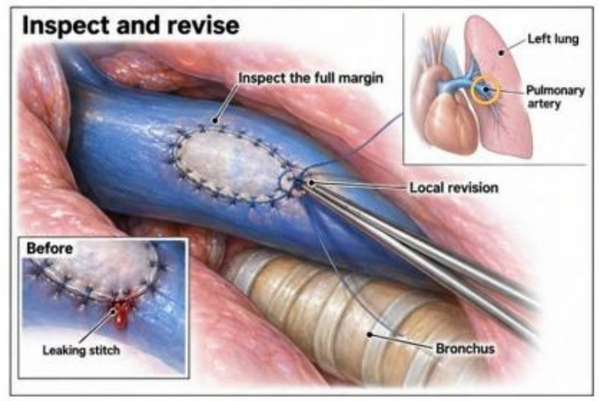


Compact working sites / previous repairs retained

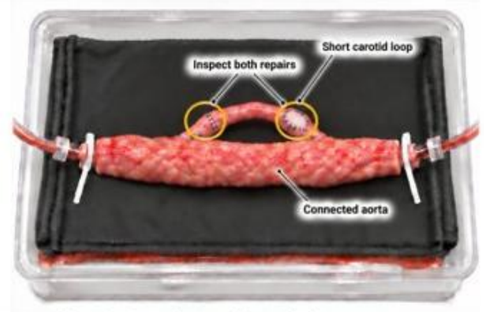
Clinical: Patch reconstruction for a selected larger sidewall defect.
Rehearse: Fit a small tissue patch into a separate right-side loop defect. Retain the direct repair.
Check: Inspect the full patch margin, corner apposition and vessel contour without bulky oversizing.

04 Inspect and revise

TWO-REPAIR LEAK ASSESSMENT / 15 MIN



CONNECTED AORTA / SHORT CAROTID LOOP



Compact working sites / previous repairs retained

Clinical: Reassess the completed vascular repair.
Rehearse: Test both sites at a faculty-validated setting. Locate leakage, stop flow, revise and retest.
Check: Inspect both suture lines and the lumen. Loop filling alone does not establish through-flow.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Reassess the direct closure and the entire patch margin. Identify a focal leak, stop flow, repair and retest. Record tissue handling, suture quality, revisions and completion time. **Target:** both repairs intact at the agreed bench setting. Use a separately validated assessment for loop through-flow; filling or main-aorta flow alone is insufficient.

YOUR REAL BLEED™ SETUP

Photo at left: your original station. One short carotid loop provides two repair sites; faculty prepare both aortic attachments. A small tissue offcut supplies the patch. The main aorta remains connected at both ends, with the same tray and original two external tubing connections.

WHAT THE MODEL REPRESENTS

Carotid models a pulmonary artery branch for suturing geometry. Its wall and the bench circuit do not reproduce the thin pulmonary artery or pulmonary circulation. Direct repair and patching are clinical options combined here for practice. This model does not reproduce thoracic access or lung re-expansion.

Educational concept for faculty review. AI-generated illustrations are not operative photographs or calibrated drawings. Faculty validate tissue, patch fit and test settings; follow the Real Bleed™ IFU. This focused suturing lab does not replace training in hemorrhage resuscitation, escalation or conversion to open surgery.

Sources: PA repair Patch Real Bleed™
One page / 17 x 11 in / Thoracic / Version 01

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Ureteral Injury Repair and Reconstruction

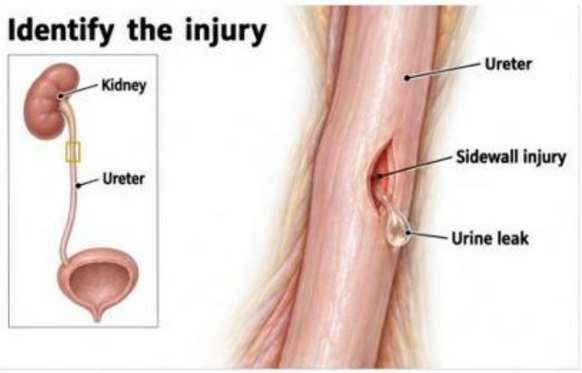
Urology | 120-minute faculty-led lab | Selected proximal / mid-ureter repair concepts using a carotid surrogate

PREPARE / 15 MIN One connected aorta + one short, narrow carotid loop, with both ends sewn end-to-side into the aorta. Preserve the original two tubing connections. Faculty select a removable internal training stent and two separate working sites. Stop flow during open-tissue work.

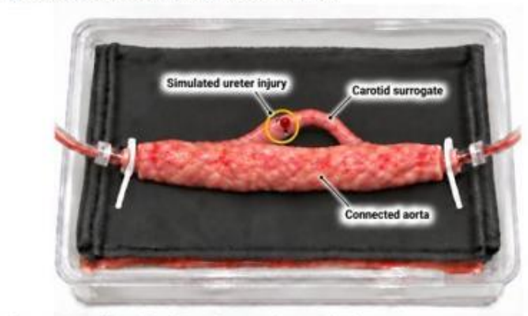
READ THE IMAGES Blue stents are shown through illustrative cutaways, not additional incisions.

01 Identify the injury

LOCATION AND TISSUE / 20 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

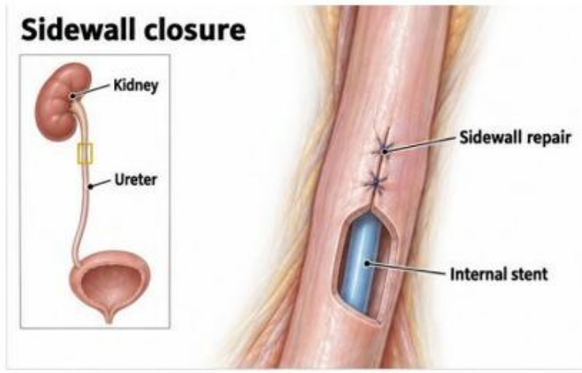


Compact working sites / previous repairs retained

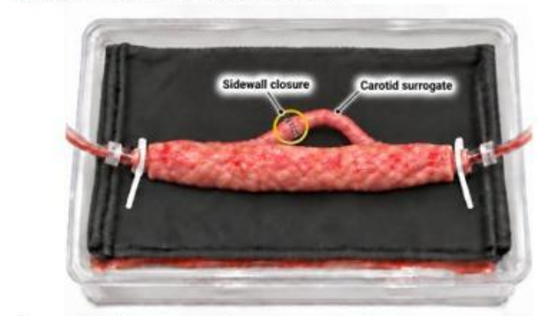
Clinical: Assess injury location, extent and tissue viability.
Rehearse: Identify a small sidewall opening on the carotid loop and observe simulated leakage.
Check: Map the two working sites. The loop represents a ureter; the aorta supplies test fluid.

02 Sidewall closure

PARTIAL-INJURY REPAIR DRILL / 25 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

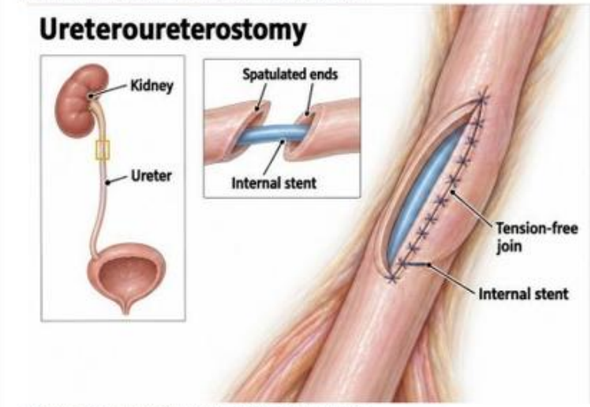


Compact working sites / previous repairs retained

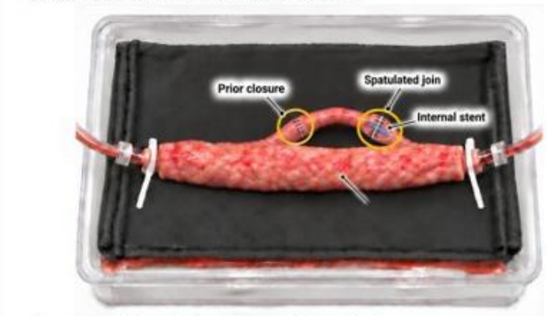
Clinical: Review selected partial-injury repair and drainage options.
Rehearse: Close the small loop sidewall defect with the faculty-selected technique.
Check: Inspect edge alignment and lumen narrowing. Discuss internal stenting; treatment depends on injury type.

03 Spatulated join

END-TO-END RECONSTRUCTION / 25 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

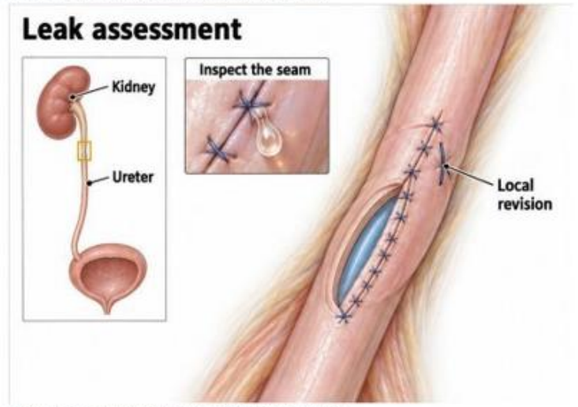


Compact working sites / previous repairs retained

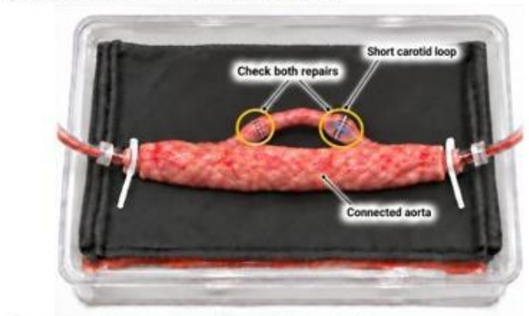
Clinical: Selected proximal or mid-ureter reconstruction over a stent.
Rehearse: Divide a separate loop site, spatulate the ends and join over a removable training stent.
Check: Preserve the first repair; avoid tension, twist and catching the stent in a stitch.

04 Test and revise

TWO-SITE LEAK ASSESSMENT / 15 MIN



CONNECTED AORTA / SHORT CAROTID LOOP



Compact working sites / previous repairs retained

Clinical: Assess the repair and urinary drainage plan.
Rehearse: Test both sites at a faculty-validated setting. Locate leakage, stop flow, revise and retest.
Check: Loop filling alone does not prove patency. Account for and remove the training stent after the exercise.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Inspect the sidewall closure and spatulated join. Find a local leak, stop flow, repair and retest. Record tissue handling, alignment, stent handling and revisions. **Target:** both repairs intact at the agreed bench setting. Assess lumen integrity separately; a leak-free, fluid-filled loop does not prove urinary drainage or healing.

YOUR REAL BLEED™ SETUP

Photo at left: your original station. One short carotid loop supplies two repair sites while the aorta stays connected at both ends. Faculty prepare the two loop attachments. The small training stent stays inside the lumen. The original tray and two external tubing connections are retained.

WHAT THE MODEL REPRESENTS

Carotid represents ureter for suturing practice; it lacks ureteral wall behavior and peristalsis. Test fluid represents urinary leakage, not ureteral blood flow. The loop is a bench circuit, not urinary anatomy. Distal injuries may require bladder reimplantation; this lab focuses on selected primary repair concepts.

Educational concept for faculty review. AI-generated illustrations are schematic, not operative photos or calibrated drawings. Cutaways expose internal stents for teaching only. Faculty validate tissue, stent fit and test settings; follow the Real Bleed IFU. This is a suturing lab, not a complete ureteral injury management protocol.

Sources: AUA Urotrauma Real Bleed™

One page / 17 x 11 in / Ureter / Version 01

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Uterine Artery Injury Repair During Hysterectomy

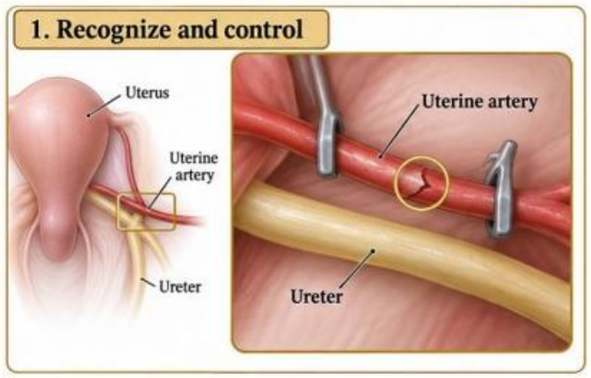
Gynecology | 120-minute faculty-led lab | Advanced vessel-preserving suturing drills; not routine hysterectomy management

PREPARE / 15 MIN One connected aorta + one short, narrow carotid loop. Faculty sew both carotid ends end-to-side into the aorta. Keep the original two aortic tubing connections. Add a yellow cord as a ureter-position marker. Reserve two separate repair sites; stop flow during open-vessel work.

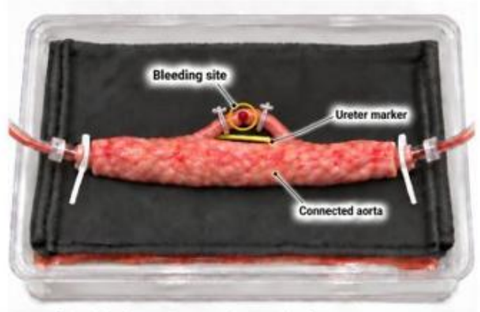
READ THE IMAGES Pelvic anatomy and repair concepts above; tissue-surrogate practice below.

01 Identify and control

BLEEDING AND ANATOMY / 20 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

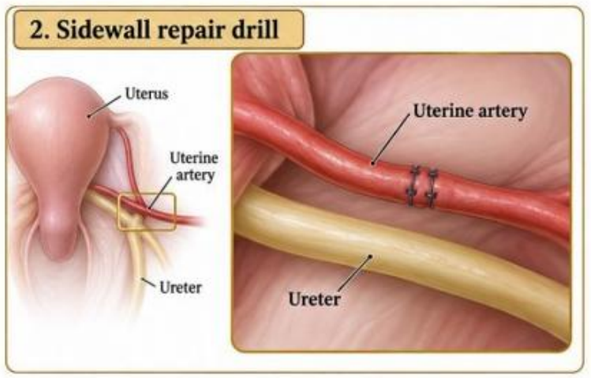


Compact working sites / previous repairs retained

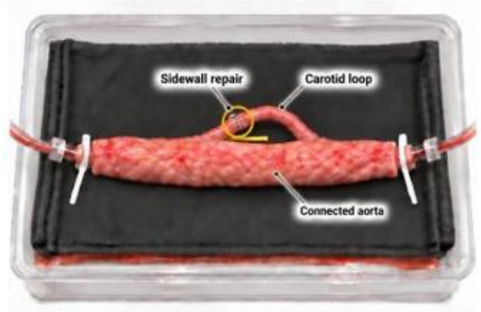
Recognize: The uterine artery crosses above the ureter near the cervix.
Rehearse: Identify a small carotid sidewall injury and control simulated bleeding.
Check: Keep the ureter marker separate from clamps and sutures. Both aortic connections stay attached.

02 Sidewall repair

LOCAL REPAIR DRILL / 25 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

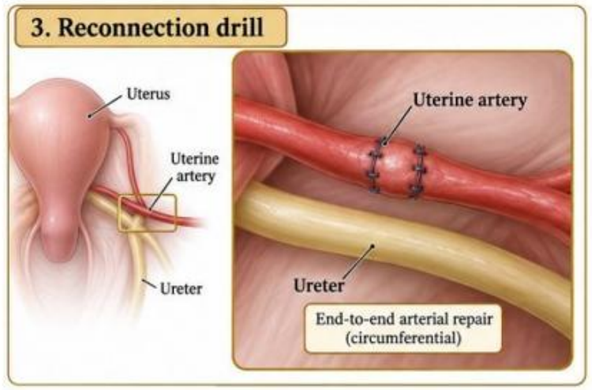


Compact working sites / previous repairs retained

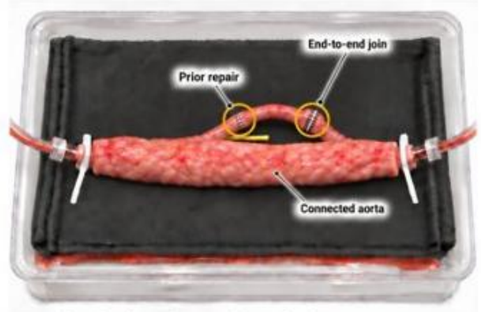
Practice: Vessel-preserving suturing on the short carotid loop.
Rehearse: Close the small sidewall injury, leaving a separate distal working site.
Check: Inspect apposition and lumen narrowing. This is a repair drill, not routine uterine pedicle management.

03 End-to-end join

RECONNECTION DRILL / 25 MIN



CONNECTED AORTA / SHORT CAROTID LOOP

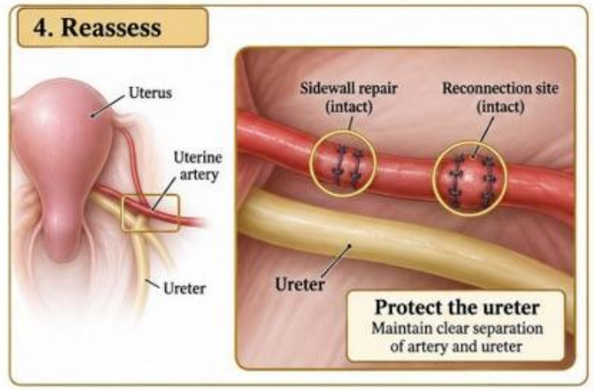


Compact working sites / previous repairs retained

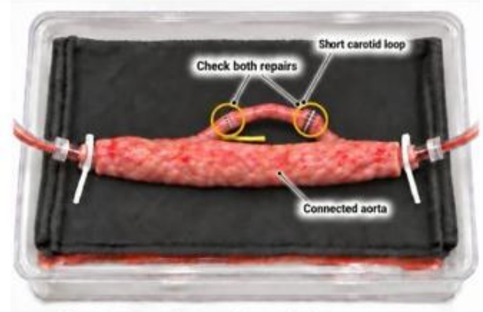
Practice: Alignment and circumferential suturing of a small vessel.
Rehearse: Divide and reconnect the loop at the distal working site, retaining the sidewall repair.
Check: Avoid twist, tension and back-wall capture. Keep tissue use to the minimum workable length.

04 Flow and reassess

TWO-REPAIR ASSESSMENT / 15 MIN



CONNECTED AORTA / SHORT CAROTID LOOP



Compact working sites / previous repairs retained

Practice: Assess both completed repairs.
Rehearse: Restore test flow at the validated bench setting; inspect both loop repairs for leakage.
Check: Stop flow before revision and retest. Loop filling alone does not establish through-flow.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Inspect the sidewall repair and end-to-end join. Identify leakage, stop flow, revise and retest. Record handling, suture quality and completion time. **Target:** two intact learner repairs at the agreed setting, with the ureter marker untouched. Aorta flow or loop filling alone does not prove loop through-flow; use a faculty-validated assessment.

YOUR REAL BLEED™ SETUP

Photo at left: your original station. The aorta stays connected at both ends. One short carotid loop provides two repair sites; faculty prepare both end-to-side aortic attachments. The yellow cord marks ureter proximity. The tray and original two tubing connections stay in place.

WHAT THE MODEL REPRESENTS

During hysterectomy, uterine vessels are generally secured and divided. Reconnection here is an advanced simulation exercise, not a routine clinical step. Carotid models the small artery; aorta supplies test fluid. The cord marks proximity only and cannot simulate ureteral injury or pelvic dissection.

Educational concept for faculty review. AI-generated schematic illustrations are not operative photographs or calibrated drawings. Faculty must validate the circuit, tissue selection and test settings. Follow the Real Bleed™ IFU. This is a focused vascular skills lab, not a complete hysterectomy or hemorrhage-management protocol.

Sources: GYN anatomy Real Bleed™
One page / 17 x 11 in / GYN / Version 02

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REAL BLEED™ ADVANCED SUTURING WORKSHOP

Vascular Injury Repair

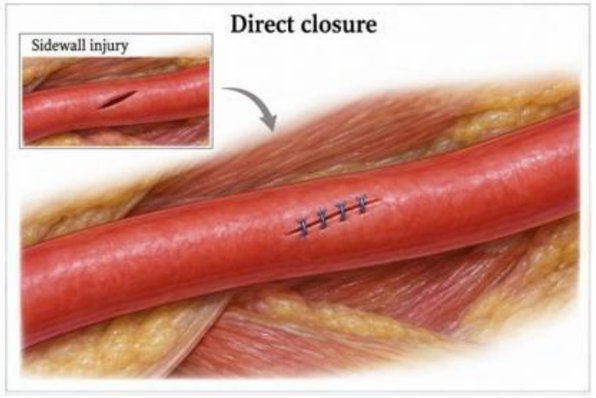
Trauma surgery: direct repair, patch, end-to-end and interposition | 135-minute faculty-led lab | Experienced residents, fellows and surgeons

PREPARE / 15 MIN One connected aorta + two short carotid loops + small patch + short ePTFE segment. Faculty attach both loops before the lab; one carotid specimen may supply both. Keep room for clamps and sutures. Create each defect only at its step. Pump off for open suturing.

READ THE IMAGES Clinical injury and repair above; completed bench stage below. All earlier repairs remain in place.

01 Direct closure

SIDEWALL REPAIR / 20 MIN



ONE CONNECTED AORTA / CUMULATIVE REPAIRS

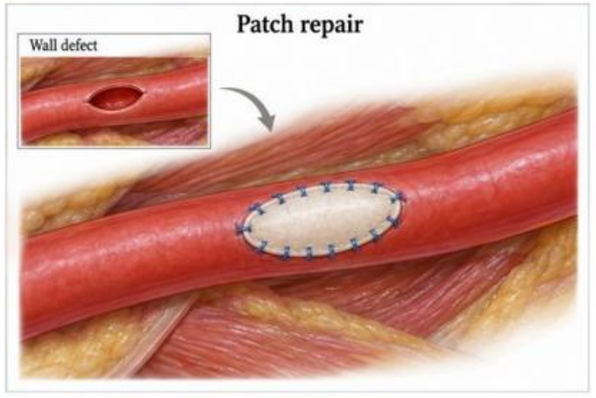


Small defects / short segments / earlier repairs retained

Repair: Close a limited arterial sidewall injury.
Rehearse: Repair a small faculty-created defect on the left aortic wall. Preserve both attached loops.
Check: Assess lumen narrowing and edge apposition. Stop flow before suturing or revision.

02 Patch repair

PRESERVE LUMEN CALIBER / 25 MIN



ONE CONNECTED AORTA / CUMULATIVE REPAIRS

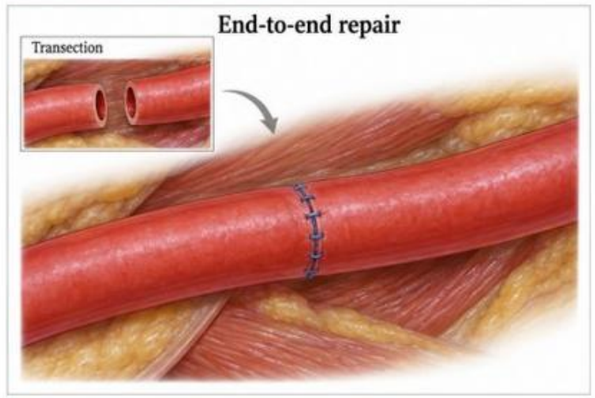


Small defects / short segments / earlier repairs retained

Repair: Reconstruct a larger sidewall defect.
Rehearse: Fit a small vascular patch to a separate right aortic site; retain the direct repair.
Check: Inspect patch corners and perimeter. Size the patch to the defect, using minimal material.

03 End-to-end repair

SHORT CAROTID LOOP / 25 MIN



ONE CONNECTED AORTA / CUMULATIVE REPAIRS

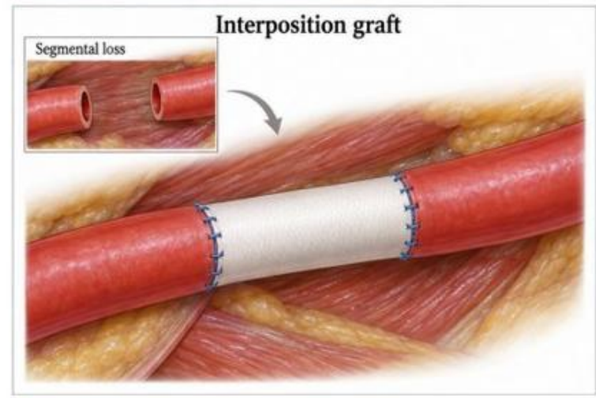


Small defects / short segments / earlier repairs retained

Repair: Rejoin a transected vessel.
Rehearse: Divide the upper carotid loop and reunite its ends. Keep both aortic repairs intact.
Check: Confirm orientation, lumen and a tension-free join. Use only a loop with adequate working slack.

04 Interposition graft

TWO SYNTHETIC-TO-TISSUE JOINS / 30 MIN



ONE CONNECTED AORTA / CUMULATIVE REPAIRS



Small defects / short segments / earlier repairs retained

Repair: Bridge a short segmental vessel loss.
Rehearse: Replace a small section of the lower loop with caliber-matched ePTFE; sew both ends.
Check: Preserve tissue cuffs for clamps and sutures. All five learner suture sites remain for testing.



05 FLOW. FIND. REPAIR.

FINAL CHALLENGE / 20 MIN

Locate leakage, control flow, repair and retest. Compare the direct closure, patch, tissue seam and two graft seams. Record leak sites, revisions and completion time. **Target:** five intact learner suture sites without visible leakage at the agreed setting. Filling alone does not prove loop through-flow; use a bench-validated test.

YOUR REAL BLEED™ SETUP

Photo at left: your original station. Both aortic cannulas stay attached. Two small wall sites and two short carotid loops provide four exercises. Preserve each repair. Cut loops from one carotid when length permits; use only enough patch and graft for workable joins.

WHAT THE MODEL REPRESENTS

Four injury-repair patterns on one training station, not a clinical sequence. Faculty prepare four loop attachment joins; learners create five repair sites. The aorta is a large-vessel surrogate. This bench model does not reproduce wound exposure, tissue viability or limb perfusion.

Educational concept for faculty review. Clinical and bench illustrations are AI-generated from anatomical descriptions and your equipment photographs; not operative photos. Follow Real Bleed™ and graft IFUs. Proposed bench setup requires validation. Synthetic graft use here is for skills practice, not a patient-specific conduit recommendation.

Sources: Vascular trauma Real Bleed™
One page / 17 × 11 in / Vascular Injury Repair / Version 01

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