Thoracofemoral Bypass

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Indications

- Presence of an abdominal stoma
- Radiation therapy
- Aortic occlusion
- Symptomatic (disabling claudication, rest pain, ulceration, gangrene, or limb salvage) lower-extremity occlusive disease
- Revascularize lower extremities where standard aortofemoral bypass grafts cannot be used due to severe patient comorbidities chronic obstructive pulmonary disease, stomas, or hostile abdomen.
- Revascularize lower extremities before or after removal of infected aortic grafts.
- Revascularize lower extremities after exclusion of infrarenal aortic aneurysm.

Essential Steps

1. Place a double-lumen endotracheal tube.
2. Position the patient on a beanbag with shoulders at a 45° angle and the pelvis as flat as possible.
3. Perform an incision at the level of the sixth intercostal space.
4. Deepen the incision, switch to single-lung ventilation, and enter the pleural cavity.
5. Transect the pulmonary ligament, and free the lung.
6. The descending aorta below the level of the pulmonary vein was selected for an inflow. Dissect a segment of the descending aorta below the pulmonary vein, and encircle it with umbilical tape.
7. Perform bilateral vertical groin incisions overlying each common femoral artery.
8. Dissect the common femoral, and if necessary superficial femoral, and profunda femoris arteries on both sides.
9. Create a small left flank retroperitoneal incision lateral to the rectus. A lateral retroperitoneal tunnel is created with a tunneler from the chest to the left groin through the diaphragm.
10. Create a retroperitoneal tunnel to the left groin. A tunnel is created to the right groin from the left retroperitoneal space traversing the abdominal musculature to the subcutaneous plane. Tunnels are marked with umbilical tape.
11. Anticoagulate with 75–100 U/kg of intravenous heparin.
12. Clamp the thoracic aorta using a side-biting or proximal and distal clamps.
13. Create an incision in the aorta, and construct the proximal anastomosis using an appropriately sized bifurcated PTFE or Dacron graft.

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14. Place a Fogarty graft clamp on the distal graft, and slowly remove the aortic clamps.
15. Pass the graft through the retroperitoneal tunnel, avoiding any twists.
16. Construct the left femoral anastomosis.
17. Construct the right femoral anastomosis.
18. Reevaluate hemostasis in all anastomoses.
19. Assess the distal vessels by both palpation and Doppler exam.
20. Place a left chest tube and close left thoracotomy.
21. Close groin incisions.

Note These Variations

- *A unilateral aorto-left femoral bypass with a femorofemoral crossover bypass can be used as described in the template dictation. Alternatively, a bifurcated graft may be used as described in the essential steps. The latter will require an additional small left retroperitoneal exposure to ensure adequate retropubic tunneling, to the right groin. It will also require one less anastomosis.*
- When constructing the proximal anastomosis, a side-biting clamp is often used to control the descending thoracic aorta yet maintain distal flow into the visceral vessels. On occasion, proximal and distal control with separate clamps may be necessary.

Complications

- Graft infection
- Ureter injury
- Bleeding
- Distal embolization
- Renal failure
- Mesenteric infarction
- Myocardial infarction

Template Operative Dictation

Preoperative Diagnosis Bilateral lower-limb ischemia

Procedure Thoracofemoral bypass

Postoperative Diagnosis Same

Indications The patient is a ___-year-old *male/female* with bilateral symptomatic lower-extremity occlusive disease (disabling claudication, rest pain, ulceration, gangrene, or limb salvage). *The patient has had multiple failed previous aortic revascularization/hostile abdomen abdominal stoma/radiation therapy/aortic occlusion/infected aortic grafts.*

Description of Procedure The patient was placed in the supine position on a beanbag. Time-outs were performed using both preinduction and pre-incision safety checklist to verify correct patient, procedure, site, and additional critical information prior to beginning the procedure. The patient was connected to general anesthesia-monitoring equipment and induced with general endotracheal anesthesia. An arterial line and pulmonary artery catheter were placed. A Foley catheter was placed. A double-lumen endotracheal tube was placed.

After intubation, the patient was positioned on a beanbag with shoulders at a 45° angle toward the patient's right side. The left arm was supported on a sling anteriorly and superiorly. The pelvis was as flat as possible.

An incision was performed with a scalpel in the left chest at the level of the sixth intercostal space. The incision was taken down through the subcutaneous tissue as well as the intercostal muscles with electrocautery. Single-lung ventilation was introduced with deflation of the left lung. The pleural cavity was incised, with care taken to avoid injury to the underlying lung. A rib retractor was utilized for exposure. The lung was freed at the inferior aspect by transecting the pulmonary ligament with electrocautery.

The left lung was retracted cephalad.

The descending aorta below the level of the pulmonary vein was selected for an inflow site. The aorta was dissected from surrounding tissue and encircled with umbilical tape for proximal and distal control.

A linear vertical groin skin incision was performed overlying each common femoral artery with a scalpel. This incision was taken down through the subcutaneous tissue and the femoral sheath with electrocautery. The common femoral, superficial femoral, and profunda femoris arteries were identified and dissected from surrounding tissue. Proximal distal control was obtained with vessel loops.

A retroperitoneal tunnel was created through the diaphragm and retroperitoneum extending into the groin incision with a tunneler. In addition, a subcutaneous tunnel was performed between each groin incision with the tunneler. Appropriately sized PTFE was selected and passed through the retroperitoneal tunnel. A second PTFE graft was placed through the subcutaneous tunnel between the groin incisions. Care was taken to ensure that no twisting of the grafts occurred. The patient was heparinized with 100 U/kg of intravenous heparin.

An aortic clamp was placed on the encircled thoracic aorta proximally. A second aortic clamp was placed on the thoracic aorta distally. A linear aortotomy was performed with a scalpel between the clamps. The arteriotomy was enlarged with Potts scissors or curved Metzenbaum scissors.

The proximal PTFE graft was beveled, and an end-to-side anastomosis was performed with a *running/continuous* 3-0 monofilament nonabsorbable suture, beginning at the inferior heel of the graft. The running suture was carried up each side of the arteriotomy and completed in the middle of the arteriotomy on the operator's side. Prior to completion of the anastomosis, the aorta was back-bled proximally and distally. The aorta was then flushed with heparinized saline. The anastomosis was completed.

A Fogarty graft clamp was placed on the distal graft after it was flushed with heparinized saline. Aortic clamps were slowly removed in the usual sequence to prevent hypotension and distal embolization. All excess graft was pulled through the retroperitoneal tunnel.

Attention was now focused on the distal anastomosis. Vascular clamps were placed on the ipsilateral common femoral, superficial femoral, and profunda femoral vessels. A longitudinal arteriotomy was performed in the common femoral with a scalpel. The arteriotomy was extended with Potts scissors. The graft was cut to appropriate length and beveled in the usual manner. The graft was anastomosed to the arteriotomy in a *running/continuous* fashion with a 5-0 monofilament nonabsorbable suture.

After completion of the femoral anastomosis, a window of graft was removed from the hood of the anastomosis. The end of the femorofemoral bypass graft was beveled and anastomosed to the PTFE hood in an end-to-side manner with a *continuous/running* 5-0 monofilament nonabsorbable suture. This anastomosis was performed as distally as possible to maximize the volume flow through the long proximal limb of the bypass graft. Prior to completion of the anastomosis, all vessels were back-bled and flushed with heparinized saline. The anesthesiologist was informed of impending revascularization of each limb so that bicarbonate and extra intravenous fluids could be administered for acid washout and to prevent hypotension. Clamps were removed from the graft and the vessels in the usual sequence to prevent distal embolization. Hemostasis was assured. A Fogarty graft clamp was placed on the femorofemoral bypass PTFE graft.

Attention was now focused on the contralateral groin anastomosis. Vascular clamps were placed on the common femoral, superficial femoral, and profunda femoral vessels. A longitudinal arteriotomy was performed in the common femoral with a scalpel. The arteriotomy was extended with Potts scissors. The graft was cut to appropriate length and beveled in the usual manner. The graft was anastomosed to the arteriotomy in a *running/continuous* fashion with a 5-0 monofilament nonabsorbable suture. Prior to completion of the anastomosis, all vessels and grafts were backbled and flushed with heparinized saline. The anastomosis was completed. The Fogarty graft clamp was removed from the PTFE graft, and vascular clamps were removed in the usual sequence.

Hemostasis of all anastomoses was assured. Distal vessels were examined by both palpation and Doppler exam and then documented. Capillary refill of each foot was examined and assured. Evaluation of distal embolization was noted.

Incisions were copiously irrigated. All instruments, lap pads, and retractors were removed. A #32 French chest tube was placed in the left chest through a stab incision in the usual manner and secured with 1-0 nylon. The chest tube was connected to a pleurovac and the lung reinflated. The chest incision was closed in layers with interrupted 1-0 Maxon to reapproximate the ribs after a rib approximator was placed. The muscle and fascia were closed in layers with *continuous*/*running* 2-0 Vicryl. The skin was reapproximated with a continuous 4-0 Vicryl subcuticular closure. Each groin wound was closed in two layers with *running*/*continuous* 2-0 Vicryl. The skin was reapproximated with a continuous 4-0 Vicryl subcuticular closure. Steristrips and sterile dressing were placed.

A debriefing checklist was completed to share information critical to postoperative care of the patient. The patient awoke in the operating room, was extubated, and was taken to the *postanesthesia care unit*/*intensive care unit* in hemodynamically stable condition. A chest X-ray was obtained.