Management Goals for Treatment of Complicated TBAD

An effective approach to complicated TBAD is multidisciplinary, structured, mitigates immediate and long-term complications, and considers both the patient's physical and emotional well-being.

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Few other emergencies in vascular and cardiac surgery are perhaps as impacted by the advent of endovascular techniques as complicated type B aortic dissection (TBAD). Prior to the introduction of robust endovascular techniques, patients presenting with complications such as rupture or major malperfusion were limited to open thoracic aortic repair or emergent bypass. Outcomes of emergent open repair of the dissected descending thoracic aorta were universally poor. Untreated complicated TBAD is at worst fatal and at best, in the setting of malperfusion, associated with a > 20% to 50% increased risk of death persisting 120 months postpresentation compared to the uncomplicated TBAD patient.[1,2]

A structured and consistent approach to management must mitigate both the immediate and long-term complications. Our management goals for the treatment of complicated TBAD are to (1) stabilize the patient; (2) seal for rupture or impending rupture; (3) correct malperfusion through support of true lumen (TL) and branch vessel intervention as indicated; (4) avoid major immediate complications such as retrograde dissection, spinal cord ischemia, or disruption of false lumen (FL)–supplied branch vessels; (5) minimize long-term complications; and (6) maximize patient quality of life.

1 Stabilize the patient.

The first and foremost goal in treating any patient with complicated TBAD is to ensure hemodynamic stability. This management goal is no different than that for the presentation of an uncomplicated TBAD.

It is recommended that a Foley catheter be placed early after diagnosis of acute aortic dissection. Urine output tracking is a critical data point in assessing resuscitation and the presence of visceral and/or renal malperfusion. Patients with acute renal malperfusion may have abrupt oliguria or anuria, and this will occur well in advance of any bump in creatinine.

All types of malperfusion presentations may worsen during efforts to control blood pressure, so a thorough neurovascular assessment should be performed and communicated during transfers of care.

2 Perform operative intervention for aortic rupture.

Early identification of rupture or impending rupture demands permissive hypotension as low as necessary, while maintaining cerebral perfusion pressure. We aim to maintain a mean arterial pressure > 50 mm Hg.

It is crucial to administer intravenous antihypertensive medications to reduce arterial pressure and thereby decrease the shearing force on the aortic wall.

Patients with rupture or concern for extraluminal contrast should be taken immediately to a hybrid suite for planned thoracic endovascular aortic repair. These patients are distinct from those with reactive effusion around the aorta, which is often present even in the hemodynamically stable and can be observed safely.

In the operating room, we avoid administration of general anesthesia for patients with contained rupture or concern for impending rupture. The goal is quick and complete exclusion of FL flow in the most common location for rupture: the descending thoracic aorta.

The following steps are taken. The patient is moved over and immediately prepped and draped. The right arm is kept out and accessible to anesthesia, and the other is tucked or put above the head. Femoral access is achieved with local anesthesia and under ultrasound guidance, while additional intravenous lines, for example, are being placed.

The goal of this sequence is to have quick femoral access in the event of decompensation. Cutdown and primary repair can occur once seal of the ruptured segment of aorta is attained.

After access is obtained, proceed with negotiating wire up the TL with a leading intravascular ultrasound (IVUS) catheter over a braided wire via an 8-F sheath. To seal a dissected and ruptured descending thoracic aorta, proximal coverage may need to include subclavian coverage to the celiac artery. The selected endograft should be sized to the total aortic diameter, both proximally and distally.

This sizing and extent of coverage has the potential to increase later risk of spinal cord ischemia risk or stent-induced new entry tear, but this is imperative to the goal of sealing the FL.

If needed after proximal entry tear stent coverage is completed, a contralateral wire can be used to achieve access into the FL and allow for embolization with a candy plug or occlusion device.

Although FL embolization techniques are often discussed as means to promote positive aortic remodeling, in the setting of rupture or impending rupture, these techniques may be critical to obtaining seal.

To minimize time in the operating room and allow for focus on resuscitation, we typically do not proceed with bare-metal stent (BMS) placement in the index operation when the indication for surgery was rupture/impending rupture.

Patients are reimaged 48 to 72 hours later, and placement of a distal BMS can be performed on a semielective basis to meet the secondary goal of positive aortic remodeling.

3 Perform operative intervention for malperfusion.

Unlike in the setting of rupture, patients with malperfusion can be induced for general anesthesia in a controlled fashion. Distal access is achieved via percutaneous "preclose" fashion or open cutdown, depending on undissected vessel access options.

In the setting of malperfusion, the primary fenestration and any large (> 1 cm) fenestrations should be covered with a stent graft oversized by 10% of the proximal seal zone total aortic diameter.

Careful interpretation of IVUS imaging before and after covered stent placement can help determine whether use of a distal BMS is needed to support the TL and optimize visceral and distal cord perfusion branches. This adjunct can help address the goal of malperfusion while also minimizing aortic coverage and spinal cord ischemia risk.

4 Minimize potential for complications.

Emergent surgery has dual goals: Correct the immediate life-threatening problem, and minimize the potential for major complications. To this end, a stent graft without any proximal bare-metal or active fixation is key in the hyperacute, acute, and subacute phases.

To avoid aggressive oversizing or inadvertent undersizing that can result in persistent filling of the FL via the primary fenestration, IVUS is required for accuracy.

IVUS can also help identify patients whose imaging may not have fully captured the proximal extent of dissection as beginning in zone 1 or zone 2. In these patients, distal fenestration to equalize TL and FL pressures is a useful technique to fall back on. Similarly, open surgical bypass such as crossover femorofemoral bypass in unilateral extremity malperfusion, for example, can resolve malperfusion and leave the dissection for intervention in a planned fashion.

Finally, in experienced hands, adjunctive great vessel stenting or arch devices can successfully treat these complicated dissections with proximal B1 or 2 entry tears.

IVUS is critical to help image after covered stent placement and confirm adequate reexpansion of the TL. It can also help determine when additional covered stent placement can be replaced with bare-metal coverage to minimize spinal cord ischemia risk.

Before taking on these complicated TBAD patients, one should put in place a postoperative monitoring plan and an algorithm for "rescue" of postoperative cord ischemia, including discrete blood pressure and hemoglobin targets and when and how to proceed with emergent lumbar drain placement.

5 Limit disease progression and reduce long-term complications.

The progression of TBAD can result in further complications and increased mortality risk. After the immediate threats of TBAD are addressed, the focus shifts to the long term. Hence, it's essential to employ strategies that can halt or slow down the progression. This may include interventions to prevent the enlargement of the FL, such as placement of a BMS or FL embolization as described previously, and it requires early and structured surveillance imaging protocols to track the size of the aorta and state of the dissection. Early rapid FL enlargement may require reintervention. The patient's blood pressure must be stringently controlled. If medication regimens are untenable, the surgical team should reflect on any possible residual renal malperfusion that may be contributing and address accordingly. Additional lifestyle factors that might exacerbate the condition, such as smoking or high-risk work environments, need attention.

6 Ensure quality of life.

The physical and emotional trauma of TBAD is profound. Beyond the immediate medical interventions, it's essential to provide patients with support, counseling, and resources that can help them cope with the diagnosis and the lifestyle changes it necessitates.[3] Education can help empower patients and help with medication compliance for blood pressure control.

CONCLUSION

Although the advent of endovascular techniques has revolutionized our approach to managing TBAD, the core principles remain anchored in patient safety and long-term prognosis. With a concerted effort between a multidisciplinary skilled aortic team, we can achieve our goal of effectively managing complicated TBAD, ensuring that patients not only survive but thrive postdiagnosis. ■

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