

# Seeing the Signs

The top precursors/predictors for earlier endovascular treatment versus medical management of type B aortic dissection.

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Acute aortic dissection is a life-threatening condition with an incidence of 5 to 30 people per million per year in Western countries and 43 people per million per year in Asian countries.<sup>1-3</sup> These numbers include both type A and type B aortic dissections in which mortality is high

if it is an aortic dissection involving an ascending aorta (type A) or a type B dissection with complications. Forty percent of these patients have acute type B dissection. The standard treatment for uncomplicated acute type B dissection is optimal medical therapy using blood pressure and pain control. Survival rates at 1 month, 1 year, 5 years, and 10 years are 89%, 84%, 60% to 80%, and 40% to 45%, respectively.<sup>2,4,5</sup> Complicated acute type B dissection is associated with high mortality (50%–85%) if left untreated. Surgery for this complex disease is associated with significant mortality of 18.2% to 50%.<sup>2</sup>

Since 1996, endovascular repair with stent grafts has emerged as a less invasive procedure for the treatment of aortic dissection by covering the primary entry tear in the proximal descending aorta, with a 30-day mortality of 16%, as reported in an early series.<sup>6</sup> Pooled outcomes of endovascular treatment for complicated type B dissection (malperfusion or rupture) from five physician-sponsored investigational device exemption clinical trials demonstrated a mortality rate of 10.8% at 30 days and 29.4% at 1 year.<sup>7</sup> Data from the International Registration of Aortic Dissection showed a significantly lower mortality rate after endovascular treatment compared to open surgery (10.2% vs 33.9%;  $P = .002$ ) for complicated type B dissection.<sup>8</sup> There is increasing evidence that endovascular treatment demonstrates a significant advantage over open surgery in patients with complicated type B dissection, even though there is no prospective randomized controlled trial, which is unlikely to happen.

There is enthusiasm to broaden the indication of thoracic endovascular aortic repair (TEVAR) to treat uncomplicated type B dissection. The objectives are to obliterate the false lumen by covering the proximal intimal tear and to stabilize the dissected aorta to prevent late complications. The INvestigation of STEnt Grafts in Aortic Dissection (INSTEAD) trial is a randomized study that compared outcomes of TEVAR to optimal medical therapy

for the treatment of subacute (2–52 weeks after onset), uncomplicated type B dissection. At 2-year follow-up, TEVAR failed to improve survival and adverse event rates despite leading to favorable aortic remodeling.<sup>9</sup> However, TEVAR significantly decreased aorta-related mortality and disease progression at 5 years compared to medical therapy alone, but there was no difference in total mortality.<sup>10</sup> This study has influenced some physicians, who started changing their clinical practices. Currently, the European Society of Cardiology recommends that, “TEVAR should be considered in uncomplicated type B aortic dissection, class IIa level B.”<sup>11</sup>

## TOP PREDICTORS FOR EARLIER ENDOVASCULAR TREATMENT OF TYPE B AORTIC DISSECTION

Some special conditions of type B aortic dissection carry significant mortality risk if treatment is delayed. These included aortic dissection with rupture, malperfusion syndrome, persistent pain, and uncontrolled hypertension. Early endovascular treatment is a crucial management strategy in these situations.

1. Rupture or leakage: Acute type B aortic dissection with rupture is an emergency. Rupture in the thoracic segment usually presents as massive left pleural effusion, but some patients may present with right pleural effusion especially if they have a tortuous descending aorta or right-sided aortic arch. After TEVAR, the pleural effusion still needs to be monitored, as some patients may develop persistent hypotension from ongoing bleeding. In this situation, open surgery via left thoracotomy is crucial to secure the bleeding point.
2. Malperfusion symptom: Organ malperfusion is indicated for endovascular treatment. TEVAR is able to restore blood flow to the true lumen in the majority of cases. In some patients, peripheral stenting may be performed adjunctively to resume specific organ perfusion. In case of spinal cord ischemia, it is very difficult to predict whether the neurologic outcome will be improved after the procedure.

- Persistent pain: Ongoing pain/symptom despite optimal medical therapy is a risk factor of threatened rupture. Endovascular repair is indicated and can prevent aortic rupture and alleviate severe pain/symptoms.
- Uncontrolled hypertension: Poor control of blood pressure is associated with a risk of aortic growth and needs close monitoring.
- Progressive dilatation of the aorta: The dissected aorta with a diameter  $\geq 5.5$  cm or with an expansion rate  $> 0.5$  cm per year is an indication for surgical intervention.<sup>12</sup>
- Large primary entry tear: Patients with a large primary entry tear ( $> 1$  cm) had more dissection-related events and a higher rate of aortic growth than those with a smaller entry tear.<sup>20</sup>

## CONCLUSION

Endovascular repair is indicated in acute complicated type B dissection and is playing an increasing role in uncomplicated dissection. Many predictors of aortic growth and complications are useful warning signs that may indicate early endovascular treatment to prevent future catastrophic events. ■

The following precursors indicate that endovascular treatment should be considered:

- Young age: Patients younger than 60 years are known to have a significantly higher aortic growth rate.<sup>13,14</sup>
- Aortic dilatation: A maximal aortic diameter  $\geq 40$  mm during the acute phase is a predictor of aortic growth.<sup>15</sup>
- Large false lumen diameter: The risk of aneurysm formation and mortality is increased in patients with a false lumen diameter  $\geq 22$  mm in the upper descending thoracic aorta (aneurysm formation was 42% vs 5%;  $P < .001$ ; mortality was 17% vs 5%;  $P = .09$ ).<sup>16</sup>
- Patency of the false lumen: A study from Japan showed that patency of the false lumen is a risk factor for dissection-related deaths and events (hazard ratio, 2.59 and 1.8, respectively). Freedom from aortic enlargement ( $\geq 55$  mm) at 1 year, 5 years, and 10 years was 100%, 94.7%, and 89.2%, respectively, in patients with an aortic size  $< 45$  mm and a thrombosed false lumen. However, in patients with an aortic size  $> 45$  mm and a patent false lumen, freedom from aortic enlargement at 1 year, 5 years, and 10 years was decreased to 72.6%, 66%, and 42.8% respectively.<sup>17</sup> The aortic growth rate among patients with a partially thrombosed false lumen appears to be higher than that in patients with a completely thrombosed or patent false lumen.<sup>18</sup> Tsai et al reported that patients with a partially thrombosed false lumen had a higher mortality rate than those with a patent or completely thrombosed false lumen at a mean follow-up of 3 years (31.6%  $\pm$  12.4% for partial thrombosis, 13.7%  $\pm$  7.1% for patent false lumen, and 22.6%  $\pm$  22.6% for complete thrombosis).<sup>19</sup>
- Configuration of false lumen: An elliptical configuration of the true lumen with a circular formation of the false lumen is a result of high pressurization in the false lumen and was associated with increased aortic growth.<sup>18</sup>

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