Stent-graft-induced intimal injury one year after surgery

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Intimal injury is a probable complication after stent-graft implantation. It is generally believed to occur more frequently during the perioperative rather than the late postoperative period and in cases of acute rather than chronic aortic dissections. We, however, encountered a case in which intimal injury occurred about 1 year after stent-graft implantation for chronic aortic dissection, and a surprisingly high incidence of such cases has recently been reported. We report this case as a word of caution.

Clinical Summary

An 83-year-old woman who had been medically treated for a dilating type IIIb aortic dissection since 1993 began having chest pain and was referred to our hospital in December 1999. Computed tomography (CT) showed an acute type I aortic dissection extending to the root of the left subclavian artery with an intimal tear in the ascending aorta, and a separate chronic type IIIb dissection with a smooth and thickened intimal membrane, an intimal tear in the distal arch, and a maximal diameter of 50 mm. Considering the patient's age, we planned an emergency operation consisting of conventional ascending aortic replacement and surgical insertion of a stent graft to close the entry in the distal arch.

After median sternotomy, cardiopulmonary bypass was instituted between the left femoral artery and both of the venae cavae. With the use of deep hypothermia and circulatory arrest with retrograde cerebral perfusion, the distal ascending aorta was transected. The intimal tear in the distal arch was clearly visible, and a stent graft comprising a 30-mm woven Dacron graft and a 30 × 75-mm Z stent was smoothly inserted to cover the intimal tear. Because the stent graft was deployed slightly too proximally and partially covered the orifice of the left subclavian artery, the proximal portion of the graft was peeled off so as not to disturb the

Figure 1. Aortogram conducted 3 weeks postoperatively revealed no endoleak leak, and the distal portion of the stent (*arrow*) fit well into the nearly straight portion of the descending aorta.

blood flow. The ascending aorta was then replaced with a 26-mm woven Dacron graft.

The postoperative course was uneventful. Angiograms 3 weeks postoperatively revealed no flow of contrast medium into the false lumen, and the distal portion of the stent seemed to fit well into a nearly straight portion of the descending aorta (Figure 1). Future problems in this area were not anticipated. In addition, CT repeated 3 weeks and 8 months postoperatively revealed expansion of the true lumen with concurrent shrinkage and thrombo-occlusion of the false lumen (Figure 2, *A* and *B*). However, to our surprise, follow-up CT conducted 14 months postoperatively revealed a new ulcer-like projection invading the thrombosed false lumen at the distal end of the stent graft (Figure 2, *C* and *D*). No apparent cause other than the continuous stress produced by the expansile force of the stent against the intimal membrane was noticed. Although the outer diameter of the descending aorta had not increased, we think additional endoluminal stent-graft placement may soon be necessary.

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Figure 2. CT conducted 3 weeks (A) and 8 months (B) postoperatively revealed shrinking false lumen in the descending aorta. CT conducted 14 months postoperatively (C) and its sagittal view (D), however, revealed a new ulcer-like projection (arrows) at the distal edge of the stent graft.

Discussion

Damaging the fragile intimal membrane by inserting a stent graft is generally believed to be the most probable cause of stent-graft-induced intimal injury. Therefore, intimal injury is believed to occur more frequently in cases of acute rather than chronic dissection, because intimal membranes are thinner and weaker in the acute phase. However, we think that once a stent graft is successfully placed, the thinner and softer intimal membrane in the acute phase will expand more easily to recover its original shape and that intimal injury is not likely to occur thereafter. Kato and associates¹ indirectly supported this idea by reporting enhanced shrinkage of the false lumina without intimal injury in patients with dissection treated with stent grafts within 6 months after the onset. In addition, Dake and coworkers² reported no intimal injury after stent-graft implantation for 19 patients with acute dissection with an average follow-up period of 13 months. On the other hand, we think that a thickened intimal membrane in chronic dissection will not expand easily and that an intimal membrane at the border between the stented and the nonstented areas will be subject to stress produced by the expansile force of the stent for a long period, eventually leading to new intimal tears in some cases. Yamazaki and colleagues³ recently reported that as many as 18%

of patients had new ulcer-like projections at the edges of stent grafts between 6 and 12 months postoperatively, as in our case. Although determining the incidence of such cases requires more data, one should keep in mind the rather high incidence of late intimal injury after stent-graft implantation for chronic aortic dissection. These patients should be followed up more closely after surgery because it is difficult to predict the onset of this type of intimal injury, which may lead to unexpected aortic rupture.

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