Midterm results of stent-graft repair of acute and chronic aortic dissection with descending tear: The complication-specific approach

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Background: Endovascular stent-graft placement for the treatment of patients with aortic dissection is emerging as an attractive alternative to conventional cardiac operations. However, there has been no report of longer-term follow-up. The purpose of this study is to describe our midterm results with endovascular stent-graft repair for the treatment of patients with aortic dissections.

Methods: Thirty-eight patients with aortic dissections with descending tears were treated with endovascular stent-grafting. Ten patients had acute type A, 14 patients had acute type B, and 14 patients had chronic type B dissection. Stent grafts fabricated from expanded polytetrafluoroethylene-covered Z stents were placed to close entry tears in all patients through the delivery systems introduced from the femoral or the iliac arteries.

Results: Two patients with complicated acute type B dissection, who would have required surgical intervention, died within 30 days of the procedure, although no other patients died within the same period. There were no late deaths during the mean follow-up period of 27 months. Early and late complication rates were 33% and 36%, respectively, in patients with acute dissection, whereas rates were 4% and 0% ($P < .05$ vs patients with acute dissection) in patients with chronic dissection.

Conclusions: Entry closure with endovascular stent-graft placement may be a safe and effective method for the treatment of patients with aortic dissection. It could be an alternative to conventional surgical intervention in selected patients with chronic dissection. However, strict patient selection and close follow-up seem mandatory in patients with acute dissection receiving Z stent-based stent-grafts. Stent-graft repair should be delayed for acute type B dissection without complications.

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Aortic dissection is one of the most catastrophic events that affects the aorta. The overall in-hospital mortality rate for acute aortic dissection is greater than 20%, despite improved diagnostic and therapeutic techniques.[1] The treatment strategy depends on the extension of the dissecting process; that is, surgical repair is required when it involves the ascending aorta, and medical treatment with the use of β-blockers and vasodilators is preferred when it does not.[2]

TABLE 1. Comparison of dissection-related complications between patients with acute and chronic dissections

	Type A	Type B (complicated)	Acute type B (uncomplicated)	Total (type B)	Total (acute)	Chronic type B
n	10	6	8	14	24	14
Age (y)	60 ± 9	69 ± 5	64 ± 7	66 ± 6	63 ± 8	61 ± 14
Male sex	100% (10/10)	67% (4/6)	75% (6/8)	71% (10/14)	83% (20/24)	86% (12/14)
Interval between diagnosis and stent grafting	8 ± 7 d*	4 ± 8 d*	12 ± 8 d*	9 ± 9 d*	8 ± 8 d*	35 ± 94 mo
Dissection-related complications	8 (80%)*	6 (100%)*	0 (0%)	6 (43%)*	14 (58%)*	0 (0%)
Aortic rupture	1 (10%)	2 (33%)†	0 (0%)	2 (14%)	3 (13%)	0 (0%)
Refractory pain/hypertension	3 (30%)†	2 (33%)†	0 (0%)	2 (14%)	5 (21%)	0 (0%)
Visceral/renal/leg ischemia	0 (0%)	2 (33%)†	0 (0%)	2 (14%)	2 (8%)	0 (0%)
Pericardial effusion	5 (50%)	0 (0%)	0 (0%)	0 (0%)	5 (21%)	0 (0%)
Aortic regurgitation	1 (10%)	0 (0%)	0 (0%)	0 (0%)	1 (4%)	0 (0%)
Paraparesis	1 (10%)	0 (0%)	0 (0%)	0 (0%)	1 (4%)	0 (0%)

*$P < .01$ versus chronic dissection.
†$P < .05$ versus chronic dissection.

There are several challenging complexities in this strategy. First, when aortic dissection is accompanied by complications, including visceral ischemia, leg ischemia, and aortic rupture, surgical intervention is required, even in patients with type B dissections. The number of such patients reaches approximately 20%.[1,3] However, the operative mortality and morbidity are extremely high in these patients. Second, patients with uncomplicated type B aortic dissections must undergo aggressive control of hypertension during the first few weeks, and they have to be followed up with strict medication for their lifetime.[2,4,5] Even if patients are compliant enough to obey all the medication requirements, there still remains concern about aortic rupture or redissection. In addition, aneurysmal dilatation is observed in more than 20% of these medically treated patients during follow-up. Surgical repair of these patients is often extensive and is associated with considerable mortality and morbidity.[6,7] Third, there are small subsets among type A dissection in which the entry tear locates in the descending thoracic aorta and propagates up to the ascending aorta in a retrograde manner. Extensive operation, including excision of the entry tear, in addition to replacement of both the ascending aorta and the aortic arch, is required for its complete treatment.[8,9]

Entry closure with endovascular stent-graft placement has emerged as a solution to these problems encountered in the treatment of aortic dissection with a descending tear.[10,11] The preliminary studies showed its effectiveness for the treatment of both acute and chronic dissections. However, both patient populations and follow-up term of those studies are limited, and no longer-term follow-ups have been reported. In addition, the timing of endovascular repair (ie, when aortic dissections should be treated) is still controversial in the acute or chronic phase. In this article we present our experiences of the treatment of both acute and chronic aortic dissections and their midterm results to clarify these unanswered questions.

Patients and Methods

Patient Selection

We have treated 38 patients with aortic dissections since 1997 (Table 1). The study population consisted of 32 men and 6 women with a mean age of 63 ± 11 years (range, 38-82 years).

Inclusion criteria were as follows: (1) patients with type B aortic dissection who have such complications as required surgical intervention, including visceral or leg ischemia, aortic rupture, refractory hypertension, and refractory pain; (2) patients with type A aortic dissection with the entry tear in the descending thoracic aorta; (3) patients with type B dissection with a descending thoracic aorta of 40 mm or larger in diameter at the onset of aortic dissection; (4) patients with a descending thoracic aorta 50 mm or larger in diameter at any time; and (5) patients with growing ulcer-like projections.

The exclusion criteria were as follows: (1) distance between the entry tear and the left subclavian artery of less than 5 mm; (2) diameter of the access artery (ie, the femoral and iliac artery) of less than 7 mm; and (3) existence of complications requiring an emergency operation, including cardiac tamponade, ischemia of the coronary artery or cervical branches, and aortic regurgitation.

Both inclusion criteria and exclusion criteria were applied to patients with both acute and chronic dissections.

The institutional review board approved this study, and full informed consent was obtained from each patient.

Preprocedural Imaging

Computed tomography (CT) and calibrated angiography were performed preoperatively in all patients. In patients with chronic dissections, the diameters of the stent grafts were determined to be approximately 10% to 20% larger than that of the aorta proximal to the entry tear, as measured on contrast-enhanced CT. In patients with acute dissections, the approximately same diameter as that of the aorta proximal to the entry tear was adopted as the diameter of the stent graft.

The distance between the entry tear and the left subclavian artery was measured on a calibrated angiographic scan in most cases. Three-dimensional reconstruction or multiplanar reconstruction images elaborated from axial CT images were used in some cases to measure the distance and the shape of the entry tear.

TABLE 2. Comparison of preoperative risk factors between patients with acute and chronic dissections

	Type A	Type B (complicated)	Acute type B (uncomplicated)	Total (type B)	Total (acute)	Chronic type B
n	10	6	8	14	24	14
Dissection-unrelated complications	8 (80%)	5 (83%)	8 (100%)	13 (93%)	21 (88%)	12 (86%)
Hypertension	7 (70%)	4 (67%)	7 (88%)	11 (79%)	18 (75%)	9 (64%)
History of ascending aortic replacement	N/A	0 (0%)	0 (0%)	0 (0%)	0 (0%)*	3 (21%)
AAA/TAA	1 (10%)	0 (0%)	3 (38%)	3 (21%)	4 (17%)	1 (7%)
Aortic regurgitation	0 (0%)	1 (17%)	1 (13%)	2 (14%)	2 (8%)	0 (0%)
Coronary arterial disease	1 (10%)	0 (0%)	1 (13%)	1 (7%)	2 (8%)	1 (7%)
Renal failure	1 (10%)	1 (17%)	0 (0%)	1 (7%)	2 (8%)	0 (0%)
Stroke	1 (10%)	0 (0%)	0 (0%)	0 (0%)	0 (10%)	0 (0%)
Coagulopathy	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (7%)

AAA, Abdominal aortic aneurysm; *TAA,* thoracic aortic aneurysm.
*$P < .05$ versus chronic dissection.

The length of the stent-graft was 7.5 cm in most cases, in which the entry tear was like a pinhole. However, in some cases the length of the stent graft was 10 cm or longer because the entry tears had considerable longitudinal length.

ACD

Device Details

We used custom-made stent-grafts in all patients. Stent-grafts were fabricated from Z stents (Cook, Bloomington, Ind) covered with expanded polytetrafluoroethylene (Impra, Tempe, Ariz), which was dilated with balloon catheters until the expected diameter was obtained, or from Z stents covered with woven polyester (Ube, Yamaguchi, Japan). Graft materials were attached to Z stents with polypropylene sutures (Ethicon, Inc, Somerville, NJ). An 18F or 20F delivery system (Cook) was used for deployment.

Methods

The methods are almost the same as those described in previous reports.[10] Stent-graft placement was performed after achievement of general anesthesia in all patients. After femoral or external iliac arteriotomy, the delivery system was advanced until its tip reached proximal to the entry tear. Then stent-grafts were inserted and advanced into the delivery system. Stent-grafts were deployed through a quick drawback of the outer sheath during firm holding of the pusher mandrel. Blood pressure control with a vasodilator or transient cardiac arrest with adenosine was adopted in all patients to avoid misplacement. Whenever any endoleak was noticed on angiography, additional procedures, including balloon dilatation and additional stent-grafting, were added.

Statistical Analysis

Patient characteristics and mortality and morbidity rates with acute and chronic dissection were compared by the χ^2 and Student t tests. Actuarial survivals, complication-free rates, and reintervention-free rates of acute and chronic dissections were compared with the log-rank test.

Results

Patient Demographics

Twenty-four (63%) patients underwent stent-graft repair within 1 month of the diagnosis (acute, Table 1). The interval between the diagnosis and stent grafting ranged from 0 to 27 days (mean, 8 ± 8 days) in this group. Ten patients had Stanford type A acute dissection, and 14 patients had type B acute dissection. Among 14 patients with type B dissection, 6 patients had complications requiring surgical repair, and the other 8 patients did not. The other 14 (37%) of the 38 patients underwent stent-graft repair 1 month or later after the diagnosis (chronic). The interval between the diagnosis and stent grafting ranged from 1 month to 30 years (mean, 35 ± 94 months) in this group. All patients of this group had type B chronic dissections.

The dissection-related complication rate of patients with acute dissection was significantly higher than that of patients with chronic dissection (Table 1). There was no significant difference in the dissection-unrelated complication rate, except for history of ascending aortic replacement (Table 2).

Immediate Outcomes

Immediate outcome data are shown in Table 3.

Mortality. Two patients with complicated acute type B dissection died within 30 days of the procedure, and no other patients died within the same period. Specifically, one third of patients with complicated acute type B dissections died within 1 month ($P < .05$ vs patients with chronic dissection). One patient had visceral ischemia before stent-graft repair. Although entry closure was successful, he died of bowel infarction on the next day. The other patient had massive hematoma in the pleural space caused by aortic rupture. He died of pneumonia on the ninth postoperative day, despite complete closure of the entry tear and thrombectomy with thoracoscopy.

Morbidity. Intraoperative complications, including intimal injury caused by balloon dilatation and minor stroke, were observed in 2 patients with acute dissection, although they were not observed in patients with chronic dissection.

TABLE 3. Comparison of early mortality and morbidity between patients with acute and chronic dissections

	Type A	Type B (complicated)	Acute type B (uncomplicated)	Total (type B)	Total (acute)	Chronic type B
n	10	6	8	14	24	14
Mortality	0 (0%)	2 (33%)*	0 (0%)	2 (14%)	2 (8%)	0 (0%)
Complication	3 (30%)	3 (50%)*	2 (25%)	5 (36%)	8 (33%)	1 (7%)
Intraoperative	1 (10%)	1 (17%)	0 (0%)	1 (7%)	2 (8%)	0 (0%)
Intimal injury	1 (10%)	1 (17%)	0 (0%)	1 (7%)	2 (8%)	0 (0%)
Stroke	1 (10%)	0 (0%)	0 (0%)	0 (0%)	1 (4%)	0 (0%)
Postoperative	3 (30%)	3 (50%)*	2 (25%)	5 (36%)	8 (33%)	1 (7%)
Aorta-related complication	2 (20%)	2 (33%)*	2 (25%)	4 (29%)	6 (25%)	0 (0%)
Endoleak	1 (10%)	0 (0%)	1 (13%)	1 (7%)	2 (8%)	0 (0%)
Aneurysmal degeneration	1 (10%)	1 (17%)	0 (0%)	1 (7%)	2 (8%)	0 (0%)
Rupture of AAA	0 (0%)	0 (0%)	1 (13%)	1 (7%)	1 (4%)	0 (0%)
Bowel infarction	0 (0%)	1 (17%)	0 (0%)	1 (7%)	1 (4%)	0 (0%)
Aorta-unrelated complication	1 (10%)	1 (17%)	0 (0%)	1 (7%)	2 (8%)	1 (7%)
Respiratory failure	1 (10%)	1 (17%)	0 (0%)	1 (7%)	2 (8%)	0 (0%)
Left arm ischemia	1 (10%)	0 (0%)	0 (0%)	0 (0%)	1 (4%)	0 (0%)
Wound infection	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (7%)

AAA, Abdominal aortic aneurysm.
*$P < .05$ versus chronic dissection.

TABLE 4. Comparison of late mortality and morbidity between patients with acute and chronic dissections

	Type A	Type B (complicated)	Acute type B (uncomplicated)	Total (type B)	Total (acute)	Chronic type B
n	10	4	8	12	22	14
Mortality	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Complication	2 (20%)	2 (50%)*	4 (50%)*	6 (50%)*	8 (36%)†	0 (0%)
Aorta-related complication	1 (10%)	2 (50%)*	3 (38%)†	5 (42%)*	6 (27%)	0 (0%)
Aneurysmal degeneration	0 (0%)	2 (50%)*	2 (25%)†	4 (33%)†	4 (18%)	0 (0%)
Growth of another ULP	0 (0%)	0 (0%)	1 (13%)	1 (8%)	1 (5%)†	0 (0%)
Growth of AAA	1 (10%)	0 (0%)	0 (0%)	0 (0%)	1 (5%)†	0 (0%)
Acute type A dissection	0 (0%)	0 (0%)	1 (13%)	1 (8%)	1 (5%)†	0 (0%)
Aorta-unrelated complication	1 (10%)	0 (0%)	1 (13%)	1 (8%)	2 (9%)†	0 (0%)
Myocardial infarction	1 (10%)	0 (0%)	0 (0%)	0 (0%)	1 (5%)†	0 (0%)
Paraplegia	0 (0%)	0 (0%)	1 (13%)	1 (8%)	1 (5%)†	0 (0%)

ULP, Ulcer-like projection; *AAA,* abdominal aortic aneurysm.
*$P < .01$ versus chronic dissection.
†$P < .05$ versus chronic dissection.

Postoperative complications, including both aorta-related and aorta-unrelated complications, were observed in 8 (33%) patients with acute dissection. In contrast, it was observed only in 1 (4%) patient with chronic dissection. Aorta-related complications, including endoleak and aneurysmal degeneration of the aorta, were observed in as many as 6 (25%) patients with acute dissection, although such complications were not observed in any patient with chronic dissection (0%). Endoleak was observed in 2 patients. It was repaired with additional stent-grafting in 1 patient and with graft replacement in the other patient. Aneurysms newly developing at the aorta, the false lumen of which was once completely thrombosed after stent-grafting, were referred to as aneurysmal degeneration. This was observed at 6 sites in 5 patients during the whole follow-up period and was repaired with additional stent-grafting in 3 patients and with graft replacement in 1 patient; it had been observed until acute type A dissection developed in 1 patient.

The postoperative complication rate of patients with complicated acute type B dissections was significantly higher than that of patients with chronic dissections ($P < .05$).

Late Outcomes

Late outcome data are shown in Table 4.

Mortality. There were no late deaths during the mean follow-up period of 27 ± 12 months (range, 6-53 months).

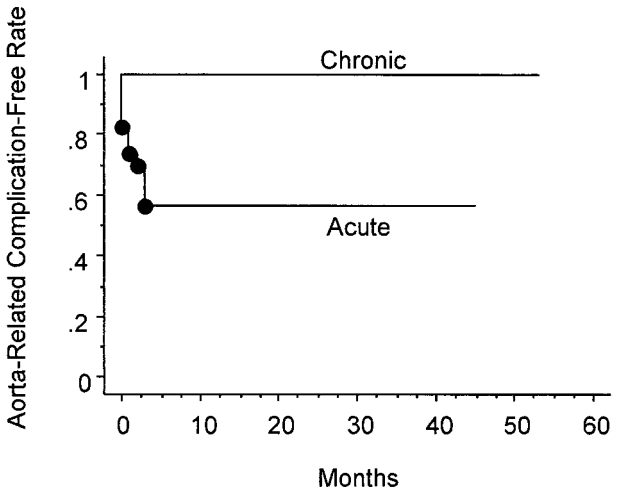

Figure 1. Actuarial aorta-related complication-free rate.

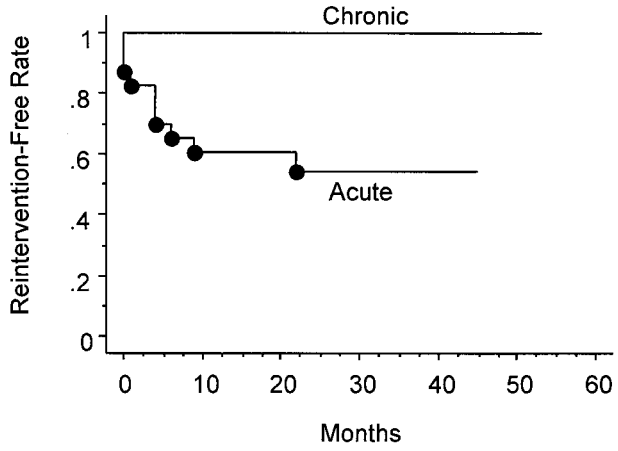

Figure 2. Actuarial reintervention-free rate curve.

One-year survival of patients with acute and chronic dissections was 92% and 100%, respectively.

Morbidity. Morbidity results are shown in Figures 1 and 2. Late complications were observed in as many as 8 (36%) patients with acute dissection, whereas there were no late complications in patients with chronic dissections ($P < .05$). Specifically, aneurysmal degeneration was observed in 4 patients with acute dissections. It developed at the proximal descending thoracic aorta proximal to the stent-grafts in all patients. The interval between the diagnosis and notification of the aneurysmal degeneration ranged from 17 to 99 days (mean, 63 ± 29 days). The 1-year, aorta-related, complication-free rates of patients with acute and chronic dissection were 56% and 100%, respectively. The 1-year reintervention-free rates were 60% and 100%, respectively.

Acute myocardial infarction developed in 1 patient with acute dissection at 1 year after the stent-graft repair, which was deemed not related to aortic dissection or the stent graft. Paraplegia developed after surgical conversion performed 4 months after stent-graft placement to fix an endoleak in 1 patient with acute type B dissection.

Procedural Success

Primary success was defined as patients who are alive during the follow-up period, with complete closure of the entry tears and no aorta-related complications requiring secondary intervention. Secondary success was defined as patients who are alive during the follow-up period with complete closure of the entry tears and no aorta-related complications after primary or secondary intervention. The primary success rate of patients with chronic dissection was significantly higher than that of patients with acute dissection (Table 5). However, there was no significant difference with the secondary success rate, except for that of patients with complicated acute type B dissections.

Discussion

Stent-Graft Repair of Chronic Aortic Dissection

Nienaber and colleagues compared stent-graft repair with surgical graft replacement for the treatment of chronic aortic dissection.[11] In their series no deaths or major complications were observed in the group undergoing stent-graft repair, whereas there were 4 deaths and 5 serious adverse events in the surgical repair group. Although the number of the patients was extremely limited, there was a significant difference in operative mortality and morbidity between groups undergoing stent-graft repair and surgical repair.

There have been several similar reports in which chronic aortic dissection was treated with endovascular stent grafting, and its safety and effectiveness were proved.[12,13] This is not surprising because stent-graft repair is far less invasive than surgical repair, which often requires extensive resection of the descending thoracic aorta and is associated with severe morbidities, including respiratory failure, renal failure, and spinal ischemia. This also matches our results with chronic dissection.

We divided patients into the 2 groups described above (ie, acute and chronic dissection) because the period of 1 month is clinically a turning point. In other words, both the adventitia and dissected flap, which are extremely fragile in the acute phase, seemingly become stable after this critical period. Indeed, there were no deaths or major complications, including aorta-related complications, in patients with chronic dissections in our series. This fact seemingly correlates with the characteristics of the aortic wall in the chronic phase (ie, stable and fibrotic adventitia and intimal flap that can well tolerate the hoop strength of the stent-grafts and other hemodynamic effects leading to aorta-related complications).

Stent-Graft Repair of Acute Aortic Dissection

Dake and associates[11] and we were the first to apply endovascular stent-graft placement for the treatment of acute

TABLE 5. Comparison of procedural success rates between patients with acute and chronic dissections

	Type A	Type B (complicated)	Acute type B (uncomplicated)	Total (type B)	Total (acute)	Chronic type B
n	10	6	8	14	24	14
Primary success	7 (70%)†	2 (33%)*	5 (63%)†	7 (50%)*	14 (58%)*	14 (100%)
Secondary success	10 (100%)	4 (67%)†	8 (100%)	12 (86%)	22 (92%)	14 (100%)

*$P < .01$ versus chronic dissection.
†$P < .05$ versus chronic dissection.

aortic dissection in clinical settings. Dake and associates accumulated a lot of data about the treatment of aortic dissection through experimental and clinical practice and concluded that entry closure with stent-grafts is the simplest and most effective method, especially for the treatment of true luminal compression.[14-17] They treated 19 patients with acute dissection, among whom 13 patients had severe complications. The mortality rate was 21% in their series, which may be acceptable when taking into consideration that more than half of the patients had severe complications. In addition, there were no complications, including aortic aneurysm or aortic rupture, during follow-up in their series.

In contrast, we experienced variable adverse events, including aorta-related events. Intimal injury during the stent-graft procedure must be caused by the edge of the stent-grafts. Although the cause of aneurysmal degeneration after stent-graft repair is not well known and some of them may be phenomena observed during the natural course of the dissected aorta, the edges of the stent-graft were thought to be the trigger of aneurysm development in at least 2 cases in our series. These complications are likely enough in patients with acute dissection because the aortic wall is extremely fragile and is easily injured by any stimulus, including the edges of stent-grafts and endovascular procedures themselves. Although there is no clear evidence to explain the difference between the results of the series by Dake and associates[10] and those of our series, the tendency to use stent-grafts with larger diameters in our series may have affected the results.

Avoidance of Intraoperative and Postoperative Complications

Several methods may be used to avoid these complications. First, stent-grafts should be placed to cover longer portions of the descending aorta. Aneurysmal degeneration developed at the proximal portion of the descending aorta to the stent-grafts in 4 of 5 patients in our series. Therefore, covering the longer portion of the descending aorta, spanning from the origin of the descending aorta to the lower portion to the entry tear, may potentially avoid this complication.

In 1 patient of our series, the stent-graft was placed in the curved portion of the descending aorta, and the bottom edge of the stent-graft was attached to the intimal flap at an angle. Subsequently, aneurysmal degeneration developed at the bottom end of the stent-graft in this patient. Because the angle made by the bottom edge of the stent-graft and the aortic wall seems to be the contributing factor of aneurysmal degeneration, several stent-grafts should be placed until the surface of the bottom stent of the stent-graft locates parallel to the aortic wall.

Second, more sophisticated stent-grafts, which have far smoother edges and far more flexible bodies than those of Z stent–based stent-grafts, should be used. If such stent-grafts are available, the risk of flap injury caused by the edges of stent-grafts may potentially be avoided, and stent-grafts may be placed without any concern, even in the curved portion of the aorta.

Indication for Stent-Graft Repair of Acute Dissection

The indications for endovascular stent-graft repair for the treatment of acute dissection may have to undergo some changes. Stent-grafting for the treatment of patients with complicated type B dissections with complications, including visceral ischemia, leg ischemia, or aortic rupture, or patients with type A dissection with the entry tear in the descending thoracic aorta may be justified, taking into consideration that operative mortality and morbidity are extremely high in these patients.[1,10,18]

However, it should be better to delay the stent-graft repair until the fragile aortic wall, including the intimal flap, becomes more fibrotic and stable, if possible. Because our data show that no deaths or aorta-related complications were observed in patients with chronic dissections, it should be obvious that delayed treatment may result in greater benefit when Z stent-based stent-grafts are used. Patients with acute type B dissections with descending thoracic aortas of 40 mm in diameter or larger at the onset of aortic dissection were enrolled in the present series because aneurysmal dilatation is often observed during follow-up in such patients.[19] However, stent-graft repair should be delayed for these patients when no dissection-related complication is associated.

The recent advanced and sophisticated medical control has reduced the mortality rate of the patients with type B aortic dissection to approximately 10%.[1] This figure is

comparable with our results of patients with acute dissection. The relationship between medical control and stent-graft repair seems like that between medical control and surgical intervention in the 1970s and 1980s, when there was controversy as to the appropriate treatment of acute type B dissection.[4-6,20] When stent-graft repair with a more sophisticated device works well and without any significant complications, there should be great benefit compared with that seen with medical control, even in patients without any dissection-related complication because patients need not have concern about late complications, including aortic rupture, redissection, or late surgical repair because of aneurysmal dilatation of the dissected aorta.

Conclusion

From our small experience, stent-graft repair of type B aortic dissection 1 month after the diagnosis may be a safe and effective method and an alternative to surgical repair in selected patients. In addition, patients with complicated acute type B dissections and those with type A dissections may benefit from this procedure. However, it should be better that stent-graft repair be delayed until the aortic wall becomes fibrotic and stable in patients with uncomplicated acute type B dissections when the so-called first-generation stent-grafts are used.

References

1. Hagan PG, Nienaber CA, Isselbacher EM, et al. The international registry of acute aortic dissection (IRAD). *JAMA.* 2000;283:897-903.
2. Fann JI, Miller DC. Aortic dissection. *Ann Vasc Surg.* 1995;9:311-23.
3. Schor JS, Yerlioglu ME, Galla JD, Lansman SL, Ergin MA, Griepp RB. Selective management of acute type B aortic dissection: long-term follow-up. *Ann Thorac Surg.* 1996;61:1339-41.
4. Wheat MW. Current status of medical therapy of acute dissecting aneurysms of the aorta. *World J Surg.* 1980;4:563-9.
5. Glower DD, Fann JI, Speier RH, et al. Comparison of medical and surgical therapy for uncomplicated descending aortic dissection. *Circulation.* 1990;82(suppl):IV39-46.
6. Glower DD, Speier RH, White WD, et al. Management and long-term outcome of aortic dissection. *Ann Surg.* 1991;214:31-41.
7. Acute aortic dissection [editorial]. *Lancet.* 1988;2827-8.
8. Lansman SL, McCullough JN, Nguyen KH, et al. Subtypes of acute aortic dissection. *Ann Thorac Surg.* 1999;67:1975-8.
9. Kazui T, Tamiya Y, Tanaka T, et al. Extended aortic replacement for acute type A dissection with the tear in the descending aorta. *J Thorac Cardiovasc Surg.* 1996;112:973-8.
10. Dake MD, Kato N, Mitchell RS, et al. Endovascular stent-graft placement for the treatment of acute aortic dissection. *N Engl J Med.* 1999;340:1546-52.
11. Nienaber CA, Fattori R, Lund G, et al. Nonsurgical reconstruction of thoracic aortic dissection by stent-graft placement. *N Engl J Med.* 1999;340:1539-45.
12. Inoue K, Hosokawa H, Iwase T, et al. Aortic arch reconstruction by transluminally placed endovascular branched stent graft. *Circulation.* 1999;100(suppl):II316-21.
13. Kato N, Hirano T, Takatsugu S, et al. Treatment of chronic type B aortic dissection with endovascular stent-graft placement. *Cardiovasc Intervent Radiol.* 2000;23:60-2.
14. Slonim SM, Nyman URO, Semba CO, et al. Aortic dissection: percutaneous management of ischemic complications with endovascular stents and fenestration. *J Vasc Surg.* 1996;23:241-53.
15. Slonim SM, Nyman URO, Semba CP, et al. True lumen obliteration in complicated aortic dissection: endovascular treatment. *Radiology.* 1996;201:161-6.
16. Chung JW, Elkins C, Sakai T, et al. True-lumen collapse in aortic dissection: part I. Evaluation of treatment methods in phantoms with pulsatile flow. *Radiology.* 2000;214:87-98.
17. Chung JW, Elkins C, Sakai T, et al. True-lumen collapse in aortic dissection: part II. Evaluation of treatment methods in phantoms with pulsatile flow. *Radiology.* 2000;214:99-106.
18. Shimono T, Kato N, Tokui T, et al. Endovascular stent-graft repair for acute type A aortic dissection with an intimal tear in the descending aorta. *J Thorac Cardiovasc Surg.* 1998;116:171-3.
19. Kato M, Bai HZ, Sato K, et al. Determining surgical indications for acute type B dissection based on enlargement of aortic diameter during the chronic phase. *Circulation.* 1995;92(suppl):II107-12
20. Miller DC, Stinson EB, Oyer PE, et al. Operative management of aortic dissections. Experience with 125 patients over a sixteen-year period. *J Thorac Cardiovasc Surg.* 1979;78:365-82.