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Complicated Acute Type B Dissection: Is Surgery Still the Best Option?

A Report From the International Registry of Acute Aortic Dissection

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Objectives Impact on survival of different treatment strategies was analyzed in 571 patients with acute type B aortic dissection enrolled from 1996 to 2005 in the International Registry of Acute Aortic Dissection.

Background The optimal treatment for acute type B dissection is still a matter of debate.

Methods Information on 290 clinical variables were compared, including demographics; medical history; clinical presentation; physical findings; imaging studies; details of medical, surgical, and endovascular management; in-hospital clinical events; and in-hospital mortality.

Results Of the 571 patients with acute type B aortic dissection, 390 (68.3%) were treated medically, 59 (10.3%) with standard open surgery and 66 (11.6%) with an endovascular approach. Patients who underwent emergency endovascular or open surgery were younger (mean age 58.8 years, $p < 0.001$) than their counterparts treated conservatively, and had male preponderance and hypertension in 76.9%. Patients submitted to surgery presented with a wider aortic diameter than patients treated by interventional techniques or by medical therapy (5.36 ± 1.7 cm vs. 4.62 ± 1.4 cm vs. 4.47 ± 1.4 cm, $p = 0.003$). In-hospital complications occurred in 20% of patients subjected to endovascular technique and in 40% of patients after open surgical repair. In-hospital mortality was significantly higher after open surgery (33.9%) than after endovascular treatment (10.6%, $p = 0.002$). After propensity and multivariable adjustment, open surgical repair was associated with an independent increased risk of in-hospital mortality (odds ratio: 3.41, 95% confidence interval: 1.00 to 11.67, $p = 0.05$).

Conclusions In the International Registry of Acute Aortic Dissection, the less invasive nature of endovascular treatment seems to provide better in-hospital survival in patients with acute type B dissection; larger randomized trials or comprehensive registries are needed to access impact on outcomes. (J Am Coll Cardiol Intv 2008;1:395–402) © 2008 by the American College of Cardiology Foundation

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Optimal therapeutic management of patients with acute type B dissection is controversial. The effective use of medical therapy and gradual improvement of surgical techniques may have resulted in better prognosis in patients with acute ascending aortic dissection, whereas for many years no substantial therapeutic concept has emerged for improved management of type B dissection. Because of high morbidity and mortality associated with surgery of the descending aorta, medical treatment is generally advocated for uncomplicated cases. However, about 30% of acute type B dissections at clinical presentation are complicated by peripheral vascular ischemia or hemodynamic instability, with a subsequent high risk of spontaneous death (1–9).

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Recently, endovascular techniques have provided additional opportunities in the treatment of descending aortic diseases (10–12). Initial studies demonstrated technical feasibility of endovascular approaches even to tackle the difficult clinical scenario of type B dissection (13–20). We utilize the resources of the IRAD (International Registry of acute Aortic Dissection) to analyze clinical characteristics, imaging findings, and in-hospital outcomes of patients with type B dissection submitted on an emergency basis to operative intervention, both endovascular and conventional open surgery.

Abbreviations and Acronyms

CI = confidence interval

CVA = cerebrovascular accident

OR = odds ratio

Methods

The IRAD is a multinational registry of 20 referral centers in 9 countries designed to provide an unbiased representative population of patients with acute aortic dissection. Full details of the IRAD methods and structure of IRAD have been previously described (21–25). Data were obtained from hospital records of 1,554 patients enrolled in IRAD with acute aortic dissection between 1996 and 2005, 571 of whom were classified as acute type B aortic dissection.

Study population. We examined data on all patients with acute type B aortic dissection enrolled in IRAD who were treated medically or underwent emergency intervention in the acute phase. Acute type B aortic dissection was defined as any spontaneously occurring nontraumatic dissection involving the descending aorta diagnosed within 14 days of symptom onset (26). Patients were identified prospectively at the time of presentation or retrospectively from discharge diagnosis, and from imaging and surgical databases. Diagnosis was based upon confirmatory imaging, surgical visualization, or autopsy. Surgical repair was performed by open thoracotomy with interposition grafting or open surgical excision of the intimal layer while endovascular techniques consisted of stent-graft placement in the descending aorta using commercially available stent-graft or percutaneous fenestration with or without vessel stenting, according to standard methods.

Data collection. Data were collected on standardized forms with standard IRAD definitions. Information on 290 clinical variables was collected including patient demographics; medical history; clinical presentation; physical findings; imaging studies; details of medical, surgical, and endovascular management; in-hospital clinical events; length of stay; and in-hospital mortality. Data forms were reviewed for internal consistency and validity and then scanned electronically into an Access database by the IRAD coordinating center at the University of Michigan.

Statistical analysis. Data are shown as frequencies and percentages, and mean ± SD. Missing data were not defaulted to negative, and denominators reflect only reported cases. Associations of death among nominal variables were compared using the chi-square test or Fisher exact test when appropriate, and among continuous variables using the Student t test.

Because surgery or endovascular treatment was not randomly assigned in this population, potential confounding and selection biases were addressed by developing a propensity score for surgical treatment. Bivariate and multivariate analyses of clinical variables were used to generate the probability of receiving surgery. Multivariate logistic regression was used to determine the independent risk of surgery for in-hospital mortality after maximal adjustment. Initial modeling used variables marginally suggestive of an unadjusted association to in-hospital mortality ($p < 0.20$). Multistage logistic regression analysis modeled the association between in-hospital death and surgery to assess the incremental impact of propensity, multivariate, and both adjustment methods on the odds of death. The probability was also used to divide the population according to quartiles of propensity score and to compare in-hospital mortality in this selected cohort. Odds ratios (ORs), 95% confidence intervals (CIs), and p values are reported. SPSS 14.0 software (SPSS Inc., Chicago, Illinois) and SAS Version 8.2 (SAS Institute, Cary, North Carolina) were used for all analyses.

Results

Demographics and patients' history. Of the 1,554 patients with acute aortic dissection enrolled in IRAD, 571 (36.7%) suffered an acute type B aortic dissection. Of these, 390 patients were treated medically and 125 were managed with either open surgery (59 patients), or an endovascular approach (66 patients). All patients were initially treated with aggressive antihypertensive and anti-impulse therapy; the subset with complicated type B dissection eventually sub-

Table 1. Demographics and History of Patients With Acute Type B Dissection, Treated Medically (390 Patients) and Treated in Emergency (125 Patients)

Variable	Medical Treatment (n = 390)	Emergency Treatment (n = 125): Endovascular (Stent-Graft or Fenestration) (n = 66)	Emergency Treatment (n = 125): Surgery (Interposition Grafting or Fenestration) (n = 59)	p Value*
n (%)	390 (75.7)	66 (12.8)	59 (11.5)	
Demographics				
Age, mean (± SD), yrs	65.5 (13.2)	58.8 (11.1)	61.9 (14.7)	<0.001
Gender, male (%)	254 (65.1)	47 (71.2)	46 (78.0)	0.11
Etiology and patients' history				
Marfan syndrome (%)	6 (1.6)	3 (4.6)	6 (10.5)	—
Hypertension (%)	295 (76.6)	54 (81.8)	41 (70.7)	0.34
Atherosclerosis (%)	150 (39.6)	17 (26.2)	17 (30.4)	0.07
Bicuspid aortic valve (%)	5 (2.1)	0 (0.0)	0 (0.0)	—
Iatrogenic dissection (%)	16 (4.5)	1 (1.5)	0 (0.0)	—
Prior aortic dissection (%)	23 (6.1)	4 (6.2)	10 (17.9)	—
Prior aortic aneurysm (%)	69 (18.2)	8 (12.3)	16 (28.6)	0.07
Diabetes (%)	21 (5.6)	4 (6.2)	6 (10.9)	—
Prior cardiac surgery (%)	67 (18.4)	11 (17.2)	14 (25.0)	0.47

*Overall p value for the 3 groups; — = numbers too small for p value.

jected to emergency care were younger than those treated with medical therapy alone, with a mean age of 58.8 years with stent-graft treatment, and 61.9 years with open surgery versus 65.5 years for the remainder ($p < 0.001$). Male patients were preponderant among cases with complicated dissection (Table 1). No significant difference was observed with respect to etiology of dissection; however, even though the small number does not allow statistical significance, in 15 patients with Marfan syndrome and type B dissection, 9 (60%) were considered complicated during the acute phase and received endovascular or open surgical treatment.

Clinical presentations, signs, and diagnostic imaging results. Pain characteristics of patients submitted to emergency treatment was described as worst ever, migrating and with abdominal location (Table 2). Most patients were hypertensive on admission, but symptoms associated with malperfusion, such as limb and visceral ischemia, were more common in patients treated by percutaneous fenestration ($p = 0.001$). Initial diagnostic tools, such as chest X-ray or electrocardiogram, did not reveal significant difference between stable and unstable patients. In patients who underwent endovascular treatment, an angiographic or magnetic resonance imaging evaluation of the thoracic aorta was used more often than in patients treated medically or with conventional surgery ($p = 0.01$ and $p < 0.001$, respectively). Clear localization of the entry site in the descending aorta ($p < 0.001$) and involvement of abdominal vessels ($p = 0.02$) were more common in patients treated with endovascular techniques. The widest aortic diameter (5.36 ± 1.7 cm) was observed in patients subjected to open surgery, while the endovascular group (4.62 ± 1.3 cm) and the medically treated patients (4.47± 1.4 cm) had smaller aortic diameters ($p = 0.003$).

Indications for treatment and treatment modalities (surgical and endovascular). The 59 open surgical procedures included interposition grafting in 56 patients and surgical fenestration in the remaining 3 by open thoracotomy. Patients submitted to open surgery were treated early compared with patients subjected to endovascular techniques (81.6 ± 114.9 h vs. 217.0 ± 191.6 h, $p < 0.001$) (Table 3). In the open surgery subset of patients, the most common reason for treatment was extension of dissection (47%, $p = 0.003$), but a significant proportion also had recurrent and refractory pain (22.0% and 15.3%, respectively), visceral ischemia 18.6%, and limb ischemia 11.9% (Table 3). Endovascular techniques consisted of stent-graft placement in the descending aorta in 43 patients and percutaneous fenestration in 23 patients. The most frequent reasons for treatment were recurrent (46.3%) or refractory pain (19.5%) in the stent-graft group while limb (42.9%) and visceral ischemia (42.9%) were the most common indications for patients treated with percutaneous fenestration. However, extension of dissection was seen as a frequent indicator of disease progression and instability in the endovascular stent-graft and fenestration groups (11 [26.8%] and 2 [9.5%] patients, respectively).

In-hospital complications and mortality. In-hospital complications occurred in 21% of patients subjected to an endovascular technique and in 40% of patients undergoing open interposition grafting or fenestration ($p = 0.04$) (Table 4). Acute renal failure and cerebrovascular accident (CVA) were frequent complications in both groups. Conversely,

Table 2. Clinical Presentations, Signs, and Diagnostic Imaging Results

Variable	Medical Treatment (n = 390)	Emergency Treatment: Endovascular (Stent-Graft or Fenestration) (n = 66)	Emergency Treatment: Surgery (Interposition Grafting or Fenestration) (n = 59)	p Value
Clinical presentations and signs				
Pain severity (%)				
Mild	25 (7.8)	0 (0.0)	0 (0.0)	—
Severe	236 (73.3)	31 (59.6)	34 (72.3)	0.13
Worst ever	61 (18.9)	21 (40.4)	13 (27.7)	0.002
Abrupt onset of pain (%)	323 (85.9)	56 (88.9)	49 (86.0)	0.81
Migrating pain (%)	64 (17.7)	25 (38.5)	7 (13.0)	<0.001
Abdominal pain (%)	126 (34.2)	35 (53.8)	22 (39.3)	0.01
Leg pain (%)	27 (7.4)	12 (19.0)	6 (11.5)	—
Presenting hemodynamics (%)				
Hypertension	269 (70.8)	50 (76.9)	26 (46.4)	<0.001
Shock	12 (3.2)	0 (0.0)	3 (5.0)	—
Neurological signs and symptoms (%)				
CVA	9 (2.3)	0 (0.0)	1 (1.7)	—
Coma/altered consciousness	10 (2.7)	2 (3.1)	3 (5.3)	—
Signs of malperfusion (%)				
Ischemic spinal cord damage	8 (2.1)	0 (0.0)	4 (6.9)	—
Mesenteric ischemia/infarction (pre-op)	11 (3.1)	8 (12.3)	7 (13.7)	—
Acute renal failure (pre-op)	45 (12.6)	12 (18.5)	3 (5.7)	0.11
Limb ischemia (pre-op)	14 (3.9)	14 (21.5)	8 (15.7)	—
Any pulse deficit	56 (16.1)	12 (20.3)	11 (20.0)	0.60
Any of the above signs of malperfusion	64 (18.4)	25 (39.1)	15 (29.4)	0.001
Diagnostic imaging results (%)				
Chest X-ray				
Pleural effusion	62 (17.9)	10 (17.2)	8 (14.8)	0.86
Wideness of the mediastinum	178 (49.7)	26 (44.8)	36 (64.3)	0.08
Electrocardiogram				
Normal	119 (31.7)	26 (41.9)	18 (31.0)	0.27
Nonspecific ST-T changes	163 (45.8)	17 (28.3)	21 (38.2)	0.03
New Q-wave/ST-segment elevations	6 (1.7)	0 (0.0)	5 (9.3)	—
Low voltage	6 (1.8)	0 (0.0)	1 (1.9)	—
Findings on diagnostic imaging				
Number of imaging studies, mean (SD)	1.94 (0.8)	2.63 (1.0)	2.02 (0.7)	<0.001
TEE (%)	238 (69.2)	42 (65.6)	32 (65.3)	0.75
CT (%)	370 (94.9)	60 (90.9)	55 (93.2)	—
MRI (%)	92 (23.6)	25 (37.9)	9 (15.3)	0.01
AG (%)	72 (20.9)	43 (66.2)	21 (38.9)	<0.001
Periaortic hematoma (%)	61 (17.1)	10 (16.9)	14 (25.0)	0.35
Site of intimal tear (%)				
Arch	25 (8.4)	5 (8.3)	4 (8.0)	—
Descending	104 (34.8)	40 (66.7)	12 (24.0)	<0.001
Multiple	8 (2.7)	6 (10.0)	2 (4.0)	—
Abdominal vessel involvement (%)	121 (31.1)	32 (48.5)	18 (30.5)	0.02
Widest diameter of descending aorta, mean ± SD (cm)	4.47 (1.4)	4.62 (1.3)	5.36 (1.7)	0.003

AG = angiography; CT = computed tomography; CVA = cerebrovascular accident; MRI = magnetic resonance imaging; TEE = transesophageal echocardiography.

paraplegia was observed in 3 patients treated with open surgery, and 1 patient each after stent-graft and fenestration. Relief of visceral and limb ischemia was observed in 9 of 18 patients subjected to percutaneous fenestration, in 16 of 17 patients after stent-graft, and in 4 of 14 patients after conventional open surgery (Tables 3 and 4). In-hospital

Table 3. Treatment: Timing and Indications

Variable	Endovascular			
	With Fenestration Only ± Bare Stent (n = 23)	With Stent-Graft Placement in Aorta (n = 43)	Surgical With Interposition Grafting or Fenestration (n = 59)	p Value
Hours from diagnosis to treatment, mean (SD)	36.9 (38.6)	217.0 (191.6)	81.6 (114.9)	<0.001
Hours from treatment to discharge, mean (SD)	955.1 (2,307.9)	342.9 (213.4)	661.0 (744.8)	0.15
Reason for treatment (%)				
Recurrent pain	3 (14.3)	19 (46.3)	13 (22.0)	0.008
Refractory pain	3 (14.3)	8 (19.5)	9 (15.3)	—
Limb ischemia	9 (42.9)	8 (19.5)	7 (11.9)	—
Visceral ischemia	9 (42.9)	9 (22.0)	11 (18.6)	0.08
Extension of dissection	2 (9.5)	11 (26.8)	28 (47.5)	0.003
Refractory hypertension	4 (19.0)	8 (19.5)	8 (13.6)	—

mortality was significantly higher after open surgery (interposition grafting and open fenestration, 20 of 59 patients, 33.9%) than after endovascular treatment (stent-graft placement and percutaneous fenestration, 7 of 66 patients, 10.6%, p = 0.002).

After multivariate adjustment, surgery versus endovascular treatment in patients with complicated acute type B aortic dissection was independently associated with in-hospital mortality (OR: 3.89; 95% CI: 1.27 to 11.91; p = 0.02) (Table 5). In multistage logistic regression, the association between surgery and in-hospital mortality remained significant with propensity adjustment alone and multivariate adjustment including propensity score. Furthermore, quartiles 2 and 3 (Fig. 1) of propensity matched quartiles were used for further analysis because of the balance of surgical and endovascular patients in this group. Mortality was significantly higher in patients treated with surgery versus patients treated with endovascular therapy (43.8% vs. 6.9%, p = 0.006). Patients treated with stent-graft placement in the descending aorta showed the lowest mortality (4 of 43 patients, 9.3%), which is similar to the mortality of patients treated medically (34 of 390 patients, 8.7%). CVA and persistent visceral ischemia were the main causes of death after stent-graft placement and fenestration, while aortic rupture was the most frequent cause of death in patients submitted to open surgery, reported in 13 of 19 patients (Fig. 2). Kaplan-Meier overall in-hospital survival estimates were significantly better for medical and endovascular patients with respect to patients submitted to open surgery (Fig. 3) (medical vs. surgical p < 0.001, endovascular vs. surgical p = 0.001).

Discussion

The appropriate treatment strategy for descending aortic dissection has long been a matter of debate and continues to be a challenge. There is a general agreement that patients with an initially uncomplicated type B aortic dissection should not receive open surgery but rather medical therapy focusing on beta-blockers to decrease the force of cardiac contraction on the aortic wall and reducing blood pressure in patients with aortic medial disease (27,28). Meanwhile,

Table 4. In-Hospital Complications and Mortality of Repair of the Descending Aorta by Percutaneous Techniques (Stent-Graft or Fenestration, 66 Patients), and Open Surgical Techniques (Surgical Interposition Grafting or Fenestration, 59 Patients)

Variable	Endovascular (66 Patients) With Stent-Graft Placement in Aorta or Fenestration	Surgical (59 Patients) With Interposition Grafting or Fenestration	p Value
In-hospital complications (post-treatment) (%)			
CVA	2 (3.4)	4 (9.1)	0.40
Coma	1 (1.7)	2 (4.5)	0.58
Spinal cord ischemia	2 (3.4)	3 (6.8)	0.65
Myocardial infarction	1 (1.8)	1 (2.6)	>0.99
Mesenteric ischemia/infarction	4 (7.4)	2 (4.9)	0.70
Acute renal failure	4 (7.4)	8 (19.0)	0.09
Limb ischemia	2 (3.6)	2 (5.0)	>0.99
Any of the above complications	11 (20.8)	16 (40.0)	0.04
Mortality (%)	7 (10.6)	20 (33.9)	0.002

CVA = cerebrovascular accident.

Table 5. Association Between Surgery and In-Hospital Mortality in Patients With Acute Complicated Type B Aortic Dissection: Effect of Multivariate Adjustment (Endovascular Treatment in the Reference Group)

Model	Odds Ratio	95% CI	p Value
Unadjusted	4.25	1.64–11.00	0.003
Multivariate adjustment*	3.89	1.27–11.91	0.02
Propensity†	3.46	1.25–9.62	0.02
Propensity and multivariate adjustment	3.41	1.00–11.67	0.05

*Surgery/endovascular, female gender, age ≥65 years, chest/back pain, abnormal aortic contour, periaortic hematoma, malperfusion; †age ≥65 years, female gender, site of intimal tear (descending), migrating pain, abnormal aortic contour, treatment with beta-blockers or vasodilators.
CI = confidence interval.

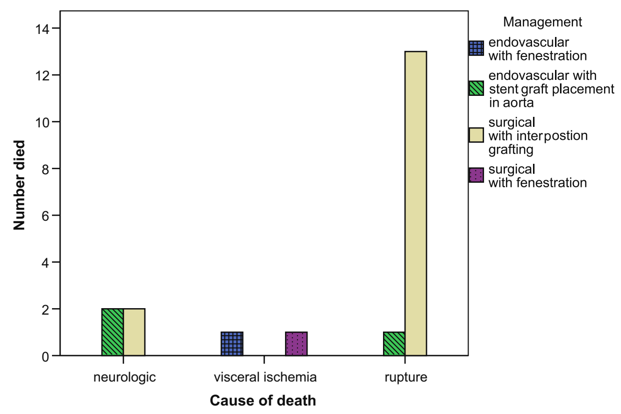

Figure 2. Cause of Death by Management

rapid diagnosis, intensive monitoring, and aggressive blood pressure management are factors likely to improve outcome. However, in about one-third of patients, specific initial findings such as refractory hypertension, recurrent pain, or malperfusion indicate instability, which may require a more aggressive approach (4). Unfortunately, despite significant improvement in anesthesia, surgical techniques, and postoperative care, mortality of emergent open surgical repair of acute type B dissection remains high (25% to 50%) in many reports, and only a few single-center series have reported more favorable results (8,9).

Recently, the advent of endovascular techniques has provided new therapeutic options to the treatment of thoracic aortic diseases (13,14). Initial series and subsequent multicenter trials demonstrated technical feasibility and a low rate of complications even in high-risk patients with type B dissection unfit for open surgery (11,12). First applied in the treatment of abdominal and thoracic aneurysm, results of stent-graft treatment on thoracic aortic dissection showed the potential for improved survival with respect to open surgery, especially in unstable patients with impending rupture. However, a direct comparison between stent-graft and conventional open surgery is scarce. The IRAD database offers a unique opportunity to analyze outcomes in large numbers of consecutive patients treated for aortic dissection in 20 referral centers around the world. The IRAD analysis, which reflects the "real-word" scenario, supports the premise of potential advantages in survival of endovascular compared with open surgical strategies. While endovascular reconstruction of complicated type B dissection lowered short-term mortality to the level of uncomplicated type B dissection with medical treatment, conventional surgery confirmed the high mortality associated with the open approach. Of course, since our study is not randomized, part of this association may be related to selection bias in treatment modality and may reflect different treatment strategy in different institutions. It is impor-

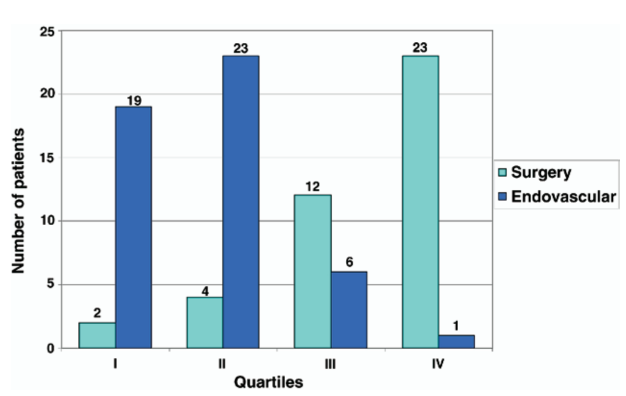

Figure 1. Propensity-Matched Quartiles

In quartiles 1 and 4, the patients are less well matched and are treated predominantly with endovascular therapy in quartile 1 and surgery in quartile 2. Quartiles 2 and 3 are well matched and balanced with regard to therapy (16 surgery and 29 endovascular therapy).

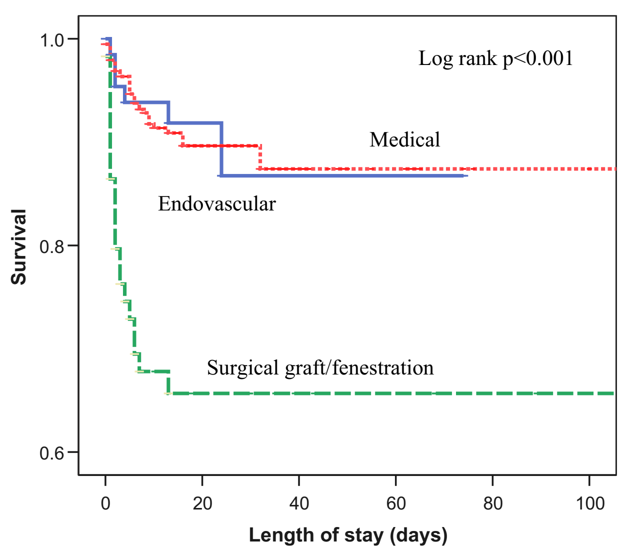

Figure 3. In-Hospital Kaplan-Meier Mortality Estimates by Management

Table 6. Mortality for Combined Quartile 2 and Quartile 3

Models	Surgery 16 (35.6%)	Endovascular 29 (64.4%)	p Value
Mortality	7 43.8%	2 6.9%	0.006

tant to note that in the first years of IRAD enrollment (1996 to 2000), stent-graft treatment was possible only in few referral centers; therefore, it was not reflecting of common practice at community hospitals. Nowadays technical evolution and wider diffusion of aortic stent-graft allow immediate emergency treatment of complicated type B dissection in many centers. On the contrary, in the first years of IRAD, the extended period (from 4 to 7 days) necessary for providing a custom-made stent-graft may have contributed to clinical selection bias. Patients treated with conventional surgical approach had a widest aortic diameter and periaortic hematoma and were treated earlier than patients submitted to endovascular repair, suggesting a subset of patients at a greatest risk. However, potential confounding and selection biases were minimized by developing a propensity score for surgical treatment to balance the covariates in the surgical and endovascular groups. After propensity adjustment alone and propensity with regression adjustment, the point estimate remained significant for an increased mortality with open surgery versus endovascular treatment. Furthermore, when evaluating mortality in quartiles 2 and 3, which represents a balanced treatment and covariate mix, mortality is highest in the surgically treated cohort (Table 6). There remain methodological concerns when using propensity and regression adjustments, which are only as "good" as the measured covariates and the decision to perform urgent open surgery versus endovascular therapy may not be easily captured. The evolution of stent-grafts to cover the primary tear and expanded indications for surgery from centers around the world make heterogeneity between surgical versus endovascular indications a significant issue. Nonetheless, propensity with covariate adjustment attempts to minimize this selection bias.

Imaging modalities have evolved in recent years to allow more rapid, detailed, and noninvasive diagnosis in aortic dissection; nevertheless, from 390 patients deemed stable and treated medically, 34 died during in-hospital course, emphasizing how recognition of an unstable condition remains a challenge. Malperfusion from aortic branch-vessel obstruction is one of the most important causes of morbidity and mortality in type B dissection, with mortality rate for patients with compromised visceral perfusion ranging from 43% to 50% (29). The mechanisms may involve a static narrowing of the vessel lumen by means of aortic wall hematoma or dynamic obstruction by means of the dissection flap prolapsing into the side branch orifice. Surgical fenestration, despite a wide array of open surgical strategies, showed a high mortality even in recent series (29–32). Because of more rapid access and limited blood loss, percutaneous techniques provided better results, with overall technical success exceeding 90%, and 30-day mortality of 25% (33–35). In the series reported from IRAD, mortality of patients submitted to endovascular fenestration was very low (3 of 23 patients, 13%), and in all cases the cause of death was determined by persistent visceral ischemia despite the technical success of fenestration. The purpose of both surgical and percutaneous fenestration techniques is to create a communication between the 2 aortic lumens in order to equalize pressure and flow in both of the lumens and in their branch vessels. However, both intimal flap excision and enlargement of re-entry site by balloon inflation may fail to stabilize for aortic rupture or late lumen dilation (36). Conversely, by the physiologic effect of stent-graft closure of the entry site, flow is directed exclusively toward the true lumen improving branch vessel perfusion with a less traumatic approach. In the present series, a relief of visceral ischemia was observed in 16 of 17 patients with malperfusion syndrome submitted to stent-graft placement, in 9 of 18 treated with percutaneous fenestration, and in just 4 of 14 patients treated with open surgery.

Study limitations. Some considerations are important in interpreting the results of this study. First, the IRAD cohort is referred to patients treated at centers specialized in aortic disease, and therefore may not reflect management of patients treated at community hospitals. Second, in IRAD, patient entries were not randomized to a pre-determined treatment strategy and rather reflect a retrospective observation, and results may partially be related to selection bias. Furthermore, even after maximal adjustment with the aid of propensity and multivariate models, the full clinical picture that determines the decision for surgery versus endovascular therapy may not be fully adjusted for. Third, as all retrospective observational studies, the database is subject to referral and ascertainment bias and information on complications and cause of death may reflect different data interpretation.

Conclusions

Complicated acute and subacute type B dissection remains a clinical challenge. Patients with complicated type B dissection and signs of clinical instability at presentation have a high risk of in-hospital mortality. With recognition of clinical and imaging findings of instability, the choice of endovascular stent-graft placement may offer a strategy to optimize management and improve in-hospital prognosis. In IRAD, endovascular treatment seems to offer better short-term outcome in terms of mortality and associated complications than open surgical repair. Long-term follow-up is necessary to assess late outcomes and establish the ultimate treatment strategy.

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Key Words: aorta ■ survival ■ surgery ■ stent-graft.

APPENDIX

For a complete list of investigators, please see the online version of this article.