

# Painless Type B Aortic Dissection

## Insights From the International Registry of Acute Aortic Dissection

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### Abstract

**Introduction:** The classical presentation of a patient with Type B acute aortic dissection (TBAAD) is characterized by severe chest, back, or abdominal pain, ripping or tearing in nature. However, some patients present with painless acute aortic dissection, which can lead to a delay in diagnosis and treatment. We utilized the International Registry on Acute Aortic Dissections (IRAD) database to study these patients. **Methods:** We analyzed 43 painless TBAAD patients enrolled in the database between January 1996 and July 2012. The differences in presentation, diagnostics, management, and outcome were compared with patients presenting with painful TBAAD. **Results:** Among the 1162 TBAAD patients enrolled in IRAD, 43 patients presented with painless TBAAD (3.7%). The mean age of patients with painless TBAAD was significantly higher than normal TBAAD patients (69.2 versus 63.3 years,  $P = 0.020$ ). The presence of atherosclerosis (46.4% versus 30.1%,  $P = 0.022$ ), diabetes (17.9% versus 7.5%;  $P = 0.018$ ), and other aortic diseases (8.6% versus 2.3%,  $P = 0.051$ ), such as prior aortic aneurysm (31% versus 18.8%  $P = 0.049$ ) was more common in these pa-

tients. Median delay time between presentation and diagnosis was longer in painless patients (median 34.0 versus 19.0 hours;  $P = 0.006$ ). Dissection of iatrogenic origin (19.5% versus 1.3%;  $P < 0.001$ ) was significantly more frequent in the painless group. The in-hospital mortality was 18.6% in the painless group, compared with an in-hospital mortality of 9.9% in the control group ( $P = 0.063$ ). **Conclusion:** Painless TBAAD is a relatively rare presentation (3.7%) of aortic dissection, and is often associated with a history of atherosclerosis, diabetes, prior aortic disease including aortic aneurysm, and an iatrogenic origin. We observed a trend for increased in-hospital mortality in painless TBAAD patients, which may be the result of a delay in diagnosis and management. Therefore, physicians should be aware of this relative rare presentation of TBAAD.

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### Key Words

Aortic dissection · Painless



**Table 1.** Demographics and Patient History

Category	Type B		<i>p</i> -value
	Not Painless (%)	Painless (%)	
Demographics			
Patients ( <i>n</i> )	1119	43	
Age (mean±SD)	63.3±14.1	69.2±10.8	0.020
Gender – male	773 (66.9)	25 (58.1)	0.234
Race – non-white	913 (82.7)	35 (85.4)	0.657
Hypertension	918 (80.2)	37 (86.0)	0.348
Diabetes	85 (7.5)	7 (17.9)	0.018
Marfan syndrome	41 (3.6)	0 (0.0)	0.396
Atherosclerosis	339 (30.1)	20 (46.5)	0.022
Known aortic aneurysm	212 (18.8)	13 (31.0)	0.049
Prior AAD	90 (8.0)	3 (7.3)	1.000
Aortic valve disease	69 (6.1)	4 (10.3)	0.302
Other aortic disease	23 (2.3)	3 (8.6)	0.051
Family history of aortic disease	48 (11.6)	1 (10.0)	1.000
Prior cath/angiography	98 (10.3)	6 (21.4)	0.061
Prior CABG	49 (4.4)	1 (2.6)	1.000
Prior surgery for aortic aneurysm/dissection	145 (13.1)	6 (14.6)	0.775
Intramural hematoma	131 (11.7)	6 (14.0)	0.654
Iatrogenic AAD	14 (1.3)	8 (19.5)	<0.001
Hours presentation to diagnosis (median)	19.0 (12.7–25.3)	34.0 (22.8–72)	0.006

AAD indicates acute aortic dissection; CABG, coronary artery bypass grafting.

## Introduction

The classical presentation of a patient with acute aortic dissection (AAD) is characterized by severe chest, back, or abdominal pain. However, previous reports showed that between 5 and 17% of all dissection patients present with painless acute aortic dissections [1,2]. As expected, atypical presentation can lead to a delay in diagnosis, which is associated with higher mortality [3,4]. Painless Type B acute aortic dissection (TBAAD) does not mean that these patients have uncomplicated dissections, as they still can develop malperfusion and aortic rupture [1,2]. Immediate adequate medical treatment is essential and has to include optimal blood pressure control in order to reduce shear stress and limit the propagation of the dissection. Therefore, it is important to recognize these patients at the earliest

**Table 2.** Presenting Symptoms/Signs of Aortic Dissection

Category	Type B		<i>p</i> -value
	Not Painless (%)	Painless (%)	
Presenting hypertensive	763 (68.8)	17 (45.9)	0.003
Presenting hypotensive	80 (7.3)	4 (10.0)	0.532
Mean systolic blood pressure	166.8	147.2	0.003
Mean systolic blood pressure	91.44	85.0	0.095
Presented with pulse deficits	173 (18.6)	2 (8.3)	0.286
Shock	11 (1.0)	1 (2.7)	0.327
Syncope	28 (2.5)	4 (10.3)	0.020
Cerebrovascular accident	14 (1.3)	2 (5.1)	0.100
Ischemic peripheral neuropathy	31 (2.8)	0 (0)	0.622
Spinal cord ischemia	31 (2.8)	0 (0)	0.622
Limb ischemia	101 (9.3)	0 (0)	0.043
Acute renal failure	161 (14.8)	8 (20.0)	0.364

possible stage. The aim of the current study was to assess the clinical characteristics, diagnostics, treatment, and outcomes of patients with painless TBAAD.

## Methods

### Patient Selection

The International Registry of Acute Aortic Dissection (IRAD) is an ongoing multinational registry designed to provide a representative population of patients with acute aortic dissection. The rationale, design, and methods of IRAD have been previously published [5]. The diagnosis of TBAAD was based on clinical symptoms, diagnostic imaging, direct visualization during surgery, and/or postmortem examination. Patients were enrolled at diagnosis or retrospectively. We analyzed all TBAAD patients enrolled in IRAD from January 1996 to July 2012 and selected those patients presenting without any pain symptoms. Demographics, medical history, presenting symptoms, management, and outcomes were compared between patients presenting with and without pain.

### Statistical Analysis

Categorical variables were compared for both groups utilizing the chi-squared tests and Fisher's exact tests. Student's *t*-test was used to analyze continuous variables and the non-parametric test of medians to analyze non-normally distributed variables. A *p*-value <0.05 was considered significant. Kaplan-Meier survival curves were plotted to estimate survival. Data analysis was performed with the use of SPSS statistical analysis software (SPSS Inc, Chicago, Ill).

**Table 3.** Imaging

Category	Type B		<i>p</i> -value
	Not Painless (%)	Painless (%)	
CXR done	1002 (86.7)	37 (86.0)	0.905
CXR normal	275 (28.1)	8 (21.6)	0.389
CXR showed abnormal aortic contour	397 (43.9)	16 (47.1)	0.713
CXR showed abnormal cardiac contour	141 (15.8)	2 (6.2)	0.211
ECG done	1087 (94.0)	36 (83.7)	0.006
ECG normal	409 (38.2)	10 (28.6)	0.250
TEE done	574 (50.4)	20 (47.6)	0.724
CT done	1110 (96.2)	34 (82.9)	<0.001
CT Normal	6 (0.6)	1 (3.2)	0.184
Angiography	207 (18.2)	9 (24.3)	0.345
MRI done	185 (16.7)	10 (27.8)	0.081
Periaortic hematoma identified on any imaging study	150 (14.5)	6 (16.7)	0.718
Most proximal extension:			
Aortic arch	263 (22.8)	7 (16.3)	0.318
Left subclavian artery	577 (49.9)	19 (44.2)	0.461
Descending	280 (24.2)	13 (30.2)	0.368
Largest diameter of descending aorta (median)	4.0 (3.5–5.0)	3.6 (3.0–4.7)	0.137

CXR indicates chest X-ray; ECG, electrocardiograph; TEE, transesophageal echocardiography; CT, computed tomography; MRI, magnetic resonance imaging.

## Results

Among the 1162 TBAAD patients enrolled in IRAD, 43 patients presented with painless TBAAD (3.7%). The mean age of patients with painless TBAAD was significantly higher than normal TBAAD patients (69.2 versus 63.3 y; *p*-value = 0.020, [Tables 1–3](#)). Painless patients presented more often with a history of diabetes, (17.9% versus 7.5%; *P* = 0.018), atherosclerosis (46.4% versus 30.1%; *P* = 0.022), and were more often diagnosed with a known prior aortic aneurysm (31% versus 18.8%; *P* = 0.049). Painless patients presented less frequently with hypertension (45.9% versus 68.8%; *P* = 0.003) and with a lower mean systolic blood

**Table 4.** Management

Category	Type B		<i>p</i> -value
	Not Painless (%)	Painless (%)	
Medical management	754 (65.2)	28 (65.1)	0.988
Surgical management	137 (11.9)	6 (14.0)	0.676
Endovascular management	251 (21.7)	9 (20.9)	0.903
In-hospital mortality	114 (9.9)	8 (18.6)	0.063
Medical management	57 (7.8)	3 (10.7)	0.468
Surgery	25 (18.2)	3 (50.0)	0.089
Endovascular	31 (12.4)	2 (22.2)	0.320

pressure (mean 147.28 mm/Hg versus 166.8.2 mm/Hg; *P* = 0.003). Syncope was more represented in the painless group (10.3% versus 2.5%; *P* = 0.020).

## Diagnostics

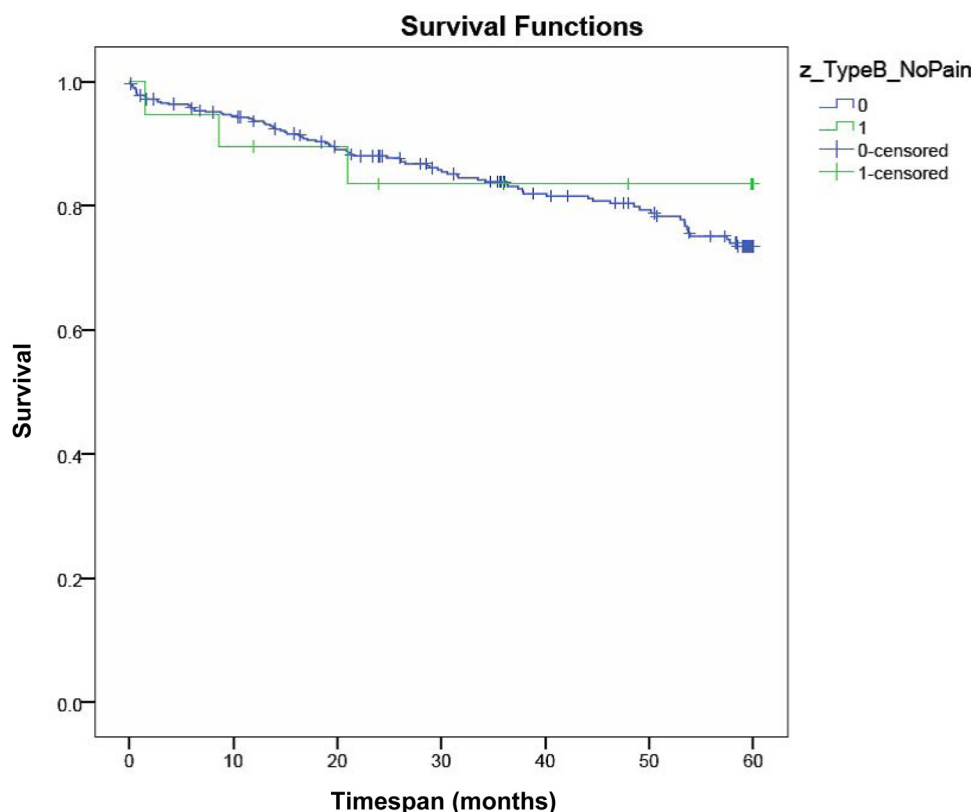
As might be expected, the mean time interval between admission and diagnosis of aortic dissection was 34.0 hours among painless patients, as compared to 19.0 hours in the control group (*P* = 0.006). Computed Tomographic Angiography (CTA) was more often used as the primary diagnostic modality in the painful group (96.2 versus 82.9%, < 0.001). Previous angiography was more frequently performed in the painless group and these patients also had significantly more iatrogenic dissections (19.5 versus 1.3%; *P* < 0.001). The iatrogenic cause in the painless group was: Percutaneous transluminal coronary angioplasty (PCTA) in three patients (37.5%), cardiac surgery in three patients (37.5%), and unknown cause in two patients (25%).

## Management and Outcome

Almost two-thirds of the patients were treated medically, which did not differ between groups. (65.2 versus 65.1%; *P* = 0.988; [Table 4](#).) Surgical and endovascular therapies were equally used in approximately 35% of each group. In-hospital mortality was 18.6% in the painless group, compared with an in-hospital mortality of 9.9% in the control group (*P* = 0.063). There were no statistically significant differences in complications between both groups. Kaplan-Meier survival curves did not demonstrate a significant difference in mortality during five-year follow-up (*P* = 0.960; [Fig. 1](#)).

## Discussion

The most common characteristic of TBAAD presentation is acute pain localized to the chest, abdomen,



**Figure 1.** Kaplan Meier survival curve.

and back. Previous IRAD reports showed that 95.5% of all AAD patients presented with pain [5]. However, in rare instances the presentation of dissection can be atypical and our study showed that 3.7% of all TBAAD patients were painless, in contrast with previous experiences which reported an incidence up to 17% in AAD [1,2]. The lower incidence that we observed could be explained by the fact that, while this study focused only on TBAAD, previous studies focused on painless dissections in general, including a majority of patients with ascending aorta involvement (Type A acute aortic dissection), which makes up for more than 75% of the patient population [1,2]. In addition, IRAD consists of cardiovascular referral centers, specialized in the treatment of aortic dissection, where patients are referred for surgical/endovascular treatment, whereas patients who are thought to be unfit for invasive management will not be transferred to these centers. Typically, transferred patients have more complications, resulting in a relative low incidence in the IRAD database. The true incidence in the population is probably even higher, as an atypical presentation will likely result in a higher risk of death prior to the diagnosis.

The clinical presentation of dissection patients may be diverse, and sudden collapse or an altered state of consciousness have been reported to be the presenting symptom in up to 30% of all patients [6]. This report also included TAAAD patients, which are more prone to develop complications like syncope or alteration in consciousness [7]. Painless AAD, especially concerning the ascending aorta, presents more often with neurological deficits, syncope, and disturbances in consciousness. These complications influence the perception of pain, resulting in a relative high prevalence of Type A dissection in this patient category. As expected, painless Type B dissection patients did not show this clinical pattern since involvement of the head and neck vessels did not occur.

Our study showed that TBAAD painless patients are older at presentation and more often had a history of atherosclerosis. With increasing age, the incidence of painless dissections might rise, as previously reported [1]. In that study, patients who presented at significantly older age, more frequently had a history of cerebrovascular accidents, and some patients had only atypical symptoms such as dyspnea, nausea, and

abdominal fullness. These three atypical clinical signs were not recorded within the IRAD registry, so we can't make any comparison.

The pathological mechanism of painless TBAAD is not well understood and multiple explanations for this phenomenon have been proposed. Our study showed that painless patients present with less hypertension. Due to low blood pressure, the propagation of the dissection might develop relatively slow, thereby reducing the wall stress, which could result in reduction of pain. Alternatively, pain will act as an acute stressor, determining an increased blood pressure. Furthermore, the perception of pain can be modulated as the adventitial layer, the site for aortic innervation, is involved by the dissection or affected by previous interventions. In addition, it is thought that other pathologies, like aneurysmatic enlargement, may influence the ability to sense pain. This possibility is supported by the higher incidence of other aortic disease and previous aortic aneurysms in our study population. Most interestingly, significantly more painless patients had a dissection of iatrogenic origin. Iatrogenic dissections are thought to occur very rarely, with Type A dissections reported in 0.04% of the patients during percutaneous coronary interventions and in 0.12 to 0.16% after cardiac surgery procedures [8–11]. The incidence of TBAAD in these patients is thought to be even lower. During such procedures, analgesics and sedation may alter the patient's perception of pain, increasing the incidence of painless TBAAD in this subset of patients [12].

The in-hospital mortality was 18.9% in the painless group, compared with an in-hospital mortality of 10.3% in the control group ( $P = 0.096$ ). The explanation for this trend is probably 2-fold. First, the painless group tended to present at older age, which is a

condition associated with a higher mortality [13]. Second, the extended delay to diagnosis and treatment, due to the difficulty in diagnosis, may have resulted in a higher mortality.

Although this study represents the first report focusing specifically on TBAAD with absence of pain at presentation, it has some limitations. Previous studies reported a higher incidence and registry data might not reflect the true incidence, since the centers are specialized in aortic dissection and therefore receive many referred patients. Furthermore, many patients may have died from a painless dissection before they were diagnosed and therefore are not registered.

## Conclusion

Painless TBAAD is a relatively rare presentation of aortic dissection and is associated with a history of atherosclerosis, diabetes, iatrogenic origin, and aortic disease like aneurysm. We observed a trend in increased in-hospital mortality rate among painless TBAAD patients, which may be the result of a delay in diagnosis and any type of management due to the absence of classical symptoms. Therefore, physicians should be aware of this relatively rare presentation of TBAAD.

## Conflict of Interest

Possible Conflict of Interest: IRAD is supported by grants from the University of Michigan Health System, Varbedian Fund for Aortic Research, Mardigian Foundation, and Gore Medical Inc (Flagstaff, Ariz).

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