SAS Journal of Surgery
Abbreviated Key Title: SAS J Surg
ISSN 2454-5104
Journal homepage: https://www.saspublishers.com

OPEN ACCESS

Cardiovascular Surgery

Emergency Tirone David Procedure in a Marfanoid Patient with Extensive Aortic Dissection and Severe Aortic Regurgitation: A Case Report

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DOI: https://doi.org/10.36347/sasjs.2025.v11i12.011 | **Received:** 13.10.2025 | **Accepted:** 10.12.2025 | **Published:** 15.12.2025

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Abstract **Case Report**

Background: Acute aortic dissection involving the entire aorta is a life-threatening condition, particularly in patients with Marfanoid features and severe aortic insufficiency. Surgical intervention remains challenging, especially in high-risk individuals with significant comorbidities. ***Case:*** We report the case of a 58-year-old male with Marfanoid features, a history of spontaneous pneumothorax, and chronic smoking (45 pack-years), who presented with acute aortic dissection extending from the ascending aorta to the aortoiliac bifurcation. Preoperative transthoracic echocardiography (TTE) revealed severe aortic insufficiency. The patient underwent successful aortic root replacement using the Tirone David procedure. Postoperative imaging (TTE and CT scans) confirmed a well-positioned aortic root graft, with no evidence of stenosis or regurgitation. ***Conclusion:*** This case demonstrates the efficacy of the Tirone David procedure in managing extensive aortic dissection with aortic insufficiency in high-risk patients, offering durable outcomes and valve preservation.

Keywords: Acute Aortic Dissection, Tirone David Procedure, Valve-Sparing Aortic Root Replacement, Marfanoid Features, Aortic Insufficiency, High-Risk Patient.

INTRODUCTION

Acute aortic dissection is a life-threatening emergency caused by an intimal tear, leading to false lumen formation and risking rupture, malperfusion, or aortic insufficiency. Hereditary connective tissue disorders, such as Marfan syndrome (linked to *FBN1* mutations), predispose individuals to aortic dissection due to weakened aortic media.[1]

The Tirone David procedure, a valve-sparing aortic root replacement (VSARR), offers a durable solution by preserving the native valve while replacing the diseased root [2]. We report the case of a 58-year-old male with Marfanoid features who presented with an extensive acute aortic dissection involving the entire thoracic aorta associated to a severe aoric regurgitation. The patient underwent emergency surgical repair using the Tirone David procedure, with a favorable postoperative outcome. This case underscores the importance of prompt diagnosis and the utility of valve-sparing root replacement techniques in high-risk patients with underlying connective tissue disorders.

CASE REPORT

A 58-year-old male smoker with a history of pneumothorax and prior neglected chest pain presented to the emergency department with acute, intense tearing chest pain for two hours. Vital signs revealed blood pressure asymmetry (127/53 mmHg right arm vs. 115/46 mmHg left arm), a diastolic murmur (grade 3/6, left 3rd intercostal space), and jugular venous distension. Labs were unremarkable except for mild anemia (Hb 11.8 g/dL). Initial EKG showed inferior ST-segment elevations, but coronary angiography ruled out obstructive disease or dissection.

Bedside TTE revealed a dilated aortic root (EF 60%), intimal tear involving the entire aorta (ascending to aortoiliac bifurcation), severe aortic regurgitation, and minimal pericardial effusion.

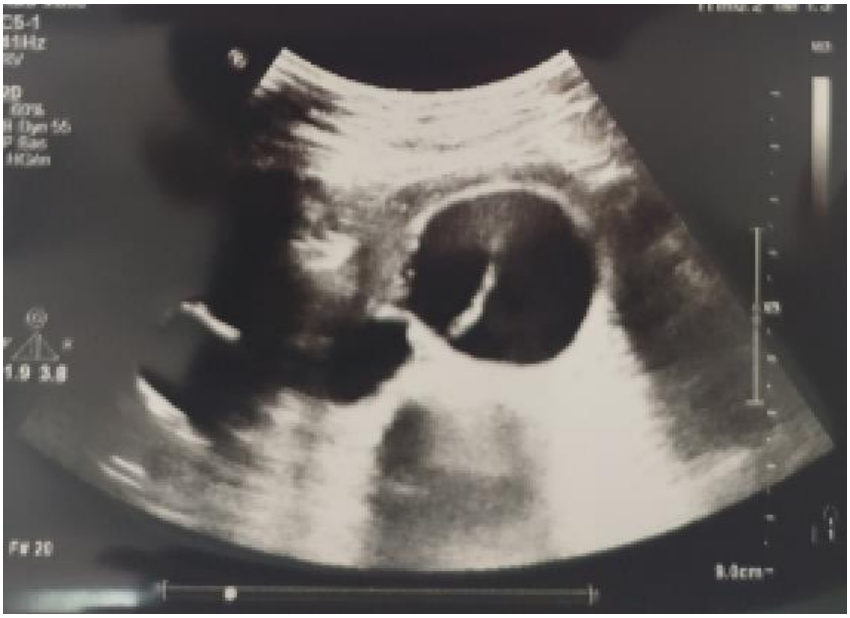

Figure 1: Abdominal ultrasound, transverse section through the abdominal aorta: showing a dissection with a maximal diameter of 38 mm in the infrarenal segment

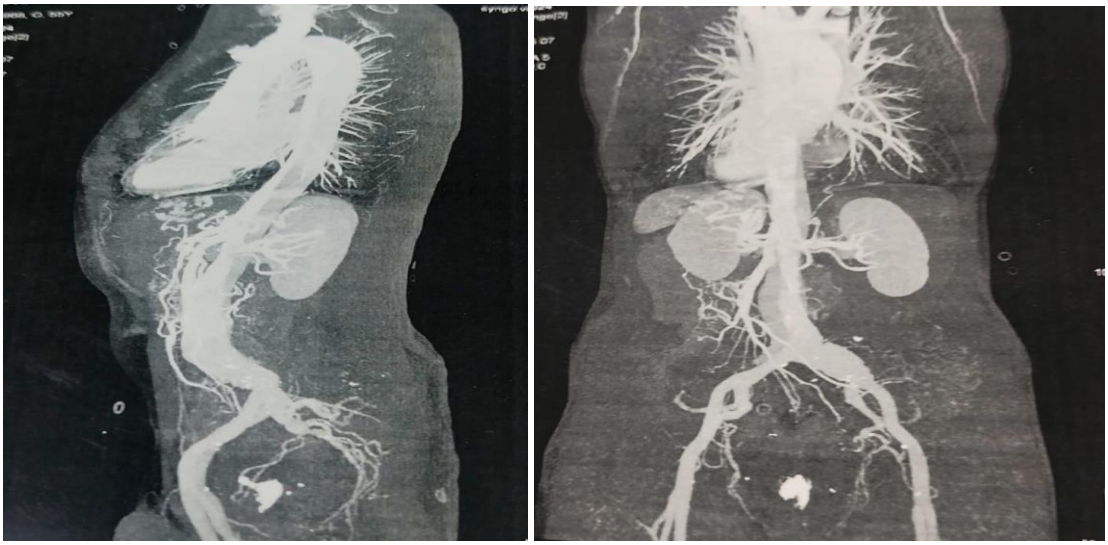

Figure 2: Thoraco-abdominal CT angiography, 3D reconstruction, coronal and sagittal planes: appearance of an aortic dissection involving the ascending aorta, the aortic arch, the descending aorta, as well as the supra-aortic trunks, with no evidence of pericardial effusion

CT angiography confirmed Stanford type A (DeBakey I) dissection (figure). Given the extensive involvement, emergent surgical repair was initiated.

Following anesthetic induction, the patient underwent median sternotomy, revealing a giant "onion-bulb" aortic root aneurysm compressing the heart. Cardiopulmonary bypass was initiated, with initial inadvertent cannulation of the false lumen corrected intraoperatively. The aortic valve, deemed suitable for preservation, was spared, and a 28-mm graft was implanted using U-stitches.

During circulatory arrest with selective cerebral perfusion, the distal aorta was repaired using Dacron graft, reinforced with Teflon felt and biological glue. Coronary ostia were reimplanted, and proximal anastomoses were completed. After de-airing, the cross-clamp was removed, achieving spontaneous sinus rhythm. The patient was successfully weaned from bypass with minimal vasopressor support.

The procedure concluded with sternal closure using steel wires and layered chest wall closure. Hemodynamics remained stable throughout.

Postoperative transthoracic echocardiography (TTE) was performed on day 2, showing normal function of the aortic valve and an intact aortic root tube. The patient's blood pressure was well controlled, and he showed signs of improvement over the following days. A postoperative CT scan of the thoracoabdominal aorta

demonstrated satisfactory graft placement, with no signs of graft leakage or stenosis.

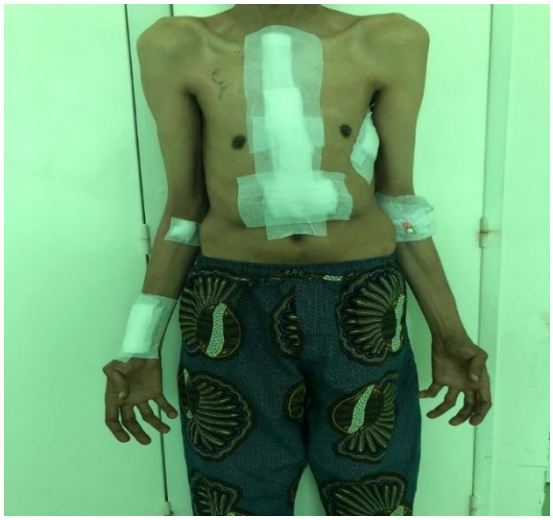

Figure 3 : Postoperative image showing the patient's marfanoid appearance

The patient was discharged on postoperative day 7 with instructions for regular follow-up. Over the subsequent 18 months, the patient was seen regularly in the outpatient clinic for follow-up evaluations. Routine transthoracic echocardiograms and CT scans were performed, showing continued patency of the aortic graft and no evidence of aortic regurgitation or graft stenosis. The tube graft remained stable in place with a favorable outcome.

DISCUSSION

Acute Stanford type A aortic dissection represents one of the most lethal cardiovascular emergencies, with mortality increasing by 1–2% per hour without surgical intervention [3] Early recognition and rapid management are therefore critical. This case illustrates several diagnostic and therapeutic complexities, including misleading EKG findings, extensive aortic involvement, and a probable underlying connective-tissue disorder suggested postoperatively by a marfanoid habitus.

Chest pain with a tearing quality remains the most recognized symptom of aortic dissection, yet atypical presentations or misleading findings can delay diagnosis. In this case, inferior ST-segment elevations initially suggested acute coronary syndrome. Such findings are not uncommon, as coronary malperfusion occurs in up to 10% of type A dissections [4], often resulting from involvement of the right coronary artery. Coronary angiography ruled out obstructive lesions or dissection, enabling redirection toward aortic pathology.

Transthoracic echocardiography was pivotal in demonstrating a dilated aortic root, severe aortic regurgitation, and an extensive intimal flap extending to the aortoiliac bifurcation. TTE remains an important first-line diagnostic tool, particularly in unstable patients, with sensitivity approaching 85% for type A dissections [5]. CT angiography subsequently confirmed DeBakey type I dissection, consistent with guideline recommendations positioning contrast-enhanced CT as the gold standard for stable patients due to its near-perfect sensitivity and specificity [6].

The involvement of the supra-aortic trunks and the absence of pericardial tamponade further guided the risk stratification and surgical planning. Abdominal ultrasound additionally confirmed infrarenal extension, highlighting the dissection's extensive longitudinal propagation.

- ***Underlying connective tissue disorder***

The postoperative observation of a marfanoid appearance raises the possibility of an underlying heritable thoracic aortic disease (HTAD), such as Marfan syndrome or a related fibrillinopathy. Marfan syndrome is associated with aortic root aneurysm, early-onset dissection, and a history of spontaneous pneumothorax—features also present in this patient [7]. Recognition of these phenotypic signs is essential for genetic evaluation, long-term management, and family screening in accordance with contemporary guidelines [8].

- ***Surgical management***

Type A dissection requires emergent open repair, as recommended by both European and American guidelines [6][7]. The patient underwent valve-sparing aortic root replacement, arch reconstruction with Dacron graft, selective cerebral perfusion during circulatory arrest, and reimplantation of coronary ostia. Valve-sparing root surgery is considered appropriate when leaflet quality is preserved, offering long-term durability and reducing the need for lifelong anticoagulation [9,10].

Intraoperative challenges such as inadvertent cannulation of the false lumen represent known risks, particularly in extensive dissections. Immediate correction prevented malperfusion, aligning with recommendations for direct visualization or imaging guidance during cannulation [11].

The absence of significant postoperative complications and successful weaning from cardiopulmonary bypass highlight the effectiveness of the chosen surgical strategy.

- ***Postoperative course and follow-up***

Postoperative TTE confirmed normal aortic valve function and appropriate graft integrity. Early postoperative CT imaging demonstrated correct graft positioning without leakage or stenosis. Blood pressure control—crucial for preventing late complications—was achieved before discharge.

Over an 18-month follow-up period, the patient demonstrated excellent outcomes, with preserved graft patency, absence of aortic regurgitation, and stable dimensions of the reconstructed aortic segments. Long-term surveillance with periodic CT or MRI is essential for patients with extensive repairs or suspected HTAD, in accordance with guideline recommendations [7].

CONCLUSION

This case highlights the successful use of the Tirone David procedure in a 58-year-old patient with extensive aortic dissection and severe aortic insufficiency. aortic dissection should be considered in patients with chest pain and pulse or blood pressure discrepancies, even in the presence of ST-segment elevations The patient's favorable postoperative outcome, as evidenced by normal echocardiographic and CT scan findings, underscores the potential for successful repair in high-risk patients with complex aortic pathology. Long-term imaging surveillance is vital to ensure graft durability and to monitor for late complications.

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