Jurnal Riset Rumpun Ilmu Kedokteran
Volume. 5, Nomor. 1 April 2026
E-ISSN .: 2828-9358; P-ISSN .: 2828-934X, Hal 95-102
DOI: https://doi.org/10.55606/jurrike.v5i1.7946
Tersedia: https://prin.or.id/index.php/JURRIKE

Chimney Thoracic Endovascular Aortic Repair (Tevar) in Stanford Type B Aortic Dissection Patient: First Time Procedure in Manado

Paat Rigel[1], Tamburian Christha[2], Sukanto Wega[3], Tangkilisan Adrian[4], Satriadi Wayan[5*]
[1-4] Divisi Bedah Kardiovaskular Toraks, Departemen Bedah, Fakultas Kedokteran, Universitas Sam Ratulangi, RS Prof. Dr. R. D. Kandou, Manado, Indonesia
[5] Departemen Bedah Fakultas Kedokteran Universitas Sam Ratulangi Manado, Indonesia

Author Correspondence: wayan.satriadi@gmail.com

Abstract. *Aortic dissection is a cardiovascular emergency characterized by a tear in the aortic intima layer and the formation of a false lumen, posing risks of fatal complications such as rupture and organ malperfusion. Stanford type B dissections may be managed conservatively; however, complicated cases require intervention. Thoracic Endovascular Aortic Repair (TEVAR) has emerged as the preferred modality, offering lower perioperative morbidity and mortality compared to open surgery. To report the first TEVAR procedure performed in Manado on a patient with Stanford type B aortic dissection, highlighting the technical approach, operative challenges, and clinical outcomes. A 62-year-old male with a history of hypertension and chronic chest pain was referred following a CT angiography that revealed a Stanford type B aortic dissection with an entry site in the proximal descending aorta. TEVAR was performed with stent-graft placement in zone 2 and a chimney graft to preserve perfusion of the left subclavian artery (LSA). Intraoperative aortography confirmed false lumen exclusion without endoleak. The patient showed significant clinical improvement and recovered without postoperative complications. The procedure was technically and clinically successful, with no major complications. Postoperative evaluation confirmed stable stent position and maintained LSA perfusion. This case demonstrates that TEVAR can be safely implemented in non-tertiary regional hospitals with thorough preparation. The first TEVAR procedure in Manado illustrates that this technique can be an effective solution for complicated type B aortic dissections. This experience marks a milestone in the development of endovascular services in resource-limited settings and may serve as a reference for similar institutions in Indonesia.*

Keywords: *Aortic Dissection; Aortography; Chimney Graft; Stanford Type B; TEVAR.*

1. INTRODUCTION

Aortic dissection is a life-threatening cardiovascular emergency characterized by a tear in the aortic intima layer, allowing blood to enter and separate the tunica media, forming a false lumen.[1,2] This condition can be fatal, as it may lead to aortic rupture, malperfusion of vital organs, or cardiac tamponade.[3] Based on the location of the intimal tear, aortic dissection is classified according to the Stanford system into type A (involving the ascending aorta) and type B (limited to the descending aorta). Aortic dissection is generally associated with risk factors such as chronic hypertension, atherosclerosis, and connective tissue disorders like Marfan syndrome or Ehlers-Danlos syndrome.

Although the incidence is relatively low, approximately 3–6 cases per 100,000 population per year, aortic dissection carries a high mortality rate, particularly if not promptly recognized and treated. Stanford type A dissections require emergency open surgery, while type B dissections are often managed conservatively unless complications arise, such as persistent pain, refractory hypertension, organ malperfusion, progressive aneurysm, or signs of impending rupture.

Naskah Masuk: 27 November 2025; Revisi: 21 Desember 2025; Diterima: 07 Januari 2025; Tersedia: 09 Januari 2026.

In complicated type B dissections, therapeutic strategies have shifted from open surgery to less invasive endovascular interventions. Thoracic Endovascular Aortic Repair (TEVAR) has become the mainstay for managing complicated type B dissections. TEVAR involves the endovascular placement of a stent-graft to seal the intimal tear, halt blood flow into the false lumen, and reduce aortic wall pressure, thereby preventing rupture and progression of the dissection.Compared to open surgery, TEVAR offers advantages such as lower morbidity and mortality rates, shorter hospital stays, and quicker recovery particularly for high-risk or elderly patients.

Advances in stent-graft technology and imaging guidance techniques have expanded the indications for TEVAR, even to cases with complex anatomy and selected type A dissections or complications post-transcatheter aortic valve replacement (TAVR) (Lombardi et al., 2020). Despite these developments, technical challenges remain, including limitations in stent landing zones, the need to preserve perfusion to aortic branch vessels, and ensuring device stability within short aortic segments (Patel et al., 2022). Recent reports underline the importance of careful pre-procedural planning using high-resolution imaging to optimize outcomes and reduce post-TEVAR complications (Huang & Cheng, 2021).

This case report aims to document the successful first TEVAR procedure in Manado, Indonesia, performed on a patient with Stanford type B aortic dissection. This achievement represents a significant milestone in the progression of endovascular interventions in a developing cardiac center. In addition to outlining the technical and clinical aspects of the procedure, this report emphasizes the importance of patient selection, multidisciplinary team coordination, and adequate institutional resource preparedness—factors consistently reported as key determinants in achieving favorable TEVAR outcomes (Sato et al., 2023). It is hoped that this publication will contribute to the establishment and advancement of minimally invasive vascular services in resource-limited regions and serve as a reference for comparable institutions in Indonesia and other developing countries (Rahim et al., 2020).

2. CASE REPORT

A 62-year-old male presented to the Cardiothoracic and Vascular Surgery (CTVS) outpatient clinic at Prof. Dr. R.D. Kandou General Hospital, Manado, on April 9, 2025, with complaints of chest pain persisting since December 2024. The pain was intermittent but had worsened over the past month. The patient described the pain as a "tearing sensation in the chest" radiating to the left side. He denied experiencing shortness of breath, palpitations, syncope, nausea, vomiting, or fever. He had a known history of hypertension for several years

and regularly took amlodipine, bisoprolol, nitroglycerin (Nitrokaf), and candesartan. The patient also had a history of heavy smoking since youth. There was no history of diabetes mellitus or coronary artery disease. No family history of similar conditions was reported.

Physical examination showed the patient in fair general condition, alert and compos mentis. Blood pressure was 140/70 mmHg, pulse rate 80 bpm, respiratory rate 20 breaths/min, body temperature 36.6°C, and pain score (VAS) 4. No significant abnormalities were found on examination of the head, neck, thorax, abdomen, or extremities. Laboratory results revealed leukocytosis (15,250/mm³), hemoglobin 12.5 g/dL, platelets 197,000/mm³, urea 33 mg/dL, creatinine 1.1 mg/dL, normal liver enzymes (SGOT/SGPT), and electrolytes Na/K/Cl at 138/3.9/103 mEq/L.

Echocardiography showed normal heart chamber dimensions, no evidence of left ventricular hypertrophy (LVH), good systolic function with an LVEF of 66%, and normal heart valves without calcification. There were no abnormalities in right ventricular function. Thoracoabdominal CT angiography revealed a Stanford type B (DeBakey III) aortic dissection with an entry site at the proximal descending aorta, extending through the entire abdominal aorta to the right common iliac artery. No rupture or pericardial effusion was observed.

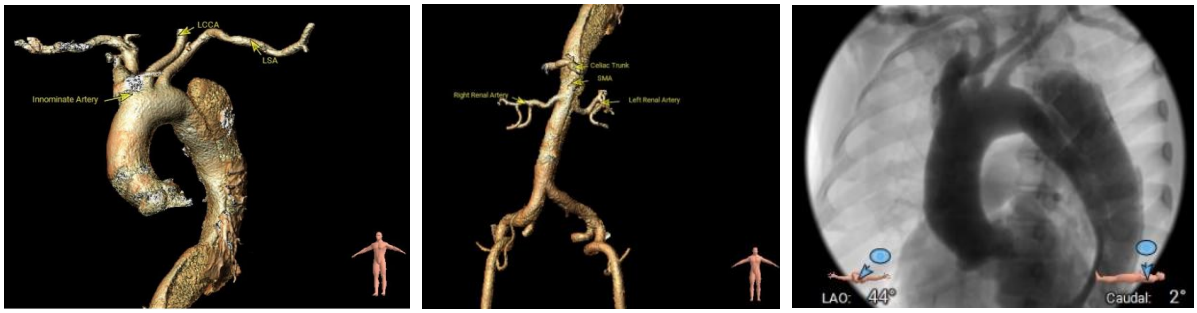

Figure 1. Preoperative CT Angiography.

The patient was scheduled to undergo Chimney LSA with Thoracic Endovascular Aortic Repair (TEVAR) as the first such procedure at this facility. After anesthesia preparation and insertion of an arterial line and central venous line, incisions were made in the left inguinal and left brachial regions. The left brachial and left common femoral arteries were preserved. A 6 Fr sheath was inserted through the brachial artery, and cannulation of the ascending aorta was performed using a guidewire. The procedure continued with placement of a long sheath into the proximal left subclavian artery (LSA) and a 7 Fr sheath through the left femoral artery.

Initial aortography showed a 2–3 cm tear distal to zone 3, with contrast filling the false lumen. A Valiant stent graft was deployed in zone 2, and a chimney technique was used to maintain LSA patency (Figure 2). Final aortography showed no type 1a or 1b endoleak, and no further contrast filling of the false lumen (Figure 3). Perfusion to the LSA via the chimney graft

appeared satisfactory. The long sheath and entrant were removed, arterial repair was performed on the brachial and femoral arteries, and layered skin closure was completed.

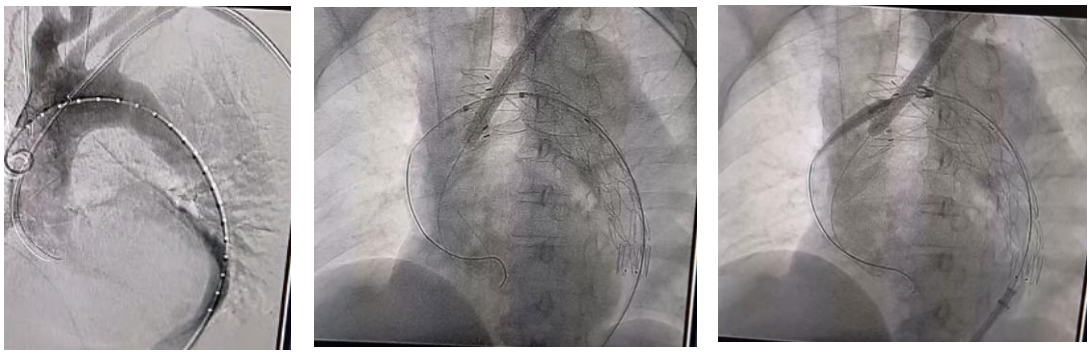

Figure 2 (left to right). Initial aortography; stent-graft inserted and positioned in zone 2; chimney procedure performed to maintain LSA patency.

Figure 3. Final aortography.

The patient was evaluated postoperatively in the intensive care unit. No early complications such as paraplegia, embolism, or bleeding were observed. Post-procedural imaging confirmed a stable stent position without leakage. The patient showed significant clinical improvement and was scheduled for outpatient follow-up.

3. RESULTS AND DISCUSSION

InterpretasinyaThoracic Endovascular Aortic Repair (TEVAR) has become the standard of care for patients with Stanford type B aortic dissection who develop complications such as persistent pain, refractory hypertension, organ malperfusion, or signs of impending rupture. Compared to open thoracic surgery, TEVAR offers advantages including lower invasiveness, shorter hospitalization, and significantly reduced perioperative morbidity and mortality rates.

Several major clinical trials, such as INSTEAD-XL and ADSORB, have demonstrated that TEVAR is beneficial not only in complicated cases but also promotes better aortic

remodeling in uncomplicated type B dissections when performed in the subacute phase.[8] A review by Malaisrie and Mehta (2020) recommends TEVAR in the acute to subacute phases when signs of progression are present. Data from the IRAD registry also show that patients undergoing TEVAR have significantly lower long-term mortality rates compared to those receiving conventional medical therapy.

As the first TEVAR procedure performed in Manado, this case posed several logistical and clinical challenges. Resource limitations such as the availability of stent grafts, readiness of intraoperative imaging systems, and the need for technical training for surgical and interventional radiology teams were initial hurdles. Thorough preoperative planning and multidisciplinary team coordination were crucial for the successful implementation of this new technology in a resource-limited hospital.

Anatomically, the location of the primary entry tear near the left subclavian artery (LSA) necessitated consideration for preserving perfusion to the upper extremity and posterior circulation. In this case, the chimney TEVAR technique was selected, in which a parallel small stent is placed to maintain flow to the LSA, even if its ostium is covered by the main stent graft. This technique is recognized as a safe alternative to open debranching.

Zone 2 of the thoracic aorta, which was the proximal landing zone for the stent graft in this case, is a challenging location due to its proximity to major aortic branches. Therefore, preserving LSA perfusion was a key concern. The chimney technique has been well-documented in the literature as an effective method to maintain perfusion without increasing the risk of neurological complications, including stroke or limb ischemia.

In addition to the implantation technique, intraoperative evaluation is critical. Intraoperative aortography was used to ensure accurate stent-graft placement, exclusion of the false lumen, and absence of endoleak or distal perfusion complications. This strategy has become standard practice in modern TEVAR procedures and is strongly recommended by various clinical guidelines.

The technical and clinical success of this case aligns with prior reports in both international and regional literature. A study by Dang et al. (2025) described the use of TEVAR in a patient with aortic dissection following TAVR, showing that the procedure can be successful even in highly complex cases.[6] In Indonesia, reports of TEVAR remain limited, making this documentation an important contribution to the national literature on endovascular aortic therapy.

Data from the International Registry of Acute Aortic Dissection (IRAD) also support the use of chimney techniques and stent placement in zone 2, with high technical success and

acceptable complication rates. This comparison indicates that despite being performed in a regional center and for the first time, the approach in this case was consistent with international best practices.

The success of this initial TEVAR procedure not only provided direct benefits for the patient but also created a significant opportunity to develop endovascular cardiovascular services in regional hospitals. With this positive early experience, TEVAR has the potential to become a routine service for eligible aortic dissection patients, particularly in areas with limited access to tertiary referral centers.

Furthermore, this report offers practical insights for other hospitals aiming to establish similar services, emphasizing the importance of ongoing training, formation of a multidisciplinary team, and clinical governance that supports individualized treatment decisions. This experience demonstrates that with careful planning and institutional support, complex procedures like TEVAR can be implemented safely and effectively, even in resource-constrained settings.

4. CONCLUSIONS AND SUGGESTIONS

Thoracic Endovascular Aortic Repair (TEVAR) is an endovascular therapeutic innovation proven to be effective and safe in the management of Stanford type B aortic dissection, particularly in cases with complications. The advantages of this procedure over open surgery have been supported by various studies and clinical guidelines, especially in reducing morbidity, mortality, and patient recovery time. The successful implementation of the first TEVAR procedure at Prof. Dr. R.D. Kandou General Hospital, Manado, marks a significant milestone in the development of minimally invasive cardiovascular services in eastern Indonesia.

This case report demonstrates that, although performed for the first time in a non-tertiary facility, TEVAR can be carried out with favorable clinical outcomes when supported by multidisciplinary team coordination, thorough planning, and technical adaptations such as the chimney technique to address anatomical challenges. The use of intraoperative aortography, appropriate landing zone selection, and comprehensive pre- and post-procedural evaluation played major roles in ensuring procedural success.

This experience is expected to serve as a preliminary reference for other institutions in Indonesia aiming to develop TEVAR services, while also reinforcing evidence that the endovascular approach can be broadly implemented even in centers with limited resources. Going forward, long-term monitoring of clinical and radiological outcomes after TEVAR is

necessary, along with the establishment of a national registry system to evaluate the procedure's success and safety at the population level. In doing so, TEVAR can become an integral part of equitable and high-standard aortic dissection management throughout Indonesia.

DAFTAR REFERENSI

Levy, D., Sharma, S., Grigorova, Y., Farci, F., & Le, J. K. (2025). Aortic dissection. In *StatPearls*. StatPearls Publishing.

Ramesh, P., Al-Zubaidi, F. I., Abdelghaffar, M., Babiker, S., Aspinall, A., Butt, S., et al. (2024, January 1). TEM classification of aortic dissection—the evolving scoring system: A literature review. *Heart, Lung and Circulation, 33*(1), 17–22. https://doi.org/10.1016/j.hlc.2023.07.007

Grabenwöger, M., Alfonso, F., Bachet, J., Bonser, R., Czerny, M., Eggebrecht, H., et al. (2012, July 1). Thoracic endovascular aortic repair (TEVAR) for the treatment of aortic diseases: A position statement from the European Association for Cardio-Thoracic Surgery (EACTS) and the European Society of Cardiology (ESC), in collaboration with the European Association of Percutaneous Cardiovascular Interventions (EAPCI). *European Heart Journal, 33*(13), 1558–1563. https://doi.org/10.1093/eurheartj/ehs134

Dang, V. C., Haddad, P., McFall, R. G., Klopfenstein, J., Reardon, M. J., & Rahimi, M. (2025, February 1). Thoracic endovascular aortic repair (TEVAR) for an acute type A aortic dissection following transcatheter aortic valve replacement (TAVR). *J Vasc Surg, 11*(1). https://doi.org/10.1016/j.jvs.2025.01.007

Howard, C., Sheridan, J., Picca, L., Reza, S., Smith, T., Ponnapalli, A., et al. (2021). TEVAR for complicated and uncomplicated type B aortic dissection—Systematic review and meta-analysis. *Journal of Cardiac Surgery, 36*(10), 3820–3830. https://doi.org/10.1111/jocs.15731

Bakel, T. V., Patel, H., Bogerijen, G. van, Upchurch, G., Bismuth, J., Beaufort, H. de, et al. (2019, December 1). TEVAR for acute type B aortic dissection: Results from the international registry of acute aortic dissection interventional cohort (IRAD-IVC). *European Journal of Vascular and Endovascular Surgery, 58*(6), e287–e288. https://doi.org/10.1016/j.ejvs.2019.08.015

Huang, W., & Cheng, Y. (2021). Advances in imaging strategies for thoracic endovascular aortic repair: Implications for clinical outcomes. *Journal of Vascular Imaging and Intervention*, 3(2), 75–84. https://doi.org/10.1016/j.jvii.2021.03.004

Lombardi, J. V., Hughes, G. C., Appoo, J. J., & Bavaria, J. E. (2020). Consensus update on indications and techniques for TEVAR in aortic dissection. *Journal of Thoracic and Cardiovascular Surgery*, 160(1), 312–326. https://doi.org/10.1016/j.jtcvs.2020.01.025

Patel, H. J., Upchurch, G. R., & Williams, D. M. (2022). Technical considerations for TEVAR in complex aortic anatomy: A contemporary review. *Seminars in Thoracic and Cardiovascular Surgery*, 34(3), 892–901. https://doi.org/10.1053/j.semtcvs.2022.04.011

Rahim, M., Yusuf, A., & Karim, M. (2020). Implementation of endovascular aortic repair programs in emerging cardiac centers: Challenges and opportunities. *International*

Journal of Vascular Medicine, 27(4), 221–229. https://doi.org/10.1155/2020/8895123

Sato, K., Takahashi, M., & Yamamoto, K. (2023). Determinants of successful TEVAR outcomes: A multicenter study highlighting institutional readiness and team coordination. *Annals of Vascular Surgery*, 91, 180–188. https://doi.org/10.1016/j.avsg.2023.01.014

Leshnower, B. G., & Chen, E. P. (2018, March 1). TEVAR for acute complicated type B aortic dissection. *Operative Techniques in Thoracic and Cardiovascular Surgery, 23*(1), 21–33. https://doi.org/10.1053/j.otscs.2017.10.003

Uchida, T., & Sadahiro, M. (2018, December 25). Thoracic endovascular aortic repair for acute aortic dissection. *Ann Vasc Dis, 11*(4), 464–472. https://doi.org/10.3400/avd.oa.18-00099

Malaisrie, S. C., & Mehta, C. K. (2020, October 16). Updates on indications for TEVAR in type B aortic dissection. *Innovations*. https://doi.org/10.1177/1556984519839892

Yuan, X., Mitsis, A., & Nienaber, C. A. (2022, October 14). Current understanding of aortic dissection. *Life (Basel), 12*(10), 1606. https://doi.org/10.3390/life12101606