Ann Vasc Dis Vol. 17, No. 4; 2024; pp 440–442

Online November 26, 2024
doi: 10.3400/avd.cr.24-00098

Case Report

Loeys–Dietz Syndrome Presenting with an Abdominal Aortic Aneurysm: A Case Report

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Loeys–Dietz syndrome (LDS) is a genetic connective tissue disorder associated with vascular involvement and craniofacial, skeletal, and cutaneous abnormalities. Herein, we describe the case of a 28-year-old female who presented with a pulsatile mass in her abdomen. Imaging studies revealed multiple aneurysms, including a 53-mm abdominal aortic aneurysm (AAA) and tortuosity of the intracranial arterial vasculature. Genetic testing revealed a mutation in transforming growth factor beta receptor 1, leading to a diagnosis of LDS. The patient underwent open surgical repair of AAA. Other arterial lesions were carefully followed. This case demonstrates that AAA can be a primary manifestation of LDS.

Keywords: Loeys–Dietz syndrome, abdominal aortic aneurysm, open surgical repair

Introduction

Loeys–Dietz syndrome (LDS) is an autosomal dominant connective tissue disorder associated with vascular involvement (arterial tortuosity, aneurysm formation, and dissection) and craniofacial, skeletal, and cutaneous abnormalities.[1,2] Since this syndrome was first described in 2005, causative gene mutations, such as transforming growth factor beta (TGFB) receptor 1 and 2 (TGFBR1/2), TGFB2 and 3 ligands (TGFB2/3), and the small mothers against decapentaplegic homolog 2 and 3 (SMAD2/3) have been identified.[3]

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Received: August 12, 2024; Accepted: November 5, 2024
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It is known that the leading causes of morbidity and mortality in LDS are aortic root and ascending aortic aneurysm and aortic dissection.[2] However, patients with LDS rarely develop an abdominal aortic aneurysm (AAA) as a primary manifestation. In this study, we describe the case of a 28-year-old female with LDS who presented with AAA.

Case Report

The patient was a 28-year-old Asian female who presented with a pulsatile mass in her abdomen. Her past medical history was significant for lumbar scoliosis, for which she underwent surgery in her childhood. There is no specific note in her family history.

Her physical examination results were as follows: height, 165 cm; weight, 55 kg; and body mass index, 20.2 kg/m^2. There was a pulsating mass in her lower abdomen. She had a mild funnel chest but lacked the typical craniofacial, skeletal, and skin characteristics of genetic connective disorders. The bilateral radial and pedal pulses were full, and her blood test results showed no abnormalities. A surveillance computed tomography (CT) imaging revealed a 53-mm infrarenal AAA, a 20-mm left subclavian artery (SCA) aneurysm, and a 40-mm aortic root dilatation. In addition, there was a 13-mm dilatation of the superior mesenteric artery (SMA), a 16-mm saccular aneurysm of the right superior gluteal artery (SGA), and multiple visceral artery aneurysms, including a 5-mm left gastric artery aneurysm and an 8-mm splenic artery aneurysm (**Fig. 1**). The head magnetic resonance angiography (MRA) demonstrated marked tortuosity of the cerebral arterial system with no cerebral artery aneurysms. Echocardiography showed trivial aortic and mitral valve regurgitation, with no evidence of coronary aneurysm. Genetic testing was carried out after obtaining informed consent, which showed a TGFBR1 mutation. The patient was subsequently diagnosed with LDS.

Although the patient had multiple arterial aneurysms, we considered the AAA and saccular aneurysm of the SGA to be at a higher risk of rupture. Therefore, we performed a staged procedure, which included a coil embolization of

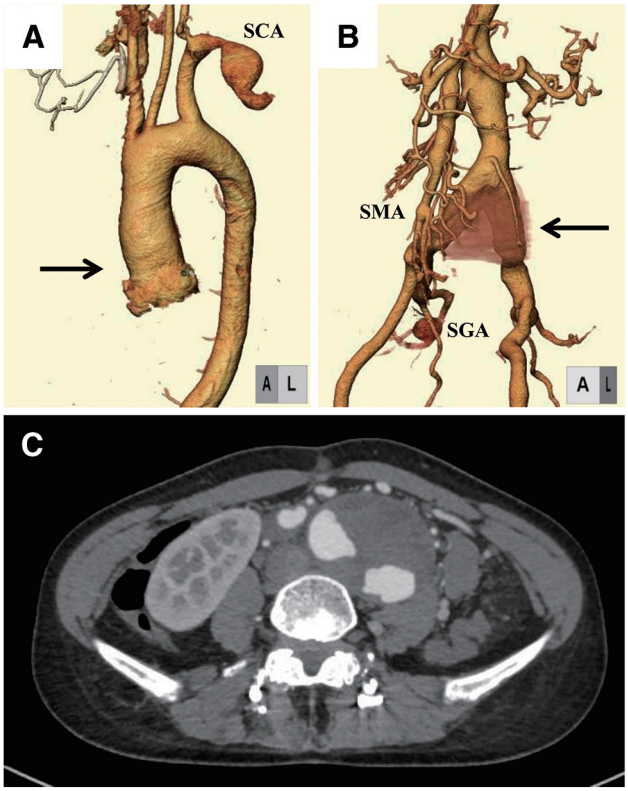

Fig. 1 Computed tomography images showing vascular abnormalities. (**A**) Dilatation of the aortic root (arrow) and left SCA aneurysm. (**B**) AAA (arrow), dilation of the SMA, right SGA aneurysm. (**C**) Axial image of AAA. AAA: abdominal aortic aneurysm; SCA: subclavian artery; SMA: super mesenteric artery; SGA: superior gluteal artery

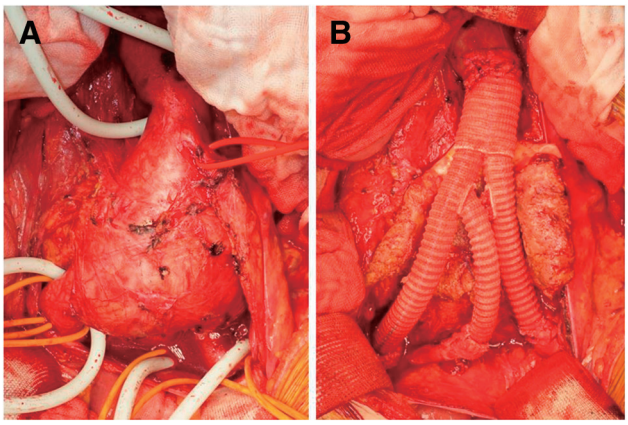

Fig. 2 Intraoperative images. (**A**) The abdominal aortic aneurysm. (**B**) After the repair.

the right SGA aneurysm, followed by a secondary open surgical repair of the AAA using a quadrifurcated woven gelatin-coated prosthetic graft (J Graft; Japan Lifeline Co., Ltd, Tokyo, Japan) (**Fig. 2**). The right limbs of the graft were anastomosed to the right external iliac artery and the proximal internal iliac artery, while the left limb was

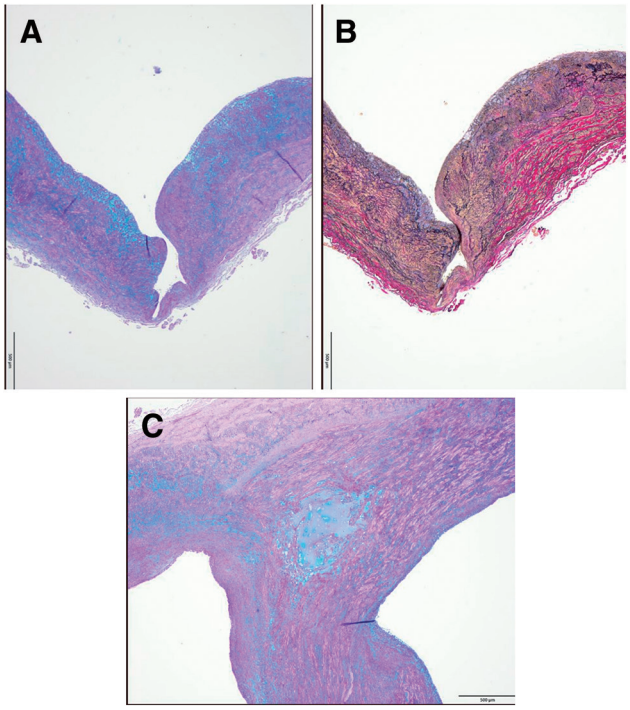

Fig. 3 Pathological examination of the aortic wall showing diffuse myxomatous changes, fragmentation of elastic fibers, and thinning of the tunica media (**A**: Periodic acid Schiff–Alcian blue stain 4×, **B**: Elastica van Gieson stain 4×). (**C**) Another specimen of the aneurysm shows cystic medial necrosis (Periodic acid Schiff–Alcian blue stain 10×).

anastomosed to the left common iliac artery. Intraoperatively, increased vessel fragility was not observed, but we strengthened the anastomoses using expanded polytetrafluoroethylene felts. The pathological examination of the aortic aneurysm wall showed diffuse myxomatous changes and fragmentation of elastic fibers in the tunica media and cystic tunica media necrosis (**Fig. 3**). The postoperative course was uneventful, and the patient was discharged 9 days after surgery. We are currently regularly monitoring the patient in an outpatient setting to assess her remaining arterial lesions and considering an appropriate timing for further intervention.

Discussion

The leading causes of morbidity and mortality in LDS are aortic root and ascending aortic aneurysm and aortic dissection. AAA is a rare complication in LDS with a reported incidence of 10% compared to 84% for ascending aortic aneurysms.[2] The present case merits reporting because patients with LDS rarely develop AAA as the most significant arterial lesion. In addition, although our patient had a history of lumbar scoliosis, she lacked the craniofacial features of LDS, such as hypertelorism, a

bifid uvula, or a cleft palate. Thus, the AAA was her leading symptom, which, in turn, led to the diagnosis of LDS. In general, AAA is strongly associated with atherosclerosis. Therefore, in young patients with AAA, it is necessary to investigate underlying pathologies, including genetic factors, inflammatory conditions, and infectious diseases. Since our patient was young and had multiple aneurysms and other vascular malformations, genetic connective tissue disorders could be included as a differential diagnosis.

In young patients with AAA, an accurate diagnosis is important for the planning of treatment strategies. In this context, surgery tends to be the first-line treatment option for aortic pathologies in patients with LDS or Marfan syndrome. However, surgery carries an increased risk of morbidity and mortality in patients with vascular Ehlers-Danlos syndrome because of significant vascular fragility.[4] In patients with Behçet's disease, special care to prevent anastomotic pseudoaneurysms and the use of adjunctive immunosuppressive therapy are essential.[5] In terms of our patient, she was diagnosed with LDS based on genetic testing, which revealed a TGFBR1 mutation. Consequently, we decided to perform open surgical repair of the AAA. We anticipate the next target of treatment to be the dilated aortic root since the guidelines suggest surgical intervention for aortic root dilatation exceeding 40 mm in patients with TGFBR1 mutations who exhibit high-risk features.[4]

Notably, the patient had multiple peripheral arterial lesions, including a 20-mm left SCA aneurysm, a 16-mm right SGA aneurysm, and dilatation of the SMA. Beaulieu et al.[6] reported that 77.8% of LDS patients with aortic disease have peripheral aneurysms. No consensus has been reached on managing peripheral arterial manifestations of LDS. Both open and endovascular procedures can be utilized depending on the location of the aneurysm.[6–8] In the present case, the right SGA aneurysm was treated with endovascular coil embolization, followed by open AAA repair without complications. Coil embolization is considered a feasible treatment option for peripheral aneurysms in selected patients with LDS.[8] Although there are no clear criteria for the optimal timing or procedures for the treatment of SCA aneurysms,[9] early intervention may be indicated for the remnant SCA aneurysm in our patient.

Conclusion

Our observations in this patient demonstrate that AAA can be a primary manifestation in patients with LDS. Thus, an accurate diagnosis of the underlying pathology is crucial for determining treatment strategies for AAAs in young patients.

Declarations

Informed consent

We obtained informed consent about this report from the patient.

Acknowledgments

We would like to thank Editage (www.editage.jp) for editing the English language.

Disclosure statement

All authors have no conflict of interest.

Author contributions

Study conception: KT
Data collection: KT and YY
Investigation: KT and YY
Manuscript preparation: KT and YY
Medical treatment: All authors
Critical review and revision: All authors
Final approval of the article: All authors
Accountability for all aspects of the work: All authors.

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