Clinical Case Report

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Endovascular stenting of a complicated type B aortic dissection in an 11-year-old patient

Case Report

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Abstract

Rationale: Endovascular aortic repair in children in the case of aortic dissection (AD) is currently unavailable. This is the first report of aortic dissection type B in an 11-years old child treated in endovascular way.

Patient concerns: Complicated AD. Since bowel malperfusion and aortic rupture the surgery was necessary in emergency.

Diagnoses: Computed angio tomography.

Intervention: The modified PETTICOAT technique (Provisional Extension To Induce Complete Attachment) was used.

Outcome: Full recovery.

Lessons: For the first-time telescope modification were used, to allow aorta to grow with a child. Such a strategy seems to be possible with long overlap and lack of oversizing between implants.

Abbreviations: AD = aortic dissection, Angio-CT = angio computed tomography, BMS-XL = bare metal stents extra large, BMT = best medical treatment, CT = celiac trunk, FL = false lumen, LCCA = left common carotid artery, LRA = left renal artery, LSA = left subclavian artery, PETTICOAT = provisional extension to induce complete attachment, RA = renal artery, RRA = right renal artery, SMA = superior mesenteric artery, TEVAR = thoracic endovascular aortic repair, TL = true lumen.

Keywords: aortic dissection, children, PETTICOAT, stent, stent-graft

1. Introduction

Reports regarding thoracic endovascular aortic repair TEVAR/PETTICOAT for children in the case of aortic dissection (AD) were not found, thought 1 traumatic aortic rupture TEVAR report was available.[1] The lack of data is mainly due to the fact that AD in children is a highly rare disease (less then 30 cases in literature for < 25 years old).[2] It is normally seen in cases of Marfan syndrome, as well as anomalies of the aortic valve and arch, or in cases of chest trauma (this was not being the case in our patient).[3–8] In complicated AD, TEVAR or PETTICOAT strategy is usually recommended in adults.[9,10] This is the first report of aortic dissection type B in an 11-year-old child treated in endovascular way. Since bowel malperfusion and aortic rupture, the surgery was necessary in emergency. The PETTICOAT technique (Provisional Extension to Induce Complete Attachment) was used.

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The authors report no conflicts of interest.

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2. Report

An 11-year-old girl presented with a sudden onset of chest and mesenteric ischemia. No injury was reported, with no marfanoid features and a normal aortic valve. A final diagnosis of type B aortic dissection was established with the aid of angio-CT. Entry was located below left subclavian artery (LSA) with complete intima tear, which was causing dynamic stenosis of the aorta. True lumen (TL) was compromised along the dissection. Celiac trunk (supply from TL) was patent. Superior mesenteric artery (SMA) was occluded at a short distance. However, efficient collateral circulation to the bowels was present. Kidney arteries with dynamic stenosis were supplied via a simultaneous false lumen (FL) and TL. Best medical treatment (BMT) was first applied. Nevertheless, it was found that effective hypertension control was impossible (250 mmHg systolic). After 2 days, mesenteric ischemia deteriorated to peritonitis and sepsis (without perforation). Second angio-CT was applied showing static/critical aortic stenosis below the LSA due to partially thrombosed false lumen. SMA static occlusion at a distance of 6 cm with thrombosis of the FL due to complete TL collapse in the visceral and infra-renal aorta. Renal arteries (RA) were dissected completely and supply was only from FL. The size of the aorta at the arch was 25 mm, below LSA 31 mm, CT/SMA level 25 mm, RA 21 mm, infra-renal aorta was 13 mm, iliac common arteries were 7.5 mm, iliac external arteries were 6.5 mm.

(Fig. 1). True-lumen collapse

3. Methods

Surgical intervention was performed as an emergency. Therefore, Ethics Committee approval was waived at that time and patient consent was obtained from the parents. Extra large bare metal stents (BMS-XL) Medicut (Pforzheim, Germany, 28 mm

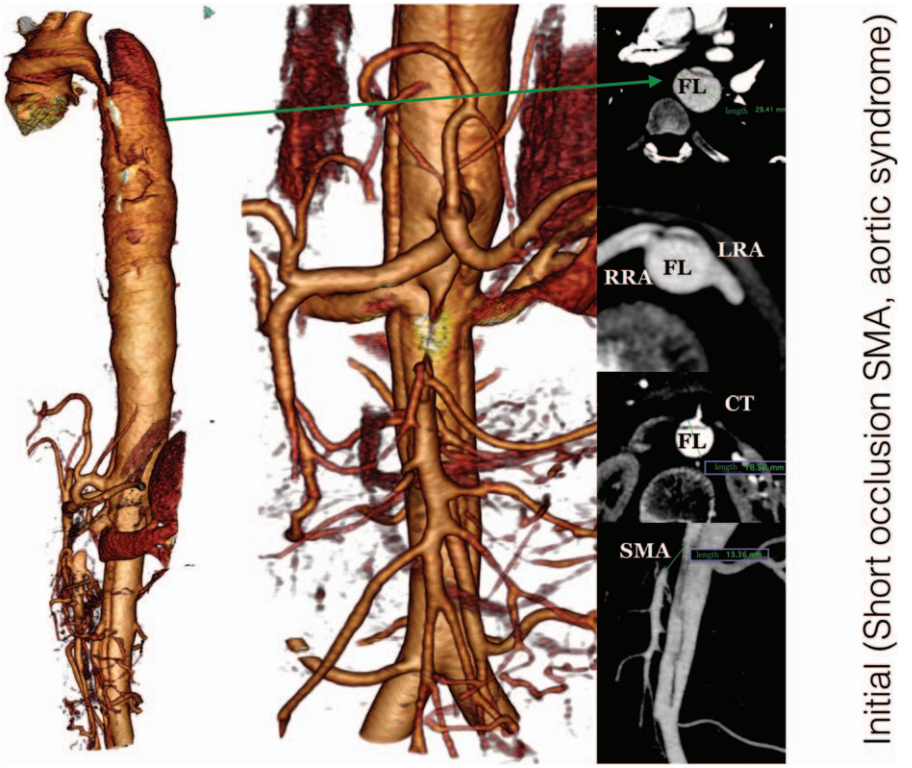

Figure 1. True-lumen collapse.

size, 200 mm length) were deployed to the thoracic and visceral aorta ending 1 cm below RA, followed by Medtronic Vailant II (Medtronic, Santa Rosa, CA, USA; VAMF2828C156TE) below LSA with long overlap (10 cm) with BMS-XL. Force ballooning of the graft was performed to restore normal TL size and close FL completely (Initially, implants were highly compressed below the LSA). Angiography showed no endo-leak, patent CT, and both RA. SMA remained occluded. Therefore, stenting and ballooning

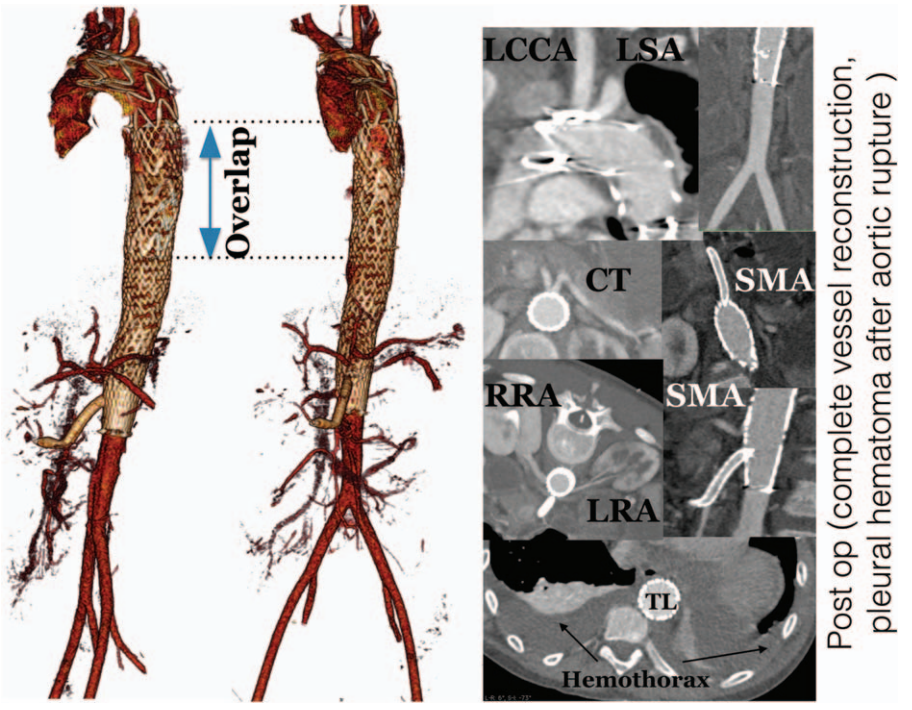

Figure 2. Aorta after endovascular treatment.

was preformed through a BMS-XL mesh with effective restoration of the flow in SMA. Two cardiac arrests occurred on the table (Pulseless Electrical Activity), though effective resuscitation was carried out. The initial arrest was before the retrieval of TL (in angiography blood and contrast extravasation along the aorta), and the second was after the reopening of the SMA, due to the bowel reperfusion syndrome. The patient was subsequently treated in the Intensive Care Unit for another 2 days. Diarrhea continued for another 3 days. Kidney function was found to be completely normal after 4 days. Control angio-CT showed very good early remodelling (Fig. 2).

The patient was discharged 3 weeks later without any symptoms. A next angio-CT is planned in 6/12 months time.

4. Discussion

Open surgical repair is possible, but is seen as risky in children.[11] Moreover, it is accepted that a prosthesis will not able to grow with the child's body. In this case, an endovascular procedure was considered. However, this was significantly modified due to expected body growth (weighed 40 kg high 159 cm). Therefore, a long (10 cm) overlap between the stent-graft and BMS-XL was carried out. This is hoped to act as a telescope for the next few years. The lack of oversizing between implants should facilitate this requirement. Moreover, implant oversizing according to aortic size varies from 0 mm to 7 mm from the top to the bottom and should keep them attached at the landing zones. It should be noted that PETTICOAT was the only strategy to re-open the orifice of CT, SLA, and RA. Implanting BMS-XL to the TL is usually enough to restore flow, provided that there is no FL thrombosis in the branches. Unfortunately, SMA was thrombosed and occluded, therefore, this required immediate reopening and subsequent stenting. Follow up will continue with this patient into adulthood.

5. Conclusion

To our knowledge, this is the youngest patient to be successfully treated with PETTICOAT (TEVAR+BMS-XL) in a complicated type B aortic dissection. Such a strategy only seemed possible with long overlap and a lack of oversizing between implants (telescope phenomenon).

Author conctributions

Conceptualization: A. Kazimierczak, P. Rynio.
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Writing – review & editing: P. Rynio, T. Jedrzejczak.

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