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Novel endovascular management of proximal (Type A; DeBakey II) aortic dissection with a PFO occluder

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Abstract:	Objective: To present a novel endovascular management and avoid open surgery in selected patients with subacute type A aortic dissection (DeBakey II). Case presentation: A 75 years old lady with previous infrarenal abdominal aortic aneurysm repaired in 2006 was admitted with chest pain and a CTA showing a new dissection in the ascending aorta extending from just above the origin of the right coronary artery to the first supraaortic branch over a distance of 6.5cm. As the patient was considered unfit to undergo surgery, an endovascular solution was suggested after multidisciplinary team discussion. With a single entry identified, coils were deployed in the false lumen, and followed by a PFO occluder placed across the entry tear to seal the cavity. Both intra-procedure DSA and TOE, as well as CTA 3-days post procedure confirmed an entirely thrombosed false lumen and reconstructed true lumen; 6-months follow-up CTA demonstrated the PFO occluder firmly in place, shrinkage of the false lumen and remodelling of the ascending aorta. Conclusion: Interventional management of the false lumen in proximal (type A) dissection is feasible and sustainable. The use of coils and closure devices may present a new efficient (minimalistic) strategy to avoid open surgery in selected cases.

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Abstract

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Case presentation: A 75 years old lady with previous infrarenal abdominal aortic aneurysm repaired in 2006 was admitted with chest pain and a CTA showing a new dissection in the ascending aorta extending from just above the origin of the right coronary artery to the first supraaortic branch over a distance of 6.5cm. As the patient was considered unfit to undergo surgery, an endovascular solution was suggested after multidisciplinary team discussion. With a single entry identified, coils were deployed in the false lumen, and followed by a PFO occluder placed across the entry tear to seal the cavity. Both intra-procedure DSA and TOE, as well as CTA 3-days post procedure confirmed an entirely thrombosed false lumen and reconstructed true lumen; 6-months follow-up CTA demonstrated the PFO occluder firmly in place, shrinkage of the false lumen and remodelling of the ascending aorta.

Conclusion: Interventional management of the false lumen in proximal (type A) dissection is feasible and sustainable. The use of coils and closure devices may present a new efficient (minimalistic) strategy to avoid open surgery in selected cases.

Introduction

Acute aortic dissection is a life-threatening condition with a population-based incidence of ~30 per 100,000 person-year in the elderly (>65 years) population(1). Even with better understanding of the pathophysiology, refined surgical techniques and devices, improvement in overall surgical outcomes remains modest over the last 20 years with a 10% to 35% mortality(2, 3). While open surgical repair is standard of care for type A dissection(4), approximately 10% to 30% of patients are still deemed inoperable due to advanced age, severe comorbidity and instability, or both.(5) Recent sporadic reports and small series revealed acceptable early results demonstrating both feasibility and preliminary efficacy of endovascular stent-graft repair in proximal(Type A) aortic dissection.(6, 7) Minimalistic endovascular repair using occluders and/or coils would be disruptive and a potential alternative in acute ascending aortic pathology, even unsuitable for stent-grafting due to the proximity of the tear to the right coronary artery. The present report describes minimalistic endovascular repair of a patient with ascending aortic dissection with imaging follow-up.

Case report

A 75 years old lady with previous infrarenal abdominal aortic aneurysm repaired in 2006 was admitted with atypical symptoms; swift CT angiography showed proximal dissection of the ascending aorta, accompanied by atypical symptoms. Chronic abdominal aortic occlusion just below the level of the celiac axis was already documented in 2015 and had prompted a subclavio-bifemoral bypass (Fig 1). Other comorbidities included apronectomy in 1999 with post-operative pulmonary embolism in 1999, pulmonary hypertension, coronary artery disease (70% LAD stenosis), relative immobility from osteoarthritis with total knee

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replacements, and lower gastrointestinal haemorrhage followed by bowel resection, had rendered her inoperable.

Figure 2 shows the CT angiogram after admission demonstrating a type A (DeBakey type II) dissection extending from just above the origin of the right coronary artery over a distance of 6.5cm to the aortic orifice of the brachiocephalic trunk. The dissected segment revealed an expanding false lumen with a tear diameter of 5 mm. Atraumatic endovascular repair was suggested after multidisciplinary team discussion as the patient was inoperable. The left brachial artery was chosen as the access, and a JR 4 coronary catheter was used to navigate the entry to the false lumen. Engaged in the ostium of false lumen, a total of 5 spiral coils (5mm x 15cm) were deployed in the false lumen. Then an 18mm Amplatzer PFO occluder guided over a Confida® wire was placed across the entry tear to close the cavity.

Intraprocedural DSA performed to check coronary ostia and dissection tear confirmed precise closure and no obstruction of coronaries (Fig 3).

Both TOE and a final angiogram showed that the entry tear was sealed and coronary ostia remained unblocked. The post-procedural CT angiogram documented successful exclusion of false lumen in this type A (DeBakey type II) dissection and no contrast communication into the false lumen (Fig 4). The patient was discharged without any complications 3 days after the procedure. The patient returned 6 months after the procedure for a follow-up evaluation when a CT angiogram of the aorta demonstrated the PFO occluder firmly in place, substantial shrinkage of the false lumen and successful remodelling of the ascending aorta (Fig 5).

Discussion

Endovascular repair for dissection of the descending thoracic aorta was introduced in 1999 and is now established management replacing open surgery.(8) However, endovascular management using stent-grafts in the ascending aorta is only an option for selected patients

with suitable anatomy.(6) Challenges are the proximity of the tear to the aortic root and coronaries, and the shape of the ascending aorta and the arch. In other words, the intimate spatial relationship between vital structures of the aortic root and the available device dimensions, not designed for the ascending aorta, portend serious limitations. Attempts to use endovascular stent-grafts for interventional management of the false lumen in proximal aortic dissection have been made to demonstrate its feasibility in selected patients, but applicability is limited.(6, 7)

An alternative to custom-made stent-grafts are minimalistic interventions based on devices such as coils and occluders to manage the false lumen(9), as illustrated in our case of proximal dissection, that was neither suitable for conventional surgery nor for endovascular stent-grafting. Given the technical feasibility to prevent antegrade false lumen flow from entries within the arch or ascending aorta coils and plugs may play a growing role in false lumen management.(10, 11) They may require a narrow proximal entry to the false lumen in the arch for the embolization materials to stay in position. Our case is unique in dealing with an entry in the ascending aorta by use of coils to promote thrombosis followed by an occlusive seal of the entry tear. The case shows that a minimalistic technique is feasible and able to promote remodelling in long-term. Advanced interventional skills and an experienced team may be essential to its safe execution. Follow-up at 6 months has proven the sustainability of this promising approach, but further surveillance is warranted.

Conclusion

Interventional management of the false lumen in proximal (type A; DeBakey II) dissection is feasible in selected cases of aortic dissection. The combined use of coils and closure devices is a new efficient (minimalistic) and sustainable strategy to avoid open surgery.

Figure 1

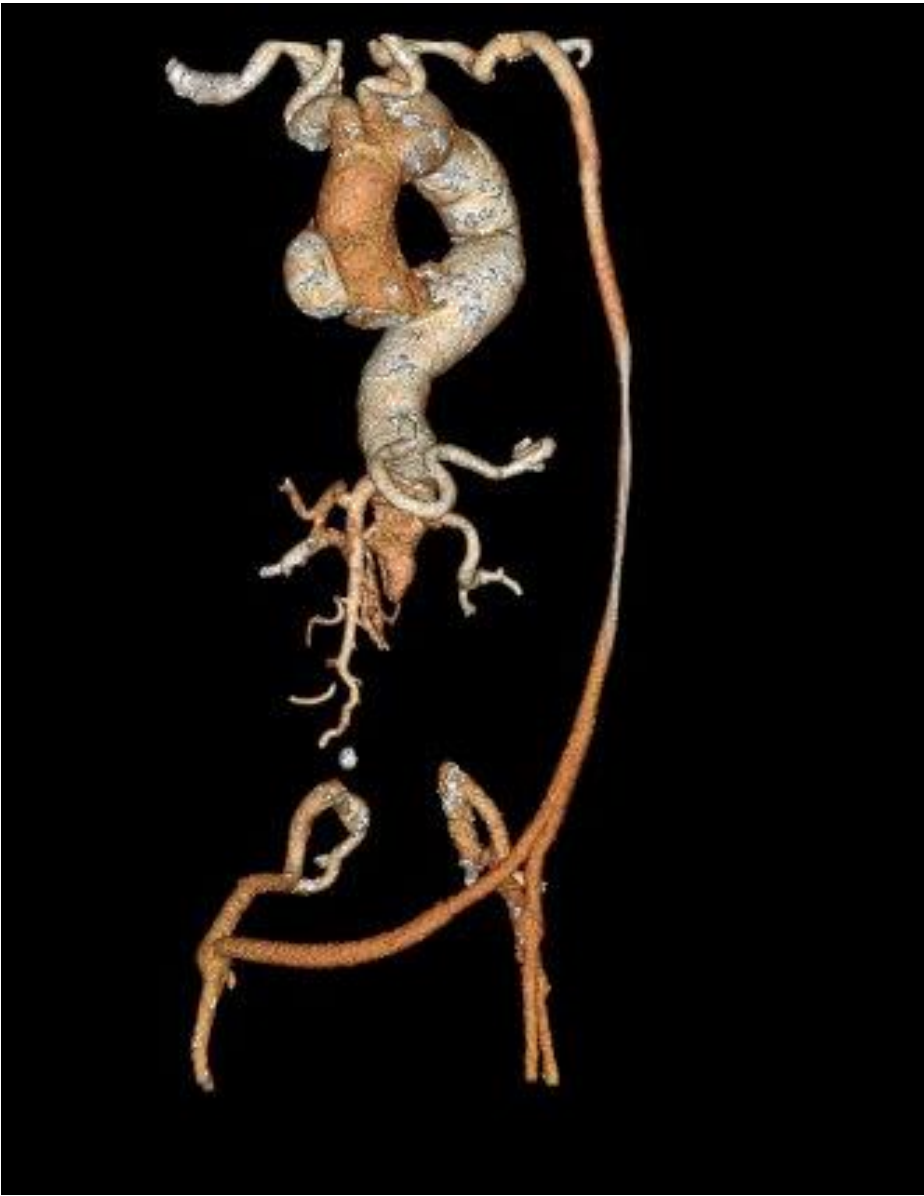


Fig 1. Patient with chronic occlusion of the abdominal aorta with a subclavio-bifemoral bypass and a new dissection in the ascending aorta just above the origin of the right coronary artery.

Figure 2

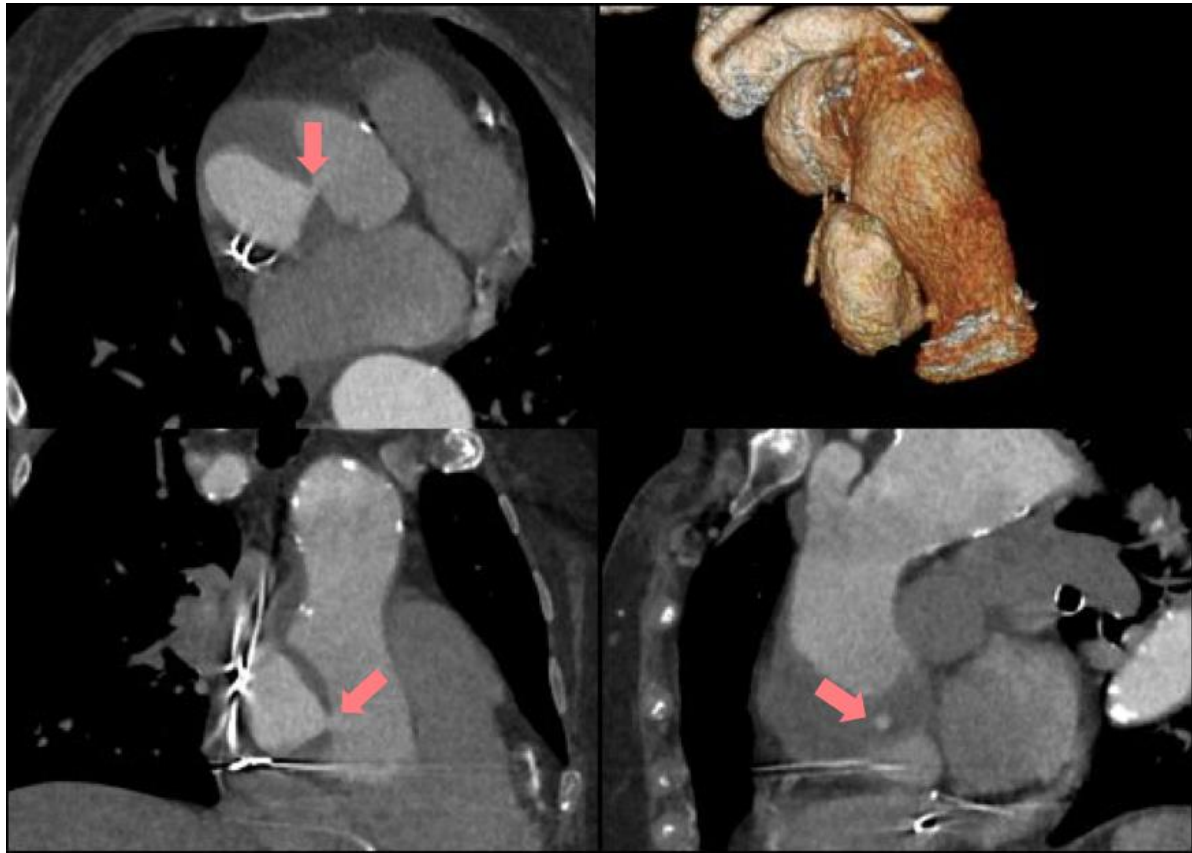


Fig 2. The CTA angiogram of aorta. The arrow shows the entry tear of the proximal dissection (type A; DeBakey type II).

Figure 3

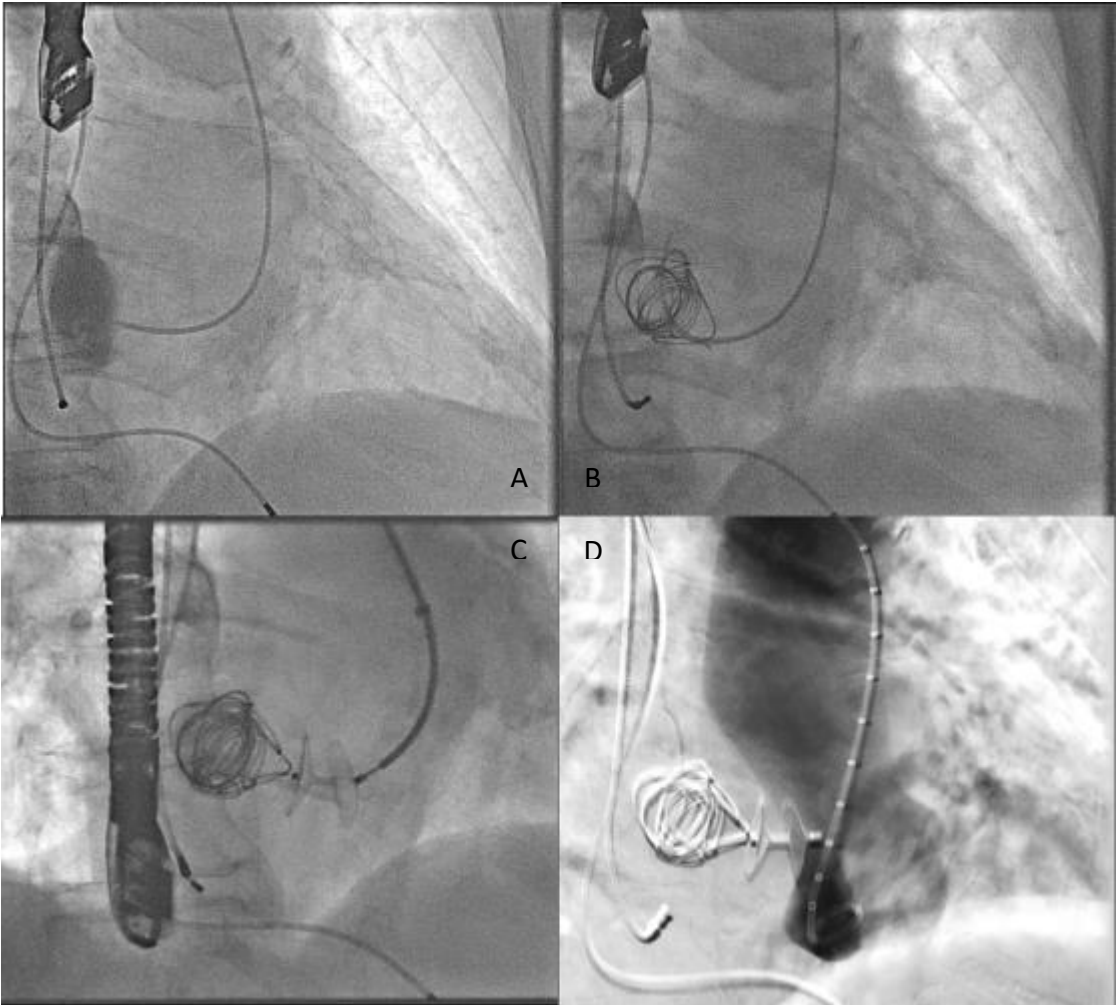


Fig 3. The process of the procedure. A. JR 4 coronary catheter navigated the entry to the false lumen. B. spiral coils were deploying in the false lumen. C. a PFO occluder was placing across the entry tear to close the cavity. D. Intraprocedural DSA confirmed precise closure and no obstruction of coronaries.

Figure 4



Fig 4. 3-days post-procedure CT angiogram result documented successful exclusion of false lumen and no contrast communication into the false lumen.

Figure 5

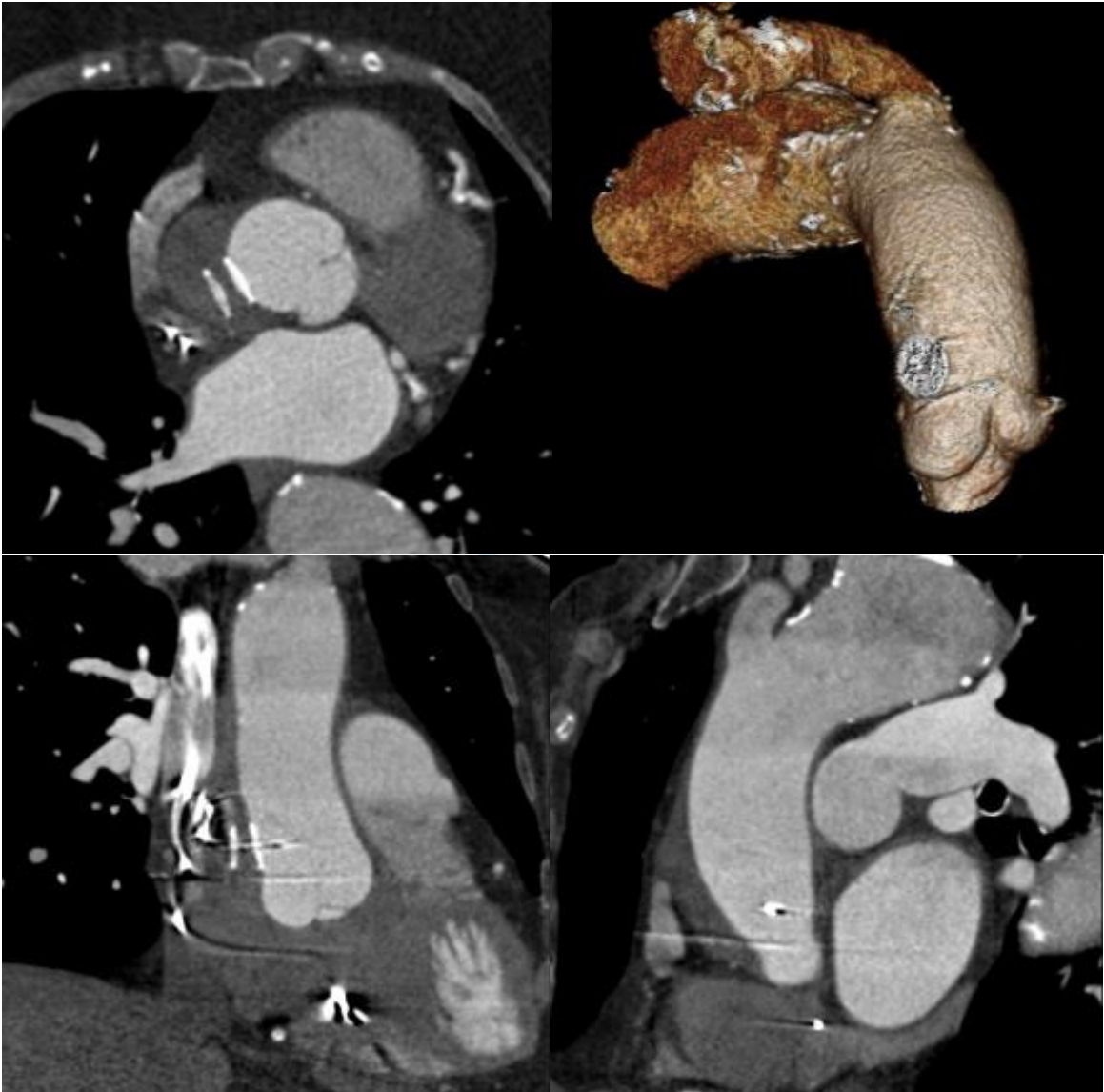


Fig 5. 6-months follow-up CT angiogram showed the PFO occluder firmly in place, together with the coils in the false lumen, successfully isolating the false lumen from flow with remodelling of the ascending aorta.

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