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Brief Report

The Use of a Steerable Sheath to Accurately Position a re-entry Catheter for the Management of a Bilateral Total Aorto-iliac Occlusion

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ABSTRACT

Aorto-iliac chronic total occlusions are increasingly treated by primarily with endovascular techniques. The patency especially of covered stent grafts is getting close to that of open surgery. In complex aorto-iliac occlusions re-entry catheters can simplify recanalisation. Current re-entry catheters are not steerable and selecting the re-entry target can be challenging.

In a complex case of a bilateral aorto-iliac total occlusion the re-entry catheter did not allow safe ipsilateral re-entry. Therefore, a steerable sheath was used to direct a re-entry catheter within the aortic wall towards a suitable entry point. This case demonstrates the successful application of steerable and re-entry catheter combination to recanalise a complex chronic total occlusion.

Introduction

Endovascular management of chronic aorto-iliac arterial occlusions (CTO) in the Trans-Atlantic Inter-society Consensus for the management of peripheral arterial disease (TACS) C and D group of patients is rapidly becoming the treatment of choice [1-3]. There is rarely a need now to perform invasive open surgical procedures with their associated morbidity and mortality to re-vascularise the lower limbs [4-6]. Traditionally recanalisation is performed retrograde starting with an attempt of luminal wire transgression. In most cases this is unsuccessful and subintimal usually antegrade crossbifurcation or transbrachial re-entry is achieved requiring complex wire and catheter manoeuvres. Re-entry devices which allow retrograde re-entry from the sub-intimal plane into the arterial lumen provide an more straightforward alternative [7,8] and can improve the re-canalization success rates considerably [9,10].

A complex case in a tertiary vascular centre highlighted some difficulties with targeting the re-entry in a challenging aorto-bi-iliac total occlusion. The use of a steerable endovascular sheath permitted the accurate positioning of the re-entry catheter to select the ipsilateral entry point distal re-entry point in the aorta. This enabled completion of the endovascular procedure preventing limb loss as an open operation was not deemed a safe option.

Report

A 56-year-old gentleman with a history of smoking presented to the vascular service with bilateral quality of life limiting fifty-yard claudication (Fontaine IIb). His co-morbidities included controlled hypertension and chronic obstructive pulmonary disease (COPD). Cardiovascular multi-disciplinary team assessment had deemed an open operation to be at high risk of morbidity and mortality.

A Computer Tomography (CT)-Angiogram demonstrated bilateral common iliac occlusive disease with a right-sided common femoral artery sub-occlusion (Figure 1). The operation was performed in a hybrid theatre with a GE Discovery 730 (GE Healthcare™, Chicago, Illinois).

Intraoperative angiography via ultrasound guided 7 Fr femoral artery punctures confirmed the bilateral common iliac artery

(CIA) occlusion (Figure 2). 5000 U Heparin were given i.e. The left CIA occlusion was successfully transgressed using a combination of luminal and sub-intimal navigation with distal aortic re-entry with C2 catheter and a 0.14" wire (Asahi Confienza™) followed by manipulation of a hydrophilic wire (Terumo 0.035") (Figure 3). Intraoperative angiography revealed that the right common femoral artery (CFA) was occluded at the time of surgery. Direct right sided CFA puncture was performed after open exposure of the femoral arteries. Here the occlusion was crossed sub-intimal following a failed luminal transgression with an 0.014" wire (Asahi Confienza™) as well as a hydrophilic 0.035" (Terumo™) wire. Re-entry into the aorta was not possible. Therefore, a re-entry catheter was selected (Cordis LTD *Outback*). The subintimal wire passage led the catheter towards the contralateral and anterior side of the aorta. A re-entry attempt in the more distal aortic lumen failed due to thickening of the aortic wall (Figure 4). More proximal re-entry where the aortic wall was less atherosclerotic would have been very close to the inferior mesenteric artery (IMA) ostium. Re-entry here would have potentially threatened the IMA patency and risking haemorrhage or trash embolization (Figure 4). Consequently a steerable 7 Fr sheath (Medtronic TM TourGuide) was advanced subintimal over a standard 0.035"wire into the aortic bifurcation. The sheath was then angulated such that is was possible to advance the re-entry (Cordis LTD *Outback*) catheter over an 0.014" wire sub-intimally along the right and posterior aspect of the distal aorta. The re-entry was successful at first pass (Figure 5). The stents were then positioned in a 'kissing' fashion (Figure 6). Completion angiography showed successful restoration of flow through recanalised and stented iliac arteries with preservation of the

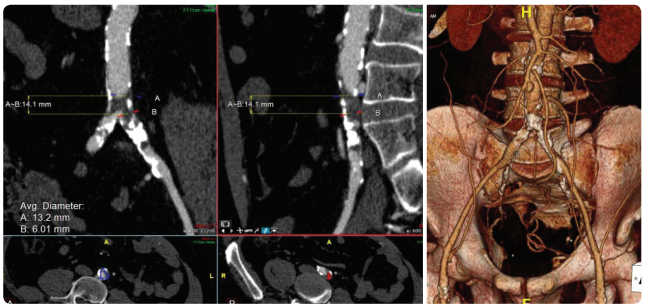

Figure 1: CT Angiography – Bilateral Iliac Occlusion and Right Common Femoral Disease.

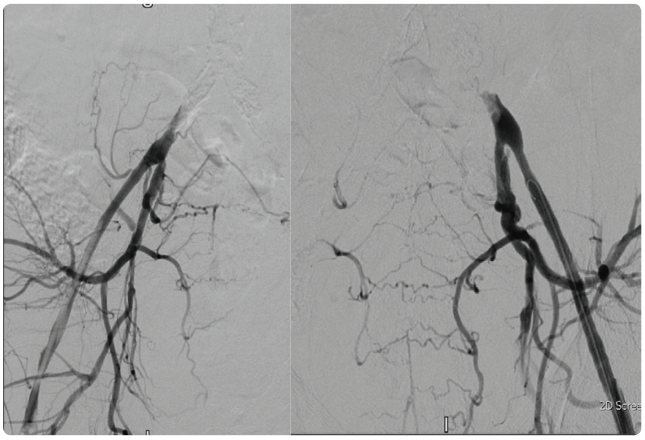

Figure 2: Bilateral Common Iliac Occlusion.

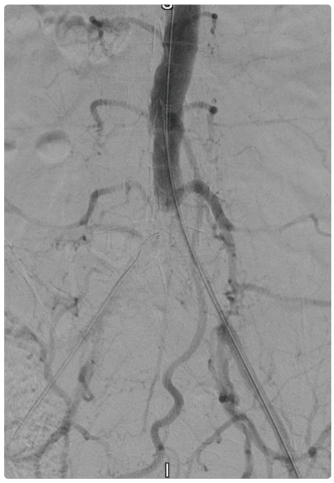

Figure 3: Left Common Iliac Occlusion sub-intimal transgression and aortic re-entry.

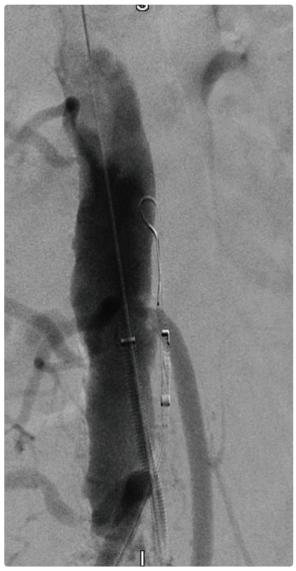

Figure 4: Right-sided 'natural' path of re-entry and proximity to the IMA.

Figure 5: Demonstrates the use of a steerable sheath to target the re-enty device towards the ipsilateral distal aorta with the desired re-entry achieved.

IMA (Figure 7). This procedure led to the prevention of limb loss and resolution of symptoms with successful 1-year patency (Figure 8).

Discussion

The Cordis LTD *Outback* catheter has high axial stiffness and one to one torque but tends to follow a straight path when unguided. Whilst this is not a problem for re-entry at the aortic bifurcation if the re-entry is required in the more proximal aorta this tends to lead the catheter to the opposite and anterior aspect of the aorta since the subintimal plane follows the iliac arteries as they arch from posterior-lateral towards the aortic bifurcation. This limits the choice of a re-entry point. Although it is possible to direct the re-entry catheter partially by manipulating the 0.014" wire into a more appropriate plane this manoeuvre an fail after a few attempts since the increasing subintimal space does not provide enough support for the catheter to retain its position other than in a straight direction.

If there is calcification or thick atheroma at the aorta re-entry target it may make it impossible to re-enter. A steerable sheath may allow the operator to choose a more suitable re-entry point in the distal aorta. This can be a decisive advantage when using a Re-entry (Cordis LTD *Outback*) catheter in the aorta successfully.

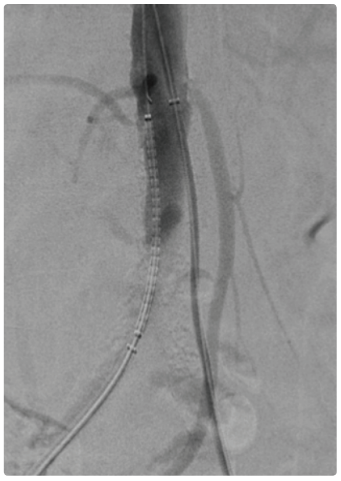

Figure 6: Targeted Re-entry with stent position (pre-deployment).

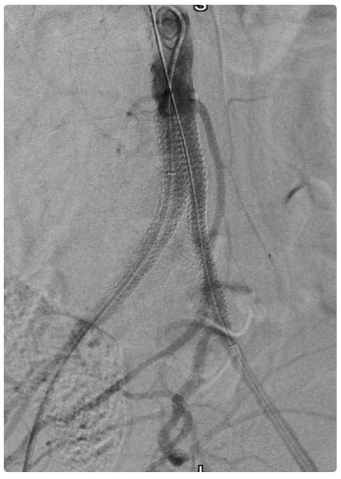

Figure 7: Completion angiography demonstrates the re-canalisation and stenting of the bilateral common iliac arteries with preservation of the inferior mesenteric artery.

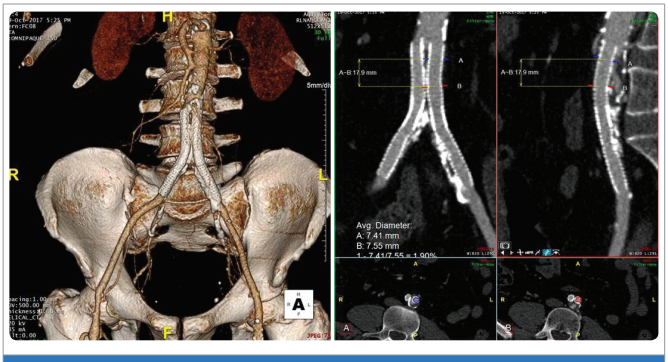

Figure 8: 1-year CT-Angiogram follow-up study.

Conclusion

Luminal re-entry in a disease-free segment of the aorta is essential when using the re-entry catheter (Cordis LTD *Outback*) to treat aorto-iliac CTO's. This case demonstrates that a steerable sheath and a re-entry catheter combination may be useful for selection of a suitable re-entry point into a diseased aorta preventing antegrade access or conversion to an open procedure.

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