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Recanalization of TASC C/D Iliac Occlusion: An Improved Technique through the Radio-brachial Access

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Authors' contributions

This work was carried out in collaboration between all authors. Authors GR and FD designed the study, author GR wrote the protocol, and wrote the first draft of the manuscript. Authors DV, KI and SB and LT managed the literature searches, Author PC analyses of the study All authors read and approved the final manuscript.

Method Article

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ABSTRACT

We describe a technique for reanalyzing total chronic long occlusion of the iliac arteries (TASC/D) through the radio-brachial approach. After having obtained the arterial approach, a 6F 90cm long Shuttle sheath (Cook Group, Bloomington, IN, USA) or a 4F 100cm Fortress sheath (Biotronik AG, Bulack, Switzerland) has been inserted into the left radial or brachial artery reaching the distal aorta, where an injection through the catheter has been made to assess the proximal occlusion cap. A 125 long MPA 4 or 5F catheter has been advanced over a coronary. 014" CTO guide-wire. The coronary guide-wire has been replaced with a Terumo guide-wire leaving the catheter into the first 4-5cm to the occlusion and a subintimal recanalization of the distal portion of the occlusion has been accomplished. Balloon dilation and implantation of long or multiple self-expandable stent have been accomplished to obtain patency of the vessels. The described technique appeared to be simple and safe allowing for recanalization of long iliac segments independently from the access, femoral or radial/brachial used. Large studies with long follow up are warranted to assess long-term effectiveness.

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1. INTRODUCTION

Trans Atlantic Inter Society Consensus (TASC [1]) C and D iliac lesions define a subset of patients with very severe and anatomically challenging iliac disease who if symptomatic have indication to surgical revascularization. Unfortunately, these very challenging patients are often old, affected by more severe systemic atherosclerosis, multiple comorbidities, and in particular severe coronary artery disease [2], that all increase the operative risk and related mortality. For these reasons, chronic iliac artery occlusion remains a debated field in which endovascular therapy is gaining reputation [3]. The radio-brachial approach in this subset of patients appears particularly attractive, especially for reducing complications related to the access. We describe here a new standardized technique for chronic TASC C and TASC D iliac occlusion using the radio-brachial approach.

1.1 Technique

After a screening angio-computed tomography useful to determine length of occlusion and potential disease of distal aorta, recanalization can be attempted from radio-brachial choosing the access site depending on the target vessel diameter: up to 9mm the radial approach is preferred, whereas above 9mm the brachial artery should be selected. After having obtained the arterial approach, a 6F 90cm long Shuttle sheath (Cook Group, Bloomington, IN, USA) or a 100cm long 4F Fortress sheath (Biotronik AG, Bulack, Switzerland) has been inserted into the left radial or brachial artery reaching the distal aorta, where an injection through the catheter has been made to assess the proximal occlusion cap. A 125 long MPA 4 or 5F catheter (Cordis Corp, Miami Lakes, Florida, FL, USA) has been advanced over a coronary .014" Persuader 6 or 9 (Medtronic Inc., Minneapolis, MN, USA) or a Confianza Pro 9 or 12 (Asahi Intecc, Nagoya, Japan) drilling the guidewire and pushing the catheter (Figs. 1A, 2A). Usually the coronary guide-wire has been replaced with a soft Terumo guide-wire (Terumo Corp. Tokyo, Japan) leaving the catheter into the first 6-7 cm to the occlusion and a subintimal recanalization of the distal portion of the occlusion has been accomplished (Figs. 1B, 2B). From both approach a high support .035" or 0.018" guide as the Supracor or V18 (Boston Scientific Corporation, San Jose, CA, USA) has been left in the lumen across the occlusion at any step of dilation and stenting procedures in order to have an easy and fast access to the artery in case of perforation or rupture (Figs. 1C, 2C).

Dilation with Mustang 7 to 9mmx60-100mm balloons (Boston Scientific Corporation, San Jose, CA, USA) with careful and slow increase in pressure and stenting with self expandable stents with Everflex EV3 7-10x60-100mm (Everflex, EV3 Inc., Plymouth, MN, USA) or Pulsar 18 (Biotronik AG, Bulack, Switzerland) has been performed (Figs. 2D, 2E, 2F). Mandatory was to check for perforation or rupture after any stage of the procedure.

This technique has been attempted in a pilot series of 21 patients from January 2010 to March 2012 (mean age 79±12.5 years, Table 1), with long (>100mm) TASC C and TASC D symptomatic chronic iliac arteries occlusion screened by Doppler ultrasound and angio-computed tomography, judged not candidates for surgery due to severe coronary artery disease (16 patients), severe heart failure (5 patients) contraindicating the surgical procedure. An informed consent was signed by all the patients and the Hospital Board approve the study. The procedure was successful in all but one case, mean length and diameter of implanted stents were 160.4±30.2mm and 8.6±1.4mm (Everflex EV3 in 18

patients, Pulsar in 3 patients), respectively. No After the procedure, in most patients standard medications included: aspirin 100mg once a day indefinitely+Clopidogrel 250mg twice a day for one-month: ticlopidin was used in initial few cases just for the fear of bleeding. In patients with previous chronic anticoagulation for other reasons, triple therapy for one month and then anticoagulant only indefinitely can be prescribed. No complications excepted an embolization to the periphery in one patient treated with manual aspiration, and a perforation needing a covered stent in another patient; no restenosis or thrombosis have been detected on Doppler US Scan at a mean follow up of 12.1±5.2 months with a significant improvement of ABI (0.29±0.6 versus 0.88±0.3, p<00.1) and Rutherford class (5.3±0.8 versus 0.7±1.9, P<0.01) compared to baseline.



Fig. 1. (A) A 76 –year-old man with very long TASC D unilateral aortoiliac occlusion was approach through the radial artery with a 100cm long 4F sheath. **(B)** after crossing the proximal cap with a Persuader 0.014” guidewire (Medtronic Inc, Minneapolis, MN, USA), a long 4F MPA diagnostic catheter (Cordis Corp, Miami Lakes, Florida, FL, USA) was used to support the subintimal recanalization with a soft 0.035” Terumo guidewire: The injection through the catheter confirmed to have gained to true lumen. **(C)** Final result after stenting with three 8.0x100mm EverflexEV2 stents

Table 1. Peripheral interventions results in the pilot study

| | Mean or n° (%) |
|---------------------------------|----------------|
| Brachial approach | 9/21(42.8) |
| Radial approach | 12/21(57.1) |
| Monolateral occlusion | 19/21(90.4) |
| Bilateral occlusion | 2/21(9.6) |
| Mean iliac occlusion length(mm) | 150.4±40.6 |
| Additional lesions | |
| Femoral occlusive disease | 11/21(52.4) |
| Popliteal occlusive disease | 6/21(28.6) |
| BTK monovessel disease | 2/21(9.6) |
| BTK bi-vessel disease | 3/21(14.3) |
| BTK triple-vessel disease | 1/21(4.7) |

BTK: below-the-knee

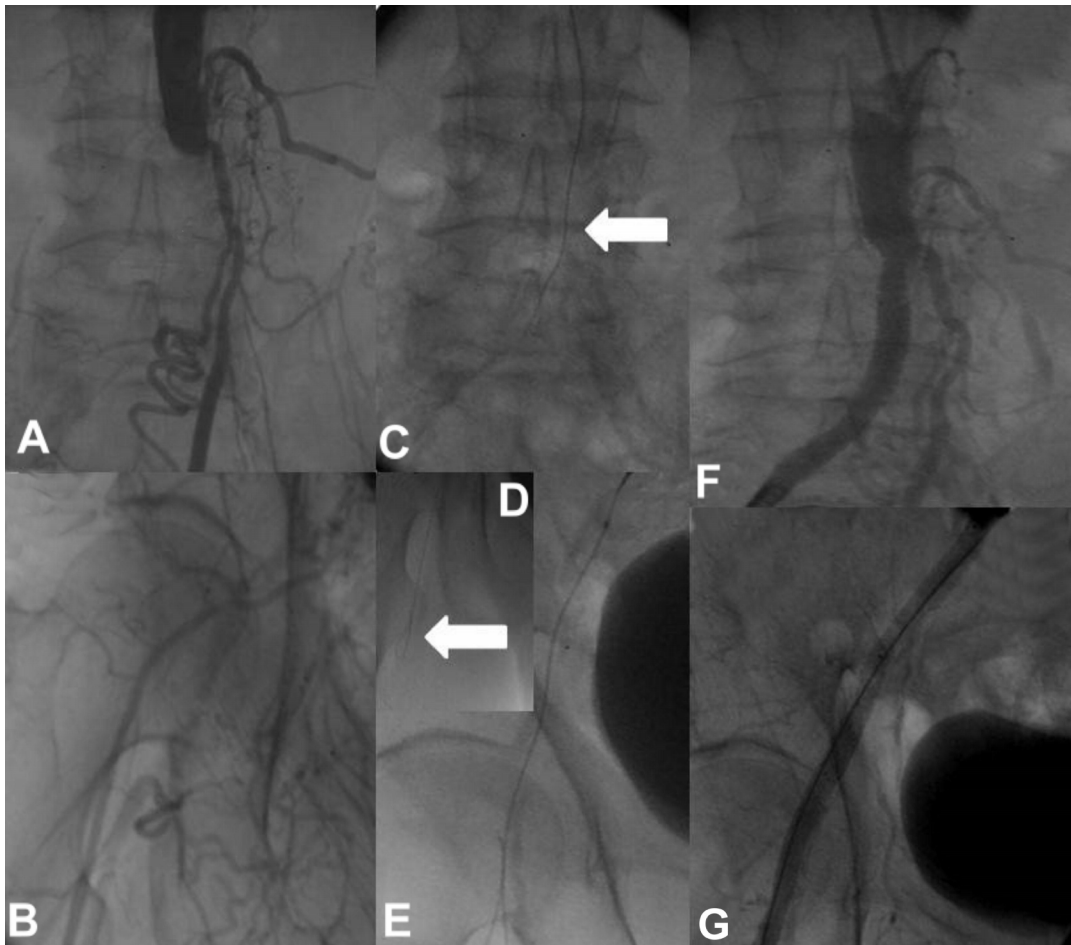


Fig. 2. (A) Angiography of the abdominal aorta of a 63-year-old man with right limb severe claudication: Total occlusion of the distal aorta (Leriche Syndrome) was observed. The entire iliac vessel and the right common femoral artery (B) were occluded. Recanalization of the right limb was planned and the patient was approached through the brachial artery with a 100cm long 4F sheath. A Confianza Pro 9(Asahi Intecc, Nagoya, Japan) .014" coronary CTO guidewire was passed through a diagnostic 120 long 4F catheter and navigated through the occlusion till the external iliac artery (C). Then a subintimal angioplasty with re-entry into the superficial femoral artery was accomplished looping a soft .035"Terumo (D-E) guidewire supported by the diagnostic catheter. Final angiography after multiple balloon dilation and implantation of 3 Pulsar 35 8x100mm stents confirmed a good result (F) and patency of the superficial femoral artery (G)

2. DISCUSSION

The proposed technique appeared to be simple and effective allowing for gain the distal lumen through the radio-brachial without using additional devices but standard equipments available in every catheterization lab. The advantages of this technique might be to minimize access complications and overcome difficult anatomies in very high risk patients with no

viable femoral access. On the contrary it is likely that as for coronary CTO through the radial approach, also this kind of technique increases the X-Ray exposure for the operators.

In recent literature, attention has been focused on re-entry device and type of stents to be used in chronic iliac occlusion. CART and Reverse CART techniques have been proposed in some other studies [4] but they imply the use of double access and necessarily increase procedural time and cost using multiple coronary guidewires, snare, ect, requiring a high operator's skillness.

Covered stents have been suggested to perform better than bare metal stents in TASC C and D iliac lesions [5], whereas bifurcated stent-grafts have been suggested to be a good minimally invasive alternative to open surgery [6].

Less attention has been posed in the past in access sites and the specific technique and materials to cross the occlusion. Standard femoral monolateral or bilateral approach with hydrophilic .035" guidewire not always allows for gaining the true lumen distal to the occlusion in particular in very long calcified occlusion lesions and often may predispose to entry site complications [3]. Re-entry devices have been suggested to be effective [7-8] but they necessarily increase the cost of the procedure and some technical challenges due to the rigidity of the devices.

On the contrary, the proposed technique through the radio brachial approach appears simple, requiring usually a single puncture, a coronary occlusion guidewire, a standard 125 cm long 4F Bernstein or MPA diagnostic catheter and standard balloons and stents. Being the tip of the diagnostic catheter very soft, to drill the stiff coronary guidewire and to push the catheter, offer a quite safe way to advance within the fibrous proximal cap of the occlusion, while the subintimal recanalization of the last portion of the occlusion into the external iliac or the common /superficial femoral artery usually appears very safe and easy to perform.

Moreover the radial or brachial approach, depending on the size of the patient, appears to have virtually no complications at the puncture size: the market is ready to have new long 4F sheath and the 4F compatible large balloon and stents which promise to allowing the use of radial approach in every patient, minimizing access complications and increasing patients' comfort.

3. CONCLUSION

In conclusion, although larger studies are required to assess the safety and long term outcomes of this strategy, the proposed technique seems to be feasible, easy and effective.

CONSENT

ALL patients gave their informed consent to the study.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. The Hospital Ethical Board gave its permission to the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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