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REVIEW ARTICLE

Aortoiliac occlusive disease: open or endo? – a narrative review

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ABSTRACT

INTRODUCTION: Aortoiliac occlusive disease (AIOD) can be treated using either open surgical revascularization (OSR) or endovascular revascularization (ER).

METHODS: A Medline search was performed in order to identify articles focused on the treatment of aortoiliac occlusive disease. Additional articles of scientific interest for the purpose of this non-systematic review were included by cross-referencing.

RESULTS: There are a few articles reporting direct results between both techniques based on retrospective or prospective single center or multicenter studies. In the majority of studies, primary patency is generally better for surgery in comparison to ER, but at a cost of more postoperative complications, with higher rates of respiratory failure and wound infection in the open group. On the other hand, endovascular recanalization is related to higher rates of limb ischemia/thrombosis, renal dysfunction and reinterventions. In the presence of femoral artery calcified disease, the hybrid approach should be considered.

CONCLUSIONS: Endovascular treatment is a suitable alternative for extensive AIOD and can be accomplished in a less invasive manner, with most midterm outcomes comparable with open reconstruction. Surgery should be reserved for multilevel calcified disease and after endovascular failure.

Keywords: Aortoiliac occlusive disease; Endovascular repair; Aortobifemoral bypass; Stent; Open surgical repair.

INTRODUCTION

The decision to treat a patient with aortoiliac aortic disease (AIOD) using an open procedure such as aortobifemoral (ABF) bypass or an endovascular revascularization (ER) depends on the severity of disease, comorbidities and functional capacity, thus making it difficult to compare the outcomes of these procedures directly in a non-randomized fashion.[1]

According to the Trans-Atlantic inter-Society Consensus (TASC) II,[2] ER is the recommended first-line therapy for TASC A and B patients. Open surgery is usually recommended for TASC D lesions, and good-risk patients with TASC C disease can also be treated with open surgery, depending on patient preference. But as endovascular techniques improve, we have seen a shift of paradigm with TASC C and D lesions also being treated with ER. The most recent guidelines, reported by the European Society of Vascular Surgery in 2017, have suggested that for patients who are fit for surgery, aortofemoral or ABF bypass should be considered for cases of aortoiliac occlusion or aortic occlusion extending to the renal arteries.[3]

The purpose of this paper is to perform a non-systematic literature review on treatment choice and outcomes for aortoiliac occlusive disease.

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METHODS

We performed a MEDLINE search using the MeSH terms peripheral arterial disease, aortoiliac occlusive disease, endovascular procedures, and vascular surgical procedures. Only English literature was considered. No specific period was predefined. Additional articles of scientific interest for the purpose of this non-systematic review were included by cross-referencing. Topics were organized as open surgical repair and endovascular repair.

RESULTS

Open Surgical Repair

Historically, the surgical options for AIOD included aortoiliac endarterectomy, aortobiiliac bypass, ABF bypass, and extra-anatomic bypass (femoro-femoral crossover bypass, or axillofemoral bypass). Given superior long-term patency, ABF grafting is currently considered the open revascularization procedure of choice unless the patient is a poor surgical candidate.

The 5-year patency after an ABF bypass performed for critical limb threatening ischemia (CLTI) is estimated to be around 80%.[4] Age has proven to be a significant predictor of outcome with primary patency rates at 5 years greater than 95% for patients older than 60 years but only 66% for those younger than 50 years.[5] One may speculate about the influence of age in ABF patency, which is probably related to a more aggressive form of atherosclerosis or maybe it is at a different point of disease evolution than their older counterparts. Despite the excellent patency outcomes in the long term, compared with ER, ABF is usually associated with higher perioperative morbidity (ABF 18% vs ER 13.4%, p = .001), mortality (ABF 2.6% vs ER 0.7%, p = .001) and longer in-hospital stay (ABF 8.5±6.2 days vs ER 2.6±0.8 days, p < .001).[5]

Endovascular repair

There are several endovascular techniques to treat AIOD, which have been previously described.[7,8] Jebbink et al. pointed out that the CERAB configuration is the most physiologic reconstruction, whereas the others have zones of flow recirculation that are related to zones of radial mismatch, which might induce thrombus formation and intimal hyperplasia. The same authors published another article assessing the geometrical consequences of these techniques.[9] In that study, the CERAB configuration with the limbs starting in the tapering part of the aortic cuff, appears to retain a double-D shape which allows for the lowest radial mismatch and a higher stent conformation to the aortic wall and aortic cuff, thereby decreasing the risk of intimal hyperplasia and thrombus formation.

Currently, aggressive endovascular treatment of TASC C and D lesions is becoming ever more common. As previously described in the COBEST trial,[10] there are no differences in patency between bare metal stents (BMS) and covered stents (CS) for TASC B lesions, but CS (specifically balloon expandable covered stents - BECS) do perform better for TASC C and D (HR, 3.302; 95% CI, 54.253-75.753; p = .003). The same is also valid for self-expanding covered stents (SECS). Piazza et al reviewed the use of SECS and BMS for AIOD and found similar overall early and midterm outcomes between both for TASC B and C lesions (87% vs. 66%, p = 0.06).[11] However, CS seem to have higher midterm patency rates than BMS for TASC D lesions (CS, 88% vs. BMS, 54%; p = 0.03), especially if the total lesion length is more than 6 cm, occlusion length > 3.5 cm and presence of calcification involving > 75% of the arterial wall circumference.

The involvement of the external iliac artery (EIA) is a decisive factor in defining patency of an endovascular recanalization. The relatively smaller EIA diameter and the decreased blood flow compared to the common iliac artery (CIA) may explain the higher risk for patency loss in EIA lesions,[12] therefore if there is concomitant external iliac artery disease, primary patency is lower and there is a higher probability of restenosis.[13] The success rate of recanalizing a chronic total occlusion (CTO) in the EIA is dependent of successfully crossing the occlusion.[14]

DISCUSSION

OSR has an unquestionable role in cases with more challenging anatomic occlusions, such as long segment occlusions with common and external iliac involvement, heavily calcified infrainguinal disease, in technically failed previous percutaneous interventions, recurrent stent thrombosis after failed endovascular intervention and in cases of hypoplastic aorta and small-diameter arteries distal to the iliac artery occlusion. When directly comparing both revascularization strategies, in the majority of studies patients treated with ER are usually older than the population of patients submitted to OSR.[15-17] If a concomitant distal bypass at the time of aortoiliac revascularization is needed, it is associated with a loss of primary patency of the aortoiliac segment with either OSR or ER.[18] The overall complication rate is higher in the OSR group (OSR 43.3% vs ER 17.8%, OR 3.5, 95% CI [1.2-10.1], p=0.016). On the other hand, the surgical group presents with lower re-intervention rates (OSR 3.3% vs ER 20.0%, OR 0.2, 95% CI: [0.1, 0.8], p=0.038).[19]

In terms of postoperative complications, OSR is associated with higher rates of respiratory failure and wound infection, and ER has higher rates of limb ischemia/thrombosis and renal dysfunction.[15,18]

Kashyap et al, described in their study comparing ER vs OSR in patients with severe AIOD a limb-based primary patency at 3 years was significantly higher for ABF in comparison with ER (93% vs 74%, P = .002). Interestingly, regarding secondary patency rates (97% vs 95%), limb salvage (98% vs. 98%), and long-term survival (80% vs 80%) the rates were similar between both techniques. Critical limb ischemia at presentation, poor outflow and renal failure were associated with decreased survival.

A retrospective analysis of more than 200 patients and 12 years follow up compared the long-term results of percutaneous iliac stenting and aortobifemoral grafting for patients with symptomatic iliac artery occlusions.[15] In that study, the authors demonstrated an evident shorter length of hospital stay, lower morbidity, and a quick return to preintervention activities with ER, supporting a secondary endovascular procedure attempt after a failed initial

percutaneous intervention. Only then, if secondary endo is unsuccessful or is not feasible, the option of ABF grafting is not precluded.

In the presence of severe iliac and common femoral artery occlusive disease, a hybrid approach combining iliac artery stenting with common femoral endarterectomy and/or profundoplasty may represent an alternative to the OSR and allows to expand the indications for the use of endovascular treatments, maintaining good patency rates and decreasing surgical risks.[16]

Several studies concluded that female sex,[6] hyperlipidemia and ipsilateral superficial femoral artery disease with iliac artery occlusion[16,17] were independent risk factors associated with loss of primary patency in the ER group, with no statistically significant independent predictors for loss of primary patency in the OSR group.

CONCLUSION

The treatment of AIOD can be accomplished with either open or endovascular means with excellent technical success. Primary patency is significantly better with open reconstruction, but secondary patency, limb salvage, and survival are nearly equivalent between groups.

Endo first is presently the most standard approach. With the current technical expertise and wide availability of a variety of stent types, endovascular treatment for AIOD produces satisfactory results regardless of the complexity of the lesion. Surgery should be reserved for multilevel calcified disease and after endovascular failure. There are still no randomized controlled trials comparing both techniques.

Conflicts of interest None

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REFERENCES

1. Indes J, Miles J, Forough F, Hillary B, Peter H, Kevin C, et al. Clinical Outcomes of 5358 Patients Undergoing Direct Open Bypass or Endovascular Treatment for Aortoiliac Occlusive Disease. J Endovasc Ther 2013;20:443–55

2. Norgren L, Hiatt WR, Dormandy JA, Nehler MR, Harris KA, Fowkes FG, et al. Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II). J Vasc Surg. 2007;45 Suppl S:S5-67.

3. Aboyans V, Ricco JB, Bartelink MEL, Bjorck M, Brodmann M, Cohnert T, et al. 2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS): Eur Heart J. 2018;39:763-816

4. Sidawy A, Perler B. Rutherford's Vascular Surgery and Endovascular Therapy 9th edition. 2019; section 15:1397-1437

5. Sen I, Stephen E, Agarwal S. Clinical profile of aortoiliac occlusive disease and outcomes of aortobifemoral bypass in India. J Vasc Surg. 2013;57(2 Suppl):20S-5S.

6. Antonello M, Squizzato F, Bassini S, Porcellato L, Grego F, Piazza M. Open repair versus endovascular treatment of complex aortoiliac lesions in low risk patients. J Vasc Surg. 2019;70:1155-65

7. Kuffer D, Soengel F, Steckmeier B. Percutaneous Reconstruction of the Aortic Bifurcation with Palmaz Stents: Case Report. Cardio Intervent Radiol 1991; 14:170-172

8. Palmaz JC, Encarnacion CE, Garcia OJ, Schatz RA, Rivera FJ, Laborde JC, et al. Aortic Bifurcation Stenosis: Treatment with Intravascular Stents. J Vasc Interv Radiol. 1991;2:319-23.

9. Groot Jebbink E, Grimme FA, Goverde PC, van Oostayen JA, Slump CH, Reijnen MM. Geometrical consequences of kissing stents and the Covered Endovascular Reconstruction of the Aortic Bifurcation configuration in an in vitro model for endovascular reconstruction of aortic bifurcation. J Vasc Surg. 2015;61:1306-11.

10. Mwipatayi BP, Sharma S, Daneshmand A, Thomas SD, Vijayan V, Altaf N, et al. Durability of the balloon-expandable covered versus bare-metal stents in the Covered versus Balloon Expandable Stent Trial (COBEST) for the treatment of aortoiliac occlusive disease. J Vasc Surg 2016;64:83-94

11. Piazza M, Squizzato F, Dall'Antonia A, Lepidi S, Menegolo M, Grego F, et al. Editor's Choice - Outcomes of Self Expanding PTFE Covered Stent Versus Bare Metal Stent for Chronic Iliac Artery Occlusion in Matched Cohorts Using Propensity Score Modelling. Eur J Vasc Endovasc Surg. 2017;54:177-85

12. Horejs D, Gilbert P, Burstein S, Vogelzang R. Normal Aortoiliac Diameters by CT. J Comput Assist Tomogr 1988;12:602-3

13. Kokkinidis D, Alvandi B, Hossain P, Foley T, Kielhorn C, Singh G, et al. Midterm Outcomes After Endovascular Intervention for Occluded vs Stenosed External Iliac Arteries. Journal of Endovasc Ther 2018; 25:183-91

14. Pescatori LC, Tacher V, Kobeiter H. The Use of Re-entry Devices in Aortoiliac Occlusive Disease. Front Cardiovasc Med 2020;7:144

15. Sachwani G, Hans S, Khoury M, King T, Mitsuya M, Rizk Y, et al. Results of iliac stenting and aortofemoral grafting for iliac artery occlusions. J Vasc Surg 2013;57:1030-7

16. Dorigo W, Piffaretti G, Benedetto F, Tarallo A, Castelli P, Spinelli F, et al. A comparison between aortobifemoral bypass and aortoiliac kissing stents in patients with complex aortoiliac obstructive disease. J Vasc Surg 2016;65:99-107

17. Mayor J, Branco B, Chung J, Montero-Baker M, Kougias P, Mills J, Gilani R. Outcome Comparison between Open and Endovascular Management of TASC II D Aortoiliac Occlusive Disease. Ann Vasc Surg 2019;61:65-71

18. Kashyap VS, Pavkov ML, Bena JF, Sarac TP, O'Hara PJ, Lyden SP, et al. The management of severe aortoiliac occlusive disease: endovascular therapy rivals open reconstruction. J Vasc Surg. 2008;48:1451-7

19. Starodubtsev V, Karpenko A, Ignatenko P. Hybrid and open surgery of Trans-Atlantic Inter-Society II type C and D iliac occlusive disease and concomitant lesion of common femoral artery. Int Angiol 2016;53:484-91