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Original Research Article

Hybrid Approach for Aorto-Iliac Disease – Beginning of New Era

Mahajan Amit[1], Luther Anil[2], Robin G. Lala[3], Sukhdev Pandey[4]
[1]Associate Professor, [2]Professor and Head of Unit, [3,4]PG Resident, Department of Surgery , Christian Medical College and Hospital , Ludhiana – 141008, Punjab, India

***Corresponding author**
Dr. Sukhdev Pandey
Email: sukhdevpanday@gmail.com

Abstract: Peripheral Arterial Occlusive Disease (PAOD) with bilateral iliac artery occlusion is one of the major causes of major amputation and morbidity in the elderly. Standard revascularization procedures are available worldwide but nowadays hybrid interventions are coming in a big way for PAOD patients, which provide the efficiency and convenience of a single-stage revascularization. In this article we will be discussing about hybrid interventions and their outcomes. Most commonly performed hybrid procedures are iliac stenting and femoral endarterectomy.
Keywords: Peripheral arterial occlusive disease, iliac artery stenting, femoro-femoral bypass , hybrid approach

INTRODUCTION

Hybrid interventions are emerging as a new method of revascularization in patients with PAOD especially multilevel occlusive disease. Hybrid interventions have become an important part of our treatment strategy for saving limbs in patients with multilevel peripheral arterial occlusive disease patients. In elderly high risk patients presenting with complete occlusion of the ipsilateral common and external iliac arteries and contralateral iliac disease, stenting of the contralateral iliac artery (donor artery) and a crossover femoral- to-femoral artery bypass is a better option than aorto-bifemoral bypass as it does not require a major laparotomy. Iliac balloon angioplasty (IBA) and stenting is done on the donor side of the FFB graft along with bypass grafting to augment flow to the donor femoral vessel. Stenosis or occlusion of the iliac vessels (pelvic vessels) is referred to as inflow disease. When the femoral vessels are affected, this is referred to as outflow disease and when the vessels below the knee are involved, it is referred to as distal disease. This hybrid procedure helps in to treat both the inflow and outflow disease. Typically, the hybrid procedure is carried out by a single vascular surgeon skilled in both endovascular and operative techniques or a team that includes an experienced interventionist and surgeon. It is estimated that hybrid interventions make up 5% to 21% of current limb revascularization procedures. Results of hybrid revascularization have been comparable to staged operative and percutaneous revascularization for multilevel arterial occlusive disease[1-3]. The main advantage of hybrid treatment includes prompt limb revascularization and patient convenience without the need for big incisions as done in standard revascularization procedures.

METHODS

In this article, we will be reviewing the current use of hybrid revascularization procedure for saving limbs in PAOD patients along with reporting an elderly gentleman who presented to us with bilateral iliac disease who underwent limb revascularization with right iliac balloon angioplasty (IBA) with stenting and femoro-femoral (right to left) crossover bypass (FFB). The aim of this research article is to define the importance and benefits for one-stage hybrid interventions in peripheral arterial occlusive disease patients.

RESULTS

Endovascular treatment has proven to be a comparable option for iliac occlusive disease; it offers better alternative to patients who are not good candidates for general anesthesia due to associated co-morbidities. However hybrid procedures have advantage of limited surgical endarterectomy of common femoral artery under conscious sedation and local anesthesia or short duration of general anesthesia, combined with endovascular treatment of iliac or superficial femoral artery disease for complete revascularization of in-flow to the extremity in the patients of critical limb ischaemia or disabling claudicationHybrid intervention allows for simultaneous reconstruction of multiple segments and provides the advantage of one-stage therapy without much added risks.

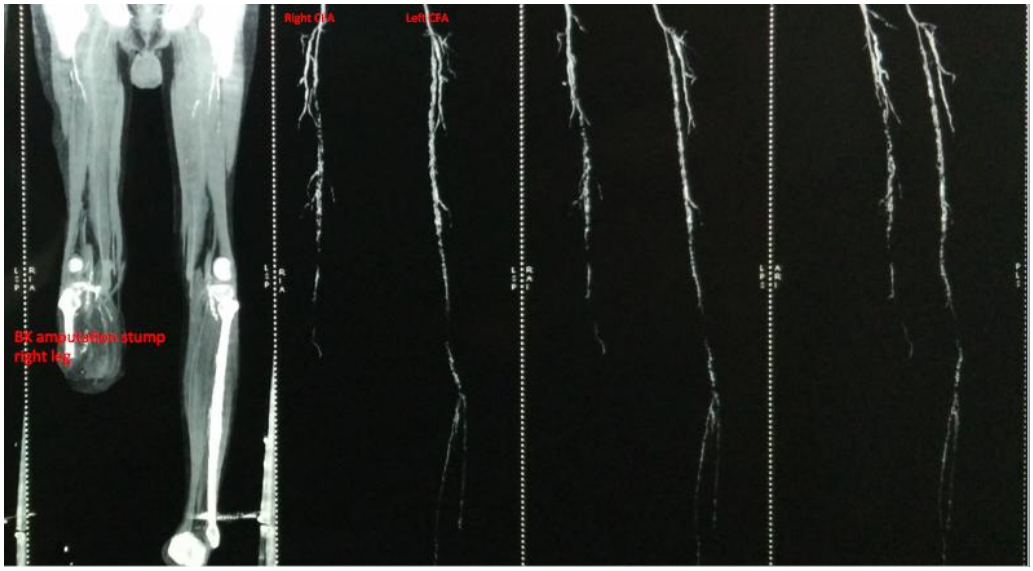

Fig-1: showing CT Angiography which revealed complete occlusion of left common iliac artery (CIA) and partial occlusion proximal right CIA

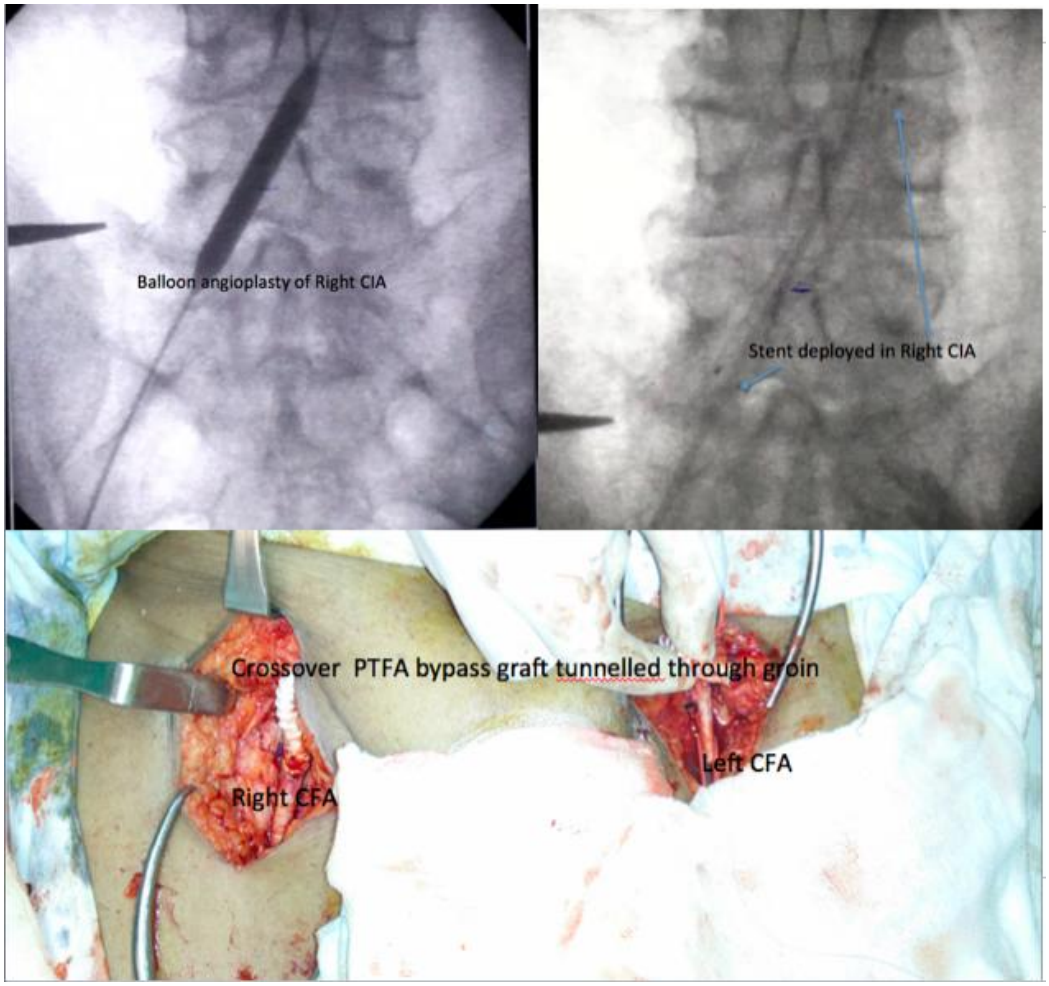

Fig-2: showing intraoperative picture of limb revascularization with right iliac artery balloon angioplasty(IBA) with stenting and femoro-femoral (right to left) crossover bypass (FFB) with ringed PTFE graft (HYBRID PROCEDURE)

DISCUSSION

Atherosclerotic arterial occlusive disease affecting the lower extremities is also known as peripheral arterial disease (PAD). It affects 8-12 million individuals in the US and is also increasingly prevalent in Europe and Asia[4]. The

overall prevalence of peripheral arterial disease (defined asan Ankle Brachial Index <0.90) is 4.3% (95% confidence interval [CI], 3.1% to 5.5%). Although prevalence is slightly higher in men than in women, the prevalence dramatically increases with age, rising from 0.9% in those younger than 50 years to 14.5% in those 70 years or older[5].

A recent case of PAOD we managed in our hospital provides a vivid picture of this scenario. A 70 year old gentleman, smoker, non-alcoholic presented with complaints of pain and pus discharge with blackening of skin flap of right below knee amputation stump and blackening of skin over tip of 1st and 2nd toes left foot 3 weeks duration. He is a diagnosed case of atherosclerotic peripheral arterial occlusive disease and had undergone right below knee amputation and closure two months back for wet gangrene. On examination, his right femoral artery pulse was weak and left side it was absent. His bilateral popliteal artery pulses were absent. His left side posterior tibial artery, anterior tibial artery and dorsalis pedis artery pulses were also absent. His Below Knee amputation stump was unhealthy, pale and was having pus discharge and slough with the skin flap necrosis.CT Angiography revealed complete occlusion of left common iliac artery (CIA) and partial occlusion proximal right CIA (fig 1). A diagnosis of atherosclerotic bilateral Common Iliac artery occlusion with non-healing infected below knee amputation stump right side and critical limb ischemia with gangrene 1st and 2nd toe left foot was made. He underwent limb revascularization with right iliac artery balloon angioplasty(IBA) with stenting and femoro-femoral (right to left) crossover bypass (FFB) with ringed PTFE graft (HYBRID PROCEDURE) and wound debridement (fig 2) . Postoperatively his right below knee amputation stump and left lower limb were revascularised evidenced by reappearance of bilateral femoral and popliteal arterial pulses and relief of his symptoms. Patient is being followed regularly in the outpatient department of surgery and is doing fine.

Prevalence of peripheral arterial disease is relatively lower in Indian population based on studies in South India and Central India but it is very important to identify the arterial disease at the early age so that medical line of treatment can be started at an early age and if required revascularization by means of endovascular or open approach can be planned[6]. Patients with peripheral arterial occlusive disease usually old and are associated with multiple co-morbidities such as diabetes, hypertension, coronary artery disease and renal insufficiency. A lower-extremity arterial duplex examination can confirm the diagnosis of occlusive arterial disease. Ultrasound arterial duplex is the best mode of investigation for the diagnosis of peripheral arterial occlusive disease[7-8]. It is estimated that approximately 25% of patients with multilevel peripheral arterial occlusive disease need both aortoiliac and infrainguinal revascularization[9]. In general this is required for patient with critical limb ischaemia having extensive tissue loss in the distal leg or foot. Simultaneous aorto-bifemoral bypass for proximal lesions and infrainguinal bypass reconstructions for distal lesions are helpful in saving limbs[10-11]. All peripheral arterial disease patients who had undergone major amputation of a lower limb are at high risk of developing subsequent amputations of the contralateral limb. Hence they need to be closely followed up and taken up for revascularization if indicated at the earliest[12]. Vetto first described femoro-femoral crossover bypass (FFB) grafting for the treatment of unilateral iliac artery obstruction in 1962. This procedure has been used extensively for unilateral iliac disease in patients deemed at high risk for abdominal aortic reconstruction[13]. Several reports have documented 5-year primary patency rates for FFB grafting that range from 55% to 92%, with an operative mortality rate that ranges from 0% to 6.2%[14-19].

With the recent advances in the endovascular procedures like angioplasty, the utility of FFB grafting can be used as combined procedure with endovascular for bilateral iliac disease in which the disease of one of the affected common iliac artery is focal and amenable to angioplasty and this side can be used as donor artery for FFB to the other side where long segment diseased iliac artery is there. Porter et al described the first report of the combined procedure for limb salvage in 1973[20]. Abu Rahma et al concluded that combined use of IBA and FFB procedures is effective and durable in cases of bilateral iliac artery occlusive disease, and the procedures can be performed simultaneously if the donor iliac stenosis length is 5 cm or less[21]. In general, endovascular treatment is preferred for trans-atlantic intra-society consensus (TASC) A and B lesions and surgery for TASC C and D lesions, although each case should be individualized[22] but now with recent advances and latest techniques even TASC C lesions can also be dealt with endovascular approach.

The term hybrid means mixture of two different things that involves the use of combined open surgical and endovascular techniques simultaneously. It started for aneurysm repair in vascular surgery, but now due to recent advances hybrid interventions have expanded to cure various types of vascular diseases. The hybrid procedure can be performed in three different types of operating theaters or environments. The first is the interventional radiology suite, which is fully equipped for endovascular procedures, including excellent imaging tools but it is not ideal for open surgery. The second option is an operating room which is ideal for open revascularization but is usually equipped with only a mobile X-ray C-arm and a basic CAT laboratory. However the third and ideal solution is a special hybrid operating theater that has the advantage of both open and endovascular approaches, but at a greater cost.

Patients with multilevel occlusive disease, especially those who are high-risk surgical candidates, may benefit from a combined hybrid surgical and endovascular intervention which restore both inflow and outflow at multiple levels, thereby decreasing the need for a big, lengthy open surgical procedure. A combined hybrid approach maintains favorable patency and limb salvage rates and is an effective option for the treatment of severe iliac and femoral occlusive disease.

Some common hybrid procedures include Ipsilateral Iliac Artery Stenting and Common Femoral Endarterectomy, Ipsilateral Iliac Artery Stenting and Infrainguinal Bypass, Iliac Artery Stenting and Crossover Femoral-to-Femoral- Artery Bypass, Superficial Femoral Artery Intervention and Distal Bypass . Although published reports of hybrid procedures are few[23-24], utilization of these combined strategies are increasing with the recent advances in this field and experience of endovascular interventions by vascular surgeons. Moreover, performing hybrid procedures as a one-step procedure compared to multistage open procedures greatly reduces hospital charges and length of stay. In the patient presented herein, we had performed a hybrid procedure with an open surgical common femoro-femoral crossover bypass ringed PTFE graft and an endovascular iliac angioplasty and stenting with minimal risk and a favorable outcome

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