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RESEARCH ARTICLE

OPERATIVE MANAGEMENT OF CHRONIC AORTA-ILIAC OCCLUSIVE DISEASE- DEMOGRAPHY AND OUTCOME ANALYSIS.

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Abstract

Background: Chronic Aorta Iliac Occlusive Disease (CAIOD) is a significant cause of lower limb ischemia and is often found in various age group with varied etiology.
Objective: To review recent results achieved treating CAIOD patients with open surgery and endovascular surgery.
Methods: From January 2017 to December 2018, 39 patients , who were admitted in Tamilnadu Government Multi Super Specialty Hospital, affiliated to The Tamilnadu Dr.M.G.R Medical University. Tamilnadu, Chennai. were operated with diagnosis of aorta iliac occlusion. Demographic data, co morbidities, clinical presentation and surgical results were analyzed.
Results: Thirty six men and 3 women were treated with aortic reconstruction. procedures included aortic bi femoral bypass (ABF; n=18), Ilio- Femoral Bypass (IFB; n=3), Aorta Iliac Plasty (AIP, n=1). Mean age was 53.7 ± 7.3 years (range: 43-79 years) and 30 patients were smokers. Thirty patients (%) had critical limb ischemia. Six of the patients treated with ABF (%) also required additional revascularization (femoropopliteal procedures). Perioperative mortality was two. Four patients (%) suffered transitory renal dysfunction, but only one patient (%) required hemodialysis. Median follow-up time was 17 months (range: 2-29 months) and there was just one late death, from ischemic heart disease, 7 months after the surgery on the abdominal aorta.
Conclusions: Aortic reconstruction with both open and endo- vascular methods is a safe for treating patients with Aorta iliac occlusions, with low perioperative morbidity and mortality rates.

Introduction:-

Chronic AortoIliac occlusion (CAIOD) is a form of Aorta-Iliac occlusive disease affecting about 20 % of patients presenting to vascular OPD with various forms of limb ischemia[1]. Although reports had been published previously[2] it was Leriche who described in detail the condition's signs, symptoms, diagnosis and prognosis and the treatment possibilities for patients, even highlighting the possibility of treating them by resection of the affected segment and construction of a direct aortic bypass (DAB).[3,4]. Oudot & Beaconsfield [5] later described what was probably the first patient with CAIOD to be treated with a DAB, constructed using a homologous graft.[5] Over the

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years, several publications have reported good results after treatment of patients with CAIOD using DAB, with mortality rates of less than 5%,[1,6-8] although other authors have described worse results, with mortality of up to 23%.[9] Alternative techniques such as the extra-anatomic bypass (EAD), using either the axillary artery or the thoracic aorta as graft donors, have been proposed by some authors,[6,10] but the risks and complications of not directly treating the segment of the aorta that has thrombosis (primarily, the possibility of proximal propagation of the thrombus) mean that these procedures are less attractive and reserved for cases in which the patient does not offer clinical conditions to conduct the direct procedure. With the widespread adoption of endovascular techniques to treat patients with Aorta-Iliac occlusive disease, there are now also reports describing use of this technique with patients with CAIOD.[11] The objective of this study was therefore to describe our recent results after surgical and endovascular treatment of patients with CAIOD.

Background:-

Peripheral Arterial Occlusive Disease (PAOD) is a disease defined as reduced arterial blood flow to the lower extremities due to atherosclerotic arterial lesions and is diagnosed by an ankle-brachial index less than 0.9. It may lead to intermittent claudication (IC) or, with progression of the disease, critical limb ischemia (CLI). Only one out of every four to five patients with PAOD will be symptomatic. The most common clinical manifestation of PAOD is intermittent claudication involving the pelvis, upper thigh and lower limb. It is defined as ischemic pain occurring during exercise, which is quickly relieved with rest (Fontaine II, Rutherford 1 to 3) . CLI is a more severe presentation of PAOD, defined as ischemic rest pain (Fontaine III, Rutherford 4) or ischemic skin lesions: either ulcers or gangrene (Fontaine IV, Rutherford 5 and 6, respectively) . See figure 2 for a description of the Rutherford classification. Patients presenting with CLI usually have multisegmental disease with involvement of the infra-inguinal arteries . Ten to twenty percent of patients with IC will progress to CLI in the course of their disease . The most important risk factors for progression to the advanced form of PAOD are age, tobacco use and diabetes mellitus . Epidemiology Newman et al. described the prevalence of PAOD (asymptomatic and symptomatic) in the general population. They found a prevalence of 13.4% in those over 65 years of age, rising to 21.6% in those over 75 years of age. The German getABI study [8] showed a prevalence of 19.8% in men over 65, and 16.8% in women over 65. The exact overall incidence of PAOD is not known, but the Framingham Study showed an incidence of IC of 26/ 10,000 in men and 12/10,000 in women. Anatomically, approximately 30% of the arterial lesions in PAOD are located in the iliac arteries . Endovascular treatment In 1964, one year before the technique was used for coronary arteries, the endovascular approach for treating aorto-iliac lesions was introduced by Charles Dotter . In 1974, a catheter mounted inflatable balloon that could fit over a guidewire was developed by Andreas Grüntzig, significantly improving the technique . Finally, in 1985, the first intraluminal stent was developed by Julio Palmaz, further improving the results of endovascular treatment . Despite the introduction of endovascular treatment in 1964, open surgical treatment has long been the treatment of choice. Open surgical repair provides good long-term patency (IC: 85 to 92%, CLI: 78 to 83%). The perioperative morbidity and mortality, however, is substantial . Due to ongoing improvements in materials and techniques over the past decades, endovascular techniques for aorto-iliac obstuctions have more and more replaced open surgical repair. These minimally invasive techniques show reduced morbidity and mortality when compared to open surgery.

Types of Aorta Iliac lesions

TASC guidelines

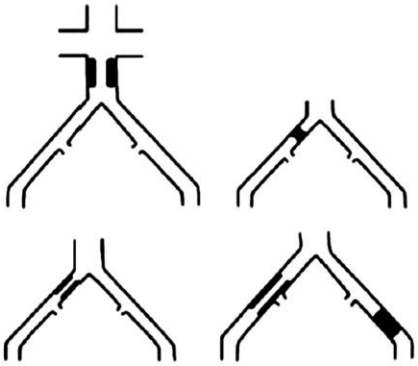
Chronic Aorta-iliac Occlusive Disease (CAIOD) is classified by the Trans Atlantic Inter-Society Consensus on the Management of Peripheral Arterial Disease (TASC II). This classification divides AIOD into four types (see Figure 1), based on the amenability to endovascular repair. The current TASC guidelines were published in 2007 and recommend an endovascular approach in type A and B lesions, and an open surgical approach for type C and D lesion.

Type A lesions

- Unilateral or bilateral stenoses of CIA
- Unilateral or bilateral single short (≤3 cm) stenosis of EIA

Type B lesions:

- Short (≤3cm) stenosis of infrarenal aorta
- Unilateral CIA occlusion
- Single or multiple stenosis totaling 3–10 cm involving the EIA not extending into the CFA
- Unilateral EIA occlusion not involving the origins of internal iliac or CFA



Type C lesions

- Bilateral CIA occlusions
- Bilateral EIA stenoses 3–10 cm long not extending into the CFA
- Unilateral EIA stenosis extending into the CFA
- Unilateral EIA occlusion that involves the origins of internal iliac and/or CFA
- Heavily calcified unilateral EIA occlusion with or without involvement of origins of internal iliac and/or CFA

Type D lesions

- Infra-renal aortoiliac occlusion
- Diffuse disease involving the aorta and both iliac arteries requiring treatment
- Diffuse multiple stenoses involving the unilateral CIA, EIA, and CFA
- Unilateral occlusions of both CIA and EIA
- Bilateral occlusions of EIA
- Iliac stenoses in patients with AAA requiring treatment and not amenable to endograft placement or other lesions requiring open aortic or iliac surgery

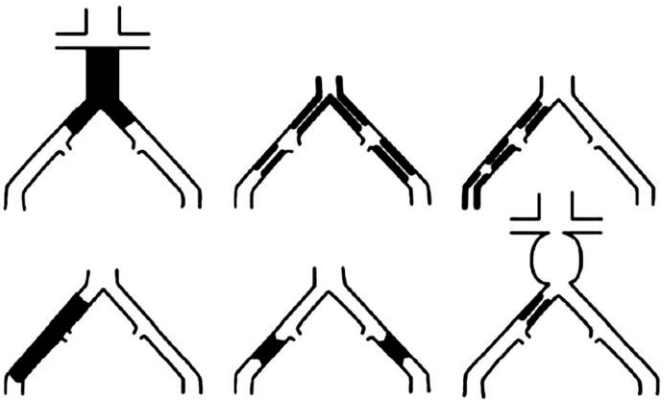


figure 1

figure 2

Table 1 Overview of the Rutherford-classification for PAOD

Grade	Category	Clinical description	Objective criteria
0	0	Asymptomatic - no hemodynamically significant occlusive disease	Normal treadmill test and ABI ≥0.9
	1	Mild claudication	Completes treadmill test. AP after exercise >50 mmHg, but at least 20 mmHg lower than resting value
I	2	Moderate claudication	Between categories 1 and 3
	3	Severe claudication	Cannot complete treadmill test *and* AP after exercise <50 mmHg
II	4	Ischemic rest pain	Resting AP <40 mmHg, flat or barely pulsatile ankle or metatarsal PVR, TP <30 mmHg
III	5	Minor tissue loss - nonhealing ulcer, focal gangrene with diffuse pedal ischemia	Resting AP <60 mmHg, ankle or metatarsal PVR flat or barely pulsatile, TP <40 mmHg
	6	Major tissue loss - extending above TM level, functional foot no longer salvageable	Same as category 5

AP = Ankle pressure, PAOD = Peripheral Arterial Occlusive Disease, PVR = pulse volume recording, TP = Toe pressure.

Methods:-

Patients

We reviewed medical records for patients with CAIOD who had been treated with OPEN and endovascular approach between. From january 2017 to December 2018, 39 patients , who were admitted in Tamilnadu Government Multi Super Speciality Hospital, chennai, affiliated to The Tamilnadu Dr.M.G.R Medical University, Chennai, Tamilnadu. with chronic aorta iliac occlusive disease. Patients were excluded if they had acute aortoiliac arterial occlusion, as were patients with abdominal aortic aneurysm with thrombosis. In all cases, CAIOD was diagnosed on the basis of clinical presentation and confirmed with computed tomography (CT) angiography.

Preoperative characteristics of patients

Data were collected on age, gender, comorbidities and clinical presentation for all patients. Comorbidities were defined as follows: smoking (current or previous cigarette smoking); hypertension (taking antihypertensive medicationor arterial blood pressure ≥ 140/90 mmHg); ischemic heart disease (prior history of acute myocardial infarction and/or coronary angioplasty and/or angina); prior myocardial revascularization surgery; renal failure (serum creatinine > 2.0 mg/dL); diabetes (taking hypoglycemic medication and/or insulin and/or fasting glycemia > 126 mg/dL). With relation to clinical presentation, patients were categorized as follows: asymptomatic; intermittent claudication (pain in lower limbs when walking that eases at rest); or critical ischemia (presence of pain at rest and/or trophic lesion). For men, erectile dysfunction was defined as difficulty achieving or maintaining an erection during sexual activity.

Surgical technique and data

All patients were operated on under general anesthesia. The procedures employed involved either aortic bifemoral bypass or aorta unifemoral bypass or ilio femoral bypass. Preoperative cardiac assessments were conducted according to routine procedure and patients with high surgical risk were treated using Endovascular approach.. For cases treated with a AFB, access to the abdominal aorta was achieved via a xyphopubic incision . In cases in which the extent of the aortic thrombus was more proximal, both renal arteries were dissected and exposed, to avoid embolization and/or thrombosis. A 14 × 7 mm bifurcated polyester synthetic graft was used for aortic surgery and 7mm straight polyester grafts were used for ilio femoral or aorta unifemoral bypass. Patients with trophic lesions and femoropopliteal occlusion were treated with infrainguinal revascularization during the same intervention, constructing a supracondylar femoropopliteal bypass, with a 6 mm polyester graf/ reveresed saphenous vein graft. Similarly, patients with renovascular hypertension (stenosis of the renal artery combined with renal dysfunction and/or difficult to control hypertension) were also treated with renal revascularization plus DAB. Cases of IRO (Infra Renal aortic Occlusion) were treated by construction of an aortic bifemoral bypass with placement of a bifurcated graft in the normal manner, clamping of the infrarenal aorta 2-3 cm from the lower renal artery, and end-to-side proximal anastomosis

All patients were given intravenous heparin (100 UI/kg) before clamping of the aorta. Routine procedure also included intravenous administration of mannitol (25 g) for renal protection and to stimulate diuresis.. Records were

kept on duration of surgery, duration of renal ischemia, estimated blood loss and number of units of concentrated red blood cells tranfused.

Endovascular approach involved, unilateral or bilateral common iliac artery/ external iliac angioplasty and stenting, access included ipsilateral or contralateral femoral approach with rare cases requiring brachial approach. Iliac angioplasty was performed with 7mm/8mm angioplasty balloon and 7mm/8mm balloon expandable stents. Aortic angioplasty was performed with simultaneous brachial and femoral approach. And stented with appropriate sized stents. All patients had preoperative ct angio imaging. With overnight hydration, with n-acetyl cystiene taken perioperatively.

Morbidity/mortality:
Mortality was defined while in hospital or within 30 days of surgery. Cardiovascular morbidity was defined as follows: angina or myocardial infarction, defined as chest pains combined with elevated troponin and abnormal electrocardiogram findings, and cardiac arrhythmia requiring treatment.

Noncardiovascular morbidities recorded were as follows: respiratory insufficiency, defined as a need for prolonged mechanical ventilation (>72 hours); reintubation or emergence of respiratory infection or atelectasis confirmed by clinical and radiological examination; and postoperative renal dysfunction, defined as an increase of at least 20% over baseline serum creatinine levels and considered transitory when levels returned to baseline or lower than 1.2 mg/dL by the time of hospital discharge. The following postoperative morbidities were also analyzed: all vascular cerebral events (strokes or transitory ischemic insults); gastrointestinal intercurrent conditions (for example, prolonged ileus, mesenteric and/or colonic ischemia, peptic disease); need for reoperation (bleeding, occlusion of the grafted segment); complications related to the surgical wound (hematoma, infection, dehiscence of walls), and other conditions (for example,deep venous thrombosis). Additionally, length of postoperative hospital stay and time spent in the intensive care unit were also recorded.

Follow-up
Patients were scheduled to attend their first consultations after surgery approximately 30 days after hospital discharge and were then followed for 6 months. Patency of bypasses was checked by clinical examination and imaging exams when necessary. Information was acquired for all patients about any intercurrent conditions, such as cardiovascular events, complications related to the graft, permanent renal dysfunction, requiring hemodialysis or not, and deaths from whatever cause. **Statistical analysis** Continuous variables are expressed as means ± standard deviations or medians and variances. No specific statistical tests were performed and neither were survival or graft patency rates calculated, because of the small sample size and the narrow time frame covered by the study.

Results:-

Preoperative characteristics of patients The patient sample comprised ten men (91.4%) and 11 women (8.6%), with a mean age of 53.7 ± 7.3 years (range: 43 to 79). 75% patients were smokers and the majority had hypertension (66.7%). Occlusive diseases were common: 28 patients had critical ischemia of lower limbs (70%), with pain at rest the most common symptom (42.8% of the whole sample); five men (12%) reported erectile dysfunction; and seven patients (33.4%) exhibited occlusive femoropopliteal disease (Table 1). **Types of occlusion** The extent of abdominal aorta thrombosis was as follows: 25 had TASC D(62.5%); 10 had TASC C (25%), and just 4 patients had TASC B (1%). **1 patient had** TASC A (0.25%) . During the period analyzed we did not treat any patients with SRO.

Surgical data: Five (12.5%) patients had aorta unifemoral bypass with 2 patients operated through retroperitoneal approach. Seven (17.5%) patients had aorta bifemoral bypass with standard intra peritoneal laparotomy approach. Eighteen (45%) patients had iliac angioplasty, Seven (17.5%) patients had bilateral iliac angioplasty. Five (12.5%) patients had combined femoral angioplasty. Sequential femoro popliteal bypass was performed in 7 patients, including both open and endovascular patients. hybrid approach was performed in 3 patients with proximal correction by endovascular and distal correction with endovascular approach. minor amputations were performed in 12 (30%)patients

Morbidity/mortality Mean number of days in hospital after surgery on the aorta was 9 days (range: 6-22 days) and median duration of stay in the intensive care unit was 2.5 days (range: 1-4 days). two death in patients who underwent aorta bifemoral bypass , both due to post operative cardiac causes. Surgical morbidities affected seven patients : one patient , who had a respiratory infection; and six patients in the open group, four of whom suffered

postoperative renal dysfunction, which was transitory in three patients and permanent in one patient, who required hemodialysis after hospital discharge; one patient who suffered pulmonary atelectasis; and one with an infection of the surgical wound at the groin . Both patients who had had respiratory complications responded well to clinical treatment with respiratory physiotherapy and antibiotics. The patient with an infected surgical wound in the groin also recovered well, with partial removal of the sutures from the skin, dressing and antibiotics.

Follow-up After hospital discharge, patients were followed for a median of 17 months (range: 2-29 months). one patient who had aortic surgery, died after 7 months of follow-up. Vascular examinations did not detect any cases of occlusion of vessels, irrespective of whether patients were treated with DAB or with EAD. Patients who were treated with a femoropopliteal bypass during the same operation (n=3), exhibited good recovery from ischemic ulcers, with complete healing of all lesions.

Discussion:-

Chronic Aorta-Iliac occlusion is an uncommon condition, occurring in up to 10% of patients treated for aortoiliac disease at some centers.[1,8,9] Currently, a diagnosis of CAIOD is still an absolute indication for surgical treatment in patients with aortoiliac occlusive disease, because the endovascular technique still suffers from limitations that impede adequate treatment of these patients, although there are already some recent studies that have reported promising results.[11,12] On the other hand, as endovascular techniques are being more and more widely adopted for treatment of patients with aortoiliac occlusive disease, open surgery has come to be reserved for patients with more severe forms of occlusive disease, such as CAIOD. García-Fernández et al.[13] found that 24% of a sample of patients operated on for aortoiliac occlusive disease had CAIOD. Some recent studies are available, such as the very significant one published by West Jr et al.,[1] who described a series of 54 patients with CAIOD seen over period of almost 12 years, and another recent one describing the experience gained treating 67 patients with CAIOD over a period of 20 years.[13] . Even though our study covered a smaller series of patients (n=40), treated over a period of approximately 2 years, we consider this to be a significant finding. Generally, patients with CAIOD are young, male and smokers.[1,6-8] Our study bears out this tendency. The most frequent clinical presentation in our study was critical ischemia, affecting 62% of the sample. In other reports the proportion of patients with critical ischemia appears to be lower, with the majority of patients presenting with intermittent claudication of the lower limbs.[1,6,7,9] This difference may be the result of delayed clinical diagnosis or late referral of these patients for vascular treatments, with the result that the disease is more advanced when they are operated on. The cause of CAIOD is generally proximal progression of occlusive lesions that involves the aortoiliac bifurcation and but rarely affects the renal arteries.[1,6,7,9] West Jr et al.[1] studied 20 patients with IRO and 34 with JRO (Juxta Renal Aortic Occlusion) in two separate groups and did not detect any significant differences between the groups in terms of demographic data or comorbidities, with the exception of the fact that the JRO group contained a higher proportion of patients with critical ischemia, which is possibly because when CAIOD is located at higher sites, collateral circulation plays a less important role. Our preference was to conduct aorto-bifemoral reconstruction in all of the patients treated with TASC D lesions. Some authors use an aortoiliac bypass, with the advantage that this approach avoids the inguinal exposure to conduct femoral anastomoses, thereby reducing the risk of complications such as infections of the surgical wound.[20] Our preference for femoral anastomoses was due to the following factors: the presence of diffuse aortoiliac disease; technical simplicity (the femoral artery is more exposed J Vasc Bras. 2015 Jan.-Mar.; 14(1):29-36 **35** Márcio Luís Lucas, Lúcia Deibler et al. than the external iliac); the need for infrainguinal revascularization in some cases; and the greater patency, which has been demonstrated in previous studies.[13,21] In some cases, the decision to use femoral arteries for distal anastomoses was taken during surgery, when we found discrepancies between the state of the external iliac artery compared with what had been seen on angiotomography, with a greater degree of calcification or a lumen that was inadequate for distal anastomosis. Seven of our patients required unilateral femoropopliteal bypasses in addition to the surgery on the aorta. Any additional procedures combined with surgery on the aorta can confer additional risk of morbidity and mortality, although some authors have reported good results. Mehta et al.[22] observed mortality rates of 5.7% among patients with aortoiliac occlusive disease subjected to renal revascularization in combination with DAB. Similarly, Chiesa et al.[23] have reported good results after infrainguinal surgery combined with surgery on the abdominal aorta. The good mortality and morbidity results observed in our study are in line with other previous studies.[1,6-8,13] Surgical mortality among patients treated for CAIOD ranges from 0 to 23%.[1,6-9,13]. Even since the rise to prominence of endovascular surgery, at our hospital we treat some patients with open surgery: in cases that present technical difficulties or contraindications against less invasive procedures. The most important complication directly related to the procedure (more than anything else, related to manipulation of the pararenal aorta) is postoperative renal dysfunction. Other authors have reported renal dysfunction rate ranging from 0% to 18.9%.[1,6,7,9,13] . Some

other studies have reported low rates of patients requiring hemodialysis during the postoperative period;[18,25] while others report that up to 10% of patients with prior renal dysfunction subjected to surgery on the juxtarenal aorta required hemodialysis afterwards.[26] West Jr et al.[1] reported that 4.1% of patients with CAIOD temporarily required hemodialysis during the postoperative period. With relation to follow-up, there was one late death in our study, secondary to acute myocardial infarction 7 months after surgery on the aorta, and this was the same patient described in the previous paragraph. In view of the sample size, we did not calculate survival for our patient series, but earlier studies have reported 5-year survival rates of up to 76.3% in patients who had been operated on for CAIOD.[1,6,9] In our study, patency of aortic bifemoral grafts was verified in all patients by clinical examination and by testing for femoral pulses and also for distal pulses in cases in which infrainguinal bypasses had been constructed. West Jr et al.[1] demonstrated 73.5% patency of aortic bifemoral bypasses over 6 years in patients who had had CAIOD. One of the patients died 7 months after surgery.

Conclusions:-

Open surgery and Endovascular treatment of patients with AIOD has proven a safe method with low morbidity and acceptable mortality in our patients. These data will serve for future comparison with results obtained using complex open aortic and advanced endovascular techniques.

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