American College of Radiology
ACR Appropriateness Criteria®

Clinical Condition: **Radiologic Management of Iliac Artery Occlusive Disease**

Variant 1: **Elderly patient with long history of mild claudication presents with acute-onset left lower-extremity pain. Absent left femoral pulse on palpation. Faint dorsalis pedis and posterior tibial pulses by Doppler.**

Treatment/Procedure	Rating	Comments
CTA pelvis with runoff	8	May be more readily available in cases of imminent limb threat.
MRA pelvis with runoff	7	May be preferable in diabetic patients and those with impaired renal function.
Anticoagulation adjunctive therapy	9	
Antiplatelet adjunctive therapy	7	
Catheter directed thrombolytic therapy	8	Therapy of choice if local expertise is available.
Catheter directed angiography	8	Consider noninvasive imaging if local expertise is available.
Surgical revascularization	6	Secondary option to be pursued if thrombolysis is contraindicated or immediate revascularization is necessary.
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Variant 2: **60-year-old patient with known atrial fibrillation. Angiogram demonstrates isolated filling defect in right common iliac artery. Patient had recent spine surgery.**

Treatment/Procedure	Rating	Comments
Anticoagulation adjunctive therapy	7	Anticoagulation is potentially contraindicated in the setting of recent spinal surgery; clinical assessment of relative risk is imperative.
Antiplatelet adjunctive therapy	5	
Catheter directed thrombolytic therapy	3	Probably not indicated but need to individualize depending on patient parameters.
Catheter directed mechanical thrombectomy	7	Need to individualize depending on patient parameters. Less appropriate for larger clot burdens.
Surgical revascularization	9	
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Clinical Condition: **Radiologic Management of Iliac Artery Occlusive Disease**

Variant 3: **Elderly patient with worsening claudication and small ischemic ulcers on digits of both feet. Angiogram demonstrates diffuse disease involving distal aorta and both iliac vessels with multiple stenoses >50%. Bilateral 75% mid superficial femoral artery stenoses and two-vessel tibial runoff bilaterally. (TASC D)**

Treatment/Procedure	Rating	Comments
Anticoagulation adjunctive therapy	3	
Antiplatelet adjunctive therapy	8	Indicated in chronic lower-extremity arterial occlusive disease.
Best medical management including supervised exercise program only	2	May be used as adjunct to more definitive therapy.
Catheter directed angioplasty (aortoiliac only)	6	May be a first step. TASC C/D lesions may require stents or surgery.
Catheter directed stent placement (aortoiliac only)	7	
Catheter directed stent placement (aortoiliac plus femoral angioplasty)	8	Should be part of a complete surgical plan for the patient.
Surgical revascularization	6	Need to individualize depending on patient parameters.
Rating Scale: **1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate**		

Variant 4: **50-year-old female smoker with severe claudication, but no symptoms at rest. Angiogram demonstrates bilateral 90% common iliac artery stenoses. (TASC A)**

Treatment/Procedure	Rating	Comments
Anticoagulation adjunctive therapy	3	
Antiplatelet adjunctive therapy	8	Indicated in chronic lower-extremity arterial occlusive disease.
Best medical management including supervised exercise program only	5	May be appropriate for initial therapy with intervention for refractory patients.
Bilateral angioplasty only	8	With selective stenting for suboptimal result.
Bilateral stent placement	8	Done primarily for some lesions depending on lesion morphology and length.
Surgical revascularization	4	Secondary therapy, especially in event of failed endovascular procedures.
Rating Scale: **1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate**		

Clinical Condition: **Radiologic Management of Iliac Artery Occlusive Disease**

Variant 5: **65-year-old sedentary male nonsmoker with no symptoms at rest, but mild left lower-extremity claudication. Asymmetrically diminished left femoral pulse. Initial physician visit.**

Treatment/Procedure	Rating	Comments
CTA pelvis with runoff	7	Depends on local expertise. Generally reserved for patients who fail medical management or have significant vascular abnormalities.
MRA pelvis with runoff	7	Depends on local expertise. Generally reserved for patients who fail medical management or have significant vascular abnormalities.
Catheter directed angiography	6	Secondary to noninvasive imaging. Often done at time of definitive endovascular therapy.
Risk factor analysis, lipid profile and ABIs	9	Combined with best medical management.
No further treatment or evaluation needed	1	
Best medical management including supervised exercise program only	9	
Anticoagulation adjunctive therapy	3	
Antiplatelet adjunctive therapy	8	Indicated in chronic lower extremity arterial occlusive disease.
Rating Scale: **1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate**		

RADIOLOGIC MANAGEMENT OF ILIAC ARTERY OCCLUSIVE DISEASE

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Summary of Literature Review

This discussion of iliac artery occlusive disease reviews the broader topic of peripheral vascular disease. Several recent consensus documents provide valuable overviews of this complex topic [1-3]. The consensus recommendations can be modulated by more recent literature with specific attention to iliac disease.

Acute Ischemia

Acute iliac ischemia may be due to thromboembolism, atheroembolism, in situ native arterial thrombosis, or thrombosis of a surgical bypass graft. Patients presenting with suspected acute iliac occlusion should be evaluated immediately by a vascular specialist. History should be obtained to determine the duration and severity of symptoms [1] and any history of prior interventions or surgery. Physical examination will reveal diminished common femoral artery (CFA) pulses. In addition, confirmatory Doppler examination should be obtained at the time of presentation to detect the presence of distal pulses. The ankle-brachial indices (ABIs) may be normal at rest in the setting of isolated iliac occlusive disease [3]. Patients presenting with acute limb ischemia without contraindications to anticoagulation should be immediately anticoagulated, typically with heparin. All patients, and particularly those with atypical presentations, should be considered for hypercoagulobility evaluation. Evaluation may be initiated concurrent with anticoagulation therapy and may include prothrombin time, partial thromboplastin time, platelet count, factor V Leiden, factor II (prothrombin) C-20210a, anticardiolipin antibody, protein C, protein S, and antithrombin III levels [1,3].

Imaging evaluation is indicated to define the underlying anatomy and extent of disease. In general, catheter-directed digital subtraction angiography is indicated in both endovascular therapy and surgical candidates. Other anatomic imaging options such as magnetic resonance angiography (MRA) or computed tomography angiography (CTA) can be considered but may pose some delay in starting definitive therapy or pose a risk of additional contrast load. Dilute iso-osmolar contrast, hydration with sodium bicarbonate solution, and pretreatment with N-acetylcysteine sodium bicarbonate drip may be useful in patients with marginal renal function. Time-of-flight MRA may be used when contrast cannot be administered [2].

The goal in the setting of acute ischemia is prompt restoration of distal blood flow. Endovascular and surgical options exist. The most widely studied and used endovascular option is catheter-directed pharmacologic thrombolysis. Alteplase, reteplase, and urokinase are the most commonly used agents, and a wide variety of infusion protocols have been described. There is evidence that the glycoprotein IIb/IIIa antagonist abciximab may reduce distal emboli [4,5]. Ultrasound (US)-assisted pharmacologic thrombolysis [6], suction embolectomy, and rheolytic therapy [7] are recognized options and may be used in conjunction with other therapies. US-assisted techniques may reduce overall thrombolysis infusion times, and suction embolectomy and rheolytic options may be particularly useful when thrombolysis is contraindicated. Surgical options include catheter embolectomy and bypass. While there is no convincing evidence for the universal superiority of endovascular or surgical approaches

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[8], it may be useful to distinguish embolic from in-situ lesions for therapy planning. Furthermore, the severity of ischemia and ability to tolerate surgery are important considerations.

For native vessel thrombosis, it is recommended that a trial of thrombolytic therapy be used for viable limbs. In those cases where a guide-wire can be passed across the lesion, intrathrombus lysis may be instituted. In cases where a guide-wire cannot be successfully passed, a trial of regional lysis should be attempted [1,2]. Prospective, randomized trials have demonstrated that 1-year limb salvage rates with endovascular techniques are similar to those of surgery, with lower mortality rates but higher rates of recurrent ischemia and amputation [3,9]. The endovascular approach will allow treatment of the underlying lesion following thrombolysis, and gradual low-pressure reperfusion may avoid reperfusion injury [10]. The use of mechanical techniques may allow more prompt restoration of flow and therefore expanded use of endovascular techniques in the threatened limb. Surgical approaches should be reserved for failure of attempted thrombolysis or endovascular thrombectomy, for cases where an unacceptable delay due to attempted endovascular techniques may jeopardize the viability of a limb, or for nonviable limbs.

For embolic occlusions, a consensus document has recommended that isolated suprainguinal emboli be removed surgically [1]. If embolic fragmentation and distal embolization into peripheral vessels have occurred, endovascular thrombolytic therapy is the preferred therapeutic option. Echocardiography is not necessary prior to thrombolytic therapy for embolic disease [10].

For occluded aortoiliac or aortofemoral bypass grafts, catheter-directed thrombolysis is the preferred therapeutic option in grafts occluded <14 days [1]. Despite a higher risk of amputation [3], catheter-directed therapy allows underlying lesions to be defined and treated. Furthermore, surgical risks related to reoperative anatomy and wound complications can be avoided [11].

Chronic Ischemia

Chronic limb ischemia can be clinically divided into asymptomatic ischemia, claudication, and critical limb ischemia (CLI). Claudication is reproducible lower-extremity muscle discomfort brought on by exercise and relieved by rest. CLI refers to chronic rest pain, ulcers, or gangrene secondary to arterial occlusive disease. While iliac occlusive disease is commonly a component of CLI, it seldom exists as an isolated lesion. Clinical evaluation of chronic ischemia should include history, physical examination, and ABI or segmental arterial pressures. Medical management should include risk factor modification such as smoking cessation and control of hyperlipidemia, and a lipid profile should be obtained covering total cholesterol, low-density lipoprotein (LDL) cholesterol (>100 mg/dL), high-density lipoprotein (HDL) cholesterol, triglycerides (TG), and homocysteine level in younger patients. Hypertension (blood pressure >140/90 mmHg) and diabetes (HbA1c >7.0%) control should be implemented in all patients with intermittent claudication and chronic limb ischemia. Other medical strategies such as a supervised exercise program or antiplatelet therapies such as cilostazol or aspirin should be implemented in all appropriate patients, but patients with iliac lesions in distinction to infrainguinal disease may be considered for revascularization without undergoing extensive medical therapy [2,3].

Arterial imaging is indicated in patients with abnormal resting ABIs or abnormal postexercise ABIs in whom revascularization would be performed if an amenable lesion is demonstrated. Patients with CLI should have expedited evaluation. Noninvasive anatomic imaging can be obtained with duplex US, MRA, or CTA, but catheter-directed digital subtraction angiography should be obtained in most patients where revascularization is being considered [2]. Intra-arterial pressure measurements may be of value, with gradients >10 mm Hg, either at rest or following pharmacologic challenge, considered significant.

Extensive literature exists describing the results of both surgical and endovascular interventions. Surgical interventions include bypass grafts, endarterectomy, and combination procedures. Endovascular interventions include angioplasty, stents, stent grafts, and plaque excision techniques. The Trans-Atlantic Inter-Society Consensus (TASC) document on Management of Peripheral Arterial Disease described anatomic classification and therapeutic recommendations for iliac occlusive disease. TASC II has modified these recommendations (see Appendix 1). Endovascular therapy is the treatment of choice for TASC A and B lesions, and recent studies confirm an expanded role for endovascular therapy in TASC C and D lesions.

Surgery versus Endovascular Therapy

The durability of endovascular therapy in TASC A and B lesions has been established, and it is generally accepted as preferable to surgery. Cumulative assisted patency rates of 71% at 10 years and limb salvage rates of 95% at 5 years and 87% at 10 years have been reported [12]. For TASC C and D lesions, surgery has been recommended. However, more recent data suggest an expanded role for endovascular therapy. Long-term durable results for aortofemoral bypass grafts for iliac disease have been established. Meta-analysis has demonstrated 5-year limb-based patency rates of 90% in claudicants and 87% in patients with CLI [13]. Two recent studies comparing surgical aortofemoral bypass to aortoiliac angioplasty and stenting have demonstrated similar results. Surgical bypass yielded higher 3-year primary patency rates and greater improvement in ABIs, but at the cost of increased surgical complication rates, including need for emergent surgery, infection, transfusion, and lymph leak. Importantly, neither study demonstrated any significant difference in secondary patency rates, limb salvage, or long-term survival [14,15]. The durability of endovascular recanalization of the iliac arteries has been established, although primary patency is generally less than that of surgery. A recent study involving iliac recanalization demonstrated 1-, 2-, and 3-year primary patency rates of 86%, 76%, and 68%, respectively. Secondary patency rates were 94%, 92% and 80%, respectively [16]. Another study has reported 3-, 5-, 7-, and 10-year primary patency rates of 90%, 85%, 80%, and 68%, respectively [17]. Despite substantial variation between these studies, the long-term patency of recanalized iliac segments has proven satisfactory. Surgical intervention incurs higher morbidity, including risk of impotence and retrograde ejaculation; endovascular therapies allow greater ease of reintervention. The TASC authors have noted that when choosing between endovascular or open-surgical/bypass therapies with equivalent short-term and long-term outcomes, endovascular techniques should be used first.

Percutaneous Transluminal Angioplasty versus Stent

The Dutch iliac stent trial concluded that percutaneous transluminal angioplasty (PTA) with selective stent placement yielded patency rates similar to those occurring with primary stenting [18]. More recent stratified studies have documented that primary angioplasty with selective stenting is effective for TASC A and B lesions [12,19,20]. However, stenting has demonstrated significant benefits over angioplasty alone in TASC C and D lesions [19,20]. Other authors have found patency rates for primary stenting of TASC C and D lesions to be similar to those for TASC A and B lesions [21,22]. Finally, a recent study found no significant difference in the patency rates of iliac artery stents among all TASC categories, questioning the utility of the TASC classification and associated endovascular and surgical recommendations in iliac disease [23].

Bare Metal versus Covered Stent

Literature is developing with respect to the role of stents covered with polytetrafluoroethylene (PTFE) in treating iliac occlusive disease. Two studies have confirmed its technical feasibility, and both demonstrated 1-year primary patency rates of 91% [24,25]. A recent report described significant benefit to using covered balloon-expandable stents in type C and D lesions as compared to bare metal stents at 18 months follow-up with respect to binary restenosis (95.4% vs 82.2%), amputation rate (1.2% vs 3.6%), and clinical improvement (94.2% vs 76.7%) [26]. Another study demonstrated significantly higher 5-year primary patency rates with use of stent grafts as compared to bare metal stents (87% vs 53%) in patients undergoing simultaneous CFA endarterectomy and iliac revascularization [27]. Additional information regarding patency rates of covered stents will also be provided by long-term review of aortic endograft experience.

Endovascular Adjunct to Other Procedures

Endovascular therapy may be an adjunct to a separate surgical or endovascular procedure. It has been demonstrated that an ipsilateral stenotic, but not occluded, superficial femoral artery (SFA) is a predictor of iliac intervention failure and that SFA stenoses should be addressed at the time of iliac intervention [28]. When iliac intervention is being performed in conjunction with infrainguinal surgical bypass, graft patency is significantly greater with stenting as compared to angioplasty alone and is similar to that of aortofemoral bypass at 5 years [29]. For external iliac artery disease that extends into the CFA, external iliac artery stent placement with CFA endarterectomy and patch angioplasty has produced durable results with less extensive surgery than conventional bypass [30]. A more recent study evaluating the combined CFA endarterectomy with stenting of the common or external iliac artery demonstrated a 5-year primary patency rate of 60% and a secondary patency rate of 98% [27]. Endovascular repair and femoral-femoral bypass may be useful in patients with a stenotic segment <5 cm in the inflow limb and contralateral iliac occlusion, but not in patients with stenoses >5 cm (primary patency rates at 3 years = 85% and 31%, respectively) [31].

Predictors of Success and Failure

Multivariate analysis of independent predictors for iliac intervention failure has been described in multiple studies. An untreated stenotic (>50%) SFA in the setting of iliac artery angioplasty or stent had a 3-year primary patency rate of the iliac intervention of 36%. SFAs that are occluded, patent, or receiving concomitant angioplasty at the time of iliac intervention demonstrated 3-year primary patency rates of 84%, 81%, and 75%, respectively. Occluded SFAs can be observed, but stenotic SFAs should be repaired at the time of iliac intervention [28]. Hypertension, hypercholesterolemia, chronic renal insufficiency, poor tibial runoff [12], external iliac artery disease, female gender [32], smoking, gangrene or ulcer [20], diabetes mellitus or presence of a distal bypass [15], and hormone replacement therapy in females [33] have all been described as independent predictors of failure. Immediate hemodynamic improvement and the presence of two-vessel femoral or two-vessel tibial runoff have been described as predictors of favorable outcome [12].

Summary

- Endovascular thrombolytic therapy and endovascular mechanical embolectomy are preferred therapies for in-situ native iliac artery thrombosis.
- Isolated iliac artery emboli are preferentially treated by surgical embolectomy; if significant associated distal emboli are also present, endovascular thrombolytic therapy is preferred.
- Endovascular repair is recommended for TASC A and B lesions.
- Primary iliac artery angioplasty with selective stenting has patency rates similar to those of primary stenting in TASC A and B lesions.
- A stenotic SFA is a predictor of failure for iliac artery intervention, and it should be repaired at the time of iliac intervention.
- Surgical repair of TASC C and D lesions is generally indicated; however, endovascular repair has demonstrated good results from a much less invasive procedure and may be indicated in some patients.

Supporting Documents

- ACR Appropriateness Criteria® Overview
- Evidence Table

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Appendix 1. TASC Classification of Aorto-iliac Lesions

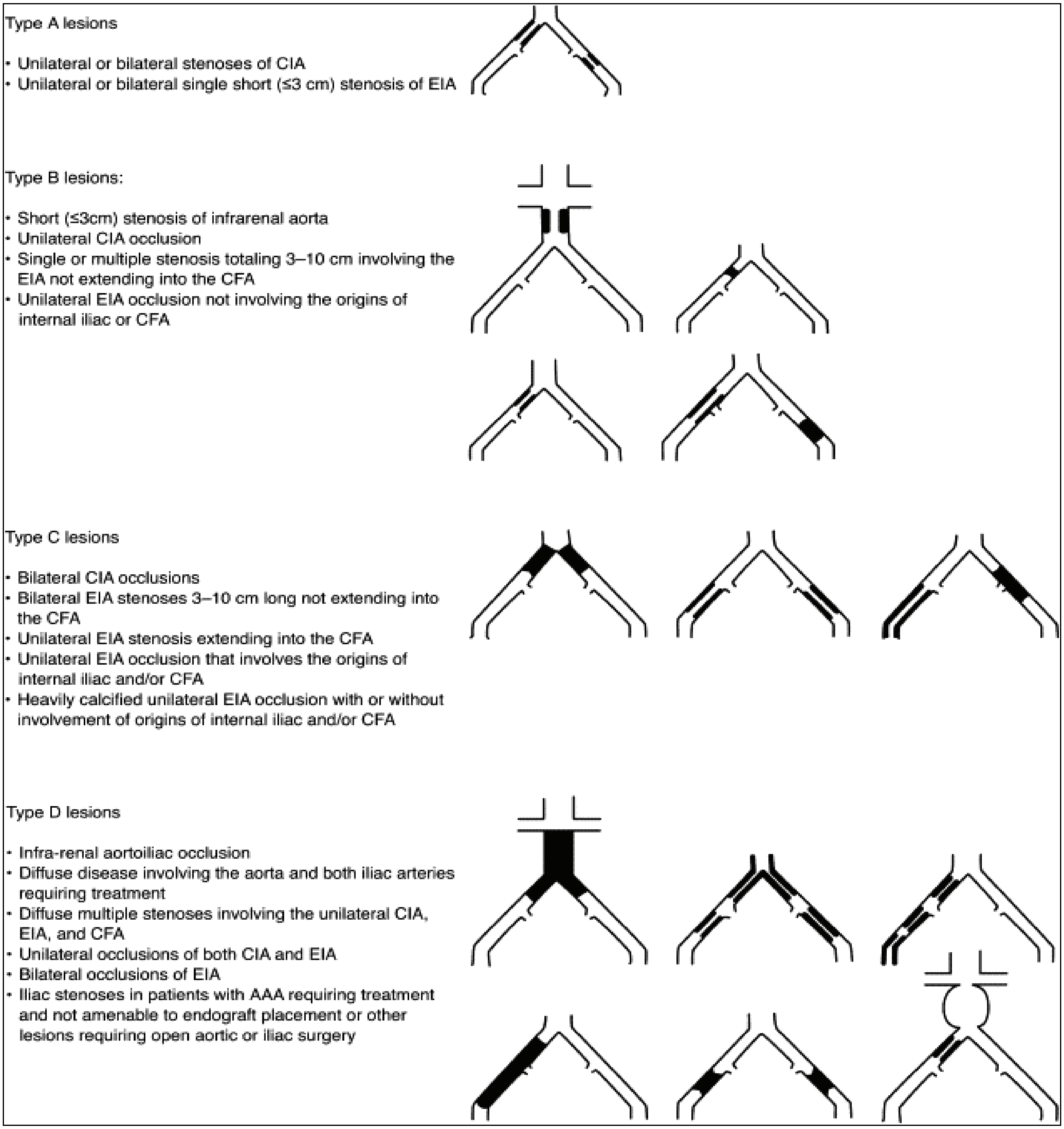

Fig. F1. TASC classification of aorto-iliac lesions. CIA – common iliac artery; EIA – external iliac artery; CFA – common femoral artery; AAA – abdominal aortic aneurysm.