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Case Report

Orthopaedics Section

Acute Thrombus in the Common Iliac Artery following Robotic Total Hip Arthroplasty: A Case Report

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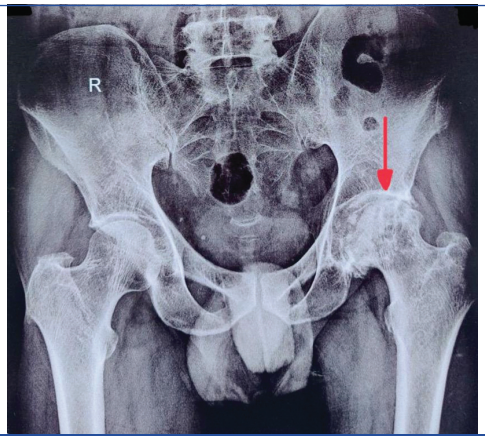
ABSTRACT

Thrombus formation following robotic Total Hip Arthroplasty (THA) has been documented; however, involvement of the common iliac artery is uncommon, even among the minimal studies available on this subject. The present report provides insight into the diagnosis and management of this rare postoperative complication. A left-sided robotic total hip replacement was performed on a 55-year-old Indian male patient, following which his left lower limb pulses were not palpable. A complete occlusion of the left common iliac artery was noted on a CT angiogram. Embolectomy was performed, after which the patient recovered well. The present report highlights the importance of pre- and postoperative monitoring and the ready availability of angiograms and vascular surgeons. With these systems in place, adequate results can be achieved.

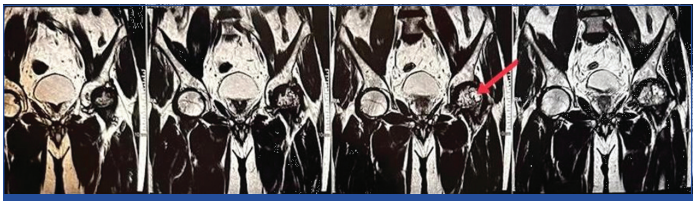
Keywords: Embolectomy, Postoperative complications, Replacement, Robotic surgical procedures

CASE REPORT

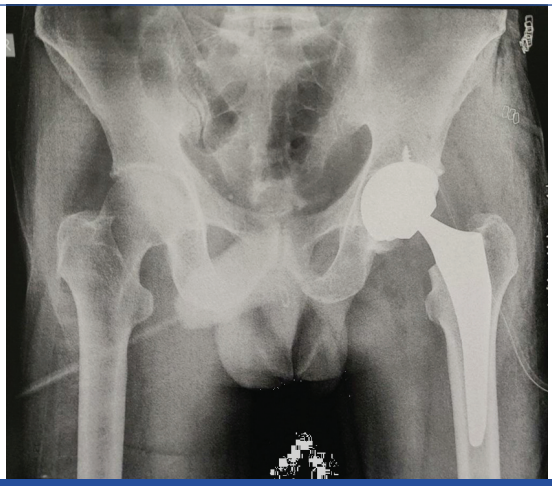
An Indian 55-years-old male old, presented with a history of hip pain and abnormal gait for the last seven years, which aggravated over the last three months. The patient was clinically and radiologically evaluated, leading to diagnosis of diagnosis of left femoral head avascular necrosis (Ficat and Arlet stage IV) [Table/Fig-1,2] [1]. The patient had no history of chronic illnesses or habits. Distal pulsations in the left lower limb, including the dorsalis pedis and posterior tibial artery, were palpable No neurological deficits in the involved limb. After written informed consent, a robotic THA was performed using the Mako total hip™ system through the posterior approach [Table/Fig-3]. Immediately postoperatively the left lower limb distal pulsations were not palpable. An immediate CT angiogram was then performed which showed complete occlusion involving the left common iliac artery extending to the superficial and deep femoral artery [Table/Fig-4,5].



[Table/Fig-1]: Preoperative pelvis and both hips Anterioposterior (AP) radiograph showing avascular necrosis of left femoral head [1].



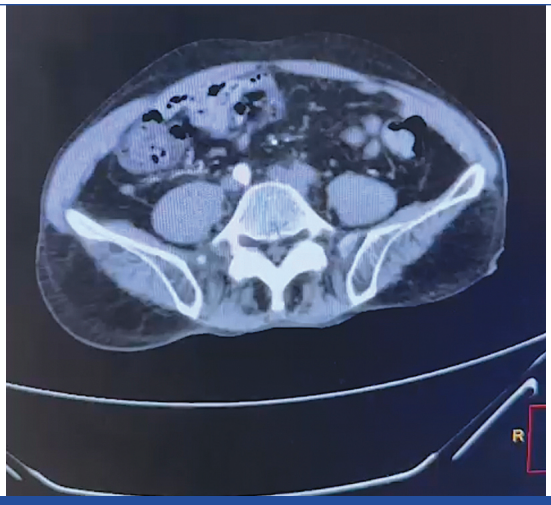
[Table/Fig-2]: Preoperative Magnetic Resonance Imaging (MRI) coronal cut showing left femoral head avascular necrosis.



[Table/Fig-3]: Postoperative pelvis and both hips AP radiograph showing robotic Total Hip Arthroplasty (THA).

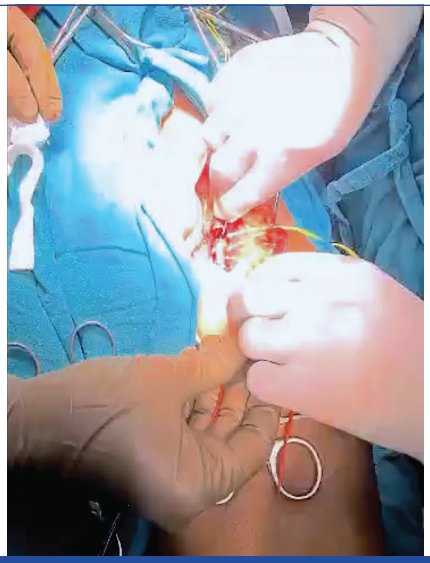
[Table/Fig-4]: A 3D CT angiogram image showing complete occlusion of the left common iliac artery.

Cardiothoracic and vascular surgery was immediately involved, and the patient underwent embolectomy within 90 minutes of diagnosing the pulseless limb. Femoral artery exploration was done and the patient was found to have a normal femoral artery without



[Table/Fig-5]: Axial cut of CT angiogram showing left common iliac artery occlusion.

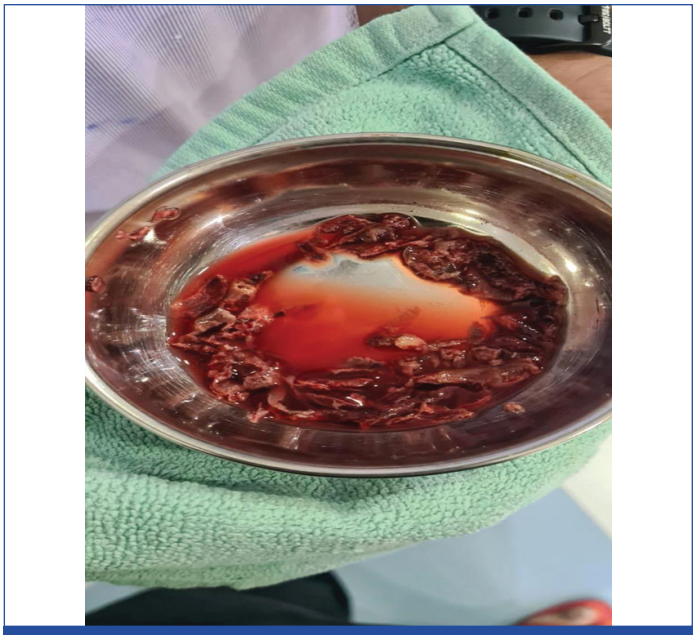
any external injury. Distal embolectomy was carried out using a no. 4 Fogarty catheter [Table/Fig-6]. Several clots were removed from the superficial and deep femoral arteries, establishing good distal backflow. Proximal embolectomy in the external and internal iliac arteries was done with a no. 5 Fogarty catheter. Gross examination of the removed clots indicated chronic thrombosis [Table/Fig-7]. The artery was closed using 6-0 prolene sutures. Peripheral pulses were felt, with a capillary refill time of less than two seconds. Active movements in the limb were confirmed after six hours. The patient was then started on heparin followed by enoxaparin for three days, transitioning to oral anticoagulants for six months. The patient was discharged following an uneventful 14-day postoperative period, the patient was discharged. A follow-up after one month showed normal peripheral pulses in the left lower limb, peripheral pulses were normal and comparable to the contralateral side. A Doppler scan of the left lower limb Doppler scan was done which showed patent lower limb arteries with normal waveform.



[Table/Fig-6]: Embolectomy procedure of left common Iliac artery through an incision in the left femoral artery.

DISCUSSION

Vascular complications following THA have an average incidence of 0.2-0.3% [2]. This includes complications such as pseudoaneurysm, haemorrhage, and arterial transection, making acute thrombus formation an extremely rare complication. Patro BP et al., described a similar case of thrombosis in the external iliac artery following a THA and stated that the external iliac artery and the common femoral artery are the most commonly injured vessels in THA [3]. Actions such as joint dislocation, traction, relocation, and excessive limb manipulation, including traction caused by retractors, exert longitudinal stress on the iliac vessels. The external iliac artery has



[Table/Fig-7]: Clots and intima removed post embolectomy.

a thicker intima with higher flexibility, and hence, is at less risk of tearing [4]. Risk factors for arterial lesions include diseases of the blood vessels including arteriosclerosis obliterans and peripheral artery disease, deformities of the acetabulum such as rheumatoid arthritis, osteoporosis, congenital hip dysplasia, and acetabular hyperplasia, as well as anatomical abnormalities of the vasculature, and acetabular or pelvic fractures [2]. The presence of these conditions significantly increases the risk of vascular complications. Fatic N et al., presented a similar complication to the patient in present report, but in a case of revision THA [5].

The mechanism of injury was divided into the following three categories by Duparc F: dislocation and reduction manoeuvres causing trauma to the vessels from torsion and elongation forces, Hohmann retractors causing compression or persistent pressure injuries, or vessel penetration (seen more commonly in revision cases) [6]. Additional important factors include a history of previous surgeries, the surgical approach used, and acetabular screw placement. The surgical approach used also plays a significant role in preventing vascular complications in THA procedures [2]. In procedures involving cement, the extrusion of cement anteroinferiorly can be reduced by pressurisation under direct vision with transparent nature along with superiorly directed force [7]. Currently, the greatest risk factor currently is still acetabular revision [2,8].

To prevent progression to compartment syndrome or the requirement of amputation, early diagnosis is crucial [6]. Patients with a history of vascular surgery or arteriopathy should undergo a vascular surgery consultation before opting for such invasive procedures [2]. During THA surgery, surgical precautions should be taken to minimise the risk of arterial injury or thrombosis. The vascular status of the patient should be carefully assessed preoperatively using duplex scan, ultrasound, or enhanced three-dimensional CT scan. Surgical precautions include avoiding penetration of screws, reamers, drills, or cement into the inner cortex of the acetabulum, especially along the anterior half [9]. Early detection of signs and symptoms of limb ischemia through a careful postoperative assessment is crucial. In high-risk situations, paraclinical assessment may also be useful [2]. A study by Calligaro KD et al., describes that the failure to diagnose arterial injuries on the day of surgery in total hip and knee replacements was as high as 44% [10].

The surgeon personally checked the pulses and vascular status of the limb immediately postoperatively which led to early identification of the vascular injury and successful limb salvage. Due to the patient being under epidural anaesthesia the patient could be immediately taken up for surgery.

The availability of a vascular surgeon is also an important factor for early intervention. Since, the patient was in tertiary care Institution, early intervention was possible.

Upon retrospective analysis, the patient in present case had acute on chronic thrombosis, which probably occurred due to manipulation and reduction. The CT angiogram also showed thrombosis extending from below the renal artery, which was in favour of chronic thrombosis. An arterial Doppler should be performed for all arthroplasty cases to rule out any pre-existing pathology, which can help prevent future medicolegal complications.

In present case of robotic THR, iliac pin placement was also considered a probable cause of injury to the common iliac artery. However, the CT scan showed that the trajectory of the pin was not near the vessels, and no external haematoma was found near the vessels.

In the treatment approach, the duration of symptoms is crucial [7]. Prevention of the propagation of thrombus proximally or distally with early heparinisation combined with delayed intervention was a concept presented by Blaisdell FW et al., [11]. Thrombectomy with a balloon catheter, bypass procedures, intraoperative isolated limb thrombolysis, and endarterectomy, which may or may not include patch angioplasty, are some open surgical techniques for salvaging an ischemic limb. Rapid restoration of arterial flow to the extremity with an operative procedure represents a significant insult that all too frequently culminates in patient demise, especially in medically compromised individuals [12-14]. Ideally, catheter-directed thrombolysis should be performed within four to six hours of the occurrence. However, most thrombi can be surgically managed within 24 hours [15].

CONCLUSION(S)

The THA procedures that lead to vascular complications are rare, making acute on chronic common iliac artery thrombosis following a robotic THA an infrequent phenomenon. However, surgeons should be aware of the possible types of vascular complications following THA, their causes, risk factors, and treatment options. Preoperative and postoperative monitoring of the patient's vascular status is essential, especially in those at risk for vascular complications. Iatrogenic causes can also be avoided with proper surgical care. The absence of pulses, cold extremity, and increased capillary refill time can provide an early clue to diagnosing vascular insults or lesions. Early diagnosis and immediate CT angiogram instead of a preliminary Doppler study can help save precious time, which can be crucial in salvaging the limb. Once identified, treatment should be initiated immediately to achieve the best outcome.

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