Physeal separation leading to proximal subluxation and popliteal artery thrombosis

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DESCRIPTION

Vascular injuries in paediatric trauma are rare, accounting for only 0.6% of cases. Of these, only 5% have popliteal artery injury. Injury to the popliteal artery can be a limb-threatening condition because of poor collateral circulation. However, the incidence of popliteal artery injury in a knee dislocation case is around 1.6%–30%. A teenage boy presented to our emergency department with a history of injury to his right knee 12 hours earlier, following a road traffic accident. Initially, he was treated in a local hospital with an above-knee slab and referred to our centre for further management. On examination, the right knee was in 45° flexion with the posterior sag of the tibia. There was no external wound. There was swelling and tenderness around the knee joint with reduced passive range of movement. Distally, the affected leg, ankle and foot were cold compared with the other side. The anterior tibial artery, posterior tibial artery and dorsalis pedis artery were not palpable. There was delayed capillary refilling time as noticed with a pinprick, reduced sensation in the L5 and S1 dermatome region, and a foot drop. The patient was immediately sent for an X-ray and colour Doppler of the affected limb. Radiographs showed a Salter-Harris (SH) type II physeal separation of the proximal tibia with posterior dislocation of the tibial metaphysis (figure 1A). A Doppler showed a void in flow at the distal superficial femoral artery. An urgent CT angiography of the right lower limb was done as vascular surgeons were consulted. CT angiography confirmed a popliteal thrombosis (figure 1B). The patient was taken to theatre and under spinal anaesthesia, physeal separation reduced under fluoroscopy and pinned with smooth cross Kirschner wires (figure 2A). A knee spanning external fixator was reinforced to provide stability. The vascular surgeons retrieved a thrombus of size 1 cm from the distal femoral artery. Postoperatively, the patient was started on injection heparin and gradually shifted to oral anticoagulants, and the patient was discharged home after 10 days (figure 2B). The fixator was removed in 6 weeks, and range of movement exercises started. At 6-month follow-up, the limb had survived, but the foot drop persisted.

Physeal injuries (PIs) are rare in the proximal tibia accounting for only 1% of all PIs. The mechanism is usually a hyperextension injury around the knee joint with or without valgus force, which causes a posterior displacement of the tibial metaphysis with physeal separation. SH type II is the most common type of hyperextension injury, as was our case. Seven to ten per cent of these PIs are associated with a vascular compromise. The vascular insufficiency could arise due to either direct pressure on the vessel due to displaced fracture fragment, tight compartment (compartment syndrome), an associated arterial injury or a developing thrombosis. Yadav et al described a case of proximal tibial PI where the vascularity returned after closed reduction and pinning. Clement and Goswami described a case of proximal tibial type II PI, where they had a vascular compromise due to compartment syndrome and required four-compartment fasciotomies in addition to reduction and pinning. Guled et al reported a case of proximal tibial and fibular PI causing vascular injury, compartment syndrome and associated peroneal nerve injury. The posterior tibial trunk was transacted, which was repaired after relapse of compartment syndrome. McGuigan et al and Shinomiya et al reported a slowly progressive popliteal artery thrombosis due to proximal tibial PI. We also had a thrombus in our case, which was retrieved.

Figure 1 X-ray picture showing type II physeal injury with posterior subluxation of tibia (A). CT angiography demonstrating a flow defect in the popliteal artery (B).

Figure 2 Postoperative X-ray showing reduced subluxation with Kirschner wires and fixator (A). The limb is surviving at 3-week follow-up (B).
and Wozasek et al have the most extensive series of proximal tibia PI where they have noted some patients develop vascular compromise or compartment syndrome, unfortunately leading up to amputation in few.11–13 These are always surgical emergencies that need immediate closed reduction and pinning if unstable. The open reduction should contemplate removing the interposed tissue if there is a persistent displacement >2 mm. SH type III and IV injuries may also require an open reduction.14 CT angiography is the best modality of investigation to detect any vascular damage though an ultrasonographic colour Doppler can be helpful. Ligamentous injuries around the knees and traction injuries to the peroneal nerves are also found in these patients.7 Guled et al could salvage the limb, but foot drop persisted as in our case.9 Finally, extended follow-up may be required as PI can cause limb length discrepancy or angular deformities in 25% of cases, necessitating a follow-up to skeletal maturity.15 16

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