Complete femoral artery transection following handlebar trauma

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Introduction

Blunt trauma of the femoral artery is relatively rare, with most cases occurring in combination with fractures and presenting contusion or thrombosis of the femoral vessels. Less frequently, bicycle or motorbike handlebar trauma can cause injury to the common femoral artery [1,2]. In this present case, femoral artery transection was caused by a direct fall onto a bicycle handlebar. To the best of our knowledge, there is only one other case in the literature [4] of a complete femoral artery transection, secondary to handlebar trauma. Patient consent was obtained for publication.

Case report

A 20-year-old male suffered direct contusion on the left groin after falling onto the handlebar of his bicycle (Fig. 1). During his transfer to a hospital, he presented severe hypotension of up to 80 mm Hg/40 mm Hg, requiring volume support. An emergency computed tomography angiography (CTA) of the abdomen, pelvis and legs showed the occlusion of the common femoral artery, with reconstruction of the distal common femoral via collaterals (Fig. 2). Also, a retroperitoneal hematoma extending to the contralateral pelvic side without any acute signs of bleeding was observed. The patient was transferred to our centre for evaluation by a vascular surgeon. When admitted he was hemodynamically stable. Giant, non-pulsatile groin hematoma was observed along his left thigh. He also presented coldness with absent pulses, although sensibility and motility were preserved. Color Doppler ultrasound (DUS) examination confirmed the findings described by the CTA.

The patient was taken to surgery for revascularization. Because the groin hematoma extended into the pelvis, a contralateral percutaneous approach was performed in order to achieve a proximal bleeding control or even endovascular treatment. We proceeded to percutaneous puncture of the right common femoral artery and progressed with a 0.035-inch Terumo Glidewire (Terumo Europe N.V., Leuven, Belgium) and ContraFlush catheter (Boston Scientific Corporation, Natick, MA) crossing to the
left common iliac artery. An arteriography was performed with multi-perforated Straight catheter (Tempo, Cordis Corporation) without observing any pelvic bleeding. Proximal control of bleeding was achieved by placing an 8 × 80-mm Oceanus dilatation balloon catheter (iVascular, BCN) in the distal left external iliac artery.

After performing a left inguinal incision and removing the hematoma, the Terumo Glidewire could be seen outside the femoral artery. Inflating the balloon device in the distal external iliac artery allowed us proximal bleeding control (Fig. 3). The common femoral artery was contused and completely ruptured. Both ends had vasospasm, while fresh thrombus was shown by means of an examination of the distal artery end. Good reflux was obtained after distal thrombectomy. Given the contusion and retraction of the distal end, primary repair was not feasible. Therefore, revascularization of the common femoral artery was performed with an 8-mm, polytetrafluoroethylene (PTFE) bypass graft (Propaten, W. L. Gore & Associates, Flagstaff, AZ). Due to small ipsilateral saphenous vein size and likely surrounding vein contusions, vein graft was not used. Distal pulses were recovered immediately. The patient had an uneventful recovery and was discharged from hospital on the third day after surgery. Six months after the operation, the patient had no claudication, but had regained palpable femoral and distal pulses and normal DUS arterial and vein examination.

Discussion

The common femoral vessel is the most commonly affected vascular structure. Blunt injury of the common femoral artery, not associated with fracture, is a rare phenomenon. A common site for these injuries is at the inguinal ligament, where the femoral artery is superficial and follows through from the anterior to the superior pubic ramus and femoral head. As such, it is prone to compression against the underlying osseous structures. A well-recognized form of common femoral artery blunt injury is the “motorcycle handlebar syndrome”, in which the common femoral artery suffers a direct blow by the handlebar of a motorcycle or bicycle as the rider falls forwards [1–6]. In such a case, as the rider falls, the bicycle front wheel and handlebar rotates at a
perpendicular angle towards the rider, so that the point of impact concentrates on the handlebar end, a relatively small area. As a result, a seemingly small injury can turn into a significant blow on the artery [2].

A faulty bike may cause up to 9.6% of the accidents in children as described by Acton et al. The fact that the handlebar in our case was unprotected emphasized the strike on the groin. Prevention of these injuries requires a change in the handlebar design or additional padded handlebar ends [8].

Vascular lesions need to be diagnosed and treated early in order to prevent severe complications. A lesion of the major artery of the limb, unless rapidly repaired, may produce a hypovolemic shock, caused by severe bleeding. Given the complete section of the artery and vasospasm of both ends, the bleeding had been limited. Prolonged ischemia can lead to gangrene. When not combined with bone injuries, a vascular lesion can often go undiagnosed, and more than 6 hour delays in diagnosis could compromise the limbs viability [5,7].

As described by Angiletta et al., and for a prompt diagnosis, the physical examination should always be associated with a DUS, and angiography should be performed in all difficult cases, as well as when an operating procedure has to be planned. It should be carried out in the operating theatre, for faster performance of either endovascular or open procedures [5].

To the best of our knowledge, there is only one other case in the literature of complete femoral artery transection from blunt trauma [7]. Our patient presented acute limb ischemia and a giant groin hematoma. Therefore, and previous to opening the groin, we opted towards gaining proximal bleeding control by inserting a balloon into the external iliac artery. Also, endovascular approach allowed us to perform an angiography so as to rule out possible pelvic damage. In addition, the endovascular procedure is a minimally invasive technique that would have allowed us treatment of the iliac vessels if necessary [6,8,9].

Fig. 2. A: CT angiography showing a retroperitoneal hematoma extending to the contralateral pelvis (arrow). B: Arterial reconstruction showing occlusion of the common femoral artery with flow reconstitution via collaterals. C: Coronal view where enlargement of left thigh due to the hematoma can be seen.

Fig. 3. A: Inflated balloon in distal external iliac artery. Mosquito Forceps holding distal artery end. B: Both common femoral artery ends trimmed and prepared for grafting. CFA: common femoral artery. SFA: Superficial femoral artery. DFA: deep femoral artery. C: polytetrafluoroethylene (PTFE) bypass graft (Propaten, W. L. Gore & Associates, Flagstaff, AZ) final result.
In pediatrics, there are particular factors that should be taken into account when vascular traumatic lesions are treated: small vessel size and a tendency to restenosis and rapid body growth \[4,10\]. However, as our patient was an adult, standard vascular surgical techniques were applied. Primary repair of arterial injuries must be advocated when possible. In blunt trauma, the extent of arterial damage may preclude primary repair \[11\]. When grafting is required, autogenous conduit is a favoured procedure. The greater saphenous vein, veins from the arms or even the jugular vein, may be used; however, in certain situations, the diameter may be inadequate. Larger grafts can be prepared with superficial femoral vein. To avoid the danger of an additional incision, given the probable surrounding veins, contusion, and given the emergency nature of our case, we preferred the use of a prosthetic graft.

**Conclusion**

The possibility of severe femoral artery injury and its prompt diagnosis should be highly considered in patients who have suffered groin handlebar trauma. A DUS and angiography must be taken into account as the diagnostic tests of choice to rule out arterial damage. The use of an Endovascular approach provides the possibility of proximal bleeding control or even endovascular repair whenever pelvic bleeding is suspected.

**Conflicts of interest statement**

None.

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