Acta Biomed 2020; Vol. 91, N. 4: e2020111 DOI: 10.23750/abm.v91i4.9185

Case report

Posterior thigh compartment syndrome associated with hamstring avulsion and antiplatelet therapy

Andrea Gatti[1], *Monica Gasparini*[2], *Matteo Primavera*[2], *Umberto Tarantino*[1]

[1]Department of Orthopaedics and Traumatology, University of Rome 'Tor Vergata', Rome, Italy,
[2]School of Specialization of Orthopaedics and Traumatology, University of Rome 'Tor Vergata', Rome, Italy;

Summary. *Background and aim of work:* Posterior thigh compartment syndrome is a rare injury. We reported a case of a 49-year-old man developing posterior thigh compartment syndrome after an accidental fall at home causing hamstring tendon avulsion while assuming antiaggregant therapy. *Methods:* We decided to treat the patient with an immediate fasciotomy and tendon avulsion fixation with two anchors. *Results:* we managed to treat successfully our patient. *Conclusions:* We suggest to pay attention to a positive medical history for antiaggregant/anticoagulation therapy and to perform in the same surgical setting both fasciotomy and fixation. (www.actabiomedica.it)

Keywords: hamstring avulsion, compartment syndrome, posterior thigh, antiplatelet therapy.

Introduction

Posterior thigh compartment syndrome must me promptly diagnosed and treated to avoid complications as muscle ischemia, and tissue necrosis.[2] Evidence is limited to few case reports and reviews focused on compartment syndrome and its association with hamstrings avulsion and coagulation defects.[[3][4][5] We report a case of a 49-year-old man developing posterior thigh compartment syndrome caused by hamstring tendon avulsion while taking antiplatelet therapy. Our case report shows the potential increased risk of compartment syndrome in patients taking antiplatelet or anticoagulation therapy. Furthermore in our experience CT scan can be extremely useful in an ER setting to evaluate muscle injury and hematoma extension. Early surgical treatment is fundamental and it is preferable that avulsed tendon bone anchoring must be carried out right after performing fasciotomy and assessing muscle injury.

Case report

A 49-year-old man presented at our emergency room (ER), complaining of pain localized to the posterior left thigh, started about 2 hours after an accidental side split (hip flexed and knee fully extended) by falling down the stairs. His past medical history was significant for an episode of ophthalmic artery thrombosis for which the patient was taking aspirin daily. At physical examination, while the left anterior thigh was nontender at palpation, the posterior thigh presented as swollen, tense and painful to light touch from the gluteal fold down to 2 cm proximal to the posterior aspect of the knee. Muscle strength of the inferior limb was recorded: knee extension was 5/5 while knee flexion could not be assessed due to pain; ankle plantar flexion, ankle eversion and great toe flexion were all registered to be 5/5. Ankle dorsiflexion and great toe extension were 5/5. No sensory deficit were recorded. Dorsalis pedis and posterior tibial pulses were present as well. About thirty minutes after the ER admission ankle dorsiflexion and great toe

extension were reported to be 0/5. At the following physical examination numbness was reported on the dorsal and plantar aspects of the left foot. A CT angiography was promptly carried out (Figure 1A-1B) and reported positive bleeding of the femoralis profundis artery giving indications to readily perform an angiography that resulted in no vessel to embolize. On the basis of the abovementioned clinical workup and the persistent clinical presentation, we made the diagnosis of compartment syndrome of the posterior tight; A CT angiography was promptly carried out (Figure 1A-1B) and reported positive for a jet of the femoralis profundis artery giving indications to readily perform an angiography that resulted in no vessel to embolize. On the basis of the abovementioned clinical workup and the persistent clinical presentation, we made the diagnosis of compartment syndrome of the posterior tight; approximately 8 hours after the initial injury, our patient was taken to the operating room to operate an emergency fasciotomy. The patient was placed in prone position to have better access to his left thigh; a posterior incision was performed starting at the gluteal fold and prolonged distally down to approximately 8 cm proximal to the popliteal fossa. A complete fasciotomy and release of the posterior compartment was performed by cutting longitudinally the overlying fascia (Figure 3). Approximately 500 mL of hematoma were forcefully ejected out of the surgical excision at the release of the posterior intracompartmental pressure. The exposed muscles appeared dark red but presumably viable while the long head of biceps femoris, semitendinous and semimembranous were completely avulsed from the ischial tuberosity. The sciatic nerve was identified along with the posterior femoral cutaneous nerve of the thigh (figure 3) and both were isolated and preserved. Any active vessel hemorrhage was rapidly blocked. Then we proceeded to suture back in place the above-mentioned tendons on the ischial tuberosity using 2 bone anchors, specifically, Corkscrew® FT suture Anchor 5,5mm x 16,3mm with two #2 Fiber Wire Arthrex® (Naples, Florida, USA)(Figure 4). The surgical excision was copiously irrigated with saline solution and sutured while leaving the fascial layer open. Postoperative care was aimed at perform-

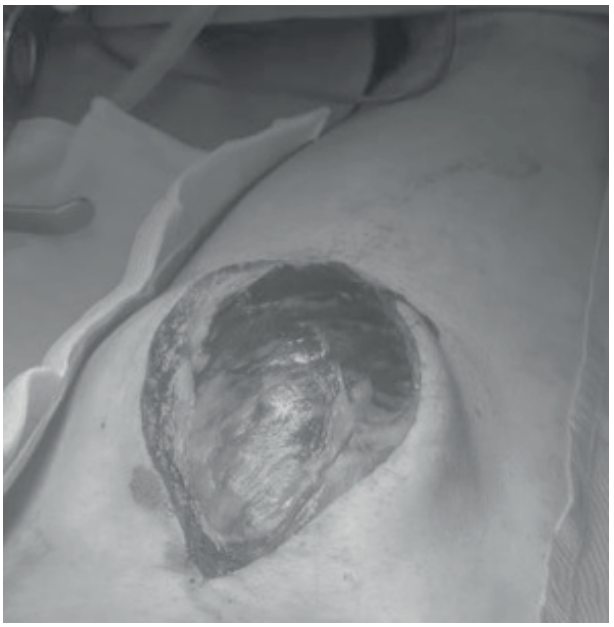
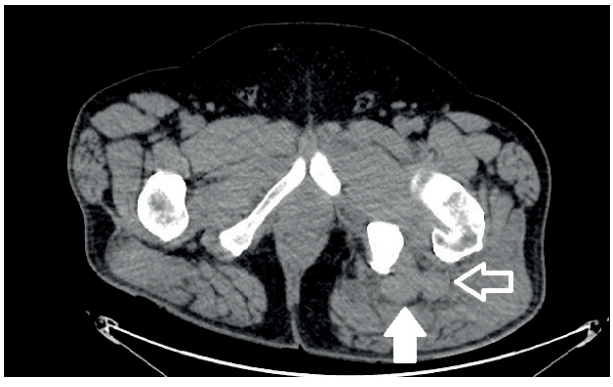


Figure 3. Fasciotomy procedure



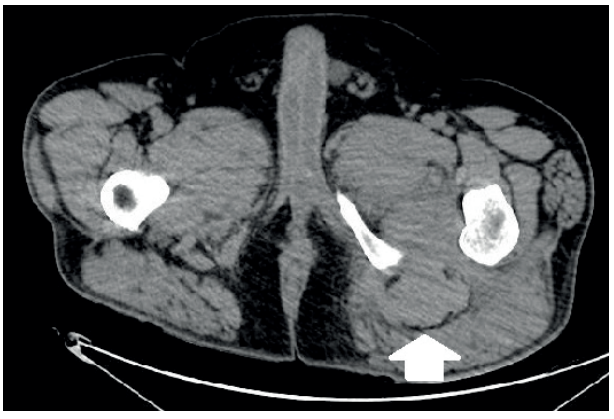


Figure 1 and 2. Angio TC showing the harmstring tendon avulsed (hollow arrow) and the formed hematoma (filled arrow).

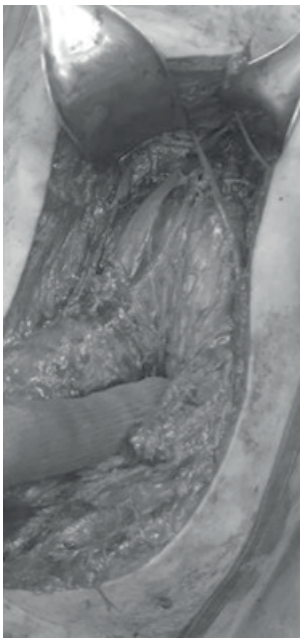


Figure 4. Integrity assessment of the sciatic and posterior femoral cutaneous nerve

ing fresh blood and plasma transfusions; at clinical inspection the patient reported an immediate pain relief. On the 3rd postoperative day (POD), sensation on the plantar aspect of the foot had returned while the sensation on the dorsum of the foot had improved markedly, with the patient reporting just paresthesia over the toes. Motor strength was assessed as 5/5 in ankle plantar flexion, ankle eversion and great toe flexion while 4/5 for ankle dorsiflexion and great toe extension. Postoperative anticoagulation therapy was administered daily, and for the following 30 days, by subcutaneous injections of 4.000 UI enoxaparin. The patient was discharged on the 5th POD with the following indications: wheel-chair use, avoid weight-bearing for 4 weeks and vitamin B12 complex for a month. At six-week follow-up the patient could successfully stand up with the aid of crutches. Full weight-bearing was achieved 8 weeks postoperatively. At five-month follow-up our patient showed full ROM of the hip and the knee while sensation was reportedly complete: the Perth Hamstring Assessment Tool score [6] was 65 when assessed at this time.

Figure 5. Suturing of the hamstrings conjoint tendon using bone anchors.

Discussion

Compartment syndrome can be caused by multiple conditions that can increase the pressure inside an osteomiofascial space: fractures, contusions, trauma or tight casts and, rarely, hamstring tendon avulsion.[7] Non-traumatic causes of compartment syndrome are less common.[8] This case report highlights how an acute compartment syndrome can also be caused by a trauma-induced hamstring tendon avulsion and how antiplatelet therapy can be a fundamental precipitating factor by inducing a massive hematoma. Furthermore CT scan can be extremely useful in an ER setting to evaluate muscle injury and hematoma extension. Oseto at al. presented a case report with some similarity to ours: a 39-year-old man taking chronic anticoagulation therapy (10 mg of warfarin daily) due to protein S deficiency admitted to the ER for an acute posterior thigh compartment syndrome associated with trauma-induced hamstring avulsion. The case was managed by first lowering the INR (from 6.1 to 2.1) using fresh-frozen plasma and then performing a fasciotomy, while minimizing tissue dissection.[9] In a systematic review on compartment syndrome by Ojike et al. a total of 19 patients had some form of coagulation defects, with four patients taking some form of anticoagulant ther-

apy, but the reviewers did not analyzed its influence on compartment syndrome outcome.[10]techniques of fasciotomy (specifically, one versus two incisions A case report, by Kakkar et al., reported an association between posterior thigh compartment syndrome and dipyridamole, aspirin, and high-dose tinzaparin (LMWH) administered due to a left ventricular assist device. In this case the patient didn't suffer any trauma. An urgent ultrasonography was carried out because of pain and numbness on the affected limb showing an extensive hematoma, probably caused by a spontaneous intramuscular bleeding promoted by LMWH; an emergent fasciotomy and hematoma evacuation were readily performed.[11]

Kwon et al. reported a spontaneous avulsion that caused a massive bleeding and a subsequent posterior compartment syndrome in a middle-aged man, treated with fasciotomy and avulsion fixation by means of 2 bone anchors.[3] Although rare in the general populations, acute hamstrings tendon avulsion has been reported in both well-trained athletes and middle-aged individuals, the letter having pathological changes in tendons or muscles that can predispose to traumatic or spontaneous rupture.[12][13][14] The hamstrings avulsion most frequently involves its origin on the ischial tuberosity; this tendon include the following muscles: biceps femoris, semitendinosus and semimembranosus.(5) In an attempt to gain valuable information about the current practice of care for compartment syndrome associated with hamstrings avulsion and antiplatelet/anticoagulative teraphy, we want to focus on the importance of an early diagnosis. Diagnosis of compartment syndrome is essentially clinical; however, we decided to perform a CT angiography to rule out any possible fracture and active bleeding. In case of muscle rupture or tendon avulsion, MRI is the gold standard to rule out damage to these structures.[15][16][17] Brandser et al. outline how MRI is more useful than CT in measuring the extent of tendon avulsion injury and, according to Garret et al., CT is not necessary for routine evaluation of muscle. [17][18] However many ER have none MRI available and, therefore, we strongly suggest CT as a valid alternative: on CT, an acute muscle injury appears as an hypodense area embedded in the affected muscle. We strongly suggest to treat both condition in the same surgical procedure in order to minimize complications and improve patients' outcome. Klingele and Sallay analyzed the outcome of 12 patients with hamstrings injury treated non-surgically: patients with complete tendon tear were left with persistent functional impairment compared to patients suffering an incomplete injury; the same study emphasize how an early surgical repair matches a smaller surgical approach and a lower tendon tension that makes easier to anchor it back to its origin.[19] In a review that compared hamstrings avulsion outcome treated with or without surgery, operative patients scored significantly higher than the nonoperative group in most categories, including patient satisfaction and ROM.[20] A major complication of both a delayed diagnosis and surgical treatment is the sciatic nerve ischemic damage, needing neurolysis.[20]

There are no guidelines in the literature on the amount of tendon(s) retraction or avulsion that needs surgical treatment.[12] According to Cohen and Bradley, surgical treatment is recommended when two hamstrings (showing a retraction >2 cm) or three hamstrings are avulsed from the ischial tuberosity.[12] Brucker and Imhoff reported 8 patients treated with a suture anchor system, highlighting the importance of an early surgery (within 3 weeks from trauma) to achieve a satisfying outcome.[21] Post-surgical care includes the optional use of harness suspension devices to maintain the knee in forced flexion from 3 to 4 weeks. Range of motion exercises and gait training are to be initiated with the goal of attaining normal gait by 6 weeks after the injury, after which a progressive supervised muscle strengthening program could be started. Return to any sport-related activity could be allowed as early as 3 months after repair.[13]

Conclusions

Our case demonstrates that using antiplatelet therapy, by causing spontaneous bleeding, can lead to severe limb-threatening conditions as compartment syndrome and life-threatening complications even in case of low-energy trauma. Management of compartment syndrome implies early diagnosis and emergency surgery as key components to avoid severe consequenc-

es (i.e. compression of the sciatic nerve) and allow for an easier surgical repair of the hamstrings. Our conclusion is to perform, in the same surgical setting, both fasciotomy and fixation of the avulsed tendon in cases similar to the one we have observed.

Compartment syndrome can be caused by multiple conditions that can increase the pressure inside an osteomiofascial space: fractures, contusions, trauma or tight casts and, rarely, hamstring tendon avulsion.[7] Non-traumatic causes of compartment syndrome are less common.[8] This case report highlights how an acute compartment syndrome can also be caused by a trauma-induced hamstring tendon avulsion and how antiplatelet therapy can be a fundamental precipitating factor by inducing a massive hematoma. Furthermore CT scan can be extremely useful in an ER setting to evaluate muscle injury and hematoma extension. Oseto at al. presented a case report with some similarity to ours: a 39-year-old man taking chronic anticoagulation therapy (10 mg of warfarin daily) due to protein S deficiency admitted to the ER for an acute posterior thigh compartment syndrome associated with trauma-induced hamstring avulsion. The case was managed by first lowering the INR (from 6.1 to 2.1) using fresh-frozen plasma and then performing a fasciotomy, while minimizing tissue dissection.[9] In a systematic review on compartment syndrome by Ojike et al. a total of 19 patients had some form of coagulation defects, with four patients taking some form of anticoagulant therapy, but the reviewers did not analyzed its influence on compartment syndrome outcome.[10] A case report, by Kakkar et al., reported an association between posterior thigh compartment syndrome and dipyridamole, aspirin, and high-dose tinzaparin (LMWH) administered due to a left ventricular assist device. In this case the patient didn't suffer any trauma. An urgent ultrasonography was carried out because of pain and numbness on the affected limb showing an extensive hematoma, probably caused by a spontaneous intramuscular bleeding promoted by LMWH; an emergent fasciotomy and hematoma evacuation were readily performed.[11]

Kwon et al. reported a spontaneous avulsion that caused a massive bleeding and a subsequent posterior compartment syndrome in a middle-aged man, treated with fasciotomy and avulsion fixation by means of 2 bone anchors.[3] Although rare in the general populations, acute hamstrings tendon avulsion has been reported in both well-trained athletes and middle-aged individuals, the letter having pathological changes in tendons or muscles that can predispose to traumatic or spontaneous rupture.[12][13][14] The hamstrings avulsion most frequently involves its origin on the ischial tuberosity; this tendon include the following muscles: biceps femoris, semitendinosus and semimembranosus.(5) In an attempt to gain valuable information about the current practice of care for compartment syndrome associated with hamstrings avulsion and antiplatelet/anticoagulative teraphy, we want to focus on the importance of an early diagnosis. Diagnosis of compartment syndrome is essentially clinical; however, we decided to perform a CT angiography to rule out any possible fracture and active bleeding. In case of muscle rupture or tendon avulsion, MRI is the gold standard to rule out damage to these structures.[15][17][18] However many ER have none MRI available and, therefore, we strongly suggest CT as a valid alternative: on CT, an acute muscle injury appears as an hypodense area embedded in the affected muscle. We strongly suggest to treat both condition in the same surgical procedure in order to minimize complications and improve patients' outcome. Klingele and Sallay analyzed the outcome of 12 patients with hamstrings injury treated non-surgically: patients with complete tendon tear were left with persistent functional impairment compared to patients suffering an incomplete injury; the same study emphasize how an early surgical repair matches a smaller surgical approach and a lower tendon tension that makes easier to anchor it back to its origin.[19] In a review that compared hamstrings avulsion outcome treated with or without surgery, operative patients scored significantly higher than the nonoperative group in most categories, including patient satisfaction and ROM.[20] A major complication of both a delayed diagnosis and surgical treatment is the sciatic nerve ischemic damage, needing neurolysis.[20]

There are no guidelines in the literature on the amount of tendon(s) retraction or avulsion that needs surgical treatment.[12] According to Cohen and Bradley, surgical treatment is recommended when two hamstrings (showing a retraction >2 cm) or three

hamstrings are avulsed from the ischial tuberosity.[12] Brucker and Imhoff reported 8 patients treated with a suture anchor system, highlighting the importance of an early surgery (within 3 weeks from trauma) to achieve a satisfying outcome.[21] Post-surgical care includes the optional use of harness suspension devices to maintain the knee in forced flexion from 3 to 4 weeks. Range of motion exercises and gait training are to be initiated with the goal of attaining normal gait by 6 weeks after the injury, after which a progressive supervised muscle strengthening program could be started. Return to any sport-related activity could be allowed as early as 3 months after repair.[13]

Conclusions

Our case demonstrates that using antiplatelet therapy, by causing spontaneous bleeding, can lead to severe limb-threatening conditions as compartment syndrome and life-threatening complications even in case of low-energy trauma. Management of compartment syndrome implies early diagnosis and emergency surgery as key components to avoid severe consequences (i.e. compression of the sciatic nerve) and allow for an easier surgical repair of the hamstrings. Our conclusion is to perform, in the same surgical setting, both fasciotomy and fixation of the avulsed tendon in cases similar to the one we have observed.

Received: 16 January 2020
Accepted: 11 February 2020
Correspondence:
SettingsAndrea Gatti
Department of Orthopaedics and Traumatology, University of Rome 'Tor Vergata', Rome, Italy
E-mail: gattiandrea14@gmail.com