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Concomitant unilateral post-traumatic leg and foot compartment syndrome in a 5 years-old child – Case report

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ABSTRACT

BACKGROUND: Compartment syndrome is one of the most serious orthopedic emergencies [4]. It is usually anticipated and looked at in every single orthopedic case. Early recognition and management of those cases are quite important in order to avoid the devastating consequences of such condition.

CASE SUMMARY: This is a case report of a 5 years old child with concomitant unilateral leg and foot compartment syndrome after a roll over trauma. The patient was presented with significant leg and foot swelling, severe pain and absent distal pulses. He was rushed to operative theatre where compartments decompression and fracture fixation were performed. Vac dressing and secondary closure followed the primary treatment. Post-operatively, the patient improved in a good way with no healing complications or functional deficits.

CONCLUSION: Compartment syndrome in children is a serious complication that can occur after trauma, high index of suspicion is crucial to start early management and to avoid complications. This injury can occur in un-fractured limb and in more than one site at the same time.

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1. Introduction

Compartment syndrome is one of the most serious orthopedic emergencies that is usually anticipated and looked at in every single orthopedic case. Early recognition and management of those patients are quite important in order to avoid the devastating consequences of such condition.

Also and most importantly, pediatric population is vulnerable to develop compartment syndrome especially after high energy trauma or with certain fractures especially in the leg or the elbow [9]. Hence, it is crucial to monitor those patients after injuries or surgeries to avoid complications. However, it is well known that the first sign of compartment syndrome is the pain that is out of proportion and uncontrolled by frequent analgesia [3], it is sometimes underestimated in children especially when the compartment syndrome is associated with fractures. Therefore, a high index of suspicion is voluble in such circumstances.

Furthermore, on reviewing the literature there was limited data about this injury in children after fractures and up to our knowledge there was no data about concomitant compartment syndrome of an ipsilateral foot and leg in the literature. This case-report would add to the general awareness about compartment syndrome in

children. Also and despite of its rarity, concomitant compartment syndrome in two anatomical regions can happen in children.

2. Case description

Our patient is 5 years old previously healthy boy. He presented to Hamad general hospital emergency in Doha/Qatar in 22nd of November 2015 after he has been injured by a car that run over his left leg. The child was presented to emergency by EMS within 1 h after the trauma with his leg and foot splinted. Due to busy emergency department, orthopedic team was consulted to see the child in the 5th hour after the injury, the patient and family complain was left leg and foot swelling, deformity and severe pain that's uncontrolled by analgesia.

On examination, the patient was vitally stable with no other injuries apart from his left leg and foot which were swollen, dusky, tense and tender. The pain was aggravated by foot passive motion and it was not relieved by anything.

More importantly, the distal pulses were not palpable – but audible – with slightly delayed capillary refill. Later and upon arrival to the operating theater the pulse was neither palpable nor audible in the affected limb.

While his laboratory results were all within normal limits, radiological examination of the child showed isolated left tibia proximal third long oblique fracture in the sagittal plane. Although the foot

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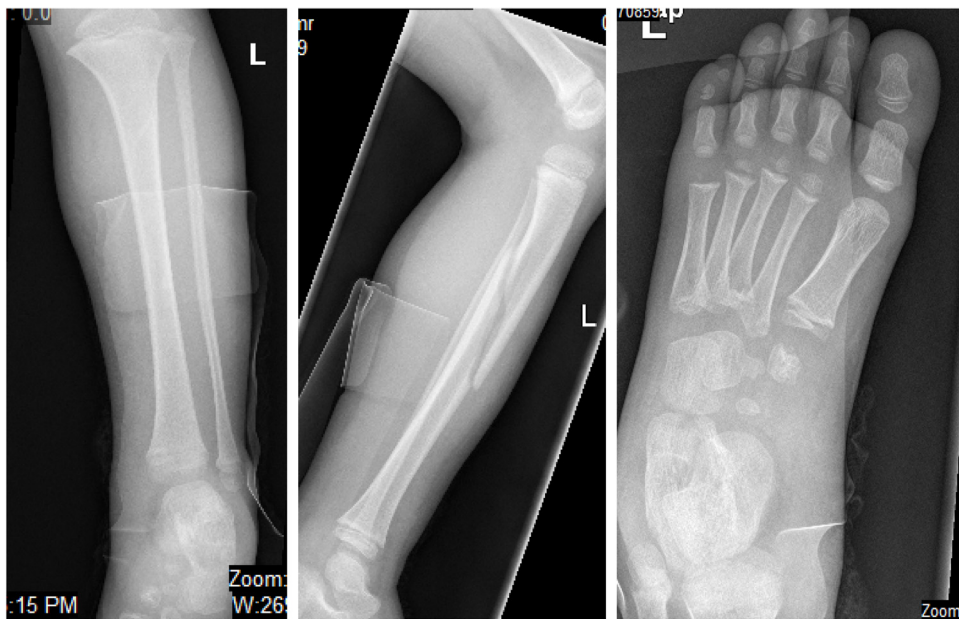


Fig. 1. Initial radio-graphs of the left leg and foot of the reported patient after the trauma and it shows long oblique fracture of the tibia in the coronal plane.

was severely swollen and tense, no fracture was seen. The fibula was also intact (Fig. 1).

The patient was diagnosed as a case of acute left leg and foot compartment syndrome and he was urgently rushed to the operating room where leg and foot fasciotomies were done and the tibial fracture was fixed with intramedullary flexible nails by a senior consultant orthopedic surgeon. The time from injury to fasciotomy was 6 h.

The four leg compartments were satisfactorily decompressed through single lateral long incision. The muscles of the superficial and deep posterior compartments of the leg were dusky but viable with no necrotic tissues. Also, the nine foot compartments were released through two dorsal foot incisions in the first and the fourth intermetatarsal spaces and there were necrotic black tissues in the interosseous and the superficial central compartments (Fig. 2).

Vascular examination after fasciotomies showed audible distal pulses, 2 s capillary refill and 95% O₂ saturation via pulse oximeter in the distal toes.

The Tibial fracture was fixed with two flexible intramedullary nails measuring 3.5 and 2 mm finally, vacuum dressing was applied on low intermittent settings with careful fluid balance and intravenous third generation cephalosporin cover (Fig. 3).

The postoperative course was uneventful with leg elevation, positive fluid balance and frequent leg examinations. The patient was taken on the fifth postoperative day for delayed primary closure which was straight forward with no skin defect.

The patient was monitored in the hospital for 5 more days after skin closure, then he was discharged home in good general condition and with no skin complications. He was advised not to bear weight on the affected limb.

Stitches were removed one week later in the clinic, and the fracture showed good healing in two months when full weight bearing was allowed (Fig. 4).

The postoperative course of the child was unremarkable, and he is currently recovering in good way. The last x-ray prior to writing showed healing in good alignment; this x-ray is 3 months after the trauma (Fig. 5).

3. Discussion

Acute compartment syndrome in children is one of the most serious limb-threatening conditions that should be anticipated and managed carefully after trauma in general and especially in injuries associated with long bones fractures [10]. Although, this condition is not as common as in adults [7], failure of early and aggressive management can lead to unfavorable consequences. Benjamin et al. [1] reported 11.6% (25/216) incidence of acute compartment syndrome in his series of children aged between (8–18) years after tibia fractures. Indeed, this incidence is much higher than the previously reported incidences as in Hope and Cole [2] who reported 4% of ACS in children after open tibia fractures after the age of 8. This would raise the attention to look up more carefully not to miss such medical condition, as it is usually very difficult to diagnose in children.

In general, traumatic acute compartment syndrome management is time dependent in order not to lose the limb or the function. However, Flynn et al. [5], reported 95% excellent results in words of limb function and post-operative pain in his series of patients treated from ACS between 3.8 and 118 h after injury. This may indicate better tolerance of children to high intra-compartmental pressure. Furthermore, not all patients with suspected ACS are absolutely for fasciotomy decompression [6], especially after the wide introduction of invasive limb compartments measuring device. Border-line cases with Δ pressure of 30 mmHG or slightly higher are just observed in some cases, Mars and Hadley reported complete recovery of 5 children with compartmental pressure between 30 and 44 mmHG after non-operative treatment.

Up to our knowledge, there was no reported multiple compartment syndromes in children after trauma, Dong-Ki Lee et al. [12] reported a 11 years old child who developed multiple ACS after minor trauma as that child was found to have CML. In our case, the patient was completely healthy and he developed ACS after a significant trauma to his leg and foot.

Fasciotomy and decompression of 4 leg and 9 foot compartments was done in our case which was the ideal management in our opinion. The patient was rushed directly to operating room once we suspected the diagnosis. Late presentation of this child did not give



Fig. 2. Intraoperative clinical photos of the leg and foot fasciotomy incisions.



Fig. 3. Intraoperative clinical photo of the leg fasciotomy incision before application of VAC, and leg radiographs after stabilization.



Fig. 4. Two months follow up radiographs of the leg and it shows healing process.

us the luxury of time for more confirmative tests like compartment pressure invasive measurement.

After fasciotomy, the tibial fracture was considered as an open fracture, and hence came the controversy whether to nail it or to externally fix it [11]. Pandya and Edmonds [13] in their retrospective cohort stated that (Immediate flexible nailing of open pediatric tibial shaft fractures can be safely performed with minimal risk of wound or infectious complications). We chose to nail the tibia because the injury was closed in the first place and because we anticipated that we are going to close the fasciotomy wounds in 3–5 days.

Conclusion

Compartment syndrome in children is a serious complication that can occur after trauma [8], high index of suspicion is crucial to start early management and to avoid complications. This injury can occur in un-fractured limb and in more than one anatomical region at the same time.

Conflicts of interest

All of the Authors declare that they have no conflict of interest either personally or with any of their relatives.

Sources of funding

All authors declare that they did not receive any source of funding by any mean to run this case report. They wrote this paper and they edit it on their own fund.

Ethical approval

This article has been reviewed and approved by Medical Research centre (MRC) in QATAR.

Reference number: 16255/16

Consent

Informed consent was taken from the patient father in order to publish this case report.

Author contributions

Dr. Aissam Elmhiregh: is the corresponding author. He contributed in study design, data collection and analysis, writing the paper and reviewing literature.

Dr. Adel El feghih: Study design and data analysis.

Dr. Khaled Faraj: Study design and data analysis.

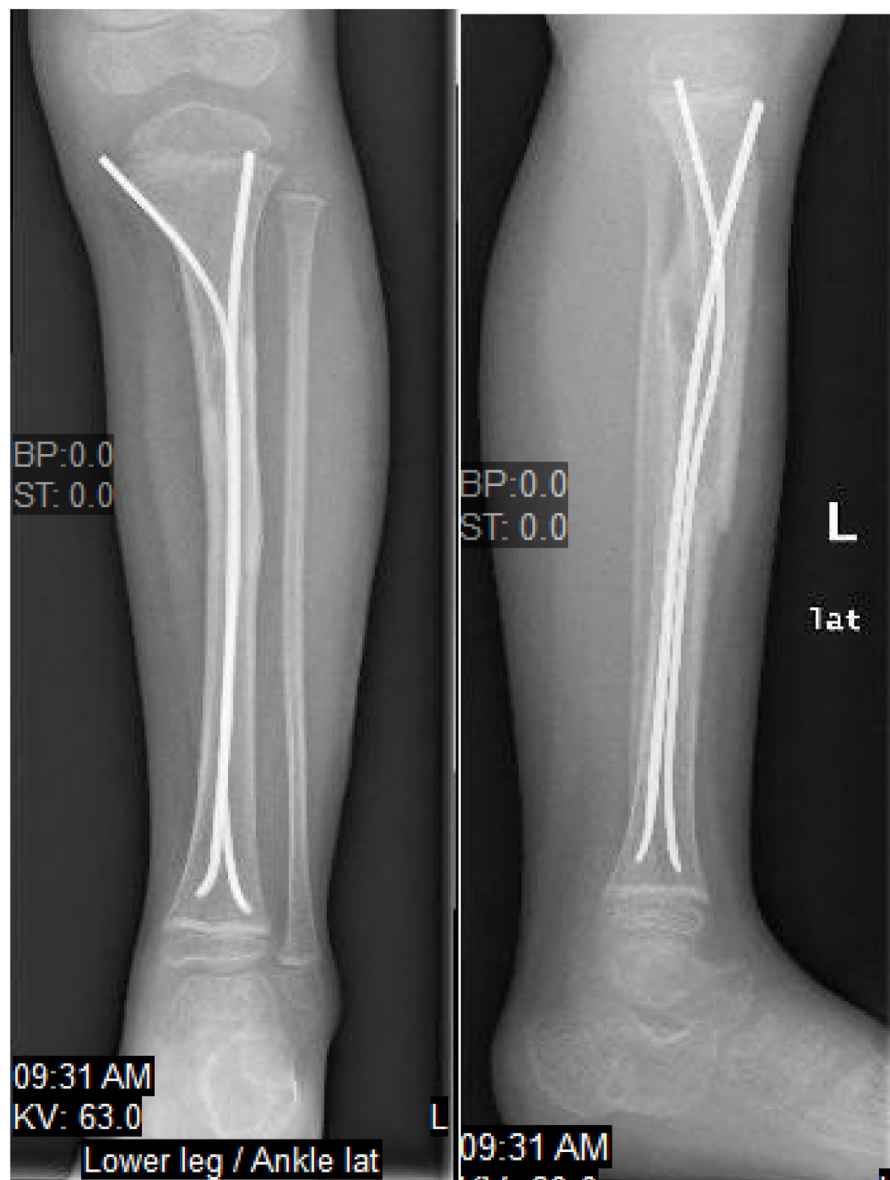


Fig. 5. Three months follow up radiograph of the leg and it shows healing of the fracture.

Registration of research studies

Researchregistry1953.

Guarantor

Dr. Aissam Elmhiregh, Orthopaedic resident, Hamad general hospital, Doha, Qatar.

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Consent form was obtained from the patient father in order to publish this case report.

This report was written in line with SCARE criteria and CARE guide lines. [15,16].

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