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## International Journal of Surgery Case Reports

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# Acute compartment syndrome secondary to disruption of the perforating branch of the peroneal artery following an acute inversion injury to the ankle



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## ARTICLE INFO

## Article history:

Received 9 September 2014

Received in revised form

17 November 2014

Accepted 17 November 2014

Available online 21 November 2014

## Keywords:

Ankle sprain

Acute compartment syndrome

## ABSTRACT

**INTRODUCTION:** Although ankle sprain by inversion is common in daily practice, acute compartment syndrome following ankle inversion injury is unusual. Only a few cases of this uncommon entity have been reported.

**PRESENTATION OF CASE:** This report describes a case of acute compartment syndrome following severe inversion of an ankle injury secondary to disruption of the perforating branch of the peroneal artery 3 h after the trauma. Although emergent fasciotomy was performed, residual weakness of ankle dorsiflexion still presented six months after surgery.

**DISCUSSION:** To the best of our knowledge, this case is the third in literature on an acute compartment syndrome following severe inversion ankle injury secondary to disruption of the perforating branch of the peroneal artery.

**CONCLUSION:** This report underscores the importance of considering compartment syndrome when individual has an inversion ankle injury, even when no fracture exists.

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## 1. Introduction

Ankle sprain by inversion is a common injury in daily practice.<sup>1</sup> However, acute compartment syndrome following ankle inversion is a rare manifestation. Without suspicion, it may be ignored by clinicians and develop into life-threatening conditions. This report describes a case of acute compartment syndrome following severe inversion ankle injury secondary to disruption of the perforating branch of the peroneal artery. This case demonstrates that vascular disruption and compartment syndrome, although rare, can be severe sequelae of an inversion ankle injury.

## 2. Case

A 24-year-old male was in a vehicular accident while riding a motorcycle. Severe inversion injury to his left ankle occurred while he tried to keep his leaning motorcycle upright with his left outstretched leg but failed. After the accident, he was unable to bear weight, and went to the emergency department immediately. Initial assessment found swelling and bruising around the lateral

aspect of the ankle with tenderness around the insertion of the anterior talofibular ligament. At this time, he was capable of ankle dorsiflexion, foot inversion, and toe movement. Ankle radiographs were normal. An acute sprain of the lateral ligaments was diagnosed. Rest, ice, elevation, painkillers, and immobilization were prescribed for initial management.

Unfortunately, approximately 3 h after his injury, he complained increased ankle pain accompanied by pins and needles in his left foot, despite receiving an opiate pain-killer. On repeat examination, there was congestive appearance over his left foot with marked swelling of the ankle, as well as swelling of the anterolateral distal third of his left leg (Fig. 1). Severe pain was identified in the anterior compartment when the patient slowly stretched his toes on his left foot; however, the calf and lateral compartments were soft and free from pain. An altered sensation existed in the distribution of the superficial peroneal nerve and weakness of the ankle and toes in dorsiflexion. *Dorsalis pedis* and posterior tibial pulses were faint. Arteriography and venography identified tapering of the distal portions of left anterior, and posterior tibial arteries and the peroneal artery with a slow flow, compatible with extrinsic compression by an adjacent hematoma (Fig. 2). Acute anterior compartment syndrome as well as severe hemarthrosis of the ankle complicated with arterial oppression and venous outflow obstruction were suspected. Emergent fasciotomy was undertaken at 5 h post-injury.

An incision was made directly from the location of significant swelling of distal third of the lateral lower limb to the tip of the

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Fig. 1. Congestive appearance of the left foot.

lateral malleolar to decompress anterior and lateral compartments as well as the ankle joint. A large anterior intracompartmental hematoma and hemothrosis of the ankle were identified and evacuated. The anterior talofibular ligament and anterior capsule of the ankle joint were torn and primarily approximated. The perforating branch of the peroneal artery was actively bleeding and was consequently tied off. The more proximal musculature looked healthy with normal color and contractility. The wound was left open and the limb was immobilized with a below-knee plaster slab.

After surgery, the congestive appearance of the foot significantly subsided with recovery of *dorsalis pedis* and posterior tibial pulses. Pain was markedly reduced and passive stretching of the toes was pain-free. At 48 h later, the wound was inspected and subsequently closed, except for a small area of wound left, which was left open for a later skin graft. At follow-up 3 weeks after surgery, the wound had healed well, but weakness of ankle dorsiflexion and numbness over the dorsal foot remained. The nerve conduction velocity test and electromyography demonstrated left common peroneal neuropathies at the lower leg level. Fortunately, by 6 months after surgery, the patient's neurology had returned to near normal, except for weakened muscle power (grade: 4/5) on ankle dorsiflexion.

### 3. Discussion

Acute compartment syndrome frequently develops following traumatic injury, such as a fractures or severe, blunt soft-tissue traumas.<sup>2</sup> However, it is seldom reported after a simple ankle sprain. Only a few case reports in the last 10 years have discussed this uncommon entity. Table 1 lists these reports.

A review of English literature indicates that the most commonly reported cause for acute compartment syndrome following ankle sprain is rupture of the peroneus longus muscle, causing lateral compartment syndrome.<sup>5–8</sup> In addition to muscle rupture, vascular injury following ankle sprain is another cause. Dhawan et al. reported that inversion ankle injury can disrupt the anterior tibial artery, causing acute compartment syndrome of the foot.<sup>9</sup> In this case and in another two reports, the perforating branch of the peroneal artery can also fall victim to an inversion of the ankle and cause acute anterior compartment syndrome of the lower leg.<sup>3,4</sup> In some cases, definite causes cannot be identified. Maurel et al. and Creighton et al. reported cases with acute compartment syndrome of the foot and acute lateral compartment syndrome of the lower leg, respectively, after ankle sprain without identifiable causative pathology, except for intracompartmental swelling.<sup>10,11</sup>

The time from ankle injury to fasciotomy for patients varied (Table 1). Acute compartment syndrome can develop as early as 5 h post-injury or even as late as 8 days after initial injury. Generally, acute compartment syndrome related to vascular lesions presents earlier than other causes after ankle sprain. However, with prompt and timely management, most cases had good outcomes without sequelae.

To the best of our knowledge, this case is the third report of acute compartment syndrome following severe inversion injury of the ankle secondary to disruption of the perforating branch of the peroneal artery.<sup>3,4</sup> This artery branches from the peroneal artery deep in the posterior compartment of the leg and passes anteriorly through a hiatus in the interosseous membrane approximately 3 cm proximal to the ankle joint.<sup>12</sup> Because of the secure attachment of the artery as it passes through the interosseous membrane, it is susceptible to stresses in inversion injury of the ankle, which may result in a false aneurysm, or a complete rupture of the vessel.<sup>3,4,13,14</sup>

However, unlike patients in the other two reports,<sup>3,4</sup> this case appeared with another unusual presentation in addition to acute compartment syndrome. Due to the limited space in the ankle joint

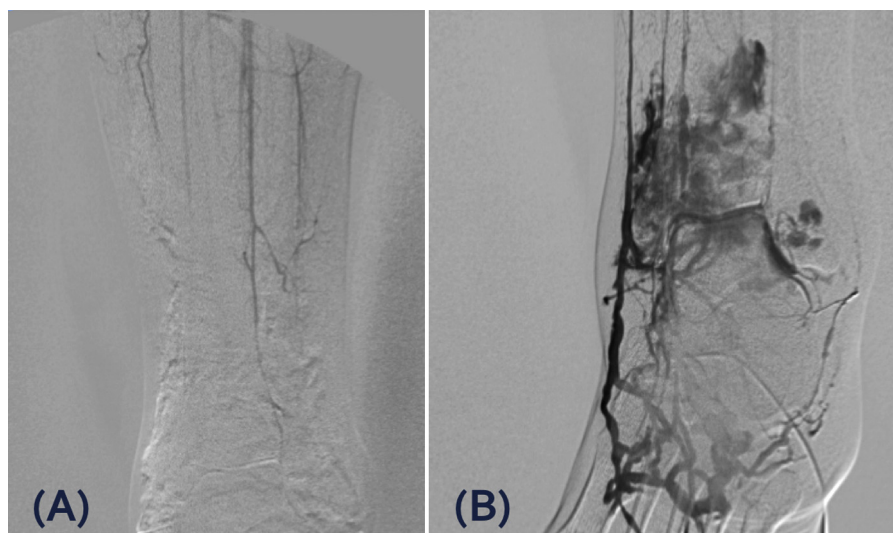


Fig. 2. (A) Angiography revealed tapering with slow flow of the left anterior and posterior tibial arteries and the peroneal artery. (B) Venography showed extravasation of contrast medium from the venous plexus in the left ankle.

**Table 1**  
Case reports of acute compartment syndrome following ankle sprain in the last decade.

Authors	Location	Cause	Time from injury to fasciotomy	Outcome for neurology and musculature
Our report	Anterior compartment of lower leg	Avulsion of perforating branch of peroneal artery	5 h	Residual weakness of the ankle dorsiflexion by 6 months
Kemp <sup>3</sup>	Anterior compartment of lower leg	Avulsion of perforating branch of peroneal artery	8 h	Full recovery without sequelae
Ward <sup>4</sup>	Anterior compartment of lower leg	Avulsion of perforating branch of peroneal artery	1 day	Full recovery without sequelae
Lee <sup>5</sup>	Lateral compartment of lower leg	Avulsion of the peroneus longus muscle	12 h	Residual peroneus muscle weakness by 9 months
Slabaugh <sup>6</sup>	Lateral compartment of lower leg	Avulsion of the peroneus longus muscle	14 h	Full recovery without sequelae
Cheng <sup>7</sup>	Lateral compartment of lower leg	Avulsion of the peroneus longus muscle	1 days	Full recovery without sequelae
Gabisan <sup>8</sup>	Lateral compartment of lower leg	Avulsion of the peroneus longus muscle	25 h	Full recovery without sequelae
Dhawan <sup>9</sup>	Compartment of foot	Disruption of the anterior tibial artery	1 days	Full recovery without sequelae
Maurel <sup>10</sup>	Compartment of foot	Unknown	8 days	Full recovery without sequelae
Creighton <sup>11</sup>	Lateral compartment of lower leg	Unknown	2 days	Full recovery without sequelae

and active bleeding by the disrupted vessel, severe hemarthrosis of the ankle developed gradually 3 h after the injury, eventually resulting in arterial oppression and venous outflow obstruction to the foot. This phenomenon is explained in this case by the unusual congestive appearance of the foot and faint pulse in the *dorsalis pedis* and tibial posterior artery. Although emergent fasciotomy was performed, residual weakness of ankle dorsiflexion remained 6 months after surgery. Further intensive follow-up will be needed for full functional recovery of the injury limb.

In conclusion, this case underscores the importance of considering compartment syndrome when an individual presents with an inversion injury of the ankle, even without fracture. Clinicians must sustain a high index of suspicion for acute compartment syndrome secondary to vascular disruption when patients present with rapid neurological changes or pain that is excessive for an ankle sprain. Fasciotomy should not be delayed in order to prevent untimely management related complications.

**Conflict of interest**

All authors have no conflict of interest.

**Funding**

No funding for our research.

**Ethical approval**

Informed consent for publication, including any necessary photographs, has been obtained from the patient himself.

**Authors' contribution**

Chen Yu Pin: First writer, writing.  
Ho Wei Pin: data collections.  
Wong Poo Kuang: Corresponding author.

**Acknowledgements**

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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