

Lower Extremity Compartment Syndrome Associated with Hypotensive General Anesthesia for Orthognathic Surgery: A Case Report and Review

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Abstract

Background: Compartment syndrome has been reported in surgical patient. However, it's seldom reported in orthognathic cases.

Clinical Case: A 31 years old man presented with restricted maxillary growth as well as a hypoplastic maxilla. He was medically fit and was not aware of any medical conditions. He was prepared for a LeFort I osteotomy advancement as well as mandibular setback and bilateral alveolar bone graft.

Patient was secured in the supine position. Hypotensive anesthesia was maintained. Lowest systolic blood pressure being 70 mmHg and lowest diastolic blood pressure being 40 mmHg.

Day one post op, He complained of pain left leg pain. Mild swelling with no color change noticed. Weak dorsiflexion was noticed. No abnormal sensation was detected. DVT was ruled out using doppler test.

Day two, Pain extended to the anterior compartment of the left leg. Passive motion of the toe was observed. Patient was unable to dorsiflex the left toe and ankle. He was also unable to ever the ankle but was able to invert and plantar flex both ankle and toe. Weak sensation was observed over dorsum of the left foot as well as the left first web space. Good circulation and palpable dorsalis pedis and posterior tibial arteries.

Upon consulting orthopedics, they agreed that the patient needed fasciotomy for anterior compartment syndrome of the left leg as well as ankle foot orthosis for common peroneal palsy.

Spinal anesthesia was administered. Anterior compartment showed a reading of 43 in three different reading. Posterior compartment reading was 17 in three different readings. Releasing the anterior compartment reflected necrosis of the tibialis anterior muscle. Open wound was maintained, and vacuum assisted closure dressing was used. Five days later, the wound debridement and primary closure was achieved.

Patient condition improved, and he no longer reported feeling pain. He was unable to extend ankle or and toe. He was informed that common peroneal palsy needs 3 months of physical therapy to improve.

Keywords: *Compartment Syndrome; Hypotensive Anesthesia; Orthognathic Surgery*

Introduction

Compartments in the body are groupings of muscles, nerves and blood vessels. These compartments are covered by a fascia which does not expand or stretch easily. Compartment syndrome (CS) is a condition that occurs when the intracompartmental pressure builds up in the body compartments which results in a decreased capillary blood flow and, ultimately, leading to cellular hypoxia, muscle isch-

emia and necrosis. Many etiologies have been described to cause CS. These include: obesity, trauma, hypotensive anesthesia, prolonged surgery, medications and vascular disease among many other causes [1-3]. We report a case of a patient who developed CS following LeFort I osteotomy and bilateral sagittal split osteotomy orthognathic surgery as well as bilateral alveolar bone graft.

Case Report

The patient was a 31 years old obese man who was also a smoker. He was medically free, no known medical problems, and was not aware of any medical conditions. He had restricted maxillary growth as well as a hypoplastic maxilla. The patient was prepared for a LeFort I osteotomy advancement as well as mandibular setback through bilateral sagittal split osteotomy and bilateral alveolar bone graft.

The patient was secured to the operating table in the supine position with both legs extended and pneumatic sequential device was applied. Anesthesia was induced using 300 mg Propofol, 200 mcg Fentanyl, 60 mg Rocuronium. Sevoflurane was used for maintenance. Hypotensive anesthesia was maintained for approximately 60 minutes with the lowest systolic blood pressure being 70 mmHg and lowest diastolic blood pressure being 40 mmHg. Surgery lasted for 8 hours.

On the first day post operatively, the patient complained of pain in his left leg. Mild swelling was noticed with no color change compared to the right leg. Weak dorsiflexion was noticed. No abnormal sensation was detected. Power of 5/5 in lower limb, knee and right ankle. Deep vein thrombosis (DVT) was ruled out using doppler test.

On the second day, the patient continued to complain of the same issue with pain extending to the anterior compartment of the left leg. Passive motion of the toe was observed. Patient was unable to dorsiflex the left toe and ankle. He was also unable to ever the ankle but was able to invert and plantar flex both ankle and toe. Weak sensation was observed over dorsum of the left foot as well as the left first web space. Good circulation and palpable dorsalis pedis (DP) and posterior tibial (PT) arteries.

Upon consulting the orthopedic team, it was agreed that the patient needed fasciotomy for anterior compartment syndrome of the left leg as well as ankle foot orthosis (AFO) for common peroneal palsy.

Spinal anesthesia was administered. Measuring the anterior compartment showed a reading of 43 mmHg in three different reading. Posterior compartment reading was 17 mmHg in three different readings. Releasing the anterior compartment reflected necrosis of the tibialis anterior muscle. Open wound was maintained and vacuum assisted closure (VAC) dressing was used. Five days later, the wound debridement and primary closure was achieved.

Patient condition improved, and he no longer reported feeling pain. He was unable to extend ankle or and toe. He was informed that common peroneal palsy needs 3 months of physical therapy to improve.



Discussion

Compartment syndrome of the lower limbs may undergo severe complications if left untreated, and, thus, early diagnosis is essential for prevention. According to Shadgan., *et al.* (2010), the most common cause of acute compartment syndrome involves the fracture of the tibial diaphysis encompassing approximately 36% of the cases [4]. Nevertheless, several case reports including the case discussed above have demonstrated an incidence of acute compartment syndrome with orthognathic surgery under general anesthesia [1,5,6].

Compartment syndrome has been further attributed to the increase of intracompartmental pressure subsequently resulting in the deficiency or absence of both venous and arterial outflow. This, in turn, leads to tissue hypoxia and subsequent increase in the capillaries' permeability is undertaken to restore the circulation. Nevertheless, this results in extravascular leakage which results in edema and further increase of intracompartmental pressure with compromised circulation [1,5]. As a result of decreased tissue perfusion; cellular anoxia, muscle ischemia and necrosis along with permanent deficit may occur if left untreated [1,7,8]. Death may further occur if progression to multiorgan system failure develops [4].

Furthermore, while the leg is composed of four compartments: anterior, lateral, superficial posterior, and deep posterior, the most commonly involved compartment is the anterior compartment due to its possession of the most rigid fascia along with its anatomic relation to the interosseous septum, fibula and tibia [9]. Moreover, Teeple., *et al.* (2010) has described the tissues most affected by ischemia in the following order: the sensory nerve, motor nerve, muscle, skin and bone [5].

Consequently, the main clinical symptom is pain in the lower limb that cannot be correlated to any clinical finding. Other clinical findings include edema, paresthesia, tight shiny skin as well as pain on passive stretching. Paresis and arterial pulse loss are described as late signs with arterial pulse loss occurring once compartment pressure exceeds diastolic pressure and significant muscle and nerve necrosis occurs [4,5].

Consequently, direct measurement of intracompartmental pressure via a 18-gauge needle attached to a pressure conductor can be a helpful diagnostic tool. Accordingly, pain and paresthesia are noticed at a reading of 20 - 30 mmHg, and reduced blood flow is observed once the compartment pressure is 10 mm Hg of the diastolic pressure [5,10].

Increased intracompartmental pressure is, in turn, relieved through the application of fasciotomies which is described by Teeple., *et al.* (2010) as longitudinal incisions through the skin into the muscle compartments running 20 to 25 cm along the limb [5]. Such incisions are then left open for a number of days for decompression to occur with delayed primary closure ultimately undertaken.

Nevertheless, accordingly to Teeple., *et al.* (2010), it is unfortunate that 30% of the cases display lower limb disability, 40% require amputation, and up to 15% patient mortality occurs through the progression of multiorgan system failure [5].

Association of Compartment Syndrome with Oral and Maxillofacial Surgery

In the case documented above, the administration of hypotensive general anesthesia for a lengthy period of time - of approximately eight hours - in supine position may have increased the risk of decreased peripheral tissue perfusion and subsequently the risk of attaining compartment syndrome. This has been further reported by Teeple., *et al.* (2010) for which compartment syndrome developed after the administration of hypotensive anesthetic agents including Midazolam 1 mg, Fentanyl 325g, and Propofol 100 mg for maxillomandibular advancement procedure [5]. Obesity may potentially play a role as well in increasing the risk of attaining compartment syndrome as a supplemental factor.

Furthermore, it should be noted that several cases which were later diagnosed with compartment syndrome have displayed evidence of pain on the same day of the procedure post-operatively as reported by Kerrary., *et al.* (2011), for example, where the patient complained of lower limb pain five hours following mandibular reconstruction [6]. On the other hand, the case documented above reported pain in the

lower limb one day following LeFort I osteotomy advancement, bilateral sagittal split osteotomy, and bilateral alveolar bone graft under general anesthesia. Beadnell, *et al.* (1988) has also reported pain on the following day post-operatively after LeFort I osteotomy advancement and bilateral alveolar bone graft [1].

Following the treatment of compartment syndrome, patients have been reported to display neurological deficit including peroneal nerve palsy, a disability that affects the patient's ability to lift the foot at the ankle [11]. After 6 months of follow-up, Kerrary, *et al.* (2011) reports that the patient complains of significant neurologic pain, paresthesia of the foot, and altered gait [6]. Nevertheless, Beadnell, *et al.* (1988) reports functional improvement after the initiated of physiotherapy, yet sensory deficit remained [1].

Conclusion

A 31 year old male patient has underwent an unusual development of compartment syndrome following LeFort I osteotomy advancement, mandibular setback through bilateral sagittal split osteotomy, and bilateral alveolar bone graft with hypotensive general anesthesia. Due to the subsequent complications of decreased tissue perfusion, cellular anoxia, muscle ischemia and necrosis, permanent deficit, and death that can be attained by compartment syndrome; early diagnosis and prevention play fundamental roles to decrease or eliminate complications. Consequently, indications to describing hypotensive general anesthesia with lengthy procedures may require re-assessment to prevent its occurrence.

Bibliography

1. Beadnell S, *et al.* "Compartment syndrome following oral and maxillofacial surgery". *Journal of Oral and Maxillofacial Surgery* 46.3 (1988): 232-234.
2. Beraldo S and Dodds S. "Lower Limb Acute Compartment Syndrome After Colorectal Surgery in Prolonged Lithotomy Position". *Diseases of the Colon and Rectum* 49.11 (2006): 1772-1780.
3. Godeiro-Júnior C., *et al.* "Peroneal nerve palsy due to compartment syndrome after facial plastic surgery". *Arquivos de Neuro-Psiquiatria* 65.3b (2007): 826-829.
4. Shadgan B., *et al.* "Current thinking about acute compartment syndrome of the lower extremity". *Canadian Journal of Surgery* 53.5 (2010): 329-334.
5. Teeples T., *et al.* "Lower Extremity Compartment Syndrome Associated With Hypotensive General Anesthesia for Orthognathic Surgery: A Case Report and Review of the Disease". *Journal of Oral and Maxillofacial Surgery* 68.5 (2010): 1166-1170.
6. Kerrary S., *et al.* "Acute compartment syndrome following fibula flap harvest for mandibular reconstruction". *Journal of Cranio-Maxillofacial Surgery* 39.3 (2011): 206-208.
7. Tzioupis C., *et al.* "Acute compartment syndrome of the lower extremity: an update". *Orthopaedics and Trauma* 23.6 (2009): 433-440.
8. Mubarak S and Hargens A. "Acute compartment syndromes". *Journal of Pediatric Orthopaedics* 3.5 (1983): 636-638.
9. Heemskerk J and Kitslaar P. "Acute Compartment Syndrome of the Lower Leg: Retrospective Study on Prevalence, Technique, and Outcome of Fasciotomies". *World Journal of Surgery* 27.6 (2003): 744-747.
10. Schneider J., *et al.* "Bilateral forearm compartment syndromes resulting from neuroleptic malignant syndrome". *The Journal of Hand Surgery* 21.2 (1996): 287-289.
11. Baima J and Krivickas L. "Evaluation and treatment of peroneal neuropathy". *Current Reviews in Musculoskeletal Medicine* 1.2 (2008): 147-153.

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