



## Bilateral Well-Leg Compartment Syndrome (WLCS) after Urological Procedure: A Case Report

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DOI: 10.31080/ASOR.2023.06.0874

**Received:** November 06, 2023

**Published:** November 27, 2023

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### Abstract

Well Leg Compartment Syndrome (WLCS) describes the development of acute lower limb compartment syndrome in an uninjured limb, which may occur without pre-existing vascular disease. This was initially observed after the patients were placed in a lithotomy position for surgical procedures. The authors experienced a case of bilateral well leg compartment syndrome that occurred after a urological procedure in lithotomy position. The patient was treated with bilateral leg fasciotomy and decompression of the common peroneal nerve.

**Keywords:** Well Leg Compartment Syndrome; Lithotomy Position; Reperfusion Injury; Fasciotomy

### Introduction

The term "Well Leg Compartment Syndrome" (WLCS) was first adopted by Leff, *et al.* in 1979 [1]. It describes the development of acute lower limb compartment syndrome in an uninjured limb, which may occur without pre-existing vascular disease [2]. This was initially observed after the patients were placed in a lithotomy position for cystectomy and urethroplasty cases [3]. Further cases were reported following procedures of general surgery, gynecology and orthopaedic surgery [4].

It is a rare condition and the incidence is estimated to be 0.03% (1/3500 patients) and 0.29% (9/3110 patients) in abdominopelvic surgeries and robot-assisted radical prostatectomy (RARP) respectively. More specifically in urology patients, this ranged between 1 in 3,500 and 1 in 500 for lithotomy and cystectomy patients respectively [5].

In terms of pathophysiology, the WLCS arises from the reduction in arterial pressure and  $SPO_2$  [5]. This is a result of hypoperfusion owing to the elevation of the legs in the lithotomy position, which can be further exacerbated by the trendelenburg tilt (Figure 1). The ischemia leads to increased capillary endothelium permeability resulting in the leakage of fluid and plasma protein in the interstitial space, which ultimately leads to a rise in the intracompartmental pressure [6].

Adding insult to injury, another phenomenon known as reperfusion injury may develop when attempts to normalize perfusion after prolonged periods of time occur. Here, oxygen-free radicals and vasoactive mediators are released leading to further damage of the endothelium and further propagating the previously described cascade<sup>6</sup>. WLCS is associated with multiple risk factors including operative time > 4 hours, compression of the extremity, coagulopathy, perioperative hypotension and obesity [7,8].

### Case Report

A 33 year-old gentleman (BMI 25) was admitted under Urology service for urethroplasty. General anesthetic + epidural anesthesia were administered. Intraoperatively, the patient was placed in the lithotomy position for a period of 5 hours. The surgery had no intraoperative or immediate postoperative complications. During the case, a generic knee support, which supports the distal thigh, knee and leg, was used.

Patient noted pain in both lower limbs, which was initially managed with observation over the course of the day (POD#0). The pain worsened significantly over the course of the following day (POD#1), and the anaesthetist on-call was asked to review the patient as per the hospital's postop pain management protocol. With the suspicion of a compartment syndrome, urgent orthopaedic consultation was requested. Upon examination, the anterolateral compartments were swollen bilaterally, tender and tense. Passive

dorsiflexion elicited extreme pain and the patient was unable to actively dorsiflex his foot and toes bilaterally. There was numbness involving the dorsum of both feet and the pulses were present.

The patient was then taken to the OR for an emergent bilateral fasciotomy with common peroneal nerve exploration and decompression (Figure 2). Intraoperatively, significant portions of the peroneus longus and brevis within the lateral compartment were found to be nonviable and were debrided.

A second-look debridement was done on the second postoperative day (POD# 2). After careful inspection and assessment, the incision was primarily closed.

Postoperatively after primary closure, the patient underwent intensive physiotherapy with the use of an ankle-foot orthosis (AFO). Four months postoperatively, the patient had 5/5 strength with the ankle/toe dorsiflexion bilaterally. However, the function of his peronei was lagging with 4/5 on the left and 3/5 on the right. Paresthesia involving the dorsum of both feet remained. Serial electrophysiologic studies showed features suggestive of moderately severe distal axonal neuropathy involving bilateral peroneal nerves. There was noted remarkable improvement in deep peroneal amplitudes. However, superficial peroneal responses remained absent.

## Discussion

Patient positioning during long surgical procedures carries the risk of neuromuscular complications. Compartment syndrome of the lower extremity is one of the most serious complications related to patient positioning under anesthesia. We report a case of bilateral leg compartment syndrome that occurred in 33 years old male patient after a urological procedure in lithotomy position. The patient was treated with bilateral leg fasciotomy and decompression of the common peroneal nerve.

Surgeons and OR staff should be aware of the complications associated with patient positioning. Enough padding, pneumatic decompression device, operative time, and high index of suspicion during the early post-operative period can reduce the number of these complications.

With the wide variation and heterogeneity of compartment syndrome presentations, the absence of a gold standard confirmatory diagnostic test and the grave consequences of a missed compartment syndrome, it is understandable how most surgeons would lean towards performing a fasciotomy with inconclusive findings<sup>9</sup>. Thus, a clear discussion with the patient, their family, and the healthcare team is paramount. It goes without saying that

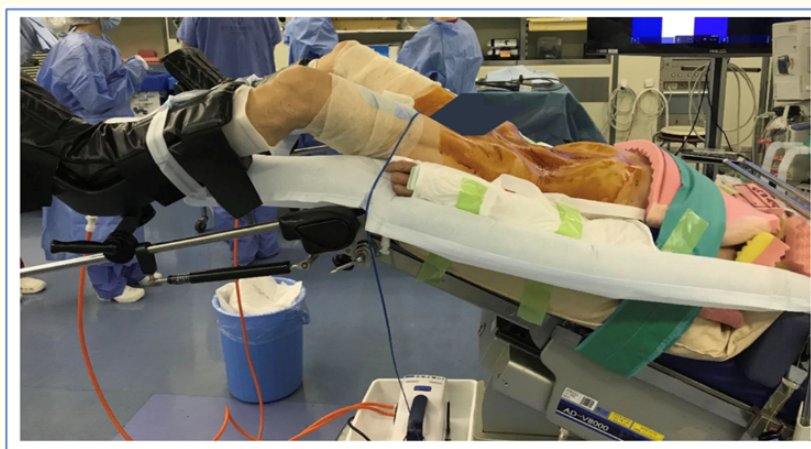
prompt and emergent action provides the best chance of a favourable outcome as irreversible axonotmesis may occur as early as 4h [10].

Several risk factors have been reported in the literature that are associated with WLCS, these include OR time over 4 hours, lithotomy position, peripheral vascular disease, Increased BMI, diabetes, hypovolaemia, use of intermittent compression devices or any compression of the leg [6]. The risk of compartment syndrome rises exponentially if the operative time is more than five hours. Positioning of extremities alone can change intracompartmental pressures. For example, sustained dorsiflexion of the ankle physiologically increases intracompartmental pressure of the calf, external pressure on the leg by the weight of the arms of the assisting team members looking for support to their tired arms after prolonged surgery. Therefore, the ankle position particularly dorsiflexion maybe a predisposing factor. Thus, neutral or slightly plantarflexed position is recommended [6].

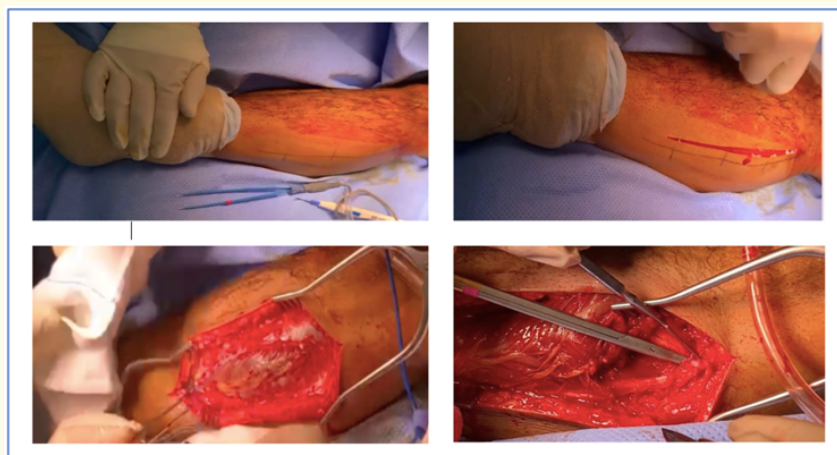
As in lithotomy position with the knee and hip both flexed 90 degrees or more, prolonged direct pressure of the affected compartment due to the weight of the leg acting against the leg support, and any compressive bandage like TED stockings or strapping, leading to ischemia/reperfusion injury with subsequent compartment syndrome.

In our case, the risk factors that could be identified are the lithotomy position, the 5-hour duration of the procedure. In addition, the presence of some of the classical signs of acute compartment syndrome including pain out of proportion and paresthesia justified the decision to pursue the fasciotomy. It is possible that further compression of the compartments may have resulted by surgical assistants leaning on the leg during the procedure. The development of compartment syndrome carries a significant impact with longer hospital stays and associated costs. Additionally, it is correlated with lower functional scores and quality of life [11]. More specifically, fasciotomy for the WLCS has been found to have 29.4% full recovery, 64.7% partial recovery and 5.9% no recovery [4]. Obviously untreated compartment syndrome is associated with far worse outcomes which include but are not limited to chronic pain, severe dysfunction because of muscle contractures, renal injury, amputation and even loss of life [9,10].

To avoid the development of the WLCS in the lithotomy position, several interventions are proposed<sup>5</sup> including (1) relieving the pressure on the lower leg contact area at the beginning of the case. (2) decompressing the contact areas every hour (3) horizontally repositioning the table every 3 hours and (4) limiting the leg elevation to the level of the right atrium.



**Figure 1:** Lithotomy position with trendelenburg tilt. Adapted from “Well leg compartment syndrome following robot-assisted radical cystectomy in the lithotomy position: a case report.” By Fukuda et al, JA Clin Rep. 2021 Jan 28;7(1):13.



**Figure 2:** Fasciotomy with common peroneal nerve exploration and decompression.

The importance of education about this topic cannot be over emphasized. Due to the variety of scenarios by which compartment syndrome can develop while under the care of different medical specialties, it is important that all health-care professionals are familiar with the presentation, diagnosis and principles of treatment of acute compartment syndrome [10]. Such efforts to surgeons have proven beneficial with a reduction in US casualty mortality and need for revision surgery [12]. One of the latest advancements in this regard was the American Academy of Orthopaedic Surgeons (AAOS) Appropriate Use Criteria (AUC) for the diagnosis and management of acute compartment syndrome, which can be simply accessed via the web-based mobile application [www.orthoguidelines.org](http://www.orthoguidelines.org) [13].

**Conclusion**

It is imperative that the surgical team is aware of the potential complications of the lithotomy position. Considering the consequence of a delayed or missed diagnosis of compartment syndrome, expeditious assessment and management is vital for optimal outcome.

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