ISSN: 2754-8880
Published 00 11 0000

Bilateral Compartment Syndrome Following Prolonged Urological Surgery: A Case Report

E Palenikova[1*], K Freeman[2], G Houghton[3], A Sabaa[4], and C Fenton[5]

[1] **Resident Doctor (FY2), Urology, Scunthorpe General Hospital, Cliff Gardens, Scunthorpe DN15 7BH**
[2] **Resident Doctor (FY1), Urology, Scunthorpe General Hospital, Cliff Gardens, Scunthorpe DN15 7BH**
[3]**Resident Doctor (FY1), Urology, Scunthorpe General Hospital, Cliff Gardens, Scunthorpe DN15 7BH**
[4] **Consultant Urologist, Urology, Scunthorpe General Hospital, Cliff Gardens, Scunthorpe DN15 7BH**
[5]**Consultant Orthopaedic surgeon, Scunthorpe General Hospital, Cliff Gardens, Scunthorpe DN15 7BH**
[*]**Correspondence author: Elitsa Palenikova, GMC: 8006149, https://orcid.org/0009-0002-7027-9839. Elitsa.palenikova2@nhs.net/ Phone: 07856744914**

ORIGINAL

Abstract

Background: Acute compartment syndrome (ACS) is a limb-threatening surgical emergency characterised by critically elevated intra-compartmental pressures and delta pressure greater than 30 mmHg, leading to ischaemia and potential tissue necrosis if untreated. A non-traumatic variant, well-leg compartment syndrome (WLCS), is increasingly recognised in surgical procedures performed in the lithotomy position. Risk factors include prolonged surgery, leg elevation, intraoperative hypotension, external compression, and morbid obesity.

Case Presentation: A 40-year-old male with a BMI of 50 underwent a prolonged elective urethroplasty in lithotomy position. He reported severe bilateral leg pain postoperatively, initially worse on the right, progressing to bilateral involvement within two hours. Examination revealed reduced left foot dorsiflexion, severe pain disproportionate to clinical findings, and firm lateral compartments bilaterally, with preserved pulses, perfusion, and sensation. Clinically, he was diagnosed with ACS and taken for emergency surgery. Bilateral fasciotomies were performed, revealing contractile grey and pink muscle and evidence of reperfusion. Incisions were temporarily closed using the lattice lacing technique.

Outcome: No further complications occurred in hospital. The patient was discharged within three weeks. Urethroplasty success was confirmed at one-month follow-up. No intervention was needed after review by plastic surgery for further closure.

Conclusion: WLCS is a rare limb-threatening complication of prolonged lithotomy positioning, particularly in obese patients. Early recognition and prevention aided by awareness of risk factors and vigilant postoperative monitoring are critical. Clinicians should limit lithotomy time (< 4 hours), periodically lower legs, optimise blood pressure, use appropriate leg support, and maintain high suspicion for prompt diagnosis and intervention.

Keywords : urology, complication, compartment syndrome, case report

OPEN ACCESS
Edited by
A.Hussain

Submitted *12 Sep. 2026*

Accepted *18 Sep. 2026*

Citation
E Palenikova, K Freeman, G Houghton, A Sabaa, and C Fenton.Bilateral Compartment Syndrome Following Prolonged Urological Surgery: A Case Report .Editorial article:BJOSS::2026:(6);204-209

Introduction

We present a case of bilateral Compartment Syndrome (CS) in a morbidly obese patient following elective urethroplasty, highlighting the clinical challenges and emphasizing the need for heightened perioperative vigilance in at-risk patients to enable early recognition and intervention. Often seen after traumatic injuries, acute compartment syndrome (ACS) is a surgical emergency defined by elevated intra-compartmental pressures, where the delta pressure (delta pressure = diastolic pressure - measured intra-compartmental pressure) exceeds 30 mmHg, leading to tissue ischemia and necrosis if untreated (1**?**). Less common and, importantly, unrelated to trauma, Well Leg Compartment Syndrome (WLCS) is a non-traumatic variant recognised as a complication of prolonged lithotomy positioning, especially in urological procedures such as urethroplasty, radical cystectomy, and prostatectomy (2; 3; 4). Contributing factors include leg elevation above heart level, intraoperative hypotension, and external compression, all of which reduce perfusion (3; 4). Morbid obesity further increases the risk by exacerbating compartment pressures (5**?**). Although rare, estimated between 1 in 3500 and 1 in 500 for high-risk procedures (2), delayed diagnosis can lead to serious morbidity or mortality (2; 3).

Background

Acute compartment syndrome is a limb-threatening surgical emergency characterized by increased intra-compartmental pressures and delta pressure greater than 30 mmHg, leading to compromised perfusion and potential tissue necrosis if not recognized and treated promptly (1; 2). Although classically compartment syndrome is associated with traumatic injuries, well leg compartment syndrome (WLCS) is not. WLCS has been increasingly recognized as a complication of prolonged surgical procedures performed in the lithotomy position (2; 3).

In urological surgery, particularly during procedures such as urethroplasty, radical cystectomy, or prostatectomy, the combination of several intraoperative factors creates a risk environment for the development of CS. Elevation of the limbs above the level of the right atrium, which in turn reduces arterial perfusion pressure, compromising distal tissue oxygenation (3**?**). Additional factors like hip flexion, knee angulation in association with hypotension and external compression can further exacerbate the imbalance between perfusion and tissue pressure. Reperfusion injury after repositioning or leg lowering postoperatively also contributes to a rise in intra-compartmental pressure, leading to further damage to limb tissue (2; 3; 4; 6).

The risk factors for WLCS are outlined below in Table 1. Several of these were present in the following case.

While the incidence of WLCS is estimated between 1 in 3500 general pelvic surgeries and as high as 1 in 500 for high-risk urological procedures (2), delayed diagnosis can result in devastating outcomes, including permanent neuromuscular deficits, amputation, renal failure, or death (2; 3; 6; 5; 7). We present a case of bilateral well-leg compartment syndrome following an elective urethroplasty in a morbidly obese male, aiming to highlight the clinical challenges, risk factors, and time-critical nature of diagnosis and management in this rare but serious complication.

Case

A 40-year-old white male patient was admitted to the surgical ward following an elective urethroplasty with buccal graft for a urethral stricture. The procedure was performed by a skilled urological consultant with no intraoperative complications or follow-up concerns, lasting nearly 6 hours. The patient was placed in the lithotomy position during the full duration of the surgery. His only significant medical history was morbid obesity, weighing 164kg at 189cm, BMI 50.

About 4 hours post completion of the procedure, the patient was reporting pain in his back, arms, and legs. Initially, the leg pain was worse on the right side compared to the left. This progressed

Category	Risk Factor	Mechanism
Patient-related	Male gender (1, 6)	Associated with higher muscle mass, increasing compartment compression.
	Morbid obesity (6)	Increases external compression and raises compartment pressures even without trauma.
	Muscular lower limbs (1, 6)	Greater muscle bulk increases external compression.
Surgery-related	Lithotomy position (5, 6)	Elevates intra-compartmental pressure and reduces perfusion pressure, predisposing to WLCS.
	Intraoperative hypotension (5, 6)	Lowers perfusion pressure, compounding ischemic risk in already compressed compartments.

Table 1. Risk Factors for WLCS

to bilateral pain within 2 hours; examination was significant only for reduced active dorsiflexion of the left foot and severe pain. Pulses were present bilaterally, with good skin perfusion and temperature, sensation intact. Analgesia was trialed, with little effect.

Review following inefficiency of analgesic escalation demonstrated hard lateral compartments bilaterally (commonly described as woody). 13 hours after initial symptoms began, the patient was reviewed by the orthopaedic team and was taken to theatre the same day. Pressures were measured and documented in theatre (Table 2). Compartment pressures were measured in each compartment using a large bore cannula attached to a manometer used for arterial pressure measurement, in the absence of specific devices used for compartment pressure measurement, meaning that the results can be inaccurate and are not necessarily diagnostic, but more indicative. The decision to operate was made based on history, symptoms, and clinical presentation. Of note, the highest pressures were in the anterior and lateral compartments that showed evidence of ischaemic muscle at the time of fasciotomies. There was no hard evidence of posterior compartment ischaemia, and this can be seen in the patterns of pressure measurement, with much lower pressures noted here.

Fasciotomy was performed based on clinical presentation and signs of CS, as well as elevated anterior and lateral pressures. He had bilateral fasciotomies with incisions on the lateral and medial aspects of both legs; evidence of reperfusion was seen. The anterior and lateral compartments were incised, and this revealed bulging, ischaemic muscle that became pink and perfused after a short time once the compartments were decompressed. The muscle was contractile when stimulated and therefore assumed to be viable. The posterior and deep posterior compartments seemed to be unaffected and had grossly normal muscle with minimal bulging. Wounds were closed using a lattice lacing technique to allow the skin edges to oppose naturally and avoid contraction as the swelling subsides.

	Right	Left
Anterior	40mmHg	68mmHg
Lateral	150mmHg	62mmHg
Deep posterior	15mmHg	30mmHg
Superficial posterior	25mmHg	40mmHg

Table 2. Compartment delta pressures taken intra-operatively

Differentials

As CS is a clinical diagnosis, differentiating it from other postoperative complications is crucial to avoid delay in treatment and limb compromise. As suggested by the literature (2; 6), WLCS can

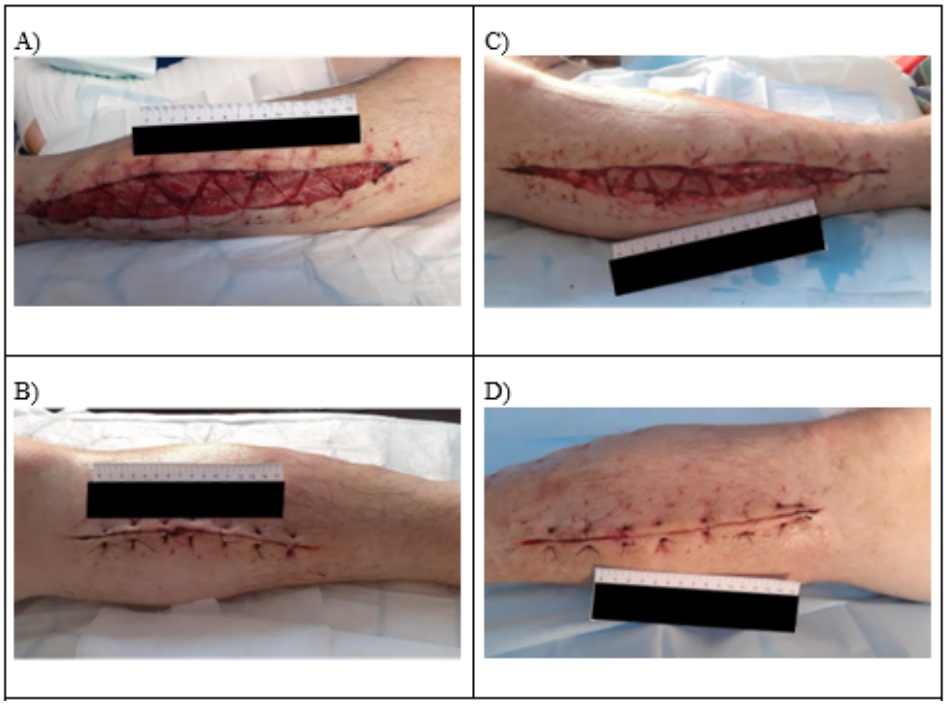


Figure 1. Post-operative images. A) left lateral leg, B) left medial leg, C) right lateral leg and D) right medial leg.

be mistaken for DVT, as was the case. Analysis of the documentation reveals an initial differential diagnosis of DVT, but also recognition of neuropathic pain, common peroneal nerve injury also being recognised as a complication of prolonged time spent in the lithotomy position (7), for which appropriate investigations were ordered but not completed pre- discharge due to specialist orthopaedic team recognition of the possibility of raised compartment pressures.

Treatment

The patient was taken to theatre and compartment pressure measurements were taken as above; these were high; therefore, the decision was made to perform fasciotomies using 2 incisions, one medial to access the superficial and deep posterior compartments and one lateral to access the anterior and lateral compartments. Compartments were released fully from proximal to distal. The superficial peroneal nerve was identified and this was protected throughout the procedure, and both were noted to be intact at the conclusion of the procedure. Primary skin closure was not possible at the primary procedure; therefore, a 'shoelace' technique was employed using elastic vascular loops under tension to allow gradual opposition of the skin edges. Afterward, the patient was taken back to theater for closure of medial wounds, but the lateral wound could not be closed. The patient had a review by the plastics team, but no intervention was necessary as the wounds were healing nicely and the patient preferred conservative management.

Patient Outcome

The patient had no further complications while in hospital and was discharged just under three weeks after the fasciotomy was performed. The urethroplasty was reviewed a month later and confirmed to have been successful. There was a plan for further follow-up with plastic surgery, which he attended, and conservative management was decided. His wounds have been healing well at the latest review, half a year later. There is no evidence to suggest long-term peroneal nerve injury.

Discussion

Recognition and Pathophysiology

Well Leg Compartment Syndrome (WLCS) is a rare but potentially devastating complication of surgical procedures involving prolonged lithotomy positioning. It often progresses insidiously, especially in anesthetised patients, where pain - a key early symptom - can be masked and ignored. This makes diagnosis dependent on vigilance and a high index of suspicion. Warner et al. (8) reported that perioperative lower limb compartment syndrome can occur in patients positioned supine and flat, with durations of procedures ranging from 3.2 to 15.7 hours, but the highest incidence occurred in those positioned in lithotomy (1 in 8,720 vs 1 in 100,000 in supine). This suggests that both positioning and duration are independently significant contributors.

In the lithotomy position, elevation of the legs above the heart level reduces perfusion pressure in the limbs by approximately 0.78 mmHg per centimeter of elevation (3). This hypoperfusion, compounded by external compression from leg supports, intraoperative hypotension, and the metabolic cascade of ischemia-reperfusion injury, results in swelling within non-expansile fascial compartments and progressive muscle and nerve ischemia. The pathophysiological process typically progresses silently during surgery, with classic symptoms such as severe pain disproportionate to clinical findings, paraesthesia, weakness, and swelling only emerging postoperatively. Pain and swelling are the first typical signs, but early neurological symptoms are often observed due to the high oxygen sensitivity of unmyelinated type C fibers (3; 4).

Risk Factors

Prolonged operative time is the most significant procedural risk factor for WLCS, with most cases occurring after surgeries exceeding four hours (2; 8). Additional factors increasing the likelihood of WLCS include raised limb positioning (leading to arterial perfusion compromise) (3), intraoperative hypotension (further reducing perfusion) (6), obesity, male gender and muscular lower limbs, both associated with higher compartment baseline pressures (5) and the use of tight leg holders or compression devices such as TED stockings or intermittent pneumatic compression (IPC) boots (4; 6). In the present case, the patient's morbid obesity (BMI 50), prolonged 6-hour surgery, and continuous raised leg position in lithotomy significantly increased the risk of developing WLCS. These factors were anticipated but were under-recognised, which delayed prompt diagnosis of the condition.

Recognition Challenges in Urological Surgery

WLCS has historically been under-recognized in urological surgery despite frequent use of high-risk positions. A survey by Simms and Terry (2) found 65 episodes of WLCS among UK consultant urologists, with most cases following radical cystectomy and urethroplasty. Diagnosis was often delayed, particularly when epidural anaesthesia masked postoperative pain. As Raza et al. (4) emphasized, unrecognized WLCS can lead to catastrophic outcomes, including permanent disability or death. This case highlights the necessity for urologists to maintain a high index of suspicion for WLCS in the postoperative period, especially in obese patients undergoing prolonged procedures in the lithotomy position.

Diagnostic Pathways

Clinical assessment remains the cornerstone of diagnosis. Key signs include severe pain out of proportion to clinical findings, pain exacerbated by passive stretch of the muscles, tense, firm muscle compartments, and weakness of dorsiflexion (early nerve dysfunction). Pulses are often preserved, making reliance on vascular examination misleading (2). In uncertain cases, direct measurement of intra-compartmental pressures is critical. A delta pressure (diastolic BP minus intra-compartmental pressure) <30 mmHg is highly suggestive of compartment syndrome and mandates urgent fasciotomy (6). In our case, the delay in recognizing compartment syndrome resulted in compartment pressures reaching as high as 150 mmHg, necessitating bilateral fasciotomies.

Guidelines and Recommendations

Current best practices to minimize WLCS risk include:

- Limit lithotomy duration to less than 4 hours if possible (6).
- Periodically lower the legs during surgery to restore perfusion (every 2 hours recommended).
- Monitor intraoperative blood pressure aggressively to maintain perfusion.
- Avoid tight external compression; use properly fitted leg holders.
- Postoperative vigilance for disproportionate pain or neurological signs.
- Early orthopaedic consultation and compartment pressure measurement if WLCS is suspected.

Conclusion

This case reinforces the need for heightened awareness of WLCS among urologists, particularly when managing patients with significant risk factors such as morbid obesity. Early recognition and intervention remain critical in minimizing morbidity and preserving limb function.

Conflict Of Interest

Author declare no conflict of interest and no funding for this study.

References

[1] Torlincasi AM, Lopez RA, Waseem M. Acute compartment syndrome. In: StatPearls. StatPearls Publishing; 2023. Available from: https://nih.gov.

[2] Simms MS, Terry TR. Well leg compartment syndrome after pelvic and perineal surgery in the lithotomy position. Postgraduate Medical Journal. 2005 Aug;81(958):534-6.

[3] Nester M, Borrelli J. Well leg compartment syndrome: Pathophysiology, prevention, and treatment. Journal of Clinical Medicine. 2022 Oct;11(21):6448.

[4] Raza A, Byrne D, Townell N. Lower limb (well leg) compartment syndrome after urological pelvic surgery. Journal of Urology. 2004 Jan;171(1):5-11.

[5] Mizuno J, Takahashi T. Male sex, height, weight, and body mass index can increase external pressure to calf region using knee-crutch-type leg holder system in lithotomy position. Therapeutics and Clinical Risk Management. 2016 Feb;12:305-12.

[6] Addley S, McMullan J, Scott S, Soleymani Majd H. 'Well-leg' compartment syndrome associated with gynaecological surgery: A perioperative risk-reduction protocol and checklist. BJOG: An International Journal of Obstetrics & Gynaecology. 2021 June;128(9):1517-25.

[7] Warner MA, Warner DO, Harper CM, Schroeder DR, Maxson PM. Lower Extremity Neuropathies Associated with Lithotomy Positions. Anesthesiology. 2000 Oct;93(4):938-42.

[8] Warner ME, LaMaster LM, Thoeming AK, Shirk Marienau ME, Warner MA. Compartment syndrome in surgical patients. Anesthesiology. 2001 Apr;94(4):705-8.