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A Case Report of Foot Drop Following Visual Internal Uretherotomy In the Lithotomy Position: Is Prolonged Surgery In the Lithotomy Position the Only Important Risk Factor?

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ABSTRACT

A 16-year-old boy underwent visual internal uretherotomy in the lithotomy position for short urethral stricture. The next day, the patient developed right foot drop and sensory loss over the right foot. Published literature describes a long surgery duration in the lithotomy position as the most significant risk factor. In our case, foot drop developed despite short surgical duration in the lithotomy position, signifying the importance of other, less-discussed factors.

INTRODUCTION

Foot drop is seen as one of the complications of compartment syndrome or following neuropraxic injury to common peroneal nerves or its branches due to direct compression or stretching of the lumbosacral plexus. Compartment syndrome of one or both of the lower extremities is an infrequent but serious complication of procedures performed while the patient is in the lithotomy position. Compartment syndrome is the increase of interstitial pressure in a closed fascial compartment, resulting in microvascular compromise.

It is reported in 1 out of 13 500 patients undergoing procedures in the lithotomy position and can be seen after urological, gynecological, or colorectal procedures [2]. The longer the legs are kept in the lithotomy position, the higher the likelihood of compartment syndrome. There is no clearly safe duration but most have suggested that > 3 to 4 hours [3] is the most important risk factor.

Peroneal neuropathy caused by direct compression at the fibular head is the most common compressive neuropathy in the lower extremity. Foot drop is its most notable symptom. All age groups are affected equally, but it is more common in males (male-to-female ratio: 2.8:1). Ninety percent of peroneal lesions are unilateral, and they can affect the right or left side with equal frequency.

We report a case of foot drop following visual internal uretherotomy (VIU) in the lithotomy position despite a short surgical duration.

CASE REPORT

A 16 year-old-boy admitted with stricture of the urethra (1.5 cm, proximal bulbar) underwent VIU under spinal anesthesia in the lithotomy (Lloyd Davies) position with stirrups supporting both popliteal fossa and proximal parts of tibia. No ankle support was used. The patient was maintained in this position for approximately 20 minutes before returning to the supine position after completion of the procedure. There was no preoperative neurological deficit, and the procedure ended

KEYWORDS: Foot drop, VIU (visual internal urethrotomy), lithotomy, compartment syndrome

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Figure 1. Image of foot drop in patient.
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Figure 2. Image of foot drop in patient while standing.
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without intraoperative complications. On the first post-operative day, he complained of decreased sensation on the lateral aspect of right leg, the lateral border of his right foot, and difficulty in dorsiflexion of the right foot.

General Physical Examination

The patient is tall and lean, with a body mass index (BMI) of 18.43 kg/m^2 (height: 158 cm; weight: 46 kg). His vitals were normal, without fever, and his calves appeared normal without tenderness.

Systemic and Local Examination

Central nervous system: The patient demonstrated normal higher mental functions, normal speech, and normal cranial nerves tests. He exhibited a high-stepping gait. Sensory system: The patient had decreased touch and pain sensations over the dorsum of the right foot and the lateral border of the right leg

Motor System

Muscle bulk and tone were both normal. The power grade of patient's plantar flexion was 5 bilaterally and for dorsiflexion it was 3 on the right side and 5 on the left side. His deep-tendon reflexes were normal bilaterally. There were no cerebellar signs and no neck rigidity. All the neck movements were normal. His spine examination was normal, and his peripheral pulses were all normal in both lower limbs.

Investigations

The patient's skeletal muscle-specific creatinine kinase (CK-MM) was normal, his urine had no sign of myoglobinuria and his nerve conduction studies were normal.

After a consultation with the neurologist, the patient was advised physiotherapy, muscle exercises, active movement of the right foot (dorsiflexion) in a gravity-eliminated position, heel strike while walking, and a foot drop splint, if no improvement. With conservative management only, the patient gradually improved over time and achieved a complete recovery within 3 months with no residual neurological deficit.

DISCUSSION

Lower extremity complications associated with surgical procedures in the lithotomy position remain a significant problem. The most prevalent continue to be mild peripheral nerve injuries, which are usually self-limiting, primarily affect sensory function, and resolve within a few days, but the compartmental syndrome of the lower extremity is a devastating complication. Delay in treatment may result in permanent disability, and extensive fasciotomy is required to

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Table 1. Patient characteristics.

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	Latency ms	Amplitude	Dist mm	NCV ms
CPN rt	3.3	7.92	80	45.1
	10.4	7.51	320	
PTN rt	3.7	9.5	95	46.4
	13.3	7.74	445	
CPN lft	3.6	9.45	70	44.3
	10.6	10.3	310	
PTN lft	4.9	13.5	80	46.5
	148	12.8	460	
Sural rt	2.48	36	110	44.4
Sural lft	3.32	23	180	54.2

CPN: common peroneal nerve; PTN: posterior tibial nerve

Table 2. Lower extremity compartments.

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Compartment	Nerve	Function
Anterior	deep peroneal	sensation to first dorsal web space; dorsiflexion foot
Lateral	superficial peroneal	sensation to dorsum of foot except first web space
Deep posterior	posterior tibial	sensation to sole of foot; plantar and phalangeal flexion
Superficial post	sural	sensation to lateral foot and calf

decompress the leg compartments. The final common cause for compartment syndrome is that the circulation and function of tissues within a closed space are compromised by increased pressure within that space. Dense bony and fascial planes in the extremities establish relatively unyielding boundaries that divide groups of muscles, blood vessels, and nerves into various anatomical compartments. The anterior compartment is the most commonly involved in lower limb compartment syndrome.

Compartment syndrome arises from ischemia that results from raising the limb above the level of the heart. Studies have shown that for every centimeter of ankle elevation above the right atrium there is a 0.78 mm Hg [1,8] decrease in local arteriolar pressure. This leads to hypoxia, endothelial injury, capillary leaks, and edema. Increased interstitial pressure causes nerve compression, vascular compression, and myonecrosis, and hypoxia causes nerve impairment. Non-myelinated type C fibers are mainly affected [6]. Paraesthesia and pain are early presenting signs. Pain that is out of proportion to the examination, pain with the passive extension of the toes, limb swelling, tense compartment, absent pulses, and pallor are other symptoms and signs. Compartment pressures > 30 mm Hg suggest a diagnosis of compartment syndrome.

Risk factors for developing compartment syndrome [4,5,10] include procedure duration (> 4 hours), lithotomy positioning, Trendelenburg position, ankle dorsiflexion, muscular lower limbs, leg-holder type, intermittent pneumatic calf compressors, circumferential wrappings, intraoperative hypotension, hypovolemia, vasoconstrictive drugs, epidural anesthesia, peripheral vascular disease, and surgical retraction on major vessels intraoperatively. Additionally, a low BMI, a lean and thin stature, and smoking are described as risk factors for nerve injury in the lithotomy position. To minimize the risk, precautions include placing in the lithotomy position with minimal elevation of the ankles above heart level, adequate padding and support to popliteal fossa and legs, avoiding head-down/Trendelenburg tilt, removal of leg support every 2 hours for short periods if operating for more than 4 hours, avoiding intermittent pneumatic compression devices, ankle dorsiflexion, hypotension, hypovolemia, and vasoconstrictive drugs.

Urgent decompression of the affected compartment by emergency fasciotomy incisions is the most important step in management, which is combined with cause-specific procedures like stabilization and the fixation of a fracture or the evacuation of a hematoma, etc.

However, in our case, the most probable etiology seems to be direct compression of common peroneal nerves, and compartment syndrome is less likely as there were no clinical signs and symptoms suggestive of compartment syndrome. The patient was lean and thin with probably inadequate leg and ankle support.

Peroneal nerve injuries are the most common peripheral nerve

injuries of the lower limb resulting from multiple traumatic injuries such as those suffered in motor vehicle accidents. The common peroneal nerve can be injured at any location along the course but the most common site is the fibular head region. Common peroneal nerve injuries [9] at the region of the fibular head include ankle sprains with associated proximal fibular fractures, knee dislocations, tibial osteotomies, total knee and hip arthroplasties, and arthroscopies. As Kaminsky reported [11], the most common form of neural compromise in the region of the fibular head is due to direct compression from habitual leg crossing, compression of the nerve against a bed railing or hard mattress in debilitated patients, or prolonged immobility such as that observed in patients under anesthesia. Direct compression from intraneural or extraneural tumors has also been seen, including compression from neurilemomas, intraneural or extraneural ganglia, schwannomas, desmoid tumors, angiomas, neuromas, fibrolipomatosis hamartomas, exostosis, chondromatosis, Baker cysts, and vascular abnormalities.

A number of other etiologic factors have been reported in the literature. Compression of the nerve against the fibrous or fascial layers of well-developed muscles of the legs in athletes and excessive weight loss can also be contributing factors in patients (slimmer's paralysis), as rapid weight loss and anorexia can result in loss of the fat pad over the fibular head, predisposing the nerve to external compression at this site. Short casts or braces can result in external compression on the fibular neck region. Individuals who spend long hours in a squatting position can also present with clinical evidence of peroneal nerve compression (strawberry picker's palsy). Other less common causes include lower-limb lengthening procedures, anorexia nervosa, and paraneoplastic syndromes. Also, peroneal nerve mononeuropathies can occur in hyperthyroidism, diabetes mellitus, vasculitic disorders, and leprosy. Many times, an underlying etiology remains unclear, and the condition is termed idiopathic.

While managing such cases, initial nonoperative treatment should focus on maximizing mobility and function. In addition, the cause of nerve compromise or compression should be corrected to reduce further nerve damage. NSAIDs or oral corticosteroids may be useful in cases in which an inflammatory process is present. Corticosteroids injected into the affected region may reduce swelling and pressure on the nerve in some cases. A brace (ankle-foot orthosis [AFO]), splints, or orthopedic shoes may control the abnormal dynamics at the ankle and provide dorsiflexion assistance for a more ideal gait pattern during nerve recovery. In-shoe orthotics may be helpful in certain instances, such as in the correction of a biomechanical malalignment in the gait (e.g., in patients with severe flat foot or cavus foot).

Many authors have reported spontaneous recovery; therefore, initial nonoperative management for a minimum of 3 to 4 months is recommended for idiopathic cases and for those suggestive of neuropraxia. Surgical decompression of the nerve and excision of the offending lesion are indicated in cases of nerve compression due to external causes, such as those associated with intraneural or extraneural tumors or masses, or in cases in which severe paresis and muscle atrophy are present.

CONCLUSION

Prolonged surgery in the lithotomy position, although described as the most important risk factor, is not the sole factor for lower-limb nerve-injury-related complications in the lithotomy position. Since there are multiple factors at play in each case, factors other than surgery duration, it is important to minimize the risk of nerve-injury-related complications when using the lithotomy position for surgery.

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