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Traction-induced Pudendal Nerve Palsy Post Intramedullary Nailing of the Femur

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Abstract

Purpose: Pudendal nerve palsy after and intramedullary femur nail is not an uncommon complication. This is due to prolonged traction on the traction table.

Methodology: This report presents a 37-year-old male who sustained a transverse left femur fracture following a motor vehicle accident. The patient underwent an antegrade intramedullary femur nail. At 6 weeks, post-surgery he complained of erectile dysfunction without any apparent medical cause. He was subsequently referred to urology and started on medical treatment after counselling.

Findings: The most likely cause of pudendal nerve palsy in this patient was insufficient muscle relaxation which led to a difficult closed reduction of the fracture and thus a prolonged traction time and increase traction force. Erectile dysfunction is a well-documented complication of traction after femoral nailing. The surgeon and anesthetist needed to put all necessary measures in place to prevent this debilitating complication and the patient must be counselled pre-operatively about this risk. The following strategies have shown to decrease the risk of traction-induced pudendal nerve palsy.

Recommendation: A large diameter, well-padded perineal post should be placed between the genitalia and the non-injured limb. Traction should be limited to the critical operative steps only and adequate muscle relaxant should be given to the patient to decrease the traction force needed.

Keywords: *Pudendal nerve, traction, femur fracture, erectile dysfunction*

INTRODUCTION

Pudendal nerve palsy following routine trauma and elective orthopaedic surgery procedures has an incidence that ranges from 1.9% to 27.9% (1). The sequelae can be sensory, motor, or mixed leading to erectile dysfunction (ED), pain in the perineal area, unilateral or bilateral hypoesthesia or anaesthesia from the scrotum to the glans of the penis in male patients and the perineum and labia in female patients (2). Causes of pudendal nerve palsy in orthopaedic surgery include inappropriate placement of perineal post, small perineal post diameter, increase magnitude of traction force, prolonged traction time, and insufficient muscle relaxation (3)Suggested mechanisms of injury include stretching and direct compressing of the pudendal nerve over the ischial spine leading to localized ischemia of the pudendal nerve (2, 4). The pudendal nerve fibers originate from the sacral plexus, the ventral rami of the second, third and fourth sacral nerves. The pudendal nerve runs in between the piriformis muscle and coccygeus muscle which exits the pelvis through the greater sciatic foramen at the inferior part. The nerve then crosses the posterior part of the ischial spines and then re-enters the pelvis through the lesser sciatic foramen. The internal pudendal artery and vein accompany the pudendal nerve in the pudendal canal. The pudendal nerve divides into deep perineal nerve and dorsal nerve of the penis. An injury to the deep perineal nerve causes ED (5, 6).

The sensory terminal branches of the pudendal nerve appear more susceptible to injury than do the motor branches. This is explained by the higher incidence of sensory signs of hypoesthesia that resolve rapidly within 4 weeks (7). More rarely severe contusion or crushing of the nerve leads to neurotmesis with clinical and electrical signs of denervation that take longer to recover in the order of 6 months (7). Phosphodiesterase inhibitors such as sildenafil, tadalafil and vardenafil are licensed for the treatment of erectile dysfunction. Treatment may be stopped once erectile capacity returns to normal, or to a level where the patient feels it is satisfactory (8). The diagnosis of pudendal nerve neuropathy can be confirmed with perineal electrophysiological examination and to give prognostic information. Bulbocavernosus muscle electromyography must be used in cases where the symptoms are not regressive (9). Pudendal nerve decompression through para-anal or perineal incision has been reported in cases of stable disorders (7).

CASE REPORT

A 37-year-old male was admitted to Edenvale district hospital after a motor vehicle accident, presenting with a closed left midshaft femur fracture as shown in figure 1. The patient presented with no known co-morbidities, was not using chronic medication and had no known allergies. The patient was cleared according to advanced trauma life support (ATLS) principles. Acute management was to place the patient on skin traction in the ward and to optimise the patient for theatre. The patient was admitted in October of 2022 and treated surgically with an antegrade intramedullary nail of the left femur. Spinal anaesthesia was chosen, and he was placed in the supine position on the traction table. A prolonged surgical time of 3 hours and 28 minutes was documented. This was a result of a difficult closed reduction. The post-operative period was uneventful and the patient was discharged 2 days post-surgery as shown in figure 2. The patient was followed up at 2 weeks post-surgery for wound review and removal of stitches and again at 6 weeks. At 6 weeks follow-up patient complained of erectile dysfunction as well as hypoesthesia over the scrotum and L2-L4 dermatomal region from the date of surgery. At this stage, he was able to fully weight bear and had a normal gait. Based on the institutional guidelines, the patient was referred to urology to exclude any possible medical cause of erectile dysfunction before the commencement of treatment.

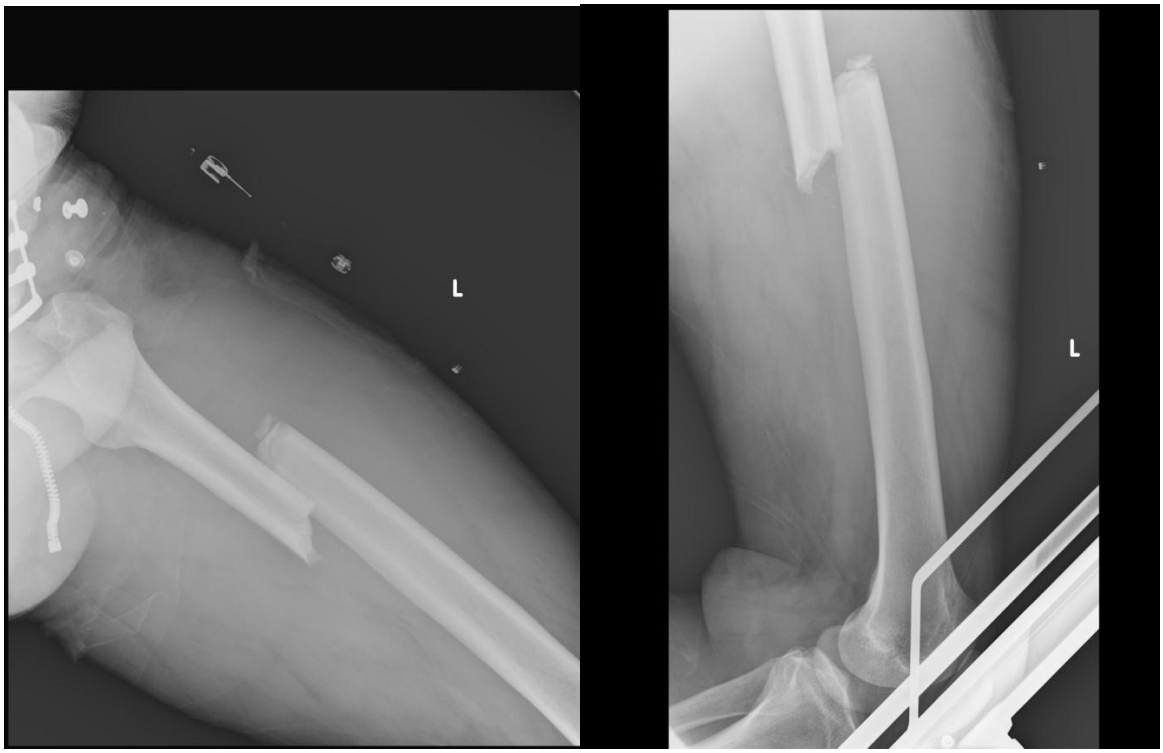

Figure 1. Pre-operative radiographs showing a transverse femur fracture with significant shortening

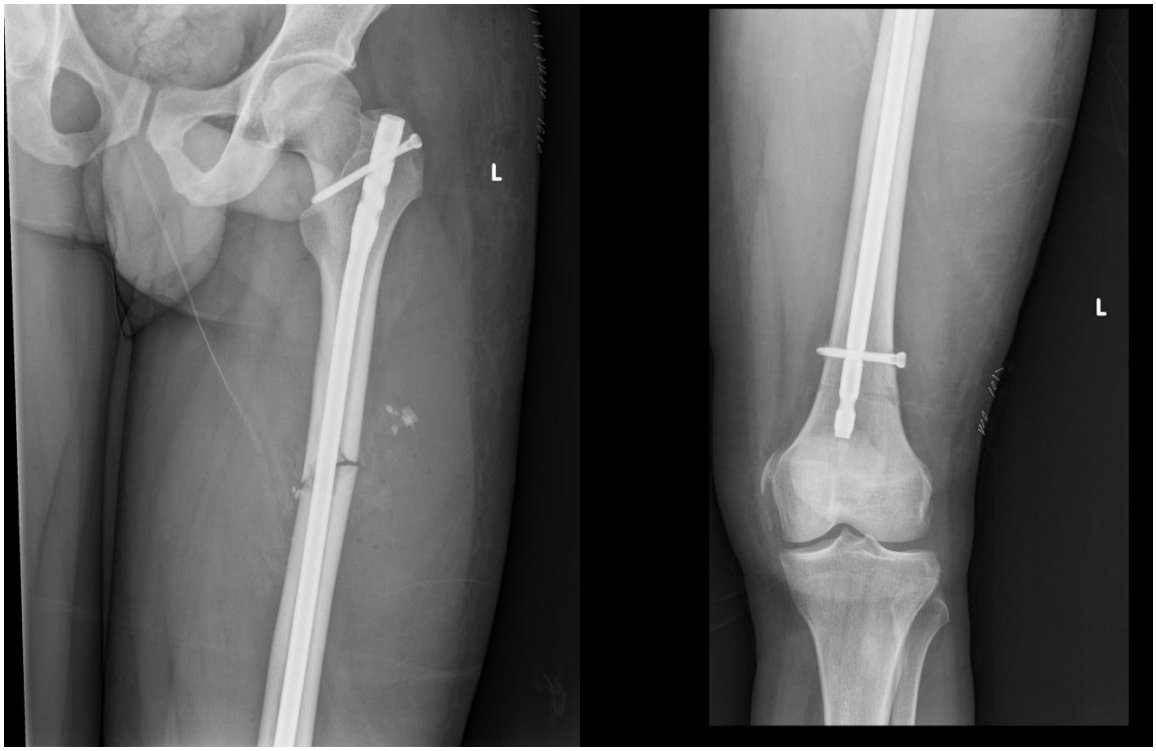

Figure 2. Post-operative radiographs after an intramedullary femur nail.

DISCUSSION

In this patient, the most likely cause of erectile dysfunction was insufficient muscle relaxation which led to a difficult closed manipulation of the fracture thus a prolonged traction time and increased traction force. It is impossible to get accurate readings of the amount of traction on the modern traction tables, thus increased amount of weight used with traction cannot be included or excluded from the possible cause for erectile dysfuntion A similar mechanism can be seen in long-distance cyclists as it has been described in studies, with a reduction in penile blood pressure by an average of 50 mm Hg after approximately 5 minutes of cycling (10)

In a study done by Matthew et al., between 1986 and 1988, they looked at 216 fracture table cases in which only 4 patients developed pudendal nerve palsy and in all 4 patients the neuropraxia resolved, without any medical treatment mentioned (11). Brumback et al., did a study on 106 patients treated with an intramedullary nail thereof 10 patients developed pudendal nerve palsy (12). Nine of the 10 patients with neuropraxia resolved at 3 months and the other 1 resolved by the 6-month follow-up. No medical treatment was given to any patient (12).

In a study done in 2013 by Rose et al., 29 patients were treated with an intramedullary nail, and 8 patients developed pudendal nerve palsy (13). All patients regained sensation as well as function without administering phosphodiesterase inhibitors. They also noted the incidence of pudendal nerve palsy increased with the comminution of the fracture (13). Strategies used to decrease the risk of pudendal nerve palsy include using a well-padded, large-diameter perineal post (>10cm) to distribute traction on the perineum. This should be placed between the genitalia and the non-injured limb to keep the tilting of the traumatized side of the pelvis against the perineal post to a minimum. Traction time should be minimized by limiting traction to the critical operative steps only. The patient should also receive adequate muscle relaxants from anaesthesia to decrease the traction force needed for the reduction of the fracture (14).

CONCLUSION AND RECOMMENDATIONS

As seen in the literature review, ED is not uncommon in patients undergoing intramedullary femoral nailing. The surgeon should be aware of the pathogenesis of ED. The probability of this complication should be discussed with the patient before surgery when obtaining consent, to make the patient aware of the risk. This should increase patient's awareness of the condition leading to a more accurate recording of the incidence of ED. The surgeon and anesthetist need to put all necessary measures in place to prevent this debilitating complication. This complication also needs to be avoided because of the medico-legal aspect that can have a huge impact on healthcare. There is an opportunity for future innovation by developing equipment that can give real time measurements of the amount of traction force applied that can aid in preventing iatrogenic ED.

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