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The Correlation of Meralgia Paresthetica and Spinal Surgery in Prone Position

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ABSTRACT

AIM: To investigate the incidence, risk factors, and recovery of patients with meralgia paresthetica (MP) following posterior spine surgery.

MATERIAL and METHODS: Patients who underwent posterior spine surgeries in prone position at the authors' clinics were included in this study. Patients with preoperative MP were excluded.

RESULTS: Among the 560 patients who underwent spine surgery in prone position, 117 (21%) had impaired sensation along the anterolateral aspect of the thigh. One hundred three of them were treated with conservative treatment, whereas 14 underwent surgery for MP.

CONCLUSION: Conservative treatment is the first option for MP. Patients who do not recover with conservative treatment may undergo surgical treatment.

KEYWORDS: Meralgia paresthetica, Spine, Prone, Entrapment neuropathy

ABBREVIATIONS: MP: Meralgia paresthetica, **LFCN:** Lateral femoral cutaneous nerve, **ASIS:** Anterior superior iliac spine, **LFCNi:** Lateral femoral cutaneous nerve injury; **LFCNi-c:** Lateral femoral cutaneous nerve injury conservative treatment, **LFCNi-s:** Lateral femoral cutaneous nerve injury surgical treatment, **BMI:** Body mass index, **DM:** Diabetes mellitus

INTRODUCTION

Meralgia paresthetica (MP) is a mononeuropathy that results from the entrapment of the lateral cutaneous femoral nerve (LFCN). It is characterized by dysesthesia, paresthesia, anesthesia, or hypoesthesia in the inguinal region of the thigh. The LFCN arises from L2 to L3 nerve roots, enters the thigh by crossing between the inguinal ligament, and adheres to the fascia lata 10 cm inferior to the anterior superior iliac spine (ASIS) (6,9,11,15). The sensory disorder of the LFCN negatively affects the daily lives of patients with MP. The etiology of MP is divided into the following two main categories: spontaneous, which includes idiopathic and metabolic reasons, and iatrogenic, caused by surgical and traumatic injuries (9).

Posterior thoracolumbar spine surgeries are performed in prone position in which patients are placed above the level of the operating table to maintain proper body alignment and minimize the pressure on the abdomen and vena cava. However, the support mechanism used to level patients, such as pads and specially designed tables, exerts pressure on the chest and pelvis. Neuropraxia due to the compression of the LFCN is a common problem in patients who undergo surgery in prone position. The LFCN is generally compressed by these supporting tools at the exit below the ASIS.

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Due to the similarities of the clinical symptoms between upper lumbar disk herniation and MP, which are characterized by numbness, burning, tingling, or pricking sensation, diagnosing MP is difficult, and it can mimic surgical sequels. The prevalence of MP after lumbar spine surgery is uncommon. The purpose of this study was to investigate the incidence, risk factors, and recovery of patients with MP following posterior spine surgery.

MATERIAL and METHODS

From 2012 to 2018, 560 patients who underwent posterior spine surgeries in prone position at the authors' clinics were included in this study. During the surgical procedure, all patients were placed in prone position on the operating table with silicone pads. Their hips were flexed at approximately 30°. Patients with preoperative MP and preexisting sensory deficit were excluded from the study. Patients who developed LFCN injury (LFCNi) following spine surgery were divided into two groups according to whether the LFCN injury symptoms were relieved with conservative treatment (LFCNi-c) or whether symptoms were not resolved despite the medical treatment for at least 3 months and patients underwent surgical treatment (lateral femoral cutaneous nerve injury surgical treatment, LFCNi-s). All patients were examined after surgery for signs of impaired sensation and pain, and the postoperative symptoms noted on the anterolateral aspect of the thigh were recorded.

Diagnosis of MP

The pelvic compression, neurodynamic tension, Tinel's, and electrophysiological tests were used for clinical evaluation (2).

In addition to clinical findings and electrophysiological data, nerve block test was performed to confirm the diagnosis of MP in all patients (2,11).

Conservative Treatment of MP

All patients received nonsteroidal anti-inflammatory drugs and gabapentin. Local anesthesia was administered via injection. Measures, such as weight loss control and prevention of the use of items (clothes, belt, etc.) causing local physical compression, were taken to remove mechanical factors. Patients whose condition did not improve with the conservative treatment for 6 months underwent nerve block test. Surgical treatment was planned only for patients whose symptoms alleviated after nerve block test, and they were included in our study. Patients whose symptoms alleviated with conservative treatment or did not alleviate after both conservative treatment and nerve block test were excluded.

Surgical Treatment of MP

Surgical intervention was performed under spinal anesthesia. The incision and interventions were performed as described previously (2). The nerve was mobilized. The fascial edge between the ASIS and the initial part of the sartorius muscle was opened and the nerve was decompressed anteromedially (Figure 1). The nerve was lifted and suspended to separate the LFCN from fascia adhesions. Isotonic saline solution was injected into the perineum of the LFCN, which was observed to be completely free in the inguinal canal.

Evaluation of Symptoms

Factors such as age, gender, height, weight, body mass index (BMI) and the length of the surgery were considered while determining the possible correlations to the LFCN.

Statistical Analyses

Paired t-test was performed to evaluate changes in visual analog scale (VAS) scores. Spearman's rank correlation coefficient was used to examine linear relationships between preoperative and postoperative VAS scores. All statistical analyses were performed using the SPSS statistical software, version 17.0 (SPSS Inc., Chicago, IL, USA).

Patients were provided with detailed information on the procedure, and informed written consent was obtained from all patients. This study was approved by the Institutional Review Board.

RESULTS

Among the 560 patients who underwent spine surgery in prone position, 117 (21%) experienced impaired sensation along the anterolateral aspect of the thigh, which was not preexcised. Twenty-seven (23%) patients showed bilateral symptoms. The distribution of characteristics of patients is summarized in Table I. The gender of patients was not statistically different (21.2% male, 23.6% female) even though it was more prevalent in women. The incidence of postoperative MP was higher in patients who underwent spine surgery for fusion (48 patients, 35.8%). Other surgical procedures that resulted in MP were discectomy (30 patients, 25.6%); laminectomy (17 patients, 14.5%); decompression (21 patients, 17.9%); and other reasons (11 patients, 9.4%) (Figure 2). BMI was significantly higher in the patients with MP (25.8 ± 4.7). Only 12 patients had BMI below 25. The average BMIs of patients

Figure 1: Intraoperative view of lateral femoral cutaneous nerve. The nerve was hanged and decompressed anteromedially (*: lateral femoral cutaneous nerve).

Table I: Demographic Distribution of Patients

Distribution of patients who has meralgia paresthetica after spine surgery		
	LCFN treated conservatively	**LCFN treated surgically**
Age (years)	43.7 ± 19.2	41.2 ± 11.6
Gender		
Male (n)	48	6
Female (n)	55	8
BMI	25.32 ± 2.7	27.1 ± 4.5
DM (n)	96 (17.1%)	3 (0.5%)
Length of surgery (hours)	2.8 ± 1.36	2.6 ± 2.27
Recovery time (days)	11 ± 4.2	23 ± 7.6

LCFNi: *Lateral cutaneous femoral nerve injury.*

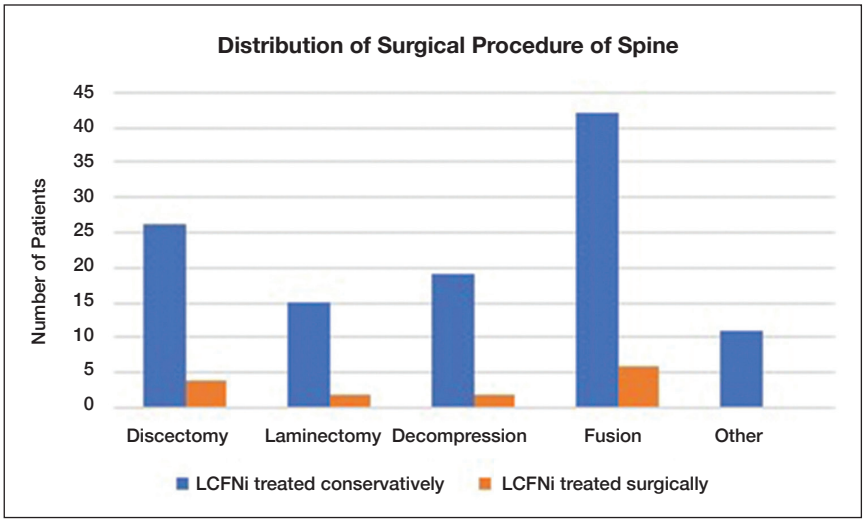

Figure 2: The graph illustrates the distributions of the surgical procedure of the spine in prone position that causes postoperative meralgia paresthetica.

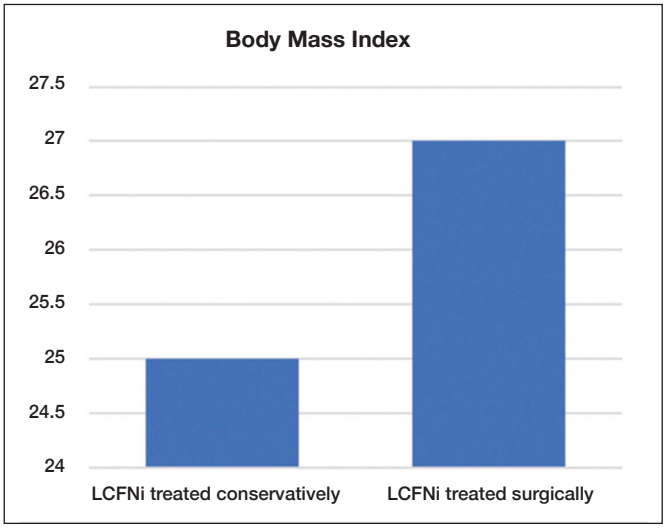

Figure 3: The number of patients with postoperative meralgia paresthetica have significantly higher body mass index in LFCNi treated surgically (LFCNi: lateral cutaneous femoral nerve injury).

with MP who were treated conservatively and surgically were 25.32 ± 2.7 and 27.1 ± 4.5, respectively (Figure 3). Patients whose surgical time was longer than 3.5 h had significantly higher incidence of MP (p=0.037; average surgical time of 2.8 ± 2.1 h). The average recovery time for the LFCNi-c group was 11 d, whereas the average recovery time for the LFCNi-s group was 34 d. Patients who did not undergo surgery for MP recovered significantly fast (Figure 4). Four patients with MP had diabetes mellitus (DM) and seven had overweight (BMI>30).

DISCUSSION

Patients with MP generally have complaints of pain along the LFCN in the anterolateral thigh. The most common symptoms were burning, coldness, pain, tingling, loss of sensation, and local hair loss. Slobbe et al. reported the incidence of the MP in general daily practice as 4,3 cases in 10000 patients (18). The existence of DM is one of the factors that increase the incidence of the MP, which is 247 cases in 10000 patients in years (17). There appears to be no general consensus

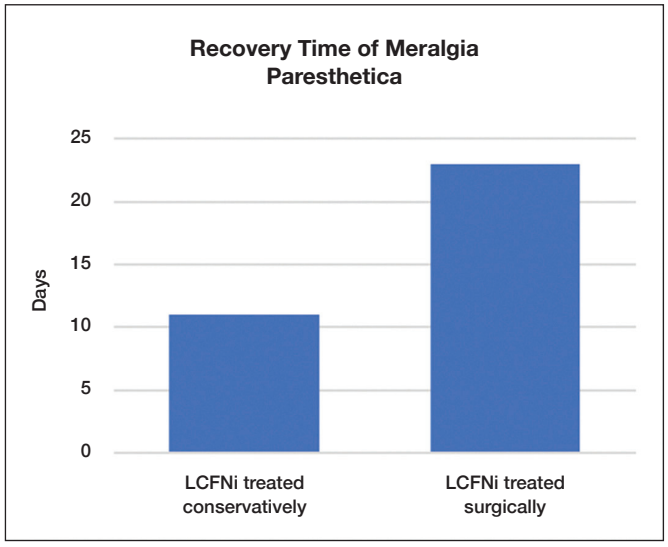

Figure 4: Time required for recovery of postoperative meralgia paresthetica.

regarding the predicted gender in MP. Several studies claim that the condition is more common in males, whereas other studies oppose this claim (4,9,18). In our study, there was a marked female predominance (46% male, 54% female).

Even though MP has varied etiologies, the mechanical compression of the LFCN is the most common cause of MP. In addition to the mechanical factors, metabolic disorders such as DM, alcoholism, hyperthyroidism, and obesity have been linked to MP (4,9,17).

Some surgical procedures such as spine surgery, hip surgery, appendectomy, and obstetrics and gynecologic surgeries were the most common causes of MP occurring after surgery (5,8,13,15,20).

Prone position–related MP was not uncommon in patients who underwent posterior spine surgery, but there are only few reports in the literature on this subject (5,10,15,20). The reported incidence of MP after posterior spine surgery is between 12% and 23.8%. LFCN neuropathy can occur as a result of compression of the nerve due to the misplacement of the patient in a prone position during spinal surgery (10,15,16,20).

The length of the surgery is more than 3.5 hours. Diabetes mellitus (DM), increased BMI, iliac crest harvesting, and degenerative spinal disorders are associated with mild preexisting damage to the L2 or L3 roots caused by degenerative intervertebral disks or hypertrophic facet joint (8,15,20). The LFCN, formed from the L2 and L3 spinal nerve, exits the root, travels along the posterolateral of the psoas, and crosses the ileum toward the ASIS and inguinal ligament while entering the thigh. Aside from the compression of the LFCN while crossing the inguinal ligament due to improper prone position, Yang et al. also pointed out the risk factor of the degenerative spinal disorders related to mild preexisting damage to L2 or L3 roots caused by degenerative intervertebral disks (20). Due to the large variation in the anatomical course of L2 and L3, LFCN is more vulnerable when the nerve travels to the posterior of the psoas. The nerve is frequently directly injured when bone is harvested from anterior part of the iliac crest. In addition, traction or compressing hematoma after bone harvesting is another cause of injury (5,15).

The abdominal wall distends during surgery due to the weight of the viscera and adipose tissue while the patient is in prone position. The LFCN is firmly attached to the iliac fascia while traveling between the inguinal ligament and ASIS, and the downward distension increases the compression of the LFCN (20). Mechanical compression of the nerve reduces the blood flow, which decreases the action potential ability of the axon (3).

Gupta et al. and Majmundar et al. mentioned that intraoperative hypotension and significant blood loss during surgery are risk factors of MP. The nerve could be more vulnerable due to hypotension and blood loss. They made this observation in both genders and noticed that it is more prevalent in thinner patients (10,14). We did not observe this in our cases, because hypotension or blood loss did not occur during surgery.

Ankylosing spondylitis is also one of the rare causes of MP. Kitchen and Simpson, and Yang et al. assumed that MP occurs due to the intervertebral foramina limitation (12,20).

Patients with increased BMI have higher risk for postoperative MP. However, patients with lower BMI are also at risk. Gupta et al. described this phenomenon as the decreased distance from the point of compression to the exit point of the nerve (1,10). The postoperative MP may be avoided by properly placing the patient in prone position with additional paddings. However, it can still occur due to the anatomical variation of the LFCN.

The conservative treatment is the first option for postoperative MP. Mirovsky and Neuwirth reported that 90% of patients with MP, caused by compression of the LFCN, recovered within approximately 2 weeks with conservative treatment. However, 10% of patients underwent surgical treatment (15). In most patients, conservative therapy alone reduces the severity of symptoms and brings them to an acceptable level. This has been supported by other studies. But Ecker and Woltman, and Williams and Trzil reported that the response rate to conservative treatment was approximately 25% (7,19).

In this study, 89.1% of patients with MP recovered through conservative treatment. Only 14 patients (11.9%) underwent surgical treatment. Four of them had DM and seven had high BMI. Overweight patients had a significantly higher incidence of prone position–related MP due to the distention of the viscera and abundance of subcutaneous fat. The duration of the surgey also effects the distention inversely. It is better to reduce the time of compression of the nerve by reducing the surgical time in patients with high BMI.

CONCLUSION

Although the recurrence of the degenerative spine disorders is thought for the anterolateral thigh pain after posterior spine

surgery, MP should be considered. The padding while the patient was lying in prone position may not be adequate. Most commonly, patients with DM and high BMI are at risk. Conservative treatments are the first option to manage MP. Patients whose condition did not improve with conservative treatment may undergo to surgical treatment. Moreover, all patients who experienced MP, recovered completely with both conservative and surgical treatment.

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