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RESEARCH ARTICLE

Peroneal neuropathy with foot drop after bariatric surgery: A neurosurgical perspective

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ABSTRACT

Objective: Peroneal neuropathy is the most common entrapment neuropathy of the lower extremity and most commonly results from compression of the peroneal nerve at the fibular head. This study aimed to evaluate the relationship between peroneal neuropathy and rapid weight loss after bariatric surgery and to assess the outcomes of surgical decompression in patients presenting with foot drop.

Method: Between 2020 and 2025, five patients underwent surgical treatment for foot drop due to peroneal neuropathy following bariatric surgery. The diagnosis was confirmed by clinical evaluation, imaging, and electromyography (EMG). Changes in body weight and body mass index before and after bariatric surgery, the duration of weight loss, time to onset of clinical symptoms, and changes in clinical findings after peroneal nerve decompression were evaluated.

Results: Of the five patients who developed peroneal neuropathy after bariatric surgery, two were female and three were male. The mean age was 37 years. Compared with preoperative body weight, the mean weight reduction was 36.6%. Patients experienced the greatest weight loss within the first 4–6 months after bariatric surgery. Foot weakness developed a mean of 7.2 months after bariatric surgery. All patients underwent peroneal nerve decompression. At the six-month follow-up, four patients had a Medical Research Council (MRC) score of 5, including one patient with bilateral involvement, whereas one patient had an MRC score of 4.

Conclusion: Both mechanical and metabolic factors may contribute to the development of peroneal neuropathy after rapid and substantial weight loss. Given the increasing prevalence of obesity, the growing use of bariatric surgery, and changing societal attitudes toward weight loss, clinicians should remain alert to such neurological complications. Early diagnosis and timely surgical intervention may contribute to favorable neurological outcomes.

Keywords: Bariatric surgery, peroneal neuropathy, foot drop, surgical decompression

INTRODUCTION

Peroneal neuropathy is the most common entrapment neuropathy of the lower extremity. It is also the third most common focal neuropathy in adults and accounts for approximately 15% of all mononeuropathies, after median and ulnar neuropathies (1). Peroneal neuropathy may cause complete or partial foot drop and may be accompanied by sensory impairment. Pain may occur in some conditions, such as traumatic

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injuries or compressive lesions, but it is not a typical presenting symptom. Trauma, compression, iatrogenic injury, and medical or metabolic disorders are among the etiological factors associated with peroneal neuropathy, with compression being the most common. The common peroneal nerve branches from the sciatic nerve, courses around the neck of the fibula, and subsequently divides into its terminal branches supplying the lower leg and foot. Compression may occur anywhere along the course of the nerve but is most common at the fibular head, where the nerve is superficial and covered by only a thin layer of subcutaneous tissue (2). Both conservative and surgical treatment options may be considered for foot drop associated with peroneal neuropathy. Conservative treatment is generally considered initially in selected patients (3).

Peroneal neuropathy has also been reported as a neurological complication following bariatric surgery. Bariatric surgery encompasses a range of procedures designed to achieve weight loss. These procedures alter gastrointestinal anatomy to restrict food intake and, in some cases, modify nutrient absorption and metabolism, thereby promoting weight loss. Loss of the protective fat pad surrounding the fibular head may predispose the common peroneal nerve (CPN) to compression, resulting in peroneal neuropathy and associated neurological symptoms. This condition, sometimes referred to as "slimmer's paralysis," describes peroneal neuropathy associated with excessive and rapid weight loss (4–7).

In this study, we present our clinical experience with patients who developed peroneal neuropathy following bariatric surgery and examine its association with postoperative weight loss.

METHODS

Data were processed using Microsoft Excel. Demographic characteristics, mean values, and standard deviations were calculated. Changes in body weight over time and body mass index (BMI) were also evaluated. No inferential statistical analyses were performed; only descriptive analyses were conducted.

Between 2020 and 2025, five of 30 patients who presented to our clinic with foot drop had a history of bariatric surgery. All patients underwent clinical examination, laboratory evaluation, and radiological imaging. Laboratory parameters, including vitamin B12, folate, thiamine (vitamin B1), vitamin E, and copper levels, were reviewed, and clinically relevant abnormalities were identified. Magnetic resonance imaging (MRI) was performed to visualize the peroneal nerve at the level of the fibular head and to exclude other potential causes of foot drop, including ganglion cysts, intraneural cysts, tumors, and other space-occupying lesions. Electromyography examinations were performed in all patients. Muscle strength was assessed using the Medical Research Council (MRC) scale (8). Clinical examination, electrophysiological findings, laboratory results, and imaging supported the diagnosis of foot drop associated with peroneal neuropathy. All patients were subsequently evaluated by a neurologist. Peroneal nerve decompression was performed in patients for whom surgical treatment was considered appropriate.

Surgical Procedure

The procedure was performed under local or general anesthesia. The knee was placed in slight flexion, and the lateral aspect of the knee was prepared according to standard sterile surgical technique. The fibular head was identified and marked, and a curved incision extending proximally and distally from this landmark was planned. After incision of the skin and subcutaneous tissue, the common peroneal nerve was carefully exposed at the level of the popliteal fossa and dissected distally. The fascia overlying the peroneus longus muscle was identified, and fasciotomy was performed at the level of the fibular head. The superficial and deep peroneal branches were subsequently identified and decompressed (Fig. 1).

RESULTS

Of the five patients who developed peroneal neuropathy following bariatric surgery, two were female and three were male. The mean age was 37 years. Three patients had right-sided entrapment, one had left-sided entrapment, and one had bilateral clinical involvement. After the onset of foot drop, all patients underwent electromyography (EMG). Electrophysiological findings included partial axonal injury involving the right deep peroneal branch in one patient, axonal injury of the right peroneal nerve in another, and conduction block of the left peroneal nerve at the fibular head in a third patient. In one patient, conduction block and reduced conduction velocity were detected at the knee level in both peroneal nerves. In another patient, bilateral peroneal nerve motor conduction blocks consistent with entrapment neuropathy were detected at the level of

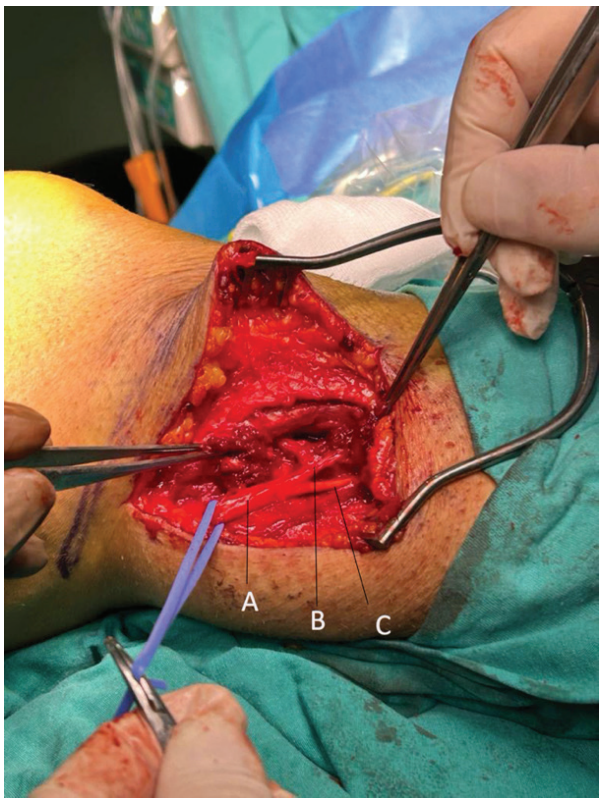

Figure 1. Surgical exposure of the right peroneal nerve. **(a)** Common peroneal nerve. **(b)** Deep peroneal nerve. **(c)** Superficial peroneal nerve.

the fibular heads. Although two patients demonstrated bilateral electrophysiological abnormalities, only one had bilateral foot drop (Fig. 2). Compared with pre-bariatric surgery body weight, the mean reduction in body weight was 36.6%. The mean monthly weight loss from bariatric surgery to the onset of foot drop was 7.4 kg/month. The greatest weight reduction occurred during the first 4–6 months after bariatric surgery. Foot weakness developed a mean of 7.2 months after bariatric surgery. The mean reduction in BMI was 36.9% compared with the preoperative value, assessed after a mean postoperative period of 4.6 months, when substantial weight loss had become evident. The mean interval during which patients experienced symptoms suggestive of peroneal nerve entrapment, such as sensory loss, tingling, or weakness of the foot or ankle, before the development of foot drop was 7.2 months (range, 5–9 months). Patients presented to our clinic a mean of 7.2 days (range, 5–9 days) after the onset of foot drop (Table 1).

At the 15-day follow-up after decompression surgery, the MRC score improved from 1 to 2 in one patient and from 0 to 1 in three patients. In the patient with bilateral peroneal nerve compression, decompression procedures were performed two weeks apart. In this patient, the MRC score improved from 0 to 1 on the right side and from 2 to 3 on the left side. At the six-month follow-up, four patients had achieved an MRC score of 5, including the patient with bilateral involvement, whereas one patient had an MRC score of 4.

DISCUSSION

This study evaluated patients who developed peroneal neuropathy and foot drop following bariatric surgery, focusing on the magnitude and duration of weight loss and the role of peroneal nerve decompression in treatment.

In 1929, Woltman was the first to describe an association between substantial weight loss and foot drop. Later, in 1947, Nagler et al. (9) reported a case

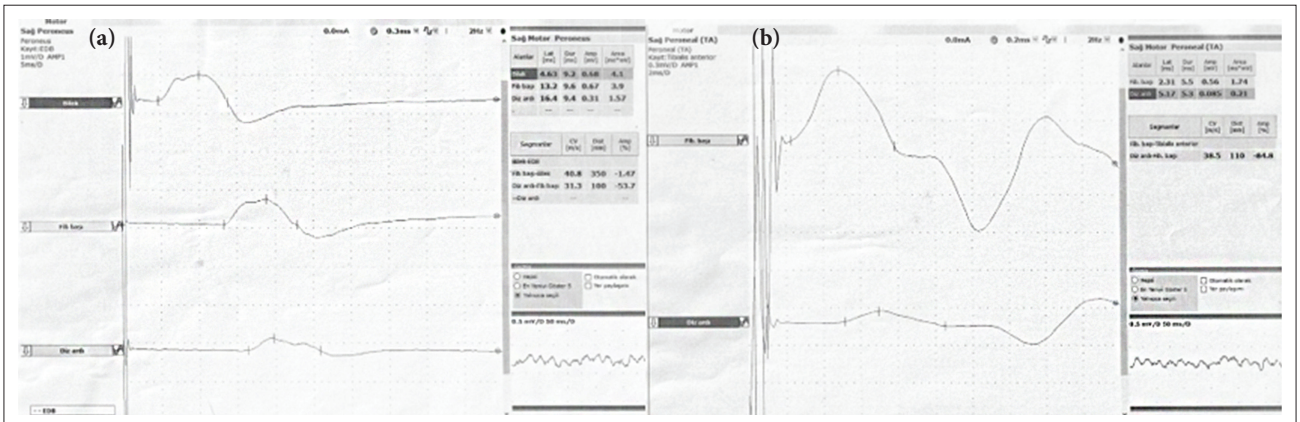

Figure 2. Electromyography (EMG) tracings demonstrating right peroneal neuropathy. **(a)** Recording site: extensor digitorum brevis muscle. **(b)** Recording site: tibialis anterior muscle.

Table 1: Demographic and clinical characteristics of patients

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Mean	Range	SD
Sex	Male	Male	Female	Male	Female			
Age, years	49	43	34	27	37	37	27–49	7.9
Preoperative weight	163	180	150	140	104	147.4	104–180	25.5
Postoperative weight	100	122	103	81	64	94	81–122	19.8
Weight loss	63 (38.6%)	58 (32.2%)	47 (31.3%)	59 (42.1%)	40 (38.5%)	53.4 (36.6%)	40–63	4.1
Preoperative BMI	53.2	54.3	62.4	46.8	34	50.4	34–62.4	9.5
Postoperative BMI	32.7	36.8	42.9	27.1	20.9	32.1	20.9–42.9	7.6
Reduction in BMI (%)	38.5	32.2	31.2	42.1	40.6	36.9	31.2–42.1	4.4
Duration of weight loss (months)	4	4	4	5	6	4.6	4–6	
Time from surgery to symptom onset (months)	6	5	8	8	9	7.2	5–9	
Time from foot-drop onset to presentation (days)	5	9	6	8	8	7.2	5–9	
Affected side	Right	Right	Left	Bilateral	Right			
Preoperative MRC grade	1	0	0	R: 0; L: 2	0			
MRC grade at 6 months	5	5	5	R: 5; L: 5	4			

BMI: Body mass index; MRC: Medical Research Council; SD: Standard deviation.

of peroneal neuropathy in which weight loss was also considered a contributing factor (9–11). Since then, numerous studies have addressed this relationship, and weight loss has become a well-recognized risk factor for peroneal neuropathy. Weight loss has been reported as an etiological factor in up to 15% of patients with peroneal neuropathy (12). Nevertheless, the exact pathophysiological mechanisms remain incompletely understood.

In addition to the proposed role of reduced protective adipose tissue at the fibular head in the development of peroneal neuropathy and foot drop after bariatric surgery, Lale et al. (12) histopathologically demonstrated fibrotic changes in the fascia surrounding the peroneal nerve following excessive weight loss. Enlargement of blood vessels and inflammatory infiltration within the fascia were interpreted as evidence of a chronic process that may increase the nerve's susceptibility to compression (12). Mechanical irritation related to instability or hypermobility of the proximal tibiofibular joint may also increase the vulnerability of the peroneal nerve (13).

Mechanical factors, however, may not be the only contributors. The pathogenesis of peroneal neuropathy associated with marked weight loss is probably multifactorial, and metabolic factors may also contribute to nerve dysfunction. Thaisetthawatkul et al. (14) investigated neuropathies associated with bariatric surgery and suggested that malnutrition may represent an important risk factor. Sural nerve biopsy findings in their study demonstrated prominent axonal degeneration and perivascular inflammation, suggesting that inflammatory and immune-mediated mechanisms may also contribute to the pathogenesis of peroneal neuropathy (14). Weyns et al. (10) proposed that that nerve edema may contribute to the development of compression neuropathy, in a manner analogous to mechanisms implicated in diabetic neuropathy. This intraneural edema may result from metabolic disturbances, such as hypoalbuminemia with reduced oncotic pressure or intracellular sorbitol accumulation causing osmotic stress, and may contribute to nerve dysfunction, particularly at anatomically vulnerable entrapment sites (10).

Weight Loss and Changes in BMI

Previous studies have emphasized the relationship between substantial weight loss and peroneal nerve entrapment. Margulis et al. (5) reported bilateral peroneal entrapment neuropathy in a patient who lost 40 kg following a strict diet. Elias et al. (15) described a patient who lost 39.5 kg after bariatric surgery and

subsequently developed peroneal neuropathy. In the study by Lale et al. (12), the mean weight loss over a six-month period was 68.74 kg.

In our series, the mean weight loss was 53.4 kg, corresponding to a 36.6% reduction in body weight at the onset of symptoms of peroneal entrapment neuropathy. Similarly, the mean reduction in BMI following bariatric surgery was 36.9%.

Duration and Rate of Weight Loss

In the study by Lale et al. (12), the reported mean monthly weight loss was 11.46 kg/month. In a review by Fares et al. (16) that included nine studies, the duration of weight loss ranged from 2 to 18 months among 21 patients who underwent bariatric surgery. Elias et al. (15) reported a six-month period of weight loss in a patient who developed peroneal neuropathy after bariatric surgery. Weyns et al. (10) compared patients who developed foot drop with those who did not and found that the mean duration of weight loss was 8.6 months in patients who developed foot drop and 21.7 months in those who did not. According to Weyns et al. (10), rapid weight loss may be associated with the development of foot drop.

In our study, the mean period during which substantial postoperative weight loss occurred was 4.6 months. The mean monthly weight loss from bariatric surgery to the onset of peroneal neuropathy symptoms was 7.4 kg/month. These observations suggest that not only the magnitude of weight loss but also its rapidity may contribute to the development of peroneal neuropathy. Our findings are consistent with those of previous studies. The substantial reduction in body weight (36.6%) over a relatively short period of 4.6 months suggests that both the magnitude and rapidity of weight loss may have contributed to the development of foot drop. Although these findings are consistent with previous reports, the small sample size of our study necessitates further investigation in larger cohorts.

Importance of the Ratio

While the standard deviations of the pre- and postoperative weight values were relatively large, the standard deviations of the changes in weight and BMI were 4.1 and 4.4, respectively, providing measurable data on the relationship between these changes and the development of the clinical picture. In other words, the rate of weight and BMI reduction may be more relevant to the development of the clinical picture than the absolute amount of weight loss. Although the magnitude of weight loss may still be important, our findings suggest that its relative contribution may be less prominent.

Treatment Options

Several studies have reported improvement in neurological symptoms with conservative management, including nutritional support, stabilization of weight loss, and physical therapy (6, 17). In contrast, Elias et al. (15) emphasized that surgical decompression may be indicated in patients with acute, severe, or persistent neurological deficits. At present, however, there is no consensus regarding the optimal selection or timing of conservative versus surgical treatment.

Oosterbos et al. (18), in a survey of specialists regarding the management of peroneal nerve entrapment and foot drop, reported that 78% of respondents believed that the available literature was insufficient to guide treatment and that additional research, including randomized controlled trials, was needed. Most specialists considered neurolysis a valid treatment option for patients with persistent foot drop. Although approximately 90% preferred surgical treatment within six months after symptom onset, there was no consensus regarding the optimal timing of surgery, and approximately one-fifth favored surgical intervention as soon as possible after diagnosis (18).

In our clinic, surgical decompression was selected for all five patients presenting with foot drop and was performed within 5–9 days after presentation. In the patient with bilateral peroneal neuropathy, decompression of the contralateral side was performed two weeks after the first procedure. Following surgery, all patients were referred for physical therapy and rehabilitation.

Selection of a Functional Outcome Measure

In the survey conducted by Oosterbos et al. (18), postoperative recovery was evaluated using several different methods. Thirty-six percent of physicians focused primarily on recovery of walking ability, 32% assessed ankle dorsiflexion strength using the MRC scale, 20% relied on patient-reported recovery, and 10% assessed electrophysiological changes (18).

In our study, late postoperative electrophysiological follow-up data were not available. Therefore, the MRC scale was used as the principal measure of neurological recovery. Based on our literature review, we selected this method because this scoring system remains valid and is currently in use.

Study Limitations

Although no significant abnormalities were observed in the laboratory values of these five patients with foot drop, further studies are needed to investigate other factors that may have contributed to the development

of these symptoms. A comparative study including patients undergoing conservative treatment could also be conducted. However, the number of patients in the present study was insufficient for such a comparison, and such an evaluation would require a prospective design. In addition, monitoring electrophysiological changes during follow-up could have provided valuable data; however, the inability to contact the patients during the subsequent follow-up period prevented such monitoring.

CONCLUSION

Peroneal neuropathy should be considered an important cause of foot drop in neurosurgical practice. Early diagnosis and timely initiation of treatment through appropriate medical history, physical and neurological examinations, and imaging are important. In patients with EMG-confirmed peroneal neuropathy, a history of recent rapid or substantial weight loss should be specifically investigated, including a history of bariatric surgery. In recent years, the prevalence of obesity has increased worldwide (19). Bariatric surgery has become an important treatment option for obesity. Bariatric surgeons and dietitians should remain vigilant for potential neurological complications during postoperative follow-up, while neurosurgeons should consider a history of bariatric surgery and associated weight loss when evaluating the etiology of conditions such as peroneal neuropathy.

Ethical Approval: This study was approved by The Biruni University Scientific Research Ethics Committee (Decision No: 2025-BiAEK/03-24 Date: 24.03.2025).

Informed Consent: Written informed consent was obtained from all participants.

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	Data acquisition	B.K., F.N.K., C.O.
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Category 2	Drafting manuscript	I.A., B.K., F.M.K., O.E.S.
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