

Surgical decompression of the lateral femoral cutaneous nerve (LFCN) for Meralgia paresthetica treatment

Experimental or state of the art? A single-center outcome analysis

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Abstract

Meralgia paresthetica (MP) is a rare lateral femoral cutaneous nerve-(LFCN)-mononeuropathy. Treatment for this disorder includes conservative and operative approaches; the latter is considered if conservative therapy fails. The most commonly used surgical approaches are decompression/neurolysis and avulsion/neurectomy. However, there are no definitive guidelines on the optimal surgical approach to be used. The purpose of this study was to evaluate the outcome of surgical decompression of the LFCN for the treatment of persistent MP with preservation of sensation along the distribution of the LFCN.

We evaluated the outcomes of LFCN procedures performed between 2015 and 2016. A total of 16 surgical decompressions could be identified. Retrospective analysis of prospectively collected patient data was performed, as well as systematic evaluation of the postoperative course, with regular follow-up examinations based on a standardized protocol. Pain was analyzed using an NRS (numeric rating scale). Several postsurgical parameters, including temperature hypersensitivity and numbness in the LFCN region, were compared with the presurgical data.

Sixty-nine percent of patients had histories of trauma or surgery, which were designated as the onset of pain. Of these patients, 78% had hip prostheses, 2 had previous falls. Postoperatively, a significant reduction of 6.6 points in the mean NRS pain value was observed. All other evaluated parameters also improved postoperatively. Patient satisfaction was high, with 86% reporting complete satisfaction, and 14% reporting partial satisfaction.

Previous studies favor either avulsion/neurectomy as the preferred procedure for MP treatment, or provide no recommendation. Our findings instead confirm the decompression/neurolysis approach as the primary surgical procedure of choice for the treatment of MP, if conservative treatment fails.

Abbreviations: ANOVA = 1-way analysis of variance, ASIS = anterior superior iliac spine, ASR = age-standardized incidence rate, LFCN = lateral femoral cutaneous nerve, MP = meralgia paresthetica, NL = neurolysis, NR = neurectomy, NRS = numeric rating scale, PCT = pelvic compression test, STROBE = Strengthening the reporting of observational studies in epidemiology.

Keywords: lateral femoral cutaneous nerve, meralgia paresthetica, mononeuropathy, numeric rating scale, surgical decompression

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The authors declare that they have no conflict of interest.

The author(s) of this work have nothing to disclose.

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1. Introduction

Meralgia paresthetica (MP), also referred to as Bernhardt–Roth syndrome, is a rare mononeuropathy of the primary sensory lateral femoral cutaneous nerve (LFCN). As a branch of the lumbar plexus, the LFCN emerges alongside the lateral margin of the psoas major muscle and runs across the iliacus muscle toward the anterior superior iliac spine (ASIS). The nerve then passes beneath the inguinal ligament, and exits the pelvis at an angle of approximately 80° before dividing into an anterior and posterior branch. Both of the branches at this point provide somatosensation to the anterolateral aspect of the thigh (Fig. 1). The nerve's angular course, and the lack of cushioning adipose tissue along its passage underneath the inguinal ligament, represent risk factors that render it susceptible to entrapment or compression at that site. MP is characterized by recurring bouts of symptoms such as pain, numbness, and a tingling or burning sensation along the course of the LFCN. Obesity, repetitive extension of the hip joint, prolonged sitting, and tight clothing, among other factors, may trigger these symptoms. With an age-standardized incidence rate (ASR) of 13.2 per 100,000 European women, and 10.7 per 100,000 European men, MP is a rather rare entrapment syndrome with a nearly equal distribution between the sexes.^[1]

In most cases, the diagnosis of MP can be made based upon patient history and the physical examination findings. Nonetheless, common clinical tests, such as the pelvic compression test (PCT), Tinel Sign testing, and neurodynamic testing, may be used to confirm a presumed diagnosis of MP.^[2] The treatment of MP

consists of conservative and operative approaches, the latter only to be considered if conservative therapy fails to achieve satisfying results, or if the patient's pain becomes unbearable.

Currently, the 2 most commonly conducted surgical approaches are decompression/neurolysis (NL) and avulsion/neurectomy (NR) of the LFCN. To date, there are no definitive clinical guidelines that have been established concerning the choice of procedure. There have been very few studies published on this subject, but those few either favor NR as the surgical treatment option,^[3,4] or they provide no recommendation regarding the choice of procedure.^[5]

The purpose of this study was to evaluate the outcome of surgical decompression of the LFCN, which is the approach in our practice for the treatment of persistent MP and for the preservation of complete sensation along the area of the LFCN.

2. Patients and methods

Within the study period, we performed 16 cases of surgical decompression of the LFCN, carried out in 13 patients between September 2015 and March 2017 at the authors' department in Salzburg, Austria. In most cases, patients were referred to our department due to a failure of conservative treatment. Confirmation of diagnosis, and consequently, the indication for surgery were determined by the following:

1. Clinical symptoms and confirmation by at least 2 out of the 3 diagnostic findings listed as follows:
 - a) signs of entrapment on neurosonography (positive ultrasound);
 - b) intermittent pain relief after infiltration therapy [3 mL ropivacaine (Ropinaest 10 mg/mL; B. Braun Melsungen AG, Carl-Braun-Straße Melsungen, Germany)]
 - c) pathological sensory nerve conduction velocity (performed by an external neurologist).

A retrospective analysis was performed on the surgical outcomes, which were assessed during follow-up visits from 3 to 18 months postoperatively. Two patients were lost to follow-up. The evaluation was performed by means of clinical testing, including PCT, Tinel sign testing, and neurodynamic testing, in addition to administering a standardized questionnaire. The questionnaire was developed specially for this study and included 13 questions that focused on pain relief, numbness, changes in temperature sensitivity, and overall postoperative satisfaction. An objective categorization of pain intensity was obtained, using a Numeric (Pain) Rating Scale (NRS, 1–10; higher numbers indicate greater pain levels). In addition, varying degrees of symptom relief were assessed, and subsequently categorized as complete, partial, no change, and worsened (see Fig. 2, parts of the standardized questionnaire). For the statistical analysis, Graphpad Prism 7.02 software (GraphPad Software Inc., La Jolla, CA) was used. One-way analysis of variance (ANOVA) testing was performed with the Holm–Sidak test for the correction of multiple comparisons using statistical hypothesis testing. The means of various postsurgical parameters were compared with the means of presurgical data. A value of $P < .05$ was considered statistically significant. The authors of this study did not apply for approval by a local ethical committee or institutional review board. The details of the study and therapy regimens were discussed with every enrolled patient during the preoperative counseling as well as postoperatively. The included patients signed an informed consent form before the surgery.



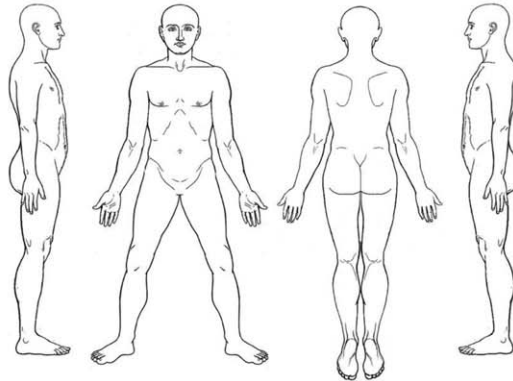
Figure 1. Schematic illustration of the cutaneous area with somatosensory supply from the LFCN in a patient suffering from MP.

Fragebogen Meralgia paraesthetica

Datum: _____

Name: _____

Geburtsdatum: _____



Bitte kennzeichnen Sie Ihren Hauptschmerzbereich

Frage 1: Wie würden sie Ihren Schmerz im Augenblick einschätzen?

1	2	3	4	5	6	7	8	9	10
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kein Schmerz

mäßiger Schmerz

stärkster Schmerz

Frage 2: Wie stark war der **stärkste** Schmerz in den vergangenen 4 Wochen?

1	2	3	4	5	6	7	8	9	10
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kein Schmerz

mäßiger Schmerz

stärkster Schmerz

Frage 3: Wie stark war der Schmerz in den letzten 4 Wochen durchschnittlich?

1	2	3	4	5	6	7	8	9	10
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kein Schmerz

mäßiger Schmerz

stärkster Schmerz

Frage 4: Im Vergleich zum Zustand vor der Operation hat/ist das schmerzhafte Gefühl:

- Verschwunden
 Vermindert
 Gleichgeblieben
 Stärker geworden

Frage 5: Im Vergleich zum Zustand vor der Operation hat/ist das Taubheitsgefühl:

- Verschwunden
 Vermindert
 Gleichgeblieben
 Stärker geworden
 Nach der Operation neu aufgetreten
 Nach der Operation neu aufgetreten, seither weniger geworden

Frage 6: Ich bin zufrieden mit dem Resultat nach der Operation:

- Ja
 Nein
 Teilweise

Frage 7: Mich plagt das Taubheitsgefühl:

- Nein
 Selten
 Oft
 Immer

Figure 2. First 2 sheets of the standardized questionnaire used for the follow-up examinations, written in German.

Frage 8: Leiden Sie im betroffenen Bereich an einem Brenngefühl?

- Nie
- Kaum
- Gering
- Mittel
- Stark
- Sehr Stark

Frage 9: Haben Sie im Bereich Ihrer Schmerzen ein Kribbel- oder Prickelgefühl (z.B. Ameisenlaufen)?

- Nie
- Kaum
- Gering
- Mittel
- Stark
- Sehr Stark

Frage 10: Ist leichte Berührung (Kleidung) in dem Bereich schmerzhaft?

- Nie
- Kaum
- Gering
- Mittel
- Stark
- Sehr Stark

Frage 11: Haben Sie im Bereich Ihrer Schmerzen blitzartige, elektrisierende Schmerzattacken?

- Nie
- Kaum
- Gering
- Mittel
- Stark
- Sehr Stark

Frage 12: Ist Kälte oder Wärme in diesem Bereich gelegentlich schmerzhaft?

- Nie
- Kaum
- Gering
- Mittel
- Stark
- Sehr Stark

Frage 13: Führt Gehen, Stehen oder Strecken der Hüfte zu einer Verstärkung der Symptome?

- Ja
- Nein
- Teilweise

Klinische Tests:

Pelvic Compression Test (PCT)	Positiv	Negativ
Hoffmann-Tinel-Zeichen	Positiv	Negativ
Neurodynamischer Test	Positiv	Negativ

Figure 2. (Continued)

The manuscript was prepared according to the STROBE (Strengthening the reporting of observational studies in epidemiology) (<https://www.strobe-statement.org>) guidelines. The study was performed, including all procedures, in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

2.1. Surgical procedure

With the patient in the supine position, under general anesthesia, a 5-cm skin incision is made 2 cm inferomedial to the ASIS and parallel to the inguinal ligament. Subsequently, dissection of the soft tissue is carried out down to the fascia lata to locate the LFCN. The nerve is then clearly visualized, mobilized, and followed proximally to its point of exit from the pelvis. The inguinal ligament is incised (only the ventral sheet) to decompress the nerve, and additional care is taken to locate and cut any compressing dorsal tendinous bands of the iliac fascia. After complete decompression (Fig. 3) at a distance of 8 to 10 cm distal to the inguinal ligament, hemostasis, and insertion of a drain, the wound is closed in layers using 3-0 Vicryl (Polyglactin 910, polyfil) sutures subcutaneously, and 4-0 Monocryl (Poliglecapron, monofil Ethicon, NJ) intracutaneously.

Patients were discharged on the first or second postoperative day. Postoperative mobilization was limited to only the minimum and absolutely necessary mobilization for 2 weeks postoperatively. Otherwise, there was no special postoperative care. During this study, we were able to confirm that complete nerve recovery normally occurred at about 4 to 5 months postoperatively.

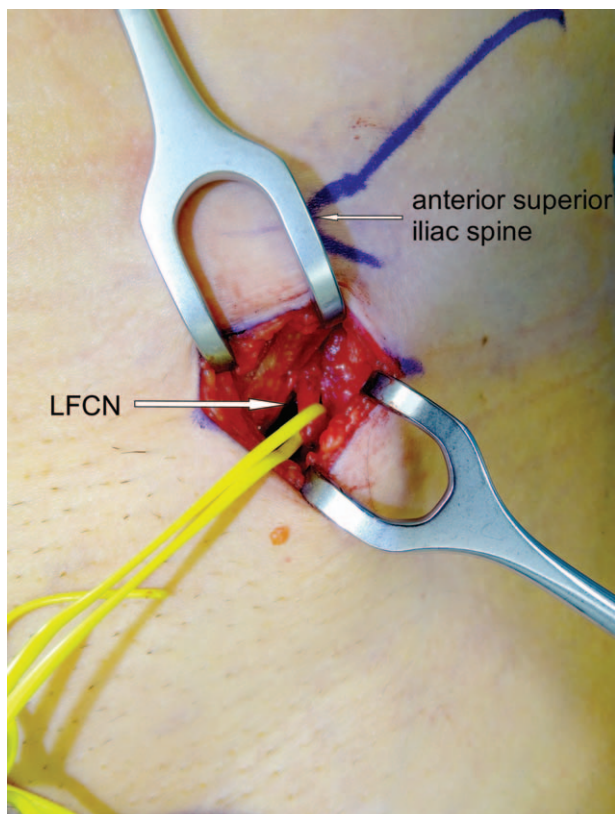


Figure 3. Intraoperative view. The LFCN caudal to the inguinal ligament after surgical decompression.

3. Results

Thirteen patients received a total of 16 surgical decompressions of the LFCN. The average patient age was 51 years (range: 17–70 years). Six of the patients were women and 7 were men. The right LFCN was affected in 8 cases (50%), and the left LFCN also in 8 cases (50%). Nine (69%) of the patients had an event of trauma or surgery in their medical history, which was designated as the “onset of pain.” Seven of these 9 patients (78%) had a history of implantation of a hip prosthesis, and 2 patients had a history of a fall. The average follow-up was 12 months (range: 3.5 months–1 year and 7 months).

The patients’ pain levels were analyzed using the NRS. The maximum preoperative pain score was 8.8 (range 7.5–10). Postoperative pain at the time of the follow-up examination was 2.1 (range 1–4). The average of the maximum postoperative pain reported during the last 4 weeks was 2.8 (range 1–7) points. The average continuous level of pain postoperatively was 2.3 (range 1–4.5). Statistical analysis showed a significant reduction of pain by 6.6 points on average on the NRS [$P < .0001$, standard error (SE) 0.42, maximum pain preoperatively vs pain at follow-up examination]. There was also a

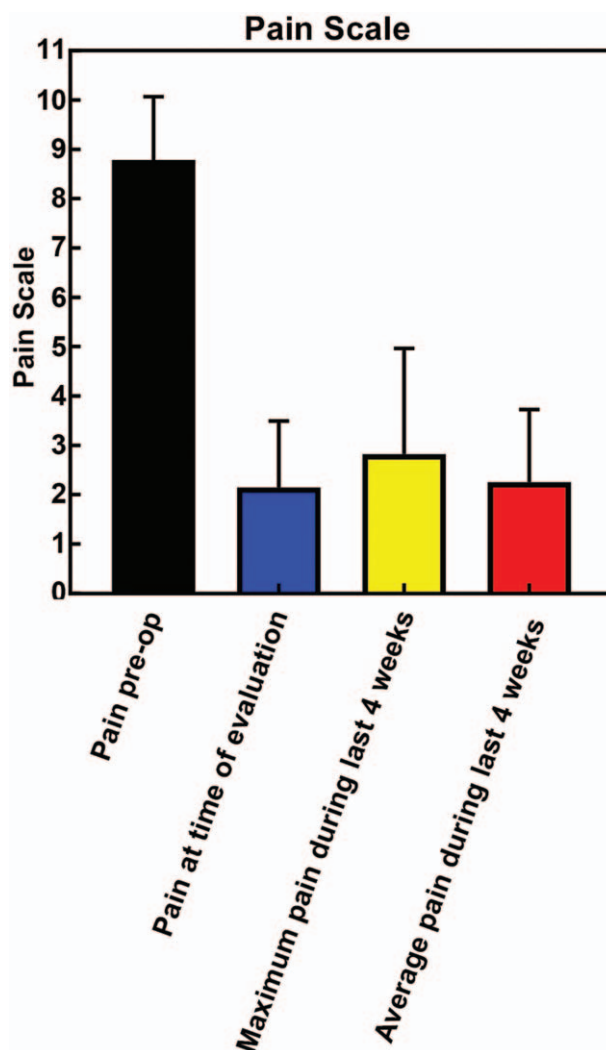


Figure 4. Pain scale, showing a significant reduction in pain on the Numeric Rating Scale postoperatively.

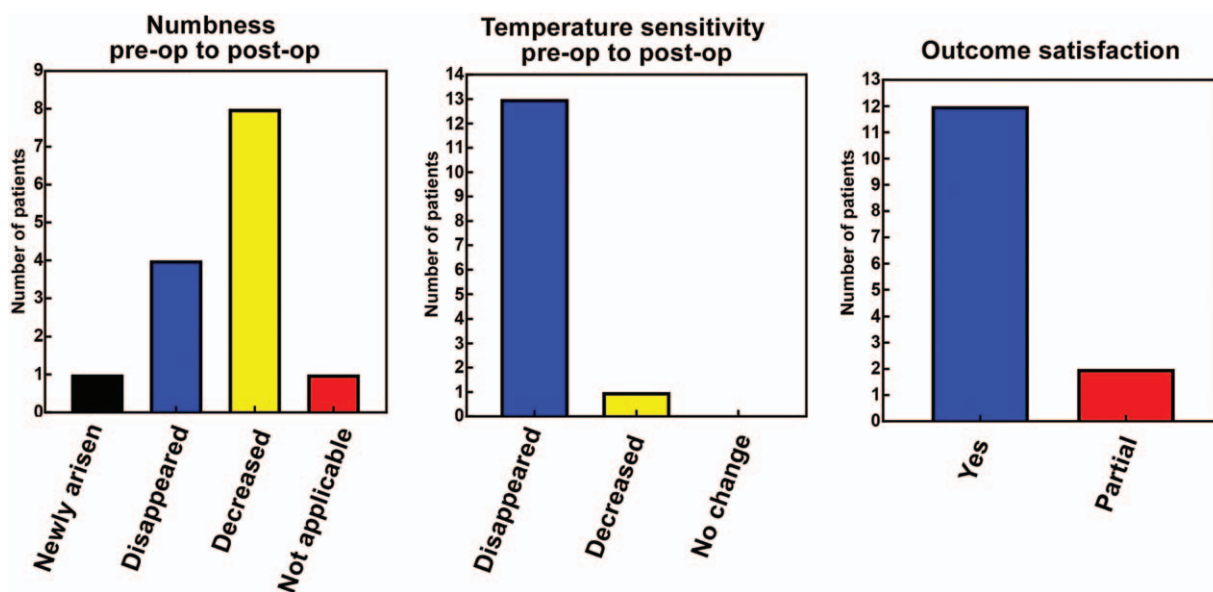


Figure 5. Diagram showing additional information, with postsurgical improvements in numbness and temperature sensitivity, and high patient satisfaction.

significant reduction of 6 points when the “maximum pain preoperatively” and “maximum pain during the last 4 weeks postoperatively” were compared ($P < .0001$, SE 0.64). In addition, there was a significant reduction of 6.5 points on the NRS between the “maximum pain preoperatively” and “average pain during the last 4 weeks postoperatively” ($P < .0001$, SE 0.45) (Fig. 4).

One patient required surgical revision after primary decompression and was treated with an open decompression procedure and lipo-filling. This patient reported a postoperative maximum pain level of 8 points during a 7-month follow-up period (vs 10 points preoperatively). Two weeks after the second procedure, this patient was completely pain-free (NRS 1 point). The revision surgery data were included in the statistical analysis. In 4 of 14 (29%) patients, a complete relief of numbness was reported postoperatively; in 8 of 14 (57%) patients, a reduction of numbness occurred; in 1 of 14 (7%) patients, a new postsurgical numbness developed; and in 1 of 14 (7%) patients, no detailed information could be obtained. Thirteen of 14 (93%) of patients reported no hypersensitivity to temperature (changes) postoperatively, and in 1 of 14 (7%) patients, a reduction of hypersensitivity regarding temperature was reported (Fig. 5).

In addition, the patients were asked during follow-up for their subjective feelings on improvement of pain after surgery, without using a scale or numbers. In this case, 9 of 14 (64%) patients reported a complete resolution of pain, and 5 of 14 (36%) patients reported a partial resolution of pain. Overall patient satisfaction was high, with 12 of 14 (86%) patients reporting complete satisfaction with the surgery, and 2 of 14 (14%) patients reporting partial satisfaction.

4. Discussion

A literature analysis performed in PubMed in December 2017 revealed a total of 15 studies published since the year 1972, which dealt with the surgical treatment of MP. A Cochrane review,^[6] published in 2008, and an article by de Ruyter et al^[7] summarized

these studies. Six studies performed a comparison between NR/avulsion and decompression/NL. All of these reports indicated better outcomes after the NR procedure. Nevertheless, there are a few studies favoring decompression of the LFCN.^[8–11]

Two recent studies, not included with the previously mentioned articles, reported better outcome rates after neurectomies.^[3,4] The primary reasons for the improved pain relief after NR and poor long-term results for NL procedures were discussed. The number of surgical cases reported in these studies is almost equal to the number of cases in our single study. Payne et al^[5] published a thorough meta-analysis in 2017. They concluded that there was no clear evidence to recommend either avulsion/NR or decompression/NL as a procedure of choice, considering all the available literature.

Our clinical experience has led us to a different conclusion. Decompression of the LFCN as a primary surgical treatment appears to be sufficient and should be seen as a type of “minimally invasive” surgery. We have found that there is no need to sever the nerve. The greatest advantage of decompression is the avoidance of the sensory denervation of the anterolateral thigh. Avulsion/NR could be an option in pain recurrence after decompression, although we only observed one case of recurrence after decompression (1/14, 7%). This case was not treated by consecutive avulsion, and on the contrary, the patient received another decompression of the LFCN as well as a lipo-filling in the area of the inguinal canal where the nerve leaves the pelvis. This patient was pain-free by 6 weeks after surgery, and sensation was preserved. In general, we achieved a significant pain reduction of 6.6 points on the NRS (from 8.8 to 2.1 points) and a high patient satisfaction level of 86%.

5. Limitations

The major limitation of this study is that it has a retrospective character. Further prospective evaluations of our technique are planned in the future. A control group would also be scientifically desirable. The problem is, that the according to literature, the only suitable control group would be a patient cohort, treated by

the second surgical procedure for MP, which is NR. But we deny performing a NR as a primary procedure for MP treatment, because we think it is not necessary and suitable at all.

6. Conclusion

The literature regarding the surgical treatment of MP is relatively sparse. The existing reports either favor avulsion/NR of the LFCN as the surgical procedure of choice, or do not give any recommendation. Our findings instead suggest that decompression/NL should be used as the surgical procedure of choice. We observed very good results and high levels of patient satisfaction postoperatively using this technique.

Author contributions

Study development and design, coordination and data collection were performed by Karl Schwaiger. Literature search and data analysis were done by Paul Panzenbeck, Klemens Heinrich, Patrick Mandal, Elisabeth Russe, René Kaplan. Statistical evaluation and critical revision was performed by Martin Purschke. Gottfried Wechselberger did the conceptualization, project administration and critical revision of the article.

References

- [1] Latinovic R, Gulliford MC, Hughes RAC. Incidence of common compressive neuropathies in primary care. *J Neurol Neurosurg Psychiatry* 2006;77:263–5.
- [2] Cheatham SW, Kolber M, Salamh P. Meralgia paresthetica: a review of the literature. *Int J Sports Phys Ther* 2013;8:883–93.
- [3] Emamhadi M. Surgery for meralgia paresthetica: neurolysis versus nerve resection. *Turk Neurosurg* 2012;22:758–62.
- [4] de Ruitter GC, Kloet A. Comparison of effectiveness of different surgical treatments for meralgia paresthetica: results of a prospective observational study and protocol for a randomized controlled trial. *Clin Neurol Neurosurg* 2015;134:7–11.
- [5] Payne R, Seaman S, Sieg E, et al. Evaluating the evidence: is neurolysis or neurectomy a better treatment for meralgia paresthetica? *Acta Neurochir (Wien)* 2017;159:931–6.
- [6] Khalil N, Nicotra A, Rakowicz W. Treatment for meralgia paraesthetica. *Cochrane Database Syst Rev* 2008;3:CD004159.
- [7] de Ruitter GC, Wurzer JA, Kloet A. Decision making in the surgical treatment of meralgia paresthetica: neurolysis versus neurectomy. *Acta Neurochir (Wien)* 2012;154:1765–72.
- [8] Ducic I, Dellon AL, Taylor NS. Decompression of the lateral femoral cutaneous nerve in the treatment of meralgia paresthetica. *J Reconstr Microsurg* 2006;22:113–8.
- [9] Nahabedian MY, Dellon AL. Meralgia paresthetica: etiology, diagnosis, and outcome of surgical decompression. *Ann Plast Surg* 1995;35:590–4.
- [10] Siu TL, Chandran KN. Neurolysis for meralgia paresthetica: an operative series of 45 cases. *Surg Neurol* 2005;63:19–23. discussion 23.
- [11] Teng P. Meralgia paresthetica. *Bull Los Angeles Neurol Soc* 1972;37:75–83.