

SURGICAL TREATMENT OF MORTON'S NEUROMA BY PLANTAR APPROACH: A RETROSPECTIVE STUDY

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SUMMARY

With the aim of evaluating the surgical technique efficiency - neurectomy by plantar approach - 19 patients with Morton's neuroma were submitted to this kind of treatment. Therefore, there were 19 neuroma patients, with 84.3% being females, and 15.7% males; 31.5% in the second intermetatarsal space, 68.5% in the third intermetatarsal space; 47.3% on the right side, and 52.7% on the left side. Surgery was performed through plantar approach in all cases, with mean follow-up time of about 9 months, and the outcomes

were considered as satisfactory for 89.5% of the patients. The time for resuming activities was 6 weeks for 84.2%. Two patients were considered unsatisfied, both because of residual pain beneath the scar. The authors conclude that neurectomy by plantar approach is satisfactory, because of the better neuroma exposure, with good healing, fast return to activities and pain improvement.

Keywords: *Neuroma; Foot diseases; Surgical procedures; Surgical treatment;*

INTRODUCTION

Morton's neuroma was first described by Thomas Morton in 1876, as a non-neoplastic injury represented by perineural fibrosis of the plantar digital nerve. The nerve is affected, in terms of space, between metatarsal heads and is often associated to adjacent inflammatory response. Injury occurs most frequently between the third and fourth metatarsal bones, and also between the fourth and the fifth⁽¹⁾. The most common affection of the third space is due to the fact that this is the most frequent site of union to lateral and medial branches of plantar digital nerves, which become enlarged and compressed in the third space. The increased mobility of the fourth metatarsus compared to the third one enables the occurrence of microtraumas⁽²⁾.

Due to the preference for females, it is suggested that the injury is resultant from the use of high-heel shoes, where an increased pressure is imposed to metatarsi heads, and, consequently, nerve compression occurs⁽²⁾.

Clinically, neuroma causes a characteristic pain in the forefoot, leading the patient, in certain occasions, to take off the shoes and apply massage onto the toes. Pain is irradiated to toes, and paresthetic phenomena may occur in areas innervated by the involved nervous ramifications, as well as a burning sensation, which may be exacerbated by wearing antiphysiological shoes⁽²⁾.

At physical examination, the Mulder's sign may be found, in which the examiner performs a laterolateral compression of the forefoot, accompanied by pressure on the plantar surface of the third intermetatarsal space. When positive, a click may be heard and a painful shunt resulting from the sudden movement of the neuroma at the space between metatarsal heads⁽³⁾.

There is no suggestive image on x-ray examinations, this being useful for the diagnosis of other pathologies causing metatarsalgia.

At ultrasound, injury appears as a circular or egg-like shaped, well-bounded, hypoechoic mass located at a juxtaproximal position to the metatarsal head, in the intermetatarsal space. Injuries smaller than five millimeters may be difficult to visualize at the ultrasound test⁽¹⁾. Ultrasound results prove that masses were found at the first space in 8% of the cases, at the second space in 44%, at the third in 46%, and at the fourth space in 2% of the cases⁽⁴⁾.

Magnetic resonance is an imaging test that certainly shows the neuroma, its characteristics and size^(5,6). For neuroma visualization, coronal oblique sections are used with the patient in supine position and with feet in 20° plantar flexion⁽⁷⁾. The image is one of a well-located mass between metatarsal heads, with low intensity sign at T-1 and T-2 images. At T-1, sequences are more useful, because the hypointense neuroma is surrounded by the hyperintense fat tissue. The hypointensity of the neuroma is attributed to the fibrous tissue^(7,8).

Pathologically, the neuroma appears as a spindle-like enlargement of the plantar digital nerve in its bifurcation, with tapering of the epineural fascicle, perineural fibrosis with large amounts of collagen (Renaut's bodies), and loss of myelinated fibers⁽¹⁾.

The initial treatment of Morton's neuroma is driven towards changing habits regarding shoes wearing, being preferable those with lower heels and larger tips, also establishing the use of non-steroidal anti-inflammatory drugs and physical therapy by stretching plantar fascia and toes flexors, plus ultrasound. Inner soles for load suppression at the affected metatarsal region may be used as an aid, with retrocapital bar. Steroids injection or a mixture of hydrocortisone and local anesthetics solution may also be used in order to provide relief, which can last for weeks or months⁽⁹⁾.

When conservative treatment fails, other methods can be used, including neurolysis and surgical release of the transverse metatarsal ligament for decompression⁽¹⁰⁾.

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Surgical resection of the neuroma and of the involved segment of the nerve is the treatment leading to the best outcomes, according to many authors^(2,9,11,12), and may be performed through plantar or dorsal approach.

The advantage of the palmar incision, in its cross-sectional plane, out of the load area, is that it prevents body weight to be transferred to the plantar surface of metatarsal heads resulting in a less painful scar, and also aesthetically less evident. Peroperatively, this approach is safer, because there is no need to perform the ligamentotomy of the deep transverse ligament, once this causes metatarsalgia by diastase of metatarsal bones⁽²⁾. However, many times, this approach does not allow the nerve to be trans-sectioned in a proximally enough point⁽¹⁰⁾.

The objective of the study is to demonstrate the efficiency of a neurectomy using a plantar approach as a surgical treatment for a patient with Morton's neuroma.

CASE SERIES AND METHODS

In the period between November 2001 and March 2004, 19 patients with Morton's neuroma were operated; 9 on the right foot and 10 on the left foot, with no bilateral cases present in this sample. Sixteen patients (84.3%) were females, and 3 (15.7%) were males, with ages ranging from 28 to 57 years old, average = 40.8 years old. Regarding location, 13 neuromas were at the third space and 6 at the second space. Patients were followed up during an average of 9 months, being the minimum follow-up 4 months and maximum 33 months. Additionally to clinical evaluation, patients were submitted to x-ray of the foot, taken at frontal and lateral planes, and to USG and/ or MNR (19 USG and 5 MNR), with neuromas being found with sizes ranging from 7 to 13 mm, average = 9 mm.

Different incidence rates of Morton's neuroma were assessed regarding gender, age, and affected side and space (Table 1).

During clinical evaluation of patients, we could notice that the vast majority (95%) presented with pain and paresthesia at plantar surface, in the space corresponding to the neuroma. For patients, pain was worse at ambulation and some reported feeling like taking off the shoe and applying massage onto the foot. At physical examination, the presence of Mulder's sign was verified in 80% of the patients.

For treating these patients, conservative measures were firstly adopted, such as the use of non-steroidal anti-inflammatory drugs and analgesics, inner soles to release pressure on affected intermetatarsal space, body weight loss, when necessary, as well as changes on shoe wearing habits, particularly for women. Patients who were used to daily walks were recommended to reduce the length of paths to a distance enough to perform their respective activities. Those measures were attempted during approximately 4 months, and failure was the major indication for surgical treatment: the neurectomy. Selected approach was plantar, through curvilinear, transversal incision, on the load-free area.

In the surgical procedure, patients were placed in dorsal decubitus and submitted to a rachidian anesthesia. The depletion of the affected lower limb was performed, followed by a garrote placed at the thigh root level, both with Esmarch band. The incision was performed in a curvilinear, transversal shape, at the load-free zone, in the affected space (Figure 1), providing the dissection of fatty cushion and superficial transverse ligament plus isolation with neuroma resection (Figure 2), without sectioning the deep transverse ligament. Subsequently, surgical cleaning and cavity inventory, hemostasis, closure by planes and compressive simple bandaging were performed.

Patients were discharged from hospital in the same day. Stitches were removed after 15 days postoperatively.

Postoperative period consisted of approximately 10 days of operated limb load suspension. After that period, the patients wore Barouk special shoes during approximately 4 weeks, making the forefoot to be free of load, returning to usual activities, most of the times, within up to 7 weeks.

As for a personal satisfaction evaluation criterion, patients were divided into satisfied and unsatisfied. Patients presenting no residual pain or unrestricted use of any kind of shoe belonged to the first group; Patients presenting residual pain in any level, paresthesia and/or restricted use of shoes were included in the second group.

RESULTS

For a better understanding and evaluation, data regarding the correspondent postoperative time, time to return to usual activities, and personal satisfaction (Table 2).

Most of the patients returned to home-, job- and sports-related activities after 6 weeks postoperatively (84.2%). Some of them (15.8%) returned after 7 weeks. No patient presented superficial infection, only one had a suture dehiscence, which healed at second intention after 4 weeks. As a result, only two patients felt unsatisfied due to a persistent residual pain at the surgical scar. There was no complaint of paresthesia.

DISCUSSION

In 1845, Durlacher was the first person to write about Morton's neuroma⁽²⁾. Since then, its etiology, physiopathology and treatment have been studied

and described by numerous authors, but just a few studies have addressed the outcomes of a surgical treatment.

Today, the definitive treatment for Morton's neuroma is known to be essentially surgical, and, although some authors report experiences with neurolysis and decompressive surgeries, neurectomy is still the procedure of choice for a better outcome^(2,5,10).

Plantar approach provides a better technical ease for the surgeon, because after skin incision and the careful dissection of the fatty cushion, the neuroma may already be accessed, not requiring transverse ligament opening, as opposite to the dorsal approach, in which this opening is required for neuroma exposure. Another advantage of the plantar approach consists of probing other intermetatarsal spaces if associated pathologies are in place. On



Figure 1 - Curvilinear transverse incision, at the load-free zone



Figure 2 - Fatty cushion dissection and neuroma isolation

the other hand, there are a higher number of complications in the plantar approach when compared to the dorsal approach. Those complications are related to the access itself, and they are divided into: immediate (suture dehiscence, hematoma, infection); mediate (increased difficulty of skin to heal compared to dorsal skin and extended time to return to usual activities), and; late (thickened scar, nodules, and pain at fat cushion)⁽²⁾.

The careful dissection of the fatty cushion and skin closure with non-absorbable sutures are factors contributing to a good healing, with a painless postoperative period and satisfactory scar formation⁽²⁾.

According to Johnson, a neuroma recurrence can occur after surgery. With a re-surgery, 31% of the patients experienced improvement of pain, and 47% continued experiencing residual pain. The pain, in those cases, is a result of an incomplete neuroma excision⁽¹¹⁾. There were no cases of neuroma recurrence in our study.

From the patients submitted to surgery, most were females, with an average age of 40.8 years old, with a little prevalence of the left side and a great prevalence of the third metatarsal space, similar to those findings described in literature^(2,7,9,10,13,14).

Operated neuromas ranged from 7 to 13 mm. This agrees with literature⁽¹⁵⁾, which describes that neuromas smaller than 5 mm do not provide good neurectomy outcomes. Thus, the accurate

#	gender	age	side	space
1	f	39	l	2
2	f	28	l	2
3	f	51	r	3
4	f	35	l	3
5	f	43	r	3
6	f	52	r	3
7	f	38	l	3
8	m	42	r	2
9	f	44	l	3
10	f	57	L	2
11	f	38	R	3
12	m	43	R	3
13	f	44	L	2
14	f	33	R	2
15	f	54	L	3
16	f	32	R	3
17	f	37	L	3
18	m	35	L	3
19	f	30	R	3

Table 1: gender, age, affected side and space

#	Postoperative time (months)	ret. Act.	personal satisfaction
1	12	6	Satisfied
2	9	6	Satisfied
3	18	6	Satisfied
4	5	6	Satisfied
5	7	6	Satisfied
6	6	6	Satisfied
7	24	7	Satisfied
8	4	6	Satisfied
9	7	7	Satisfied
10	13	6	Unsatisfied
11	5	6	Satisfied
12	9	6	Satisfied
13	5	6	Satisfied
14	4	6	Satisfied
15	6	6	Unsatisfied
16	33	6	Satisfied
17	4	6	Satisfied
18	5	7	Satisfied
19	8	6	Satisfied

Table 2 - postoperative time, return to activities, personal satisfaction

surgical indication was crucial for the results achieved.

After 9 months of follow-up in average, the vast majority of patients returned to their home- and job-related activities within 6 weeks (84.2%), and were satisfied with the treatment (89.5%), as seen in literature⁽²⁾. Only one patient presented with suture dehiscence, which was attributed to an early load support, not compliant with doctor's recommendations. This patient, as an aggravating circumstance, is a smoker, but, by the end of follow-up, despite the thickened scar, this was painless. Two patients, although presenting with a good healing, continued experiencing pain, which was attributed to a surgical

scar in the load zone. These patients are currently presenting a partial improvement of the painful picture with the adoption of conservative measures, but they refused to be submitted to a new surgical procedure.

CONCLUSION

A neurectomy in a Morton's neuroma through plantar incision, if properly indicated and performed with a suitable surgical technique, allows for the exposure of the neuroma, not requiring transverse ligament resection. The great majority of the patients submitted to surgery presented satisfactory outcomes, good wound healing, fast return to usual activities, and improvement of pain.

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