Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/jor

Original Article

Minimally invasive endoscopic decompression of the intermetatarsal nerve for Morton's neuroma

Mitsuaki Kubota^{a,*}, Ryuichi Ohno^a, Muneaki Ishijima^b, Ryo Hanyu^a,
Kensuke Sakai^a, Yu Sugawara^a, Hironori Ochi^a, Humihiro Mukasa^a,
Kazuo Kaneko^b

^a Department of Orthopaedic Surgery, Koshigaya Municipal Hospital, Japan^b Department of Orthopaedic Surgery, Juntendo University School of Medicine, Japan

ARTICLE INFO

Article history:

Received 1 November 2013

Accepted 5 January 2014

Available online 31 January 2014

Keywords:

Morton's neuroma

Endoscopic decompression

Minimum invasive surgery

ABSTRACT

Background: We presented case reports of endoscopic decompression for a Morton intermetatarsal neuroma.

Methods: Three patients underwent surgery using an instrument designed to release the transverse carpal ligament for carpal tunnel syndrome. Each patient was 61, 56 and 24 years old. The mean follow up period was 1.5 years.

Results: All patients experienced reduced pain postoperatively. The postoperative scar was very small (only 1 cm). There is no loss of sensation, no hematoma and no infection.

Conclusion: This procedure is simple, and the postoperative morbidity for the patient is minimal. There is rapid recovery with minimal risk of complications that are associated with open techniques. Therefore endoscopic decompression for Morton neuroma offers many advantages and should be studied in a larger number of patients.

Copyright © 2014, Professor P K Surendran Memorial Education Foundation. Publishing Services by Reed Elsevier India Pvt. Ltd. All rights reserved.

1. Introduction

Endoscopic decompression of the intermetatarsal nerve for Morton's neuroma offers many advantages over the current techniques.^{1–3} We report the endoscopic decompression of Morton's neuroma with an instrument designed to release the transverse carpal ligament for carpal tunnel syndrome.

2. Patients and methods

Three decompression procedures were performed in two women and one man. Two female patients were 56 and 25 years old, and one male patient was 61 years old. Numerous conservative treatments, including insoles, physical therapy, oral nonsteroidal anti-inflammatory agents and injections of

* Corresponding author. Department of Orthopaedic Surgery, Koshigaya Municipal Hospital, 10-47-1 Higashi-koshigaya, Koshigaya City, Saitama 343-8577, Japan.

E-mail address: mkubota@juntendo.ac.jp (M. Kubota).

0972-978X/\$ – see front matter Copyright © 2014, Professor P K Surendran Memorial Education Foundation. Publishing Services by Reed Elsevier India Pvt. Ltd. All rights reserved.
<http://dx.doi.org/10.1016/j.jor.2014.01.004>

local anesthetics and corticosteroids had been performed, but there was insufficient pain relief. The amount of the time between the appearance of the symptoms of Morton's neuroma and the operation were 5 months, 5 and 7 years, respectively. The average follow-up period was 1.5 years. The pain visual analog scale (VAS) was investigated at the time of the first visit and at the final follow-up for both patients. In addition, the degree of satisfaction regarding the treatment using a VAS was assessed at the final follow-up.

3. Surgical technique

The procedure was performed using an instrument designed to release the transverse carpal ligament for carpal tunnel syndrome under general anesthesia. An air tourniquet was inflated to 300 mmHg at the thigh level. The 30-degree, 4 mm endoscope and ECTRA 2 (Smith & Nephew®) system designed to release the transverse carpal ligament for carpal tunnel syndrome were used. The ECTRA 2 system consists of an elevator, slotted cannula and obturator, and a disposable knife to release the transverse intermetatarsal ligament (TIML) (Fig. 1). A 1 cm longitudinal incision was made in the affected interdigital interspace, and blunt dissection was done using a mosquito forceps to palpate the edge of the TIML. After the distal edge of the TIML was palpated using the elevator, the slotted cannula/obturator was inserted into the planter side of the TIML. Next, the obturator was removed from the cannula and the 4 mm scope was introduced into the cannula (Fig. 2). The TIML was visualized with the slot of the cannula facing the 12 o'clock dorsal position (Fig. 3). The TIML was seen as dense and white. The intermetatarsal nerve was seen by rotating the slotted cannula and scope, facing 6 o'clock in the plantar position. The distal side of the intermetatarsal nerve was often seen to be thick and fibrous, especially at the contact point of the TIML (Fig. 4). After the scope was removed and the slot cannula was rotated to the 12 o'clock position, the disposable knife was inserted with the blade facing the 12 o'clock position. The TIML was transected to pull the knife. If additional tension on the TIML remained, digital pressure could be applied dorsally between the adjacent metatarsal heads. The scope

Fig. 1 – The ECTRA 2 system contains an elevator, a slotted cannula, an obturator, and a disposable knife.

Fig. 2 – The scope was introduced into the interdigital interspace.

was reinserted to confirm complete transection of the TIML (Fig. 5). Finally, it was confirmed that the TIML was not palpable by the elevator, and the skin was closed.

Patients started to walk the day after the operation. Normal activities, including athletics, can be resumed in four weeks.

4. Results

The decompression procedures provided relief of the neuroma symptoms in all patients. They needed no walkers or crutches postoperatively. The pain VAS was significantly decreased postoperatively compared with preoperatively (from preoperative 89,90 and 95 to postoperative 0, 10 and 34, respectively). The postoperative scar was very small (1 cm). There was no loss of sensation, no hematoma and no infection. The patients did not require treatment with oral anti-inflammatory agents or injections of local anesthetics at the

Fig. 3 – The transverse intermetatarsal ligament (TIML) was visualized with the slot of the cannula facing the 12 o'clock dorsal position.

Fig. 4 – The intermetatarsal nerve was seen by rotating the slotted cannula and scope, facing 6 o'clock in the plantar position.

time of the final follow-up. However, one patient needed a shoe gear, and one patient still has some pain. The degree of satisfaction with the operation was 100, 85 and 60, respectively. However one patient complained of a feeling of dull pain on the operation scar. There were no problems regarding the activities of daily living.

5. Discussion

Morton's neuroma is one of the most commonly reported lesions of the foot. The clinical symptoms of interdigital neuroma were first described by Durlacher in 1845, and later by Morton in 1876.^{4,5} The etiology of the disease has been debated extensively in the medical literature. More recently, evidence points to chronic intermittent trauma caused by compression and stretching of the common digital nerve.^{6,7}

The decompression of the intermetatarsal nerve was first described by Gauthier in 1979.⁸ He reported 304 neuromas

Fig. 5 – The TIML was transected to pull the knife. The space was empty.

Fig. 6 – The lumbrical tendon was left side of the TIML.

treated by release of the transverse intermetatarsal ligament. A total of 83% of his patients had good results, 14.5% fair results, and 2.5% had no improvement. The another results of decompression of the intermetatarsal nerve compares favorably with the results of the excision of a neuroma (80% substantially improved, 6% slightly improved, and 14% considered failures).⁹

Endoscopic decompression of the intermetatarsal nerve for Morton's neuroma offers many advantages over the current techniques.^{1–3} These are the rapid recovery, minimal risk of hematoma or infection, and satisfactory cosmetic outcome resulting from the small incision. The procedure is the same as that used for the endoscopic transverse carpal ligament procedure for carpal tunnel syndrome. Therefore, the procedure is simple and easy to learn, and requires minimal instrumentation. Of course, the anatomy of the foot should be well known. The lumbrical tendon is lateral and plantar to the transverse intermetatarsal ligament (TIML), and it is close to the TIML. Therefore, the lumbrical tendon and the TIML are visualized at the same endoscopic division (Fig. 6). However, the distinction between the lumbrical tendon and TIML is easy, because the lumbrical tendon can be seen as a longitudinal fiber, while the TIML is seen as a transverse fiber. Moreover, if the lumbrical tendon is cut, no significant functional loss will occur.²

The postoperative pain visual analog scale (VAS) score was different among the three cases. One patient relieved pain, but the other patients remained pain. The patient who was performed earlier after the appearance of symptoms for Morton's neuroma relieved pain. The amount of time between the appearance of symptoms of Morton's neuroma and the operation were 5 months and 5 or 7 years, respectively. The pain remaining despite the decompression of the intermetatarsal nerve may be related to the adhesion of the intermetatarsal nerve to the adjacent tissue. The adhesion of the intermetatarsal nerve is also caused by recurrent injections or the long-term progression of the inflammation. Although conservative treatment has been advocated for Morton's neuroma, the long-term use of invalid conservative treatment should be avoided to help prevent the adhesion of

the intermetatarsal nerve. In patients who have been treated for a long time, the decompression of the intermetatarsal nerve may not be sufficient to provide complete recover.

There are some limitations to this study. First, we have performed this procedure in only 3 patients. Second, the follow-up period was short. Further clinical trials in a larger number of patients and longer follow-up should be included for future studies.

Conflicts of interest

All authors have none to declare.

REFERENCES

1. Barrett SL, Pignetti TT. Endoscopic decompression for intermetatarsal nerve entrapment—the EDIN technique: preliminary study with cadaveric specimens; early clinical results. *J Foot Ankle Surg Br.* 1994;33:503–508.
2. Shapiro SL. Endoscopic decompression of the intermetatarsal nerve for Morton's neuroma. *Foot Ankle Clin.* 2004;9:297–304.
3. Zelent ME, Kane RM, Neese DJ, et al. Minimally invasive Morton's intermetatarsal neuroma decompression. *Foot Ankle Int.* 2007;28:263–265.
4. Durlacher L. *Treatise on Corns, Diseases of Nails, and the General Management of the Feet.* London: Simkin and Marshall; 1845.
5. Morton TG. A peculiar and painful affection of the fourth metatarso-phalangeal articulation. *Am J Med Sci.* 1876;71:37–39.
6. Goldman F. Intermetatarsal neuroma: light microscopic observations. *JAPA.* 1979;69:317–324.
7. Goldman F. Intermetatarsal neuroma: light and electron microscopic observations. *JAPA.* 1980;70:265–278.
8. Gauthier G. Thomas Morton's disease: a nerve entrapment syndrome. A new surgical technique. *Clin Orthop Relat Res.* 1979;142:90–92.
9. Mann RA, Reynolds JC. Interdigital neuroma: a critical clinical analysis. *Foot Ankle.* 1983;3:238–243.