

Neuroma under the fifth metatarsal head. A retrospective study

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Summary. This retrospective study was carried out over 83 surgical cases at the distal portion of the fifth metatarsal, compromising the treatment of tailor's bunion, fifth metatarsal overload and the concomitant presence of both pathologies in some cases. Neuromas were founded under the fifth metatarsal head in 18 of the cases studied (21.7%). The results look at whether if there is an association between different fifth metatarsal pathologies and the presence of neuromas and found a significant association between the appearance of neuromas in patients with the same metatarsal overload, especially if it is accompanied by a tailor's bunion pathology.

Key words: Neuroma, Fifth metatarsal, Surgery

Introduction

There is sufficient literature regarding interdigital neuromas, which debate the concept of neuroma, aetiology, pathogens and diagnosis by complementary tests and different treatments. However, the scarcity of literature regarding the neuroma under the fifth metatarsal head can lead to suggest that this injury is something exceptional. Our practical experience, following previous studies from other authors (Fabrikant and Califano, 1981; Thul and Hoffman, 1985) shows that the neuroma under the fifth metatarsal head is a relatively common tumour often associated to tailor's bunion surgery and overload syndrome of the fifth

metatarsal (Valero, 2003; Moreno and Valero, 2000).

In our personal opinion, these kind of neuromas, under the head of the fifth metatarsal, have not received the consideration they deserve, although in many cases the pain is masked by the referred pain from osteo-articular alterations, and the diagnoses, in these particular cases, tend to be casual (Hansson, 1989; Coughlin, 1997); on the other hand the intense neurological pain that the patient experiments, which manifests sporadically or continuously even in repose makes osteo-articular surgery a secondary matter. We consider that if this type of lesion is not considered it could lead to the failure of osteo-articular surgical treatment, which will lead to persisting pain symptoms after surgery.

According to Thul and Hoffman the location of the plantar neuroma in the lateral position under the fifth metatarsal head suggests that the affected nerve is a lateral branch of the lateral plantar nerve (Fig. 1). It should be remembered that the sensory innervation of the external border of the foot corresponds to the sural nerve, and the plantar innervation of the fifth metatarsal corresponds to superficial branches of the lateral plantar nerve which is divided into two plantar digital nerves. The lateral of these supplies the lateral side of the fifth toe, and the medial one in the fourth intermetatarsal space is divided into two proper digital nerves which supply the lateral side of the fourth toe and medial of the fifth toe.

In this study, through a comprehensive review of clinical histories of patients that were treated surgically in the fifth ray of the foot and due to the fact that the all the potential neuromas extracted were sent to pathology for histological confirmation, we aim to correlate the high frequency of neuromas under the fifth metatarsal head and its association with different pathologies in the

fifth ray of the foot.

Materials and methods

A retrospective, cross-sectional and observational study of 83 feet, of 55 patients surgically treated for a lesion in the fifth metatarsal in José Valero Salas Clinic (Zaragoza, Spain) 2003-2010, all the surgeries were performed by the same surgeon using different types of osteotomies in the distal portion of the fifth metatarsal.

In this study we include all the patients that had been diagnosed with tailor's bunion, overload of the fifth metatarsal and tailor's bunion associated with overload of the fifth metatarsal. We excluded all the cases that were not treated surgically. All the patients underwent a radiological weight bearing AP and baropodometric study in static and dynamic pressure by platform Podobit Pro[®] 1.5, in order to determine the diagnosis and the most suitable surgical technique to be performed.

The presence of tailor's bunion was determined according to the classification of Coughlin radiology (Coughlin, 1991) when the angle of lateral deviation of the fifth metatarsal head was more than 8° and/or intermetatarsal angle between the fourth and the fifth metatarsal more than 8° with or without hypertrophy of the fifth metatarsal head. Overload of the fifth metatarsal was determined when there is overpressure under the fifth metatarsal head in the baropodometric study in

dynamic and static, with or without plantar keratosis.

Clinical records of patients were reviewed and the following variables were considered: age and gender of the patient, foot, laterality, diagnosis of the fifth ray pathology, post surgery complications and corroboration of diagnosis by pathological study.

The data was analysed using the software package SpSS 17.0. An analysis of frequencies was carried out and Chi-square test was used ($p < 0.05$) in order to analyse the presence of neuroma under the fifth metatarsal head according to the diverse fifth ray pathologies that have been surgically treated.

Results

The sample analysed compromised 83 osteoarticular pathologies in the fifth metatarsal surgically treated feet, corresponding to 55 patients, 86.7% (72 feet) were women and 13.3% were men (11 feet). The average age of the sample was 56.83 years old, in the 15-84 years old range (standard deviation of 19), finding no significant differences between the average age and the gender of the sample.

Surgery was performed to treat the following pathologies

- Tailor's bunion, 49.4 % of the sample (41 feet)
- Overload fifth metatarsal, 26.5 % of the sample (22

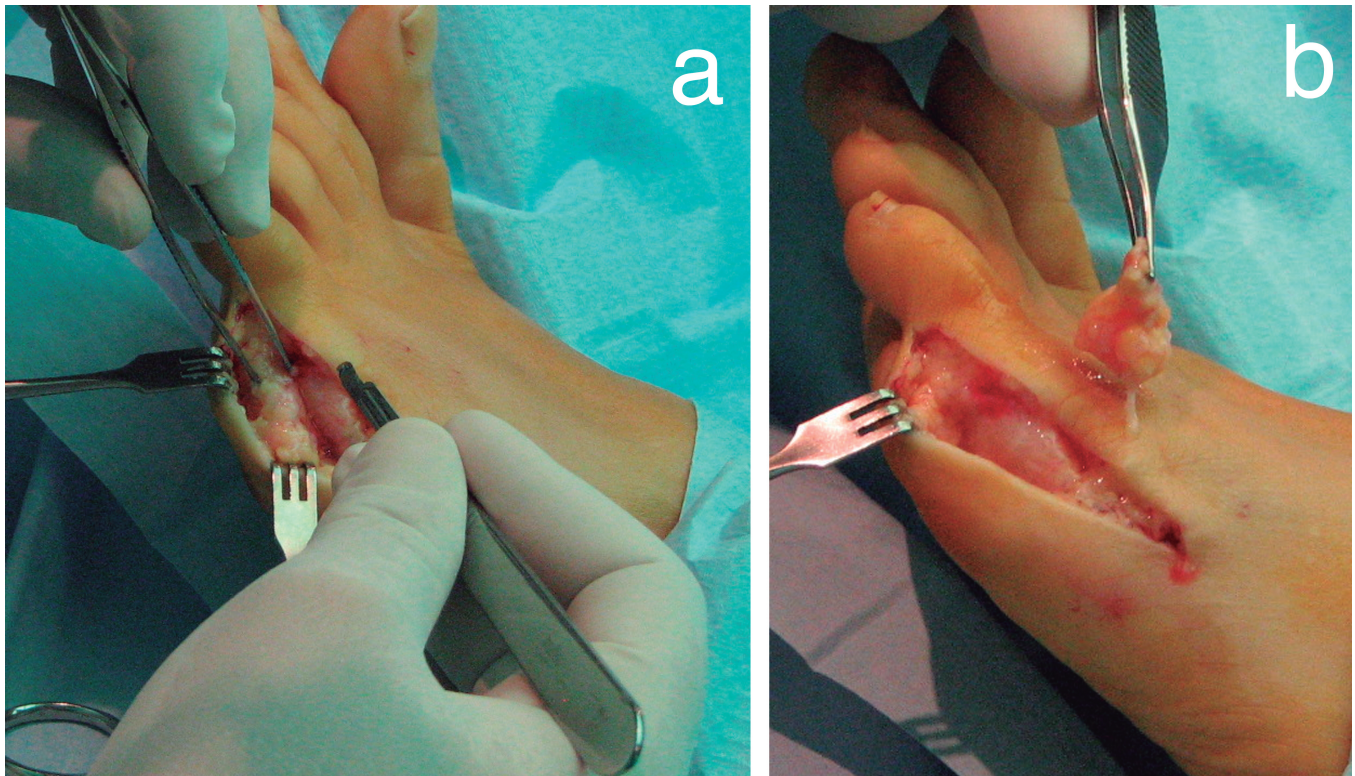


Fig. 1. Intra operative image showing the location (a) and excision (b) of a neuroma under the fifth metatarsal head.

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feet)

-Tailor's bunion associated with overload metatarsal, 24.1% of the sample (20 feet)

In 22 of the sample feet (26.51%) a surgical specimen was extracted from under the head of the fifth metatarsal, in 18 feet (21.7%) pathological study of this specimen qualified for neuroma, 2 for fibrosis, 1 for ganglion and 1 for bursitis.

Out of the 18 feet presenting neuroma, 17 feet (94.4%) were females and a single case was male, with an average age of 55.11 years old (standard deviation of 22.14), in the 15-82 years old range. Out of those, 6 feet were simultaneously treated for hallux abductus valgus and 4 feet treated for hammer toes. Only a single case presented a neuroma in both feet.

Of the feet presenting neuroma the following percentages were surgically treated for:

-Tailor's bunion in 22.2% (4 feet)

-Overload in 33.3% (6 feet)

-Tailor's bunion associated with fifth metatarsal overload in 44.4% (8 feet).

The statistical Chi-Square test revealed significant differences, p value=0.02 (<0.05) in the frequency of manifestation of neuroma among the different surgically treated pathologies and as Figure 2 shows, the presence of this type of nerve injury is associated to a greater extent in patients with fifth metatarsal overload, even more if those also present tailor's bunion:

-Out of the 41 feet with tailor's bunion (without overload in fifth metatarsal), 9.75% (4 feet) of the sample had neuroma.

-Out of the 22 feet with fifth metatarsal overload (without tailor's bunion), 27.27% (6 feet) of the sample had neuroma.

-Out of the 20 feet with tailor's bunion associated to overload in fifth metatarsal, a 40% (8 feet) of the sample

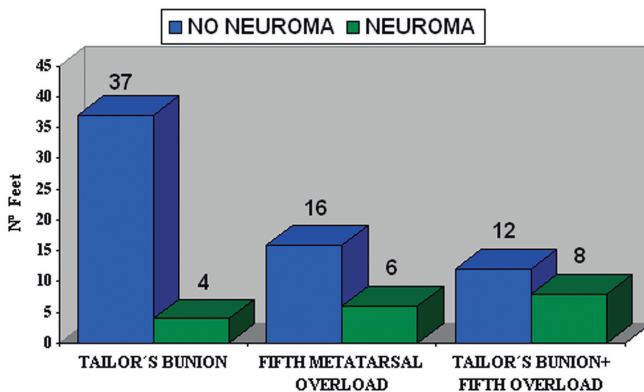


Fig. 2. Relationship between the surgical pathology of the fifth metatarsal and neuroma under the head of the same metatarsal.

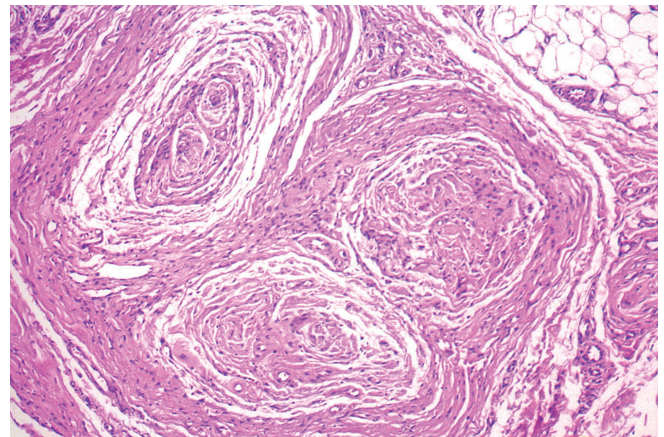


Fig. 3. Hypertrophic nerves with marked fibrosis perineural concentric. Nodular Fibrosis defined. HE, x 200

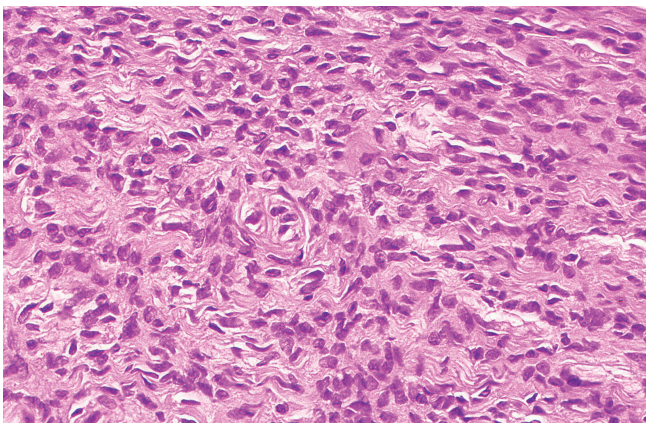


Fig. 4. Detail of a nerve thickened with important fibroblastic proliferation endoneural which gives disorganized and hypercellular aspect. HE, x 400

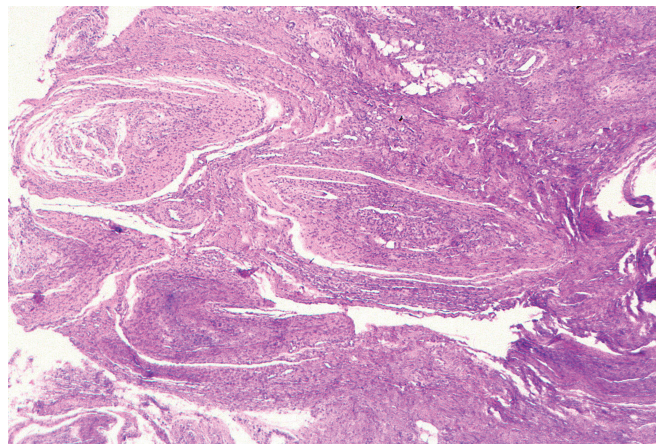


Fig. 5. A proliferation of thickened nerve tracts and distorted with marked epineural fibrosis. HE, x 40

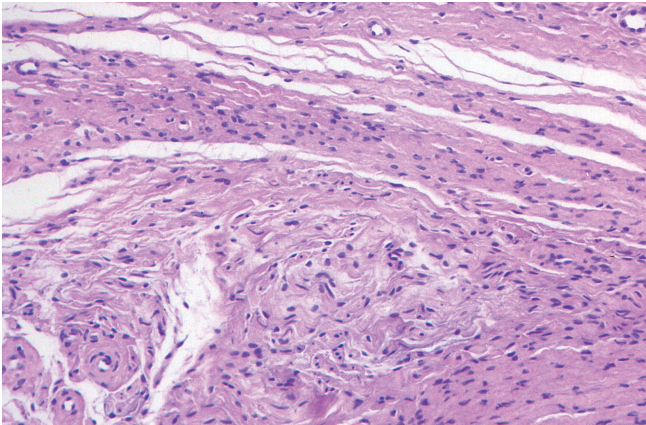


Fig. 6. Detail of the hypertrophic nerve with the perineurium thickened. In the lower left corner are three arterioles with thickened wall by hyalinization. HE, x 400

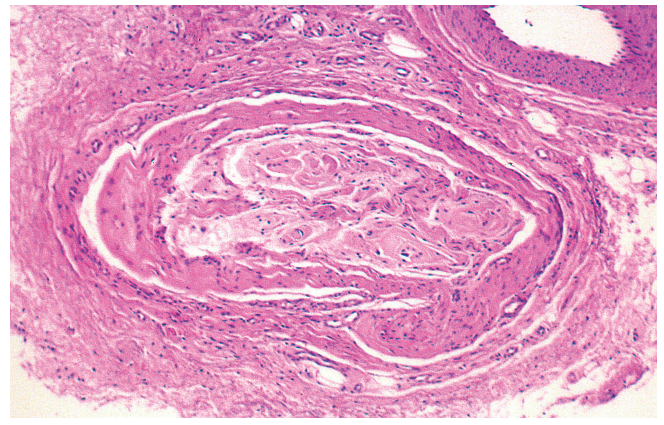


Fig. 7. Nerve fiber with fibrosis perineural concentric, fibrosis and endoneural axonal distortion. HE, x 200

had neuroma.

The most relevant histopathologic features after anatomopathological study of the pieces classified as neuromas are:

- Interstitial fibrosis and hypertrophy perineural, endoneural and epineural (Figs. 3-5)
- Hyalinization of the walls of endoneural blood vessels with sclerosis (Fig. 6).
- Demyelination with axonal loss (Fig. 7)

Discussion

Many authors consider neuromas and, in particular, Morton's neuroma (Morton, 1893), one of the most commonly presented neuromas, as a "false tumour" or a "non tumour". There is extensive literature regarding this matter that leads to debate between researchers. Among those that are against this definition, there are two strands of thinking. Firstly, some authors consider that a random proliferation of axons does not exist and they believe that it is a degenerative process, not a proliferation (Greer, 1994). The other strand considers it as a hyperplastic injury more than a hypertrophic injury (Delagoutte, 1989).

According to our studies we consider the different types of neuromas in the foot (excluding the iatrogenic or stump neuromas), whether they are superficial neuromas, interdigital neuromas, Joplin's neuromas or neuromas under the fifth metatarsal head, as an injury to continuity of a nerve due to certain compression and traction forces acting on it, revealing a series of structural changes that leads to a neuromatous thickening as a result of a peri and intraneural fibroblastic reaction. Therefore, we consider that the neuroma is a reactive pathomechanic aetiology as a final result of a continuous micro traumatism or injury of a chronic compression of nerve, due to abnormal gait, and aesthetic use of footwear.

And, as shown in our study, the digital plantar lateral branch of the subdivision of the plantar lateral nerve due to its journey is more susceptible to compression forces (Butterworth and Dockery, 1991) to an even in a greater extent when there is an excess load on the fifth metatarsal head, increasing the likelihood if this is diverted in abduction.

From a histological point of view, there are no differences between the neuroma under the fifth metatarsal head and any other interdigital neuroma. As figures 3, 4, 5, 6 and 7 show the presence of fibrosis in the epineurium, perineurium and endoneurium are diagnostic signs of this type of nerve injury. The typical histopathological report of a neuroma under the fifth metatarsal head is as follows (literal transcript from the histopathological report): "Fibrofatty tissue observed in the presence of nerve endings with a peri and intraneural fibrous proliferation. Also observed arteriolar muscle wall vases that show a decrease in lumen with intimal fibrosis and muscular wall".

Although some authors such as Marinelli and Valentin (2007) suggest different osteotomies by minimal incision for the surgical treatment of the pathology of the fifth ray, in particular for tailor's bunion removal, due to the high percentage of neuromas associated with this condition, we suggest a more suitable approach is to perform open surgery that gives the surgeon a wider scope to identify neuromas and the chance to remove them. If those are not removed, neurological symptoms can be persistent in the future.

Conclusions

1- The neuroma under the fifth metatarsal head may be considered a pathology often associated with other pathological processes of the fifth ray of the foot, especially to tailor's bunion, and more significantly to overload syndrome of the fifth metatarsal.

2- Consequently, considering the presence of this

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pathology a probability when performing surgery, it will aid the surgeon to perform a complete surgical treatment of the fifth ray of the foot.

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