

## Original Article

# Postoperative outcomes of oblique osteotomy and capsuloplasty for the treatment of bunionette in the fifth metatarsal neck

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## Abstract

**Objective:** Present the outcomes of oblique osteotomy and capsuloplasty based on the pre-/postoperative American Orthopaedic Foot & Ankle Society (AOFAS) scores and demonstrate the possibility of correcting all four types of bunionette through a single technique.

**Methods:** Descriptive observational study performed through medical records assessment based on the pre-/postoperative AOFAS scores.

**Results:** Fifty-three feet were operated on, 28 on the right side and 25 on the left, predominantly female (n=34) and one male. The mean age was 44.8 years (range 19-77). The improvement in the AOFAS score occurred in all patients, the preoperative mean was 53.7 (44-57), and the postoperative mean was 77.4 (65-80). The distal oblique osteotomy of the fifth metatarsal associated with capsuloplasty was used.

**Conclusion:** The technique used in our study presents a significant improvement in all cases, corroborating with the outcomes in the literature.

**Level of Evidence IV; Descriptive Observational Study.**

**Keywords:** Osteotomy; Metatarsal bones; Bunion; Postoperative.

## Introduction

The bunionette of the fifth metatarsal is defined as a painful prominence of the fifth metatarsal head secondary to a valgus deformity of the fifth ray and medial displacement of the fifth toe<sup>(1)</sup>.

The multifactorial etiology includes anatomical and biomechanical variations, enlargement of the metatarsal head, lateral deviation in the metadiaphyseal transition, and increased intermetatarsal angle. Most commonly, the deformity results from an increased 4-5 intermetatarsal angle and varus of the metatarsophalangeal joint<sup>(2)</sup>.

The pathology occurs more frequently in adolescents and adults. Its prevalence is 13.8%, with a mean age of 45 years<sup>(3)</sup>, and affects 3-6 times more women than men<sup>(4)</sup>.

According to Lui et al.<sup>(2)</sup>, the patient can present dorsolateral, lateral and/or plantar pain. Symptoms are mechanically induced by using narrow shoes and are often associated with diffuse callosity and chronic irritation of the bursae. The diagnosis is based on clinical and radiographic findings.

As described by Coughlin et al.<sup>(5)</sup>, the bunionette can be classified into three subtypes: enlargement of the metatarsal head (type 1), lateral deviation in the metadiaphyseal transi-

Study performed at the Conjunto Hospitalar do Mandaqui, São Paulo, São Paulo, Brazil.

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tion (type 2), and increased 4-5 intermetatarsal angle (type 3). Fallat et al.<sup>(6)</sup> described type 4, a combination of these abnormalities.

Non-surgical treatment aims to relieve symptoms. The treatment involves footwear changes, or use of insoles and/or orthoses, presenting satisfactory results in mild cases<sup>(7)</sup>. Surgical treatment can be considered in patients with refractory symptoms<sup>(8)</sup>.

Surgical techniques include lateral condylectomy, metaphyseal osteotomy (distal or proximal), and fifth metatarsal open or percutaneous diaphyseal osteotomy<sup>(9)</sup>. The proximal metaphyseal osteotomy is suitable for types 3 and 4, while the distal is used for types 2 and 3. Diaphyseal osteotomy is recommended if more corrections are needed than would be achieved with a distal osteotomy.

The outcomes of surgical treatment with osteotomy are satisfactory, with low complication rates<sup>(10)</sup>.

This descriptive observational study was conducted to evaluate patients submitted to oblique osteotomy and capsuloplasty, a technique used to correct all four types of deformity and supination-adduction deformity of the fifth toe (present in 20% of our cases) and compare our results with the literature. This study is relevant because of the high prevalence of this pathology in orthopedic practice. Therefore, it can generate valuable information in applying a reproducible technique with excellent results and very low complication rates.

## Methods

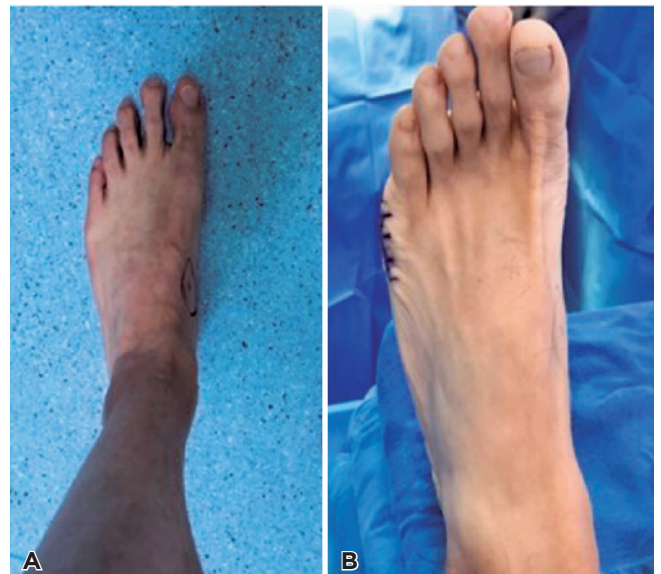
This study was approved by the Institutional Ethics Committee. A descriptive, observational study including thirty-five medical records of patients submitted to surgical treatment between January 2010 and January 2021 from a reference public orthopedic service, according to the inclusion/exclusion criteria.

The inclusion criteria were patients aged 18 years or older, diagnosed with bunionette of the fifth metatarsal and submitted to surgical treatment by the same surgeon, with oblique osteotomy and capsuloplasty, after non-surgical treatment for at least six months.

Exclusion criteria were patients' refusal to access the medical record, under 18 years, and patients cognitively unable to understand the terms of the informed consent form.

The surgical technique used was the same in all patients, regardless of the type of fifth metatarsal deformity. Patient in dorsal decubitus with a cushion under the ipsilateral gluteus, tourniquet at the thigh root, mean incision of 3cm in the transition of the dorsoplantar skin lateral to the fifth metatarsal, the opening of the capsule in line with the skin incision with careful detachment and wide exposure of the fifth metatarsal neck and base of the proximal phalanx of the fifth toe. As shown in Figure 1A-B a short oblique osteotomy was performed from distal lateral to proximal medial in the fifth metatarsal neck. The prominence of the proximal fragment was resected and regularized to leave no bone prominence. Then,

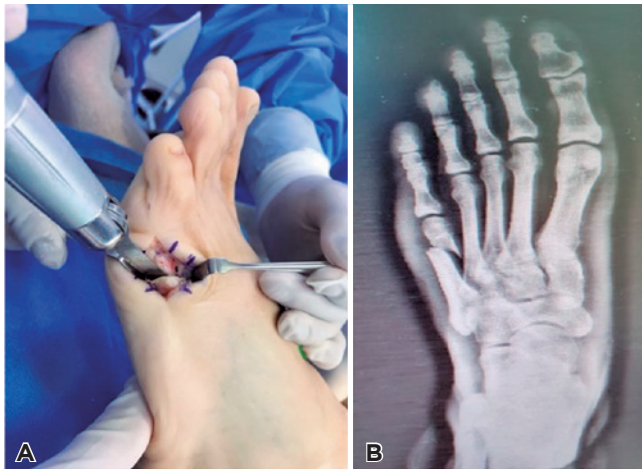
one 2.0mm anchor was placed (Figure 2) on the fifth metatarsal head. Its threads were passed through the dorsal and plantar capsule, keeping the fifth metatarsal head in the medial position, simultaneously correcting the supination-adduction (Figure 3A-B) of the fifth toe when necessary. The closure was performed by layers, compressive dressing, and a robotfoot boot. On the postoperative, the patients were instructed to ambulate with partial load for short periods, and the stitches were removed after 21 days. The patients were asked to perform active and passive movement of the fifth toe in the same period, and the boot was removed six weeks after surgery. Then the use of wide and comfortable footwear was authorized. Around 90 days, the patients could use common, daily, and recreational shoes. Figure 4 shows the osteotomy consolidated.



**Figure 1.** A) Preoperative and B) Immediate postoperative.



**Figure 2.** Anchor fixation.



**Figure 3.** A) Osteotomy, intraoperative, and B) Postoperative radiographic image.



**Figure 4.** Postoperative radiographic image showing the osteotomy consolidated.

The study was based on medical records analysis, including epidemiological data and American Orthopaedic Foot & Ankle Society (AOFAS) score assessment on preoperative and between 90-120 days postoperative.

AOFAS is a standardized system to assess the treatment outcomes of patients with foot and ankle conditions to conduct the patients' pre-/postoperative analyses. This score was completed in all pre-/postoperative consultations in patients indicated for surgical treatment.

The following data were compiled from medical records, gender, age, comorbidities, laterality, practice of physical activity, supination-adduction deformity, complications, pre-/postoperative AOFAS scores, and year of surgery.

The data were compiled on Microsoft Excel® (Microsoft Corporation, Redmond, Washington, USA). Descriptive statistics were used to determine the normal distribution and compare the means of AOFAS scores. The Shapiro-Wilk test was performed to verify normal distribution. The paired Student's *t*-test was used to compare the means of pre-/postoperative AOFAS scores. The Mann-Whitney U test would be applied in case of nonparametric distribution. A significance level of  $p < 0.05$  ( $\alpha = 0.05$ ) was applied.

The study was explained to the patients via contact by the researcher, and then the informed consent form was signed.

## Results

The study was based on medical records analysis, including epidemiological data and AOFAS score assessment on preoperative and between 90-120 days postoperative. All medical records contained the data and met the necessary criteria. There was no exclusion in the study.

Table 1 shows the epidemiological data. A total of 53 feet were included from 35 patients, 34 (97.1%) female, and one (2.8%) male. The mean age was 44.8 years, ranging from 19 to 77 years. In the laterality, 28 patients (52.8%) were affected on the right side and 25 (47.2%) on the left side.

In our sample, 12 patients practiced physical activity. Among the activities, the most common was running. Only two patients had comorbidity among the 35 patients. Supination-adduction deformity of the fifth toe was found in 20% of cases ( $n = 7$ ). Regarding complications, four dehiscences (7.5%) were treated with serial dressing and three pseudarthroses (5.6%) without surgical intervention.

Table 2 shows the improvement in the AOFAS scale in all patients, the preoperative mean was 53.7 (44-57), and the postoperative mean was 77.4 (65-80). There was a nonparametric distribution between the groups of scores, and the Mann-Whitney U test was used, which showed a significant difference between the pre-/postoperative groups. ( $U = 0$ ,  $p < 0.00001$  ( $\alpha = 0.05$ )).

**Table 1.** Epidemiological data of the patients analyzed

Name	Sex	Age	Side	Activity	Comorbidities	Supination-adduction	Complications	Preop AOFAS	Postop AOFAS	Year of surgery
1	Female	76	Right	Inactive	No	No	No	52	72	2010
2	Female	77	Left	Inactive	No	No	No	52	72	2010
3	Female	26	Bilateral	Inactive	No	No	No	57	80	2010
4	Female	33	Bilateral	Run	No	No	No	57	80	2011
5	Female	56	Right	Inactive	No	Yes	No	57	80	2011
6	Female	25	Bilateral	Run	No	No	Dehiscence	57	80	2011
7	Female	23	Bilateral	Inactive	No	Yes	No	57	80	2011
8	Female	60	Bilateral	Inactive	No	No	No	52	80	2012
9	Female	69	Right	Inactive	No	No	No	52	80	2012
10	Female	35	Bilateral	Tenis	No	No	No	57	80	2012
11	Female	27	Bilateral	Inactive	No	No	Dehiscence (left)	57	80	2013
12	Female	55	Right	Inactive	No	Yes	Pseudoarthrosis	44	62	2013
13	Female	57	Right	Inactive	No	No	No	57	80	2013
14	Female	31	Bilateral	Volleyball	No	No	No	57	80	2013
15	Female	53	Left	Walking	No	No	Pseudoarthrosis	52	70	2014
16	Female	49	Left	Walking	No	No	No	52	80	2014
17	Female	47	Left	Inactive	Obesity	Yes	No	57	80	2014
18	Female	30	Bilateral	Inactive	No	No	No	57	80	2014
19	Female	42	Right	Run	No	No	No	57	80	2015
20	Female	54	Bilateral	Inactive	No	Yes	Dehiscence	52	80	2016
21	Female	57	Left	Inactive	Rheumatoid arthritis	No	No	57	80	2016
22	Female	37	Right	Inactive	No	Yes	No	57	80	2016
23	Female	42	Bilateral	Fighting	No	No	No	57	80	2016
24	Female	42	Right	Inactive	No	No	No	57	80	2016
25	Female	27	Bilateral	Cross-fit	No	No	Pseudoarthrosis	44	65	2017
26	Female	27	Bilateral	Run	No	No	No	57	80	2018
27	Female	38	Left	Run	No	No	No	57	80	2018
28	Female	19	Bilateral	Soccer	No	No	No	57	80	2019
29	Female	55	Bilateral	Run	No	No	No	57	80	2019
30	Female	60	Left	Inactive	No	Yes	No	44	75	2019
31	Female	35	Right	Inactive	No	No	No	57	80	2019
32	Female	46	Bilateral	Inactive	No	No	No	44	75	2019
33	Female	63	Right	Inactive	No	No	No	44	75	2020
34	Female	39	Bilateral	Inactive	No	No	No	57	80	2020
35	Male	59	Bilateral	Inactive	No	No	Dehiscence	44	65	2021

AOFAS: American Orthopedic Foot and Ankle Society.  
Source: Authors

**Table 2.** Comparison between pre-/postoperative AOFAS scores

	Preoperative AOFAS	Postoperative AOFAS
Mean	53.77	77.45
Median	57	80
Standard deviation	4.92	5

AOFAS: American Orthopedic Foot and Ankle Society.  
Source: Authors

## Discussion

The chosen surgical technique in this study, the use of the 2.0mm anchor in the fifth metatarsal head, allowed a better rotation control of the head and gave the possibility to control how much medial deviation was necessary to correct each deformity. The stitch passed with the anchor wire through the capsule is made in a U-shaped dorsal and plantar position

in a way where the stitches help to control with good precision how much it is necessary to correct the rotation of the fifth toe and also how much of medial deviation of the metatarsal head to give a fine tune to the correction.

The bunionette of the fifth metatarsal is a common pathology in a foot and ankle outpatient clinic with varied clinical conditions and may present from mild to disabling symptoms.

Our study showed that the highest prevalence of this pathology in mature adults (mean age: 44.8 years) were female (97.14%). When compared to the current literature, our results were compatible with Mazoteras-Pardo et al.<sup>(3)</sup> with a mean age of 45 years and the Laffenêtre et al.<sup>(4)</sup> with an involvement 3-6 times more in women than men.

The aim of Tonogai et al. study<sup>(9)</sup> was to evaluate the vascularization of the fifth metatarsal through barium injection and tomographic evaluation, and they concluded that the nutrient artery penetrates the fifth metatarsal in the medial position around the junction of the middle and proximal thirds with distal direction. Thus, the direction and location of the nutrient artery of the fifth metatarsal are important when performing an osteotomy because a proximal osteotomy can interrupt blood flow in the artery, resulting in osteonecrosis or pseudarthrosis. The conclusion of this study explains the low rate of these complications in our studies, pseudarthrosis (5.6%) without long-term clinical repercussion and no osteonecrosis (0%).

Martijn et al.<sup>(10)</sup>, in a meta-analysis including 28 studies aiming to define the best osteotomy for bunionette of the fifth metatarsal, concluded that the lowest number of complications occurred with distal osteotomies. This data is comparable to our findings, which demonstrated only four superficial wound dehiscences, controlled with serial dressings, and three pseudarthroses without surgical intervention. Therefore, distal osteotomy may be the treatment of choice due to its low complication rates and is an easy-to-reproduce technique. Furthermore, data from this study corroborate

our outcomes, which demonstrated the improvement in the AOFAS scores in all patients (mean preoperative 53.7 and postoperative 77.4). It is important to highlight that in this meta-analysis, only two studies had a higher number of cases than ours.


The study by Magnan et al.<sup>(11)</sup> evaluated the results of percutaneous subcapital osteotomy of the fifth metatarsal in 30 patients from 1996 to 2006, concluding that the percutaneous technique is safe and reliable and also offers the potential benefits of a minimally invasive procedure. Similar to the literature, our study showed low complication rates and significant improvement in postoperative AOFAS scores in all patients. Thus, comparing the results of the open and percutaneous techniques, it can be inferred that they present satisfactory results; however, to date, no relevant studies define superiority between these treatment options.

Our study had limitations, such as a higher statistical value with a larger sample; however, it can contribute to future meta-analyses. In the literature research, it was not found any study that referred to the deformity of the fifth toe (present in 20% of our cases); although the pre-/postoperative comparison between patients with supination-adduction deformity was not performed due to low statistical sampling, the preliminary findings suggest that the scores increase even within this group.

Ultimately, based on our outcomes, the distal oblique osteotomy technique and capsuloplasty for the surgical treatment of bunionette in the fifth metatarsal proved to be reliable, reproducible, and with low complication rates.

## Conclusion

The surgical technique used in our study presents a significant improvement in the postoperative AOFAS scores in all patients with low complication rates.

**Authors' contributions:** Each author contributed individually and significantly to the development of this article: GDFJ \*(<https://orcid.org/0000-0003-2410-4691>) Wrote the article, interpreted the results of the study; JMN \*(<https://orcid.org/0000-0002-0837-4037>) Conceived and planned the activities that led to the study, wrote the article, participated in the review process, approved the final version; CASA \*(<https://orcid.org/0000-0002-2533-5793>) Wrote the article, participated in the review process; AMO \*(<https://orcid.org/0000-0003-2364-3183>) Wrote the article, participated in the review process; DSL \*(<https://orcid.org/0000-0003-4401-5354>) Wrote the article, participated in the review process; RSM \*(<https://orcid.org/0000-0002-7120-1649>) Wrote the article, participated in the review process. All authors read and approved the final manuscript. \*ORCID (Open Researcher and Contributor ID) 

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