

SCARF OSTEOTOMY FOR HALLUX VALGUS CORRECTION: RADIOLOGICAL AND CLINICAL ANALYSIS

OSTEOTOMIA DE SCARF PARA CORREÇÃO DO HÁLUX VALGO: ANÁLISE RADIOLÓGICA E CLÍNICA

BRUNO AIR MACHADO DA SILVA¹ , DANIEL ALMEIDA ZANDONÁ² , DIEGO BRANDÃO SIQUEIRA² ,
REINALDO ANTÔNIO ALVES JUNIOR² 

1. Hospital de Urgências de Aparecida de Goiânia e Instituto Ortopédico de Goiânia, Goiânia, GO, Brazil.
2. Instituto Ortopédico de Goiânia, Goiânia, GO, Brazil.

ABSTRACT

Objectives: This article aims to radiographically and clinically evaluate the results of the surgical correction of hallux valgus using the scarf technique. The pre- and postsurgical hallux valgus angles – metatarsophalangeal angle (MP), intermetatarsal angle (IM), and degree of dislocation of the sesamoids – were retrospectively evaluated, as well as their clinical parameters. **Methods:** 70 pre- and postoperative radiographs of patients undergoing surgical correction of hallux valgus by the scarf osteotomy technique were retrospectively evaluated. The American Orthopedic Foot And Ankle Society Score (AOFAS) was used for pre- and postoperative clinical evaluation. **Results:** There was a statistically significant improvement in the MP, IM, and sesamoid position, in addition to the clinical improvement verified by the AOFAS. **Conclusion:** Scarf osteotomy improves the MP and IM angles and correct the position of the sesamoid, as well as improve the AOFAS. **Level of Evidence IV, Retrospective Comparative Study.**

Keywords: Hallux Valgus. Osteotomy. Bunion.

RESUMO

Objetivos: Analisar radiograficamente e clinicamente os resultados da correção cirúrgica do hálux valgo pela técnica de Scarf, assim como os ângulos pré e pós-cirúrgico do hálux valgo – ângulo metatarsofalângico (MTF) e ângulo intermetatarsal (IM) –, grau de luxação dos sesamóides e parâmetros clínicos. **Métodos:** Foram avaliadas retrospectivamente 70 radiografias com carga pré e pós-operatórias dos pacientes submetidos à correção cirúrgica do hálux valgo pela técnica de osteotomia de Scarf. Para avaliação clínica pré e pós-operatória foi utilizado a escala da American Orthopaedic Foot And Ankle Society (AOFAS). **Resultados:** Foi observado melhora estatisticamente significativa dos ângulos MTF e IM e posição dos sesamóides, além de melhora clínica verificada pela escala AOFAS. **Conclusão:** A osteotomia de Scarf é capaz de melhorar os ângulos MTF e IM e corrigir a posição dos sesamóides, acompanhado da melhora da escala AOFAS. **Nível de Evidência IV, Estudo Retrospectivo Comparativo.**

Descritores: Hallux Valgus. Osteotomia. Joanete.

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INTRODUCTION

Hallux valgus – first described by Carl Heuter in 1871¹ – is a complex and progressive deformity that interferes with the forefoot aesthetics, characterized by lateral hallux deviation, varus or medial deviation of the first metatarsal, and pronation on the longitudinal axis

Treatment options range from changing shoes to surgical intervention. There are more than 130 procedures described to correct first metatarsal variance; distal osteotomies are usually indicated for mild deformities and proximal osteotomies, for more severe deformities.²

The Z osteotomy of the first metatarsal for the treatment of hallux valgus was described by Burutarán in 1976,³ later revised by

Gudas and Zygmunt in 1982, and modified by Weil in 1984.⁴ Weil and Borelli popularized the technique in the United States while Barouk disseminated it in Europe and worldwide.⁵ Since then, scarf osteotomy has become one of the options for treating hallux valgus.

Scarf osteotomy versatility lies on its ability to correct the intermetatarsal angle and the distal metatarsal joint angle simultaneously by a lateral translation and medial rotation of the plantar fragment. This osteotomy allows the health professional to lengthen or shorten the first metatarsal while correcting plantar or dorsal deviation.⁵ Each correction is performed by maintaining a large contact area

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The study was conducted at Instituto Ortopédico de Goiânia.

Correspondence: Bruno Air Machado da Silva. Rua T 27, Goiânia, GO, Brazil, 74210200. brunoairmachado@hotmail.com

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between the fragments, allowing an excellent consolidation when compared to other osteotomies.⁶ This retrospective study aims to evaluate the clinical and radiological results of scarf osteotomy.

METHODS

The study was submitted to Plataforma Brasil and approved by the Ethics Committee through the CAAE protocol: 29159720.1.0000.5082; all patients signed a consent term. This is a quantitative, retrospective, descriptive, and exploratory study. It was developed using radiological evaluations and the American Orthopedic Foot And Ankle Society Score (AOFAS) of patients diagnosed with hallux valgus who underwent scarf osteotomies.

The inclusion criteria were patients with clinical and radiographic diagnosis of hallux valgus who underwent scarf osteotomy with at least one year of follow-up. The exclusion criteria were: 1) patients diagnosed with rheumatological diseases and/or neurological diseases, 2) patients without radiographs after one year of follow-up, and 3) those who did not respond to the AOFAS survey.

A total of 67 patients (97 feet) who met the inclusion criteria were evaluated. Among them, nine were excluded (four patients with rheumatoid arthritis, two patients with cerebral palsy, and three patients who did not respond the AOFAS), leaving 56 patients (70 feet) for the final sample.

The mean age of patients at the time of surgery was 48.61 years (ranging from 13 to 78 years), with a higher prevalence of females, 91% (51) and five males (9%) (Table 1).

The surgeries were performed by a senior surgeon (M.B.) with the patient in the supine position with a tourniquet at ankle level , at 250 mmHg. Firstly, a medial incision was made, from the base of the proximal phalanx of the hallux to the proximal third of the diaphysis of the first metatarsal. Then, a lenticular incision was made in the joint capsule, resecting an ellipse at the level of the first metatarsal and later dorsal and medial release for visualization of the metatarsal. Subsequently, the sesamoid was released by the same access route, releasing only the lateral suspensory ligament.

Table 1. Sample characteristics

CHARACTERISTIC	MALE		FEMALE		TOTAL	
Individuals	5	9%	51	91%		56
Right foot	3	4%	38	54%	41	70
Left foot	4	6%	25	36%	29	
Minimum and maximum age	< 28	> 47	< 13	> 78	< 13	> 78
Mean age	40.40		49.41			48.61

Bone cuts were made with the aid of an appropriate guide. Firstly, a 1.0 mm Kirschner (K) wire was inserted into the medial metaphysis, at the level of the 1st metatarsal head in the dorsal third proximal to the articular cartilage. The guide was placed on the k-pin directed to the plantar third of the metatarsal proximal metaphysis.

The longitudinal cut was performed with an oscillating saw through the guide. The guide was then rotated on the K wire to make the distal cut with an angle of 70–90° in relation to the longitudinal cut. The distal cross-section was made approximately 5 mm proximal to the articular cartilage. The proximal transverse bone section is made freehand following the same direction as the K wire (Figure 1).



Figure 1. K wire with osteotomy guide.

After all the cuts were made, the plantar fragment was dislocated laterally to an ideal position (sesamoid centered on the head of the 1st metatarsus) and provisionally stabilized with forceps (Figure 2). Fixation was done with 2.7 mm headless screws, one more distal and the other proximal (Figure 3). The capsule was then sutured with 2-0 Vicryl thread and intradermal suture with 4-0 Monocryl.



Figure 2. Lateral dislocation of plantar fragment.



Figure 3. Fixed osteotomy with two screws.

During the first postoperative week, weightbearing was authorized, with therapeutic sandals, limited to essential activities (going to the bathroom, getting food). In the second week, patients were allowed to walk with a rigid sole tennis shoes, without crutches.

Physical therapy is initiated in the second week with passive movements of the metatarsophalangeal joint of the hallux and resistance exercises to strengthen the hallux flexors. After three months, patients were allowed to participate in any type of physical activity and use any type of footwear.

The angles between the first and second metatarsus (IM), the angle between the first metatarsus and the proximal phalanx of the hallux (MTP),⁷ and the position of the medial sesamoid were measured, which were graduated from 0 to 3 in relation to the anatomical axis of the first metatarsal according to a technique by Smith et al.⁸ The radiographs evaluated were those from the preoperative period and one year after surgery.

The AOFAS⁹ was applied in the preoperative consultation and one year after the surgical procedure.

RESULTS

The mean values of the MTP and IM angles in the preoperative were 29.60° and 16.79°, respectively. Both decreased significantly in the postoperative period ($p < 0.00001$). We found a statistically considerable increase ($p < 0.00001$) in the AOFAS score (Table 2).

EVALUATION	Preoperative	Postoperative	p-Value
	MEAN	MEAN	
Intermetatarsal angle I-II	16.79° (11-20)	7.19° (5-11)	< 0.00001
Metatarsophalangeal angle	29.60° (18-41)	13.07° (12-20)	< 0.00001
AOFAS	51.3 (32-68)	89.6 (68-97)	< 0.00001

When assessing the position of the sesamoid in the preoperative period we noticed that 99% of the evaluated feet had some degree of displacement of the medial sesamoid. In the postoperative period, 83.3% of the cases presented complete correction of the medial sesamoid in relation to the head of the first metatarsus.

DISCUSSION

The scarf osteotomy is a versatile procedure, it allows for an accelerated recovery while preserving the mobility of the MTP joint of the hallux. Its versatility lies in the potential to correct the distal joint angle by lengthening or shortening the first ray and correcting the plantar deviation of the head of the first metatarsus in a single osteotomy. Additionally, due to the stability provided by its "z" configuration

and the large bone contact area, the procedure provides more security for a more aggressive rehabilitation and weightbearing, factors that help maintain the mobility of the hallux MTP.¹⁰

The objective of this osteotomy is to obtain a congruent joint, free of pain and deformity, allowing patients to use closed shoes. Radiological correction is one of the parameters to achieve such objectives.¹¹

The potential of radiological correction and clinical improvement has been demonstrated over the years. Perugia et al. showed a 9.9° correction of the IM angle, 21.1° of MTP angle, improvement in the position of the medial sesamoid by 2.3 points and improvement of the AOFAS scale by 54.1 points. According to these authors, the improvement of these parameters is strongly related to the patient's clinical improvement.¹² These results corroborate ours since the improvement was significant in all evaluated parameters. In the work of Perugia et al.¹² only severe cases (IM > 16°) were included, which explains a greater variation in the AOFAS scale (54.1 × 38.3) and in the MTF angle (21.1 × 16.53).

The study by Aminian et al.¹³ found results similar to ours. They demonstrated an improvement in the AOFAS score (pre-op. 54.5 and post-op. 86.5), decreased IM angle (pre-op. 15.4 and post-op. 10.1), and decreased MTP angle (pre-op. 34.5 and post-op 16.9). Notably, they did not evaluate the position of the sesamoid.¹³ Other studies evaluated the same parameters and found results that corroborate ours.¹⁴⁻¹⁶ This reinforces the corrective potential of the scarf osteotomy and the clinical improvement following the procedure. Nery et al.¹⁷ emphasized the technical difficulty of the procedure, with a long learning curve and a complication rate of 17%. The author notes that complications occur in the first 26 patients, with another 43 feet operated in the sequence having no complications. The most common complications were dorsal fracture of the proximal fragment (10%) and shortening of the first metatarsus (6%). In our study, we did not observe any of these complications, but we agree that the learning curve of the technique is long. One factor that can justify our low complication rate is that all surgeries were performed by a senior surgeon, who has been performing the procedure since 2012. The cases evaluated were from 2017, thus the surgeon had over five years of experience with this technique.

Despite a considerable number of cases, the limiting factor of this study is the short follow-up of patients. The 1-year follow-up is not able to rule out a possible late recurrence. Studies have observed that recurrences can occur even in the first 1.5-2.8 years.¹⁸

CONCLUSION

Scarf osteotomy improves MTP, IM angles, and corrects the position of the sesamoid, as well as improves the AOFAS score of patients.

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