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CLINICAL AND FUNCTIONAL OUTCOMES OF SURGICAL RECONSTRUCTION OF THE RHEUMATOID FOREFOOT: CASE SERIE

DESFECHOS CLÍNICOS E FUNCIONAIS DA RECONSTRUÇÃO CIRÚRGICA DO ANTEPÉ REUMATOIDE: SÉRIE DE CASOS

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ABSTRACT

Objective: To evaluate the changes in quality of life and function of patients with rheumatoid arthritis submitted to reconstruction of the forefoot by resection arthroplasty of the 2nd to 5th metatarsal heads by plantar route – associated with arthrodesis of the hallux metatarsophalangeal joint by medial route. Methods: This is a series of retrospective cases of patients with confirmed diagnosis of rheumatoid arthritis submitted to resection arthroplasty of the 2nd to 5th metatarsal heads by plantar route – associated with arthrodesis of the hallux metatarsophalangeal joint via medial route. Data were collected through anamnesis, clinical examination and application of functional score questionnaires (AOFAS – for smaller toes and hallux) and quality of life (EQ-5D) before the surgical procedure and at least 12 months postoperatively. Results: We evaluated 26 feet of 23 patients with a mean age of 62.8 years, submitted to the same procedure. The AOFAS functional evaluation of the minor fingers in the pre- and post-operative increased from 42.4 to 85.8 ($p < 0.01$), and the hallux AOFAS from 41.5 to 78.5 ($p < 0.01$). In the evaluation of quality of life, there was an improvement in the EQ5 score. Conclusion: Performing the procedure properly and with multidisciplinary follow-up is the main factor to obtain good results in patients with rheumatoid feet with severe deformities, resulting in functional improvement and quality of life. ***Level of Evidence IV, Case series.***

Keywords: Arthritis, Rheumatoid. Forefoot, Human. Arthroplasty. Quality of Life.

RESUMO

Objetivo: Avaliar as modificações na qualidade de vida e função de pacientes portadores de artrite reumatoide submetidos a reconstrução do antepé por meio de artroplastia de ressecção da cabeça dos metatarsos do 2º ao 5º por via plantar – associado a artrodese da articulação metatarsofalangeana do hálux por via medial. Métodos: Trata-se de uma série de casos retrospectiva de pacientes com diagnóstico confirmado de artrite reumatoide submetidos à artroplastia de ressecção da cabeça dos metatarsos do 2º ao 5º por via plantar – associado à artrodese da articulação metatarsofalangeana do hálux por via medial. Os dados foram coletados por meio de anamnese, exame clínico e aplicação de questionários de escore funcional (AOFAS – para dedos menores e hálux) e qualidade de vida (EQ-5D) antes do procedimento cirúrgico e com pelo menos 12 meses de pós-operatório. Resultados: Foram avaliados 26 pés de 23 pacientes com idade média de 62,8 anos, submetidos ao mesmo procedimento. A avaliação funcional AOFAS dos dedos menores pré e pós-operatória foi de 42,4 para 85,8 ($p < 0,01$), e a AOFAS hálux foi de 41,5 para 78,5 ($p < 0,01$). Na avaliação da qualidade de vida houve melhora do escore EQ5. Conclusão: A realização do procedimento de forma adequada e com acompanhamento multidisciplinar é o principal fator para obter bons resultados em pacientes portadores de pés reumatoides com deformidades graves, resultando em melhora funcional e da qualidade de vida. ***Nível de Evidência IV, Série de casos.***

Descritores: *Artrite Reumatoide. Antepé Humano. Artroplastia. Qualidade de Vida.*

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INTRODUÇÃO

The involvement of the forefoot in rheumatoid arthritis (RA) has an enormous influence on the morbidity and functional decline of patients with this pathology. Around 40 to 80% of individuals affected by RA will present some deformity in this region, greatly affecting their quality of life.[1-3] The most prevalent deformities are hallux valgus associated with dislocation or subluxation of the smaller toes, which are the main responsible for the metatarsalgia of difficult control, commonly observed in these patients.[4,5]

The recognition and early treatment of patients with RA has allowed them to develop fewer deformities over time. Chao et al.[6] showed good results with the use of joint preservation techniques in patients with rheumatic arthritis under control and without signs of joint degeneration.[7]

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However, patients who do not have adequate control of the disease or with late diagnosis evolve with deformities in the feet. Among them, the hallux valgus, the deformity of the fingers associated with subluxation or dislocation of the metatarsophalangeal joint of the fingers are responsible for generating calls, metatarsalgia difficult to control and difficulty in the use of closed shoes, affecting the mobility and performance of occupational and recreational activities of these patients.[8]

Once the deformity is consolidated, the conservative treatment is based on reducing the effect and pressure on the forefoot as well as reducing the friction between toes and footwear or soil. Then, patients are oriented how to choose suitable shoes – firm sole with wide and high anterior chamber. However, when there is failure of the conservative treatment or in very severe deformities, surgical correction may be indicated.[8]

The surgical management of the rheumatoid forefoot involves the correction of the toes deformities, maintaining the metatarsal formula to harmonize the distribution of plantar load and to resect diseased tissues.[9] In severe cases, these objectives can be achieved with some procedures such as resection arthroplasty of the metatarsal heads for the deformities of the smaller toes, associated with arthrodesis of the hallux metatarsophalangeal joint or resection arthroplasty of the head of the first metatarsal bone, described by Mayo in 1908.[10-16]

This study evaluates the changes in quality of life and function of patients who underwent a reconstructive procedure of the forefoot affected by RA. Patients were submitted to resection arthroplasty of the head of the metatarsal, from the 2nd to the 5th, by plantar route – associated with arthrodesis of the hallux metatarsophalangeal joint by medial route.

MATERIALS AND METHODS

This study was approved by the Research Ethics Committee, registered in *Plataforma Brasil*, under the CAAE No.: 77827517.5.0000.0068. This is a series of retrospective cases with patients followed in the outpatient clinic of foot and ankle service, submitted to arthrodesis of the hallux metatarsophalangeal joint by medial route, associated with resection arthroplasty of the heads of the second to fifth metatarsal bones by plantar route. Data were collected with anamnesis, clinical examination, and application of functional score questionnaires (AOFAS – for smaller toes and hallux) and quality of life (EQ-5D) before the surgical procedure and at least 12 months post-surgery. All participants signed the informed consent form.

Inclusion criteria:

- Patients with a confirmed diagnosis of rheumatoid arthritis, followed up at the rheumatology outpatient clinic of the Hospital das Clínicas de São Paulo
- Aged more than 18 years
- Complaint of forefoot deformity and metatarsalgia, patients refractory to conservative treatment

Exclusion Criteria:

- Performing simultaneous procedures in the hindfoot
- Follow-up time of less than one year

For the scheduling of the surgical procedure, the patient needed a report from the rheumatologist who presented the surgical release and guidance on the management of his medications during the pre, intra, and postoperative period.

Epidemiological data of patients such as gender, age and comorbidities were collected. The AOFAS questionnaire (smaller toes and hallux) was applied to all patients and Quality of Life questionnaire EQ-5D, before and at least one year after the procedure. All patients filled out the informed consent form and the personal data were kept confidential.

The AOFAS smaller toes and hallux scores are classified from 0 to 100 points, being 0 considered severe functional limitation and 100 when there is no limitation. The EQ5 questionnaire assesses patient's quality of life, ranging from 5 to 15 points, and the higher its value, the worse the expected quality of life. Statistical evaluation was performed using student's t-test.

The surgical procedure consisted of arthroplasty resection of the lateral metatarsal heads through plantar access, with a transverse incision to the longitudinal axis of the foot, at the level of the four lateral metatarsals heads, dissection and exposure, followed by osteotomy at the level of the metatarsal neck, focusing in keeping the metatarsal formula.[10,13] By a longitudinal medial approach, under the hallux metatarsophalangeal joint, capsulotomy and joint exposure were performed, followed by blood cleansing of the articular surfaces that compose the metatarsophalangeal joint. After proper positioning, arthrodesis was fixed with an interfragmentary compression screw associated with a neutralization plate in a medial dorsal position (Figure 1).

Figure 1. Pre- and intra-operative clinical and radiographic images. **A** and **B:** Clinical images of the forefoot present severe hallux valgus associated with "crossfinger' of the toes; **C:** Dorsal clinical image of the foot demonstrating impression of the heads of 2, 3, and 4 metatarsal bones on the plantar fat pad (arrow); **D:** Anteroposterior radiography of the preoperative foot shows severe hallux valgus associated with dorsal dislocation of the 2,3, 4, and 5 toes; **E:** Intraoperative clinical image shows the ease of approach of the lateral metatarsal heads through the plantar pathway; **F:** Plantar clinical image of the foot after resection arthroplasty of the lateral heads and metatarsophalangeal arthrodesis of the hallux shows satisfactory alignment of toes; **G** and **H:** Clinical images show correct positioning of the arthrodesis of the metatarsophalangeal joint with preserved mobility of hallux interphalangeal joint; **I:** Postoperative fluoroscopy demonstrates alignment of the toes and preserved metatarsal formula.

Then, patients were kept with bandage, positioning the toes aligned in relation to the metatarsal bones, without load until removal of the plantar suture, usually until the third week. The patients returned weekly for bandage change and evaluation of the surgical wound. Soon after, the load was released with rigid sole shoes associated with dorsal orthosis made-to-measure by the occupational therapy team in order to maintain the proper positioning of the toes. The orthosis was maintained full-time for six weeks, followed by a period of exclusive night time use for another six weeks (Figures 2 and 3).

Figure 2. Third week in postoperative period, with the beginning of the orthosis use. **A** and **B:** Plantar clinical images of the foot without and with orthosis, respectively, demonstrating its ability to keep the lateral toes positioned correctly; **C:** Dorsal clinical image of the foot without orthosis showing dorsal edema; **D:** Dorsal clinical image of the foot with orthosis. Due to the progressive reduction of edema, it is important to weekly review and to remodel the orthosis to ensure the maintenance of its function.

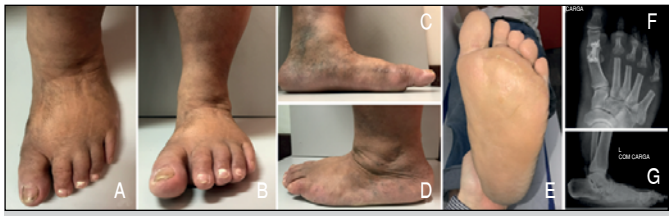

Figure 3. Clinical and radiographic images three months after surgery. **A** and **B:** Clinical imaging shows the alignment of the toes; **C** and **D:** Lateral clinical images of the foot show the positioning of the toes in relation to the soil; and: Clinical image of the plantar surface of the foot shows absence of plantar calluses and distal scar to the loading region; **F** and **G:** Radiography in front and profile of the foot with load, demonstrating the arthrodesis consolidation and postoperative metatarsal formula obtained.

RESULTS

In total, 26 of 23 patients underwent arthrodesis of the hallux metatarsophalangeal associated with resection arthroplasty of the metatarsal heads, from the second to the fifth, with a mean follow-up time of 72 (12-168) months (Table 1).

Table 1. General sample characteristic

General characteristics:	
Number of patients	23
Number of feet operated	26
Mean age	62.8 (52-80)
Sex F/M	(23/0)
Mean follow-up time (months)	72 (12-168)
Postoperative complications	1
Comorbidities	
– Hypertension	7
– Diabetes mellitus	1
– Heart failure	1
– Hypothyroidism	1

On average, the patients were aged 62.8 years (52-71). All patients were diagnosed with rheumatoid arthritis, among them, seven had a diagnosis of arterial hypertension, one of diabetes mellitus without peripheral neuropathy and one patient reported asthma. Among the complications, one patient required surgical re-approach two years after resection of the plantar osteophyte in the fourth metatarsal bone due to local pain.

In the functional evaluation, the preoperative mean of AOFAS smaller toes score and AOFAS hallux was 42.4 (15-80) and 41.5 (5-94), respectively. In the postoperative re-assessment at 12 months, an increase in the mean was observed to 85.8 (62-100) in the AOFAS smaller toes score and 78.5 (44-90) in the AOFAS hallux score ($p < 0.01$). When analyzing this score in detail, it was also observed that the limitation of activities – with score ranging from 0 to 10 – increased from 5 to 8.7 after the procedure ($p < 0.01$). When evaluating the alignment of the hallux, the AOFAS hallux scores zero in case of total misalignment of the toe and 15 points for a good alignment, preoperatively, the mean points observed in this sample was 3.8 increasing to 13.8 after one year of the procedure ($p < 0.01$) (Table 2).

Table 2. Mean scores evaluated in pre- and post-operative periods

	AOFAS HALLUX	**T-test**	**AOFAS Smaller toes**	**T-test**	**EQ5**	**T-test**
Preoperative	41.5 (5-94)		42.46 (15-80)		8.9 (6-13)	
Postoperative	78.5 (44-90)	P < 0.05	85.80 (62-100)	P < 0.05	6.3 (5-9)	P < 0.05

In the evaluation of the patients' quality of life, an improvement was also observed by the EQ5 score, with a preoperative mean of 8.9 (6-11) and after one year of procedure, the score decreased to 6.3 (5-9) (Table 1).

DISCUSSION

With the discovery of new medicines for the treatment of rheumatoid arthritis – especially immunobiological ones – there was a reduction in the incidence of joint deformities in patients with this disease, especially in developed countries. However, the difficulty of access to these medications due to its high cost, the performance of late diagnoses, and the presence of more aggressive RA patterns still generate severe deformities in the forefoot, contributing to the reduction of the quality of life of these patients.[5,7]

Regarding the deformity of the hallux, it is well established that the metatarsophalangeal joint arthrodesis is considered the gold standard for its correction, mainly because it provides a more predictable positioning and it also stabilizes the medial spine, making it more stable for the feet support.[17,18] In our sample, a statistically significant improvement was observed in the AOFAS hallux scoring, with an increase in the mean from 41.5 to 78.5, before and after surgery, respectively. Note that, the AOFAS hallux score scores ten points for mobility of the hallux metatarsophalangeal joint, thus, as this joint arthrodesis was performed in all patients, the maximum possible score of this measure tool in the post-operatory would be 90 points.

Resection arthroplasty surgery of the metatarsal heads from the second to the fifth finger is widely use; the literature presents some changes regarding the angulation of its osteotomy and the route used.[18] Bass et al.[19] in a prospective series of 13 cases submitted to arthrodesis of the hallux metatarsophalangeal associated with resection arthroplasty of the lateral metatarsal bones, diverged from our sample only in the pathway, using four dorsal pathways in resection arthroplasty of the lateral metatarsal heads. In this study, an improvement in the AOFAS smaller toes score was observed, from 46 to 72, before and at least 12 months post-surgery, respectively, and three complications occurred – a suture dehiscence, an infection, and a digital pulp necrosis. In our series, a significant improvement was observed in the AOFAS smaller toes score,

42.4 to 85.8 before and after surgery, respectively. However, no immediate postoperative complications related to the access route were observed. We believe that performing a single plantar pathway in these cases with advanced deformities — taking advantage of the plantar dislocation of the metatarsal head — makes this approach easier. Moreover, multiple back accesses can make the distances between pathways narrow, generating tissue hypoperfusion and consequent skin necrosis.[20]

Wickman et al.[2] analyzing the quality of life of 69 patients with rheumatoid arthritis with and without foot involvement, concluded that minimal changes in the feet of these patients represent an intense negative effect on mobility, functional capacity and quality of life. In our series, a statistically significant improvement in the quality of life of these patients was also observed using the EQ-5 score (8.9 to 6.3). The data reflects that even with drug control of the disease, the improvement of the functional capacity of these patients is directly associated with a gain in quality of life.

Many authors choose to fixate the toes with Kirschner wires for four to six weeks to maintain the correction and thus avoid recurrences of the deformity. However, even if rare, these fixations can extrude, break, or be responsible for local infection.[18] To reduce these risks, we used the strategy of serial dressings followed by the use of orthotics to maintain correction, in order to maintain the proper positioning of the toes less invasive as possible.[16,21]

CONCLUSION

It was observed a functional improvement and better quality of life of the patients submitted to metatarsophalangeal arthrodesis and arthroplasty of the lateral metatarsal heads associated with the use of bandages and moldable orthosis in the postoperative period to maintain toes positioning. We believe that performing the procedure adequately with multidisciplinary follow-up is the main factors for obtaining good results in patients with rheumatoid feet with severe deformities submitted to this type of surgical procedure.

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