

Surgical treatment of rheumatoid forefoot: evaluation of functional outcome and quality of life

Tratamento cirúrgico do antepé reumatoide: avaliação funcional e da qualidade de vida

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ABSTRACT

Objective: To evaluate the functional outcome and quality of life of patients with rheumatoid arthritis (RA) who underwent resection arthroplasty of the first to fifth metatarsal heads.

Methods: Prospective case series study in which 8 feet of 5 patients underwent resection arthroplasty of the five metatarsal heads via a plantar approach to the lateral rays and via a medial approach to the first metatarsal. Dressing and orthotics were used for 3 months to correct the position of the toes. Patients were evaluated in the preoperative period and at least one year after the procedure using two functional evaluation scales (AOFAS lesser toes and AOFAS hallux) and one quality of life scale (EQ-5D). All results were subjected to statistical validation using the Mann-Whitney U test.

Results: The subjects had a mean age of 71 years, with a prevalence of the female gender. The mean AOFAS lesser toe and AOFAS hallux scores increased from 38.6 and 24.5 preoperatively to 85.7 and 83.1 postoperatively, respectively ($p < 0.001$). The quality of life scores measured through the EQ-5D improved from 8.0 to 5.6, on average.

Conclusion: Resection arthroplasty of the five metatarsal heads improves the function and quality of life in the short term of patients with rheumatoid foot.

Level of Evidence IV; Therapeutic Studies; Case Series.

Keywords: Arthritis, rheumatoid; Forefoot, human; Arthroplasty; Quality of life.

RESUMO

Objetivo: Avaliar o desfecho funcional e da qualidade de vida dos pacientes portadores de AR submetidos à artroplastia de ressecção das cabeças do primeiro ao quinto metatarsais.

Métodos: Estudo prospectivo de série de casos, no qual 8 pés de 5 pacientes foram submetidos à ressecção artroplástica das cabeças dos cinco metatarsais, por via plantar dos raios laterais, e por via medial do primeiro metatarsal. A posição de correção dos dedos foi mantida por meio de curativos e órtese por 3 meses. Os pacientes foram avaliados no pré-operatório e com pelo menos um ano após a realização do procedimento, através de duas escalas de avaliação funcional (AOFAS dedos menores e AOFAS hálux) e uma de qualidade de vida (EQ-5D). Todos os resultados foram submetidos a validação estatística através do método U de Mann Whitney.

Resultados: A amostra apresentou média de 71 anos de idade, com prevalência do gênero feminino. A média dos escores AOFAS dedos menores e AOFAS hálux aumentaram de 38,6 e 24,5 no pré-operatório para 85,7 e 83,1 no pós-operatório, respectivamente ($p < 0,001$). Os índices de qualidade de vida medidos através do EQ-5D melhoraram de 8,0 para 5,6 na média.

Conclusão: A ressecção artroplástica das cabeças dos cinco metatarsais melhora a função e a qualidade de vida no curto prazo de pacientes com pés reumatoides.

Nível de Evidência IV; Estudo Terapêuticos; Série de Casos.

Descritores: Artrite reumatoide; Antepé humano; Artroplastia; Qualidade de Vida.

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INTRODUCTION

Rheumatoid arthritis (RA) is a multifactorial and systemic autoimmune disease characterized by inflammatory arthritis of the small joints of the hands and feet. Approximately 16% of RA patients present with pain in the feet and ankles as the first manifestation of the disease, and 40% to 80% will eventually present anatomical alterations in the forefoot, such as claw toe, hallux valgus, and luxation or subluxation of the lesser toes, causing pain called metatarsalgia (Figures 1 and 2)⁽¹⁻⁵⁾.



Figure 1. Preoperative x-rays of the left foot: A. Anteroposterior view with load. B. Oblique view without load. C. Profile view with load. X-rays demonstrating the foot with luxation or subluxation of the toes.

Source: Author's personal archive.

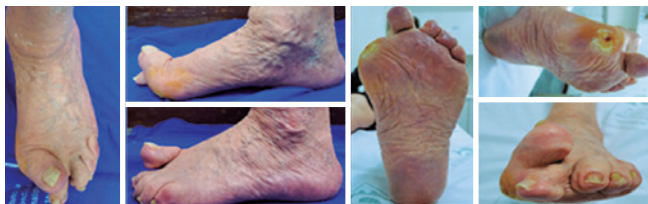


Figure 2. Clinical photographs of the left foot in the preoperative period. Images showing a severe deformity of the hallux and second toe associated with a plantar ulcer on the topography of the first metatarsal head.

Source: Author's personal archive.

These foot deformities often prevent the use of footwear and generate intense pains in the plantar region, especially when associated with load bearing. These factors are responsible for reducing the patient's capacity to walk and perform occupational and recreational activities⁽⁴⁾. Patients with RA also exhibit other degenerations in various joints and internal organ damage and use drugs with side effects, all factors that lead to a worsening quality of life^(2,6).

Conservative treatment is based on the use of bandages and padding in the plantar region of the feet, orthotics and shoes with hard soles, and soft insoles and wide toe boxes to avoid excessive pressure in the forefoot region and toe friction. However, when conservative treatment fails, surgical correction of the deformity is indicated^(2,4).

Historically, several procedures have been described for the treatment of deformities of the lateral rays of the forefoot affected by RA to correct load distribution. Such procedures include resection arthroplasty of the metatarsal heads combined or not with resection of the base of the proximal phalanx through dorsal or plantar approaches. In cases of pain or an associated deformity in the first metatarsophalangeal joint, there is the option to perform arthrodesis or the resection arthroplasty itself^(4,5,7-11).

Regarding the hallux, metatarsophalangeal arthrodesis has been considered the gold standard, mainly because it provides a stable column with a more accurate positioning compared to other procedures. However, resection arthroplasty of the first metatarsal head has the advantage of being faster and does not require synthetic material and is thus considered less invasive and less expensive. Some randomized studies have reported no significant difference between these procedures, justifying its study, especially in patients who undergo surgery at an advanced age and present with other comorbidities^(12,13).

The literature has shown a high rate of complications following the surgical treatment of these patients, such as dehiscence and infection of the surgical wound, the recurrence of deformities and metatarsalgia^(5,14). Although the recurrence of deformities may also be associated with

RA exacerbation, strategies such as the use of Kirschner wires, serial dressings and, more recently, the use of custom heat-moldable orthotics are strategies that can help maintain good toe alignment until complete healing of the surgical procedure^(15,16).

The aim of this study was to evaluate, using functional (AOFAS) and quality of life (EQ-5D) scores, the performance of patients who underwent reconstruction of the forefoot affected by RA through resection arthroplasty of the first to fifth metatarsal head via a plantar approach combined with the use of heat-moldable orthotics in the postoperative period.

METHODS

This study was approved by the Research Ethics Committee and is registered on the Brazil Platform under CAAE number 77827517.5.0000.0068.

This study is a prospective case series of patients followed up in the foot and ankle outpatient clinic who underwent resection arthroplasty of the first to fifth metatarsal heads. The data were collected through medical interview and clinical examination together with the application of functional score (AOFAS - for lesser toes and hallux) and quality of life (EQ-5D) questionnaires before and at a minimum of 12 months postoperatively.

The inclusion criteria were patients with a confirmed diagnosis of RA who were followed up at the rheumatology outpatient clinic of the Clinics Hospital of São Paulo, aged over 18 years, complaining of ankle deformity and metatarsalgia and refractory to conservative treatment. All subjects underwent resection arthroplasty of the five metatarsal heads and were followed up for more than one year.

The exclusion criteria were simultaneous procedures in the forefoot and a follow-up time of less than one year.

To schedule the surgical procedure, the patient needed a report from the attending rheumatologist who provided approval for surgery and instructions on the management of the patient's medications during the pre-, intra- and postoperative periods.

Patient data, such as sex, age, surgical description, progression, complications and x-rays, were collected. The AOFAS questionnaire (lesser toes and hallux) and the EQ-5D quality of life questionnaire were applied to all patients. All patients signed an informed consent form, and their personal data were kept confidential.

The AOFAS lesser toes and hallux scores range from 0 to 100 points, where 0 is considered severe functional impairment and 100 is no impairment. The EQ-5D questionnaire evaluates the quality of life of the patient using a scale from 5 to 15 points, where the higher the score is, the worse the quality of life expected.

The surgical procedure consisted of a plantar approach transverse to the longitudinal axis of the foot at the level of the four lateral metatarsal heads, dissection and exposure, followed by osteotomy performed at the level of the metatarsal neck, being careful to preserve the metatarsal formula^(10,17). Through a medial longitudinal approach, under the metatarsophalangeal joint of the big toe, capsulotomy was performed with exposure of the joint, followed by resection arthroplasty of the first metatarsal head (Figure 3). Care was taken to avoid the presence of bone spicules that may lead to increased local pressure and may cause calluses, ulcers or pain^(10,11).

The patient was then maintained with a dressing, aligning the toes with the metatarsals, with no load bearing until the plantar suture was removed, which generally occurred during week three. Immediately afterwards, load bearing was allowed but with the use of hard soles combined with a dorsal orthotic made by the occupational therapy team to maintain the proper position of the toes. The orthotic was used full-time for 6 weeks, followed by a period of use only at night for another 6 weeks (Figure 4).

Statistical evaluation was performed using the Mann-Whitney U test.



Figure 3. Clinical photographs of the left foot in the immediate postoperative period. Images showing correction of the deformity through a plantar approach to the four lateral toes and a medial approach to the first metatarsal.

Source: Author's personal archive.



Figure 4. Clinical photographs of the left foot at three weeks after surgery demonstrating the heat-moldable orthotics applied to maintain correct alignment of the toes.

Source: Author's personal archive.

RESULTS

Between January 2014 and June 2017, eight feet of five patients underwent resection arthroplasty of the first to fifth metatarsal heads. There was a predominance of females in the sample, which comprised four women and only one man.

The mean age of the patients was 71 years (61-86 years). Although all had been followed up by the institution's occupational therapy team, one of the patients did not use the orthotics correctly as instructed. Among the five patients, four were diagnosed with hypertension and two with diabetes mellitus with preserved plantar sensitivity. Regarding complications, only one patient required reopening of the surgical site for plantar wound debridement due to delayed healing.

In the functional evaluation, the preoperative mean of the AOFAS lesser toes and AOFAS hallux scores was 38.6 (15-65) and 24.5 (10-58), respectively. In the 12-month postoperative reevaluation, the mean AOFAS lesser toes score increased to 85.7 (67-100), and the AOFAS hallux score increased to 83.1(64-100) ($p < 0.01$). When this score was analyzed in detail, functional impairment, whose score ranged from 0 to 10, increased from 4.3 to 9.2 after the procedure ($p < 0.01$). When evaluating finger alignment, the AOFAS lesser toes score is zero when there is total misalignment of the toes and 15 when there is good alignment. Preoperatively, the mean score observed for the sample studied was 3, increasing to 11.5 at one year after the procedure ($p < 0.01$).

Regarding the quality of life, improvement was also observed through the EQ-5D score, with a preoperative mean

of 8 (6-12), which decreased to 5.6 (5 -7) one year after the procedure ($p < 0.01$).

DISCUSSION

Inflammatory arthritis caused by RA causes joint deformities mainly in the feet and hands, generating disabilities, and reduces the quality of life of patients with this disease^(2,10). Even with the emergence of new drugs for the control of this morbidity, which has led to a decline in the number of orthopedic interventions, there is still a considerable number of individuals with RA with foot deformities⁽¹⁸⁾. In our sample, 80% were female, with a mean age of 71 years, and this RA prevalence is consistent with the literature⁽¹⁵⁾.

In a study on 21 feet of patients with RA, Rosenberg et al. reported good results with hallux metatarsophalangeal joint arthrodesis combined with resection arthroplasty of the lateral metatarsal heads⁽⁷⁾. However, although Clayton et al. believe that arthrodesis leads to good results, they recommend the use of resection arthroplasty of the first ray because it is a less invasive procedure with high efficacy⁽⁴⁾. In our sample, the AOFAS hallux score increased from 24.5 to 83.1 at 12 months after resection arthroplasty of the first metatarsal head.

We believe that the main advantages of resection arthroplasty of the first metatarsal head compared to arthrodesis are reduced manipulation, shorter surgical time and less soft tissue damage, no need for consolidation for treatment success and non-use of osteosynthesis material.

Since this procedure is commonly performed in elderly and immunosuppressed patients due to the use of RA medications, it makes sense to opt for faster and less invasive procedures, especially in patients with lower functional demand. Another issue is related to the use of immunobiologicals, which may increase the chances of infection, with one of the advantages being the non-use of metal implants^(7,4).

In 1997, Hamalainen and Raunio⁽¹⁹⁾ evaluated more than 500 patients with RA who underwent resection arthroplasty of the second to fifth metatarsal heads combined with the resection or fusion of the first metatarsophalangeal joint and concluded that arthrodesis results in better outcomes in the short term. However, at the 14-year follow-up, the results were reversed. In our sample, an improvement in the ability of the RA patient to perform their activities was observed, with their AOFAS hallux scores increasing from 4.3 to 9.2 in the preoperative period and one year after the

procedure. There was also an improvement in the quality of life of the patients, demonstrating the potential of this procedure^(11,17)(Figures 5 and 6).



Figure 5. X-rays of the left foot at one year after surgery: A. Anteroposterior view with load. B. Oblique view without load. C. Profile view with load.

Source: Author’s personal archive.



Figure 6. Clinical photographs of the left foot at one year after surgery. Images showing toe alignment obtained with surgical treatment and the appearance of the plantar scar.

Source: Author’s personal archive.

Recent studies have opted to use two dorsal approaches, alleging problems with the plantar wound for performing resection arthroplasty of the lateral metatarsal heads. In this sample, resection was performed with a plantar approach, with no postoperative complaint regarding the wound, even in the patient whose wound was reopened due to suture dehiscence. The particularity of this approach is that due to the metatarsal heads being plantarly subluxated or luxated, it creates easy access to the metatarsophalangeal joint with low rates of skin and soft tissue damage^(12,19).

This study showed an improvement in the quality of life of patients with RA, with gain in function, mobility and the ability to wear shoes. Similarly, Hulse et al. observed excellent results after resection arthroplasty of the first metatarsal head in a sample of 45 surgically treated feet (29 patients), with 75% of their sample becoming asymptomatic⁽⁹⁾. The mean EQ-5D score in the postoperative period was 5.6, with a maximum score of 7, which was lower than the preoperative mean.

Due to the multidisciplinary care provided at our institution and to provide the patient with an early load, we use dressings and orthotics instead of temporary fixation with Kirschner wires to correct the alignment of the toes. This outcome was interpreted as good and excellent in our sample during evaluation of the AOFAS lesser toes score. We believe that the use of orthotics minimizes the possibility of complications compared to osteosynthesis material, such as extrusion, infection, toe necrosis or implant breakage. With the use of orthotics, the preoperative mean for toe alignment increased from 3 to 11.5 in the evaluation using the AOFAS lesser toes score.

CONCLUSION

Although the present study had some limitations, such as a small case series and a short follow-up period (12 months), improvements in functional capacity and quality of life were observed in patients who underwent resection arthroplasty of the first to fifth metatarsal heads combined with the use of postoperative heat-moldable orthotics. We believe that a multidisciplinary follow-up and serial return visits are the main factors for obtaining good results in RA patients who undergo this type of surgical procedure.

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