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ORIGINAL ARTICLE

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Functional and quality of life assessment of patients with ankle ulcers subjected to complete Achilles tendon resection

Avaliação funcional e de qualidade de vida de pacientes com úlceras no tornozelo submetidos à ressecção completa do tendão de Aquiles

Wrgelles Godinho Bordone Pires[1], Philipe Eduardo Carvalho Maia[1], Felipe Daniel Vasconcelos de Carvalho[1], Rodrigo Simões Castilho[1], Fernando Araújo Silva Lopes[1], Roberto Zambelli de Almeida Pinto[1]

1. Hospital Mater Dei, Belo Horizonte, MG, Brazil.

ABSTRACT

Objective: To assess the quality of life and functional status of patients subjected to debridement of ulcers in the posterior ankle who required complete Achilles tendon resection without any type of reconstruction or tendon transfer.

Methods: This is a case series of 5 (mostly diabetic) patients who underwent complete Achilles tendon resection due to an ulcer in the posterior ankle region. Preservation of the Achilles tendon was prevented due to tendon exposure, extensive degeneration and the need for infection control. Patients answered the Brazilian Portuguese version of the Achilles Tendon Total Rupture Score (ATRS-BR) questionnaire and the 36-item Short-Form Health Survey (SF-36) during the postoperative period, and follow-up varied between 6 and 24 months. The ATRS-BR ranges from 0 to 100, and higher scores indicate fewer symptoms and limitations. The SF-36 consists of 36 questions comprising 8 domains, which are independently assessed and given a score of up to 100 points, with higher scores indicating better health status.

Results: The mean age of patients was 70 years. The mean score on the SF-36 physical functioning domain was 70 (50-95) points. The mean value of the ATRS-BR was 54.6 (31-88) points; however, the patients had few complaints about their functional status.

Conclusion: Non-reconstruction of the Achilles tendon in predominantly diabetic elderly patients with posterior ankle ulcers presents encouraging functional outcomes. This study suggests that complete Achilles tendon resection is a viable option for ulcer treatment in this population.

Level of Evidence IV; Therapeutic Studies; Cases Series.

Keywords: Diabetes mellitus; Achilles tendon; Ulcer.

RESUMO

Objetivo: Avaliar a qualidade de vida e funcionalidade de pacientes submetidos ao desbridamento de úlceras na região posterior do tornozelo que evoluíram com a ressecção completa do tendão de Aquiles, sem a realização de qualquer tipo de reconstrução ou transferência tendínea.

Métodos: Trata-se de uma série de casos de 5 pacientes, em sua maioria diabéticos, submetidos à ressecção completa do tendão de Aquiles, devido à úlcera na região posterior do tornozelo, sendo sua preservação impossibilitada pela exposição e degeneração extensa do tendão, além da necessidade de controle do processo infeccioso. Os pacientes responderam aos questionários ATRS-BR e o SF-36 no pós-operatório, sendo que este seguimento variou entre 6 e 24 meses. O ATRS varia de 0 a 100, sendo que maiores pontuações revelam menos sintomas e limitações. O SF-36 é constituído por 36 questões compreendendo 8 domínios, que avaliados independentemente, apresentam um total de 100 pontos, sendo a maior pontuação relacionada ao melhor estado de saúde.

Work performed at the Hospital Mater Dei, Belo Horizonte, MG, Brazil.

Correspondence: Wrgelles Godinho Bordone Pires. Rua Gonçalves Dias, 2700 - Santo Agostinho - CEP: 30190-094, Belo Horizonte, Minas Gerias, Brazil
E-mail: wrgelles@gmail.com

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Resultados: A média de idade foi de 70 anos. Os resultados do SF-36 com relação ao domínio capacidade funcional revelam uma média de 70 pontos (50-95). Já o ATRS-BR apresentou uma média de 54,6 pontos (31-88), no entanto, com os pacientes pouco queixosos quanto à sua funcionalidade.
Conclusão: A não reconstrução do tendão de Aquiles em pacientes em sua maioria diabéticos, idosos e com úlceras posteriores do tornozelo revela resultados funcionais encorajadores. Este trabalho sugere como uma opção viável este tipo de tratamento das úlceras para tal população.
Nível de Evidência IV; Estudos Terapêuticos; Série de Casos.

Descritores: Diabetes mellitus; Tendão de Aquiles; Úlcera.

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INTRODUCTION

The term leg ulcer should not be viewed as a diagnosis but rather should be considered a manifestation of many different pathologies. Most leg ulcers have vascular or neuropathic etiology due to changes caused by diabetes[1,2].

Studies have found that 60 to 70% of ulcers are caused by venous hypertension, and 10 to 25% are caused by arterial insufficiency; when ulcers are caused by a combination of both etiologies, they are called mixed ulcers[3].

Diabetic foot ulcers are a major problem, with a prevalence of 6.3%, and are more common in patients with type 2 diabetes. The occurrence of foot injuries is a common cause of hospitalization and lower limb amputation in patients with diabetes. Peripheral neuropathy results in loss of proprioception and pain perception, allowing patients to undergo repetitive trauma without the ability to protect themselves due to the absence of pain perception, which can lead to ulcer formation. Factors associated with the onset of ulcers include peripheral neuropathy, microvascular and macrovascular complications, elevated glycated hemoglobin (HbA1C) levels, trauma and duration of disease[4,5].

Ulcers can become infected, thus compromising structures such as the Achilles tendon, which may require complete tendon resection for radical debridement. The treatment goals of an infected Achilles tendon are to control the local infection and restore ankle plantar flexion. Numerous therapeutic interventions are described in the medical literature, such as flap rotation to cover wounds and tendon transfer[6,7].

Individuals with signs of Achilles tendon infection typically include patients with comorbidities, such as peripheral vascular disease and diabetes mellitus, and/or older individuals. However, these patients have lower functional demands and tolerate a reduction in ankle flexion strength[8].

Elderly patients with comorbidities and with posterior ankle ulcers compromising the Achilles tendon can be surgically treated with radical debridement and total resection of the Achilles tendon, as shown in the literature[9].

The objective of this study was to evaluate the quality of life and functional status of the lower limbs of patients subjected to debridement of ulcers in the posterior ankle region and hindfoot who required complete Achilles tendon resection without any type of reconstruction or tendon transfer.

METHODS

This study was approved by the Research Ethics Committee with registration in the Brazil Platform under CAAE number: 07928819.8.0000.5128.

This is a case series of 5 consecutive, mostly diabetic patients who underwent complete Achilles tendon resection due to an ulcer in the posterior ankle, tendon exposure and extensive degeneration who had contraindications for tendon preservation due to the need to control the infection. Magnetic resonance imaging (MRI) scans were performed in all patients to confirm the extensive tendon degeneration, as indicated by changes in the calcaneus signal, suggesting the presence of osteomyelitis. All patients signed the informed consent form and agreed to be included in the study. This study met all requirements regarding human rights.

The established treatment was radical debridement of the injuries, performed serially. Most patients were also subjected to negative pressure therapy as well as dressings with special coverings, according to the hospital protocol. After adequate progression and wound bed granulation, a reverse sural flap was created, or perforator peroneal artery flap rotation was performed (Figures 1-5). We chose not

to reconstruct the ankle flexor mechanism due to the possibility of calcaneal osteomyelitis and the risk of infection relapse.

Patients answered the Achilles Tendon Total Rupture Score, adapted for Brazilian Portuguese (ATRS-BR) questionnaire and the 36-item Short-Form Health Survey (SF-36) during the postoperative period, and the follow-up period ranged from 6 to 24 months. The ATRS-BR is a questionnaire with high sensitivity and reproducibility for evaluating clinical-functional outcomes after treatment of patients with complete Achilles tendon rupture. It consists of 9 items divided into 3 categories: functional aspects, pain and alignment. The ATRS varies from 0 to 100, and higher scores indicate individuals with fewer symptoms and limitations. The SF-36 is a generic instrument, and its theoretical basis is described as "health-related quality of life". It consists of 36 questions comprising 8 domains: physical functioning, physical role functioning, bodily pain, general health, social role functioning, vitality, mental health and emotional role functioning. The domains are independently evaluated and have a total score of 100 points; higher scores are related to a better health status[10,11,12].

The patients were also evaluated with regard to the plantar flexion ability of the ankle with weight-bearing by performing the one-foot test with the limb that underwent complete Achilles tendon resection in ankle plantar flexion. This test is conducted as follows: the patient, in a standing position, while supporting the arms or not on a surface so as not to lose balance, is asked to stand on only one foot using the operated limb and then to stand on tiptoe, with only the forefoot touching the ground. This test evaluates ankle flexion strength.

All patients in the present study were evaluated by vascular surgeons or angiologists to identify the need for additional vascular procedures and for authorization to undergo the orthopedic procedure.

Figure 1. Patient 1: Progression of posterior ankle ulcer surgery until the immediate postoperative period of flap rotation surgery. **Source:** Author's personal archive.

Figure 2. Patient 2: Progression of posterior ankle ulcer surgery until the immediate postoperative period of flap rotation surgery. **Source:** Author's personal archive.

Figure 3. Patient 3: Image showing a large area of degeneration and necrosis of the Achilles tendon and the immediate postoperative period of flap rotation surgery.
Source: Author's personal archive.

Figure 5. Patient 5: Image showing the appropriate bed for receipt of the flap after serial debridement and the immediate postoperative period of flap rotation surgery.
Source: Author's personal archive.

Figure 4. Patient 4: Image showing the wound after serial debridement and the immediate postoperative period of flap rotation surgery.
Source: Author's personal archive.

RESULTS

Table 1 describes the preliminary demographic data of the 5 patients, who exhibited ulcers in 4 Achilles tendons on the left and 1 on the right and included 4 male patients. The mean age of the patients was 70 years. All patients were hypertensive, and only 2 were not diabetic. Three patients underwent adjuvant treatment with negative pressure therapy, and no patients underwent hyperbaric oxygen therapy.

The mean value of the ATRS-BR was 54.6 (31-88) points. The mean score on the SF-36 physical functioning domain was 70 (50-95) points, and the mean score on the physical role functioning domain was 25 (0-75) points. All patients were able to perform the one-foot support test in ankle plantar flexion using the limb with the healed ulcer (Figure 6).

Patients in the present study were evaluated by vascular surgeons or angiologists and received authorization for orthopedic procedures; no patients had indications for vascular procedures at that time.

DISCUSSION

The present study found a mean score of 70 points for the SF-36 physical functioning domain. A study by Almeida et al.[11] that examined diabetic patients who were mostly older than 60 years and had leg ulcers found a mean score of 17.8 ± 16.76 on the SF-36 physical functioning domain. In the present study (SF-36: 70 points), the individuals presented much higher functional capacity than those of the study by Almeida et al.[11] (SF-36: 17.8 ± 16.76), although the populations were similar. It is also noteworthy that, even without reconstruction of the Achilles tendon, the re-

Table 1. Patient data

Patient number	Side	Age (years)	Sex	ATRS-BR	SF-36 (FC)	SAH	DM or pre-DM	Hyperbaric therapy	Negative pressure therapy
1	D	70	F	55	50	Yes	No	No	Não
2	E	73	M	55	65	Yes	Yes	No	Sim
3	E	66	M	31	65	Yes	Yes	No	Não
4	E	70	M	44	75	Yes	No	No	Sim
5	E	71	M	88	95	Yes	Yes	No	Sim

R: Right/L: Left/F: Female/M: Male/FC: Functional capacity/SAH: Systemic arterial hypertension/DM: Diabetes mellitus/Pre-DM: Pre-diabetes.
Source: Prepared by the author based on the results of the research.

Figure 6. Two- and one-foot support with ankle plantar flexion using the limb with the healed ulcer.
Source: Author's personal archive.

sults of our group are better than those of individuals with ulcers in the study of Almeida et al.[11].

A mean score of 54.6 points was observed on the ATRS-BR questionnaire. In a study by Eid[13], patients with type 2 diabetes, with a mean age of 54.8 years (ranging from 47 to 65 years), who were diagnosed with degenerative Achilles rupture, were evaluated and presented a mean ATRS of 15.1 (range: 11 to 22). In the present study, which includes a similar patient population in terms of comorbidities and age, the mean ATRS was 54.6 points, which is higher than that found in the study cited above[13].

Fourniols et al.[9] conducted a study of 15 patients with Achilles tendon necrosis who were treated with radical debridement and gradual wound closure. After wound healing, all individuals in the study were able to achieve one-foot support with the operated foot, and 9 recovered normal strength. Yuan et al.[8] argued that the ability of these patients to raise the heel is due to compensation by other muscles, such as the flexor hallucis longus, tibialis posterior and flexor digitorum longus. Although our study did not compare muscle strength, all of our patients also achieved one-foot support with the foot on the operated side[8,9].

In a study by Mafulli et al.[14], diabetic patients with Achilles tendon rupture were surgically treated with tendon repair and were evaluated using the ATRS during the postoperative period, with a mean follow-up period of 64 months (ranging from 48 to 100 months). The patients presented a mean ATRS of 70.4 (SD: 13, 55 to 92). This value is higher than that found in the present study; however, patients from the study by Mafulli et al.[14] were on average younger (53.6 ± 11.7 years old) and did not present ulcers in the Achilles region, which are factors for a poor prognosis and may affect the final ATRS[14].

The nonperformance of Achilles tendon reconstruction, which could be performed at the time of flap rotation

for wound closure or during a new surgery, was a shared decision made by the medical staff, patients and their families after a long debate on the risks and benefits of a greater intervention with the use of grafts and fixation devices. Patients with ulcers in the Achilles tendon are older individuals with comorbidities and greater chances of surgical complications. Although all patients in this study had vascular conditions and were confirmed by vascular surgeons/angiologists as adequate for the surgical procedures performed, diabetic patients are known have risks for micro- and macrovascular complications and peripheral nerve alterations, which may result in changes in healing, increased morbidity and mortality and even unsatisfactory surgical results when major procedures are performed. The performance of fewer surgical procedures in such individuals will result in a lower likelihood of complications. Thus, this study provides a feasible option for treatment of ulcers in the Achilles tendon for older individuals with comorbidities[8,15,16].

A limitation of the present study is the small number of patients included. Thus, further prospective multicenter studies are encouraged so that this study can be replicated to confirm the reported results.

CONCLUSION

Non-reconstruction of the Achilles tendon in mainly diabetic and elderly patients with posterior ankle ulcers showed good results and encouraging functional scores. When treating older individuals with comorbidities and with a lower functional status, large reconstruction procedures may not achieve a satisfactory result due to the risk of unwanted outcomes, given the increased risk of complications and the lack of modification of the functional result. Thus, the present study suggests that this method of non-reconstruction of the Achilles tendon is a viable option for ulcer treatment in this population. Further studies with a larger number of patients and a prospective methodology are needed to reproduce the results.

Authors' contributions: Each author contributed individually and significantly to the development of this article: WGBP *(https://orcid.org/0000-0002-0725-8755) conceived and planned the activities that led to the study, interpreted the results of the study, wrote the article and approved the final version; PECM *(https://orcid.org/0000-0002-3171-3738 conceived and planned the activities that led to the study, interpreted the results of the study, participated in the review process and approved the final version; FDVC *(https://orcid.org/0000-0002-3861-2841) interpreted the results of the study, participated in the review process and approved the final version; RSC *(https://orcid.org/0000-0002-8930-7046) interpreted the results of the study, participated in the review process and approved the final version; FASL *(https://orcid.org/0000-0001-5214-2420) interpreted the results of the study, participated in the review process and approved the final version; RZAP *(https://orcid.org/0000-0001-9692-5283) conceived and planned the activities that led to the study, interpreted the results of the study, participated in the review process and approved the final version. *ORCID (Open Researcher and Contributor ID).

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