ORIGINAL ARTICLE

Impact of ankle arthrodesis on quality of life

Impacto da artrodese do tornozelo na qualidade de vida

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ABSTRACT

Objective: To evaluate the quality of life of patients undergoing ankle arthrodesis through functional scores such as the American Orthopedic Foot & Ankle Society (AOFAS) scale adapted for the Portuguese language and the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36).
Methods: A descriptive cross-sectional study was carried out between January 2005 and December 2016, with 26 patients undergoing ankle arthrodesis. Two quality of life assessment questionnaires were applied: the AOFAS in the pre- and postoperative period and the SF-36 in the postoperative period. Descriptive and analytical statistical analyses were performed using SPSS, version 23.
Results: The main findings are related to the correlations of functional capacity (p=0.002; R^2=0.42), limitation due to physical aspects (p=0.05; R^2=0.19) and pain (p=0.006; R^2=0.35) with age as the predictor and the correlation between preoperative AOFAS scores (p=0.03; R^2=0.27) and the aetiology of arthrodesis as the predictor.
Conclusion: Ankle arthrodesis is a procedure capable of improving the quality of life of the patient as a whole, including the physical, social, emotional and mental health aspects, rather than pain alone, which has been the main objective of the procedure until the present moment.
Level of Evidence II; Prognostic Studies.

Keywords: Joint diseases; Ankle; Arthrodesis; Quality of life.

RESUMO

Objetivo: Avaliar o impacto na qualidade de vida dos pacientes submetidos à artrodese de tornozelo, através de escores funcionais tais como *American Orthopaedic Foot & Ankle Society* (AOFAS), adaptado para a língua portuguesa e o *Medical Outcomes Study 36 – Item Short – Form Health Survey* (SF 36).
Métodos: Estudo transversal descritivo analítico realizado entre janeiro de 2005 e dezembro de 2016, com 26 pacientes submetidos a artrodese de tornozelo. Aplicados dois questionários de avaliação de qualidade de vida: AOFAS pós-cirúrgicos; SF 36 no pós-cirúrgico. Realizada análise estatística descritiva e analítica através do SPSS, versão 23.
Resultados: Os principais achados estão relacionados à correlação entre capacidade funcional (p=0,002; R^2=0,42), limitação por aspectos físicos (p=0,05; R^2=0,19) e dor (p=0,006; R^2=0,35), com o preditor idade; a correlação entre AOFAS pré-cirúrgico (p=0,03; R^2=0,27) o preditor etiologia da artrodese.
Conclusão: A artrodese de tornozelo mostra ser um procedimento capaz de melhorar a qualidade de vida do paciente como um todo, nos aspectos físicos, sociais, emocionais e saúde mental e não só a dor, objetivo principal até o presente momento.
Nível de Evidência II; Estudos Prognósticos.

Descritores: Artrose; Tornozelo; Artrodese; Qualidade de vida.

INTRODUCTION

Ankle arthrosis causes a negative impact on the lives of patients due to chronic pain and functional limitation caused by joint degeneration, which can directly and indirectly affect quality of life[1].

The main cause of ankle injury is previous joint trauma, with a higher incidence in the younger population relative to that for injuries to other joints such as the knee and hip[2]. The progression of arthrosis ultimately necessitates surgical treatment in cases of conservative treatment failure[3].

Ankle arthrodesis remains the best solution for severe degenerative changes in the ankle, leading to pain relief and functional improvement for patients. This procedure can be considered the gold standard for the treatment of end-stage post-traumatic arthrosis[4]. Arthrodesis reduces pain at the expense of ankle motion loss; therefore, the cost-benefit of the procedure to the patient should be assessed[5].

Considering the advances in surgical techniques for ankle arthrodesis, better results and a decrease in complications have been observed, with a resultant positive impact on individuals' quality of life[6].

Ankle arthrosis can be debilitating and have a significant impact on quality of life as it is a major cause of disability with a negative impact on one's daily routine, similar to hip arthrosis and advanced congestive heart failure[7].

Notably, surgical treatment should be thoroughly discussed between patient and physician[4] because undergoing the procedure should be a well-informed choice.

Considering the effects of the surgical procedure, the quality of life of patients undergoing arthrodesis may be impacted. Accordingly, several scores can be applied to patients, including the American Orthopedic Foot & Ankle Society (AOFAS) scale adapted for the Portuguese language and the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36), which are data collection instruments that can be used to quantitatively assess subjects' quality of life[4,8,9].

The aim of this study is to evaluate the impact of ankle arthrodesis on patients' quality of life through functional scores on the SF-36 and AOFAS.

METHODS

This study was approved by the Research Ethics Committee with registration in the Brazil Platform under CAAE number: 79246517.5.3001.5137.

A prognostic, cross-sectional, descriptive and analytical study was carried out with a sample of 26 patients undergoing ankle arthrodesis at the study hospital from January 2005 to December 2016. Subjects were recruited by non-probabilistic, sequential sampling from among those who met the inclusion criteria. The inclusion criteria were: having undergone ankle arthrodesis at the study institution, age greater than 18 years, either gender, no neurological alterations and having signed the informed consent form.

The individuals participating in the study were evaluated through data collection using two questionnaires in the pre- and postoperative periods. The questionnaires used were the ankle and hindfoot scale developed by the American Orthopedic Foot & Ankle Society (AOFAS) adapted for the Portuguese language[8] and the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) adapted for the Portuguese language[9]; these instruments were applied in both the pre- and postoperative periods.

Notably, the AOFAS allows functional assessment of the hindfoot and ankle and includes nine questions, with the total score ranging from 0 to 100.

The SF-36 instrument is a generic questionnaire for assessing quality of life. It is easy to administer and understand and multidimensional and consists of 36 items distributed among eight scales or domains: functional capacity, physical aspects, pain, general health, vitality, social aspects, emotional aspects and mental health[9].

In addition, the SF-36 has a final score ranging from 0 to 100, and the final scores are obtained by calculating the raw score, with zero corresponding to the worst general health status and 100 corresponding to the best health status[9]. Notably, the SF-36 was only applied in the postoperative period because the assessment of quality of life is related to the success or failure of the surgical procedure.

In the statistical analysis, the variables were initially tested for normality of their distributions. Then, the data were entered into tables for distribution by frequency for categorical variables and by the mean and standard deviation for numerical variables. For the analysis, the following variables were considered independent variables: age, gender, affected side, duration of progression until arthrodesis in years, arthrodesis aetiology and surgical indication. The variables adopted as dependent variables were quality of life measured by the SF-36 questionnaire and functionality measured by the AOFAS.

For categorical variables, the associations between the dependent variables and independent variables were calculated by the chi-square test. Student's t-test and analysis

of variance were used to compare the means of numerical variables. To test the differences indicated in the analysis of variance, the Bonferroni post-hoc test was used.

A multivariate analysis of variance (MANOVA) model was used to identify the independent predictors in the AOFAS and SF-36 with the backward technique. Within the model, variables with p<0.05 were adopted and termed independent predictors. The model was calibrated by the coefficient of determination R^2. For all analyses, the statistical significance was 5%. The statistical programme SPSS version 23 was used to compile the database for all statistical analyses.

RESULTS

A total of 26 individuals were included in the study, including 12 males (46.2%) and 14 females (53.9%), and the mean age of the study population was 58.19 years (SD=15.13). The affected side was the left side in 34.6% (n=9) of the patients, the right side in 57.7% (n=15) of the patients and both sides in 7.7% (n=2) of the patients. Regarding the aetiology of arthrodesis, most of the individuals underwent the procedure due to trauma (65.4%), followed by poliomyelitis sequelae (26.9%) and lastly rheumatoid arthritis (7.7%). All 26 study patients had debilitating pain as an indication for the surgical procedure.

The mean score on the preoperative AOFAS was 39.5 (SD=12.1), and the mean score on the postoperative AOFAS was 77.35 (SD=9.7); this difference was significant (p=0.000). Therefore, an increased AOFAS score indicates improvement in the patient's functionality. Table 1 shows the means and standard deviations of the eight domains of the SF-36 questionnaire for the sample.

Table 2 presents the comparison between the characteristics of the sample and the SF-36 domain scores. Significant differences were identified between all characteristics and scores for the domains of the SF-36 as a function of age and between the affected side and functionality.

Table 3 shows the comparison between the sample characteristics and the AOFAS scores. Significant differences were identified between age, gender and the aetiology of arthrodesis for preoperative AOFAS scores and between surgical indications for the postoperative AOFAS scores.

In the multivariate analysis, the following dependent variables were initially tested: preoperative AOFAS score, postoperative AOFAS score, functional capacity, limitation due to physical aspects and pain. The following items were selected as covariables: age, gender and the aetiology of arthrodesis. For the dependent variables functional capa-

Table 1. Mean and standard deviation of the SF-36 domain scores of the sample (n=26).

SF-36 Domain	Mean (SD)
Functional capacity	73.5 (23.3)
Limitation due to physical aspects	79.81 (27.4)
Pain	72.7 (14.8)
General health status	67.5 (11.9)
Vitality	75.2 (7.7)
Social aspects	86.8 (20.6)
Limitation due to emotional aspects	81.8 (21.8)
Mental health	82.9 (6.4)

Source: Prepared by the author based on the results of the research.

city (p=0.002; $R^2 = 0.42$), limitation due to physical aspects (p=0.05; $R^2=0.19$) and pain (p=0.006; $R^2=0.35$), age was found to be significant predictors, whereas for the dependent variable preoperative AOFAS score (p=0.03; $R^2=0.27$), the aetiology of arthrodesis was found to be a significant predictor.

DISCUSSION

Previous joint trauma is the most common cause of ankle arthrosis. Secondary and primary arthritis and congenital deformities may also cause the condition[2]. Surgical treatment aims to correct foot and ankle alignment and improve pain and is indicated in cases refractory to conservative treatment (ice, physical therapy, anti-inflammatories, corticosteroid infiltration, viscosupplementation and orthoses)[5].

Ankle arthrodesis was performed before 1900 for stabilisation of paralysis secondary to poliomyelitis and was first described by Albert. In the 1950s, Charnley introduced a device similar to an external fixator for compression arthrodesis[6]. Arthrodesis is the gold standard procedure for the treatment of end-stage post-traumatic arthrosis[4].

The complications of arthrodesis include pseudarthrosis and consolidation delay, incomplete relief of pain if another source is involved, and functional limitations even with successful arthrodesis, directly affecting the daily activities of patients.

Total ankle arthroplasty is an alternative to arthrodesis for the treatment of end-stage arthrosis. The procedure offers a wider range of motion and better gait kinematics, decreases stress on other joints, and minimises the progression of arthrosis to adjacent joints. However, arthroplasty is an expensive procedure with its own associated

Table 2. Comparison of SF-36 domain scores per sample characteristic (p-values; n=26).

	Functional capacity	Limitation due to physical aspects	Pain	General health status	Vitality	Social aspects	Limitation due to emotional aspects	Mental health
Age (full years)	0.000*	0.008*	0.001*	0.012*	0.039*	0.001*	0.058*	0.040*
Sex	0.097	0.092	0.143	0.188	0.375	0.42	0.38	0.591
Affected side	0.738	0.919	0.62	0.742	0.023*	0.736	0.913	0.296
Time of progression until arthrodesis (years)	0.198	0.839	0.729	0.788	0.196	0.688	0.478	0.817
Aetiology of arthrodesis	0.765	0.759	0.237	0.898	0.365	0.402	0.368	0.563
Surgical indication	0.028	0.848	0.2	0.374	0.317	0.289	0.164	0.703

Source: Prepared by the author based on the results of the research.

Table 3. Comparison of the AOFAS score per sample characteristic (p-values; n=26).

Preoperative AOFAS	Postoperative AOFAS
0.098*	0.348
0.041*	0.689
0.032*	0.317
0.496	0.052*

Source: Prepared by the author based on the results of the research.

complications, including implant loosening, instability, osteolysis, higher infection rates and higher revision rates[10].

Currently, whether a particular treatment or surgical technique has achieved positive or negative results and the impact of a treatment on patients' quality of life in terms of their feelings and how they perform activities of daily living, especially with respect to social and psychological status, are sources of substantial concern. The major challenges for researchers are how to quantify subjective data and which issues should be addressed in the various health-related quality of life assessment instruments[8].

A generic health instrument measures the impact of a disease or injury on a patient's quality of life and allows comparison with other conditions or surgical interventions, but it may not elicit small differences[11].

Pain is considered the most important parameter in ankle arthrosis treatment by both orthopaedic surgeons and patients[2].

This study analysed changes not only in the functionality of the joint but also in patient quality of life, which may be positive or negative, through AOFAS scores, which is the most important factor for the authors of this study. The SF-36 score was also used because it encompasses several factors related to daily routine and evaluates the success or failure of a surgical procedure[9]. The SF-36 has been used in more than 4,000 publications and has been translated into 170 languages, and a bibliographic search using the term "SF-36" yielded more than 13,000 publications[12].

The variables related to the social, emotional and mental health domains of the SF-36 were assigned high scores (Table 1). These variables play an important role in guiding future patients undergoing ankle arthrodesis and help quantify postoperative circumstances of daily living to some extent, thus improving the prognosis as such circumstances are often more valued by patients than by orthopaedic surgeons. The general state of health and pain, which were assigned lower values, may be influenced by other pre-existing limitations and pathologies[11].

Comparing the independent variables collected with the SF-36, we found statistical significance (Table 2) for age in relation to all scale domains, indicating that age should always be considered when analysing postoperative results, improvement expected by the surgeon and patient, and prognosis. Debilitating pain caused by severe ankle arthrosis has a greater negative impact on the quality of life of older people, who experience greater limitations in their daily activities. Given this scenario, as observed in the results of this study in relation to SF-36 scores, the improvement in quality of life was greater in elderly patients who were able to resume their routine activities after surgery without limitations due to pain. Significant differences were identified between the affected side in relation to functionality because the patients were more willing to perform daily activities due to the improvement achieved after surgery, most often on the dominant side, frequently with better execution.

Comparing the AOFAS scores with the independent variables (Table 3), we found significant differences in preoperative AOFAS scores in relation to age and post-trauma sequelae as the aetiology of arthrodesis and in postoperative AOFAS scores in relation to surgical indication. Pain was the main surgical indication identified in this study,

sometimes with associated deformity, which may account for the statistical significance observed in the postoperative period favouring the performance of arthrodesis, with an improvement in the AOFAS score from a mean of 39.5 to 77.35.

The study has limitations, including the subjective understanding of each patient when answering the SF-36 questionnaire, even though they were instructed with the same criteria, and also the inclusion of patients in the sample with other orthopaedic or non-orthopaedic pathologies directly affecting their quality of life, which may have interfered with the evaluation of the arthrodesis outcomes.

CONCLUSION

Ankle arthrodesis is a procedure capable of improving the quality of life of the patient as a whole, including physical, social, emotional and mental health aspects, rather than pain alone, which has been its main objective until the present moment. Age was shown to be relevant for the improvement in quality of life; that is, a younger patient age corresponded to better results.

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