

First-generation total ankle arthroplasty: a 39-year-old case

Prótese total do tornozelo de primeira geração: um caso com 39 anos

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ABSTRACT

Ankle prostheses are a source of disagreement within the orthopedic community due to the poor initial results. The lack of alternatives to arthrodesis has promoted the evolution of arthroplasties. Biomechanical compatibility has been improved, new surgical techniques and instrumentation devices have been developed, and biological techniques for fixation of the various components have been introduced. The first-generation arthroplasty prostheses introduced in the 1970s were cemented and had a stable constrictive design, but because they required extensive bone resection for implantation, they failed due to loosening and extensive osteolysis. We report a case of left total ankle arthroplasty performed in 1980 that is still "in situ". Based on the bibliographic research performed, this case seems to represent the longest-lasting implant reported to date.

Level of Evidence V; Therapeutic Studies; Expert Opinion.

Keywords: Arthroplasty, replacement, ankle; Arthrodesis; Ankle fractures.

RESUMO

As próteses do tornozelo geram discordância dentro da comunidade ortopédica, pelos maus resultados obtidos inicialmente. A falta de alternativas à artrodese promoveu a evolução das artroplastias. Registaram-se melhorias na compatibilidade biomecânica, novas técnicas cirúrgicas e instrumentação, bem como a introdução de técnicas biológicas para fixação dos componentes. As de primeira geração, introduzidas nos anos 70, cimentadas, com design constritivo estável, mas requerendo extensa ressecção óssea para implantação falharam devido a descelamento e extensa osteólise. Reportamos um caso de uma prótese total do tornozelo esquerdo implantada em 1980 e ainda "in situ". Da pesquisa bibliográfica efetuada, parece-nos tratar-se do implante mais longo relatado.

Nível de Evidência V; Estudos Terapêuticos; Opinião do Especialista.

Descritores: Artroplastia de substituição do tornozelo; Artrodese; Fraturas do tornozelo.

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INTRODUCTION

The use of total ankle arthroplasty (TAA) began in 1970 as an alternative to ankle arthrodesis (AA). The first generation of cemented implants, either restrictive or nonrestrictive, had high failure rates, primarily due to poor prosthetic designs, loosening and instability⁽¹⁾.

However, TAA was improved with several modifications, including implants that were not cemented, semirestrictive implants, and implants with movable or fixed polyethylene components⁽¹⁾.

Although the topic of TAA remains controversial, interest in this procedure as a viable alternative to AA has been

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increasing due to improvements in gait quality and range of motion for patients⁽¹⁾.

According to the literature, both TAA and AA have very similar complication rates.

A minor and the most common complication of both surgeries is skin problems, with rates ranging from 1-6%^(2,3).

The most frequent major complication of AA is pseudarthrosis, which occurs in 2-10% of cases, although this rate has decreased with the development of new techniques and materials^(2,4).

The most frequent major complication of TAA is infection (1.4-2.4%)⁽⁵⁾, although this procedure preserves more of the range of motion in the sagittal plane, provides greater pain relief, and results in higher patient satisfaction compared with AA⁽⁶⁾. However, the long-term results of TAA are not yet fully understood. At 10 years, 70-90% of implants are still intact⁽⁵⁾. Similar to other arthroplasty procedures, TAA is not free from complications, the most universally known of which is aseptic loosening, which necessitates extraction of the implant for review or conversion to arthrodesis. However, arthrodesis may also have long-term consequences, such as arthrosis, which often affects the remaining joints of the foot and sometimes the knee.

We report a case of an intact first-generation prosthesis placed by TAA in 1980 in France that is followed up by

consultation 35 years later at our institution. Our objectives are to inform the international scientific community of this unusual case because it represents the longest-lasting implant described in the literature and to report long-term degenerative changes in the adjacent joints.

CASE REPORT

This study was approved by the Ethics Committee of our institution.

A 65-year-old woman who emigrated from France approximately 30 years ago attended a consultation due to pain in her right foot. She presented claudication and pelvic tilt while walking.

She reported a history of postpartum depression with a suicide attempt in 1979 when she jumped out of a window, which resulted in a bilateral fracture of the tibial pilon. She was treated in France and reported having walked with a plaster apparatus and undergoing subsequent surgeries in different cities. Some time later, she stopped attending her appointments and continued to work as a housemaid. After the patient returned to Portugal and resumed working in the field (subsistence agriculture), a diagnosis of mental illness could not be confirmed, although she presented clinical features of depression.



Figure 1. Radiological study of the ankles (X-ray): A) Arthrodesis of the right ankle performed in 1979 as a salvage treatment due to failed conservative treatment of a tibial pilon fracture; B) Cemented total ankle arthroplasty of the left ankle performed in 1980 as a salvage treatment due to failed conservative treatment of a tibial pilon fracture.

Source: Author's personal archive.

At a consultation in 2015, she complained of pain on the right side, which limited her agricultural activity. Upon clinical examination, the patient exhibited a bilateral rigid ankle (mobility of the left ankle <math><5^\circ</math>) and pain due to hindfoot movement. X-rays and CT performed at the time of the consultation (Figure 1) showed arthrodesis of the right ankle, open arthrosis of the entire hindfoot and the knee, and a cemented prosthesis in the left ankle without signs of loosening or osteolysis but with some bone bridges, which prevented it from working, and hindfoot and knee arthrosis degrees lower than those of the contralateral hindfoot and knee (Figures 1 and 3). Only the location where TAA was performed could be determined, but we did not have access to documentation reporting the type of arthroplasty. According to the X-rays, the patient appeared to have undergone Mayo TAA. From her clinical history, we were able to determine that the patient stopped attending her appointments some time after placement of the prosthesis, but we were unable to determine the number of years that she maintained range of motion in the ankle with TAA.

Since the patient had the original radiographs (Figure 2), we were able to reconstruct her clinical history: the fractu-

res were initially treated conservatively, with AA performed on the right side in 1979 and TAA on the left in 1980.

Arthrodesis of the subtalar joint (Figure 4) was selected because all of the patient's complaints were exclusively on the right side. No procedure was performed on the left side.



Figure 2. Radiological study of the ankles in 2015 (X-ray and TAC): A) Arthrodesis of the right ankle at 36 years postoperatively with evolution to open arthrosis of the entire hindfoot; B) Cemented total ankle arthroplasty of the left ankle 35 years after implantation without signs of loosening or osteolysis but with some bone bridges and arthrosis of the hindfoot. **Source:** Author's personal archive.



Figure 3. Radiological study of the knees in 2015 (X-ray): Evaluation of degenerative alterations above the two surgical sites: the signs of gonarthrosis are more pronounced on the right side where ankle arthrodesis was performed than on the left side where cemented total ankle arthroplasty was performed. **Source:** Author's personal archive.



Figure 4. Radiological study of the right ankle in 2015 (X-ray): Subastragaline arthrodesis as a surgical option to resolve complaints related to the hindfoot. **Source:** Author's personal archive.

The patient returned to her previous daily activities and had only residual pain on the right side after extraction of the material, which does not limit her activity. On the left side where the prosthesis is implanted, the patient reports only sporadic pain. However, she stopped attending her orthopedic appointments, and the patient could not be re-examined despite numerous attempts.

DISCUSSION

The best treatment for primary or secondary ankle arthrosis remains controversial. AA has shown good results, but the long-term consequences in terms of functional limitation are a concern⁽⁷⁾, which has been corroborated by several authors, including Beat Hintermann⁽⁸⁾ (Europe) and Mark Easley⁽¹⁾ (USA), based on a large series of tibiotarsal desarthrodesis cases. Some of the reasons cited for the performance of this technique are correction of poor ankle alignment, avoidance of the consequences of arthrodesis extending to the level of the remaining joints of the limb, and to manage bilaterality, where the gait with bilateral arthrodesis is difficult, especially on inclined planes and when encountering obstacles such as stairs.

However, related studies have reported better prosthesis survival. This study focuses on several aspects, namely, the design of new components, studies and computer analysis of the mechanics of the tibiotarsal joint and the materials used, and increasing the survival of prostheses placed by TAA. Biomechanical studies show that AA affects the kinematics of the ankle more than TAA⁽⁶⁾.

The application of AA and TAA in the same patient to address the same trauma and the different results regarding joint wear and pain led us to carefully consider the two techniques. We could not quantify several variables analyzed, such as the alignment achieved by AA or TAA and the associated consequences for the knee and subtalar joint. However, the differences in the two limbs and the patient's pain and gait pattern stood out to the authors, which cannot be reproduced or support the use of TAA.

Regarding TAA longevity, we found no similar case in the national literature even though the literature review was extensive and detailed⁽⁹⁾, reflecting the interesting nature of the case.

We found only one case of talar resurfacing with a "Vitalium" implant, which was performed in Iowa (USA) and achieved results lasting for more than 40 years⁽¹⁰⁾. Notably, resurfacing is not a form of total arthroplasty, and this case may therefore represent the longest surviving ankle prosthesis.

CONCLUSION

We believe that this case represents the longest surviving TAA prosthesis to date.

However, the authors consider that the most relevant finding in this case is the difference in arthrosis in adjacent joints. By comparing the AA side with the TAA side, we identified a difference in arthroscopic lesions, although this finding may not be due exclusively to the difference in techniques used.

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