Total ankle replacement in young patients

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Summary. High physical demand and younger age are currently considered contraindications for total ankle replacement. The number of Total Ankle Replacements (TAR) is widespread increasing and indications are expanding thanks to a steady improvement in prosthetic designs and better outcome. *Commentary of the literature:* in 1999 a study of 100 uncemented STAR™ (Waldemar-Link, Hamburg, Germany) prostheses showed a survival rate of 75% at 6.8 years in patients under 50 years old. Other studies (es, Barg et Al.) shows the risk of failure age-related in young patients compared to older group. A report of 780 TAR from the Swedish Ankle Register showed patients with primary or post-traumatic osteoarthritis under 60 years of age to have a 1.8 higher chance of revision compared to older patients. *Discussion:* ankle replacement has been traditionally reserved for patients older 50 years old and with low physical demand. Contrariwise this belief, TAR have already been used with a wide range of ages, sometimes even patients younger than 30 years old. Most of the "negative" score and results showed before are related to "second-generation" prosthetic designs, while recent studies used a "third-generation" prosthetic design. *Conclusions:* recent evidences showed better clinical results and higher satisfaction in people under the age of 50 compared to ankle arthrodesis with comparable rate of complications and survivorship. Younger people will have however a higher rate of reoperation but in the meantime, they will prevent progressive degeneration of adjacent joints. (www.actabiomedica.it)

Key words: End-stage ankle osteoarthritis, Ankle replacement, Age at surgery, Survivorship rate.

Introduction

The number of Total Ankle Replacements (TAR) is widespread increasing [1-3] and indications are expanding thanks to a steady improvement in prosthetic designs and better outcome.

Historically, relative contraindications for TAR were: avascular talar osteonecrosis/loss of bone stock [4-5], smoking, diabetic neuroarthropathy, poor skin conditions [6-7], osteoporosis, non-compliant patient[8], high physical demand/obesity[7-8] and age over 50 years old [9-10].

The "optimal" patient for TAR is said to be physically low-demanding, non-obese, older (at least over 50) with end-stage non traumatic primary ankle arthritis and good bone stock.

End-stage ankle osteoarthritis despite being relatively uncommon if compared to hip and knee osteoarthritis is associated with worse mental and physical disability[11].

A substantial difference from hip and knee osteoarthritis is the primary cause; from recent studies overall 80% of ankle osteoarthritis is post-traumatic [12-13].

This difference is especially important because patients are usually younger with higher physical demands and therefore in these cases TAR would bear more stress[14].

In the past, thanks to the belief that arthrodesis has a better outcome in younger patients, TAR was reserved to older people with low physical demand [15]. This was due to reports of low clinical scores and early failure rates with so-called first and second generations TAR.

Recent studies have shown moreover that, when compared with ankle arthrodesis, ankle arthroplasty can provide similar pain relief and better functional outcome [16].

Therefore, such traditional beliefs have slowly been disenchanted in the last years thanks to a constant improvement of the biomechanical model and prosthetic designs and, nowadays, an ankle joint replacement, as well in other districts, is no more a surgery reserved only for old and inactive people. Various authors started to utilize TAR in patients under the age of 50 and with high-spicily demand [17-19].

However, there's still controversy in literature about this specific topic and there are very few studies that directly compared results between younger and older patients. The goal of this commentary is to summarize the current evidence about age related factors in patients undergoing TAR.

Commentary of the literature

Younger age at surgery might influence longevity of the implants in two main ways:
1 The prostheses will need to function longer (higher life expectancy of the patient).
2 The patient will be more active, and this has been proved to be associated with a larger amount of polyethylene wear in hip prostheses [20].

A special consideration should be given to patients with inflammatory joint disease (IJD) because of the fact that even if they are younger, they are less active due to multiple joints affected [21].

Only few authors directly studied the effect of age on results of TAR. In 1999 a study of 100 uncemented STAR™ (Waldemar-Link, Hamburg, Germany) prostheses showed a survival rate of 75% at 6.8 years in patients under 50. The group over 50 showed a survival rate of 81% at 6 years of follow up [22].

Barg et al. [23] found that age under 70 is an independent predictor of failure of the Hintegra™ ankle prosthesis (Integra™ Neurosciences Implants, Sophia Antipolis, France) (average follow up of 6.3 years). Another study showed that patient's underage of 54 had a 2.65 times greater risk of failure compared to older patients. Their estimated rate of survival at 61 months was 0.74 for the younger group vs 0.89 of the older group [24].

A report of 780 TAR from the Swedish Ankle Register showed patients with primary or post-traumatic osteoarthritis under 60 years of age to have a 1.8 higher chance of revision compared to older patients [27].

Nevertheless, on the other hand, a review of 103 Salto third generation prostheses [25] (Salto Talaris™, Integra Lifescience Corporation, Austin TX, USA) specifically compared patients under 50 age and over 50 age. In this study both age groups had an equivalent AOFAS score (26.7 points vs 27.0 points) and a significative post-operative increase in AOFAS score was seen (p<0.001). However, this increase was significantly higher in the younger group (mean 66.8 points vs 62.8 points). There was no significative difference with the preoperative Range Of Motion (ROM) values in both groups and both groups had their ROM significantly improved at follow-up (p<0.001) but the younger group had a significantly higher ROM (37.2° vs 33.9°; p = 0.020). There was no difference between major complications and survival.

Wand et al. reported outcomes of a cohort of 395 primary Inbone (Inbone™, Wright Medical Group NV, Memphis TE,USA), Salto Talaris and Star prostheses divided into 3 groups: under 55, between 55-70 and over 70 [26] with an average follow up of 3.5 years. There were no differences about wound complications, reoperation and revisions.

Discussion

There's conflicting evidence of the influence of age on TAR survival and, over time, more and more studies have been published. Ankle replacement has been traditionally reserved for patients older 50 years

old and with low physical demand under the assumption that the prostheses would have to bear less stress preventing early failure.

Contrariwise this belief, TAR have already been used with a wide range of ages, sometimes even in patients younger than 30 years old [27-28-29]. The total ankle arthroplasty in young patients requires technical peculiarities such as: removal of the osteophytes, assessment of the joint instability, removal of the medial and lateral impingement, subtalar stiffness, gastrocnemius contracture and axial deviation (Figure 1).

Most of the "negative" score and results showed before are related to "second-generation" prosthetic designs, while recent studies used a "third-generation" prosthetic design[30,31]. Despite this, there's still no consensus as to which is the appropriate age to perform TAR and most of the studies conclude that the treatment should be patient-specific [32].

A recent review comparing ankle arthrodesis and ankle replacements over the last decade showed an overall higher complication rate of ankle arthrodesis but a higher reoperation rate for TAR [33]. This is especially true in younger patients who are physically more active and with higher life expectancy. Besides ankle arthrodesis is associated with poorer results and lower patient satisfaction score [34-35].

Altogether, younger patients will live longer with a high physical demand and, even if they'll need a second reoperation, TAR will allow them to gain time and live a better quality of life while sparing adjacent joints from progressive degeneration.

Recent reports showed that younger patients displayed better clinical and functional score while the rate of complications (minor, such as skin necrosis/intraoperative malleolar fracture or major as reoperations) did not statistically differ compared to older patients [25-29,32].

There are however some limitations and the results don't have a unique interpretation.

First, in most of the studies patients are evaluated by different surgeons. Second, the number of the younger patients are significantly lower if compared to older patients.

Even the average follow-up, especially if we consider "third generation" prostheses, is short, usually within 2 years. Another inconsistency is the used scores, that differ among the studies. The most widely used is the AOFAS score which, unless it allows direct comparison, has already been criticised for what concerns the validity of its clinical-base score [35-36].

Last, almost no one of the studies went in-depth about the exact cause of the reported implant failures.
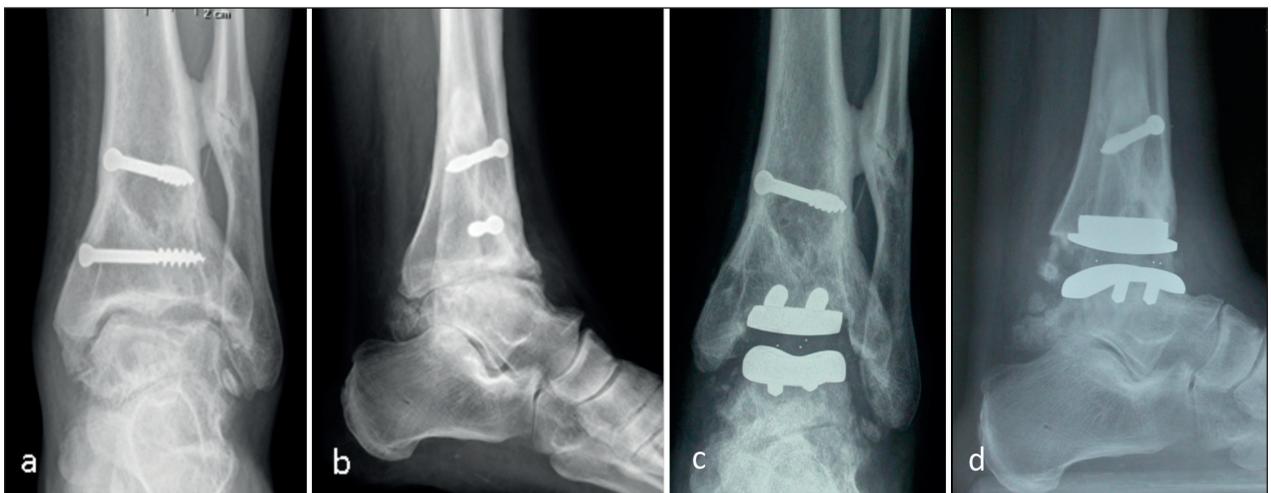
Figure 1. Clinical cases of a 43 years old male affected by post-traumatic osteoarthritis of the left ankle following a pilon fracture 4 years before; a-b: Antero-posterior and lateral view X-ray of the ankle pre-operatively; c-d: X-ray at 3 years follow-up after removal of the impingement and the implant of a total ankle replacement (Box prosthesis).

Conclusions

The reported results might support the hypothesis that ankle replacements are a valid and effective treatment for young and physically active patients. Recent evidences showed better clinical results and higher satisfaction in people under the age of 50 compared to ankle arthrodesis with comparable rate of complications and survivorship.

Younger people will have however a higher rate of reoperation but in the meantime, they will prevent progressive degeneration of adjacent joints.

Choosing between TAR and ankle arthrodesis should be however patient-specific because other factors (as patient expectation and activity level or other comorbidities such as diabetes, neuroarthropathy or inflammatory joint disease) might have an important role.

Lastly, further studies and longer follow-ups are needed.

Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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