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Original Article

The effect of patient age and diagnosis on the 5-year outcomes of mobile-bearing total ankle replacement☆

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ABSTRACT

Total Ankle Replacement is an established technique for the management of end-stage ankle arthritis. However, there are few studies focussing on patient-reported outcomes in the medium and long term related to age or arthritis type. We compared demographic data and patient-reported outcomes preoperatively and at five years postoperatively for patients who underwent total ankle replacement with the aim of establishing whether differences exist in outcome depending on patient age or diagnosis. The Foot and Ankle Score (FAOS) and 36-item Short-Form (SF-36) Health Survey were analysed by diagnosis (osteoarthritis, rheumatoid arthritis, post-traumatic arthritis) and age (under or over 60 years).

At 5 years, the post-traumatic arthritis group had a significantly higher composite score than the osteoarthritis ($p < 0.0001$) or rheumatoid arthritis groups ($p < 0.0001$). Only the post-traumatic arthritis group experienced a significant increase in composite SF-36 score from baseline ($p < 0.0001$). There was a significant improvement from pre-operatively to 5 years in all three domains of the FAOS and in total scores in both groups (over 60 $p < 0.0001$; 60 and under $p = 0.0002$). There was a significant improvement in composite SF-36 score from pre-operative to 5 years in the patients 60 years or younger at the time of surgery ($p = 0.0006$), but not for the patients over 60. Three patients have been revised (4%), at a mean of 4.8 years following surgery with one patient awaiting revision.

1. Introduction

Total Ankle Replacement is an established technique for the management of end-stage ankle arthritis. However, there are few studies focussing on patient-reported outcomes in the medium and long term related to age or arthritis type. Most patients presenting with end-stage ankle arthritis have a post-traumatic aetiology and are consequently relatively young population [1,2]. There have previously been mixed reports of outcomes following total ankle replacement for post-traumatic arthritis with total ankle replacement, some suggesting increased post-operative stiffness [3–6] and few studies including patient-reported outcomes [5,7–8]. Earlier results have however previously reported comparable outcomes at 1–2 years with post-traumatic arthritis compared to patients with rheumatoid or primary osteoarthritis [9]. Previous studies have demonstrated safety and satisfactory survival of total ankle replacement in patients with inflammatory joint disease, including rheumatoid arthritis [10]. However, pre-operative coronal plane deformity of > 10% has been suggested as a risk factor for failure due to persistent deformity or aseptic loosening [11] and a higher rate of delayed wound healing has been reported in patients with inflammatory joint disease. Age has not been shown to influence post-operative patient reported outcomes.

Demographic data and patient-reported outcomes preoperatively and at five years postoperatively for patients who underwent total ankle replacement with the aim of establishing whether differences exist in outcome depending on patient age or diagnosis were compared in this study.

2. Methods

Patients who underwent total ankle replacement at the Freeman Hospital under the care of the senior author between March 2006 and December 2009, were invited to take part in the hospital joint registry. The registry provides an ongoing clinical audit of all lower-extremity total joint arthroplasties and is part of a routine audit for monitoring patient progress; therefore, ethics committee approval was not required for this study. The audit was registered with the research and development department of the Newcastle Upon Tyne Hospitals NHS

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Foundation Trust and had the required approvals including Caldicott Guardian approval. This was a single-center and single-surgeon case series. Exclusion criteria included revision surgery of the ankle, Charcot arthropathy, previous deep-seated infection, osteomyelitis, or neuromuscular disease and patients who declined to participate in the registry.

2.1. Surgery and prosthesis

The MOBILITY Total Ankle System (DePuy International) was used in all procedures, which were performed by a single surgeon using an anterior surgical approach.

2.2. Postoperative rehabilitation

Postoperatively, wound drains were removed after twenty-four hours and a vacuum-assisted closure (VAC) dressing was applied for five days. Active dorsiflexion and plantarflexion were encouraged from post-operative day one, under the supervision of the physiotherapy team. After five days, patients were mobilised weight-bearing as tolerated in a below knee cast, with the use of walking aids as required. Patients who had undergone a calcaneal osteotomy at the time of the total ankle replacement were mobilized in the same fashion. Patients were seen at six weeks, twelve months and annually thereafter for follow-up assessment.

2.3. Outcome measures

The Foot and Ankle Score (FAOS) was validated in adults with arthritis [12]. The items were scored on 5-point Likert scales and the scores for each subscale were normalised to a score out of 100 (100 = no problems, 0 = extreme problems). FAOS and 36-item Short-Form (SF-36) Health Survey [13,14] were collected by independent research staff immediately preoperatively and annually at post-operative follow-up evaluations. Complications were also recorded during the follow-up clinic visits.

2.4. Statistical methods

To study differences in age between the groups, analysis of variance (ANOVA) tests were used, as the data were normally distributed (as demonstrated Shapiro-Wilk tests). All tests were two-tailed and a significance level of 0.05 was used. Pearson correlation coefficient was used to correlate pre- and post-operative stiffness. Because there was insufficient power to analyse the outcome scores, for the rheumatoid arthritis group, descriptive statistics were used.

3. Results

106 patients underwent total ankle replacement between March 2006 and December 2009, 76 of whom had completed 5-year follow-up data and are included in this study. The mean age of the patients was 63 years (range 32–80) and mean BMI was 28.5 (range 17.7–49.1). 24 of the patients were female (32%). The underlying diagnosis leading to ankle replacement was primary osteoarthritis in 40, post-traumatic arthritis in 27 and rheumatoid arthritis in 9 (Table 1).

There was a higher proportion of female patients in the rheumatoid arthritis group (56%) than either the osteoarthritis (23%) or post-traumatic arthritis (37%) groups. BMI was lower in the rheumatoid arthritis group (25.0 kg m^2) than either the osteoarthritis (28.4 kg m^2) or post-traumatic arthritis groups (29.6 kg m^2) but these differences were not found to be significant. The mean age of the post-traumatic osteoarthritis group was significantly lower (58.8 years) than that of the osteoarthritis group (66.7 years) ($p = 0.0017$) and the rheumatoid arthritis group (63.2 years) but this was not significant.

Table 2 summarises the pre-operative and 5-year FAOS scores for each domain and the total normalised to a score out of 100.

Table 1
Demographic data (* mean age of PTOA group significantly lower than mean age of OA group $p = 0.0017$).

	PTOA	OA	RA
Number	27	40	9
Mean age (range)	***58.8* (32–75)***	66.7 (47–80)	63.2 (47–77)
Mean BMI (range)	29.6	28.4	25.0
Number female (%)	10 (37)	9 (23)	5 (56)
Mean number co-morbidities	0.85	1.15	1.11

Pre-operatively, there was no significant difference in any of the domains of pain, function or stiffness or in total FAOS score between any of the diagnostic groups. There was a significant improvement in total FAOS score from pre-operative to 5 years for the osteoarthritis ($p < 0.0001$) and post-traumatic arthritis groups ($p = 0.0007$) but not the rheumatoid arthritis group ($p = 0.1045$). For the osteoarthritis group, there was also a significant improvement in all three individual score domains (pain $p < 0.0001$; function $p < 0.0001$; stiffness $p = 0.0004$), for the pain ($p = 0.0008$) and function ($p = 0.0092$) domains for the post-traumatic arthritis group. There was, however, no significant difference between the total FAOS scores for any of the groups at 5 years.

When analysed by age 60 and below and over 60, there were no significant differences in the pain or function domains of the FAOS score, but significantly higher scores were seen for the stiffness domain pre-operatively ($p < 0.0001$) and this was maintained at 5 years ($p = 0.0001$). There was a significantly higher mean FAOS total score in the over 60 years group both pre-operatively ($p = 0.0425$) and at 5 years ($p = 0.0019$). There was a significant improvement from pre-operatively to 5 years in all three domains of the FAOS score and in total scores in both groups (over 60 $p < 0.0001$; 60 and under $p = 0.0002$).

There was a significant positive correlation between pre-operative stiffness and that reported at 5 years in all groups (combined Pearson correlation coefficient = 0.39, $p = 0.0009$).

Table 3 summarises the total pre-operative and 5-year SF-36 scores (normalised to a score out of 100) for each of the diagnostic and age subgroups.

No significant differences were seen between the groups for any of the domains of the SF-36 pre-operatively or at 5 years, although at 5 years the post-traumatic arthritis group had a significantly higher composite score than either the osteoarthritis ($p < 0.0001$) or rheumatoid arthritis groups ($p < 0.0001$) (Fig. 1). The post-traumatic arthritis group was the only group that experienced a significant increase in composite SF-36 score from baseline ($p < 0.0001$) and there were no significant differences in any of the separate domain scores for any of the groups from baseline to 5 years.

There was a significant improvement in composite SF-36 score from pre-operative to 5 years in the patients 60 years or younger at the time of surgery ($p = 0.0006$), but not for the patients over 60. There were no significant improvements in any of the separate domain scores from baseline to 5 years. There were also no significant differences between groups for any of the separate domains or total score either pre-operatively or at 5 years (Fig. 2).

Complications included 2 (3%) patients with medial malleolar fractures, one of which required operative treatment, the other being successfully treated non-operatively. One patient had persistent pain in the distribution of the superficial peroneal nerve. There were also three patients (4%) with superficial wound infections, which all resolved with oral antibiotics. Three patients were revised (4%), at a mean of 4.8 years following surgery and a further one patient is awaiting revision. The reasons for failure were varus instability in two patients, progressive loosening in one and talar subsidence on a background of talar avascular necrosis. 10 patients (13%) underwent calcaneal osteotomy