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Patient Expectation and Satisfaction as Measures of Operative Outcome in End-Stage Ankle Arthritis: A Prospective Cohort Study of Total Ankle Replacement Versus Ankle Fusion

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Abstract

Background: Current operative outcome scales are based on pain and function, such as the Ankle Osteoarthritis Scale (AOS). Outcomes based on patient expectation and satisfaction may be more useful. The purpose of this prospective cohort study was to evaluate associations between patient expectation, satisfaction, and outcome scores for ankle fusion and total ankle replacement (TAR).

Methods: In total, 654 ankles in 622 patients were analyzed at a mean of 61 months. Patient expectation and satisfaction with symptoms were quantified pre- and postoperatively using the Musculoskeletal Outcomes Data Evaluation and Management Scale questionnaires from the American Academy of Orthopaedic Surgeons, while function was quantified using the AOS.

Results: Patients undergoing ankle replacement had a higher preoperative expectation score (79; 95% confidence interval [CI], 77-81) compared with those undergoing ankle fusion (72; 95% CI, 68-75). Preoperative expectation scores correlated weakly with AOS scores (R^2 = 0.02) and with the “expectations met” score for ankle fusion (R^2 = 0.07) but not for ankle replacement (R^2 < 0.01). Satisfaction scores were similar for ankle fusion and ankle replacement at follow-up, but a greater number of ankle replacement patients showed improvement in satisfaction (84% vs 74%, P < .005). Higher satisfaction at final follow-up was associated with better expectations met and greater improvement in AOS outcome scores for both ankle fusion and ankle replacement. Expectations met and AOS scores at follow-up correlated for ankle fusion (R^2 = 0.38, P < .0001) and ankle replacement (R^2 = 0.31, P < .0001).

Conclusions: Patients undergoing TAR had higher expectation scores prior to surgery than those undergoing ankle fusion. Expectations may be more likely to be met by ankle replacement compared with ankle fusion. Ankle replacement patients were more likely to report improved satisfaction scores after surgery. Preoperative expectation scores showed little correlation with preoperative AOS scores, indicating that expectation is independent of pain and function. However, postoperative expectations met and satisfaction scores were strongly associated with AOS scores at follow-up. Better preoperative patient education may change expectations and requires study.

Level of Evidence: Level II, prospective cohort study.

Keywords: total ankle arthroplasty, ankle fusion, ankle arthrodesis, total ankle replacement, ankle arthritis, expectation, satisfaction, operative outcomes

Currently, the most common measures used to determine the success of an operative intervention are outcome scales based on pain and function, such as the Ankle Osteoarthritis Scale (AOS),[7] the Foot Function Index (FFI),[5] or American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot scale.[17]

However, it may be useful (and perhaps more appropriate) to measure outcomes based on whether a patient's expectations for the surgery have been met. Several studies have reported that patients whose surgeries have met their preoperative expectations are more likely to be satisfied following knee replacement.[1,2,13] Conversely, dissatisfaction and failure to meet expectations appear to be contributing factors in litigation following hip and knee replacement.[2,13,21] In addition to indicating both improved function and reduced pain, scores that quantify the extent to which a patient's expectations have been met may reflect a patient's goals regarding surgery. Such scores may therefore provide an improved measure of a patient's overall satisfaction and of his or her perception regarding the success of an operation.

Prior to surgery, expectation can be measured via the use of questions that address what the patient anticipates will improve following a procedure. These questions can then be repeated during postoperative follow-up to determine whether preoperative expectations have been met.

The use of patient expectations as an outcome measure in the orthopedic literature has increased substantially in recent years, with 14 studies published in 2012 versus a total of 4 studies prior to 2000.[33] Patient expectations have been measured in arthroscopic shoulder surgery,[32] shoulder replacement,[14] cervical spine surgery,[18] scoliosis surgery,[4] hip replacement,[15,25] revision hip replacement,[9] and knee replacement.[22,25,28] With regard to ankle surgery, Tai et al[27] measured patient expectations for hallux valgus surgery. However, we are not aware of any similar studies for operative treatment of ankle arthritis.

In addition to expectation, patient satisfaction has also been quantified for a number of orthopaedic procedures, including hip[23]and knee-joint replacement.[20,30,31] A 4-point scale (from *very satisfied* to *dissatisfied*) was used by the Swedish Joint Registry for total knee replacement.[8]

While the term *satisfaction* usually refers to the patient's perception of a procedure, it can be assigned to a number of different attributes. For the present study, the term was applied either to "satisfaction with symptoms" or to "satisfaction with surgery."[8] (See Methods for definitions of these terms as used in this study.)

Expectation scores can be evaluated via patient questionnaires containing questions regarding the probability of improvement or value-based questions (ie, the importance to the patient of various items after surgery and recovery).[33] Most of these scales are joint or disease specific. Currently, the only standardized, validated scoring instrument applicable to foot and ankle surgery is the Musculoskeletal Outcomes Data Evaluation and Management Scale (MODEMS) questionnaire, which includes the Medical Outcomes Study Short-Form 36 (SF-36).[33]

The primary objective of the present prospective cohort study was to quantify patient expectation, satisfaction, and outcome scores for ankle fusion (AF) and total ankle replacement (TAR) using validated scoring instruments and to evaluate any association between these scores. We hypothesized that the extent to which patient expectations were met would positively correlate with satisfaction and outcome scores. Our second objective was to compare the above scores between these 2 operative interventions, with variability in the type of prosthesis, surgeon, and operative technique. We hypothesized that preoperative expectation scores would be similar for TAR versus AF.

Methods

Patients

Patients who were enrolled in this study were on a waiting list for operative treatment of end-stage ankle arthritis by 5 fellowship-trained foot and ankle orthopaedic surgeons in 3 teaching centers. Patients were enrolled from 2002 until September 2010, and data from all centers were consolidated in September 2012. Minimum follow-up was 2 years and averaged 61 months (5.1 years) for the entire group. Informed consent was obtained from all patients both for surgery and for study participation prior to the procedure. Ethical approval was obtained from each site's institutional review board.

Inclusion criteria for TAR or AF were skeletal maturity, failure of nonoperative treatment of end-stage ankle arthritis, ability and willingness to give informed consent, and a minimum of 1 expectation and satisfaction score. Exclusion criteria for surgery were Charcot arthropathy, poorly controlled diabetes, osteonecrosis of the talus, active or prior infection, and poor vascularity. Exclusion criteria for the present study were an inability to communicate or fill out questionnaires, age younger than 19 years, prior AF or TAR, or failure to complete all 4 expectation and satisfaction questions.

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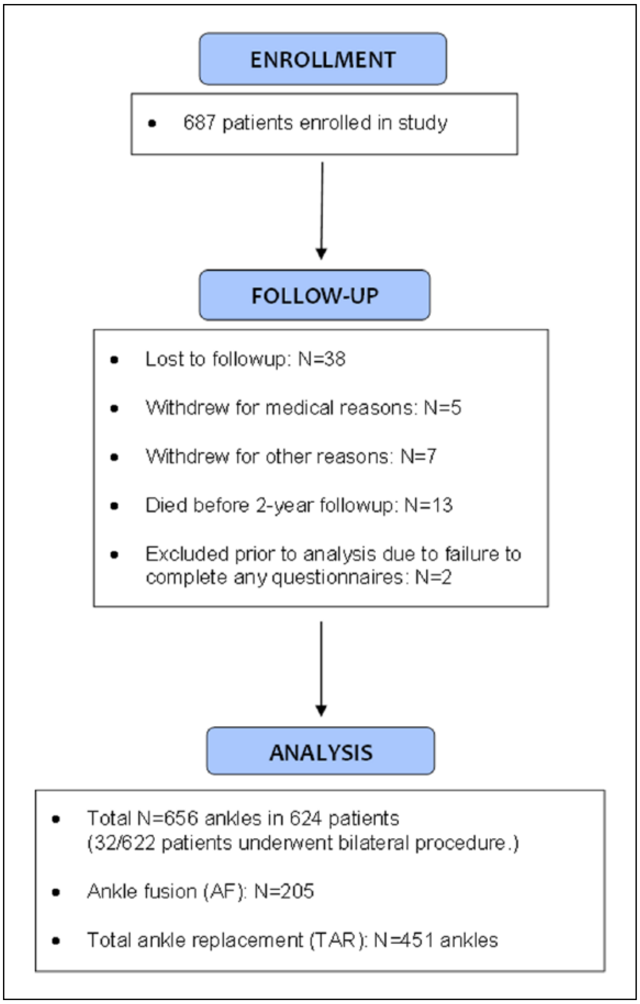

Figure 1. Flow diagram of patient enrollment, follow-up, and analysis.

Demographics

From November 2001 to September 2010, 687 patients underwent follow-up for operative treatment of end-stage ankle arthritis. A total of 622 patients were still enrolled after 2 years and met all inclusion and exclusion criteria (Figure 1). A total of 654 ankles were included in the study, as 32 patients had a bilateral procedure. In total, 204 ankles underwent fusion, and 450 underwent TAR. Demographic variables are shown in Table 1.

The demographics of the fusion and replacement groups are different. The TARs were performed on average earlier in the series, were followed longer, were older, were more likely to be female, had lower BMI, were more likely to have inflammatory arthritis, were less likely to smoke or have diabetes, and were not equally distributed between surgeons.

With regard to completion of questionnaires, 2 patients were excluded prior to analysis because they failed to complete any questions. Thus, of 656 ankles that were originally followed, 8% (54/656) of questionnaires were still partially incomplete. The distribution of missing scores among the 4 questionnaires (pre- and postoperative expectation; pre- and postoperative satisfaction) is listed in Table 2. Table 3 lists the demographic comparison between the 2 groups. Patients who failed to complete 1 or more expectation or satisfaction scores were older, and 1 of the 5 surgeons had a higher percentage of these patients than the others. Otherwise, the 2 groups were similar.

Procedure Selection

The decision regarding operative treatment selection for each patient (ie, TAR or AF) was not randomized. Rather, it reflected current standards of practice and consensus between surgeon and patient.

Data Collection

Data were collected at each study site prior to surgery and yearly thereafter. Patient demographics, comorbidities, and diagnoses were recorded preoperatively. Operative details and revision data were also collected.

The expectation score was based on a quantitative scale ranging from zero to 100. Expectation data were collected prior to surgery using the expectations domain of the preoperative MODEMS questionnaire published by the American Academy of Orthopaedic Surgeons (AAOS)[33] (Figure 2A). The postoperative, "expectations met" MODEMS questionnaire (Figure 2A) was administered annually until final follow-up. Expectation scores were calculated using the formula provided by the AAOS. Questionnaires were either mailed, then returned during a follow-up interview with a study coordinator, or were completed in the clinic under supervision of a study coordinator. If patients failed to answer a particular question, they were either called by or met with a study coordinator in an effort to improve compliance.

Satisfaction scale scores were also recorded, using the single-question MODEMS satisfaction questionnaire (Figure 2B). This questionnaire uses a 5-point scale to score questions regarding a patient's satisfaction with current symptoms.

Clinical outcomes were recorded preoperatively and at each follow-up visit using the AOS[7] and the Short Form-36 (SF-36) Standard Version 2.0 Health Survey.[3] If a revision surgery was performed, final postrevision outcome scores were used.

Operative Technique

Ankle fusions were performed with cartilage debridement using either an arthroscopic approach and stable

Table 1. Demographics at Baseline: Summary by Surgery Type.

Characteristic	Ankle Fusion (n = 205)	Ankle Replacement (n = 451)	Total (N = 656), *P* Value
Age, mean (SD), y	55 (12.1)	63.2 (10.7)	<.0001
Male sex	125 (61)	223 (50)	<.01
BMI, mean (SD), kg/m^2	28.9 (5.1)	28.0 (4.7)	<.05
Patients with inflammatory arthritis	24 (12)	100 (22)	<.001
Patients with rheumatoid arthritis	181 (88)	351 (78)	<.001
Regular smokers	23 (11)	20 (5)	<.01
Follow-up, mean (SD), mo	57 (23.0)	63 (26.6)	<.005
Patients with diabetes	29 (14)	37 (8)	<.05
Side of surgery, left	98 (48)	209 (46)	NS
Percentage of patients assigned to surgeon A/B/C/D/E	25/15/22/18/20	7/15/46/7/23	<.0001
Patients with incomplete questionnaires	12 (6)	39 (9)	NS

Values are presented as number (%) unless otherwise indicated. BMI, body mass index; NS, not significant.

Table 2. Number of Ankles for Which Patients Failed to Complete Individual Expectation and/or Satisfaction Scores.

Type of Score(S) Missing	No. (%) of Ankles (Initial Total = 656)
Excluded prior to analysis, did not complete any questionnaires	2 (<1)
Number missing 1 or more expectation or satisfaction scores	54 (8)
Number missing both preoperative and postoperative expectation scores	50 (8)
Number missing both preoperative and postoperative satisfaction scores	12 (2)
Number missing preoperative expectation score	25 (4)
Number missing preoperative satisfaction score	10 (2)
Number missing postoperative "expectations met" score at final follow-up	27 (4)
Number missing postoperative satisfaction score at final follow-up	5 (<1)

Table 3. Demographics of Patients Who Did or Did Not Complete All Expectation and Satisfaction Questionnaires Including 2 Patients Who Were Excluded Prior to Analysis Due to No Expectation or Satisfaction Questions Completed.

Characteristic	One or More Questionnaires Incomplete (n = 51/656)	All Questionnaires Completed (n = 605/656)	*P* Value
Year of surgery, mean (SD)	2007 (2.2)	2007 (2.1)	NS
Age, mean (SD), y	65.3 (10.5)	60.2 (11.7)	<.005
Male sex	26 (49)	280 (46)	NS
BMI, mean (SD), kg/m^2	27.7 (4.8)	28.4 (4.9)	NS
Inflammatory arthritis	11 (31)	113 (19)	NS
Smoker	1 (2)	42 (7)	NS
Follow-up, mean (SD), mo	59 (26.6)	61 (25.6)	NS
Diabetes	4 (7)	62 (10)	NS
Left side	19 (36)	288 (48)	NS
Percentage of patients treated by surgeon A/B/C/D/E	8/16/60/4/12	13/15/37/11/23	<.001
Replacement vs fusion	40 vs 11 (75 vs 25)	412 vs 193 (68 vs 32)	NS

Values are presented as number (%) unless otherwise indicated. BMI, body mass index; NS, not significant.

What results do you expect from your treatment? (Circle one response on each line.)

	Not at all likely	Slightly likely	Somewhat likely	Very likely	Extremely likely	Not Applicable
36. Relief from symptoms (pain, stiffness, swelling, numbness, weakness, instability)	1	2	3	4	5	6
37. To do more everyday household or yard activities	1	2	3	4	5	6
38. To sleep more comfortably	1	2	3	4	5	6
39. To go back to my usual job	1	2	3	4	5	6
40. To exercise and do recreational activities	1	2	3	4	5	6
40a. To prevent future disability	1	2	3	4	5	6

Are the results of your treatment what you expected? (Circle one response on each line.)

	Definitely yes	Probably yes	Not sure	Probably not	Definitely not	Not applicable
36. Relief from symptoms (pain, stiffness, swelling, numbness, weakness, instability)	1	2	3	4	5	6
37. To do more everyday household or yard activities	1	2	3	4	5	6
38. To sleep more comfortably	1	2	3	4	5	6
39. To go back to my usual job	1	2	3	4	5	6
40. To exercise and do recreational activities	1	2	3	4	5	6

A

If you had to spend the rest of your life with the symptoms you have right now, how would you feel about it? (Circle one response.)

1 Very dissatisfied   2 Somewhat dissatisfied   3 Neutral   4 Somewhat satisfied   5 Very satisfied

B

Figure 2. (A) Musculoskeletal Outcomes Data Evaluation and Management Scale (MODEMS) preoperative expectation questionnaire (upper questionnaire), administered prior to surgery, and postoperative "expectations met" questionnaire, administered during annual follow-up (lower questionnaire). (Figure courtesy of the American Academy of Orthopaedic Surgeons.) (B) MODEMS satisfaction questionnaire. Note that questionnaire addresses symptoms, rather than outcome of surgery. (Figure courtesy of the American Academy of Orthopaedic Surgeons.)

screw fixation (54 procedures) or an open technique (150 procedures). Open fusions were performed in isolation or combined ankle and subtalar fusion using screws, plates, or a retrograde rod. Bone grafting with autograft or bone-graft substitute was performed according to surgeon preference.

Patients undergoing TAR received 1 of 4 prostheses: The Agility semi-constrained prosthesis (Depuy, Warsaw, IN), the Scandinavian Total Ankle Replacement (STAR) mobile-bearing prosthesis (Waldemar Link, Hamburg, Germany; subsequently distributed by SBI, Morrisville, Pennsylvania), the Mobility mobile-bearing prosthesis (Depuy, Leeds, UK), or the Hintegra mobile- bearing prosthesis (Integra Life Sciences, Plainsboro, NJ).

The Agility prosthesis was placed without cement as licensed in Canada. The talar design changed during the study. The Agility was discontinued after 2007.

The STAR prosthesis was placed using a jig system provided by Waldemar Link. The STAR was discontinued after 2007.

The Mobility prosthesis was placed through a bone window using a stem on the tibial side and transfixed using 2 keels and was inserted from 2005 for the duration of the study.

The Hintegra prosthesis was placed with fixation on the flat surface tibial component via 6 small pyramidal spikes and an anterior flange with optional screw fixation. The Hintegra was placed from 2007 to the end of the study.

Outcome Measures

The primary outcome measure for the present study was the AAOS MODEMS questionnaire,[33] including the "expectation" and "satisfaction" domains (Figure 2A,B). Secondary outcome measures included the AOS pain and disability subscales.[7] SF-36 Standard Version 2.0 Health Survey scores (a generic measure of general health status)[3] were recorded and used as an adjustment factor in statistical modeling. Otherwise, the results of the SF-36 were not reported. The AOS is responsive and shows acceptable criterion validity in patients with end-stage ankle arthritis.[17]

In the present study, *expectation* was defined as the anticipation of particular outcomes of an operative procedure or the assumption that these would occur, based on information received by the patient. *Expectations met* was defined as the extent to which a patient's postoperative perceptions regarding the surgery matched his or her preoperative expectations.

Satisfaction with symptoms, defined as a measure of a patient's perception of pain and overall function, was scored on a 5-level ordinal scale (1 = very dissatisfied, 2 = somewhat dissatisfied, 3 = neutral, 4 = somewhat satisfied, 5 = very satisfied).

Statistical Analysis

All analyses considered only the data collected preoperatively and at the most recent follow-up time for each patient. For regression analysis, R^2 was used to summarize the relationship between numeric variables. All reported P values and 95% confidence intervals (CIs) accounted for clustering of data by surgeon.

Expectation scores were analyzed as continuous outcomes. Linear mixed effects models were used to assess differences in expectation scores between AF and TAR, in both unadjusted and adjusted analyses. Baseline variables included in all adjusted analyses were age, sex, smoking status, diabetes, body mass index (BMI), inflammatory arthritis, preoperative AOS score, preoperative SF-36 mental component score (MCS), and SF-36 physical component score (PCS).

Satisfaction was analyzed both as a 5-level ordinal outcome and as a binary outcome, with scores of 1 to 3 points grouped as "dissatisfied" and scores of 4 to 5 points grouped as "satisfied." Mixed-effects logistic regression models were used to assess differences in satisfaction (as a binary outcome) between AF and TAR in both unadjusted and adjusted analyses. All adjusted analyses were adjusted for the baseline variables described above.

The model was repeated for the postoperative "expectation met" score for the above 2 analyses and also repeated adjusting for the preoperative confounding variables listed above and for postoperative AOS score.

Sources of Funding

Direct or indirect research funding support for this study was received from Integra LifeSciences Corporation, Wright Medical Technology, Synthes, ConMed Linvatec, BioSET, and Smith & Nephew. An unrestricted research grant was received from DePuy to support data collection on the Mobility prosthesis for each patient. Some patients receiving a Mobility TAR at one site were also part of an independent radiostereometric analysis study that was supported by an unrestricted research grant from DePuy.

Results

Expectation Scores

In scoring the MODEMS questionnaires, a high preoperative expectation score indicated high expectations, while a low postoperative "expectations met" score indicated that expectations were well met. Overall, patients who received a TAR had a higher mean preoperative expectation score (78.9; 95% CI, 77-80.6) compared with patients who underwent AF (71.8; 95% CI, 68.4-75.23) (Figure 3), with a difference of 7.1 points. After adjusting for baseline factors and surgeon using the linear mixed-effects model, the difference was 6.2 points (95% CI, 2.0-10.4; $P < .005$).

The mean preoperative expectation score declined by roughly 2 points per year from 2002 to 2010 for patients undergoing AF but remained relatively unchanged over this same period for patients who received total TAR (Figure 3).

There was a possibility that some patients did not recollect their original expectations and therefore that the expectations met score may have changed over time. However, expectations met scores were not correlated with duration of follow-up ($R^2 < 0.01$).

Postoperatively, mean expectations met scores at follow-up were 5.2 points lower (ie, better) for TAR (30.2; 95% CI, 27.4-32.7) compared with AF (35.4; 95% CI, 31.1-39.8). However, after adjustment for baseline variables and surgeon, this difference was reduced to 3.8 points and was not statistically significant (95% CI, –1.4 to 8.9; $P = .15$).

When preoperative and postoperative scores were compared, preoperative expectation scores were weakly correlated with expectations met scores at follow-up for AF ($R^2 = 0.07$) but not for TAR ($R^2 < 0.001$). For AF, a higher mean preoperative expectation score of 79.6 was associated with an expectations met score of 0 (good), while a lower mean preoperative expectation score of 57.2 was associated with an expectations met score of 100 (poor).

Satisfaction Scores

Preoperatively, the distribution of satisfaction with symptoms scores was similar for TAR (Figure 4) and AF (Figure 5). When preoperative satisfaction with symptoms scores were dichotomized (satisfied vs dissatisfied), the odds of achieving satisfaction were similar in both groups (odds ratio [OR],

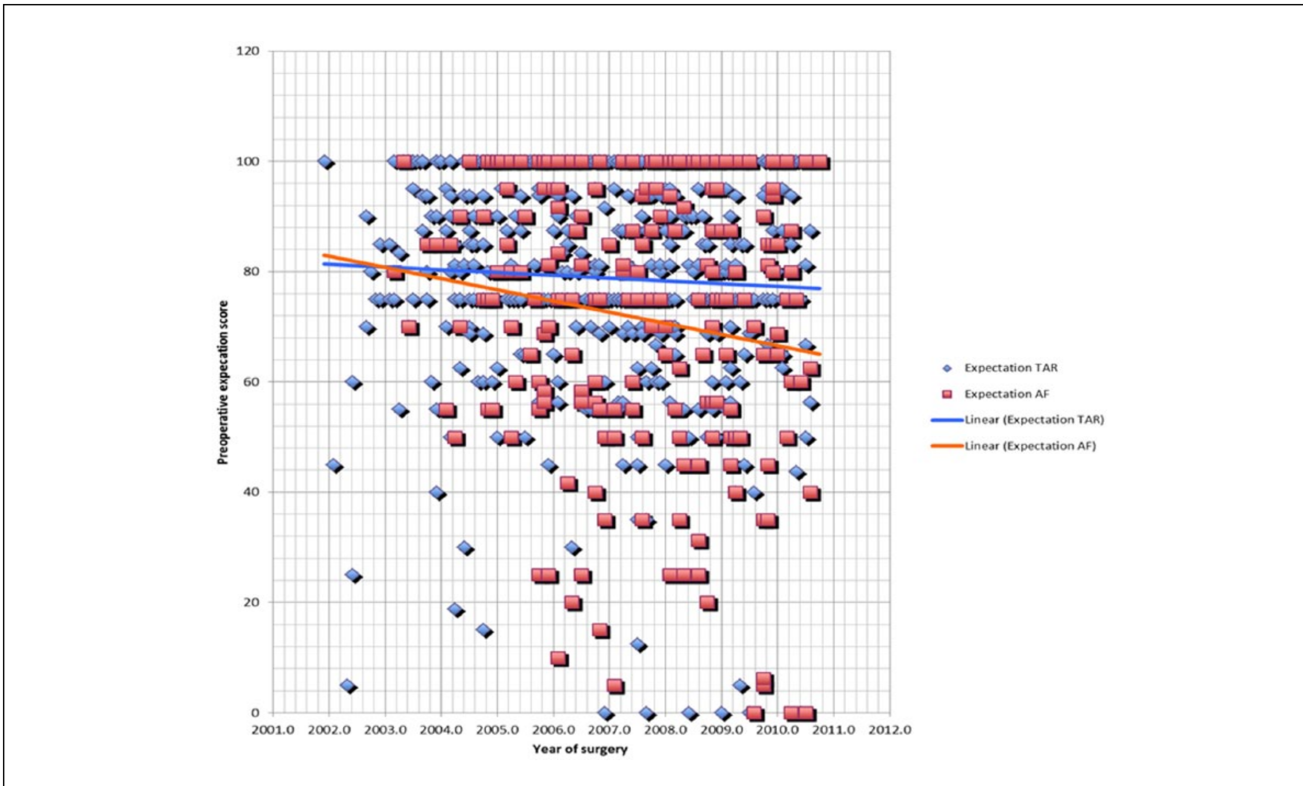

Figure 3. Relationship between preoperative expectation score and year of enrollment for ankle fusion (AF) and total ankle replacement (TAR). The intercepts are 81.9 (2002) and 65.3 (2010).

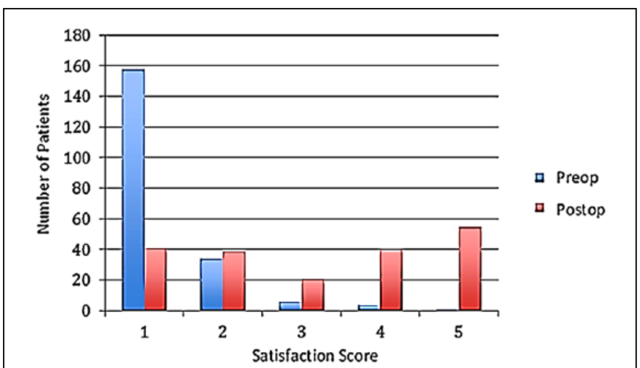

Figure 4. Preoperative vs postoperative satisfaction scores for total ankle replacement (TAR). Satisfaction scores were defined as follows: 1 = very dissatisfied, 2 = somewhat dissatisfied, 3 = neutral, 4 = somewhat satisfied, and 5 = very satisfied.

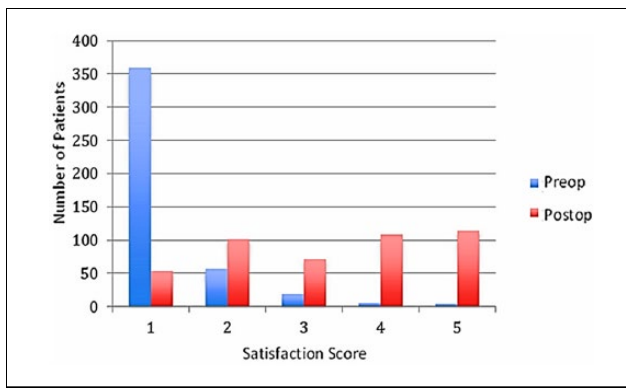

Figure 5. Preoperative vs postoperative satisfaction scores for ankle fusion (AF). Satisfaction scores were defined as follows: 1 = very dissatisfied, 2 = somewhat dissatisfied, 3 = neutral, 4 = somewhat satisfied, and 5 = very satisfied.

1.14; 95% CI, 0.33-3.96; $P = 0.83$) when adjusted for baseline variables and surgeon.

Postoperatively, mean satisfaction scores were also similarly distributed at follow-up between TAR and AF, and the odds of achieving satisfaction were similar (OR, 0.95; 95% CI, 0.64-1.40; $P = .78$) after adjustment for baseline variables and surgeon. However, when the change in satisfaction score was analyzed, a greater number of patients who had undergone TAR had improved satisfaction scores compared with those who had undergone AF (84% vs 74%).

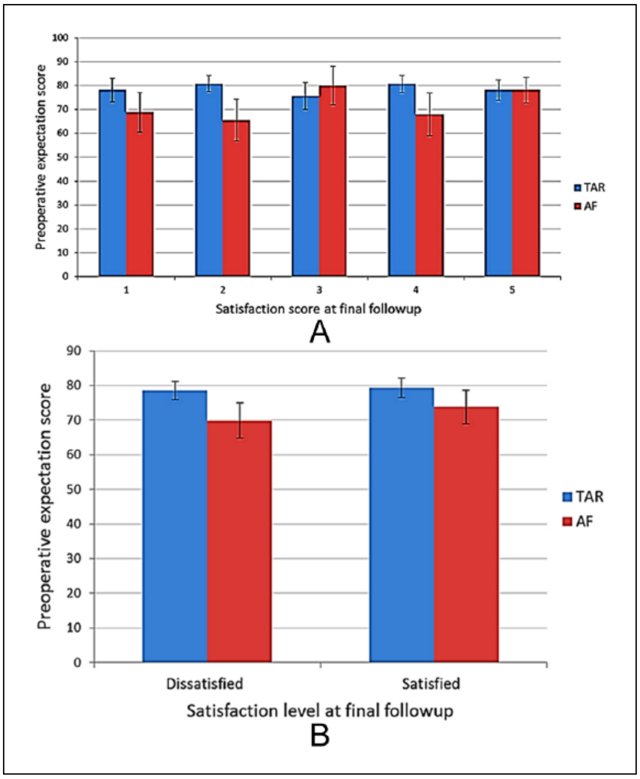

Figure 6. (A) Preoperative expectation scores, grouped by postoperative satisfaction score at final follow-up: ankle fusion (AF) vs total ankle replacement (TAR). Satisfaction scores were defined as follows: 1 = very dissatisfied, 2 = somewhat dissatisfied, 3 = neutral, 4 = somewhat satisfied, and 5 = very satisfied. (B) Bimodal plot, same data, with mean satisfaction scores consolidated into 2 groups: dissatisfied (satisfaction scores of 1-3) and satisfied (satisfaction scores of 4-5).

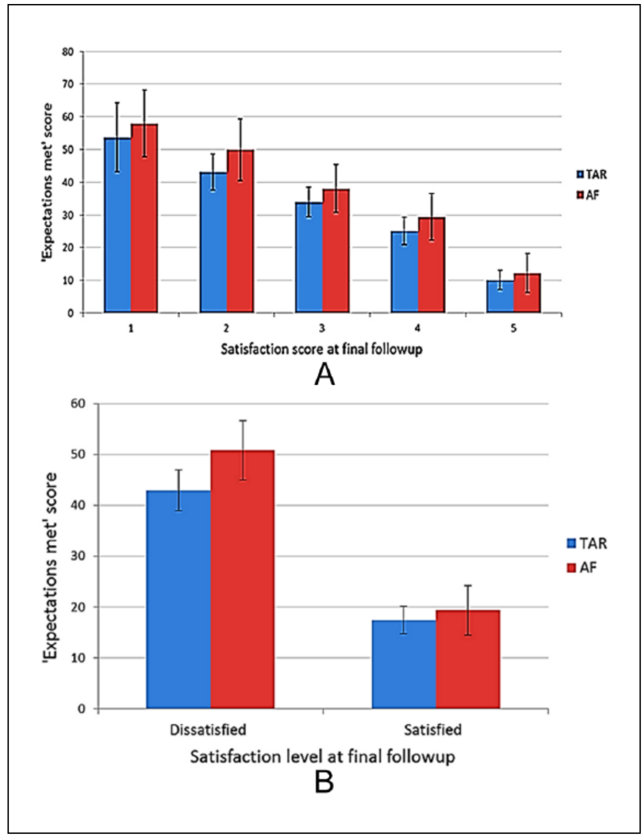

Figure 7. (A) Postoperative expectations met scores grouped by satisfaction score at final follow-up: ankle fusion (AF) vs total ankle replacement (TAR). Satisfaction scores were defined as follows: 1 = very dissatisfied, 2 = somewhat dissatisfied, 3 = neutral, 4 = somewhat satisfied, and 5 = very satisfied. (B) Bimodal plot, same data, with mean postoperative satisfaction scores consolidated into 2 groups: dissatisfied (satisfaction scores of 1-3) and satisfied (satisfaction scores of 4-5).

Relationship Between Preoperative and Postoperative Expectation, Satisfaction, and AOS Scores

Mean preoperative expectation scores showed little correlation with mean satisfaction scores at follow-up and were similar for AF and TAR (Figure 6A,B). However, as predicted, better (ie, lower) mean expectations met scores were associated with improved mean satisfaction scores at follow-up, for both AF and TAR (Figure 7A,B).

Mean preoperative expectation scores also showed little correlation with mean preoperative AOS scores. (Although preoperative AOS score was a statistically significant predictor of preoperative expectation score [P = .02], only 2% of the variability in the expectation score was explained by the preoperative AOS score.)

Mean satisfaction scores at final follow-up demonstrated a strong association with mean final AOS scores. Lower AOS scores (ie, good outcome) were linked to higher satisfaction scores (Figure 8A,B).

Mean expectations met scores also demonstrated good correlation with mean AOS scores at follow-up, with a low mean postoperative AOS score (ie, good outcome) associated with a low (ie, good) expectations met score. As much as 34% of the variability of expectations met scores could be explained by postoperative AOS scores (R^2 = 0.34). Similar results were observed for AOS pain scores (R^2 = 0.30) and AOS disability scores (R^2 = 0.31). The relationship between expectations met and AOS scores at final follow-up was better for AF (R^2 = 0.38) compared with TAR (R^2 = 0.31).

Final mean postoperative scores for AOS and expectations met were better correlated (R^2 = 0.34) than were mean change in AOS score (from preoperative to final follow-up) versus mean change in expectation score (from preoperative expectation score to expectations met at final follow-up) (R^2 = 0.11). The mean expectations met versus mean change in AOS score had a slightly better correlation (R^2 = 0.17).

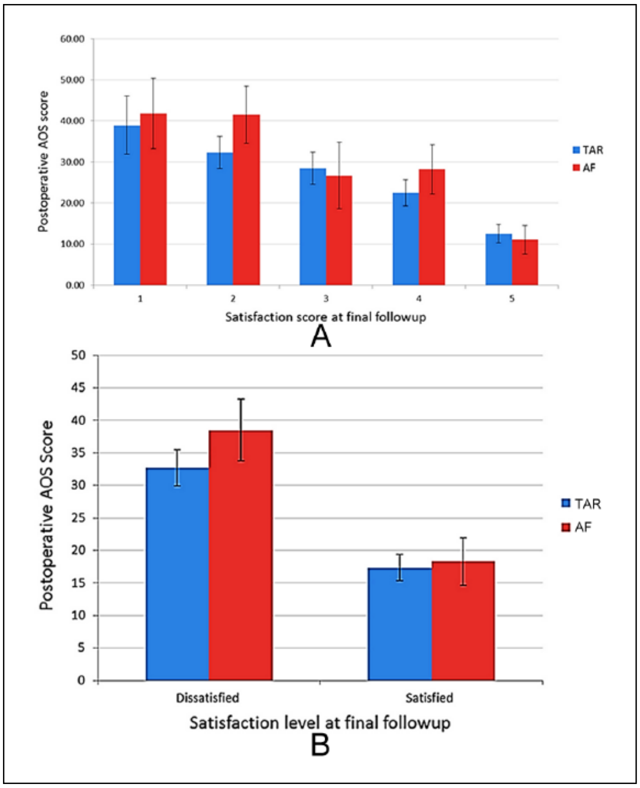

Figure 8. (A) Postoperative Ankle Osteoarthritis Scale (AOS) scores grouped by satisfaction score at final follow-up: ankle fusion (AF) vs total ankle replacement (TAR). Lower AOS score indicates better function. Satisfaction scores were defined as follows: 1 = very dissatisfied, 2 = somewhat dissatisfied, 3 = neutral, 4 = somewhat satisfied, and 5 = very satisfied. (B) Bimodal plot, same data, with mean postoperative AOS scores consolidated into 2 groups: dissatisfied (satisfaction scores of 1-3) and satisfied (satisfaction scores of 4-5).

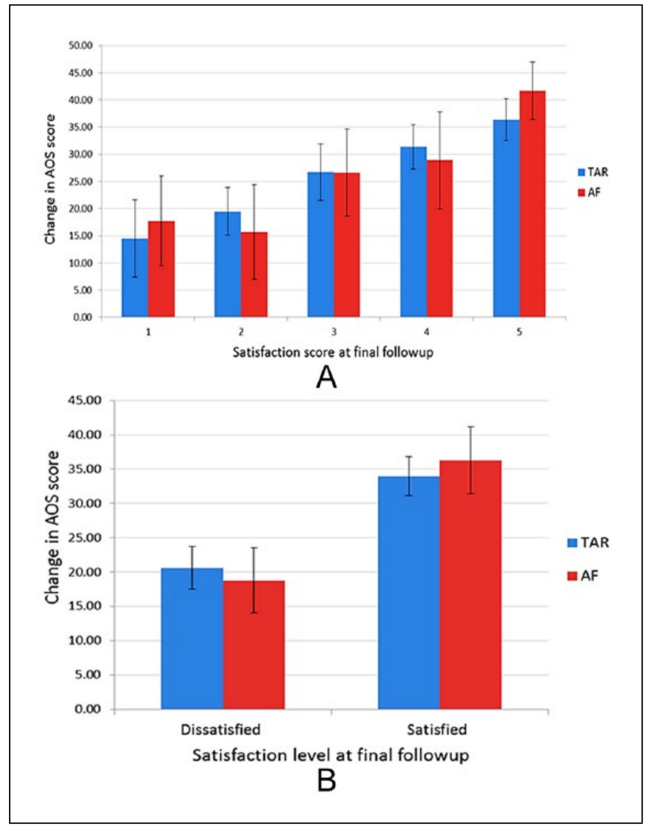

Figure 9. (A) Mean changes in Ankle Osteoarthritis Scale (AOS) score (preoperative to postoperative) grouped by mean satisfaction score at final follow-up: ankle fusion (AF) vs total ankle replacement (TAR). Satisfaction scores were defined as follows: 1 = very dissatisfied, 2 = somewhat dissatisfied, 3 = neutral, 4 = somewhat satisfied, and 5 = very satisfied. (B) Bimodal plot, same data, with changes in AOS score (preoperative to postoperative) consolidated into 2 groups: dissatisfied (satisfaction scores of 1-3) and satisfied (satisfaction scores of 4-5).

Higher satisfaction scores at follow-up were correlated with greater improvement in AOS scores (ie, change in AOS score from baseline to final follow-up) (Figure 9A,B). This was true for both AF and TAR. Increased satisfaction scores were also associated with a greater change in expectation score (from preoperative to expectations met at follow-up) for both AF and TAR; however, the change was less marked than those for the final scores.

Discussion

Patient expectation and satisfaction may be valuable measures for defining the success of an operative intervention.[19] This prospective, multicenter cohort study evaluated the association between patient expectation, satisfaction, and standard outcome scores for AF and TAR, using validated scoring instruments. These scores were also compared between TAR and AF.

Postoperative AOS, expectations met, and preoperative expectation scores versus postoperative satisfaction scores appear to yield similar results at final follow-up. The satisfaction scores used in this study were not a measure of satisfaction with the operative procedure but rather a measure of satisfaction with symptoms. A satisfaction score similar to that employed by the Knee Society might be more appropriate,[8] although patients may have interpreted the question in a similar manner.

The expectation scores used in the present study were the MODEMS scores, which are currently the only scores that are applicable to ankle outcomes.[33] An expectation score has been developed for hallux valgus surgery.[27] A score for ankle arthritis based on the value-based principles for expectation used to evaluate lumbar spine surgery,[20] cervical spine surgery,[18] scoliosis surgery,[4] hip replacement,[15,25] revision hip replacement,[9] and knee replacement[22,25,28] may be more appropriate for ankle arthritis than MODEMS. An expectation scale suitable for all foot and ankle surgery might be helpful to enable comparative studies of outcomes and to assist in the development of preoperative educational interventions.

Preoperative patient expectation scores remained higher among patients who were to undergo TAR, while scores for patients undergoing AF declined over time from 2002 to 2010 (Figure 3). This result was surprising, as we believe that we have adjusted our efforts to educate patients in the opposite direction (in favor of AF) based on clinical experience and advances in arthroscopic fusion techniques yielding better outcomes.[29]

There are 3 potential explanations for this observation: (1) we have not actually altered our recommendations or patient education regarding treatment choice to any significant degree, (2) patients are using alternative sources of information beyond preoperative education in the clinic, or (3) preoperative education does not change patient expectations. Because previous studies have shown that patient expectations can be adjusted prior to surgery with educational interventions such as preoperative courses,[19,24] it would seem most plausible that the results of the present study indicate that patients are obtaining information from additional sources that may not reflect the surgeon's opinion or advice, such as the Internet or advice from family and friends.[16]

This alternative information may influence patient expectations. While expectation and satisfaction scores do generally indicate improved function and reduced pain,[8] they may also reflect the patient's goals for surgery. These goals, in turn, are influenced by the preoperative education the patient has received, and the surgeon or treating team may not be aware of the specific information influencing the patient's decisions. In many cases, a patient's expectations may therefore be quite different from those of the surgeon. It is also worth noting that this discrepancy is a potential source of patient dissatisfaction.[11,12] For example, Ghomrawi et al[12] found that patients were more likely to have discordantly higher expectations if they filled out an expectations questionnaire before, rather than after, a preoperative educational class.

Adequate preoperative patient education is therefore critically important to provide accurate information regarding probable outcomes and to explicitly address any misconceptions that the patient may have. Such educational interventions may be expected, in turn, to yield more realistic expectations and greater patient satisfaction.

Incorporating a preoperative patient education assessment tool may thus be helpful in determining how preoperative expectations might be best measured and modified in the future. While the present study did not evaluate patient education directly, it would be extremely useful in future studies to evaluate all educational resources used by patients, as this would allow the effect of education on expectations to be benchmarked.

Some trends previously observed for hip, knee, and spinal patients[1,10,25,26] were also seen in this study. Patient expectations were more likely to be met if the patient had a higher expectation score prior to surgery. Unlike prior studies, however, patients with poor preoperative functional scores in the present study did not expect more from their surgeries.

In the comparison between AF and TAR, expectation and satisfaction scores revealed some differences that were not demonstrated by AOS scores. The improvement in satisfaction with symptoms was greater for the TAR group (Figures 4 and 5), despite the fact that this procedure had a considerably higher revision rate. The expectations met, AOS, and satisfaction scores at final follow-up were similar. While the expectations met score was different initially, this difference disappeared after confounding variables were taken into consideration. This is a similar result to prior analysis on AOS outcomes.[6]

The present study did not break down the results of different types of ankle replacement prosthesis or the different types of fusion (eg, open vs arthroscopic). These factors, including the effects of revision, could be assessed in future studies.

The primary limitation of this study was that it was an observational series. In addition, several patients did not complete all of the expectation questions, while they did complete other outcome questions. This may indicate that current expectation questions are nonintuitive for patients.

Conclusions

Expectation and satisfaction appear to add another dimension to outcome analysis of end-stage ankle arthritis and to reveal information that is not captured with standard AOS outcome scores. Preoperatively, patient expectation scores provided a very different measure than AOS scores. However, with regard to postoperative assessment of the success of an operation, expectations met scores provided a similar measure to AOS scores, and both were strongly correlated with patient satisfaction scores. The final AOS and expectations met scores were more closely correlated than were changes in these scores before and after surgery.

Comparing TAR and AF, patients undergoing TAR had expectation scores prior to surgery that were considerably higher than those undergoing AF but had similar expectations met scores. TAR patients were more likely to report improved satisfaction scores after surgery. Otherwise, all other preoperative and postoperative scores were similar for TAR and AF.

Patients had higher preoperative expectations for TAR than for AF procedures. Expectations for AF surgery decreased over the time period of the study. These differences did not change when adjusted for confounding variables. These results may be due to the influence of multiple information sources accessed by patients. Patient education should therefore be assessed preoperatively in future outcome studies to determine its effect on preoperative expectations.

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