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Bilateral Arthrodesis of the Ankle Joint: Self-Reported Outcomes in 35 Patients From the Swedish Ankle Registry

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ABSTRACT

Bilateral ankle arthrodesis is seldom performed, and results concerning the outcome and satisfaction can only sparsely be found in published studies. We analyzed the data from 35 patients who had undergone bilateral ankle arthrodesis in the Swedish Ankle Registry using patient-reported generic and region-specific outcome measures. Of 36 talocrural arthrodeses and 34 tibio-talar-calcaneal arthrodeses, 6 ankles (9%) had undergone repeat arthrodesis because of nonunion. After a mean follow-up period of 47 ± 5 (range 12 to 194) months, the mean scores were as follows: self-reported foot and ankle score, 33 ± 10 (range 4 to 48); the EuroQol Group's EQ-5D™ score, 0.67 ± 0.28 (range −0.11 to 1), the EuroQol Group's visual analog scale score, 70 ± 19 (range 20 to 95), 36-item Short Form Health Survey (SF-36) physical domain, 39 ± 11 (range 16 to 58); and SF-36 mental domain, 54 ± 14 (range 17 to 71). Patients with rheumatoid arthritis seemed to have similar self-reported foot and ankle scores but possibly lower EQ-5D™ and SF-36 scores. Those with talocrural arthrodeses scored higher than did those with tibio-talar-calcaneal arthrodeses on the EQ5D™ and SF-36 questionnaires ($p = .03$ and $p = .04$). In 64 of 70 ankles (91%), the patients were satisfied or very satisfied with the outcome. In conclusion, we consider bilateral ankle arthrodesis to be a reasonable treatment for symptomatic hindfoot arthritis, with high postoperative mid-term satisfaction and satisfactory scores on the patient-reported generic and region-specific outcome measures, when no other treatment option is available.

In Sweden, with a population of about 10 million, 400 ankles, or 4 in 100,000 inhabitants, will either be replaced or fused annually. Most (96%) of these procedures will be reported to the Swedish Ankle Registry (1). A limited number of patients will undergo bilateral, but staged, procedures. The knowledge concerning the outcome and satisfaction of patients with bilateral ankle arthrodesis (AA) is very sparse. Recently, a study of a small number of bilateral AA reported high patient satisfaction (2). The aim of the present study was to analyze the patient-reported function and outcomes for patients who underwent bilateral AA with a minimum follow-up of 1 year using validated generic and ankle-specific questionnaires.

Patients and Methods

A total of 51 patients who had undergone bilateral AA as a primary procedure from January 1997 to October 2014 were identified in the Swedish Ankle Registry. Of these, 1 patient (2%) had died of an unrelated reason and 6 (12%) had too short of a follow-up period (<12 months).

At a minimum of 1 year after the most recent arthrodesis, 44 patients were asked to report their general health status using the 36-item Short Form Health Survey (SF-36) (3), the EQ-5D™ (EuroQol Group, Rotterdam, The Netherlands), and the EuroQol Group's EQ-visual analog scale (VAS) (4). The EQ-5D™ score range is from 0 to 1 and the EQ-VAS score range is from 0 to 100. The lower the score, the worse the general health estimation. The score range is also from 0 to 100 for both the SF-36 physical and mental domains. A score of 0 implies maximum disability and a score of 100, no disability. For ankle function, we used the validated self-reported foot and ankle score (SEFAS). The SEFAS contains 12 items, with 5 response options, each with a possible score of 0 to 4, with a total score of 0 representing the most severe disability, and that of 48, normal function (5) (Fig.).

The patients also reported their satisfaction with the result of each ankle using a 5-grade Likert scale: very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, and very dissatisfied (6). Very satisfied corresponded to 1 point and very dissatisfied to 5 points.

Of the 44 patients, 8 (18%) did not return the questionnaires, and the answers of 1 patient (2%) were not applicable because of a paraplegic condition; thus, that patient's scores were not specific to the ankles. Thus, the data from 35 patients (70 ankles) were available for analysis.

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We would like you to answer the 12 questions below. Each question is graded from 0- 4
4 = the mildest or least troublesome and 0 = the most severe or most troublesome.

Please cross the box that best describes your condition during the last 4 weeks

1. How would you describe the pain you usually have from the foot/ankle in question? 4 ☐ None 3 ☐ Very mild 2 ☐ Mild 1 ☐ Moderate 0 ☐ Severe	5. How much has the pain from the foot/ankle in question interfered with your usual work including housework and hobbies? 4 ☐ Not at all 3 ☐ A bit 2 ☐ Moderately 1 ☐ Greatly 0 ☐ Totally
2. For how long have you been able to walk before severe pain arises from the foot/ ankle in question? 4 ☐ No pain up 30 min. 3 ☐ 16-30 minutes 2 ☐ 5-15 minutes 1 ☐ Around the house only 0 ☐ Unable to walk at all because of severe pain	6. Have you been limping when walking because of the foot/ankle in question? 4 ☐ No days 3 ☐ Only one or two days 2 ☐ *Some days* 1 ☐ Most days 0 ☐ Every day
3. Have you been able to walk on uneven ground? 4 ☐ Yes, easily 3 ☐ With little difficulty 2 ☐ With moderate difficulty 1 ☐ With extreme difficulty 0 ☐ No impossible	7. Have you been able to climb *a flight of* stairs? 4 ☐ Yes, easily 3 ☐ With little difficulty 2 ☐ With moderate difficulty 1 ☐ With extreme trouble 0 ☐ Impossible
4. Have you had to use an orthotic (shoe insert), heel lift or special shoes? 4 ☐ Never 3 ☐ Occasionally 2 ☐ Often 1 ☐ Most of the time 0 ☐ Always	8. Have you been troubled by pain from the foot/ ankle in question in bed at night?) 4 ☐ No night) 3 ☐ Only one or two nights 2 ☐ Some nights 1 ☐ Most nights 0 ☐ Every night
9. How much has pain from the foot/ankle in question affected your usual recreational activities? 4 ☐ Not at all 3 ☐ A bit 2 ☐ Moderately 1 ☐ Greatly 0 ☐ Totally	11. After a meal (sat at a table) how painful has it been for you to stand up from a chair because of the foot/ankle in question? 4 ☐ Not at all painful 3 ☐ Slightly painful 2 ☐ Moderately painful 1 ☐ Very painful 0 ☐ Unbearable
10. Have you had swelling of your foot? 4 ☐ None at all 3 ☐ Occasionally 2 ☐ Often 1 ☐ Most of the time 0 ☐ All the time	12. Have you had a severe sudden pain shooting, stabbing or spasms from the foot/ankle in question? 4 ☐ No days 3 ☐ Only one or two days 2 ☐ Some day 1 ☐ Most days 0 ☐ Every day

Fig. Self-reported foot and ankle questionnaire.

Of the 35 patients, 15 were female (43%) and 20 were male (57%), with a mean age of 63 (range 38 to 80) years. The reason for surgery was primary osteoarthritis in 10 patients (29%), rheumatoid arthritis in 14 (40%), post-traumatic arthritis in 5 (14%), diabetic arthropathy in 4 (11%), psoriatic arthritis in 1 (3%), and secondary osteoarthritis (pes cavovarus) in 1 patient (3%). Of the 70 ankles, 36 (51%) underwent talocrural (TC) arthrodesis and 34 (49%), tibio-talo-calcaneal (TTC) arthrodesis; 3 patients (9%) underwent TC arthrodesis on 1 side and TTC arthrodesis on the other side. Six ankles (9%) in 5 patients (14%) required repeat arthrodesis because of nonunion. No repeat repeat arthrodeses were reported to the registry.

The mean follow-up period was 47 (range 12 to 194) months. The follow-up period was >5 years for 17 ankles (24%) in 13 patients (37%). The mean interval between the first and second arthrodesis was 27 (range 5 to 94) months. For the patients with rheumatoid arthritis, the interval was 28 (range 5 to 94) months and for the remaining patients, 27 (range 10 to 111) months.

The Wilcoxon sign ranked test was used for comparisons between groups. We did not perform extensive subgroup analyses owing to the small numbers in the groups and only analyzed the differences between the TC and TTC arthrodesis patients.

Results

Previous subtalar fusion had been performed in 1 patient (3%) with rheumatoid arthritis. No secondary subtalar fusions were reported in the TC group. All 35 patients completed the questionnaires, but 1 patient did not complete the SF-36 properly.

The scores for the patient-reported generic and region-specific outcome measures (SEFAS, SF-36 physical and mental component

Table 1
Patient-reported generic and region specific outcome measure scores (N = 70 ankles in 35 patients)

Variable	SEFAS	SF-36 Physical*	SF-36 Mental*	EQ-5D™	EQ-VAS
All patients (n = 35)	33 (4 to 48)	39 (16 to 58; n = 34)	54 (17 to 71; n = 34)	0.67 (−0.11 to 1)	70 (20 to 95)
RA (n = 14)	32 (11 to 43)	36 (17 to 59; n = 13)	48 (17 to 71; n = 13)	0.59 (−0.11 to 1)	70 (30 to 90)
Other diagnoses (n = 21)	34 (4 to 48)	40 (16 to 58)	54 (31 to 66)	0.75 (−0.07 to 1)	70 (20 to 95)
TC arthrodesis (n = 17)†	36 (11 to 45)	43 (21 to 58)	53 (22 to 64)	0.73 (−0.11 to 1)	68 (30 to 95)
TTC arthrodesis (n = 15)†	30 (4 to 48)	33 (16 to 44; n = 14)	57 (17 to 71; n = 14)	0.62 (−0.07 to 1)	67 (20 to 90)
Follow-up >5 y (n = 13)	31 (10 to 48)	39 (27 to 58)	49 (23 to 66)	0.73 (−0.11 to 1)	66 (20 to 95)

Abbreviations: EQ-VAS, EuroQol Group visual analog scale; RA, rheumatoid arthritis; SEFAS, self-reported foot and ankle score; TC, talocrural; TTC, tibio-talar-calcaneal.
Data presented as mean (range).
* One patient did not complete the SF-36 properly.
† Numbers refer to cases with bilateral TC and TCC fusion, respectively.

summary scales, EQ-5D™, and EQ-VAS) are listed in Table 1. The mean follow-up SEFAS was 33 (range 4 to 48) of 48. The score was about the same, irrespective of the diagnosis, but was somewhat lower for the 15 patients (43%) with bilateral TTC fusions. The difference was not statistically significant ($p = .10$). Also, the SF-36 physical component summary scale and EQ-5D™ scores were lower for those with TTC fusion, and these differences were statistically significant ($p = .04$ and $p = .03$ respectively). The 7 patients (20%) with bilateral TTC fusion and rheumatoid arthritis had a mean SEFAS of 31 (range 22 to 40).

Of the 35 patients, 10 (29%) were very satisfied with both their ankles and 19 (54%) were either very satisfied or satisfied with both ankles. The satisfaction grades are listed in Table 2.

Discussion

The results of the present study show a very high degree of satisfaction (89% very satisfied or satisfied) for patients with bilateral AA. This is consistent with the findings from Vaughan et al (2), who reported that 7 of 8 patients (88%) were very satisfied or satisfied.

To date, no normative data are available for the SEFAS. However, the mean SEFAS in our study of 33 (range 4 to 48) of a possible maximum of 48 corresponded well with the values reported in earlier studies. Cöster et al (7) reported a mean SEFAS of 29 after surgery for hindfoot and ankle disorders. In patients undergoing surgery for adult acquired flatfoot, Cöster et al (8) reported a mean SEFAS at 2 years postoperatively of 33. The only SEFAS data for primary ankle arthrodeses in published studies are from a small series by Henricson et al (9). In patients with total ankle replacement and contralateral ankle arthrodesis, they found a mean SEFAS of 27 for the arthrodesis side. With salvage ankle arthrodesis after failed total ankle prosthesis, Kamrad et al (10) found a mean SEFAS of 22.

In the present study, patients with rheumatoid arthritis had about the same SEFAS as that of patients with other diagnoses, although the SF-36 and EQ-5D™ scores were lower. This most probably reflected that patients with rheumatoid arthritis frequently have other problems, in addition to those in the foot and ankle.

Table 2
Grade of satisfaction (N = 70 ankles in 35 patients)

Variable	Ankles (n)	No. of Ankles of Patients Who Were		
		Very Satisfied or Satisfied	Neither Satisfied Nor Dissatisfied	Dissatisfied or Very Dissatisfied
All ankles	70	64	5	1
Ankles with RA	28	23	4	1
Ankles with other diagnoses	42	41	1	0
Ankles with TC	37	35	2	0
Ankles with TTC	33	29	3	1
Follow-up >5 y	17	15	2	0

Abbreviations: RA, rheumatoid arthritis; TC, talocrural (arthrodesis); TTC, tibio-talar-calcaneal (arthrodesis).

We also found that the SEFAS, SF-36 physical summary scale score, and EQ-5D™ score of patients in the TTC group were lower than those in the TC group. The difference was only statistically significant for the latter 2 scores. However, in the TTC group, 8 patients (53 %) had rheumatoid arthritis, which, at least to some extent, might explain their lower scores.

The score for the physical component summary scale of the SF-36 was somewhat lower than the score of 43 reported by Hendrickx et al (11) in a follow-up study of unilateral AA. However, the mental component score of 54 in our study was the same as that in the study by Hendrickx et al (11).

Few studies have addressed patients with bilateral ankle arthritis. Bilateral total ankle replacement has previously been found to result in a high degree of patient satisfaction (12,13). The results from bilateral AA has only reported for a few patients in studies of unilateral ankle arthrodesis (14,15). In these studies, patients with bilateral AA were noted to have difficulty with stairs, inclines, and walking on uneven terrain. In a small series of patients with total ankle replacement on 1 side and contralateral ankle arthrodesis, most were satisfied with their ankles (9).

Long-term studies of unilateral AA have shown multiple problems. Coester et al (16) found in a 22-year follow-up study of 23 patients that the patients had difficulties with climbing stairs and standing upright. They also experienced swelling and pain, leading to increased foot disability. However, 67% of their patients were satisfied with the procedure (16). Fuchs et al (17), in another long-term study of unilateral AA in 17 patients (1 with bilateral AA), found that all their patients were happy with their ankles. In a 9-year follow-up study of unilateral AA, Hendrickx et al (11) found good functional outcomes, with 91% of their patients satisfied, although many experienced some pain in the ankle. Their SF-36 scores were in accordance with the SF-36 scores in our study.

The limitations of the present study included the concern with incomplete reporting to the registry. However, the procedure-based coverage of reporting AA has been about 96%. Also, the present study was a registry study; thus, we have no information regarding immobilization time and no access to any radiologic reports. We also lack information regarding return to employment and sports activities. The nonunion rate of 9% in the present study was similar to that from other reports (11,18), although cases of asymptomatic nonunion could have been present.

The strength of our study was the nationwide inclusion of cases and surgeries performed by different surgeons at different hospitals. This allowed an objective evaluation of real world clinical results for the procedures but not necessarily the best possible results. Few studies have been performed of bilateral AA, and our study included relatively many cases with a mid-term follow-up time.

In conclusion, we found that patients with bilateral AA have a high degree of satisfaction in a mid-term perspective. The SEFAS and SF-36 scores were reasonably good. Usually, the desire is to avoid bilateral AA; however, our results have shown that when no alternative options are

available, bilateral AA could be a reasonable option with a satisfying outcome. However, no long-term outcome data are available.

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