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Functional Results and Patient Satisfaction of First Metatarsophalangeal Joint Arthrodesis Using Dual Crossed Screw Fixation

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ABSTRACT

A total of 262 feet in 228 consecutive patients underwent first metatarsophalangeal joint (MPJ) fusion; thus, the present study is the largest single-surgeon patient series reported. The inclusion criteria included severe painful deformity of the first MPJ due to osteoarthritis, rheumatoid arthritis, or gouty arthritis and stage 3 or 4 hallux rigidus. The exclusion criteria were revision surgery of the first MPJ, fixation other than with dual crossed screws, and a postoperative follow-up period of <3 months. Fusion of the first MPJ was fixated with dual-crossed 3.0-mm screws. The office follow-up period was ≥3 months postoperatively and the survey follow-up period was ≥6 months postoperatively. The mean duration to radiographic evidence of arthrodesis was 7.00 ± 2.33 weeks, and 252 of the feet (96.18%) achieved successful arthrodesis. The mean postoperative office follow-up duration was 30.43 ± 6.59 weeks. The mean modified American College of Foot and Ankle Surgeons scale score was 51.2 ± 3.28 of maximum possible of 68 points. The mean subjective score was 37.1 ± 2.5 (maximum possible of 50 points), and the mean objective score was 14.5 ± 1.7 (maximum possible of 18 points). Furthermore, 200 patients (87.72%) reported that they had little to no pain, 187 (82.02%) reported they either mostly liked the appearance of their toe or liked it very much, and 173 (75.88%) reported that they could wear any type of shoe most or all the time after the operation. Of the respondents, 207 (90.79%) stated they would have the surgery repeated, and 197 (86.40%) would recommend the surgery to a family member or friend.

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Pain at the first metatarsophalangeal joint (MPJ) has been addressed surgically through various forms of arthrodesis, implants, resection arthroplasty, and osteotomy. Since it was first described by Clutton (1) in 1894, arthrodesis has been shown to be a viable procedure for multiple painful deformities at the first MPJ. Clutton (1) initially used arthrodesis for severe hallux valgus deformities; however, it has also been recommended for other conditions, including severe hallux rigidus, rheumatoid arthritis, post-traumatic arthritis, gouty arthritis, failed bunion and implant surgeries, and neuromuscular conditions (1–10). Not only is arthrodesis a reliable method, multiple studies have also shown that patient satisfaction with fusion of the first MPJ is ≥89% (11–15).

The fixation techniques for first MPJ fusion have included Kirschner wires, Steinmann pins, Herbert screws, plates, a single lag screw, and dual screws using both parallel and crossed techniques (5–7,11–14,16–24). The fusion rates have ranged from 53% to 100%, depending on the type of fixation and the reason for arthrodesis (7,13,20,23,25).

In an effort to better understand the surgical outcomes after first MPJ arthrodesis, we undertook a retrospective cohort study to report the results in terms of the incidence of successful fusion and patient function and satisfaction.

Patients and Methods

A total of 262 feet in 228 consecutive patients who had undergone first MPJ fusion under the surgical care of the senior author (P.A.B.) from January 2000 to June 2014 were identified by a review of the billing records for the Current Procedural Terminology (American Medical Association, Chicago, IL) code 28750. The inclusion criteria included severe painful deformity of the first MPJ due to osteoarthritis, rheumatoid arthritis, or gouty arthritis with stage 3 or 4 hallux rigidus (26), fusion of the first MPJ using dual crossed 3.0-mm screw fixation, an office follow-up visit ≥3 months postoperatively, and a survey follow-up period of ≥6 months postoperatively. The exclusion criteria included revision surgery of the first MPJ, fixation other than with dual crossed screws, and/or an inadequate postoperative follow-up duration.

The pre- and postoperative serial weightbearing radiographs in the anteroposterior, medial oblique, and lateral views of all qualified patients were examined for fusion position and radiographic signs of fusion across the metatarsal–phalangeal interface. Fusion was defined as clinically pain free with trabeculation and ossification across the arthrodesis site and no evidence of hardware movement or lucency around the hardware. This was determined by 1 of us (P.A.B.). The radiographic data were used in a modified

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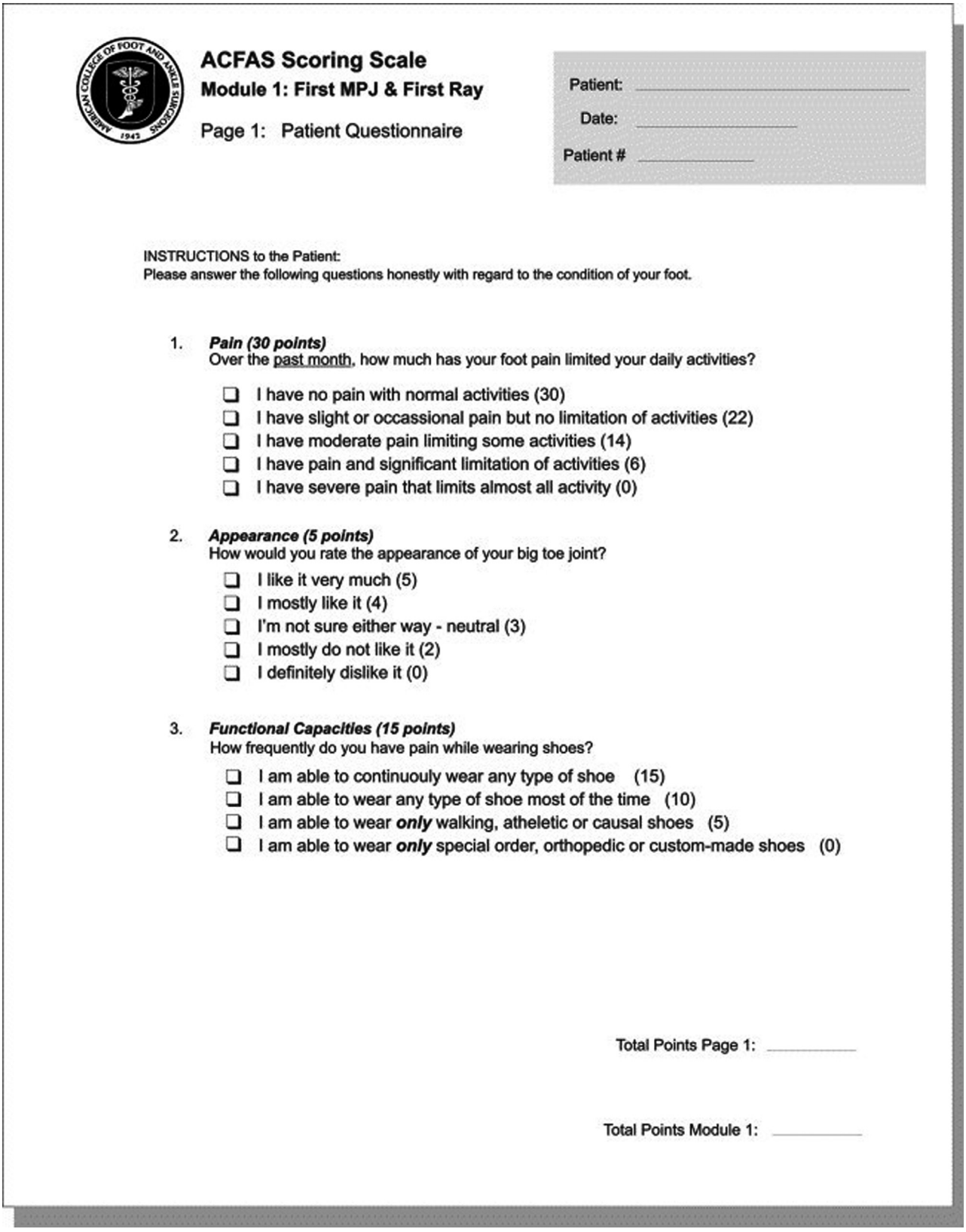

ACFAS Scoring Scale
Module 1: First MPJ & First Ray
Page 1: Patient Questionnaire

Patient: _____
Date: _____
Patient # _____

INSTRUCTIONS to the Patient:
Please answer the following questions honestly with regard to the condition of your foot.

1. ***Pain (30 points)***
Over the past month, how much has your foot pain limited your daily activities?
- ❑ I have no pain with normal activities (30)
- ❑ I have slight or occassional pain but no limitation of activities (22)
- ❑ I have moderate pain limiting some activities (14)
- ❑ I have pain and significant limitation of activities (6)
- ❑ I have severe pain that limits almost all activity (0)

2. ***Appearance (5 points)***
How would you rate the appearance of your big toe joint?
- ❑ I like it very much (5)
- ❑ I mostly like it (4)
- ❑ I'm not sure either way - neutral (3)
- ❑ I mostly do not like it (2)
- ❑ I definitely dislike it (0)

3. ***Functional Capacities (15 points)***
How frequently do you have pain while wearing shoes?
- ❑ I am able to continuouly wear any type of shoe (15)
- ❑ I am able to wear any type of shoe most of the time (10)
- ❑ I am able to wear ***only*** walking, atheletic or causal shoes (5)
- ❑ I am able to wear ***only*** special order, orthopedic or custom-made shoes (0)

Total Points Page 1: _____

Total Points Module 1: _____

Fig. 1. Subjective assessment of American College of Foot and Ankle Surgeons (ACFAS) first metatarsophalangeal joint (MPJ) and first ray scoring scale.

version of the objective assessment portion of module 1 (first MPJ and first ray) of the American College of Foot and Ankle Surgeons (ACFAS) scoring scale (27,28) (Fig. 1). Given fusion of the first MPJ, the functional sections for the first MPJ and first ray of the ACFAS scoring scale were removed, reducing the maximum possible total score to 68 points.

A variety of demographic variables was abstracted from the medical records for use in the present investigation. The data were abstracted by 1 of us (R.J.D.). The demographic variables used in the present study included patient gender, operated side (left, right, or bilateral), etiology of the first MPJ arthrosis, age at surgery, concomitant

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