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Diagnostics in tarsal fusion: The theory and practise in The Netherlands

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ABSTRACT

Background: This study compares the preferences of Dutch orthopaedic surgeons for different diagnostic modalities in performing tarsal fusions versus consensus, evidence or expert opinion reported in the literature.
Methods: A literature search of Medline was performed to obtain evidence-based information on various diagnostic tools. In addition, 89 registered Dutch foot and ankle surgeons were sent a questionnaire concerning the diagnostic modalities use in tarsal fusion.
Results: Fifty-eight (65%) questionnaires were returned. The experienced surgeons measured outcomes significantly more often than other surgeons. Diagnostic injections were often used, although scant evidence exists in the literature. Postoperative diagnostics mainly consist of X-ray examination, although there is consensus in the literature that computed tomography is more accurate.
Conclusions: The study revealed some surprising discrepancies concerning the use of diagnostic imaging in tarsal fusion. More clinical research is needed to identify the most effective diagnostic imaging modalities so as to encourage their wider adoption.

1. Introduction

Many different joints make up the hindfoot; the subtalar joint with anterior and posterior facets, the talonavicular joint, and the calcaneocuboid joint. Various pathological conditions cause pain and dysfunction in the hindfoot such as osteo-arthritis, posttraumatic arthritis, rheumatic disease, congenital malformations such as tarsal coalitions, and neurological disease. Owing to this complex architecture of the hindfoot and the variety of pathological conditions causing hindfoot problems, diagnostic imaging tools are necessary to establish the diagnosis and a treatment plan. Although a thorough history and physical examination may point to a problem in a specific joint in the tarsus, diagnostic injections, X-ray examinations and scans (computed tomography (CT), magnetic resonance imaging (MRI), or bone scintigraphy) are necessary when surgery is contemplated. In a recent review of the literature concerning the outcome of tarsal fusion [1] it was found that authors do not comment on the diagnostic imaging modalities used in the workup towards a tarsal fusion. Also it is generally accepted that a precise work-up and the correct indication for surgery is a very important determinant for successful treatment. We find a discrepancy exists in the above mentioned findings, and state that apparently there is no generally accepted standard work-up and no consensus regarding the value of specific diagnostic modalities. A recent study showed that diagnostic injections, although generally accepted, to be of no true predictive value for successful surgery [2]. Moreover, the value of postoperative X-ray examination to determine the union of an arthrodesis has been debated in the past decade by multiple authors [3–6]

Abbreviations: AOFAS, American Orthopaedic Foot and Ankle Score; AP, anteroposterior; CAOS, computer-assisted orthopaedic surgery; CT, computed tomography; FAOS, Foot and Ankle Outcome Score: FFI, Foot Function Index; Lat, lateral; MRI, magnetic resonance imaging; PET, positron emission tomography; PROMS, Patient Reported Outcome Measures; PTTD, posterior tibial tendon dysfunction; PVNS, pigmented villonodular synovitis; SPECT, single-photon emission tomography; VAS, Visual Analogue Scale.

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This study was performed to map the preferences of Dutch orthopaedic surgeons in the work-up towards tarsal fusion and to compare these preferences with the consensus and evidence in the literature. The hypothesis was that experience in foot and ankle surgery influences the choices of diagnostic modality and outcome measurement.

2. Materials and methods

2.1. Literature search

A PubMed literature search was performed to find articles reporting the value of different diagnostic tools. Search terms were [Hindfoot arthrodesis] AND [MRI Hindfoot arthrodesis] AND [CT Hindfoot arthrodesis] AND [X-ray Hindfoot arthrodesis] AND [Ultrasound Hindfoot arthrodesis] AND [Diagnostic Modality in Foot and Ankle]. The search was conducted for the years 1946 to 2014.

2.2. Questionnaire

A questionnaire was sent to 89 registered orthopaedic surgeons who specialise in foot and ankle surgery. Three recalls by E-mail were made to encourage the surgeons to participate. The number of years of experience in the orthopaedic profession was queried by providing tick boxes: "less than 5 years", "between 5 and 10 years" and "more than 10 years". Also, the degree of experience was evaluated by the percentage of hindfoot surgery in the total practise and the number of hindfoot surgeries (>10 or <10) per specialist per year. Participants were asked if they routinely check the outcome of surgery and, if so, which instrument they use. For six different diagnoses (degenerative flatfoot, osteoarthritis, posttrauma, clinically active arthritis, neuromuscular disease, clubfoot, previous surgery tarsus) and four different types of tarsal fusion (triple arthrodesis, talonavicular arthrodesis, calcaneocuboid arthrodesis, double arthrodesis) the following questions were asked: "How often do you use X-ray examination, CT, MRI, bone scintigraphy, ultrasound, diagnostic injections or gait analysis pre-operatively in your practise?" Answers were subdivided into never, seldom, regularly, often, and always. Also, the frequency of intraoperative use of X-ray examination (fluoroscopy) or computer-assisted orthopaedic surgery (CAOS) and the use of postoperative X-ray examination or CT scanning was queried (see Table 1 for examples). The local hospital review board granted permission for this study. Ethical approval was not required for this study.

Table 1
Survey sample questions.

How often do you use the described intraoperative diagnostic tools in the following patient groups?						
Intraoperative diagnostic tools in Triple Arthrodesis						
	Never	Seldom	Often	Usually	Always	NA
X-ray	O	O	O	O	O	O
Computer Assisted Surgery	O	O	O	O	O	O
Intraoperative diagnostic tools in Subtalar Arthrodesis						
	Never	Seldom	Often	Usually	Always	NA
X-ray	O	O	O	O	O	O
Computer Assisted Surgery	O	O	O	O	O	O
Intraoperative diagnostic tools in Talonavicular Arthrodesis						
	Never	Seldom	Often	Usually	Always	NA
X-ray	O	O	O	O	O	O
Computer Assisted Surgery	O	O	O	O	O	O
Intraoperative diagnostic tools in Calcaneocuboid Arthrodesis						
	Never	Seldom	Often	Usually	Always	NA
X-ray	O	O	O	O	O	O
Computer Assisted Surgery	O	O	O	O	O	O

2.3. Statistics

The data were analysed using descriptive statistics. Frequency statistics were used to describe the degree of experience in hindfoot surgery amongst the respondents and to describe the pre-, intra- and postoperative use of diagnostic modalities for different diagnoses and tarsal fusions. Crosstabs were used to analyse the differences in use of pre-, intra-, and postoperative diagnostic modalities between the low- and high-experienced surgeons. For this purpose, the degree of experience, defined by the number of hindfoot surgeries performed per year, was dichotomised into more than 10 or less than 10 per year.

STATA 13.1 (StataCorp LP, Texas, USA) was used to analyse the data.

3. Results

3.1. Descriptive analyses

Fifty-eight questionnaires were returned by the 89 solicited foot and ankle surgeons, a response rate of 65%. Forty-seven (81%) of the returned questionnaires were filled out completely. The distribution of the respondents' years of experience in hindfoot surgery was balanced (Table 2). Forty-three (74%) of the respondents reported devoting 25%–75% of their practise to foot and ankle surgery. Most surgeons evidently have two or more other specialities. Thirteen percent of the respondents reported they perform more than 30 hindfoot surgeries per year.

Concerning the evaluation of surgical outcome, foot and ankle surgeons who perform more than 10 tarsal arthrodeses annually ($n = 37$; 64%) evaluate the outcome more frequently than surgeons who perform fewer than 10 annually (51% vs 24%, $p = 0.041$). Visual Analogue Scale (VAS) is used most often (30%) as a first-choice outcome instrument, followed by the Foot Function Index (FFI) (25%), American Orthopaedic Foot and Ankle Score (AOFAS) (17%), the Foot and Ankle Outcome Score (FAOS) (8%), and Patient Reported Outcome Measures (PROMS) (4%). The majority of surgeons (59%) did not measure outcome routinely (see Table 3).

3.2. X-ray examination

3.2.1. Reports from the literature

Regarding the diagnostic workup towards surgery of the hindfoot, there are strong indications of an empirical consensus in the literature that antero-posterior (AP) and lateral (Lat) weight-bearing X-ray examination and posture of the foot are important [7–11], and there is scientific proof that a long axial view is more reliable than a Saltzmann view for adequate planning of correction in the case of malalignment [12]. In the assessment of osseous union after arthrodesis, there is consensus in the literature that X-ray examination is not accurate [3,5].

3.2.2. Results of the questionnaire

Weight-bearing X-ray AP and Lat examination of the foot were considered to be always indicated by most of the respondents (80%

Table 2
Years of experience in 58 Dutch foot & ankle specialists.

	Frequency	Percentage
1–5 years	17	29.31
5–10 years	23	39.66
>10 years	18	31.03
Total	58	100.00

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