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The Foot 14 (2004) 124–128
The Foot
www.elsevierhealth.com/journals/foot

The new press-fit ceramic Moje metatarsophalangeal joint replacement: short-term outcomes

Talal Ibrahim*, Grahame John Saint Clair Taylor

Orthopaedic Surgery, Glenfield Hospital, Groby Road, Leicester LE3 9QP, UK

Received 12 January 2004; accepted 12 January 2004

Abstract

In view of the Medical Devices Agency (MDA) alert relating to the poor short-term outcomes of the ceramic and titanium screw-fit Moje metatarsophalangeal (MTP) joint replacement, we investigated the short-term outcomes of the new all ceramic press-fit Moje prosthesis.

Eleven feet in eight patients treated for hallux rigidus were reviewed. All patients were assessed with a subjective questionnaire, Foot Function Index (FFI), clinical examination, American Orthopaedic Foot and Ankle Society (AOFAS) Hallux Scale, radiographs and pedobarographic analysis. The average time to follow-up was 17 months.

The median FFI scores for operated and non-operated feet were both zero (means: 7.5 and 0, respectively). The median AOFAS score for operated feet was 85 compared to 95 for non-operated feet (means: 83 and 95, respectively). Pedobarographic assessment demonstrated significantly lower peak pressures through the hallux in the operated feet compared to non-operated feet ($P = 0.008$).

Management of hallux rigidus using the new press-fit ceramic Moje joint replacement produced acceptable short-term outcomes.

Keywords: Hallux rigidus; Metatarsophalangeal joint replacement; Questionnaire; Pedobarography

1. Introduction

Hallux rigidus is the commonest osteoarthritis of the foot in adults over the age of 50 years [1]. Surgical management of hallux rigidus remains controversial although arthrodesis is considered the best procedure at present [2]. Many patients especially females are reluctant to undergo fusion because of the permanent loss of motion in the metatarsophalangeal (MTP) joint and inability to wear variable heel height footwear. Other reported problems with fusion are malunion, non-union and transfer of loading to other areas of the foot.

Numerous first MTP joint replacements have been developed with variable success. Many are still available on the market. A screw-fit titanium and ceramic MTP joint replacement was introduced in the United Kingdom in June 1999. Orthopaedic surgeons reported 10 cases of loosening in 149 joints (7%) with this prosthesis up to 2 years after implantation. The Medical Devices Agency (MDA) issued an alert in May 2002 that this prosthesis should not be implanted into patients. A newly developed press-fit all ceramic prosthesis was subsequently introduced in December 1999.

The objective of this study was to assess the short-term outcomes of the new all ceramic press-fit Moje MTP joint replacement.

2. Materials and methods

A retrospective review of 12 feet in nine patients undergoing first MTP Moje joint replacement for hallux rigidus and one patient undergoing third MTP Moje joint replacement for Freiberg's disease was performed. Of the 10 patients, 8 agreed to participate in this study. These eight patients all had first MTP Moje joint replacements with 11 operated feet. The patients consisted of seven women and one man with an average age of 58 years (range: 51–80.5). The mean time to follow-up was 17 months (range: 10–22). The two patients that declined to participate had their notes and radiographs reviewed.

2.1. Operative procedures

The senior author (G.J.S.T.) performed all surgical procedures after failure of medical treatment for disabling pain

* Corresponding author. Tel.: +44-116-256-3448; fax: +44-116-250-2676.
E-mail address: talal_ibrahim@hotmail.com (T. Ibrahim).

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doi:10.1016/j.foot.2004.01.002

Table 1
Subjective questionnaire

Please answer the following with regard to how your toe joint replacement is now:

1. My present level of pain:

At rest is:		When exercising is:	
	None		None
	Slight		Slight
	Moderate		Moderate
	Severe		Severe

2. The activity limitations due to my toe joint replacement are:

No limitations
No limitation of daily activities such as my job, but limited with leisure activities
Limited daily and leisure activities
Severely limited daily and leisure activities

3. The current footwear following my toe joint replacement is:

Fashionable or normal shoes with no shoe insert
Comfort shoes or shoe insert
Modified shoes or brace

4. Are you having any problems with shoe fitting:

No
Yes please specify .....

5. The movement of my toe joint replacement is:

Normal or mildly restricted
Moderately restricted
Severely restricted

6. The toe joint replacement is:

Stable
Unstable or able to dislocate

7. Do you have any hard skin (callus) around your toe joint replacement:

No
Yes

8. The toe joint replacement looks:

Good and straight
Fair with some bend, but no symptoms
Poor and obvious deformity and symptoms

9. My mobility following the toe joint replacement has:

Improved
Deteriorated
The same as before the operation

My walking Distance is .....

10. Are you using any walking aids because of your toe joint replacement:

No
Yes please specify .....

11. Are you able to do the following:

Stand	YES/NO
Jump	YES/NO
Run	YES/NO
Climb a flight of stairs	YES/NO

12. Have you had any complication(s) with your toe joint replacement:

No
Yes please specify .....

.....

Comments: .....

.....

and difficulties with footwear from hallux rigidus. One patient had a revision of arthrodesis malunion of the first MTP joint for hallux rigidus 16 months prior to the joint replacement. The first MTP joint replacements were performed following the manufacturer's recommended technique [3]. "Wool and crepe" dressings were applied postoperatively, then the patients were allowed to fully weight bear. Immediate post-operative radiographs were obtained.

Two patients had complications following the surgery. One of the first and the third MTP joint replacements dislocated postoperatively and required manipulation. Below knee plaster for 6 weeks was used to hold the first MTP joint reduction. Taping to the adjacent toe was used to stabilize the third MTP joint. Both remain in joint to date. One of the patients had persistent pain following the first MTP joint replacement despite exploration and an excisional biopsy which showed no abnormality and the joint replacement was soundly fixed. Three of the patients had bilateral first MTP joint replacements as a single procedure. Three of the 10 patients underwent concurrent procedures. One of these patients underwent ipsilateral second, third and fourth proximal interphalangeal joint fusions. The second patient underwent second toe proximal interphalangeal joint fusion and a Mitchell's osteotomy in addition to the third MTP joint replacement. The third patient underwent a contralateral Mitchell's osteotomy.

2.2. Clinical assessment

Patients were interviewed by the first author (T.I.) who was not involved in their treatment. Patients were sent a subjective questionnaire based on the American Orthopaedic Foot and Ankle Society (AOFAS) Scale via post regarding their operated foot/feet two weeks in advance of their outpatient date. On the outpatient day, patients completed the same subject questionnaire again (Table 1) and the Foot Function Index (FFI) for both feet. The AOFAS Scale was completed by the first author (T.I.) for both operated and non-operated feet. All pre-operative radiographs were reviewed and graded according to Hattrup and Johnson's [4] classification for hallux rigidus. The preoperative radiographs showed five cases of grade I (38%), three cases of grade II (23%) and three cases of grade III (23%) hallux rigidus. One patient had a previous first MTP joint fusion and one patient suffered from Freiberg's disease of the third metatarsal head.

2.3. Pedobarographic assessment

Pedobarographic assessment was performed using the Musgrave Footprint (Preston Communications Ltd, Dublin, Ireland). For each patient, weight and height was obtained. The patient was then asked to walk across the platform barefoot. Three trials were obtained and the average was analysed. For analysis, the foot pressure areas were divided into first and second metatarsal heads, hallux and second toe. Peak pressures were recorded for these areas.

2.4. Statistical analysis

The pedobarographic data for the operated and non-operated feet were analysed with a Student's t test.

3. Results

3.1. Clinical review

The overall agreement between the postal and outpatient questionnaire was 92%. There were 12 differences in 154 identical questions. Comparing the postal and outpatient subjective questionnaire to the doctor administered AOFAS; there were 10 and 2 differences in 55 identical questions, respectively. The overall agreement being 82% between the postal subjective questionnaire and AOFAS and 96% with the outpatient subjective questionnaire and AOFAS.

In reviewing the subjective questionnaires, no patient required any walking aids following the joint replacement and all patients were able to stand, jump, run and climb a flight of stairs. All patients graded their operation as satisfactory except one patient who was unsure. When asked if they would undergo the joint replacement again, seven of the eight patients said "yes" and one was "unsure". This one patient had no complications following her bilateral joint replacements and seemed subjectively and objectively to have had an excellent outcome. The remaining responses are provided in Table 2.

The median FFI scores for the 11 operated feet and five non-operated feet were both zero (means: 7.5 and 0, respectively, range: 0–56). The median AOFAS hallux score for

Table 2
Results of subjective questionnaire in 11 first MTP joint replacements

Symptom	Number of responses
Pain at rest	
None	8
Mild	3
Pain at exercise	
None	3
Mild	6
Moderate	1
Severe	1
Shoe fitting problems	
None	7
Present	4
Activity limitations	
None	4
Recreation	6
Daily and recreation	1
Mobility	
Improved	8
Deteriorated	1
No change	2

Table 3
Pedobarographic results in first MTP joint replacement and non-operated feet

Group	First metatarsal head	Second metatarsal head	Hallux	Second toe
Operated	3.4	5.0	2.4	2.4
Non-operated	2.5	4.2	5.4	3.3
P value	0.31	0.45	0.008	0.33

Peak pressures measured in kg/cm^2.

the 11 operated feet was 85 (mean: 83, range: 62–95) compared to 95 for the non-operated feet (mean: 95, range: 90–100).

Postoperatively, two radiographs showed subsidence of 3 mm. One of the patients had suffered from Freiberg's disease while the other showed stress fractures of the second and third metatarsals not related to any trauma with osteopenic bones. One patient had tarsometatarsal joint osteoarthritis. No other adverse features were detected in the other post-operative radiographs.

3.2. Pedobarographic review

The peak pressures through the hallux in the operated feet were significantly lower than the non-operated feet ($P = 0.008$). The peak pressures through the first and second metatarsal heads and the second toe were similar in the operated and non-operated feet (Table 3).

4. Discussion

This study evaluated the results of first MTP joint replacements with a new press-fit ceramic prosthesis (Moje) using various outcomes measures. The original screw-fit prosthesis had an MDA alert only after 10 reported cases of loosening [5]. This corresponds to a 7% failure rate up to 2 years after implantation. When compared with other available joint replacements on the market, no alert has been issued for other joint replacements even though they have higher reported failure rates. The silastic hemiarthroplasty was reviewed by Rahman and Fagg [6] in 1993 and they recommended that this procedure be abandoned because of a 72% incidence of silicone granulomatous reactions. Despite this high rate of complication, the silastic prosthesis is still available on the market today. A review study by Notni et al. [7] showed that 42% (11 of 26) of titanium and polyethylene implants (42%) had radiological evidence of loosening 13–41 months after insertion and three joint replacements had to be removed for pain. Ess et al. [8] also showed only a 60% satisfactory outcome with the same prosthesis after 2 years with only 50% of patients being pain free after the joint replacement. Titanium wear particles cause osteolysis [9]. Nevertheless, this prosthesis is still available on the market with no MDA alert issued. Conversely, a cobalt chrome resurfacing hemiarthroplasty has been reported to give 90% good long-term results with up to 33 years of follow-up [10].

Questionnaires and clinical scoring scales are used to provide a standard method of comparing outcomes of treatment of the same surgical problem. Several questionnaires are available and have been utilised to measure improvement following foot surgery. One of the most commonly used is the AOFAS score [11]. However, this scoring system has not been validated. Another scoring scale is the FFI [12], which is a fully validated self-administered index measuring the impact of foot pathology on function. In our study, we evaluated the results of a modified version of the AOFAS Hallux Scale sent to patients in the post and repeated at the outpatient review. There was a good overall agreement (92%) between the postal and outpatient questionnaires. When comparing the full AOFAS Hallux Scale administered by the doctor to our subjective questionnaire, the overall agreement in the outpatient review was higher (96%) than the post version (82%). The presence and input from the doctor in the outpatient questionnaire suggests the questions may be too complex and not suitable in its present form for postal use only. With regards to the FFI, two patients scored worse than the group. One patient had suffered second and third metatarsal stress fractures postoperatively and had a score of 56, while the other patient had persistent pain following the joint replacement and had a score of 22. The first patient that scored 56 on the FFI scored highly due to other associated pathology in the foot and had no complications with the first MTP joint replacement. An important daily function that several patients had problems with, but is not mentioned in any of the questionnaires was driving. We suggest that driving needs to be considered in questionnaires relating to foot pathology.

Two patients presented with painless dislocations postoperatively. Early dislocations can present without pain and can be misdiagnosed by just inspecting the MTP joint. We suggest an antero-posterior and true lateral post-operative radiograph is essential.

Pedobarography produces vast numbers of data points making analysis difficult. We chose to analyse peak pressures at four areas. Pedobarographic peak pressures were similar between operated and non-operated feet except the hallux which bore less pressure in the operated halluces. Betts et al. [13] found that patients with non-operated hallux rigidus have abnormally high peak pressures beneath the hallux and similarly after fusion [2]. Overall, 88% of patients had adequate or complete pain relief. Only one patient had persistent pain despite the joint replacement. The aetiology of this pain remains unknown despite exclusion of infection and loosening with bloods, Magnetic Resonance Imaging and surgical exploration. The majority of the patients (88%) would have the surgery again and there have been no revisions with up to 22 months of follow-up.

5. Conclusion

Clinical, subjective, radiographic and pedobarographic assessment of 11 new all ceramic press-fit Moje first MTP joint replacements for hallux rigidus produced good results.

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