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ORIGINAL STUDY

Percutaneous hardware free corrective osteotomy for bunionnette deformity.

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When bunionette deformities are not responding to conservative treatment, several surgical procedures are available. Recently, minimal invasive techniques have been proposed with good results. We present our results of a strictly percutaneous 5th metatarsal osteotomy to correct the deformity with bandage after care. We present a retrospective review on 20 percutaneous distal oblique 5th metatarsal osteotomies for correction of bunionette deformity. Aftercare consisted of 5-6 weeks of corrective taping with full weight bearing using a post-op shoe. Patients were evaluated radiographically and clinically by the American Orthopaedic Foot & Ankle Society (AOFAS) Lesser Toe Metatarsophalangeal-Interphalangeal scale, Visual Analogue scale (VAS) and Coughlin classification. At a mean follow-up of 27.05 months, the AOFAS improved from a mean of 51 points to 91.6 points (max 100). 90% of patients had good or excellent clinical result and a mean pain score on the visual analog scale was 0.7 out of 10. Radiographic evaluation showed a good correction of the intermetatarsal and metatarsophalangeal angle. We did not encounter any complications such as infections, wound breakdown, neurovascular problems, non-union or recurrence. The percutaneous hardware free corrective osteotomy is an effective, reliable and safe procedure concerning the treatment of bunionette deformity. The results are comparable with previously published outcomes of open and minimal invasive procedures with considerable less soft tissue damage, shorter operating time and the lack of internal fixation.

Keywords : foot, bunionette, percutaneous surgery

INTRODUCTION

A Tailor's bunion is a painful deformity on the lateral aspect of the 5th metatarsal. (*6, 7, 21*). It's name is derived from tailors who sustained these lesions frequently due to their typical sitting position with the legs crossed (*29*). Several retrospective studies indicate that it is between 3 and 10 times more frequent in women than men and has a peak incidence between the fourth and fifth decade of life (*29*). The bunionnette is often seen in splayfoot disorders and many times accompanied with a hallux valgus. An enlarged fifth metatarsal head (congenital or traumatic) or a lateral angulated metatarsal shaft do give a more prominent metatarsal head. (*29*) Typically, these patients complain of pain on the lateral side of the foot, more pronounced when narrow shoes are worn. Often there is some callus or inflammation notable. In severe cases a bursa can develop due to the chronic irritation, and over time this can evolve into an ulceration.

According to Du Vries and Coughlin there are 3 different deformity types, based on weight-

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bearing dorsoplantar radiographs (figure 1). Type 1 is an enlargement of the head of the 5th metatarsal, type 2 is characterized by a lateral bowing of the 5th metatarsal and type 3 is noted by an increased intermetatarsal angle between the 4th and 5th metatarsals (>8°). (*1, 4, 6, 10, 15*).

Fig. 1. — Pre-op Tailor's bunion bilateraal (Type 1).

Conservative treatment such as oral anti-inflammatories, topical keratolytics, shoe wear changes or orthoses can solve most of the complaints though often will not produce long lasting relief (*29*). When these are found to be insufficient, operative possibilities are developed to address the complaints and anatomy. There are a great variety of different techniques available though most include osteotomies to correct the bony deformity. The purpose of surgery is to decrease the width of the forefoot as well as the prominence of the bunionette. (*29*) Lonely soft tissue procedures do have high recurrence rates especially when dealing with type 2 and 3 bunionette's. In these specific cases, percutaneous distal osteotomies have gained popularity and recently several studies showed good clinical en radiographic outcomes. (*22, 24*) The possible advantage of percutaneous hardware free surgery is the reduced risk of wound healing problems and symptomatic hardware, as well as improved cosmetics.

We present our short-term data in the ongoing discussion about percutaneous hardware free distal osteotomy in case of tailor's bunion.

MATERIALS AND METHODS

We retrospectively reviewed the patients operated between December 2009 and January 2013. The percutaneous hardware free distal subcapital osteotomy was performed on 20 feet (16 patients). Mean age at surgery was 36.65 years (range 17-66) and 80% of these patients were women (Table 1). All medical records were reviewed, all patients were contacted and information concerning the study was provided. Informed consent was obtained. Patients were reviewed one year after surgery or longer at the time of this investigation. The study protocol was approved by the ethical committee of our institution. One skilled ankle and foot surgeon (P.D) performed all the interventions using the below described method.

The Indication for surgery was a tailor's bunion resistant to conservative treatment, including shoe wear adaptation and oral anti-inflammatory drugs. In 1 patient a classical hallux valgus correction was performed simultaneously (Patient 6). All patients were followed for at least 1 year (average 27, 05 months) (Table 1).

We refer to the technique described by De Prado and the Grecmip (group of research and study into minimally invasive surgery of the foot and ankle) (*24*). Though without performing a condylectomy.

Adequate percutaneous surgical instruments are essential and the surgeon should be trained in percutaneous operation techniques.

Surgery was performed under general anesthesia or a locoregional popliteal block without tourniquet. The patient was positioned in dorsal decubitus distal on the table. After draping, the foot is placed directly on the mini c-arm.

Tabel I. — Patient characteristics

Patient	Gender	Age	Type	Side	IM angle 4-5		MTP angle		AOFAS		VAS		FU (months)
					pre	post	pre	post	Pre	Post	pre	post	
1	M	31	1	re	7	5	9	0	37	90	4	4	18
2	F	21	3	re	13	6	21	10	63	100	1	0	20
		21	3	li	14	8	28	14	63	100	1	0	20
3	F	66	2	re	7	1	21	9	73	78	1,5	0,5	28
4	M	52	3	li	13	7	25	18	32	93	6	0	26
		52	3	re	10	3	23	12	32	100	6	0	26
5	M	65	3	re	14	8	20	9	62	93	4	0	32
6	F	34	2	re	9	6	17	3	70	70	5	3	19
7	F	25	2	li	9	5	19	8	37	100	6,5	0	16
8	F	38	2	li	8	1	22	8	29	100	5	0	28
		38	2	re	8	5	16	8	60	100	3	0	26
9	F	64	2	re	9	3	23	11	52	90	5	3	26
10	F	18	2	li	9	7	19	10	62	100	6	0	20
11	F	17	3	re	13	6	23	10	70	100	4	0	16
*12	F	21	3	li	13	6	26	9	37	95	7	0	32
		22	3	re	10	7	22	6	37	68	7	3	29
13	F	30	3	re	11	6	23	12	42	100	8	0	42
**14	F	64	1	re	6	6	14	8	25	70	10	0	53
15	F	22	1	re	6	4	13	9	80	100	6	0	44
16	F	32	2	li	7	1	30	8	57	85	4	0	20
Average		36,65			9,8	5,05	20,7	9,1	51	91,6	5	0,675	27,05

OAFAS : American Orthopaedic Foot & Ankle Society Lesser Toe Metatarso-phalangeal-Interphalangeal score.

In most cases the osteotomy is made just proximal to the metatarsal head at the metaphysis. In type 3 we go slightly more proximal to obtain more correction. The osteotomy was always complete (no closing wedge) with a medial translation of the metatarsal head and was always conducted under direct fluoroscopic guidance.

With a small beaver blade, a dorsal step wound (2mm) was made under fluoroscopic guidance lateral to the extensor tendons at the level where the osteotomy should be performed. The osteotomy was performed fluently by placing the percutaneous burr directly lateral to the bone in a 45 ° direction (preventing dorsal displacement), making a small groove while going plantarly and changing the burr from a vertical oblique position into a horizontal position. Still in the same movement, the osteotomy is completed by pulling the rotating burr from plantar proximal to distal dorsal in a oblique 45°plane. The metatarsal head spontaneously moves medially (figure 2 and 3). With a small percutaneous rasp the bone debris can be removed.

In all cases a burr of 2mm diameter and 15mm long (Integra, Newdeal) was used. Burr speed was maximal 9000 rpm to avoid skin burns. The skin is closed with a single stitch (figure 4).

A splint dressing was applied post-operatively to hold the correct position of the fifth metatarsal head after the osteotomy (figure 5). This bandage is essential for the success of the procedure. It holds the medial translated fifth metatarsal head in the right position. Therefore it's important the taping

Fig. 2. — Post-op X-ray AP view left

Fig. 3. — Post-op Lateral view left

is performed by the surgeon himself. Fluoroscopic check is necessary after the application in the operation theatre and radiographs are made at 1 and four weeks.

The first week rest, elevation and ice applications are recommended. Immediately after surgery, heel

Fig. 4. — Clinical view post-op wound left

Fig. 5. — Clinical view post-op bandage post-operatively

weight bearing for 1 or 2 weeks was allowed with a hard soled shoe. Early forefoot weight bearing was allowed if tolerated. The bandage was first changed after 1 and 2 weeks and removed after 4 weeks. Afterwards a simple taping around the forefoot was advised for 2-3 weeks (figure 6).

Clinically the patients were evaluated using the American Orthopaedic Foot & Ankle Society (AOFAS) Lesser Toe Metatarsophalangeal-Interphalangeal Scale. It provides a subscore counting for subjective and objective outcomes like pain sensation, functional capacity and radiographic alignment. Even so patient satisfaction was classified

Fig. 6. — Clinical view post-op bandage after 4 weeks

with the Coughlin Score as excellent, good, fair and poor. The Visual Analogue Scale was recorded pre- and post-operatively.

Radiographic assessment consisted of anteroposterior and lateral weight bearing x-rays of the foot pre-operatively and post-operatively at week 4 and at final follow-up. The metatarsophalangeal angle and intermetatarsal angle were compared to evaluate the correction as well to assess consolidation.

RESULTS

In all cases, wound healing occurred without any problems. Oedema was present for several weeks but did not interfere with daily live and was not seen as a problem by most of the patients. One patient was known to have fibromyalgia and one patient sustained severe burning wounds (including the foot), these influenced the outcomes negatively (Table 2). The mean OAFAS Lesser Toe Metatarsophalangeal-Interphalangeal score improved from 51 points to 91.6 points at final follow-up. (max 100, $P < 0.05$). All patients mentioned a great reduction of pain or a pain free operation site at final follow-up (pain score pre-op 13, post-op 37, max 40, $P < 0.05$). Function subscores increased from 31.6 towards 42.1 post-operatively with a maximum of 45 points ($P < 0.05$) (Table 2). Clinically union occurred at 6 weeks (no pain when walking). No complications like infection, wound breakdown, nerve or vascular injuries were noted during the follow-up visits.

Tabel II. — Results

	Pre-op	Post-op	P-value
Mean OAFAS (Max 100)	51	91,6	P<0,05
Pain OAFAS (Max 40)	13	37	P<0,05
Function OAFAS (Max 45)	31,6	42,1	P<0,05
VAS scale	5	0,7	P<0,05

OAFAS : American Orthopaedic Foot & Ankle Society Lesser Toe Metatarso-phalangeal-Interphalangeal score.
VAS: Visual analogue scale

According to the Coughlin classification the subjective satisfaction was in 15 feet excellent, 3 feet good and 2 feet fair. The Visual Analogue Scale (VAS) improved from mean number 5 pre-operatively to 0.7 post-operatively ($P < 0.05$)(Table 1, 2). One patient, known with fibromyalgia, was slightly dissatisfied with the result though a great reduction in pain was achieved. She had a little callous development more distally on the fifth toe but she refused any other surgery. All patients returned to their pre-operative activity level and those who were unable to perform sports before surgery could resume their sport activities after surgery.

The intermetatarsal angle (normal < 8°) decreased from 9.8° to 5° and the fifth metatarsophalangeal angle (normal < 10°) decreased from 20, 7° to 9, 1° both at the time of latest follow-up (Table 1). In nearly all patients a limited bone remoddeling was seen after 4 weeks and all united at final follow-up (last visit) (figure 7, 10). No major complications as non-union, osteonecrosis or late displacement occurred.

DISCUSSION

Even though a tailor's bunion seems to be a small problem, it can have a great influence on quality of life, cause frustrations and work problems. If conservative treatment is not sufficient, operative correction will be mandatory. Several procedures are described and proposed depending on the deformity. (*7, 17, 23, 33*). As shown by Kitaoka et al (*17*) partial metatarsal head resection can be performed with a Type 1 deformity. A metatarsal head resection can be performed, mostly as a salvage procedure as it will induce joint instability and transfer metatarsalgia. (*9, 12, 16*)

As for first ray deformities, several osteotomies have been described for the fifth metatarsal

Fig. 7. — Post-op 4 weeks AP view left

ray including proximal, diaphyseal and distal osteotomies. (*5, 6, 8, 11, 18, 19, 25, 30, 31, 32, 33*). The goal of these procedures is to narrow the forefoot resulting in less compression at the fifth metatarsal head. (*19*) All osteotomies do have their specific indications and complications. Proximal osteotomies are indicated when the intermetatarsal angle is greater than 9° and the deformity is located over the entire metatarsal. Though there is a greater risk of non-union caused by interruption of the vascularity (*3, 8, 26, 31*). The same goes for the diaphyseal osteotomies, although less correction can be achieved compared to proximal

Fig. 8. — Post-op week 12 AP left

Fig. 9. — Post-op week 12 lateral

osteotomies. Still higher rates of non- and delayed union are noted.(*5, 30, 31*) Distal osteotomies are most commonly performed due to the higher rates of union reported but with a limited potential for correction. Therefore these are ideal in type II-III deformities (*5, 6, 18, 19, 25*).

Fig. 10. — Post-op 1 year left

Common complications of forefoot surgeries are loss of alignment, delayed-/non-union, transfer metatarsalgia, infections, soft tissue irritation due the fixation techniques, fractures and recurrence of deformity. (*13, 14, 19, 20, 24, 28, 31, 33*).

Recently there have been several studies published who presented new minimally invasive distal osteotomy techniques with good results.(*15, 22, 23*) Some of the studies used stabilization in order to maintain reduction. (*15, 22*). Michels et al showed the possibility to adapt the osteotomy according to the deformity and correct the intermetatarsal angle in minimal invasive procedures (*24*) Even without in situ stabilization there was no higher rate of recurrence (*24*).

Our technique differs from Michels et al. because we performed a metatarsal osteotomy without adjacent condylectomy of the metatarsal head. The post-operative rehabilitation regimen was more or less identical. Both studies present comparable results and this on all investigated outcomes like the clinical, functional and radiographic parameters. By avoiding a condylectomy we could reduce the operating time and we may cause less soft tissue damage leading to a faster recovery. These potential advantages did not make any difference in the outcome scores. General satisfaction of the patients are both high. When pronounced deformity is encountered the percutaneous metatarsal osteotomy can slightly be proximised to allow greater correction possibilities.

As mentioned in the studies (*23, 24*) radiographic bone healing is delayed with respect to clinical healing (figure 8, 9). It is important to know that the early success is not directly related to the radiological outcome, but rather the clinical and pain free experience. In general, clinical healing can be expected after 6 weeks, allowing normal shoes to be worn securely starting at 4 to 6 weeks. Bony healing can take up to 3 months or sometimes even longer. Limitation of heavy physical activities is recommended during this time frame (Figure 6, 7, 8, 9).

This study has some limitations as the retrospective character and relatively small sample size. There wasn't a control group either. On the other hand this study has some potential strengths as it focused on all indications of bunionette deformities. All patients were treated by the same surgeon using one and the same procedure. Evaluation was performed by an independent observer using several standard evaluation scores (AOFAS Lesser Toe Metatarsophalangeal-Interphalangeal scale, Visual Analogue scale (VAS) and radiographic evaluation).

CONCLUSIONS

Our study confirms the good outcome of a percutaneous hardware free distal osteotomy in tailor's bunion deformities. The procedure is suited for the 3 different types of deformities with small alterations on the surgical procedure. Patients satisfaction is high, quick recovery can be expected without malunions and very low complication rates, such as infection and absent hardware friction. As

reported in previous articles and shown in our study, clinical healing precedes radiological union.

This study confirms this procedure to be useful as a standard technique for the percutaneous interested foot- and ankle surgeon treating a tailors bunion.

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