Minimally invasive bunionette correction

Introductory remarks and objective

Bunionette or ‘tailor’s bunion’ is a deformity of the fifth ray, which comes along with a metatarsus quintus valgus and a varus deformity of the fifth toe with subluxation of the metatarsophalangeal joint (Fig. 1; [5]). The sitting position of a tailor with crossed legs has led to the term ‘tailor’s bunion’ [22]. Due to the friction between the fifth metatarsal head and a close fitting shoe the deformity usually leads to a painful chronic bursitis lateral and plantar of the fifth metatarsal head, localized hyperkeratosis, and increasing difficulties regarding footwear [8].

Multifactorial etiology is discussed, including anatomical variations of the fifth metatarsal head, i.e., the enlargement of the fifth metatarsal head, metatarsus quintus valgus, and biomechanical causes [9].

Conservative treatment includes use of wide shoes, insoles, metatarsal bars, physiotherapy, nonsteroidal analgesics, shaving of hypertrophic callus [10, 18], and corticosteroid injections [1, 10, 16].

The standard surgical procedure is an osteotomy, which can be performed either at the distal metatarsal, the diaphyseal region, or the proximal metatarsal [4]. After realignment and internal fixation the procedure is finished with an exostectomy [19]. Resection arthroplasties have proven to be unrewarding.

In recent years, the use of minimally invasive surgery (MIS) has continued to rise. MIS correction of tailor’s bunion deformity was first described by De Prado and Isham ([Table 1]; [6]). They performed a percutaneous osteotomy of the fifth metatarsal without internal fixation using burrs [6]. Apart from that some authors denote mini open osteotomies performed with an oscillating saw and retrograde Kirschner-wire fixation as “minimally invasive” [7].

Similar to open surgical procedures, the type of osteotomy complies with the underlying pathology. MIS procedures allow comprehensive treatment of various types of tailor’s bunion deformities.

Radiographic classification

The classification of bunionette is described by Coughlin [3]:

<table>
<thead>
<tr>
<th>Table 1 Algorithm of indication [6]</th>
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<tbody>
<tr>
<td>Exostectomy + release of soft tissues</td>
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<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Intermetatarsal angle Normal</td>
</tr>
<tr>
<td>Metatarsal lateral deviation angle Normal</td>
</tr>
<tr>
<td>Addition Congruent metatarsophalangeal angle</td>
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</tbody>
</table>
Type 1: Enlargement of the head of the fifth metatarsal head (16–33%; Fig. 2)
Type 2: Lateral bowing of the distal aspect of the fifth metatarsal shaft (10%; Fig. 3)
Type 3: Increase in the intermetatarsal angle of the fourth and fifth ray (57–74%; Fig. 4)

Advantages of MIS fifth ray surgery
- High patient satisfaction
- Superior aesthetic result
- Low cost surgery
- Short operation time
- No material removal

Disadvantages of MIS fifth ray surgery
- Learning curve
- Reliable patient compliance
- Limited stability of the osteotomy

Indications
- Symptomatic tailor’s bunion deformity
- Failed conservative treatment
- Closed epiphyseal gap

Contraindication
- Osteoporotic bone
- Non-compliant patient

Patient information
- General surgery-related risk factors
- Revision surgery
- Alternative treatment
  - Conservative treatment
  - Open surgical approach
- Necessity of full compliance
- Outpatient surgery
- Incapacity for work up to 6 weeks
- Clinical and radiological follow-up after 6 weeks
Preoperative work-up, anesthesia, and intraoperative positioning

- X-rays anteroposterior and lateral (weight bearing) (Fig. 5)
- General anesthesia, spinal anesthesia, popliteal or complete ankle block (Fig. 6)
- Single shot antibiotic prophylaxis with cefuroxime 1.5 g intravenous, e.g., Zinacef®
- Supine positioning on a radiolucent table (Fig. 7)
- Intraoperative patient temperature control with air warming blankets
- Dispense with tourniquet, nonobligatory
- Portable C-arm image intensifier fluoroscopy
- Standard antiseptic preparation

Instruments

- Minimally invasive surgery set, e.g., Arthrex (Munich, Germany) (Fig. 8)
  - Raspin blunt elevator, small
  - Raspin blunt elevator, medium
  - Combi-elevator, straight and curved ends, sharp
  - Straight burr 20 mm length, 2 mm diameter, e.g., Arthrex (Fig. 9a)
  - Conical burr 20 mm length, 2.9 mm diameter, e.g., Arthrex (Fig. 9b)

Abstract · Zusammenfassung

Satisfying results up to 97% [8]

G. A. Morawe · M. H. T. Schmieschek

Minimally invasive bunionette correction

Objective. Bunionette or ‘tailor’s bunion’ is a deformity of the fifth ray, which comes along with a metatarsus quintus valgus and a varus deformity of the fifth toe with subluxation of the metatarsophalangeal joint. A minimally invasive osteotomy of the fifth metatarsal without internal fixation using burrs is an increasingly used alternative for symptomatic tailor’s bunion deformity. Similar to open surgery procedures the type of osteotomy complies with the underlying pathology. Minimally invasive surgical (MIS) procedures allow comprehensive treatment of various types of tailor’s bunion deformities.

Indications. Symptomatic tailor’s bunion deformity, failed conservative treatment, a closed epiphyseal gap.

Contraindications. Osteoporotic bone, poor patient compliance.

Surgical technique. The technique comprises percutaneous resection of the lateral exostosis of the fifth metatarsal head with a straight burr and an osteotomy of the fifth metatarsal,

either distally, diaphyseal or proximally with a conical burr due to the shape of the deformity, usually without internal fixation.


Results. The clinical outcome is comparable to standard surgical procedures with the advantages of MIS. Based on our results and the current literature, the minimally invasive distal metatarsal osteotomy without fixation is becoming a reliable treatment for tailor’s bunion.

Keywords

Tailor’s bunion · Metatarsophalangeal joint · Minimally invasive surgery · Percutaneous surgery · Metatarsal osteotomy

Abstract · Zusammenfassung

Oper Orthop Traumatol https://doi.org/10.1007/s00064-018-0542-z
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Zusammenfassung

Minimal-invasive Bunionette-Korrektur


Indikationen. Symptomatische Bunionette-Deformität, Versagen der konservativen Behandlung, ein geschlossener epiphysealer Spalt.

Kontraindikationen. Osteoporotischer Knochen, mangelnde Compliance des Patienten.


Schlüsselwörter

Tailor’s Bunion · Metatarsophalangealgelenk · Minimal-invasive Operation · Percutane Operation · Metatarsale Osteotomie
**Fig. 5**  
Weight bearing X-rays anteroposterior and lateral preoperatively

**Fig. 6**  
(a) Ankle block superficial peroneal nerve.  
(b) Ankle block sural nerve

**Fig. 7**  
Operative setting

**Fig. 8**  
Minimally invasive surgery set, Arthrex. (Courtesy of Arthrex GmbH, Munich, Germany)
Surgical technique
(Figs. 10, 11, 12, 13, 14, 15, 16, 17, 18)

Exostosectomy

Indication for exostosectomy and soft tissue release: enlarged 5th metatarsal head with normal intermetatarsal angle IV/V and congruent metatarsophalangeal joint.

Fig. 9 a Straight burr 20 mm length, 2 mm diameter, Arthrex. b Conical burr 20 mm length, 2.9 mm diameter, Arthrex. (Courtesy of Arthrex GmbH, Munich, Germany)

Fig. 10 a Stab incision on the lateral proximal edge of the fifth metatarsal head. The mini blade has to be aligned parallel to the bone until osseous contact has been reached. Minimally invasive surgery (MIS) raspatorium is used to create a working space between the exostosis and the surrounding tissue. b Fluoroscopically guided resection of the exostosis using the straight burr in a mopping movement. The burr should not be placed at one spot permanently to avoid excessive bone resection. c Fluoroscopy after resection.

Fig. 11 a, b Fluoroscopically guided resection of the exostosis using the straight burr in a mopping movement. The burr should not be placed at one spot permanently to avoid excessive bone resection. c Fluoroscopy after resection.
**Surgical Techniques**

**Distal osteotomy**

Indication for distal osteotomy:
- Bulky 5th metatarsal head
- Intermetatarsal angle IV/V < 14°

*Fig. 12* The soft bone mass should be pressed out of the skin incision

*Fig. 13* Stab incision dorsal and lateral of the extensor digitorum tendon at the top of the arc of deformity. Soft tissue dissection with a minimally invasive surgery (MIS) raspatorium. Insertion of the long burr in contact with the medial side of the metaphysis of the distal fifth metatarsal at the bow of deformity. Osteotomy is performed from distal to proximal plantar in an angle of 45°, although the lateral cortex should not be cut completely to spare a lateral hinge.

**Diaphyseal osteotomy**

Indication for diaphyseal osteotomy:
- Bulky 5th metatarsal head
- Intermetatarsal angle IV/V > 14°

*Fig. 14* Manual reposition with a “push & pull” maneuver under fluoroscopy. Redressing wraps without skin sutures

*Fig. 15* Same procedure as the distal osteotomy, positioned at the midshaft area at the point of bowing of the fifth metatarsal
**Proximal osteotomy**

Indication for proximal osteotomy

- Bulky 5th metatarsal head
- Intermetatarsal angle IV/V >14°
- Incongruent MTP 5 joint

**Fig. 16 ▲** Same procedure as the distal osteotomy, but performed at the proximal metaphysis

**Fig. 18 ▲** Varisation of the fifth ray

**Fig. 17 ▲** Manual reposition with a “push & pull” maneuver under fluoroscopy. Redressing wraps without skin sutures

**Fig. 19 ▲** a Postoperative shoe, e.g., MedSurg™ (DARCO Int., Huntington, WV, USA). b Insole modification, e.g., Puzzle Insole®, DARCO Int.
Surgical Techniques

Add-on minimally invasive surgery of the fifth metatarsal

- Overlapping 5th toe: percutaneous tenotomy of extensor digitorum longus
- Subluxation of the fifth metatarsophalangeal joint: medial capsuleotomy
- Flexible hammer toe deformity: percutaneous tenotomy of flexor digitorum longus
- Digitus quintus varus: osteotomy of the base of proximal phalanx

Postoperative management

- Distal osteotomies: 6 weeks postoperative shoe (Fig. 19a, b) with soft bedding of the 5th ray and pain-adapted full weight bearing. Proximal and diaphyseal osteotomies: 2 weeks partial weight bearing with heel contact in a postoperative shoe on crutches for 2 weeks, then pain adapted weight bearing for further 4 weeks.
- First change of dressing after one week. Consequent redressing bandage (Fig. 20) at daily intervals for 6 weeks day and night, after that additional 4 weeks at night, en passant the patient should be trained regarding this.
- Non-steroidal anti-inflammatory drug (NSAID) for 3–5 days depending on pain and swelling
- Lymphatic drainage
- Intermittent cooling
- Regular elevation of the foot in the initial days and moving exercises of the ankle
- Radiographic assessment at day 1 postoperatively (Fig. 21)

Complications

- Intraoperatively lack or loss of reduction of deformity: switch to open surgery
- Intraoperatively instable fracture of osteotomy plane: switch to open surgery and internal fixation
- Break of instruments: switch to open surgery
- Superficial wound infection: wound dressing, calculated antibiotic therapy, if symptoms remain: wound revision
- Delayed union: prolonged mobilization in a cast with non-weight bearing, extracorporal shockwave therapy, ultrasound therapy
- Non-union: surgical revision, open approach, resection of non-union, autologous bone transplantation, osteosynthesis with plate and screw fixation
- Transfer metatarsalgia: soft padding insoles, revision surgery in patients with persistent pain
- Recurrence of deformity: open approach, osteotomy with osteosynthesis

Results

In reference to the described technique we overview the following unpublished data. A total of 32 feet (24 women, 4 men) with a mean age of 47 years with type 1 bunionette deformities and a mean follow-up time of 14 months were retrospectively reviewed. After percutaneous minimally invasive surgery without fixation one delayed fusion occurred. The mean intermetatarsal angle IV/V was reduced...
Table 2  Overview of published results MIS fifth ray. (Adapted from Ceccarini et al. [2])

<table>
<thead>
<tr>
<th>Authors</th>
<th>Level of evidence</th>
<th>Year</th>
<th>Procedures</th>
<th>Bunionette classification</th>
<th>Type of osteotomy</th>
<th>Patients/Feet</th>
<th>Follow-up (months)</th>
<th>Clinical outcomes (AOFAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giannini et al. [7]</td>
<td>IV</td>
<td>2008</td>
<td>SERI/Fixation with K-wire</td>
<td>All cases types 2 and 3</td>
<td>Distal, sub-capital, 25° inclined</td>
<td>32/50</td>
<td>56</td>
<td>94</td>
</tr>
<tr>
<td>Laffene`tre et al. [11]</td>
<td>IV</td>
<td>2015</td>
<td>Percutaneous/No fixation</td>
<td>Type 1: 34 Type 2: 5 Type 3: 10</td>
<td>From distal dorsal to proximal plantar at 45°</td>
<td>38/49</td>
<td>34</td>
<td>97</td>
</tr>
<tr>
<td>Legenstein et al. [12]</td>
<td>IV</td>
<td>2007</td>
<td>Boesch/Fixation with K-wire</td>
<td>All cases types 2 and 3</td>
<td>Subcapital, transversal</td>
<td>65/77</td>
<td>56.6</td>
<td>95.2</td>
</tr>
<tr>
<td>Magnan et al. [14]</td>
<td>IV</td>
<td>2011</td>
<td>Percutaneous Distal Osteotomy/Fixation with K-wire</td>
<td>All cases types 2 and 3</td>
<td>Distal, sub-capital</td>
<td>21/30</td>
<td>96</td>
<td>98.4</td>
</tr>
<tr>
<td>Martinelli et al. [15]</td>
<td>IV</td>
<td>2007</td>
<td>SERI/Fixation with K-wire</td>
<td>All cases types 2 and 3</td>
<td>Distal, sub-capital</td>
<td>20/25</td>
<td>28</td>
<td>92</td>
</tr>
<tr>
<td>Michels et al. [17]</td>
<td>IV</td>
<td>2013</td>
<td>Percutaneous/No fixation</td>
<td>Type 1: 5 Type 2: 3 Type 3: 13</td>
<td>Distal, from dorsal distal to plantar proximal</td>
<td>20/21</td>
<td>29</td>
<td>96.5</td>
</tr>
<tr>
<td>Waizy et al. [20]</td>
<td>IV</td>
<td>2012</td>
<td>Minimally invasive/ Fixation with K-wire</td>
<td>Type 1: 1 Type 2: 5 Type 3: 12</td>
<td>Distal, subcapital, from lateral–proximal to medial–distal</td>
<td>20/31</td>
<td>52</td>
<td>80–100 (16 feet): Type 1:12 Type 3: 4</td>
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<td>60–80 (14 feet): Type 1:2 Type 2: 5 Type 3: 7</td>
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<td></td>
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<td></td>
<td>56 (1 foot): Type 3</td>
</tr>
<tr>
<td>Weitze et al. [21]</td>
<td>IV</td>
<td>2007</td>
<td>Minimally invasive/ fixation with K-wire</td>
<td>Type 2: 12 Type 3: 18</td>
<td>Distal, transverse</td>
<td>21/30</td>
<td>92</td>
<td>88.2</td>
</tr>
</tbody>
</table>

AOFAS American Orthopaedic Foot and Ankle Society

from 13.1° preoperatively to 4.5° at follow-up. The clinical outcome measured by the American Orthopaedic Foot and Ankle Society (AOFAS) forefoot score increased significantly from preoperative 74 points to postoperative 92 points.

The results are in concordance with recent studies [2, 7, 11–15, 17, 20, 21], illustrated in Table 2, which was adapted from Ceccarini et al. [2].

Based on the current literature, the minimally invasive distal metatarsal osteotomy without fixation appears to become a reliable treatment in tailor’s bunion.

Compliance with ethical guidelines

Conflict of interest. G.A. Morawe and M.H.T. Schmieschek declare that they have no competing interests.

This article does not contain any studies with human participants or animals performed by any of the authors.

References