Journal of Orthopaedics, Trauma and Rehabilitation 19 (2015) 25–30

Contents lists available at ScienceDirect

Journal of Orthopaedics, Trauma and Rehabilitation

Journal homepages: www.e-jotr.com & www.ejotr.org

Original Article

Percutaneous Chevron Osteotomy in Treating Hallux Valgus: Hong Kong Experience and Mid-Term Results
經皮Chevron截骨術治療拇外翻：香港的經驗和中期結果

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ARTICLE INFO

Article history:
Received 7 October 2013
Received in revised form
15 February 2014
Accepted 15 February 2014

Keywords:
hallux valgus
minimally invasive surgery
percutaneous chevron osteotomy
screw fixation

ABSTRACT

Background/Purpose: Minimally invasive surgery (MIS) has become popular in every specialty. Different distal metatarsal osteotomy methods using minimally invasive percutaneous approach with or without fixation have been proposed to treat mild to moderate degrees of hallux valgus.
Methods: From June 2010 to May 2012, we performed 23 percutaneous chevron osteotomies with screw fixation in 20 patients.
Results: At 18 months postoperatively, the mean hallux valgus angle (HVA) was corrected from 31.68° to 14.39°, mean intermetatarsal angle (IMA) from 13.77° to 7.98° and mean American Orthopaedic Foot and Ankle Society (AOFAS) score from 59.26 to 88.35. There were four cases of medial plication stitch impingement and four cases with screw impingement but no other complications such as joint stiffness, avascular necrosis of metatarsal head, union complication, wound infection or deep vein thrombosis.
Conclusion: The mid-term results are encouraging, indicating that this is an effective method in the treatment of mild to moderate hallux valgus with advantages of percutaneous technique. Further study with longer-term results and larger sample size is needed in order to compare with other percutaneous or open techniques.

中 文 摘 要

目的: 微創手術(minimally invasive surgery)在每一個專科都普及起來。不同的微創經皮遠端蹠骨截骨術(有或無內固定)，都被提出來治療輕度至中度的拇外翻。
方法: 從2010年6月至2012年5月，我們在20個病人上完成了23個經 皮chevron截骨術和螺釘內固定。
結果: 在術後18個月的平均拇外翻角（HVA）從31.68 矯正到14.39，平均蹠骨間角（IMA）從13.77 至 7.98，平均美國骨科足踝協會評分（AOFAS評分）從59.26到88.35。當中有4個病人出現內側折疊術縫線夾擠和4個病人出現螺釘夾擠，但無其他併發症(如關節僵硬，蹠骨頭缺血性壞死，愈合問題，傷口感染或深靜脈血栓形成)。
結論: 中期結果是令人鼓舞的，表明這是一種有效的方法治療輕中度拇外翻並擁有經皮技術的優勢。需要有更長期和更大的樣本的研究，來與其他經皮或開放技術作比較。

Introduction

The first metatarsophalangeal joint (MTPJ) is the most complex among all the MTPJs in the forefoot due to the sesamoid mechanism. The joint is composed of relatively large bones stabilized by collateral ligaments and intrinsic muscles that insert into the base of the proximal phalanx. Stability of the joint is further enhanced by extrinsic muscles.[1] However as there is no muscle insertion at the metatarsal head, the joint is vulnerable to deformity.[1] The term hallux valgus was introduced by Carl Hueter, who defined the condition as static subluxation of the first MTPJ with lateral deviation of the great toe and medial deviation of the first metatarsal. In juvenile cases of hallux valgus, the deformity can result from lateral deviation of the articular surface at the metatarsal head with no subluxation of the first MTPJ. Great toe pronation is also seen in advanced cases due to sesamoid sling slides laterally.[1]

More than 130 different operative techniques have been described for the correction of hallux valgus.[2] In 2004, a systematic

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http://dx.doi.org/10.1016/j.jotr.2014.02.001

review of the published literature concluded that there was no compelling evidence of advantages of any of these techniques over any other particular type of surgery.[2] As minimally invasive surgery becomes popular in every specialty, different distal metatarsal osteotomy methods using minimally invasive percutaneous approaches with or without fixation have been proposed[4–10] to treat mild to moderate hallux valgus [hallux valgus angle (HVA) < 40° and intermetatarsal angle (IMA) < 20°]. Among these, the Reverdin osteotomy modified by Isham (Reverdin–Isham osteotomy),[3,9] and distal metatarsal osteotomy using Kirschner wire for temporary stabilization[4–8,11] are the more commonly used and published in English-language journals. The most recent systemic review[12] of different minimally invasive techniques treating HV was still inconclusive on which minimally invasive method is the best.

Materials and methods

In 2010, we learnt the idea of percutaneous chevron osteotomy[13] from Dr. Joel Vernois (GRECMIP (Group for Research and Study of Minimally Invasive Surgery of the Foot and Ankle) group). From June 2010 to May 2012, we performed 23 percutaneous chevron osteotomy procedures in 20 patients. All of them were women with a mean age of 48 years (range: 22–67 years). There were 12 right feet and 11 left feet. All of them had HV with HVA of 20–40°, IMA < 20°, and distal metatarsal articular angle (DMAA) < 10°. We excluded those with degenerative changes, stiffness of the first MTPJ, or instability of the metatarsocuneiform or first MTPJ.

The preoperative planning included a detailed history and clinical and radiological examination. The severity of the bunion, flexibility of the HV deformity, hypermobility of the metatarsocuneiform or MTPJ, presence of plantar callosity, and associated lesser toe deformity were assessed. A standard radiographic examination, by dorsoposterior (DP) and lateral weight-bearing views of the forefoot, allowed the assessment of arthritis and joint congruency, and measurement of the HVA, IMA, DMAA, and metatarsal and digital formula.[8] Prior to the operation, the American Orthopaedic Foot and Ankle Society (AOFAS) score[14] was charted and compared to the postoperative score.

All the patients had preoperative assessment by anaesthetists and were admitted to hospital on the day of operation. All surgery was performed by qualified foot and ankle surgeons in our department. Fifteen patients underwent surgery under general anaesthesia, and the other eight under spinal anaesthesia. All patients had percutaneous chevron osteotomy and percutaneous lateral release. Twenty-two patients had additional percutaneous medial capsule plication performed. Thirteen patients also had percutaneous Akin osteotomy and one of them had additional lesser toe correction.

Data were collected and analysed in June 2013. All the results were analysed by SPSS version 17 (SPSS Inc., Chicago, IL, USA), using Wilcoxon signed ranks test.

Surgical technique

The percutaneous chevron osteotomy was performed under general or spinal anaesthesia. The patient was placed in the supine position with legs separated for a better position. A pneumatic tourniquet was applied at the thigh level. Flexibility of the deformity was first tested. Then, a haemostat was used to identify the centre of the chevron osteotomy under fluoroscopy in both DP and lateral views. We defined the centre of osteotomy at the subcapital region of the first metatarsal in both DP and lateral views (Figures 1 and 2). The osteotomy was extracapsular in location, as compared to classical chevron osteotomy, which was located at the centre of the metatarsal head. A 3-mm skin incision was made over the defined centre at the medial border of the metatarsus, and then a 2-mm minimally invasive side-cutting burr (Vilex®, in Tennessee, Inc.) was used to drill passing both cortices from medial to lateral perpendicular to the second metatarsal head (Figure 3). After that, dorsal osteotomy was performed, which should be parallel to the second metatarsal articular surface. The plantar cut followed, which should be parallel to the plantar surface of the foot. During

Figure 1. The centre of chevron osteotomy is first identified using a haemostat. It is located at the subcapital area of the first metatarsus.

Figure 2. The centre of chevron osteotomy at the lateral view indicated by a minimally invasive burr.