RESEARCH ARTICLE

Comparison of Clinical Outcomes of Scarf and Chevron Osteotomies and the McBride Procedure in the Treatment of Hallux Valgus Deformity

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Abstract

Background: Hallux valgus deformity is a common chronic problem with a reported prevalence of 28.4% and its chief complaint is pain. Thus far, different surgical procedures with their proposed indications have been introduced. This study compared three current procedures, namely the chevron and scarf osteotomies and the McBride procedure.

Methods: This retrospective cohort was conducted at the Ahvaz University of Medical Sciences on 44 patients with moderate hallux valgus deformity from 2010 and 2013. All of the patients underwent one of the three procedures (chevron, scarf or McBride). Preoperative and follow up radiographies were evaluated in terms of hallux valgus and intermetatarsal angle correction. The Foot and Ankle Disability Index was filled out to assess the functional outcome and the Visual Analogue Scale was used to evaluate pain. Also, satisfaction, aesthetics and the rate of recurrence was evaluated.

Results: Hallux valgus angle and intermetatarsal angle correction were significantly higher in scarf, but not in chevron and McBride. However, from amongst the three procedures, there was no significant difference in terms of the Foot and Ankle Disability Index score, aesthetics, satisfaction level, pain score and recurrence rate.

Conclusions: Considering that scarf osteotomy had better results in this study, we think that scarf osteotomy can be considered as a first choice for the treatment of moderate hallux valgus deformity.

Key words: Chevron osteotomy, Hallux valgus, McBride procedure, Scarf osteotomy

Introduction

Hallux valgus (HV) is one of the most common foot complaints presenting to foot and ankle specialists with a prevalence of 28.4% in adults (1, 2). It usually occurs when the big toe deviates laterally, and the first metatarsal head becomes prominent medially to form a bunion (3).

Weight-bearing anteroposterior (AP) and lateral radiographs of the foot are taken to help assess the deformity and assist in pre-operative planning. The hallux valgus angle (HVA) and intermetatarsal angle (IMA) are measured on the weight bearing AP and lateral radiographs of the foot for pre-operative planning (4). According to the radiographic angles, HV is divided into three categories of mild, moderate and severe deformity (5).

Operative treatment of HV can be classified into two major categories including soft tissue and bone procedures. The most commonly used soft tissue technique is the McBride procedure and the most popular distal osteotomy is the chevron osteotomy that can be used in mild to moderate deformities (6). Among proximal osteotomies, scarf and Ludloff osteotomy techniques are the most popular, which are recommended for moderate to severe HV (7).

In this study, we hypothesized that there is no significant difference between the scarf proximal osteotomy and the other two corrective procedures.

Materials and Methods

In this retrospective cohort study, 44 patients with

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Table 1. Demographic characteristics of the study patients

Treatment Group	Chevron	McBride	Scarf	Total	*P* value
Number of patients	23	11	10	44	
Mean age	35.6	32	41.7	36	0.08
Number of females	20 (87%)	9 (81%)	9 (90%)	38 (86%)	0.20

* *P* value among the three groups in terms of age and sex

Table 2. Functional and radiographic measurements in the three treatment methods of HV

Treatment Group	Chevron	McBride	Scarf	*P* value
Mean HVA correction	16.17±3.7	11±4.1	18±2.1	<0.001^
Mean IMA correction	4.5±2.4°	2.6±1.4°	6.3±1.9°	0.010^
Mean FADI score	90.±7.6	86±14	92±12	0.20^

HVA= hallux valgus angle, IMA= intermetatarsal angle, FADI= Foot Ankle Disability Index
^ = one way ANOVA

HV, who were treated surgically from 2010 to 2013 at the Imam Hospital of the Ahvaz University of Medical Sciences, and who met inclusion criteria were enrolled in our study. These patients were placed into three different treatment groups.

Inclusion criteria were patients treated with one of three methods of chevron, McBride or scarf; moderate deformity (HVA between 15 to 30 degrees, IMA between 9 to 15 degrees); no other deformity or abnormality in the foot and ankle; no previous operation on the foot and hallux; and being available for follow up.

Post-operatively, casts were applied for all patients for six weeks. Patients were visited in the clinic every two weeks for the first six weeks and then at 12 and 24 weeks. Follow up continued if needed thereafter. Sutures were removed after two weeks and a toe spacer was prescribed for the first three months. Also, the patients were encouraged to wear wide toe box shoes for at least three months post-operatively.

At the one year follow up, we used the Visual Analogue Scale (VAS) for pain evaluation and 0 represented no pain and 10 represented the worst pain ever experienced. Moreover, patients reported their aesthetic condition based on their opinion; expressing either good aesthetic appearance or improper appearance.

We used the Persian version of the Foot and Ankle Disability Index (FADI) questionnaire to evaluate the foot function. This questionnaire is a self–administered questionnaire that includes two sections with 26 questions. The first part consists of 22 questions and it evaluates the patient's ability to walk and perform daily activities, and in the second part with four questions, the patient's pain is assessed in different positions. Individual scores were calculated via the web-based software. The Persian version of this questionnaire is validated and is currently in use (8).

During the office follow up visit, standing AP and lateral radiographs of the foot were taken and HV and IMAs were measured using an orthopedic goniometer. The degree of correction calculated was based on the preoperative and one year postoperative radiographs.

Recurrence has been defined as any deformity reforming after six months of initial operation, where in any type of intervention is required. Patients were tracked for one year for recurrence.

The study was approved by the Research Committee of the Ahvaz University of Medical Sciences and all of the patients were signed an informed consent form in order to be enrolled in this clinical study.

Data was analyzed using SPSS version 19 software (SPSS Inc., Chicago, IL). The demographic data was analyzed and described with frequencies and percentages. The scores in the questionnaire were analyzed with mean ± standard deviations if normally distributed. One-way ANOVA with post hoc analysis was used to compare the means among the three groups in terms of functional score, HVA and IMA and VAS pain. Logistic regression was applied to compare aesthetic satisfaction and the recurrence rate among the three techniques. *P*-value <0.05 was regarded as significant.

Results

There was no significant difference among groups in terms of age and sex (Table 1).

Preoperative IMA was 11 ± 2.6 degrees (range: 9-15) and the HVA was 25 ± 4.2 (range: 16-30). In the analysis of HVA correction by one way ANOVA, significant difference was found among the groups. By the post hoc test, no statistically significant difference was found in the correction angle between the chevron and scarf procedures (*P*=0.42). But, when each of the two methods were compared separately to McBride there was a significant difference between chevron and McBride (*P*=0.020) and between scarf and McBride (*P*<0.001) (Table 2, Figure 1).

Regarding IMA correction, there was a significant difference between McBride and chevron (*P*=0.038)

Table 3. Post-op results of patients in three groups

	Chevron	McBride	Scarf	*P* value
Satisfactory aesthetic	19 (82.6%)	7 (63.6%)	9 (90%)	0.312*
VAS pain (mean±SD)	2.7±2.1	3.2±1.2	1.4±1.07	0.054^
Recurrence	3 (13%)	3 (27%)	0 (0%)	0.607*

* = Logistic regression, ^ = one way ANOVA

and McBride and scarf (*P*=0.010). But when comparing scarf and chevron, this difference was not statistically significant (*P*=0.79). There was no significant difference in terms of FADI among the three groups (*P*=0.20) (Table 2, Figure 2).

Regarding aesthetic satisfaction, recurrence rate, and VAS pain, there was no significant difference among the three techniques (Table 3, Figure 3-4-5).

Discussion

Overall, treating the moderate deformity with the scarf method results in better correction and patient satisfaction compared with the chevron and McBride procedures. In fact, we can conclude that scarf provides better results than the chevron and McBride procedures; in turn, chevron produces better results than McBride.

More than 200 procedures were described for the treatment of HV deformity; however, none of them are universally suitable for all kinds of deformities.

Surgical procedures for moderate to severe deformities include distal soft tissue release, distal metatarsal osteotomy, diaphyseal metatarsal osteotomy, proximal metatarsal osteotomy, and arthrodesis (9). But, still there is controversy regarding what is the most appropriate and best method among varying surgical treatment methods for the HV deformity. The ideal surgical procedure should be able to concomitantly correct HV and IMA, restore joint congruity, eliminate pain, and preserve range of motion (2). Therefore, numerous studies have been conducted and several articles have also been published that have compared various methods of surgical treatment procedures of HV deformity. Although there were fewer number of patients in our study, Kayali *et al*'s study also showed lower results with a larger number of patients treated with the McBride procedure (10). In another study with a mean follow-up of nine years, average HV and IMA correction was 6 and 3 degrees, respectively (11). Although, the results of this study and other studies have suggested the McBride procedure for the treatment of moderate HV deformity, the success of this operation was not too high to rely on or to suggest it as the preferred method of choice. Thus, the high percentage of patient dissatisfaction with soft tissue procedures and lower rates of corrections in this method have led the investigations to be focused more on osteotomy.

Regarding HVA and IMA, the chevron technique had better correction than the McBride procedure. In a study in 1991 by Johnson *et al*, radiological correction was better achieved in the chevron method than soft tissue procedures (12). Trnka *et al* in 1991 studied 46 patients treated with chevron osteotomy (13). By the end of the two year follow up, the average HVA and IMA were corrected to 15 and 5 degrees, respectively, which is similar to our present study.

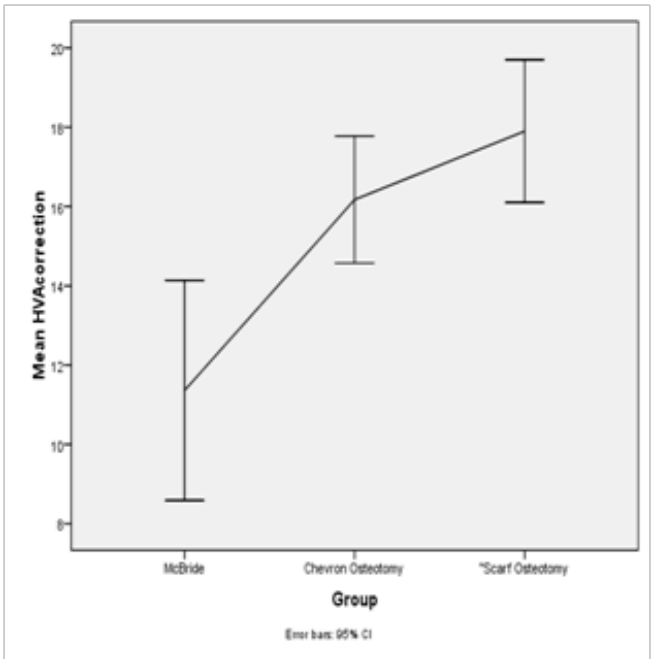

Figure 1. Comparing the mean and range of Hallux valgus angle correction between 3 treatment methods.

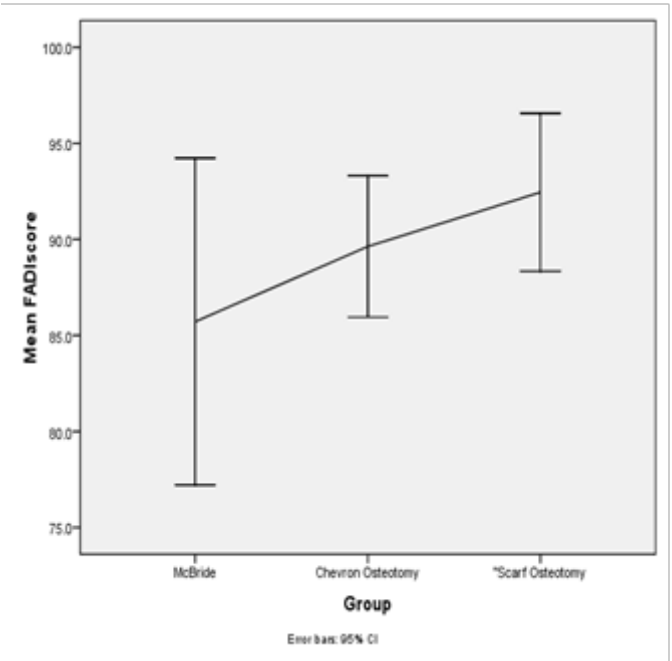

Figure 2. Comparing the mean and range of functional scores between the three treatment methods.

Figure 3. Pre-op (a), post-op (b) and final follow-up visit of a woman after Scarf osteotomy with screw fixation. Patient was satisfied of aesthetic.

Figure 4. Pre-op (a) and post-op (b) x-ray of a 32 year-old woman with hallux valgus after Chevron osteotomy.

Figure 5. Pre-op (a) and post-op (b) x-ray of a 29 year-old woman after McBride procedure.

Comparing the two techniques for FADI average score and pain, higher results were achieved with the chevron osteotomy. Although this superiority was not statistically significant in the FADI score, angle correction was statistically significant. This osteotomy alone can correct the HVA for an average of 11-18 degrees and correct IMA for an average of 4-degrees (14).

In a clinical trial from 1999 and 2001, Deenik *et al* treated 96 patients in two groups using the chevron and scarf methods (15). In this study, both groups showed a significant improvement in the American Orthopaedic Foot and Ankle Society scores and HV and IMA correction. However, these differences were not statistically significant. In our study, higher FADI scores were obtained by the scarf method compared to the chevron; but similar to the study of Deenik *et al*, no statistically significant difference was detected. In contrast to the aforementioned study, the amount of HV and IMA was higher in the scarf method than the chevron and that superiority was statistically significant.

The results of this study suggest that osteotomies are significantly superior to soft tissue procedures and will lead to greater correction with a lower rate of recurrence.

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