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Original Article

Bösch technique for hallux valgus surgery in a tropical setting

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ABSTRACT

Objectives: To evaluate the early clinical and radiological results using the Bösch technique to treat hallux valgus.

Material and methods: We reviewed retrospectively four patients with 6 feet undergoing the Bösch technique for mild and moderate hallux valgus from 2009 to 2012 with an average follow-up of 10.8 months. All patients complained of pain around the first metatarsophalangeal joint. They had cosmetic concerns, and difficulty in wearing shoes. At final follow-up patients were asked about the improvement of pain, cosmetic appearance of the foot, problems with wearing shoes, the ability to walk, and their satisfaction with the operation. Complications encountered were also recorded. The radiographic evaluation considered osteotomy site union, the hallux valgus angle, and the intermetatarsal angle.

Results: All patients complained of mild or no pain. They had a satisfactory cosmetic result, wore normal shoes without problems with no limitation of walking ability. They were satisfied with the procedure. One case of superficial infection was noticed. All osteotomies healed primarily within three months. The average hallux valgus angle improved from 32.7° preoperatively to 14.8° at final follow-up and the average intermetatarsal angle from 17.5° to 9.2°.

Conclusion: The Bösch technique is a cost effective procedure that yields good clinical and radiological results while correcting mild and moderate symptomatic hallux valgus with reduced risk of surgery related complications.

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1. Introduction

Hallux valgus (HV) is successfully treated surgically in Mediterranean countries in Africa.^{1–3} This deformity is common in our subregion⁴ but experience of local surgeons treating operatively HV is limited in our setting. Due to ignorance, the vast majority of patients do not seek for treatment by

orthodox practitioners. Patients from developed world prefer having care for their HV with surgeons of their countries. Minimally invasive surgery in foot surgery is becoming increasingly popular.^{5,6} The Bösch technique⁷ (BT) is a minimally invasive procedure without lateral release of soft tissues commonly performed for mild and moderate HV. This procedure is popularized by Magna⁸ and Giannini.⁹ Giannini^{6,9}

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summarized the characteristics of this technique with the abbreviation SERI (simple, effective, rapid, inexpensive). This operation has the additional advantage of reduced risks of complications related to surgical exposure. Minimally invasive procedures with their numerous advantages should be offered to patients in our setting who are generally reluctant to operative procedures. Literature is replete with studies based on relatively large sample size dealing with long-term results performed by surgeons familiar with BT.^{7,10–12} The aim of this preliminary report was to evaluate the early clinical and radiological results using the Bösch technique to treat hallux valgus.

2. Patients and methods

The study design was a retrospective case series of a therapeutic intervention. From 2009 to 2012 four patients (six feet) undergoing BT for HV were reviewed. The surgery was performed by a single surgeon (EJBS) in a private clinic. There were two men and two women with a mean age of 37 years (range, 33 to 57 years).

All patients complained of pain around the first metatarsophalangeal joint. They had cosmetic concerns and difficulty in wearing shoes. As outlined by Giannini et al⁹ and Maffulli et al¹³ deformities operated were reducible with a hallux valgus angle (HVA) < 40° and the first intermetatarsal angle (IMA) < 20°, independently of the congruence of the metatarsophalangeal joint. Mild degenerative arthritis of the first metatarsophalangeal joint was not a contra-indication. The HVA and IMA were measured on the anteroposterior view of the foot according to the method described by Hiroaki et al.¹⁴ The HVA was measured as the angle between the line connecting the center of the metatarsal head and the center of the proximal articular surface of first metatarsal and the line connecting the centers of the proximal and distal articular surfaces of the proximal phalanx.

The IMA was measured as the angle between the former line and the line bisecting the diaphyseal portion of the second metatarsal. Table 1 summarizes the radiological features of our patients. Operations in patients with bilateral deformity were separated by an interval of 8 weeks. This was carried out under general anesthesia ($n = 3$) and spinal anesthesia ($n = 3$).

Table 1 – Radiological results at follow-up.

Case	HVA (°)		IMA (°)	
	Preoperative	At follow-up	Preoperative	At follow-up
1 ^a	36	18	15	8
2 ^a	27	19	17	10
3	37	15	19	7
4	29	10	20	13
5 ^b	32	13	18	9
6 ^b	35	14	16	8

HVA; hallux valgus angle, IMA: intermetatarsal angle.

^a Bilateral deformity in the same patient.

^b Bilateral deformity in the same patient.

Fig. 1 – Preoperative aspect of the foot.

BT is well described.^{7,8} Main steps are summarized (Figs. 1–7). The patient was in supine position with the knee flexed and the foot in plantigrade position. An Esmarch bandage was used at the level of the ankle. The image intensifier was positioned to the side of the patient while the surgeon stood at the end of the table. We inserted a 2.0 mm K-wire from the proximal medial corner of the great toe nail ($n = 2$) and the level at the middle of the proximal phalanx ($n = 4$). The K-wire was manually driven to the site of the planned osteotomy. The

Fig. 2 – The K-wire was in an extraperiosteal position at the level of the metatarsophalangeal joint.

Fig. 3 – Skin incision.

wire was in an extraperiosteal position and midway between the dorsal and plantar aspect of the great toe in order to engage the metatarsal head correctly and allow lateral displacement of the capital fragment. We performed a nearly 2 cm skin incision proximal to the first metatarsal head that reached directly the bone and cut the periosteum equidistant from the dorsal and plantar region to avoid the neurovascular bundle

Fig. 4 – Osteotomy in the subcapital region of the metatarsal, lateral displacement of the distal portion of the metatarsal, the wire was driven through the tarsometatarsal joint.

Fig. 5 – The wire was cut.

The osteotomy was performed through the subcapital region of the first metatarsal with an oscillating saw perpendicular to the long axis of the shaft of the sagittal plane. The proximal part of the metatarsal was then displaced medially with the aid of a bone forceps. After lateral translation of the metatarsal head, the K-wire was introduced under direct vision into the medullary canal of the shaft. If pronation was present, correction was obtained with derotation of the big toe up to neutral position. The wire was driven through the first

Fig. 6 – Postoperative aspect of the foot and suture of the skin.

tarsometatarsal joint for greater stabilization. The skin was sutured. The wire was curved and cut.

A plantar pad was placed and an elastic bandage was tape in supination manner to counteract pronation of the big toe. The patients were discharged within 1 to 2 days. The dressing was changed every week until the removal of the sutures. Three patients with specially designed shoes were allowed to bear-weight on the day after surgery. A posterior leg plaster cast was applied to the other patients. They were mobilized non-weightbearing until the withdrawal of K-wire. Sutures and K-wires were removed respectively 3 weeks and 8 weeks after surgery on an outpatient basis under local anesthesia in an office setting. Full weightbearing as tolerated with comfortable normal shoes was allowed. Gradually they returned to normal footwear. The patients were encouraged to move the metatarsophalangeal articulation with special care to achieve a complete dorsiflexion in 3–5 weeks. Patients were followed up monthly until bone union and then every 6 months. The average duration of follow-up was 10.8 months (range 8–14 months). At final follow-up, they were asked about the improvement of pain, cosmetic appearance of the foot, problems with wearing shoes, the ability to walk, and their satisfaction with the operation. Complications encountered were also recorded. The radiographic evaluation considered osteotomy site union, the HVA, and the IMA.

3. Results

Clinical and radiological results are depicted in Tables 1 and 2. Superficial infection due to the protrusion of the wire was present in one foot. This settled with oral antibiotics and the removal of the wire. There was no case of recurrence or hallux varus. All osteotomies healed primarily within three months. The average HVA improved from 32.7° preoperatively to 14.8° at final follow-up. The average IMA was 17.5° preoperatively and 9.2° at follow-up.

4. Discussion

This study preliminary study showed good results in the improvement of the clinical aspects and the radiographic parameters, findings in line with that reported by other studies.^{2,15–17} Despite the short follow-up period, all patients

were already fully weightbearing and resumed their former activities as a sign of a complete healing process. The average follow-up period of 10.8 in our series can be regarded as acceptable. Indeed with this procedure the radiographic evidence of healing of osteotomy occurs within 6 months. Clinical stability and unrestricted ambulation is always achieved within 45 days.¹⁰ In our series the evaluation of the patients was based on their expectations. The subjective opinion of the patients is of greater value than the objective rating by surgeons as variables obtained from patients showed a higher correlation with the overall result than variables recorded by surgeons.¹⁸ Thus at final follow-up clinical results were characterized in most cases by a pain free great toe, the wearing of normal shoes without problems, and no limitation while walking. These criteria are the most important factors influencing the outcome of hallux surgery.¹⁸ The retrospective design of the study and the fact that patients in developing countries customarily do not visit surgeon when the fracture healing is achieved prevented the use of scoring system. The criteria used can be evaluated by any orthodox practitioner. Patients can also answer the reviewer's questions by phone. Considering radiological parameters the preoperative HVA was found to be the most reliable radiological indicator and the best predictor for expected correction of deformity.^{1,19} We achieved at follow-up a mean HVA angle of 14.5°, which is satisfactory. According to Bösch an HV between 5° and 25° is in general cosmetically accepted.⁷

We have used like Tong et al¹⁵ the method proposed by Hiroakiet al¹⁴ to measure the HVA though this was described for crescentic osteotomy. Since the distal segment is lateralized after osteotomy, the reference points to define the longitudinal axis need to be adjusted.^{14,15} The reference points used are distal and proximal to the osteotomy. These points are not influenced by the type and position of the osteotomy.^{14,15} We have performed the operations in a private clinic where an image intensifier was available. The patients were also able to pay for their care. Since the operation requires no particular instrumentation and can be performed under direct vision without fluoroscopy^{13,20} this minimally invasive surgery can be carried out in any operating room equipped with an oscillating saw. Osteotomy stabilization is carried out with a K-wire, a cost effective device. The insertion level of the wire is a key point of the technique. Undercorrection was achieved in the early cases in the series by Lin et al²⁰ with insertion of the wire at the middle of the proximal phalanx.

Table 2 – Clinical results at follow-up.

Case	Pain	Cosmetic appearance	Footwear	Walking ability	Level of satisfaction	Complications	Duration of FWP (months)
1 ^a	No	Happy	Normal	No limitation	Satisfied	No	8
2 ^a	No	Happy	Normal	No limitation	Satisfied	Superficial infection	10
3	Mild	Happy	Normal	No limitation	Satisfied	No	9
4	No	Happy	Normal	No limitation	Satisfied	No	14
5 ^b	No	Happy	Normal	No limitation	Satisfied	No	11
6 ^b	Mild	Happy	Normal	No limitation	Satisfied	No	13

FWP: follow-up.

^a Bilateral deformity in the same patient.

^b Bilateral deformity in the same patient.

Fig. 7 – a and b: Postoperative dressing.

Therefore the procedure should be performed as described by Bösch et al⁷ and Magnan et al.⁸ The more distal the insertion of the wire, the more greater the correction obtained because of a longer level arm to abduct the big toe. Bösch et al⁷ and Magnan et al⁸ used a bent manufactured grooved probe to achieve the lateral displacement of the metatarsal head and then the insertion of the wire in the medullary canal of the metatarsal. In our series we manipulated the metatarsal shaft with a forceps but the medial displacement of the proximal metatarsal can be easily achieved with a small curved forceps. Special designed shoes are not necessary in the postoperative management. A posterior leg cast can be used. The study has limitations. The sample size is small. The short follow-up cannot enable us to mention transfer metatarsalgia which generally appear after a long period.

5. Conclusion

Although the current report needs to be interpreted in the light of the aforementioned limitations, we have observed favorable midterm results with the Bösch technique. We think that this study can be continued over a longer period, and with a large sample size enough data can be collected to draw meaningful conclusions on the surgical treatment of hallux valgus not sufficiently covered by publications in our environment.

Conflicts of interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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