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Clinical and radiological outcomes of concomitant endoscopic gastrocnemius release with scarf osteotomy☆

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ABSTRACT

Background: Studies showed patients with hallux valgus also have tight gastrocnemius concomitantly. This study aims to investigate (1) prevalence of tight gastrocnemius in symptomatic hallux valgus (2) clinical and radiological outcomes of concomitant endoscopic gastrocnemius release with scarf osteotomy.

Methods: Between January 2011 to December 2013, 224 patients underwent hallux valgus surgery were evaluated. They were categorized into 2 groups: scarf osteotomy (n = 195), scarf and endoscopic gastrocnemius release (combine, n = 29). Clinical outcome measures assessed included VAS, AOFAS Hallux MTP-IP and SF-36 scores. Radiological outcomes included HVA, IMA, HVI and TSP. All patients were prospectively followed up for 6 and 24 months.

Results: The prevalence of ipsilateral gastrocnemius tightness in symptomatic hallux valgus is 12.9%. No significant difference in preoperative clinical outcomes between the two groups (all $p > .05$). Although AOFAS was 6 ± 2 points poorer in the combine group compared to the scarf group at 6 months follow up ($p = 0.021$), at 24 months, all clinical outcomes were comparable between the two groups (all $p > 0.05$). Significant difference in the HVA change between the groups were observed but comparable radiological outcomes in IMA, TSP and HVI at 24 months follow up.

Conclusions: We conclude clinical and radiological outcomes of concomitant endoscopic gastrocnemius release and scarf osteotomy are comparable with scarf osteotomy alone at 24 months.

1. Introduction

Hallux valgus is a common forefoot condition that affects the first ray of the foot. This condition is characterized by lateral deviation of the great toe and medial deviation of the first metatarsal. This causes progressive subluxation of the first metatarsophalageal joint (MTPJ) and result in formation of bunion. Patients suffer from pain and discomfort as a result of irritation of the dorsal cutaneous nerve and inflammation of the bursa [1,2].

Isolated gastrocnemius tightness is characterized by inability of ankle dorsiflex when the knee is extended but resolved when the knee is flexed. There are evidences to show that patients with hallux valgus also associated with gastrocnemius tightness concomitantly. DiGiovanni et al. conducted a case control study that consists of 34 patients in both groups. The experimental group consists of patients with foot and ankle symptoms while the control group was asymptomatic. They observed almost 3-fold higher prevalence of isolated gastrocnemius contracture in the experimental group. There were 13 (38%) patients with hallux valgus deformity in this group [3]. However, this is mainly an observational study and there is no current literature which prove gastrocnemius tightness leads to hallux valgus. Barouk and Barouk had reported the clinical outcomes of hallux valgus corrective surgery with gastrocnemius release [4]. Their study consisting of 182 cases found that patient underwent gastrocnemius lengthening with hallux valgus corrective surgery reported excellent clinical outcomes. However, the study was mainly a descriptive study and no control group. This was followed by Barouk publishing his comparative study on 30 cases, which show no difference in the clinical outcomes between the two groups. However, his study was limited by its small sample size and not sufficiently powered [5].

The present study aims to investigate (1) the prevalence of tight gastrocnemius in symptomatic hallux valgus (2) clinical and radiological outcomes of concomitant endoscopic gastrocnemius

☆ Level of Evidence Level III, retrospective comparative series.

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release with scarf osteotomy. We believe this study is the first adequately powered comparative study in assessing the outcomes of hallux valgus corrective surgery with concomitant endoscopic release. We postulate that scarf osteotomy with concomitant endoscopic gastrocnemius release has no difference in clinical and radiological outcomes compare to scarf osteotomy alone.

2. Materials and methods

Two hundred and twenty-four patients who underwent scarf osteotomy by a foot and ankle surgeon at our tertiary center were included in this study. They were categorized into 2 groups: one group underwent only scarf osteotomy (n = 195), the other group underwent scarf and endoscopic gastrocnemius release (combine, n = 29). The indications for surgery were painful hallux valgus deformity and failed conservative management. Concomitant endoscopic gastrocnemius release performed for patients who also have clinically evident gastrocnemius tightness. The exclusion criteria were rheumatoid arthritis, peripheral vascular disease, neuromuscular disease, recurrence of hallux valgus and revision surgery.

Pre- and postoperative weight-bearing anteroposterior radiograph of the affected foot was taken for all patients. This was to evaluate and classify the severity of the deformity and to determine the intraoperative correction required. The radiological parameters assessed were the hallux valgus (HV) angle, intermetatarsal (IMA) angle, hallux valgus interphalangeus (HVI) angle and tibial sesamoid position (TSP). The HV angle was measured through the anteroposterior view as the angle between the long axis of first metatarsal and the long axis of proximal phalanx. The intermetatarsal angle was measured as the angle between the long axis of first metatarsal and long axis of second metatarsal. TSP relative to the axis of first metatarsal was graded using a 7-point system described by Hardy and Clapham [6].

At our center, 2 cannulated, self-taping, headless compression screws were utilized to fix the scarf osteotomy cut [7,8]. Preoperatively, we used the Silfverskiold test to evaluate patients and to confirm the diagnosis of isolated gastrocnemius contracture. The senior author place one hand at the level of subtalar joint, and the other around the midfoot to stabilize the talonavicular joint. The foot keeps in a neutral position while dorsiflexing the ankle [3,9]. The test is considered positive when ankle passive dorsiflexion less than 5° in knee extension, but able to dorsiflex more than 10° during knee flexion [3]. This clinical test was performed by the same senior author using geometric evaluation to optimize the reproducibility of the test. The long shaft of fibula and lateral border of the foot were used as the anatomical landmark to measure the ankle range of motion (Fig. 1). This method of measurement has sensitivity and specificity approximately 90% [10]. Patients with concomitant gastrocnemius tightness underwent endoscopic gastrocnemius release. Stab incisions were made to the medial gastrocnemius runout. This was followed by insertion of the slotted cannula through the incisions. Endoscopic recession was performed until the ankle could dorsiflex up to 20° when knee was in extension.

In the same surgical setting, patient with associated hallux valgus interphanlangeus of 10° or more underwent an akin osteotomy [11]. The proximal phalanx medial closing wedge osteotomy was fixed with a staple. Likewise, patient with associated metatarsalgia underwent weil osteotomy of the lesser toes. Cannulated, self-taping and headless compression screws were used to fix the osteotomy cuts.

All patients were assessed by an independent physiotherapist preoperatively, at 6 and 24 months postoperatively. The demographics of the patients including age, gender, body mass index (BMI) were collected preoperatively. Clinical outcomes were measured through American Orthopaedic Foot & Ankle Society Hallux Metatarsophalangeal-Interphalangeal score (AOFAS), Visual Analog Scale (VAS), and the Short-Form 36 Health Survey (SF-36) score preoperative and 6 and 24 months postoperatively.

The American Orthopaedic Foot & Ankle Society Hallux Metatarsophalangeal-Interphalangeal score (AOFAS) was used for forefoot specific outcomes [12]. This score had high reliability, and had been widely used in clinical studies [13]. The questionnaire focused on three categories: pain (0–40 points), function (0–45 points) and alignment (0–15 points). The sum up of all scores was 100 points.

The Visual Analog Scale (VAS) was used to measure the intensity of pain. It ranged from 0 being no pain to 10 being the worst pain [14]. It had been shown to have good validity [15].

The Short-Form 36 questionnaire was used to collect the health-related quality of life (HRQOL) data [16]. This survey focused on 8 aspects: physical functioning; role limitations due to physical health; role limitations due to emotional problems; energy/fatigue; emotional well-being; social functioning; pain; general health. These 8 subscales were further aggregated to Physical Component Score (PCS) and Mental Component Score (MCS). These 2 summary scores had been proven to show high validity in clinical research [17,18].

2.1. Statistical analysis

Power analysis was done prior to the conduct of our study, based on the difference in AOFAS Hallux MTP-IP Scale at 24 months follow up. The minimal detectable change of AOFAS Hallux MTP-IP Scale was reported to be 7 points [19]. The prevalence of ipsilateral gastrocnemius tightness was assumed to be 12.5%; hence a 1:7 allocation ratio was used. To detect a difference of 7 points in

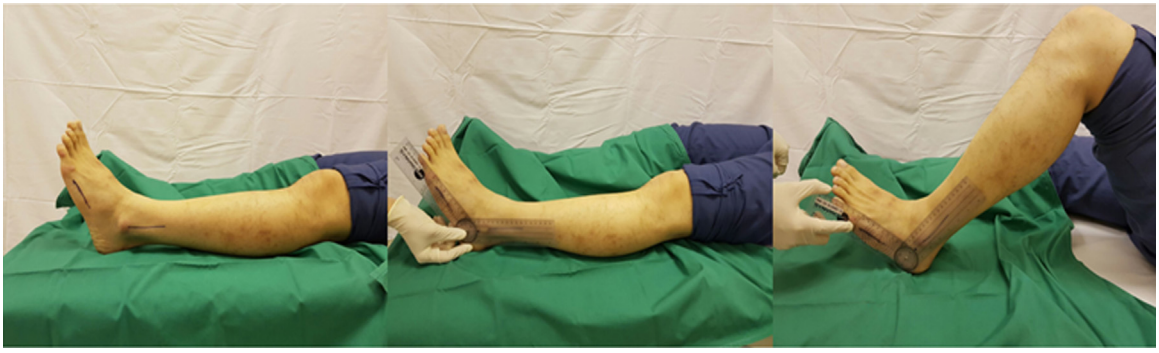

Fig. 1. (Left): Anatomic Landmarks to measure ankle dorsiflexion. The long shaft of fibula and lateral border of the foot were used as the anatomical landmark to measure the ankle range of motion. (Center): Measurement with knee extended. (Right): Measurement with knee flexed.

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