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Hallux Valgus Surgery in the Athlete: Current Evidence

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ABSTRACT

Hallux valgus is a common disorder characterized by a medial deviation of the 1st metatarsal, eventually leading to subluxation and pain of the 1st metatarsophalangeal joint. This can inhibit sports activity. Despite being a common forefoot pathology, debate exists regarding the appropriate surgical approach in the athletic population. Paucity in literature exists with reporting of outcomes of 1st metatarsal procedures leading to best outcomes. This review was able to identify 5 studies of surgical correction of hallux valgus in athletes published to date. The aim is to guide the physician in treating athletes with hallux valgus deformity. Currently, the literature supports distal 1st metatarsal osteotomy (Chevron) with a return to activity of approximately 3 months for mild to moderate deformity, and the Ludloff osteotomy for moderate to severe deformity at a slightly slower time frame of return to sports. At best, the Lapidus procedure allows approximately 80% of patients to return to activity. Studies need to document activity level and return to sport in order to help guide treatment.

Hallux valgus deformity is a common foot condition affecting sedentary and active patients alike. It is characterized by a lateral deviation of the hallux and an increase of the 1st intermetatarsal (IM) angle. This results in a prominent medial eminence of the 1st metatarsal head, subluxation of the sesamoid apparatus and progressive subluxation of the 1st metatarsophalangeal joint (1). Hallux valgus in athletes will range from simple pain in shoe gear to loss of propulsion, transfer lesions from abnormal weightbearing distribution, to overall decrease in athletic performance (2–4). Hallux valgus deformity in the athlete is no different from that in the nonathlete and should be evaluated similarly. Conservative measures should be initiated first and include change in shoe gear, training modification, bunion shield, padding, and orthotics (1,2,4). When the pain continues, activities and sports are impaired given the progressive nature of this condition. Hallux valgus may affect athletic performance, and surgical correction is sometimes recommended.

During running and jumping activities, a greater amount of force is generated and imposed on the 1st metatarsophalangeal joint. Weightbearing forces applied to the 1st metatarsophalangeal joints can be in excess of 400% of body weight, in comparison to 80% of body weight during normal walking (2,4). It is therefore imperative to have a congruous, healthy, and functional metatarsophalangeal joint to allow the demands of the athlete's sport. A paucity in research exists regarding the most appropriate surgical correction in athletes, along with an appropriate concern from the treating physician that a less than perfect surgical result may jeopardize the athlete's career.

Despite the common occurrence of these deformities, differences in opinion exist on the correct treatment approach and the most appropriate surgical technique, especially in the athlete. Mild deformity, described as an IM angle up to 15 degrees (1), is typically corrected with a distal metatarsal osteotomy, whereas moderate to severe hallux valgus is treated with a proximal metatarsal osteotomy to allow a greater degree of correction. Adequate soft tissue correction, release of contractures, and muscle-tendon rebalancing must be performed adequately at the metatarsophalangeal joint regardless of the osteotomy chosen. Regardless of whether the patient is active or not, the goals of hallux valgus correction should remain the same: correcting an increased IM angle, reestablishing a congruent joint, and repositioning the sesamoid apparatus. One should keep in mind the greater demand on the 1st metatarsophalangeal joint of an athlete, in excess of 4 times body weight during running and jumping activities. An increase in range of motion is also required for certain sports, such a ballet dancing. It is therefore critical that not only must the deformity be corrected, but its function must be restored. For these reasons, one should be careful before performing any joint destruction procedures, such as implant or Keller arthroplasty, unless other associated conditions exist (2).

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Methods

A literature review was performed by the senior author (M.F.), searching the PubMed and MEDLINE databases using the following keywords: "hallux valgus," "bunion," "athlete," "sport," "surgery." Multiple searches were performed, such as "bunion + surgery + sport" and "hallux valgus + athlete + surgery." Nineteen articles were retrieved; 5 met the inclusion/exclusion criteria. Inclusion criteria were articles involving case series from 1990 through May 2017. Exclusion criteria were traumatic deformity, sesamoid pathology, hallux rigidus, and review articles. Articles were excluded if patients did not have their activity level defined or their return to their desired activity was not reported. They were further classified as dealing with "mild to moderate" deformity and "moderate to severe" hallux valgus deformity. The outcomes of the procedures as reported by the authors were reviewed. The 5 studies were evaluated and commented on below (Fig. and Table). When noted, we described the return to activity time frame and athletic level as reported by the authors. Our aim in this report was to describe the findings described in the selected prior publications in a narrative fashion with an emphasis on the degree of hallux valgus deformity, rather than pool heterogeneous results from the published literature an effort to meta-analyze the prior findings.

Results

Mild to Moderate Hallux Valgus

Distal Chevron osteotomy and its modifications are widely accepted for the correction of mild to moderate hallux valgus. It is recommended and described for congruent joints with a large eminence (3,5). The osteotomy offers several advantages, including an early return to activities given its inherent stability, which is appealing to athletes. Saxena (4) reported the average time return to activity for athletes (RTA) with a distal Chevron procedure. Athletes were defined as those engaged in 6 or more hours of sports specific activity/week, running 25 miles/week, varsity high school, college, or professional sports. RTA is defined as being able to return to a practice session of the athlete's desired sport, which was an average of 8.9 weeks following the procedure for hallux valgus. This study concluded that the distal Chevron osteotomy procedure is technically easy to perform, leads to minimal shortening of the 1st metatarsal, and therefore reduces potential risks of transfer lesions and overload of the lesser metatarsals, which can be a detriment to athletes.

Giotis et al. (6) recently published a prospective analysis measuring both subjective and objective outcomes of the modified Chevron osteotomy for the treatment of mild to moderate hallux valgus deformity in the female athlete (IM angle <16 degrees). Forty-two feet in 33 patients were treated over a period of 3 years with a mean follow-up visit of 32 months. The surgery consisted of a Chevron osteotomy fixated with a percutaneous Kirschner wire (removed at 6 weeks postoperatively) without adductor halluces brevis tendon release. The athletes were allowed to bear weight at 2 weeks postoperatively and returned to their desired level of activities at 12 weeks. Objective results showed that all patient osteotomies were healed at the 2-year follow-up visit, with a reduction in IM angle from 14.2 degrees to 8.1 degrees postoperatively. In addition, 1st metatarsophalangeal joint range of motion was maintained postoperatively (from 69.7 to 67.1 postoperatively). Forty out of 42 feet were completely pain free at the follow-up visit. The mean American Orthopedic Foot and Ankle Society score improved from 47.4 preoperatively to 96.3 at 2 years postsurgery. Cosmesis was evaluated, and 95% of patients reported good to excellent results. Overall, no complications were reported by these authors (6).

Moderate to Severe Deformity Hallux Valgus

Traditional indication for a proximal metatarsal osteotomy for the treatment of hallux valgus is an IM greater than 15 degrees. This procedure is more effective in reducing larger angular deformity based on geometrical principles. Proximal osteotomies are also suited to correct sagittal plane deformity such as elevated 1st ray (1). With these come additional concerns and complication rates. Proximal osteotomies have been considered to be unstable and often associated with delayed healing, malunion, and shortening of the 1st metatarsal, and necessitate longer postoperative immobilization (6). Arthrodesis of the 1st tarsal-metatarsal joint (TMT; i.e., "Lapidus procedure") also offers correction of a severe deformity especially in the presence of hypermobility of the 1st ray. However, concerns exist about its indication in the athletic population, with potential stiffness that results related to the loss of the 1st TMT joint. Some authors question its indication in the athletic population (2). The Lapidus procedure is regarded as technically difficult with a high rate of complications such as nonunion, malunion, shortening, elevation, progression of midfoot arthrosis, transfer metatarsalgia, neurovascular compromise, hematoma, and hardware issues (4,7,8). Unfortunately, very few studies present objective results aiming to guide the physician in making appropriate technique choice between a proximal osteotomy versus an arthrodesis of the 1st TMT.

MacMahon et al. (7) reported some promising results, concluding that the modified Lapidus procedure (described as 1st metatarsal-cuneiform joint arthrodesis without 1st and 2nd metatarsal base arthrodesis, as originally described) is a viable option in athletes. Their retrospective study included a cohort of 48 athletes with a mean follow-up visit of 2.8 years. A modified Lapidus arthrodesis was performed for hallux valgus deformity with associated hypermobility of the 1st ray. Their study

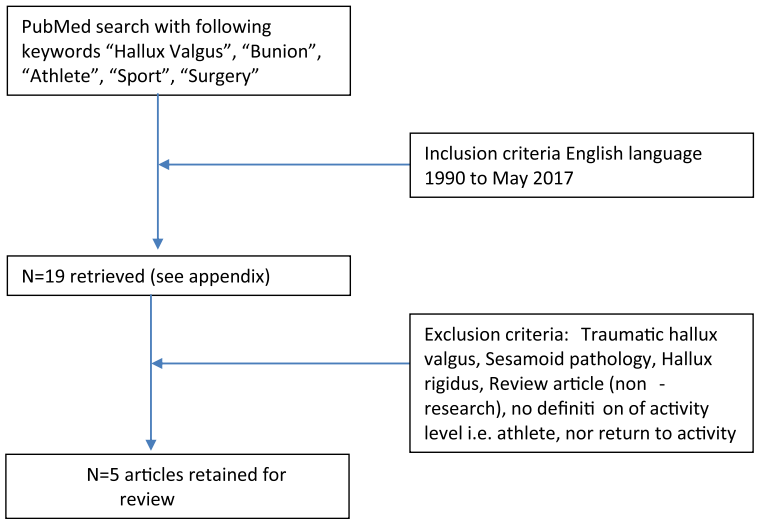

Fig. Systematic review portion: evaluation of outcomes of hallux valgus surgery in the athlete.

Table
Published studies and results

Study (Year)	Procedure	Study Design	Cohort	Follow-Up Visit	Results
Giotis et al (2016) (6)	Chevron osteotomy	Prospective	33 patients (42 feet)	32 months	40 of 42 pain free at f/u
Saxena & McCammon (1997) (9)	Ludloff osteotomy	Retrospective	12 patients (14 feet)	48 months	Average IM reduction of 6.5°
MacMahon et al (2016) (7)	Lapidus arthrodesis	Retrospective	48 patients	2.8 years	80% able to return to sport
McInnes & Bouché (2001) (8)	Lapidus arthrodesis	Retrospective	25 patients (32 feet)	39 months	30% able to return to sport
Saxena & St. Louis (2013) (10)	Ludloff osteotomy	Prospective	112 patients (119 feet)	75 months	100% able to return to sport

reported subjective findings only, with 81% of the patients being satisfied with their return to activities and 80% being able to participate in their previous sports. This was based on 2 self-administered postoperative questionnaires. Fifteen percent of patients experienced complications ranging from hematoma (requiring surgical evacuation) to transfer metatarsalgia. No objective findings of the outcomes were evaluated and/or reported on.

In 2001, McInnes and Bouché (8) published a retrospective study on outcomes of the modified Lapidus arthrodesis and reported on both subjective and objective findings. Thirty-two feet in 25 patients were included with an average follow-up visit of 39 months. The procedure was performed for the management of moderate to severe hallux valgus in the presence of 1st ray hypermobility. Subjective evaluation revealed that 78% of the patients rated the surgery as "completely" or "very" effective, yet athletes demonstrated a lower return to activity (30%) than the 80% found in the study of MacMahon et al (7). Their objective findings reported shortening of the 1st metatarsal on an average of 3.4 mm. Average postoperative 1st metatarsophalangeal joint dorsiflexion measured 62.6 degrees. Complications included 5 nonunions and 2 delayed unions. No significant differences in outcome were seen among athletes, active patients, and sedentary patients (8).

Saxena and McCammon (9) reported on the Ludloff osteotomy (oblique osteotomy of the 1st metatarsal shaft oriented from dorsal-proximal to distal-plantar) as a means to correct a moderate increase in the IM angle in the athletic population. This osteotomy prevents excessive shortening on the 1st ray allowing for plantarflexion of the capital fragment if necessary. Their postoperative protocol allowed for weightbearing at 3 weeks, making this an attractive alternative for athletes wanting to maintain their fitness level. This retrospective study published in 1997, evaluated the results of 14 procedures performed on 12 patients, with an average follow-up visit of 48 months. The study demonstrated an average reduction of the IM angle from 15.9 degrees to 9.4 degrees. The average 1st metatarsal shortening was 1.4 mm, and no transfer lesions were noted to the lesser metatarsal. One delayed union was reported. Subjective findings found an average American Orthopedic Foot and Ankle Society rating of 92.3. A follow-up study by the same lead author with a total (but different) cohort of 112 patients demonstrated an RTA at 3.6 months in the athletic population (10). All 50 athletes in this study on the Ludloff procedure returned to their desired sport. The author considers the Ludloff osteotomy to be more suitable for competitive athletes with hallux valgus by allowing early weightbearing, avoiding the surrounding joints and therefore potential capsular adhesions, while being able to correct length and a large IM angle (10).

Postoperative Management

Regardless of the type of surgical procedure chosen, an appropriate postoperative protocol must be followed. It is generally safe to allow the athlete on a stationary bicycle with a cast or cast boot early postoperatively to maintain cardiovascular fitness (4,10). One should refrain from impact activities until the osteotomy shows radiographic evidence of healing, and physical therapy might be necessary to facilitate regaining of full metatarsophalangeal joint range of motion.

Discussion

In general, the relationship between hallux valgus deformity severity, specific bunionectomy procedure outcomes, and patient activity levels has not been well studied. There clearly is a paucity of study on this topic, and therefore direct conclusions or recommendations cannot be made. This review is limited by the fact that we were able to retrieve only 5 studies that met our inclusion criteria. This is obviously a limitation, as other databases may have yielded additional studies. Furthermore, ours was a narrative review, and no effort was made to undertake meta-analysis of previously published, heterogenous results. Nonetheless, we believe that this review makes clear the importance of RTA when treating athletes, and the need to rigorously assess this outcome in future investigations that focus on hallux valgus in this group of patients, so that assessments of the results of treatment can be made while limiting biases that may influence the findings.

In conclusion, when dealing with hallux valgus deformity in athletes, it is imperative to conduct a thorough evaluation, assess patients' goals and activity level, and then properly counsel them regarding possible outcomes of the surgery. The Chevron osteotomy has proven to be an effective and reliable osteotomy choice for the mild to moderate deformity, allowing a rapid return to activity, with a minimal complication rate in athletes. No consensus exists regarding the treatment of moderate to severe hallux valgus, although the Ludloff procedure has good reported outcomes in 2 studies. Caution should be taken with the Lapidus procedure, as the RTA ranges from 30% to 80% as of current reported research. A sound postoperative protocol and rehabilitation program is imperative regardless of the procedure chosen. Clearly, more research is needed before any definitive conclusions can be made on hallux valgus surgery in athletes.

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