International Journal of
Health, Medicine and Nursing Practice
(IJHMNP)

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CARI

International Journal of Health, Medicine and Nursing Practice
ISSN 2710-1150 (Online)
Vol.8, Issue No.3, pp 10 - 29, 2025
www.carijournals.org

Hallux Abductovalgus Deformity: A Review of Literature

Blasius Okechukwu Okwara[1*], Kenneth Amaechi Agu[2], Anulika Perpetua Okwara[3] Amaechi Ugbala[4], Augustine Oviosun[5], Ezinne Chidinma Oviosun[6].

[1]Department of Orthopaedics and Trauma, University of Nigeria Teaching Hospital, Nigeria.

[2]Department of Surgery, University of Nigeria Teaching, Ituku/Ozalla Campus, Enugu, Nigeria.

[3]Department of Nursing Services, National Orthopaedic Hospital, Enugu, Nigeria.

[4]Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Ebonyi State, Nigeria.

[5]Department of Anatomy, Faculty of Biomedical science, Kampala International University, Uganda

[6]Department of Anatomy, Faculty of Basic Medical Sciences, Ambrose Alli University,Ekpoma,Edo State, Nigeria.

https://orcid.org/0000000308665181

Accepted: 14th Aug, 2025, Received in Revised Form: 14th Sep, 2025, Published: 25th Sep, 2025

ABSTRACT

Purpose: The purpose of this study is to review the previous works done by some scholars on hallux Abducto-Valgus deformity. This will in turn evaluate some research studies and their implications to management of persons with hallux abductovalgus deformity

Methodology: This review was done through searching previous studies done on this topic hallus abductovalgus deformity. This was done using the search databases like Medline, Hinari, scopus and sciencedirect. Here the different researcher's thoughts on the aetiology, pathophysiology, clinical manifestations, investigations, classifications, treatments, rehabilitation and outcome of treatment of hallux abductovalgus deformity were analysed to produce this piece.

Findings: The findings showed that hallux Abducto-valgus (HAV) is a deformity of the first metatarsophalangeal joint towards the midline of the foot due to the eversion and abduction of the hallux. The two main factors contributing to the development of hallux abductovalgus include congenital causes and inappropriate footwear. Several factors have been reported to be associated with hallux abductovalgus including genetic predisposition, structural factors, sex, age, BMI, foot pain, pes planus and footwear. Patients can also present with fore foot pain due to a variety of associated problems such as painful calluses and corns, Inter – digital neuromas, lesser toe deformities. Hallux valgus occurs in two distinctive aspects; it can occur either on the left or right foot (Unilateral hallux valgus) or on both feet (Bilateral hallux valgus) with prevalence more in the elderly and women. Evaluation of the hallux abducto valgus deformity should be carried out with the patient weight-bearing as well as non-weight-bearing. Imaging investigation is an important evaluation tool. Treatment could be either conservative or surgical.

Unique Contribution to theory, practice and policy: Since there is increase in the incidence of hallux abductovalgus deformity, there is need for in-depth awareness and knowledge of this clinical condition. It is recommended that daily foot check and care should be regularly done individuals. The idea of using shoe gear with narrow shoe box, high-heeled, tight fitting and pointed should be discouraged in preference to broad-based, flat, wide and loose-fitting shoes. Early and timely consultation with specialist in foot care should be advised if the symptoms of hallux abductovalgus deformity develops.

Keywords: *Hallux abductovalgus, Metatarsophalangeal, Bunion, First ray, ill-fitting, Arthropathy.*
JEL Codes: I12, I10, I12, I10, I12, I12.

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Background

Hallux Abducto-Valgus (HAV) is defined as a deformity of the first metatarsophalangeal joint towards the midline of the foot (1) due to the eversion and abduction of the hallux (2). The two main factors contributing to the development of hallux abductovalgus include congenital causes (3,4). and inappropriate footwear (4,5) Tight fitting, pointed, high-heeled shoes induce a passive transition of the metatarsophalangeal joint towards the midline causing active deforming forces to develop. Eventually the abductor hallucis loses its abduction capacity and the first metatarsophalangeal joint angle increases (3).

Hallux abductovalgus deformity refers to a fore foot deformity in which the hallux is abducted and in a valgus position, often associated with the development of a painful bursa, more commonly known as a bunion (2). Hallux abductovalgus deformity is a common disorder of the fore foot that results from the medial deviation of the first metatarsal and lateral deviation or rotation of the great toe (Hallux) with or without a bunion (6).

Several factors have been reported to be associated with hallux valgus including genetic predisposition, structural factors, sex, age, BMI, foot pain, pes planus and footwear (4,7). Hallux valgus occurs in two distinctive aspects: it can occur either on the left or right foot (Unilateral hallux valgus) or on both feet (Bilateral hallux valgus) (8,9,10).

In orthopaedic texts, it is often referred as “hallux valgus” (HV) deformity whereas, many podiatry texts prefer the term “hallux abductovalgus” (HAV) deformity. The lay person is more familiar with the expression "bunion." The term bunion, derived from the Latin word for “turnip”. Bunion can be described as the protruding medial eminence that is characteristic of 1st metatarsophalangeal joint enlargement caused by osteoarthritis, bursal inflammation, ganglion formation, or gouty arthropathy. Hallux abductovalgus deformity can be associated with posterior tibial tendon rupture, neuromuscular disorders and inflammatory arthropathies (6).

Most cases of this deformity start with lateral deviation of the hallux by external forces. With the development of hallux abductovalgus, the abductor tendon becomes a deforming force in the lateral position, then gradually “levers” the first metatarsal into drifting medially (or into varus) (11). There is usually an associated enlargement of the medial side of the head of the first metatarsal bone, together with the formation of a bursa and callus over the area. The bony prominence and its overlying bursa constitute a bunion (11,12).

Anatomic factors predisposing to hallux valgus include varus alignment of the first metatarsophalangeal joint (13). The medially directed first metatarsal widens the angle between the first and second metatarsal beyond the normal 5-8 degrees. This so called metatarsus varus adds mechanical advantages to the adductor hallucis tendon insertion on the proximal phalanx of the great toe, with resulting lateral deviation of the toe (13). Ligamentous laxity may also aggravate the imbalance (13).

Genetic factors are important in the formation of tumors, people who get bunions are usually genetically predisposed to this bone displacement, and may cause its onset by wearing improperly fitting shoes, or by running or walking in a way that cause stress to the feet (14). Another common cause for bunions is wearing high heeled shoes resulting in the weight of the body in these shoes pushing the toes into an unnatural position, possibly causing bone displacement (14).

In the 19th century, the prevalent understanding of Hallux abductovalgus deformity was that it was purely an enlargement of the soft tissues, first metatarsal head, or both, most commonly caused by ill-fitting foot wear. Thus, treatment is associated with varying results and there is controversy over whether to remove the overlying bursa alone or in combination with an exostectomy of the medial head. These surgeries were considered to be beneath many surgeons, so the understanding of the pathology of hallux valgus deformity was gradually in its development. Surgeons slowly began to recognize that hallux abductovalgus deformity could develop as a result of numerous different factors that they tended to be familiar and that they often were associated with other foot deformities (15,16), investigated the intraobserver and interoberserver reliability of different radiographic method used to measure the hallux abductovalgus and intermetatarsal angles and to determine the most reliable method for making these measurements before and after a proximal crescentic osteotomy of the first metatarsal. The method that fielded the highest intraobserver and interobserver correlation coefficients for the preoperative hallux abductovalgus and intermetatarsal angles and the postoperative hallux abductovalgus angle was that in which in line connected the centers of the first metatarsal head and the proximal articular surface of the first metatarsal to define the longitudinal axis of the first metatarsal (17,18).

Anatomy of The First Ray

Standing on level ground, the heads of the metatarsals and the calcaneus are in the same horizontal plane. Suspended off the ground are the talus, the navicular, and the cuneiform bones. The head of the talus has a relatively large convex joint surface that articulates with the corresponding concave posterior facet of the navicular (14). The distal joint surface of the navicular has individual facets that articulate with the first, second, and third cuneiforms. Cuneonavicular and intercuneiform articulations are planar joints that glide or slightly gap when moving apart (14).

The cuneiform bones articulate distally with the first 3 metatarsals. Neighbouring metatarsals adjoin at their base, although the joint between the first and second metatarsals is often poorly developed (14,19). The second metatarsal is mortised between the first and the third cuneiform bones, making it relatively immobile, whereas the other metatarsals have greater freedom of movement (14,19). The first metatarsal is the shortest and thickest of the metatarsals (14,19). Two sesamoid bones, encased in the tendons of the intrinsic muscles, lie beneath the head of the

first metatarsal. Suggested sesamoid functions include: to elevate the first ray so the first metatarsal can plantar flex during extension of the hallux, to enhance the load-bearing capacity of the first metatarsal and to improve the mechanical leverage for the attached intrinsic muscles (14,20,21). The first metatarsocuneiform joint combines with the surrounding ligaments to form a stable segment (22). The triangular base of the first metatarsal has a lateral joint surface, a medial joint surface, and an inferior joint surface. The metatarsal joint surface is concave, with a near-vertical central groove that aligns the metatarsocuneiform joint axis in slight inversion relative to the foot (14,22). A mediodorsal and lateroplantar protuberance is commonly found, which adds rotational stability to the joint (22). The dorsal capsule of the joint is thin, whereas the plantar capsule is thickened with ligamentous support (22).

Muscle activity can provide support to the first ray. Tendons of the tibialis posterior, tibialis anterior, and peroneus longus muscles insert onto the first ray (14,22). The tibialis posterior muscle inserts on the navicular tuberosity, with additional plantar attachments to the cuboid, the cuneiforms, and the second, third, and fourth metatarsals. The tibialis anterior muscle inserts on the medial cuneiform and the base of the first metatarsal. The peroneus longus muscle inserts on the first metatarsal. The flexor hallucis brevis muscle divides into 2 bellies encasing the sesamoid bones and inserts on the base of the proximal phalanx. Passing under the first metatarsal, the tendon of the flexor hallucis longus muscle inserts on the distal phalanx (14).

Appropriate treatment of hallux valgus requires a clear understanding of the anatomy of the entire first ray (14). The hallux has a distal phalanx and proximal phalanx, the proximal phalanx articulates with the first metatarsal. The first ray is single foot segment consisting of the first metatarsal and first cuneiform bones (14).

The metatarsophalangeal (MTP) joint is a biaxial condylar articulation that relies on a synovial capsule, collateral ligaments and a fibrous plantar plate to maintain bone and a lateral sesamoid bone, encased in the tendons of the intrinsic muscles, lie beneath the head of the first metatarsal (14).

Dorsally, the extensor hallucis longus (EHL) tendon is stabilized medially and laterally by the extensor hood ligament. Plantar to this extensor hood is the extensor hallucis brevis tendon, which inserts on the dorsal lip of the proximal phalanx. Plantar to the first MTP, the joint capsule is augmented by lateral and medial tendons of the flexor hallucis brevis (FHB). These Tendons insert broadly on the sesamoids proximally. Distally the sesamoidophalangeal ligaments serve as the extension of these tendons from the sesamoid to the base of the proximal phalanx. The FHL tendon runs between the sesamoids bounded by a firm sheath, and proceeds distally to the base of the proximal phalanx. The abductor hallucis (ABH) tendon, plantar medially, is contiguous with the MTP capsule and inserts on the medial sesamoid and medial plantar base of the proximal phalanx (14,19). The adductor hallucis tendon is plantar lateral and inserts on the lateral sesamoid, the lateral capsule and the lateral aspect of the proximal phalanx. This leaves

area of relative weakness dorsomedially, and dorsolaterally, where only the hood ligament augments the joint capsule (14,19).

EPIDEMIOLOGY OF HALLUX VALGUS DEFORMITY

Hallux valgus is a very common problem in western societies (23,24). The prevalence of hallux abductovalgus is unknown (8,24) and appears to vary between different populations, but in all studies females are affected more often than males. In unshod populations, the prevalence is around two per cent (25). A recent systematic review estimate the prevalence of hallux valgus to be 23% in the general population aged 18 – 65 years and 35.7% in the population aged over 65years, with an overall increased prevalence in females (24), while prevalence of hallux valgus deformity done in Enugu metropolis, Southeast, Nigeria was 13.6% with increased prevalence in females and elderly (8).

Epidemiological data demonstrate the highest incidence of hallux valgus in elderly people, with women representing 90% of all cases. Specifically Gould *et al*, (26) estimated the deformity to affect 1 in every 45 individuals over the age of 50 years. The deformity may also develop in childhood, the term "juvenile hallux valgus" is used when the condition presents prior to skeletal maturity (8,27). The incidence and prevalence is lower in children and increases with age and there is often a significant family history (8,27).

Aetiology of Hallux Abductovalgus Deformity

The cause of hallux valgus is unknown (28), many theories have been put forth, and perhaps most common is that ill-fitting footwear may contribute (27,29,30,31). The prevalence of hallux abductovalgus is highest in the female populations living in western societies that wear fashionable shoes (27,32). Shoes worn by women typically have a high-heel and narrow toe box.(38) Heeled shoes increase pressure borne by the forefoot and, when worn over prolonged time periods, may lead to adaptive shortening of the ankle plantar-flexor muscles (27). Decreased ankle dorsiflexion, by itself, is considered a factor in hallux valgus (27,34). Greater than 60% of subjects having hallux valgus show a family history of the deformity (35). Congenital neurological pathology, such as ankle equinus associated with cerebral palsy and chronic inflammatory conditions have been found to be related to hallux abductovalgus (27,34). Damage of the first MTP joint occurs in nearly 25% of patients having rheumatoid arthritis (27). Arthritis weakens the articular tissues, leaving weight bearing joints at risk of dislocation; collapse of the arch is common (36,37). Coughlin and colleagues reported that 10% surgeries performed in their practice to correct hallux abductovalgus were for inflammatory arthritic conditions, predominantly rheumatoid arthritis (38).

The shape of the first metatarsal head also has been explored as a potential predisposition of hallux valgus (27,39,40). A flattened head is considered to be resistive to deforming forces, whereas a round head is thought more prone to allow the hallux to drift into deformity (3). With

varying evidence in the literature, pes planus, 1st ray hypermobility, footwear, occupation, heredity, Achilles contracture, and ligamentous laxity have all been implicated as causes of hallux abductovalgusdeforminty (4,41). A recent prospective study by Coughlin and Jones evaluated 103 subjects with 122 feet treated for moderate to severe deformity, they found that: 83% of patients had a family history of hallux valgus. 71% of feet with hallux valgus deformity had an increased 1st metatarsal length – 2.4mm longer when compared with the 2nd metatarsal. 71% of feet had an oval or curved MTP joint surface. 32% of feet had moderate to severe metatarsus adductus. 34% of patients implicated shoes wear or occupation as a causative factor in the development of their bunions. 23% of feet had plantar gapping at the 1st metatarsocuneiform (MTC) joint, 13% of feet had increased 1st ray mobility as defined by 9mm or more of motion determined by klaue's device. Factors that were not significantly increased in hallux abductovalgus patients included pes planus (15%) and Achilles contracture (11%) (41).

Pathophysiology of Hallux Abductovalgus Deformity

Although there are many stabilizing structures crossing the metatarsophalangeal (MTP) joint, there are no tendons attaching to the distal metatarsal to prevent medial deviation. The progression of hallux valgus, although not well understood, is predictable (34,42). The tensile strength of the medial collateral ligament of the first MTP joint weakens and the hallux abducts laterally into valgus (27). Coincident with abduction of the hallux, the metatarsal shifts medially into adduction, potentially subluxating the sesamometatarsal articulation (43,44). Hallux valgus angle refers to the offset in first MTP joint positioning (27,45). The relative distance between the first and second metatarsals, which increases as deformity becomes worse, is called the intermetatarsal 1–2 angle. The deformity is judged to be severe when the hallux valgus angle is greater than 40 degrees and the intermetatarsal 1–2 angle is greater than 16 degrees (27,45). Severe deformity leaves the medial aspect of the metatarsal articular surface uncovered and exposed to injury. This gives rise to hypertrophy, resulting in the cosmetic feature most commonly associated with hallux valgus (34).

Scranton and Rutkowski (46), qualitatively evaluated the extent of cartilage and subchondral bone damage in 35 cadavers having hallux valgus. Erosion of the plantar surface of the metatarsal head was present in every specimen having completely dislocated sesamoids. In a different study (47), mapped articular wear patterns in 166 feet undergoing hallux valgus surgery. All patients older than 50 years showed erosive damage involving nearly half of the combined MTP joint surface area, such late-stage changes in joint structure may render the hallux painful and without functional utility (27).

The imbalance of moments acting on the hallux during gait worsens the deformity. Plantar pressure measurements are highest near the end of stance when loads carried by the hallux approach 40% of body weight (27,48). Walking with a laterally rotated foot angle and walking in excess foot pronation are gait compensations known to redirect the distribution of weight to the

medial side of the hallux (27,49). Moment generated mostly by the flexor hallucis longus (FHL) counters the ground force moment reacting to dorsiflexors of the hallux (50,51). These action and reaction moments have been modeled to explain the progression of deformity (27,52). As the hallux abducts, the ground reaction force (GRF) acting on the hallux has a medial component that increasingly works to displace the first metatarsal into adduction. The magnitude of this medial force component equals the GRF acting on the hallux multiplied by the tangent of the angle approximating the hallux valgus angle (52).

Assessment and Classification of Hallux Abductovalgus Deformity

Assessment and classification of pathology severity are important for the prescription decision of physicians. An optimal outcome could be achieved by selecting the appropriate procedure with a careful assessment. Angular measurements via radiographs are the main tools for assessment. Pain and function score are often used in clinical evaluation of patients' conditions. Weight-bearing radiographs are often taken at anteroposterior, lateral and oblique directions. Hallux valgus angle and the first metatarsal angle are the most commonly assessed angles. The hallux valgus angle is represented by the intersected axis of the first metatarsal and the first proximal phalanx (53).

Normal foot exhibits an angle less than 15°. Twenty-degree or less represents mild deformity, while moderate deformity ranges from 20°to 40°. Severe deformity has a hallux valgus angle greater than 40° (42,54). The First intermetatatarsal angle is formed by the intersection axis between the first and second metatarsal shafts. An intermetatatarsal angle less than 9°is normal.[53] A mild deformity exhibits 11°, while moderate deformity shows less than 16°. Severe deformity has an angle greater than 16° (42,54).

Diagnosis of Hallux Abductovalgus Deformity

Clinical Presentation

The report from Coughlin *et al,* (42,54), showed that, 70 – 75% of patients presented with pain over the medial eminence. Patient can also present with fore foot pain due to a variety of associated problems such as: Painful calluses, Inter – digital neuromas, lesser toe deformities, Painful corns. Other symptoms include – soreness, inflammation and redness, a burning sensation and possible numbness.

Evaluation of the hallux abducto valgus deformity should be carried out with the patient weight-bearing as well as non-weight-bearing. Usually the hallux abductovalgus deformity is accentuated when the patient is standing or bearing weight on the foot. Equally important to this examination is an evaluation of the associated deformities (i.e., hammer toes, digital subluxation, hyperkeratotic lesions) present on weight-bearing. Lateral deviation of the great toe may be a result of luxation within the metatarsal phalangeal joint or involve the structure of the hallux

itself. Hallux abduction may be caused by positional or structural changes within the metatarsal phalangeal joint. This hallux abduction may also be caused by the structural shape of the proximal phalanx (56). It is important to clinically differentiate the level and aetiology of this lateral deviation so that the appropriate corrective procedure or procedures are selected. The generally accepted normal range of motion of the first metatarsal phalangeal joint is approximately 70°-90° of dorsiflexion and approximately 30° of plantar flexion. Any limitation in either dorsiflexion or plantar flexion should be noted and compared to that of the contralateral extremity. Limitation of motion, pain on motion, or crepitation may indicate deterioration or degeneration of the articular surfaces of the joint

The subject is observed while walking, standing, and sitting. While weight bearing, the hallux and lesser toe positions, hind foot alignment, and arch morphology are also observed. Range of motion of the ankle with the knee flexed and extended, the subtalar joint and transverse tarsal joint are assessed. The first MTC joint is evaluated for hypermotility and crepitus. The degree of hallux valgus deformity is assessed with and without weight bearing. The 1st MTC joint is assessed for reducibility of deformity, range of motion, crepitus and pain with motion. The hallux should be reduced to a corrected position and put through a range of motion in the sagittal plane to assess joint congruity. A joint that is concentric and spherical will typically reduce better and have a greater range of motion than one that is squared or not concentric.

The lesser metatarsophalangeal joints are evaluated for synovitis, range of motion, and stability. The skin is carefully examined for plantar callosities suggestive of transfer lesions, bursitis and erosions. A careful neurovascular examination in conducted to assess digital neuralgias. Also peripheral pulses are noted.

Investigations

Proper radiographic evaluation of the hallux abductovalgus deformity requires standard preoperative weight-bearing views taken in the angle and base of gait (57). Standard preoperative views should consist of weight-bearing dorsi-plantar, lateral, forefoot axial, and medial oblique projections. Dorsiplantar and lateral views together will allow the practitioner to accurately measure traditional relationships and identify positional and structural components of the deformity. A 45° medial oblique projection demonstrates hypermobility from lack of parallelity between the first and second metatarsals. The medial oblique projection will also act as a standard for assessment of pre-and postoperative correction of the deformity. The forefoot axial projection will aid in evaluating degenerative changes noted within the sesamoid apparatus. The plantar crista of the first metatarsal head may also be viewed and evaluated for erosive changes that may accelerate the deformity. The tibial sesamoid position on the forefoot axial view is not evaluated, because it should be remembered that activation of the "windless mechanism" will cause the deformity to appear less severe than it actually is (58). Finally, the preoperative radiographic evaluation must be combined with a thorough history of the subject's

presenting complaint and proper clinical examination in both the non weight-bearing and weight-bearing stance. X-ray will show the degree of deformity and may indicate subluxation at the MTP joint. A weight bearing AP radiography assesses: hallux valgus angle (HVA) intermetatarsal angle (IMA), distal metatarsal articular angle (DMAA), hallux valgus interphalangeal (HVIP) angle, metatarsophalangeal joint congruency, sesamoid position and the degree of metatarsus adductus.

This evaluation allows for classification and preoperative planning. The lateral radiograph should be assessed for plantar gapping at the 1st MTC joint and dorsal translation of the 1st metatarsal relative to the cuneiform indicative of instability.

Staging

The work done by Root *et al,* (58), proposed the division of the pathomechanical development of hallux valgus into four stages as follows:

- Stage 1 - Excessive pronation causes hypermobility of the first ray, causing the tibial sesamoid ligament to be stretched and the fibular sesamoid ligament to contract; lateral subluxation of the proximal phalanx occurs
- Stage 2 - Hallux abduction progresses, with the flexor hallucis longus and flexor hallucis brevis gaining lateral mechanical advantage
- Stage 3 - Further subluxation occurs at the first MTP joint, with formation of metatarsus primus adductus
- Stage 4 - The first MTP joint finally dislocates.

Treatment

Treatment of hallux valgus includes both conservative and operative procedures. The future of the treatment of many of the common disabilities of the foot lies in re-education of function rather than in reinforcement by mechanical contrivances or more drastic treatment by refinements of surgical technique (59). Conservative treatment is primarily directed at decreasing the shoe pressure against the bunion by making shoe gear changes as well as by controlling the abnormal pronation motion through the use of orthotic devices. Lace style shoes with a wide toe box should typically be used. Loafer, flats or heels should be avoided because by design these shoes are always narrower through the front of the foot (60). In addition to shoe gear changes occasionally using an orthotic device within the shoe can restore more normal joint motion thus decreasing the achy quality pain that can occur. Other treatments are more supportive but can include the use of padding on the foot as well as the use of anti-inflammatory medications.

If conservative measures fail to decrease pain, surgical correction may be considered. Surgical correction must be individualized for each subject and is based upon thorough clinical and x-ray evaluations. The main goal of surgery is to decrease pain by restoring the joint to normal

position. This typically involves the surgical release of tight soft tissues surrounding the joint as well as cutting the metatarsal bone to reposition it. The surgical procedure is usually performed in a surgical center with a local anesthetic and 'light sedation' administered by an anesthesiologist. Recovery varies depending on the procedure performed (14). Patient should be given appropriate information and advice about hallux abductovalgus (14). The advice should include the following: wear appropriate shoes (low, wide fitting shoes), wear shoes with laces or an adjustable strap, avoid tight fitting shoes, understand that the deformity are progressive and that non-surgical treatments alleviated symptoms but do not limit progression. The most important indication for surgery is pain, not deformity, although there will often be concern about the appearance of the deformed joint (14).

Conservative Treatment

Analgesics, including non-steroidal anti-inflammatory drugs, may reduce pain and make the condition more bearable. A steroid injection into the joint may give some relief of pain and inflammation. Antiphlogistic salves can be administered locally, nonsteroidal anti-inflammatory drugs systemically. Pain in the smaller toes can be alleviated with pads and toe straighteners. Wide, soft shoes are helpful if they give the toes enough space. Once hammer toes or claw toes have developed, however, surgery is necessary (66).

Hallux abductovalgus in most patients can be managed conservatively (61), however, by the time subjects come to a specialist, most have tried and exhausted many of these measures: use of roomier foot wear with soft leather upper and/or a wider toe box can supply relief from impingement on the medial eminence and lesser toe prominences, shoes that can further be modified by an orthotist, stretching regions where the shoes cause irritation, some subjects experience relief from specific hallux valgus night splints, pads, toes spacers and/or posts and custom orthotics may help by correcting associating conditions such as pes planus, flexible flat foot deformity and ligamentous laxity. Although orthotics cannot improve the deformity, they may provide short term relief and delay the need for surgery (61).

Operative Treatment

The indications for surgery include: painful joint, deformity of the joint complex, pain or difficulty with foot wear, inhibition of activity or lifestyle, and associated foot disorders that can be caused by this condition (60). Associated foot disorders include: Neuritis or nerve entrapment, overlapping or under lapping of the adjacent toe, hammer toes, hallux metatarsocuneiform joint exostoses, sesamoiditis, foot ulceration and inflammatory conditions, such as bursitis, or tendonitis of the first metatarsal head. Surgical correction of hallux valgus rebalances the first ray, correcting the various features of the deformity (62). It is important to keep in mind the greater demands placed on the 1st metatarsophalangeal joint of a patient.

The goals of hallux valgus surgery are not only to correct the valgus angulation and pronation of the 1st metatarsophalangeal joint, but also to narrow the forefoot by resecting the medial eminence and/or correcting intermetatarsal angle. Other surgical goals are to re-establish; normal weight bearing status of the 1st ray, congruency of the metatarsophalangeal joint and congruency and relationship of the metatarsal head sesamoid joint.

Various surgical techniques are used to address this pathology. The simplest pathology is a congruent joint with mild or moderate deformity, which can be treated with a medial eminence resection, proximal phalangeal osteotomy, distal soft tissue reconstruction (DSTR) or any combination of the three.

Hallux valgus interphalangeus (HVIP), can be corrected by a closing medial wedge proximal phalangeal osteotomy. A DSTR or modified McBride procedure involves a lateral release as well as a medial capsulorrhaphy after the medial eminence has been resected. The extent of lateral release depends on whether the deformity is reducible. A full lateral release involves release of the metatarsal – sesamoid ligament and insertion of the adductor hallucis on the fibular sesamoid, transverse metatarsal ligament, and finally, the lateral capsule (63). Mild deformity with an incongruent joint can be addressed with a distal metatarsal osteotomy such as chevron osteotomy combined with a DSTR and medial eminence resection. When the distal metatarsal articular angle (DMAA) is high, a biplanar osteotomy should be considered. The biplanar chevron osteotomy involves taking a laterally based wedge at one or both of the limbs of the osteotomy to allow both lateral translation and internal rotation of the distal piece to reduce the distal metatarsal articular angle (63).

Moderate hallux valgus requires a more proximal metatarsal osteotomy to correct the intermetatarsal angle at the actual apex of deformity. These proximal osteotomies are used in combination with a DSTR. Other proximal osteotomies used for moderate to severe hallux valgus include the proximal crescentic, proximal chevron, proximal opening wedge, lateral closing wedge, and oblique osteotomies (64). Severe hallux valgus can be treated with proximal metatarsal osteotomies, but sometimes requires fusion of the 1st metatarsophalangeal joint or a modified Lapidus procedure (65,66). A modified Lapidus procedure is a fusion of the 1st metatarsocuneiform joint joint with a lateral and plantar based proximal wedge to allow narrowing of the intermetatarsal angle. This should be considered in patients with 1st metatarsocuneiform joint hypermotility, instability, or arthrosis or in those who have a previous failed hallux surgery but only if there is adequate range of motion of the 1st metatarsophalangeal joint exists (66).

Minimally Invasive Techniques in Hallux Abductovalgus Treatment

Minimally invasive hallux abductovalgus techniques, such as arthroscopy, percutaneous and minimum incision osteotomies, have the theoretical advantage of decreasing recovery and rehabilitation times, because surgical exposure and deep soft tissue dissection are less extensive

and milder (67,68,69). With the advance of foot and ankle arthroscopy, distal soft tissue procedures such as lateral soft tissue release and medial capsular placation have been performed endoscopically (67,70,71,72). Though these procedures give better evaluation of sesamoid reduction and the potential to minimize the risk of overcorrection, they are technically demanding, time-intensive and carry the potential risk of digital nerve injury (67,70,71,72).

Percutaneous and minimum incision osteotomies for the management of patients with hallux valgus have received increasing recognition because of the perceived efficacy comparable to traditional open approaches but with purported less cost and higher patient satisfaction.[67,73] Percutaneous and minimum incision techniques seem to be indicated in high-risk patients who have ulceration or recurrent ulceration as a means of performing limb preservation/salvage without extensive soft tissue and osseous trauma (67,74,75,76). Percutaneous surgery is performed through the smallest possible working incision (usually 1–3 mm long) without direct visualization of the underlying target structures, using a mini-blade for soft tissue incision, and a power rotatory bur for bony procedures under intra-operative fluoroscopy (67,73,74,75).

Minimally incision surgery is performed through the smallest incision necessary to perform the procedure (usually 1–3 cm long) using a traditional scalpel blade for soft tissue incision and power saw blades for bony procedures under direct visualization of the structures, and may or may not require intra-operative fluoroscopy (67,73). The most common complication following minimally invasive foot procedures is recurrence of the deformity, as a result of incorrect selection of the procedure, incorrect surgical technique, and underestimated healing time of the osteotomy (77,78).

Contraindications to Surgery

The contra indications to surgery in a subject with hallux abductovalgus include; peripheral arterial disease, active infection, active osteoarthropathy, septic arthritis, lack of painful deformity. The principal contraindication to surgery is arterial occlusive disease (65,84). Because it is the part of the body most distant from the heart, the foot is the first place where decreased perfusion will make itself noticed. If the pedal pulse is not distinct, the vascular status must be determined. Only if sufficient perfusion is assured can surgery take place. Diabetes, even with early polyneuropathy, does not represent a contraindication. Hallux abductovalgus can also be treated surgically in the presence of chronic polyarthritis or other rheumatic diseases, although care must be taken to select an appropriate procedure (60,79).

Rehabilitation

The type of procedure performed and its inherent stability is determined by postoperative management of the patient. Dressings applied at the time of the surgery should supply corrective forces (eg, derotation, plantarflexion, adduction) while the soft tissue remodels, with mild compression to control postoperative edema. Orthotics may be employed for postoperative immobilization (80,81).

Pain should be well controlled postoperatively. The patient's weight-bearing status is determined on the basis of the type of surgery performed but generally is limited during the first 2 weeks to prevent deviation or displacement and to minimize edema. The patient may begin range of motion exercises on a daily basis after the sutures are removed, and weight-bearing is advocated to prevent limitation of joint motion from excessive scarring (82).

Radiographs to assess alignment, fixation, and progression of ossification are obtained immediately after surgery and when a change in activity level is anticipated (16).

Complications

This include delayed healing of the incision, osseous malunion or non union, nerve damage, haematoma, failure of a prosthesis, displacement of the osteotomy, delayed suture reaction, cellulitis, osteomyelitis, vascular necrosis, and recurrence can be complications of operative treatment of hallux valgus deformity while, bursitis (most common). second toe hammer toe deformity, degenerative disease of the metatarsal head, central metatarsalgia, medial dorsal cutaneous nerve entrapment and MTP joint synovitis (83,84).

Prognosis

Recurrence rates of 10-47% have been documented in single individual osteotomy series. Unfortunately, surgical correction and recurrence are often defined as changes related to normal radiographs and not actually as the magnitude of correction lost with follow-up (85). The aetiology is typically multifactorial but typically includes anatomic predisposition, compliance with postsurgical instructions, medical co-morbidities, and poor surgical technique (86,87). The outlook is highly variable, as is that of the subjects who are treated. Hence there is a shortage of adequate trials to compare the outcomes of the various forms of treatment. A Cochrane review found very little good evidence on which to assess either conservative or operative treatments (33).

Prevention

Correction of the biomechanical factors may prevent excessive pronation and progression of the deformity. Judicious foot wear may help to prevent progression in some, but not all case. If the diagnosis is made early on, such as in preadolescence, hallux valgus development can be slowed and, in some cases, arrested with the proper supportive shoe gear, a soft leather shoe with a wide toe box and custom functional shoe inserts (orthotics). Avoidance of certain athletic activities with improper shoe fit and toe pressure can prevent the symptoms that occur with hallux valgus. Early examination by a podiatrist is recommended (87).

Conclusion

Hallux abductovalgus deformity is one of the common forefoot deformities. It manifests as a deformity in the big toe, causing it to bend towards the other toes, and the joint tends to become

red and painful. The exact cause is not known. However, it tends to occur more often in women, elderly and people who wear tight shoes or high – heel shoes. The diagnosis is through a physical examination and imaging investigation is essential because it helps assess the severity of the deformity. Early diagnosis and appropriate treatment are very important to improve the quality of life. Treatment can be conservative with non-surgical approaches such as wider shoes, use of orthotics, and night splinting. If this is ineffective, surgical treatment is recommended. Exercises should not be neglected during this process.

Recommendation

Since there is increase in the incidence of hallux abductovalgus deformity, there is need for in-depth awareness and knowledge of this clinical condition. It is recommended that daily foot check and care should be regularly done individuals. The idea of using shoe gear with narrow shoe box, high-heeled, tight fitting and pointed should be discouraged in preference to broad-based, flat, wide and loose-fitting shoes. Early and timely consultation with specialist in foot care should be advised if the symptoms of hallux abductovalgus deformity develops.

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