Disorders of the First Metatarsophalangeal Joint

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Abstract

The two most common disorders of the first metatarsophalangeal (MTP) joint are hallux valgus and hallux rigidus. The hallux valgus deformity has been the subject of numerous clinical studies in the past decade. This information has enabled the creation of an algorithm to assist the clinician in evaluating the patient with hallux valgus and selecting the appropriate surgical procedure. The technical aspects of various operative procedures and the most common complications are reviewed. The other major disorder of the first MTP joint is arthrosis, which results in hallux rigidus. As the arthrosis progresses, there is often proliferation of bone on the dorsal aspect of the metatarsal head, which results in impingement of the proximal phalanx during dorsiflexion. The impingement causes jamming, instead of gliding, of the proximal phalanx on the metatarsal head, which results in pain. The treatment for this condition consists of debridement of the MTP joint to relieve the dorsal impingement and, in most cases, the pain. If the arthrosis is advanced in an active individual, arthrodesis is indicated.

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Hallux valgus and hallux rigidus are the most common disorders of the first metatarsophalangeal (MTP) joint. Selection of the optimal treatment for either of these painful conditions must be based on careful consideration not only of objective clinical and radiographic findings but also of subjective factors, such as the patient's lifestyle and expectations.

Hallux Valgus

The hallux valgus deformity can present in many forms. The main problem may be a prominent medial eminence (bunion) or may be due to the lateral deviation of the proximal phalanx on the first metatarsal, which results in a second-toe problem. The precise type of the deformity, the patient's clinical complaints, and the physical examination and radiographic findings form the basis for rational decisions regarding treatment of the deformity. There is no single operative procedure to correct all types of hallux valgus deformities, since no two bunion deformities are exactly alike. The surgeon must be very specific in the selection of the operative procedure, which must then be carried out in a technically correct manner and carefully followed postoperatively to obtain the maximum correction and to minimize complications.

Historical Overview of Surgical Treatment

Keller[1] approached hallux valgus by decompression of the MTP joint through resection of the base of the proximal phalanx and removal of the medial eminence. Unfortunately, this approach destabilizes the first MTP joint due to loss of the windlass mechanism and results in transfer metatarsalgia and deformity of the great toe due to lack of stability. Furthermore, many physically active patients had poor function.

To alleviate the chief complaint of pain over the medial eminence, Silver[2] advised excision of the medial eminence and plication of the medial joint capsule. This relatively simple procedure resulted in alleviation of the painful bunion, but the correction of the first MTP joint abnormality was not achieved in most cases, except in those with a minimal deformity.

It became recognized that there were some patients in whom the problem was more than just a deformity at the MTP joint, and that the intermetatarsal (IM) angle must also be corrected. The McBride procedure[3] consists of excision of the fibular sesamoid, removal of the medial eminence, plication of the medial joint capsule, and implantation of the adductor tendon into the first metatarsal in order to reduce the IM angle. This procedure provided better long-term results than just excising the medial eminence and plicating the

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capsule, since it did address, to a certain extent, the increased IM angle. Overall results were satisfactory, but overcorrection of the MTP joint occurred, resulting in hallux varus, probably mainly due to the imbalance brought about by excision of the fibular sesamoid and plication of the medial joint-capsule structures.

To diminish the incidence of varus, DuVries[4] proposed that the adductor tendon no longer be placed into the metatarsal, but rather sutured adjacent to it, which resulted in satisfactory alignment but inconsistent results. Osteotomy then began to be used increasingly.

Osteotomies

The recognition that the abnormal IM angle must also be addressed resulted in metatarsal osteotomies of many shapes and forms designed to address this component of the deformity. Ideally, the most useful osteotomies correct the IM angle with minimal shortening and provide adequate stability of the osteotomy site. Most metatarsal osteotomies are carried out either distally or proximally, although the degree of correction that can be obtained with a distal osteotomy is not as great as with a proximal osteotomy. As a rule, the distal osteotomy is used for the mild to low-moderate deformity, and the proximal osteotomy is used for the more severe deformity. Regardless of the site, 2 to 3 mm of shortening is inevitable.

Further, it has been recognized that metatarsal osteotomy alone is insufficient to correct the entire deformity. A distal soft-tissue procedure must be added, including release of the lateral soft-tissue contracture. This release involves the adductor hallucis from the proximal phalanx and fibular sesamoid, the lateral joint capsule, and the transverse metatarsal ligament. The medial eminence is exposed and excised in line with the medial aspect of the metatarsal shaft. The medial joint capsule is plicated.

Occasionally, some dorsiflexion results after osteotomy. Precisely how much shortening and dorsiflexion can be tolerated without causing a clinical symptom remains uncertain. Dorsiflexion of the first MTP joint does bring about plantar flexion of the first metatarsal, which, in turn, will allow for a certain degree of shortening and/or elevation of the metatarsal. In a recent study of our patients with a proximal osteotomy,[5] about 30% were found to have some element of dorsiflexion of the metatarsal, but 43 of 48 patients with a preexisting lesion beneath the second metatarsal had relief of symptoms, and no transfer lesion developed in any case.

Fusions

Instability of the metatarsocuneiform joint is a factor in 2% to 3% of patients with a hallux valgus deformity.[6] If there is marked instability, a metatarsocuneiform arthrodesis is necessary. Without arthrodesis, an early recurrence of the deformity results. This procedure has limited application and should probably not be used in the patient with high athletic ambitions.

Arthrodesis of the MTP joint will produce excellent correction of a severe deformity or can be used to salvage a failed operative procedure. The result will not deteriorate with time, and patients can resume most activities. This procedure is not recommended for persons engaged in competitive athletics. It is not necessary to correct even a significant deformity of the IM angle when an arthrodesis is carried out; the metatarsocuneiform joint will self-correct after arthrodesis due to the motion that normally occurs at the joint.[7]

Clinical Evaluation

In addition to the medical history, it must be determined whether the patient's main concern is cosmesis, transfer metatarsalgia, second-toe deformity, problems with shoe fit, or pain. The patient's occupational and recreational requirements are also important; professional dancers and high-performance athletes need very special consideration before any type of foot surgery.

A critical factor is patient expectations. It is crucial that the patient understand precisely what can be achieved surgically and what cannot. Unfortunately, patients may have been led to believe there is a "quick fix" for many foot problems. In a study of our patients, we found that prior to surgery for hallux valgus only one third of the patients could wear the type of shoe they desired. After surgery, two thirds achieved their goal, which unfortunately left one third unsatisfied.

Physical Examination

Physical examination begins with the patient standing in order to observe the alignment of the lower extremities, the longitudinal arch, and the great toe and the relationship of the lesser toes to it. With the patient in a sitting position, it usually is impossible to fully appreciate the dynamic instability in the foot. The range of motion of the ankle and the subtalar and transverse tarsal joints of the forefoot is assessed. Overall tissue elasticity is evaluated, and the presence of a tight Achilles tendon is sought, especially in the juvenile.

The range of motion of the first MTP joint is carefully observed by dorsiflexing and plantar flexing the joint while attempting to realign the great toe. The degree of restriction of dorsiflexion indicates how much correction can be obtained surgically. If the great toe cannot be brought into fairly good alignment without severe restriction of dorsiflexion, the surgeon and the patient should understand that full motion will not be achievable. The degree of pronation of the great toe should also be noted. As a general rule, the more severe the deformity, the greater the degree of pronation.

Other physical findings of note include synovial thickening, dorsal osteophytes, sesamoid pain, and crepitation. Significant callosities under the first metatarsal head are secondary to prominence of the tibial sesamoid; under the second metatarsal, they are due to the increased weight-bearing brought about by instability of the hallux. The second MTP joint must be evaluated for instability, medial deviation, and the presence of a hammer toe. Not infrequently, the second toe is more symptomatic, in terms of pain and deformity, than the hallux even though the great toe has initiated the problem.

The stability of the first metatarsocuneiform joint is evaluated by holding the second metatarsal head in one hand and the first metatarsal in the other. The first metatarsal head is deviated dorsomedially and then plantarward and laterally. Unfortunately, because there are no precise guidelines for instability, the examination cannot be quantified. Significant instability is observed in about 2% to 3% of patients with hallux valgus, often associated with a moderate to severe flatfoot deformity.

Finally, the neurovascular status of the foot should be evaluated. If there is any doubt about the integrity of the circulation, further studies should be obtained before any surgery is contemplated.

Radiographic Evaluation

The foot should always be evaluated with weight-bearing radiographs, because non-weight-bearing radiographs often fail to indicate the severity of a deformity. The following factors should be assessed:

Hallux Valgus Angle

The extent of hallux valgus deformity is determined by measuring the angle between the long axes of the proximal phalanx and the first metatarsal (Fig. 1). The normal value is less than 15 degrees.

Fig. 1 The hallux valgus (HV) angle is formed by the intersection of lines bisecting the proximal phalanx and the first metatarsal. Normal is less than 15 degrees. In this case, it measures 40 degrees. The IM angle is formed by the intersection of the lines that bisect the first and second metatarsals. Normal is less than 9 degrees. In this case, it measures 16 degrees.

Intermetatarsal Angle

The IM angle is the angle between the first and second metatarsals (Fig. 1). The normal value is less than 9 degrees.

Distal Metatarsal Articular (DMA) Angle

The DMA angle describes the relationship between the distal articular surface and the long axis of the first metatarsal (Fig. 2).[8] The normal value is less than 10 degrees of lateral deviation.

Hallux Valgus Interphalangeus

Hallux valgus interphalangeus is a deformity involving only the phalanges of the hallux. The presence of this abnormality is identified on the basis of the relationship between the articular surface of the base of the proximal phalanx and the long axis of the proximal phalanx and the relationship between the long axis of the proximal phalanx and that of the distal phalanx (Fig. 3). A deformity may exist at one or more levels. The normal value is less than 10 degrees of lateral deviation.

Obliquity of the Metatarsocuneiform Joint

The angle of the metatarsocuneiform joint is quite variable radiographically. If there appears to be more than 15 degrees of medial deviation, one should reevaluate the patient for possible instability of this joint (Fig. 4).

Fig. 2 **Top,** The normal DMA angle is less than 10 degrees of lateral deviation. In this case, it is 0 degrees. **Bottom,** An abnormal DMA angle of 27 degrees.

Fig. 3 Hallux valgus interphalangeus is identified on the basis of the angle between the lines bisecting the proximal and distal phalanges of the metatarsal. Normal is less than 10 degrees. In this case, it is 30 degrees.

Sesamoid Position

The position of the sesamoids in relation to the metatarsal head provides information regarding the severity of the hallux valgus deformity, the degree of pronation of the hallux, and possible pathologic changes in the sesamoids.

Fig. 4 The metatarsocuneiform joint demonstrates marked obliquity, which may indicate instability. A radiographic appearance such as this indicates that the patient should be reevaluated clinically.

Arthrosis of the MTP Joint

Arthrosis is not common, but may occur in hallux valgus and can influence the treatment outcome.

Determination of the Congruence of the MTP Joint

A congruent MTP joint has no lateral subluxation of the proximal phalanx on the metatarsal head.[9] An incongruent or subluxated joint demonstrates lateral deviation of the proximal phalanx from the metatarsal head (Fig. 5).

Decision Making

Essentially, all hallux valgus deformities can be treated conservatively with use of a wide, soft shoe that provides an adequate toe box and sufficient insole padding to make the patient comfortable. A surgical option is considered if the patient is not satisfied with that conservative approach.

The most important factor in determining the surgical approach is the congruence of the MTP joint. A congruent joint is one in which the articular surfaces of the proximal phalanx and metatarsal head are parallel. The operative procedure should protect the integrity of an anatomically aligned joint. If there is incongruence, or lateral subluxation, the surgical correction should attempt to bring the proximal phalanx back onto the metatarsal head, thereby recreating a congruent joint.

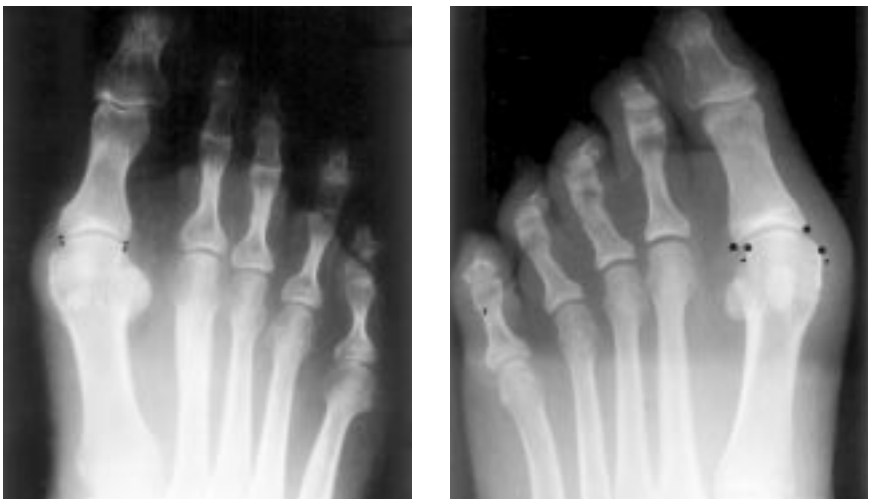
The other major determining factor is the presence of arthrosis of the joint. Realignment of the joint will result in satisfactory correction of the deformity; unfortunately, however, significant joint stiffness and usually pain will result. In the 2% to 3% of patients who have hypermobility of the metatarsocuneiform joint, stabilization of that joint must be achieved to obtain a satisfactory long-term result.[6]

The algorithm presented in Figure 6 presents an approach the surgeon may find useful in the selection of an operative procedure from among the more than 130 options. The choices presented in the algorithm have evolved over a period of time and have undergone extensive clinical evaluation. The selection of a procedure is guided by the severity of the deformity. The measurements given in the algorithm to assess the deformity are guidelines, and there certainly is a moderate degree of leeway in the selection process. The physical and radiographic findings must always be correlated when making a decision.

For the patient with significant arthrosis of the MTP joint, an arthrodesis is recommended, although a carefully performed Keller procedure can give a satisfactory result in the patient with limited ambulatory capacity. Currently, the use of a prosthesis in primary bunion surgery is not recommended because of the less-than-optimal long-term results and the silicone-related problems that often occur, such as significant synovitis, osteolysis, and migration of silicone particles to the regional lymph nodes.[10,11]

For the patient with a congruent joint, the chevron procedure, the distal soft-tissue procedure, and the Akin procedure with excision of the medial eminence are alternatives. The chevron procedure is probably the most reliable, particularly in the patient with a large medial eminence.

Incongruent deformities are classified as mild (hallux valgus angle less than 30 degrees and IM angle less than 13 degrees), moderate (hallux valgus angle less than 40 degrees and



A B

Fig. 5 **A,** In a congruent joint, the joint surfaces are parallel, and there is no lateral subluxation of the proximal phalanx on the metatarsal head. **B,** In an incongruent or subluxated joint, the joint surfaces are no longer parallel, and there is lateral subluxation of the proximal phalanx on the metatarsal head.

IM angle greater than 13 degrees), and severe (hallux valgus angle greater than 40 degrees and IM angle greater than 20 degrees). As a general rule, most patients have a mild to moderate deformity. For the mild deformity, the chevron procedure usually will yield a satisfactory result, as will the distal soft-tissue procedure. However, if the indications are stretched, an incomplete correction can result. The Mitchell procedure is an excellent alternative, but it is technically somewhat more difficult to perform, and the osteotomy is not as stable as that created by the chevron or more proximal metatarsal osteotomies.

For advanced moderate and severe deformities, a distal soft-tissue procedure with a proximal osteotomy will give a reproducible satisfactory result in most cases, although it is technically demanding. The MTP arthrodesis is an excellent procedure for treating a severe hallux valgus deformity, particularly in older patients and those with rheumatoid arthritis, spasticity, or arthrosis. Occasionally, a Keller procedure, particularly in the less active individual, or a double-stemmed hinged silicone prosthesis can be considered.

When there is hypermobility of the metatarsocuneiform joint, metatarsocuneiform arthrodesis is used along with the complete distal soft-tissue procedure. Complications of arthrodesis are stiffness of the foot and nonunion.

The various operative procedures presented in the algorithm will now

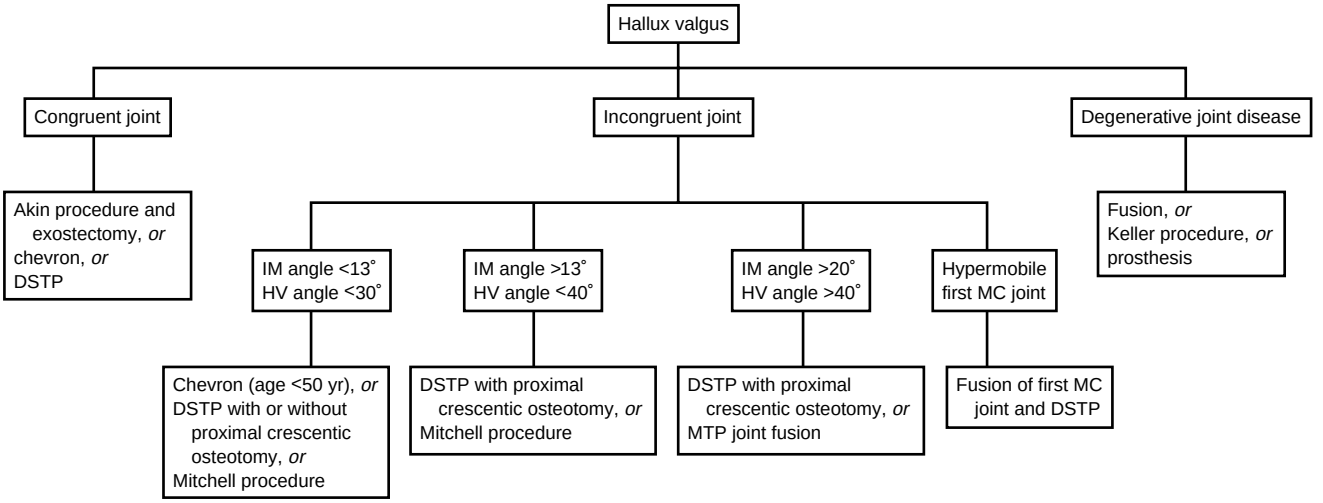


Fig. 6 Algorithm for selecting the operative approach to treatment of hallux valgus (HV). DSTP = distal soft-tissue procedure; MC = metatarsocuneiform. (Adapted with permission from Mann RA: Decision-making in bunion surgery. *Instr Course Lect* 1990;39:3-13.)

be discussed in terms of their indications, contraindications, main complications, and special technical aspects.

Proximal Phalangeal Osteotomy (Akin Procedure)[12,13]

Indications

The indications for this procedure are hallux valgus interphalangeus, a congruent joint with a large medial eminence with a DMA angle of less than 10 degrees, and use as a secondary procedure if a primary procedure (e.g., chevron or distal soft-tissue procedure) did not provide sufficient correction due to a large DMA angle or hallux valgus interphalangeus.

Contraindications

The contraindications are an incongruent joint and hallux valgus with a DMA angle greater than 15 degrees.

Complications

Hallux valgus deformity will frequently increase if the procedure is attempted on an incongruent joint.[13]

Technical Aspects

The osteotomy must be distal to the concavity of the proximal phalanx to prevent violation of the joint.

Comment

The Akin procedure occupies a small niche in foot surgery. Its main indication is to treat hallux valgus interphalangeus or to augment a chevron or distal soft-tissue procedure in order to gain complete correction. It is not recommended as a primary bunion procedure for an incongruent joint since the correction will deteriorate with time.

Chevron Procedure [14]

Indications

This procedure is used to treat a mild deformity (hallux valgus angle of less than 30 degrees and IM angle of less than 13 degrees).

Contraindications

The sole contraindication is a deformity with a hallux valgus angle greater than 35 degrees and an IM angle greater than 15 degrees.[15]

Complications

Possible complications include incomplete correction if the hallux valgus deformity is too advanced, loss of position of the capital fragment secondary to lack of internal fixation, and avascular necrosis (in 1% to 2% of cases).[15-17]

Technical Aspects

A medial approach is used to avoid the dorsal medial cutaneous nerve (Fig. 7). Soft-tissue stripping is limited. Internal fixation is preferred. If the DMA angle is greater than 10 to 15 degrees, a medial closing-wedge osteotomy is added to rotate the articular surface from excessive lateral deviation into the normal range.

Comment

The chevron osteotomy is an excellent procedure for the mild to moderate hallux valgus deformity. Complications are most likely to occur when the indications are exceeded. Incomplete correction will occur if the DMA angle is greater than 10 to 15 degrees and more bone needs to be removed from the medial aspect of the proximal metatarsal, thereby creating a medial closing-wedge effect to correct the articular surface. This eliminates the need for the addition of the Akin procedure to gain full correction. The medial closing wedge is achieved by removing an additional 1 to 3 mm of bone from the proximal portion of the osteotomy so that the articular surface can be rotated medially.[18] The prevalence of avascular necrosis is probably 1% to 2%, but can be minimized by limiting soft-tissue stripping.

Distal Soft-Tissue Procedure[18]

Indications

This procedure is recommended in the treatment of mild hallux valgus deformities (hallux valgus angle less than 30 degrees and IM angle less than 13 degrees).

Contraindications

The contraindications include (1) a deformity with a hallux valgus angle greater than 35 degrees and an IM angle greater than 15 degrees, (2) a deformity with a DMA angle greater than 15 degrees (a chevron procedure with a medial closing-wedge osteotomy would be preferable), and (3) arthrosis of the MTP joint.

Complications

Recurrence of the deformity is due to failure to include a metatarsal osteotomy, inadequate lateral release, or the poor quality of the medial capsular tissue. Hallux varus may occur, especially if too much of the medial eminence is excised or if the fibular sesamoid is removed.

Technical Aspects

Two incisions should be used: one in the first web space and the other on the medial side of the joint. The medial eminence should be excised in line with the medial aspect of the metatarsal. A metatarsal osteotomy should be added if the first and second metatarsals do not close down easily at the time of surgery. The postoperative dressings, which consist of 2-inch conforming gauze (Kling, Johnson & Johnson Medical Products, Arlington, Texas) and 0.5-inch adhesive tape, are used for 8 weeks. The dressing binds the metatarsal

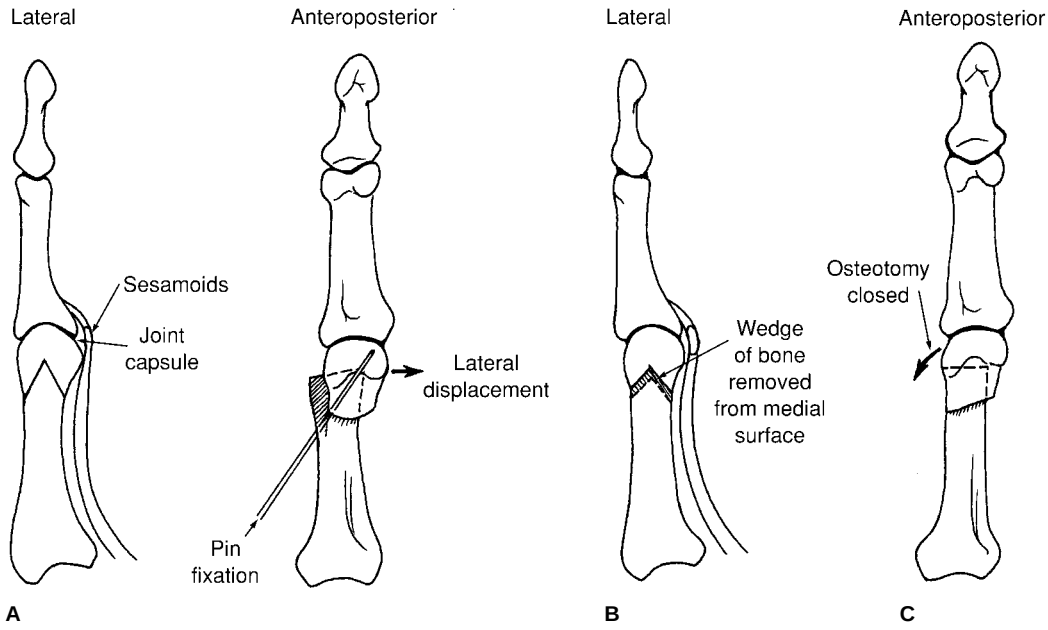


Fig. 7 Biplanar chevron osteotomy to correct a laterally sloping distal metatarsal articular surface. **A,** Placement of the normal chevron osteotomy. **B,** Removal of medial bone wedge measuring 1 to 3 mm. This permits medial deviation of the articular surface of the metatarsal head, thereby correcting the DMA angle. **C,** Distal articular surface after correction. The osteotomy site should be fixed with a pin.

heads together and maintains the hallux in correct alignment.

Comment

This procedure will give satisfactory results when used within its limitations. Failure to add a metatarsal osteotomy, however, often results in recurrence. The soft tissues on the lateral aspect must be completely released for the medial plication to be effective. Excision of too much of the metatarsal head can result in a hallux varus deformity.

Distal Soft-Tissue Procedure Plus Proximal Metatarsal Osteotomy[5]

Indications

The indication for this procedure is a deformity with a hallux valgus angle greater than 30 degrees and an IM angle greater than 13 degrees.

Contraindications

The contraindications are a congruent joint and the presence of arthrosis.

Complications

Excessive lateral deviation of the metatarsal head will result in hallux varus. Excessive dorsiflexion of the osteotomy and excessive shortening may also occur.

Technical Aspects

I prefer a crescentic osteotomy carried out through a dorsal incision, with the concavity directed proximally toward the heel. Internal fixation of the osteotomy site is recommended. The postoperative dressing requires careful management, as described for the distal soft-tissue procedure.

Comment

The distal soft-tissue procedure with a proximal osteotomy can be used for most hallux valgus deformities. A variety of osteotomies have been advocated, ranging from a proximal crescentic osteotomy to a horizontal chevron or an opening or closing wedge. The basic principles of the osteotomy are to correct the IM angle with minimal shortening and to avoid overdisplacement of the metatarsal head laterally, which would result in an incongruent joint and possibly hallux varus deformity.

Mitchell Procedure[19,20]

Indications

This procedure can be useful in treating a deformity with a hallux valgus angle greater than 30 degrees and an IM angle greater than 13 degrees.

Contraindications

This procedure is not appropriate in the presence of a congruent joint or a deformity with a hallux valgus angle greater than 40 degrees and an IM angle greater than 20 degrees.

Complications

Loss of position of the capital fragment can occur due to dorsal migration, and transfer metatarsalgia can occur secondary to dorsiflexion of the metatarsal head. Other possible complica-

tions are avascular necrosis and nonunion.

Technical Aspects

Soft-tissue stripping should be minimized. Adequate fixation of the osteotomy site is necessary.

Comment

The Mitchell procedure will result in satisfactory correction when used within its limitations. However, it is technically more demanding than the chevron procedure and the distal soft-tissue procedure with osteotomy, and the osteotomy site is somewhat less stable. For these reasons, the procedure has not been used as much in recent years.

Distal Soft-Tissue Procedure With Metatarsocuneiform Fusion[6,21]

Indications

This procedure is appropriate in the presence of an unstable metatarsocuneiform joint or a deformity with a hallux valgus angle greater than 35 degrees and an IM angle greater than 15 degrees.

Contraindications

This procedure is contraindicated in the presence of a congruent joint. It is also not appropriate for an athletic younger patient or for a patient with normal metatarsocuneiform joint stability.

Complications

Possible complications include increased stiffness of the foot secondary to the arthrodesis, nonunion of the arthrodesis site, and overcorrection of the metatarsal head laterally, resulting in hallux varus.

Technical Aspects

The metatarsocuneiform joint should be redirected plantarward and laterally along the lines of the normal movement of the articular surfaces. The arthrodesis is carried out with the joint in this position, and the joint is fixed with a screw or plate. Local bone graft may be used. The distal soft-tissue procedure is also carried out to correct the hallux valgus deformity.

Comment

A metatarsocuneiform joint arthrodesis is indicated in the 2% to 3% of patients with hallux valgus who have an unstable metatarsocuneiform joint. The procedure is technically difficult. It also adds to the stiffness of the foot and should not, therefore, be overutilized, particularly in the athletic patient.

Metatarsophalangeal Arthrodesis[22]

Indications

This procedure can be useful in the presence of arthrosis of the MTP joint or a severe hallux valgus deformity with dislocation of the MTP joint. It may also be useful in the patient with spasticity or as a salvage procedure.

Contraindications

Use of this procedure is not appropriate for less severe deformities that can be managed with other procedures.

Complications

Possible complications include nonunion, malalignment, and degenerative changes in the interphalangeal joint.[23]

Technical Aspects

Alignment is critical; the joint should be placed into approximately 15 degrees of dorsiflexion in relation to the floor, 15 degrees of valgus, and neutral rotation. Rigid internal fixation should be used. I prefer the use of an interfragmentary screw and a dorsal plate.

Comment

The arthrodesis is an excellent choice in patients with advanced arthrosis or rheumatoid arthritis.[24] It is also useful as a salvage procedure. The long-term results are excellent, although changes may occur at the interphalangeal joint, especially if there is malalignment. The arthrodesis is an integral part of the reconstruction of the rheumatoid forefoot.

Keller Procedure[1]

Indications

This procedure is most useful in less active patients with advanced hallux valgus deformity or with arthrosis of the MTP joint (as an alternative to fusion).

Contraindications

This procedure is not appropriate for active individuals.

Complications

Possible complications include instability of the medial aspect of the foot, due to loss of the windlass mechanism; drifting of the hallux into varus or valgus rotation or dorsiflexion; transfer metatarsalgia; and significant shortening of the hallux.

Technical Aspects

An attempt should be made to insert the intrinsic muscles back into the proximal phalanx to prevent a cock-up deformity. The joint should be stabilized with a pin for 3 to 4 weeks to permit scarring around the MTP joint to occur.

Comment

Because this procedure destabilizes the first MTP joint, it should not be used for patients who are very active. There are other proce-

dures that will give a more stable foot with fewer complications. It is an excellent procedure for the housebound ambulator or for the patient who places fewer demands on the foot.

Juvenile Hallux Valgus

Symptomatic hallux valgus deformity is uncommon in children, but it does occur. Unfortunately, surgical correction of the juvenile form is associated with a significant rate of recurrence and variable clinical outcomes compared with the adult form.[19,25] Most surgeons advocate delaying surgery until skeletal maturity has been achieved unless an unusual degree of pain and deformity significantly interferes with activities.

The evaluation of the patient with juvenile hallux valgus is extremely critical. There is a high prevalence of pes planus and ligamentous laxity. There also appears to be an increased incidence of lateral deviation of the distal articular surface of the first MTP joint, which may account for the high incidence of failure in the juvenile patient. When there is an unrecognized lateral slope of the distal articular surface, either the deformity recurs or the joint becomes stiff despite maintenance of correction.

When considering treatment for the patient with juvenile hallux valgus, one can follow the same decision-making precepts based on the severity of the deformity already outlined in the algorithm in Figure 6. However, if there is an open metatarsal epiphysis at the time of surgery, it should be avoided to prevent possible growth disturbance. One should even be cautious in placing pins across the epiphysis, since this can theoretically result in closure or alteration of its growth.

Hallux Rigidus[24,26,27]

Hallux rigidus is a painful affliction of the first MTP joint secondary to arthrosis and is associated with restriction of dorsiflexion. The condition can occur in adolescence, although it is uncommon; in those instances, it is usually associated with an osteochondritic lesion.[28]

Clinical Evaluation

The condition usually occurs insidiously without a history of trauma. The main complaints are pain, loss of dorsiflexion, and increased bulk of the joint, which makes shoe wearing difficult. The patient's level of activity must be carefully evaluated, particularly the limitations that have been necessitated by the condition.

Physical examination reveals increased bulk of the joint and loss of dorsiflexion, which should be quantified. Marginal osteophytes are typically present dorsally and laterally. Forced dorsiflexion will usually reproduce the patient's pain, as will lateral deviation if a lateral osteophyte is present. Often, the dorsal medial cutaneous nerve is sensitive.

The radiographic evaluation includes weight-bearing anteroposterior, lateral, and oblique views. Bone proliferation along the lateral aspect of the joint is evaluated on the anteroposterior radiograph; that along the dorsal aspect, on the lateral radiograph. The extent of joint narrowing is determined from the oblique radiograph.

Conservative management consists of use of a shoe with adequate width and depth to accommodate the increased bulk of the joint and with a rigid rocker sole to diminish joint motion. If there is significant bone proliferation or pain with dorsiflexion, a cheilectomy or debridement of the MTP joint should be considered. It is important to explain the expected outcome before surgery, since an arthritic joint will still be present, which may be symptomatic when stressed.

I have observed that patients with a relatively mild to moderate degree of restriction of dorsiflexion tend to do very well with a cheilectomy, which I believe is due to reestablishing some of the normal gliding that occurs at the MTP joint. More severe and advanced degenerative changes, particularly marked osteophytes, are associated with less certain outcomes, and a certain degree of residual discomfort can be expected. The alternative is to carry out an arthrodesis of the joint, which will eliminate the pain and permit a return to most activities at a nonprofessional level.

The Keller procedure or an implant arthroplasty can be considered in less active individuals with significant arthrosis, although the long-term results of these procedures do not compare favorably with those of cheilectomy or fusion.[11]

Operative Procedures

Cheilectomy is carried out through a dorsal approach, with the incision being carried down through the extensor hood on either side of the MTP joint. The capsule is opened, and a complete synovectomy is carried out. Proliferative bone is removed along the lateral side of the metatarsal head, in line with the long axis of the metatarsal, and over the dorsal aspect by removing 20% to 30% of the metatarsal head. Dorsal bone must be removed until approximately 60 to 70 degrees of dorsiflexion at the MTP joint has been achieved. If less bone is removed, dorsal impingement will persist, and the patient will usually not be satisfied with the result. The average increase in dorsiflexion is about 25 degrees, but it varies considerably. The main benefit is relief of the dorsal impingement, which is the main source of pain.

The patient wears a postoperative shoe until the wound is healed (at about 10 days), after which active range of motion is encouraged. As a general rule, maximum improvement will occur by approximately 3 to 4 months. The advantage of cheilectomy is that if the procedure fails, one can still carry out a fusion, possibly a Keller procedure or implant arthroplasty.

Occasionally, a patient with hallux rigidus still does not have adequate dorsiflexion after surgery, which may be a source of pain. Under these circumstances, one might consider doing a dorsal closing-wedge osteotomy of the proximal phalanx (Moberg procedure),[29] which makes use of the fact that plantar flexion can still occur at the MTP joint. With this procedure, one is able to gain approximately 25 degrees of dorsiflexion, which decreases the stress on the MTP joint.

As a general rule, proximal phalangeal osteotomy should not be carried out at the same time as cheilectomy, since the cheilectomy requires early motion and the proximal phalangeal osteotomy requires a period of immobilization for adequate healing.

Summary

Satisfactory bunion surgery is predicated on the integration of the patient's chief complaints, the findings from a thorough physical and radiographic evaluation, and selection of the appropriate surgical procedure. The postoperative management must be meticulously carried out to ensure optimal alignment of the hallux.

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