Hallux valgus

How I do it

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Hallux valgus is a problem of the foot in the shoe. Much has been written on the etiology of the deformity, which was best summed up by Shine who undertook to investigate the entire population of the South Atlantic island St. Helena with regard to foot deformity (Shine 1965). After measuring 88% of the 4000 inhabitants over 5 years of age, he suggested that hallux valgus is an "unfavorable interaction between female genotype and shoes". The effect of shoes, however, is not that of confining the foot and thus with their direct pressure causing deformity, but rather it is that of inhibiting the active use of the toes for more demanding tasks, such as hauling in nets or climbing trees, that leads to muscle atrophy and imbalance (Resch 1995).

It is also the wearing of shoes which primarily causes the patients' suffering. Studies of unshod populations indicate that the incidence of hallux valgus is about the same in men and in women (2%) but it has changed in the shod populations, where two to three times as many women as men suffer from hallux valgus deformity (Resch 1995). However, in most studies of patients operated for hallux valgus, 90% are women. The over-representation is due in part to the demands made by women on shoewear—once again the problem of the foot in the shoe. Wearing shoes is not only a physical necessity, protecting our feet from cold and injury, but in most civilized societies also a cultural necessity. Traditionally, women's shoes are narrower and even modest hallux valgus deformity will lead to problems which cause the patient to seek her physician.

A consecutive series of 201 patients (244 feet) treated at the University Hospital in Lund were investigated between 1987 and 1990 (Table 1) (Resch 1995). In this series, only one fourth can wear what is considered a normal narrow shoe, most of the remaining subjects can only use wide, standard shoes. Over 90% of patients complain of pain at the medial aspect of the first metatarsal head, while wearing shoes, as their major problem. Of these, approximately half also have other forefoot problems. Very few, only 1%–2%, have any real problem from the valgus position of the great toe, i.e., crowding of the other toes, callosities or ulcers. It is the wide forefoot which causes the patient to seek help.

Closed treatment

Physiotherapy and exercise

Since hallux valgus develops from a combination of hereditary predisposition, the female gender and the use of shoes which leads to muscular imbalance in the foot, it is tempting to suggest some form of physical exercise as a preventive measure. To my knowledge this has not been tried on adults, although congenital hallux valgus which is very rare can be treated in this manner (Lieberson and Mendes 1991). It seems unlikely that we in our culture can develop the kind of muscular feet found in populations who actually use their feet in daily work.

Splints

Various splints have been advocated. When the geta, a shoe with a strap between the first and second toes and a very tight metatarsal band was worn, hallux valgus was rare in Japan. After the advent of western shoewear in Japan, the deformity has increased (Kato and Watanabe 1981). The use of this kind of splint on a daily basis during the larger part of the day may thus prevent the development of hallux valgus both by splinting the metatarsals and the great toe in position and by forcing the active use of the flexors of the toes in order to be able to walk with the stiff sole and lack of other support in this shoe. Using a night splint has not been shown to have any permanent effect.

Shoewear

Since hallux valgus problems are the problems of the

foot in the shoe, sufficiently large shoes should solve the problem. When women's feet are measured, most do not fit the shoes worn (Frey et al. 1993). Often, shoes of the right size which can be considered to be culturally acceptable to the patient are not commercially available. In situations where there are operative risks such as with reduced circulation, the shoe, rather than the foot, will have to be adjusted. However, most patients who have 30 years of shoe-wearing to look forward to, prefer operative correction, which allows them to purchase normal shoes.

Surgery

The hallux valgus deformity consists of both an increased valgus angulation of the great toe on the first metatarsal head but also, in most cases, a varisation of the first metatarsal, which causes a subluxation of the metatarsal head on the base of the great toe leading to a pseudoexostosis—the bunion—where the patient generally experiences pain and difficulty with shoe-fitting (Table 1). Over 130 operative procedures have been described (Helal 1981). They can be divided into soft-tissue procedures, osteotomies of both the great toe and the first metatarsal, and combined procedures as well as excisional arthroplasty.

Soft tissue procedures

Silver's procedure (1923), with a lateral capsulotomy and medial reefing, is one of the oldest. McBride's procedure (1954)—often used for adolescents where one was reluctant to do bony procedures because of the growth zones—includes not only the division of the adductor tendon but also its reinsertion in the lateral aspects of the first metatarsal as well as excision of the lateral sesamoid in certain situations. Medial capsulotomy has been done in various ways, such as the Y to V plasty and simple raphing. Various sling procedures, using both natural and synthetic materials to strap together two or more of the metatarsals in the forefoot, have been reported (Resch 1995).

Excision arthroplasty

In 1912, Keller described his arthroplasty, which includes removal of a part of the proximal phalanx of the great toe. Other variants of excision arthroplasty are the Mayo procedure, which removes part of the first metatarsal head (Jahss 1991). These arthroplasties generally work by shortening the first ray and allowing repositioning of the toe in better alignment with the first metatarsal. They solve the problem of valgus of the great toe, but not of widening of the forefoot, and can at times lead to weakening of the push-off (Dhanendran et al. 1980, Betts et al. 1991).

Table 1. The problem: patients' preoperative complaints and function. 244 feet from a consecutive series of 201 patients treated at the University Hospital in Lund between 1987 and 1990 (Resch 1995)

Pain	%
Pain only during sports	9
Pain daily, but not restricting activities	75
Pain daily, restricting activities	11
Pain when barefoot	2
Pain at rest	0
Shoes	
Can use any shoe without discomfort	2
Can use narrow shoes, but with discomfort	25
Can only use wide standard shoes	71
Can only use orthopedic shoes	2
Localization of pain	
Bunion only	62
Bunion and forefoot	32
Location other than bunion	7 [a]

[a] includes 3 patients with toe crowding

Osteotomy

Osteotomy is by far the commonest procedure used today for the treatment of hallux valgus. Such procedures can be divided into valgus osteotomies of the first metatarsal to alleviate the varus deformity, and varus osteotomies of the great toe—for example, the Akin osteotomy, which entails the removal of a medially based wedge in the proximal phalanx (Jahss 1991). This osteotomy may benefit the small minority who have problems of pressure by the great toe or on the second toe, possibly with callosities.

The osteotomies in the first metatarsal can be placed proximally or distally. Theoretically, the placement of the osteotomy more proximally in the metatarsal shaft should give correctional advantages in the form of larger correction distally because of the longer axis. In practice, there is very little difference in the correction obtained by proximal and distal osteotomies and there is no difference in patient satisfaction. There is, however, a greater risk of transfer metatarsalgia, with pain under the second metatarsal head postoperatively in proximal osteotomies, shown both in our own as well as in other series on proximal osteotomy (Resch et al. 1989). An osteotomy of the first metatarsal changes not only the varus position of the bone but can also affect its dorsal-plantar placement and its length. The removal of a wedge always shortens the first metatarsal, which can lead to functional dorsal displacement, unless this is compensated by widening the base of the wedge to allow plantar displacement. A sliding type of osteotomy, such as the Wilson osteotomy, can also lead to shortening

(Wilson 1963). Angulation of the saw cut in the sagittal plane allows for plantar shift of the metatarsal head which gives a good plantar weight bearing surface. Shortening of the first metatarsal may have the advantage of making it easier to reposition the great toe because of the more relaxed ligamentous structures of the joint. In an opening wedge osteotomy, shortening is avoided and therefore a tendency to dorsal displacement of the first metatarsal, but tightening of the first metatarsophalangeal joint has been reported (Klenerman 1991).

I have not been able to correlate shortening to patient satisfaction (Resch et al. 1993, 1994), but in individual cases I have seen deleterious effects of extreme shortening due to lack of weight bearing.

The stability of the osteotomy is important. An inherently unstable osteotomy, such as the proximal osteotomy, requires firm fixation in the form of pins or screws, but allows greater freedom in the placement of the osteotomy in the desired position. An osteotomy can be stable by virtue of its configuration such as the chevron osteotomy (Shereff et al. 1991), thus not requiring fixation. This eliminates the need for removing fixation material. The foot does not have much soft tissue and removal is almost always necessary which leads to a second operation with some discomfort and a period of swelling.

The stability of the chevron osteotomies with a limited range of movement in translation because of the form of the osteotomy has both advantages and disadvantages, i.e., it is not possible to correct in several planes without adjusting the osteotomy, but at the same time there is less risk of dislocation in an undesired plane.

Combined procedures

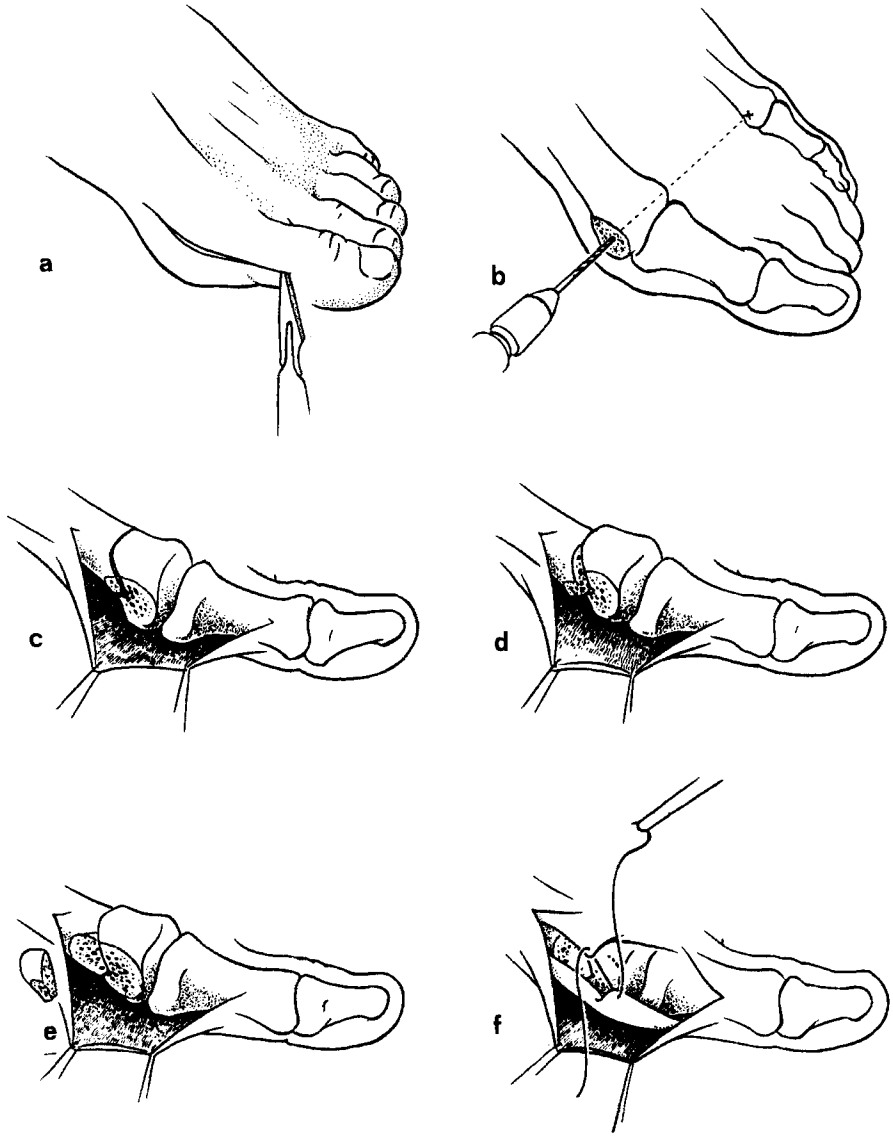
Studies have shown that the correction of the hallux valgus angle measured through the first metatarsophalangeal joint is greater than can be expected from the corrections and osteotomies of the first metatarsal indicating that some readjustment of soft tissue occurs (Resch et al. 1995). This is, of course, desirable. The aim of the osteotomy of the first metatarsal is to reposition the plantar and dorsal tendons, so that the deleterious valgus pull on the great toe will be eliminated. Whereas the decrease in the width of the forefoot is the patient's main concern, most will appreciate a straightening of the great toe to what we consider a normal valgus angle of approximately 10 degrees. This may be achieved in individual cases by the addition of the soft-tissue procedure, such as a reefing of the medial capsule, either as in the section of soft tissue above or by a modfied McBride procedure in addition to an osteotomy. While our studies show an improved correction of the hallux valgus angle with the addition of an adductor tenotomy to the chevron osteotomy, it is small and clinically insignificant (Resch et al. 1994).

My approach

For most cases of hallux valgus deformity I choose a chevron procedure. Indications for surgery are mainly pain on wearing shoes due to hallux valgus deformity. Usually the pain is at the bunion, but in a few cases, crowding of the toes can cause discomfort. At times, there is general forefoot pain, possibly due to the fact that the patient has a tendency to overload the lateral part of the foot to avoid pressure on the bunion. Since complications with this osteotomy are unusual, and patients almost never become worse after surgery, the indications can be quite generous. There are some exceptions, however. If there is considerable arthrosis and this, rather than the widening of the forefoot, seems to be the focus of the patient's pain, the chevron osteotomy will not alleviate this pain. In this case one should consider an excision arthroplasty or an arthrodesis. Mild cases of arthrosis do not, however, preclude chevron osteotomy, which may alleviate some of the symptoms by changing the position of the joint surface of the first metatarsophalangeal joint.

Which ranges of deformity then are suitable for chevron osteotomy? We have investigated this question in a large series of patients where chevron and proximal osteotomies were compared (Resch et al. 1993). Although proximal osteotomy gives a slightly greater correction both of the intermetatarsal and the hallux valgus angle, there was no difference in the clinical outcome, and the patients' satisfaction was the same. Both osteotomies give the same amount of correction, regardless of size of the deformity. Thus, the greater the deformity the less significant the small gain made by a proximal osteotomy. Practical experience has shown that even quite large angular deformities can be satisfactorily corrected with a chevron osteotomy, sometimes with minor adjustments (Figure). In the studies we have presented, hallux valgus deformity up to 45° and intermetatarsal angles up to 22° have been corrected to the patients' satisfaction (Resch 1995). The major advantages of the chevron osteotomy are its ease of application, its inherent stability and its absence of postoperative complications. It is at times tempting to supplement the osteotomy with a soft-tissue procedure, such as a lateral release. This has previously not been recommended because of a presumed risk for avascular necrosis in the first metatarsal head when combined with distal osteotomies. We have shown that although circulato-

Figure. The chevron osteotomy.



a. A straight medial incision is made through the capsule and to the bone. This avoids damaging the dorsomedial nerve.

b. After resecting the medial osteophytes with an oscillating microsaw, the direction of the tip of the V osteotomy is determined and defined with a 2 mm drill. If slight shortening of the first metatarsal is desired, the drill can be aimed 2–3 mm more proximal in the fifth metatarsal head. Small bone hooks behind the head of the first metatarsal help in visualization.

c. The V osteotomy is made preferably with a single cut for each leg. Avoid skewing; err on the side of making the lateral part of the V narrower to facilitate translation.

d. Translate the metatarsal head laterally with the help of a towel clip in the shaft. Usually 3–5 mm of translation can be obtained.To ensure stability, it is not advisable to translate the head more than half the width of the neck, but this is rarely possible. Impact the head on the neck.

e. Remove the spike of bone from the shaft with the saw and smoothe the edges.

f. The first capsule suture, with 2–0 absorbable suture is placed in the thickened plantar medial capsule and attached to the dorsal capsule at the level of the metatarsal neck. Thereafter a straight reefing is done. Skin sutures are removed at 3 weeks.

ry deficiency does occur after distal osteotomies, it is not increased when combined with a soft-tissue procedure, such as adductor tenotomy, and it does not lead to any clinical problems (Resch et al. 1992). One major advantage of the chevron osteotomy is that a limited amount of repositioning is possible, especially in a plantar-dorsal direction, thus leading to a very low incidence of transfer metatarsalgia after this operation. In fact, only 2 of 171 feet operated with a chevron osteotomy (Resch 1995) developed metatarsalgia postoperatively, whereas 14 cases were found among the 73 proximal osteotomies—i.e., about the same rate as found by other authors. This is a serious complication, since it is difficult to treat and at times gives the patient more problems than the hallux valgus.

The chevron osteotomy can be used in young patients, even children, since it does not disturb the growth zone.

Perioperative aspects

Preoperatively all patients have both standing AP and lateral radiographs and, in most cases, photographs. The procedure is done unilaterally or bilaterally, at the preference of the patient. Sick-leave time is not increased in bilateral operations (Resch et al. 1994). Most patients seem to tolerate this well and appreciate the time saved.

Most patients are operated on an outpatient basis with an ankle-block anesthesia (Sarrafian et al. 1983) performed by the surgeon. Bupivacain hydrochloride 5 mg/mL is injected behind the medial malleolus to block the tibial nerve (about 7 mL), the deep peroneal nerve is blocked at the base of the first and second metatarsals or at the ankle level with 3–4 mL, and the superficial peroneal branches are blocked subcutaneously (3–4 mL). This usually provides adequate anesthesia. In most cases, a bloodless field with a tourniquet applied just above the ankle is used. This location of the tourniquet is well tolerated for at least 30 minutes. The foot is elevated 2 hours postoperatively to minimize bleeding. The ankle block generally provides anesthesia for 10 and 15 hours, which allows the patient to return home with minimal discomfort. Although most patients have some pain on the following 2–3 days, a number experience almost no pain at all, because of the long duration of the block.

The operation (Figure)

I do the chevron osteotomy as described by Austin and Leventen (1981), with minor variations. A straight medial incision is placed over the first MP joint from the skin straight to the bone, through the joint capsule. Thereafter, the medial part of the capsule is lifted proximally from the head both dorsally and plantarly to allow for the insertion of small osteotomy hooks behind the metatarsal head. The lateral capsule is left intact. The pseudoexostosis is then excised with a microsaw dorsal-to-plantar parallel to the medial edge of the foot (not the metatarsal!). The V osteotomy is then placed. If one does the procedure only occasionally, it is a good idea to define the point of the V with the help of a small drill. The point of the V should be placed medially in the center of the circle formed by the metatarsal head, which is approximately 8–10 mm proximal to the joint surface. If the point of the V is placed too distally, there is a risk of fracturing the metatarsal head, which then must be stabilized—for example, with pins. Make sure to put the edge of the V exactly horizontally in the standing foot and aim the lateral point of the V towards the middle of the fifth metatarsal head. Once the direction of the point has been established, the two remaining osteotomy cuts can be made to join the point to the neck. The angle is approximately 60°. Too narrow an angle will come out proximally on the shaft, too wide an angle makes the osteotomy less stable after impaction, with a greater risk of dorsal or plantar dislocation of the metatarsal head. There is a great advantage in making the legs of the V with one smooth osteotomy cut, since this allows for easier translation of the metatarsal head. It is easy to tell when the second cortex is cut by the saw. Avoid making the lateral V wider, i.e., less acute than the medial V! Preferably they should be the same size, but tend to err on the side of a narrower angle laterally, in order to make translation easier. When the V has been made, grasp the proximal shaft with a towel clamp, pull the great toe straight forwards and translate the metatarsal head laterally by pushing with your thumb. In the literature, limitations of translation are often given, i.e., not more than half the metatarsal width. These recommendations are reasonable, but I have never been able to dislocate the metatarsal head more than half the metatarsal width, thus in general one can use the maximum translation possible which gives stable fixation. When it is fully translated, compact the head upon the shaft. Usually the osteotomy is now fixed in a stable manner. Thereafter, saw off the projecting spike medially with a dorsal-to-plantar saw cut and smooth the edges leaving no sharp points. Sometimes the head dislocates in this sawing and has to be reimpacted. Flush the joint thoroughly with saline. In some cases, I have seen the development of rounded prominent osteophytes quite different in appearance from preoperative osteophytes, which may have developed from bony debris and have required reoperation.

The assistant should then hold the great toe in an overcorrected position. The hypertrophied joint capsule adjacent to the medial sesamoid (the sesamoid ligament) is grasped with a two 0 absorbable suture plantarly and fixed to the dorsal capsule approximately in the area of the metatarsal neck. Thus a slight medial pull is put into the suture. If there is a great deal of excess capsular tissue, a small capsule strip is excised. Bursal tissue is removed. The remaining capsule is reefed in a dorsal-to-plantar fashion. The medial incision is closed with monofilament suture.

If it is difficult to obtain sufficient correction because of tight lateral structures, an adductor tenotomy may be added. This is done through a separate incision in the first intermetatarsal space. The attachment of the adductor tendon is largely plantar on the base of the proximal phalanx of the big toe. At times, it is part of the conjoined tendon and cannot be clearly visualized. After retracting the nerves and vessels in the space, pull the toe into varus. The tight tendon and lateral capsular structures can be clearly felt, and are cut with a scissors. I add this procedure in less than 10% of cases.

Postoperative treatment

For comfort and protection during the first few days, the patient receives a small medial plaster splint projecting from the end of the big toe to the heel, applied over moist compresses. The first dressing is changed by a district nurse after 4–5 days when the plaster splint is also removed. Thereafter a simple dressing is applied to the wound. Most patients prefer elastic bandages for an additional week because of the postoperative swelling. They are advised to bandage the great toe in a neutral position, avoiding a valgus position against the other toes. Patients are encouraged to bear weight immediately. In general, they bear weight mainly on the heel and on the lateral side of the foot for the first week or so. Since most patients leave the hospital with a still partially anesthetized foot, all receive crutches and a postoperative shoe which fits outside the bandages. The sutures are removed by the district nurse at 3 weeks. During the first 3 weeks, the patients are advised to elevate the foot frequently and to avoid swelling as much as possible. Postoperative antibiotics are not routinely used.

After this point, a few can return to work on a part-time basis, depending on their shoe requirements. In general, however, patients are home from work 7 weeks, which is the time required to be able to wear normal shoes during the whole day. At approximately 2–3 months after the operation, patients return to the operating surgeon for a postoperative check. Postoperative radiographs are not generally necessary. The osteotomy can still be seen on radiographs for up to 3–4 months after surgery, well after clinical healing.

Concluding comments

Most patients are very satisfied with the results of the chevron osteotomy. Our studies have not shown less angular correction in dissatisfied cases. The patient who has a wide foot and a relatively small hallux valgus deformity is the one most likely to be dissatisfied after surgery, indicating undercorrection of forefoot width as the reason for dissatisfaction, rather than residual valgus deformity. Most patients require surgery in order to be able to wear normal shoes without discomfort. This usually entails primarily a correction of the wide forefoot. Bunionectomy is not an adequate procedure, although the above requirement is met (Kitaoka et al. 1991). This may be due to the fact that the metatarsus varus continues to stretch the medial structures and to produce new osteophytes. If the correction obtained with the chevron osteotomy is not sufficient, the procedure can be repeated, with additional correction. One may, of course, use another procedure such as a proximal osteotomy, but it is not necessary unless one also desires correction in another plane, for example, dorsoplantar. The tendency to transfer metatarsalalgia in the proximal osteotomy must always be considered.

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