Conservative Treatment of the Foot

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GENERAL CONSIDERATIONS

Office management of foot and ankle problems requires an understanding of the interaction of the foot and ankle and the shoe or device applied. The biomechanics of normal foot function and the effect of the disease entity being treated should be analyzed. The anatomy of the normal shoe, the function of each component, and the effect of modifying each of these components must be understood. The practitioner should have a thorough knowledge of the available orthoses and appliances and the effects of these devices on the foot and ankle.

APPLIANCES

TREATMENT

Arthritis
Tendon Dysfunction
Heel Pain
LESSER METATARSALS
Calluses and Corns
Neuromas
Bunionettes
FIRST METATARSOPHALANGEAL JOINT
Hallus Valgus
Hallux Rigidus

Most of the acquired forefoot deformities seen in the adult population are a consequence of poor-fitting footwear. These include hallux valgus deformity, hammer toes, hard corns, interdigital neuromas, and plantar keratoses. Educating the patient about the effects of improper shoes is the starting point of conservative management. This education is often met with resistance because ill-fitting shoes continue to be a hallmark of high fashion. It is often necessary to remind patients that there is no other part of the body they would consider putting in a container whose shape is so drastically different from that body part for daily dress. Comparing an outline of the patient’s foot to his or her current footwear assists in conveying this
point (Fig. 4–1). Unless the patient is willing to accept that a change in footwear is indicated, both conservative and operative intervention may be futile.

Proper fitting of the shoe should accommodate the variations in the person’s foot. A set of consumer guidelines has been developed by the National Shoe Retailers Association, the Pedorthic Footwear Association, and the American Orthopedic Foot and Ankle Society (Table 4–1). Foot width can expand up to two sizes and length by one-half size on weight bearing. For proper sizing of the shoe, the foot must be measured under weight bearing and late in the day because the foot expands in volume as much as 4% by the end of the day. Shoes should be fitted with the normally worn socks. There should be a full finger breadth at the tip of the shoe at the end of the longest toe with the toes fully extended.

The popularity of walking and jogging shoes has made proper-fitting shoes more socially acceptable. The breakdown of sexual stereotypes has allowed the redefinition of acceptable styles of footwear in many workplace environments. Acceptance of proper fit over trends in style often adequately relieves a patient’s symptoms.

Deformity of the foot and ankle caused by progressive disease entities often requires modification of shoes or application of orthoses. The choice of the proper modification is based on a thorough understanding of the effects of the disease on the normal function of the foot. Disease can compromise motor function, joint function, skin integrity, sensation, and proprioception. Once the effects have been assessed, the proper modifications should be prescribed to try to restore normal function or protect the affected limb from further breakdown.

**SHOE ANATOMY**

Shoes can be broken down into various components. The upper is the part of the shoe that is seen from the top. The outsole and heel form the bottom of the shoe, which contacts the ground. The insole contacts the plantar aspect of the foot inside the shoe (Fig. 4–2).

The shank extends from the heel breast (the front of the heel) to the ball of the shoe. The ball is the area under the metatarsal heads. The forepart extends from the ball to the tip, or end of the shoe. The toe box describes the height of the shoe at this level. The vamp, part of the upper, extends from the tip back over the ball and instep to the quarters, which join in the back of the shoe at the back seam. The Balmoral, or Bla last, shoe has the quarters meeting at the front of the throat of the shoe, with the vamp extending as the tongue beneath them. The Blucher last has the quarters loose at the inner edge and is made to be laced over the vamp and tongue.

The last is the three-dimensional form that the upper of the shoe is made from (Fig. 4–3). Historically, all lasts were made by hand with no distinction between the left and right foot until about 1820. In the 1850s the ability to duplicate shoe lasts, mold the leather uppers, and attach them to the soles by machine allowed the shoemaker to progress from making 1 pair of shoes per day to more than 600 per day. Over the next century and a half, the technology

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**TABLE 4–1**

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<thead>
<tr>
<th>10 Points of Proper Shoe Fit</th>
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<tr>
<td>1. Sizes vary among shoe brands and styles. Do not select shoes by the size marked inside the shoe. Judge the shoe by how it fits on your foot.</td>
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<tr>
<td>2. Select a shoe that conforms as nearly as possible to the shape of your foot.</td>
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<td>3. Have your feet measured regularly. The size of your feet changes as you grow older.</td>
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<tr>
<td>4. Have both feet measured. For most persons, one foot is larger than the other. Fit to the larger foot.</td>
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<td>5. Fit at the end of the day when the feet are largest.</td>
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<tr>
<td>6. Stand during the fitting process and check that there is adequate space (3/8 to 1/2 inch) for your longest toe at the end of each shoe.</td>
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<td>7. Make sure the ball of your foot fits snugly into the widest part of the shoe.</td>
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<tr>
<td>8. Do not purchase shoes that feel too tight, expecting them to stretch.</td>
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<tr>
<td>9. Your heel should fit comfortably in the shoe with a minimum amount of slippage.</td>
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<tr>
<td>10. Walk in the shoe to make sure it fits and feels right.</td>
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</table>

of manufacturing has rapidly progressed, just as the materials available have.3

**Lasting** also describes the bottoming method that is employed to attach the upper to the sole. Many techniques have been used, and one shoe can be lasted with more than one method, called *combination lasting*. Slip lasting involves sewing the upper pieces together moccasin style and gluing this to the midsole, giving a flexible construction. With *board lasting*, the upper is glued to a firm board, providing a stiff shoe; this method is often employed in athletic shoes to decrease pronation. A combination last can provide stability from a board-lasted heel and flexibility from a slip-lasted forefoot (Fig. 4–4).

### Types of Uppers

Many different materials are available for constructing the upper of the shoe. Traditionally, leather has been employed because of its durability, moldability, and breathability. Athletic shoes are made from soft nylon, mesh nylon, and canvas reinforced at the counter, toe box, or vamp with leather, rubber, or plastics for added stability. This combination allows the shoe to be lighter but still stable. The nylon mesh shoe may be useful in accommodating deformities of the lesser toes.

Leather uppers can be stretched to accommodate forefoot deformities, but the extent of shoe deformation is limited. The toe box should have the height and width to properly fit the foot. If friction against the skin is a concern, as in a neuropathic foot, a
heat-moldable foam (Thermold) upper may be employed.

Several patterns of lace stays are available, and each has its own advantage (Fig. 4–5). The Blucher pattern, with no seam across the instep, has the advantage of allowing easier entry into the shoe. The Bal pattern can provide more stability, but the entry is limited and might not accept an orthotic device. The U-throat and lace-toe patterns allow the shoe to open even wider and may be useful in accepting an orthosis or allowing entry into the shoe after hindfoot fusion.

Many lacing patterns can secure a better fit of the shoe (Fig. 4–6). Athletic shoes often have multiple eyelets to allow for different lacing techniques. By changing the lacing to avoid crossing the dorsum of the foot, pressure can be relieved over bony
prominences or a high-arched foot. Wide or narrow feet can be secured by different lacing patterns.

Once the proper material, shape, and lacing pattern of the shoe have been determined, it may still be necessary to stretch the upper to avoid pressure over bony deformities. With the patient standing and bearing full weight on the affected foot, the area of impingement can be identified and marked. A shoemaker’s wand can stretch the shoe at this area (Fig. 4–7).

**Types of Lasts**

Shoe manufacturers have many different lasts, and there is great variation in the fit of shoes that are labeled with the same size. A shoe manufacturer might have 30 to 60 active last styles with 80 to 90 sizes for as many as 5000 different lasts. Thus it is difficult to define a normal last.

The concept of a corrective last is not accurate because the last cannot correct a deformity. Lasts come in several general categories (Fig. 4–8). A conventional last is made in right- and left-foot shapes. A straight last has a straight medial border from heel to toe without curving at the toe box. Women’s dress shoes can simulate a straight last on the medial side and have the point of the toe box at the end of the great toe. The outflare last, or reverse last, flares to the lateral side of the shoe and is often employed after treatment for metatarsus adductus. The inflare last curves medially and is used in athletic shoes, with a 7-degree curve to allow greater mobility of the foot.

**Types of Soles**

Traditionally, soles of shoes were constructed of leather. In dress shoes this material is still commonly used. Soles in athletic, work, and recreational shoes are

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**Figure 4–7** A, Shoemaker’s wand. B, Stretching shoe with the wand.
Generally made from rubber compounds. Microcellular blown rubber compounds and polyurethane are used for midsole and wedges. Black carbon rubber and styrene–butadiene are very hard-wearing compounds used for outsoles. Ethyl vinyl acetate is also commonly used in running shoes for its flexibility and impact-absorbing properties. Manufacturers often combine the blown rubber for impact resistance covered by black carbon rubber for wear on the outsole. The superior impact absorption of these rubber and synthetic materials can be used to decrease pressure and loading of the foot and ankle. As a result, many manufacturers now offer dress shoes with soles made of these materials.

Traction between the shoe and the floor can be influenced by the material of the sole and the pattern on the outsole. Various patterns have been developed for different sports (Table 4–2). The pattern and amount of friction can also influence how well a patient with balance or proprioceptive loss can tolerate a shoe. Too much friction can cause a patient to stumble, whereas loss of friction with a slick surface can be equally dangerous.

The outsole of the shoe can be modified (Fig. 4–9). A medial wedge can be used to decrease forefoot eversion, and a lateral wedge can be used to decrease forefoot inversion in a flexible foot.

Various metatarsal bars have been described for treating metatarsalgia. The principle is to have the bar placed proximal to the metatarsal heads to adequately relieve pressure under the area of greatest loading. Rocker soles are often useful in unloading the forefoot and decreasing the need for metatarsophalangeal joint dorsiflexion. Rocker soles allow a better gait pattern when used with rigid bracing of the foot and ankle.

**Types of Heels**

The materials used for the heel are similar to those used for the sole. The decision about the material used should stem from the demands placed on the foot. Many modifications of the heel have been described (Fig. 4–10). The Thomas and Stone heels were used to help prevent pronation. Medial and lateral heel wedges help block heel eversion and inversion, respectively. These wedges should be used with a rigid heel counter to effectively grip the heel and produce the desired effect. External heel wedges have an advantage over inserts by not raising the heel out of the counter, which allows for a better grasp of the heel.

Flared and offset heels allow for a broader base of support in walking. These heels decrease the amount of subtalar motion in patients with arthritis. A lateral flare can help prevent ankle sprains in patients with chronic instability. The offset heel is often useful with bracing in patients with advanced hindfoot deformities.

The solid ankle cushion heel (SACH), or plantar flexion heel, is also useful with bracing when ankle motion is lost (Fig. 4–10G, H). It uses a wedge of soft compressible material within the heel. It may be combined with a rocker sole to compensate for decreased ankle dorsiflexion and plantar flexion. The degree of rocker-bottom effect is controlled by the height of the heel, thickness of the wedge, and position of the rocker bottom.

Heel lifts are used to compensate for leg-length discrepancy. These may be all external or combined with an internal device on the shoe. These are often useful

<table>
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<tr>
<th>Table 4-2: Outsole Options for Athletic Shoes</th>
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<tr>
<td><strong>Running Shoes</strong></td>
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<tr>
<td>Wear-area reinforcement</td>
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<tr>
<td>Cantilevered designs for shock absorption</td>
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<tr>
<td><strong>Court Shoes</strong></td>
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<tr>
<td>Pivot points</td>
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<tr>
<td>Herringbone pattern</td>
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<tr>
<td>Suction-cup designs</td>
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<td>Radial edges</td>
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as a temporary device when the opposite extremity is placed in a prefabricated walking cast. These walking casts usually have a built-in rocker-bottom and are higher than the patient’s normal shoe. Patients who have difficulty with this temporary leg-length discrepancy can be helped by application of a lift to the opposite shoe to compensate. A heel lift may also be used when a SACH and rocker bottom have been applied to the opposite shoe.

When the outsole and heel of the shoe for postural abnormalities are modified, the shank of the shoe should afford some flexibility to allow the foot to respond to the correction applied. When arthritic conditions of the midfoot and forefoot are treated, the shank should be stiffened to decrease the motion of the foot.

The advances in shoe manufacturing and materials have led to a new popularity of running and walking.


shoes. In general, these shoes allow better fit of the forefoot and greater cushioning of the foot and ankle. The popularity of these shoes helps in the treatment of many foot and ankle problems without the need to prescribe the traditional orthopaedic oxford. Patient acceptance of this type of footwear affords greater compliance with treatment.

**ORTHOSES**

Orthoses are devices that can be placed inside a shoe to help accommodate anatomic abnormalities or to relieve pressure or stress at a specific site on the foot or ankle. They function by applying a force on the body in a controlled manner to achieve a desired result, that is, transfer of pressure or restriction of motion. Orthotic devices range from simple shoe inserts to braces. The popularity of shoe inserts for runners has led to many anecdotal claims about the efficacy of their use. There are few controlled studies to confirm these claims.

It should be remembered that orthoses are accommodative devices and not corrective devices. There is no evidence that an orthosis can correct or prevent the development of hallux valgus or other deformities or prevent knee, hip, or back arthritis. Given the correct indications, orthoses can be very effective in clinical management of many foot and ankle problems.

It is not always necessary to use a custom orthosis. For the accommodation of many forefoot- and heel-related problems, over-the-counter devices may be equally effective at a considerably lower cost. The abuse and overprescribing of custom inserts has led most medical insurance companies to deny payment for these inserts. Familiarity with the over-the-counter devices allows the treating physician to direct the patient on how to use these devices effectively.

**Custom Orthoses**

Custom orthoses can be rigid, semirigid, or soft. Rigid orthoses are generally used to diminish motion in the treatment of arthritis of the midfoot or forefoot. The device stiffens the shoe and functions similar to a steel shank within the shoe. Patients with plantar prominences or significant fat-pad atrophy might find these too uncomfortable to wear. A rigid orthosis has been prescribed to block pronation but may be no more effective than a semirigid device and may be more difficult to tolerate. Rigid orthoses offer no shock-absorbing properties and should be avoided in patients with impaired sensation.

Semirigid orthoses are the most commonly prescribed inserts. Unlike rigid orthoses, they offer shock absorption and some flexibility while still providing tensile strength and durability. They are used to support and stabilize flexible deformities and relieve pressure by weight transfer. Combinations of materials are often used; the inserts are generally thicker than rigid inserts and might require the patient to wear a deeper shoe. The materials used include leather, polyethylene compounds, closed or open cellular rubber compounds, cork, felt, and viscoelastic polymers.

Soft orthoses offer the most cushioning and impact absorption and reduce shear forces of friction in the insensitive foot. They can be used to accommodate fixed deformities and may be combined with a semirigid material to gain better mechanical properties. These inserts are generally thicker than the rigid orthoses and require the use of an extra-depth shoe. The materials used are polyurethane foam, polyvinyl chloride foam, and latex foam.

There are several commonly prescribed foot orthoses made in accordance with these various rigidities (Fig. 4–11). Shaffer’s orthosis, made of rigid or semirigid materials, incorporates a concave heel cup, convex longitudinal arch support, and medial heel wedge and is prescribed to control hindfoot pronation. Mayer’s orthosis is a three-quarter-length inlay of semirigid material with a metatarsal pad to relieve pressure under the heads of the metatarsals. The Whitman orthosis is a rigid orthosis prescribed to block pronation. It consists of a concave heel cup, medial convexity under the navicular, and lateral wall flange at the cuboid. The pump, or cobra, insert allows the calcaneus to rest on the insole and uses a cupped heel and medial support to stabilize the hindfoot. Its low profile allows its use in a pump dress shoe. Morton’s orthosis, of semirigid material, extends beyond the first metatarsal to redistribute weight bearing under the metatarsal head.

The Levy mold is a full-length orthosis that extends from the heel to the tip of the shoe. It is made from a positive mold of the foot in subtalar neutral position and can incorporate various corrections to accommodate fixed deformities and weight transfer. It can be made of a combination of rigid, semirigid, and soft materials and requires the use of an extra-depth shoe. The full-length cushioned inlay is made of compressible soft materials and reduces compression, friction, and impact on the foot.

**Over-the-Counter Inserts**

With the advances in material used in shoe manufacturing, it is often possible to accomplish many of the goals of orthosis without the expense of custom-molded inlays. Several companies offer padded insoles for shock absorption and heel cushioning (Fig. 4–12).
Spenco, Viscopeds, Dr. Scholl’s, and other companies provide padded insoles and inlays that can be effective in providing relief for metatarsalgia and fat-pad atrophy. The addition of metatarsal supports, such as the Hapad longitudinal metatarsal pad on a cushioned inlay or in a shoe with a soft sole, can effectively relieve metatarsalgia or neuroma symptoms. Various heel inserts, such as Visco heels or Tuli heel cups, are often helpful in treating plantar heel pain. These devices are readily available through medical supply catalogs and are often found in pharmacies and athletic shoe stores. Patients should be educated on their proper placement and use.

Once the patient has been evaluated and the desired correction chosen, the proper footwear should be selected. In some instances, this may be all that is needed. If additional correction is needed, off-the-shelf items should be considered. The cost to the patient is considerable for custom orthoses, and more insurance companies now refuse payment for any orthosis that does not cross the ankle joint. If adequate correction cannot be accomplished, custom orthoses can be prescribed.

**BRACES**

Three types of braces that have proved useful in treating foot and ankle problems are the ankle–foot orthoses (AFO) of either molded polypropylene or
double-upright construction, Marzano braces, and University of California Biomechanics Laboratory (UCBL) inserts.

**University of California Biomechanics Laboratory Inserts**

The UCBL insert controls flexible postural deformities by controlling the hindfoot. The brace should be molded with the heel in neutral position. To work successfully, the brace must be able to grasp the heel and prevent it from moving into valgus. By keeping the calcaneus in neutral position, the brace stiffens the transverse tarsal joints, and pronation and forefoot abduction can be diminished (Fig. 4–13). It may be necessary to add medial posting to the heel and front of the brace to keep the heel out of valgus. As medial posting is added, it may be necessary to lower the medial trim line to avoid impingement on the medial malleolus.

In fixed deformities, such as arthritis of the midfoot, a UCBL insert can decrease motion and relieve pain. The manufacture of the brace is modified for this application. The foot is molded in situ, and the polypropylene should have a relief over the area of bony prominence. The brace can be lined with a material for pressure absorption such as polyurethane foam (PPT) in the relief, and then the entire brace can be covered with a material such as polyethylene foam (Plastazote) to resist shear forces (Fig. 4–14).

**Marzano Braces**

The Marzano brace (Fig. 4–15) combines a UCBL insert with an anterior shell and a hinged ankle. It has been employed to treat various foot conditions. It provides greater support than the UCBL and allows motion of the ankle.

**Ankle–Foot Orthoses**

AFOs can be made from double uprights attached to the shoe or molded polypropylene either as a posterior shell or incorporated into a leather lacer (Arizona brace) (Fig. 4–16). The molded AFO is more effective in most instances. The brace can be made with a fixed or hinged ankle. The brace is manufactured from a positive cast of the lower limb and can be lined with shear-resistant material such as Plastizote. Modifications can be made through reliefs over bony prominences to accommodate fit, and these can be lined with PPT under the Plastizote to afford pressure relief. These modifications of the brace allow better control of deformities and expand the use of these braces to rigid, as well as flexible, deformities.
The molded AFO can provide stability to one or several joints of the foot and ankle complex. The trim line can be modified, depending on the rigidity desired. To diminish ankle motion, the trim lines should extend anteriorly to the midline of the malleoli, but the foot plate can end at the metatarsal heads. If one is controlling subtalar or transverse tarsal motion, the trim lines can be cut behind the malleoli to allow some ankle motion. If one is controlling midfoot arthritis, it may be necessary to use a full foot plate. A SACH heel can provide a smoother gait pattern for most patients. If a full foot plate is used, a rocker-bottom sole should be considered. In patients with a normal ankle joint, a hinged ankle may be employed to allow ankle motion.

The Arizona brace AFO can be constructed with either lace or hook-and-loop (Velcro) closures. It provides stability to the hindfoot through three-point fixation similar to a short-leg cast. It has the advantage of being lower than a standard molded AFO and might have better patient acceptance.

**APPLIANCES**

Various appliances have been developed for the treatment of forefoot deformities. Pads and cushions can be effective in relieving pain but will not correct deformities. Padding is effective only if the shoe is the correct shape and material. Pads take up additional space within the shoe and can increase pressure if the toe box is too small.

A toe crest can be effective in relieving pressure on the tips of the toes from hammer toe and mallet toe deformities. Corn and callus pads can also relieve pressure but are more effective if the overlying callus and corn tissue is removed and the shoe is stretched over the offending prominence or a wider toe box is employed. Foam or gel (Silipos) sleeves can also effectively relieve pressure (Fig. 4–17). Toe separators can be used, but lamb’s wool can be equally effective between the toes and has the advantage of better absorption of moisture than the separators have.

**TREATMENT**

**Arthritis**

Bracing can be effective in the treatment of arthritis of the foot and ankle by decreasing the pressure and motion across the affected joint. Braces should be custom molded and padded appropriately over any bony deformity. The patient must understand that a brace does not cure the problem but can offer an effective means of controlling symptoms if he or she wishes to avoid surgery.
For ankle and subtalar arthritis, a molded AFO with a fixed ankle or Arizona brace is most effective. In some patients with normal ankles and disease restricted to the subtalar joint, a molded AFO with a hinged ankle or a UCBL with high trim lines can be used. Often, these patients use the AFO for heavy activities and the UCBL for light activities of daily life.

For arthritis restricted to the transverse tarsal and tarsometatarsal joints, the same principles apply, but the success rate of the UCBL is much higher. A SACH and rocker-bottom sole can increase the effectiveness of the brace and afford the patient a more normal gait pattern. Patients often need to change the lacing pattern on their shoes to avoid pressure over dorsal spurs.

Tendon Dysfunction

Chronic tendon tears can lead to significant pain and deformity if left untreated. Although surgical reconstruction has proved successful, some patients are not candidates for surgery because of concomitant medical conditions, whereas others wish to undergo surgical intervention. For chronic dysfunction of the Achilles, peroneal, and anterior and posterior tibial tendons, a custom-molded AFO or Arizona brace, usually lined with Plastizote, can effectively control symptoms. These braces can be combined with a rocker bottom or SACH heel to give a better gait pattern, although a running shoe may be satisfactory.

Patients should understand that the purpose of the brace is to control the position of the foot and hopefully prevent progression of any deformity. If significant tendon damage is present, the brace will not be curative and the patient can decide between using a permanent brace or having reconstructive surgery.

In instances of tendinitis or early tendinosis, prolonged use of a molded AFO for ambulation can allow for healing. This has been successful in managing early tendinosis. Bracing is continued until the swelling, bogginess, and tenderness have resolved, and then progressive mobilization and physical therapy are
prescribed. If the objective changes have not resolved within 6 months, bracing has proved not curative and the patient has the option of continuing with bracing as the elected form of treatment or choosing surgical correction.

In patients with complete tendon rupture, bracing can be effective for pain relief and providing increased, although not normal, function. With long-standing rupture there is often a fixed deformity of the foot and ankle complex. For bracing to be effective, the mold must incorporate reliefs and padding over bony prominences. An outflare heel may be needed to support the brace in the shoe and provide an adequate base of support in advanced deformities.

**Heel Pain**

The role of inserts in treating chronic heel pain remains controversial. It is an area with an abundance of anecdotal treatment but a paucity of scientific knowledge. Part of this problem comes from the difficulty in diagnosing a specific cause of heel pain. Recommendations for inserts for heel pain vary from the use of a rigid orthosis to soft pliable inserts. Recent studies cast doubt on inserts being effective in the treatment of heel pain, but this might reflect the overprescription of these devices without the proper indications.

In patients with atrophy of the heel fat pad, soft inserts and a well-padded shoe would be indicated. For chronic plantar fasciitis, soft inserts may be indicated for shock absorption if overuse is a causative factor. Over-the-counter devices and appropriate shoes can be as effective as custom devices at significantly less cost. This treatment should be combined with other treatment modalities.

Night splints for the treatment of chronic plantar fasciitis has been shown to be effective. Although the original studies were performed using a custom-molded AFO with full foot plates, over-the-counter alternatives are now readily available and appear to be equally effective.

**LESSER METATARSALS**

**Calluses And Corns**

Callus and corn formation occurs in response to excessive pressure over a bony prominence. This may be the consequence of a loss of the normal fat pad without deformity, secondary to pressure developing in response to deformity, improper footwear causing pressure in an otherwise normal foot, or wearing improper shoes on an abnormal foot. Adequate management of these problems requires patient education and acceptance of appropriate shoes. Removal of the overly hyperkeratotic tissue by paring the lesion produces significant relief of symptoms (Fig. 4–18). To prevent recurrence of the lesion, the shoe must be modified to keep pressure off the affected area.

For plantar callosities, recurrence can be prevented by an appropriately sized metatarsal pad placed proximal to the lesion. The pad can be placed directly in the shoe or on a padded inlay that can be transferred from shoe to shoe. For dorsal corns, after the removal of the hyperkeratotic tissue, toe sleeves or toe crests may be effective (Fig. 4–19). Stretching the toe box above the affected toe also helps relieve pressure and decreases the rate and incidence of corn formation.

The commonly found corn over the dorsal and lateral aspects of the fifth toe without deformity is seen in patients wearing pointed dress shoes. Paring is initially effective; however, the lesion recurs if the footwear is not modified. If the patient is unwilling to change his or her footwear, the shoe should be pre-stretched with a shoemaker’s wand over the affected toe to help decrease the pressure. Surgery in this instance is rarely successful if the patient is unwilling to change his or her shoe style. The success of shoe

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**Figure 4-18**  A, Number 17 blade for paring callus has no sharp points but rounded edges.  B, Paring callus.
modifications when accepted by the patient makes surgery rarely indicated.

In some patients, a tongue pad can prevent the patient’s foot from sliding forward in the shoe when walking and can increase the effectiveness of the other modalities (Fig. 4–20). This is also helpful when hammering has progressed from instability of the metatarsophalangeal joints to subluxation, dislocation, or crossover deformities. In these cases, the addition of a metatarsal pad is indicated to relieve plantar pain.

Taping can add stability to the metatarsophalangeal joint with a hammer toe deformity. A strip of 1/4-inch tape can be looped over the base of the toe to mimic the force of the intrinsic muscles and plantar plate (Fig. 4–21). This loop should be applied in the morning and removed at the end of the day. It can help patients with crossover deformities and subluxating hammer toe deformities.

**Neuromas**

Interdigital neuromas can often be successfully treated with appropriately placed and sized metatarsal supports (Fig. 4–22). A custom-molded orthosis is rarely indicated. If a custom orthosis is prescribed, rigid material at the distal end of the orthosis should be avoided. In my experience, a longitudinal metatarsal Hapad has proved most effective. When using these pads, the patient should be instructed to break in these devices gradually. A protocol starting with 4 hours the first day and then increasing by 1 hour per day is usually successful. In most instances, patients start with a small size and may increase the size of the pad if their symptoms have not been relieved once they are wearing the pad all day.

**Bunionettes**

Bunionettes can often be treated successfully by pre-stretching the shoe to avoid pressure over the bony prominence. A rounded or squared toe box can help prevent progression of the deformity.

**FIRST METATARSOPHALANGEAL JOINT**

**Hallux Valgus**

Hallux valgus deformities cannot be prevented or corrected by orthotic devices, and such devices should not be prescribed for that purpose. In patients with excessive pronation, an orthotic device to reduce pronation may be indicated and can relieve valgus stress on the great toe. Nonoperative treatment of hallux valgus revolves around the choice of proper footwear to accommodate the present deformity and prevent...
increased valgus pressure on the great toe to reduce progression. The choice of shoes is determined by the severity of the deformity. To prevent development of hallux valgus or to accommodate a mild deformity, the patient should wear a shoe built on a straight last. Prestretching of the shoe above the first metatarsophalangeal joint can be useful to relieve pressure.

In moderate-to-severe deformities, an extra-depth shoe may be required. The shoe can be prestretched over the bunion, and a soft leather upper or Thermold should be used. A tongue pad can also keep the foot seated in the shoe.

**Hallux Rigidus**

Hallux rigidus is an arthritic condition, and nonoperative management involves accommodating the dorsal exostosis and decreasing the motion at the joint. An
extra-depth shoe with a steel shank and rocker bottom can be used. If significant dorsal exostosis is present, the toe box might need to be stretched. A full-length rigid orthosis can prevent motion at the metatarsophalangeal joint but should be used with a rocker-bottom shoe.

REFERENCES