소아 발"Growing Foot"
- Good Shoes -

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목 차

- Introduction
- Shoe construction
- Shoe fitting

The history of shoes

- From about 10,000yrs ago, to protect the foot from injury or become a status symbol
- During the past 200yrs, shoe design for children was determined by the impression that the child's foot required "support". Supportive footwear was usually rigid and often compressive.
- Staheli and Griffin(1980), 269 physicians and podiatrists 44% preferred soft shoes, 32% preferred high-topped shoes, 24% preferred tennis shoes, only 7% orthopedic shoes
- During the past decade, shoes became more flexible and less constrictive that those manufactured in the past

The Bare foot

Hoffman P.(1905), Engle ET and Morton DJ.(1931) James CS.(1939) Sim-Fook L and Hodgson A. (1958)

The unshod human foot is characterized by

- Excellent mobility, especially of the forefoot
- Thickening of the plantar skin as great as 1cm
- Creases on both the plantar and dorsum of the foot due to the flexibility of the midtarsal joints
- Alignment of the phalanges with metatarsals causing the toes to spread
- Variability in arch height
- An absence of static deformity

Effects of footwear on the foot

- *Emslie M(1939), McKee JJ(1942), Bleck EE(1971)*
- Footwear has the potential to produce foot deformities in children and significant disability in the adult

Children's footwear

available in many forms

- Babygros and sleep suits
- Stretch tights and socks
- Knitted booties
- Pram shoes

Figure 12.5 Babygros, sleep suits, stretch tights and socks.

Babywalkers : It is best to 'let nature take its course' and allow the child to walk naturally when ready instead of prematurely stressing tissues and loading joints.

Inadequate footwear

- Inadequate in many differing ways

Being too short, too narrow,
having a pointed toe box,
poor or no retaining medium,
inadequate heel stiffener,
heel height too high,
narrow base to the heel,
synthetic uppers and/or lining……

Figure 12.7 (A, B) Examples of inadequate children's footwear.

Plimsolls

- Ideally, for everyday wear one pair of shoes should be purchased and worn to destruction.
- Plimsolls do not provide a suitable environment for a growing foot.
- Plimsolls do not allow for changing flare of a young foot, and this may have a damaging influence if they are worn continually.
- Plimsolls are unsuitable as a vehicle for casted orthoses.

Figure 12.8 Plimsolls. Note the straight flare, indicated by the straight line through the centre of the heel and sole. In the young child this line should ideally emerge in the lateral distal region of the sole, allowing space in the medial part of the forefoot for the relatively adducted position of the first ray.

The rate of growth of the feet

- constant from birth until the mid-teens
- increasing by approximately 2 sizes/yr for the first 4yrs, and then by 1 size annually

Staheli et al(1987), Gould et al(1989)

* Longitudinal arch develops spontaneously during infancy and childhood. This development occurs naturally and independently of footwear.

Foot type

Figure 12.9 The 'ideal' flare for a young child's shoe (left) compared with that of an unsuitable shoe (both shoes are for left feet).

Viewed from below,

- triangular in infant (particularly in premature children, who may also be late walkers)
- As child progresses into adolescence, rectangular
  => the difference in shape btw adult and children's footwear
  : the child's shoe being inflared and the adult's tending to be relatively straight-flared.
- The first ray; be in a relatively adducted position at this age
  -> straight-flared or small shoe may cause or result in soft-tissue patologies or digital deformity.

Typical foot types

- Short broad – relatively short in relation to its length
- Square forefoot – all the digits are virtually the same length(commonly found in down's syndrome)

At-risk feet

- Hypermobile
- Long slender
- Triangular
- Long inner border

Shoe constructions

- The three primary aspects of shoe construction

1) shoe shape: determined by the last or mold over which the shoe is constructed.
2) sole attachment: can be done in a variety of ways, depending on the type and purpose of the shoe.
3) shoe materials

Parts of shoe

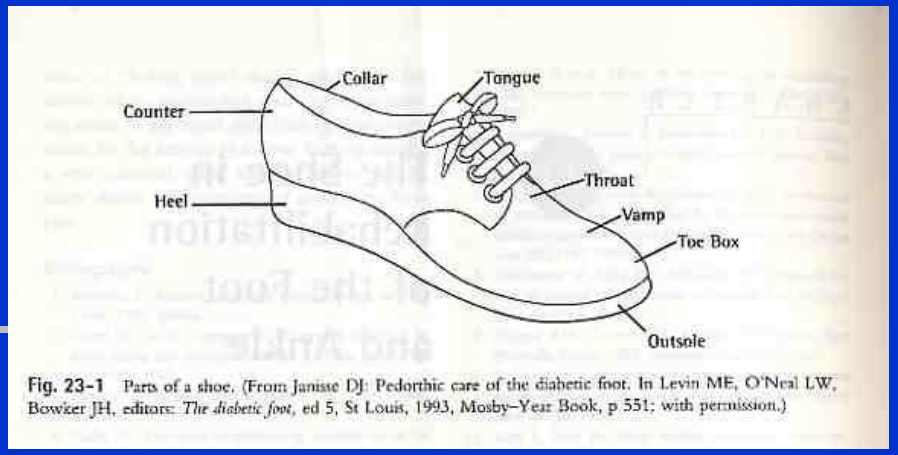
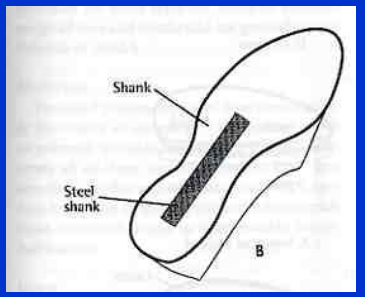


Fig. 23-1 Parts of a shoe. (From Janisse DJ: Pedorthic care of the diabetic foot. In Levin ME, O'Neal LW, Bowker JH, editors: *The diabetic foot*, ed 5, St Louis, 1993, Mosby–Year Book, p 551; with permission.)

- Toe box: the part of the shoe that covers the toe area
- Vamp: the part that covers the instep
- Counter: the part behind the heel
- Throat: the place where the vamp meets the tongue
  the blucher and the balmoral
- Sole
- Shank: bridge btw the heel and ball area of the shoe
  * steel shank: reinforced shank with a thin strip
    of spring steel added between the out sole and insole



Shoe shape

- The shape of a shoe is dependent primarily upon the last of the mold over which the shoe is made.
- Lasts are made in an unlimited variety of shapes and sizes.
  * Standard last: most popularly priced, mass-produced shoes are made from a single, basic last.
- The last determines not only the shape of the sole but the shape of the uppers as well.

Materials

1. Upper

2. Sole
   - Leather
   - Hard rubber
   - Crepe(microcellular rubber)
   - Ethyl vinyl acetate(EVA)

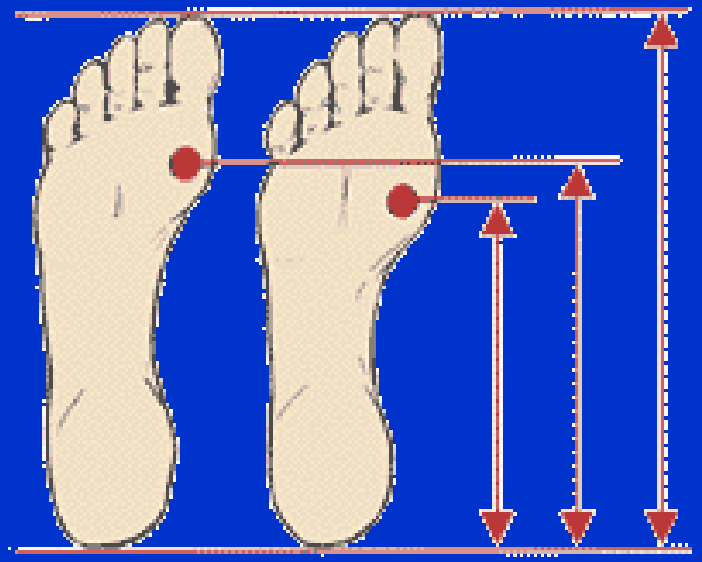
Shoe fitting

Shoe shape

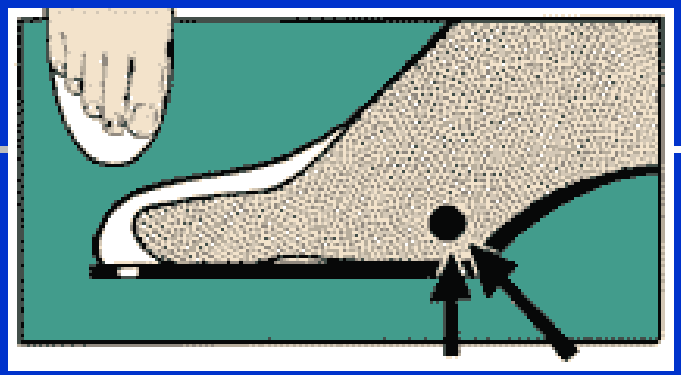
- A shoe that has a high toe box and a rounded, or oblique, toe
  : provides the best fit by allowing the toes to fit comfortably inside the shoe
- A shoe with a tapered toe box and a pointed toe
  : applies pressure to the toes and forces them into an unnatural shape, causing calluses and discomfort and eventually leading to deformity
- The vamp should be high enough to prevent pressure on instep.
- A shoe with a laces generally provides the best fit.
- The blucher is generally preferred over the balmoral.

Shoe size

- Three essential measurements in determining shoe size
  1) overall foot length (heel to toe)
  2) arch length(heel to arch, or first metatarsal)
  3) width



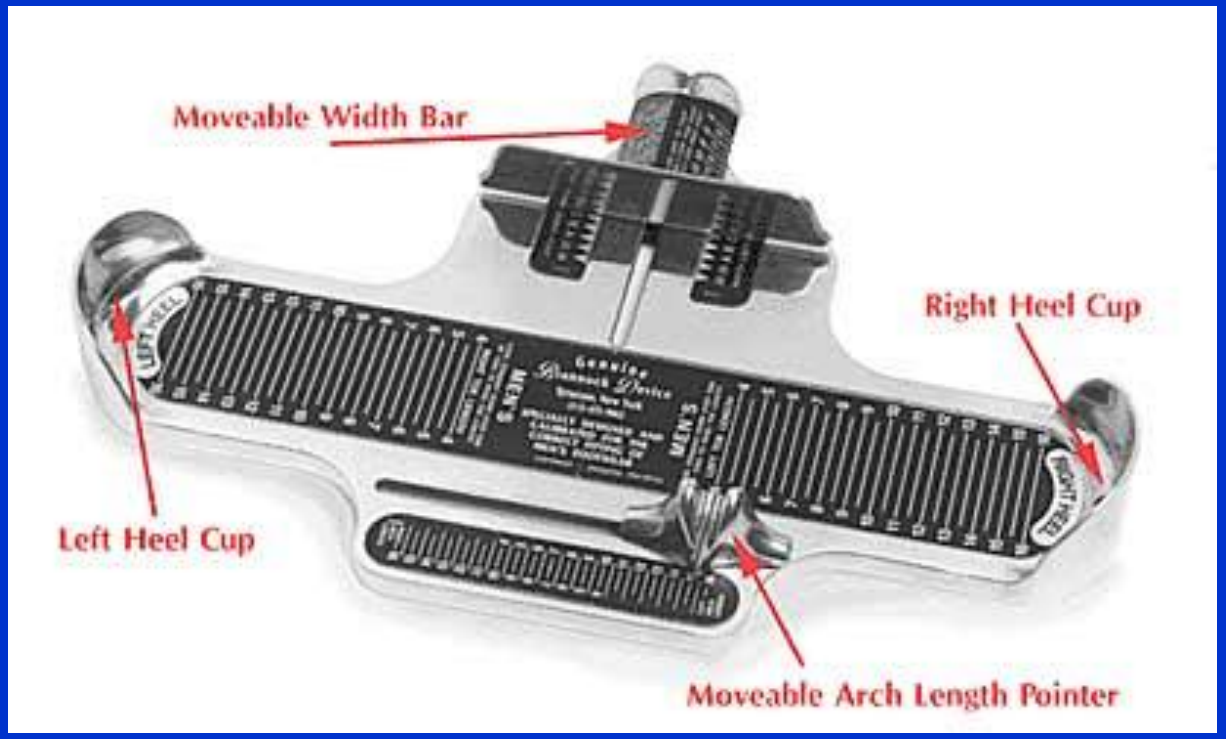
- Shoes must be fit by arch length
  rather than by overall foot length
- The proper shoe size
  : accommodates the first MP joint
  (i.e., the widest part of the foot)
  in the widest part of the shoe



Improperly fitted shoes can cause a variety of foot problems in addition to general discomfort and shoe breakdown. If the arch of the foot is not positioned properly in the shoe, the foot will become fatigued and uncomfortable.

The foot is correctly fitted. The arch of the shoe and ball joint of the foot meet at the same point. The foot arch is correctly positioned in the shoe. The foot and shoe bend at the same location, with the arch fully supported, allowing the toes to remain straight. There is ample space in front of the toes to allow adequate ventilation. This will ensure a correct and comfortable shoe which will keep its shape.

The Brannock Foot-Measuring Device ®



Guidelines for attaining proper shoe fit

- Measure both feet with appropriate measuring device.
- Fit shoes on both feet while weight-bearing
- Check for the proper position of the first MP joint. It should be in the widest part of the shoe
- Check for correct toe length. Allow 3/8 to ½ inch between the end of the shoe and the longest toe
- Check for the proper width, allowing adequate room across the ball of the foot
- Look for a snug fit around the heel
- Determine that proper fit over the instep has been achieved by appropriately high vamp, preferably with laces to allow adjustability.

Noncontroversial shoe modifications in current use

- Shoe lifts for the short leg
  : equalize limb length and may improve gait
- Shoe inserts in older child or adolescent with rigid foot deformities
  : may redistribute weight bearing more evenly about the sole for pain relief or skin protection of the insensate foot
- Shock-absorbing footwear with cushioned soles or foam rubber inserts is helpful in managing overuse syndromes such as heel or shin pain during later childhood and adolescence.

Shoes for infants and children with normal feet

The most effective footwear should be

- Quadrangular
  : to conform to the normal foot configuration, with abundant space for the toe
- Flexible: to allow free foot movement
- Flat without elevation of the heel
- Porous
  : Uppers should be made of leather or unsealed fabric to avoid skin maceration or fungal infections.

- Moderately tractive

  : Sole friction should be equivalent to that of the bare foot. Soles that are slippery(leather) or that created excessive friction (some rubber soles) should be avoided.
- Light weight: to reduce energy expenditure
- Extended above the ankle in the toddler

  : to prevent the shoe from slipping off during running.
- Acceptable in appearance

  : because children are very sensitive about that
- Reasonably priced.

감사합니다.