



## FOOT TYPE AND MEASUREMENT

## Medical Science

Arif Wicaksono

Medical Faculty Universitas Tanjungpura; Hadari Nawawi St, Post. Code 78124, West Kalimantan, Indonesia

## ABSTRACT

Standing, walking and running. These three daily activities require a fair pose and normal structure of the foot. The foot contains bones, ligaments, tendons and muscles inside, covered by skins and connective tissues outside. The formation inside the foot can be examined to show foot characteristics, foot arch and foot type. We can't determine foot type without undergo an examination or measurement. There was several measurements of foot, traditional to modern way. And now a modern, non-invasive and simple measurement is available to determine our foot type.

## KEYWORDS

the foot, characteristics, measurement

## INTRODUCTION

Every day in our life, we stand, walk, exercise, mostly without thinking of our foot. Do we know if our foot is normal? Or we're pretending to be normal because we never had a problem with our foot. Actually, we have to do examination or test to know our foot condition.

## Foot Anatomy

The bones in the foot are tarsal, metatarsal and phalanges. The foot has two main functions, namely to support body weight and as a lever in walking or running. One bone can carry out these two functions but will be difficult on uneven ground surfaces. The presence of segmentation in the foot makes the foot more stable and can still walk or run on uneven surfaces. [1]

There are three main arches, namely: medial longitudinal arc, lateral longitudinal arc and transverse arc. The medial longitudinal arc extends from the heel to the first metatarsophalangeal joint. This arc is formed by the calcaneus bone, talus, navicularis, three cuneiform bones and three metatarsal bones. Supporting this arcus is the posterior aspect of the calcaneus and three metatarsal heads. [2]

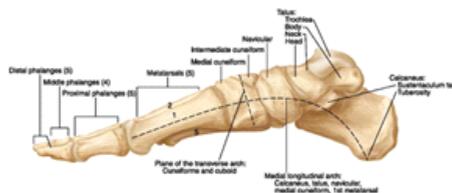


Figure 1: The medial longitudinal arc

Sources: Standring S. Gray's Anatomy: the Anatomical Basis of clinical Practice. 39th Ed. Elsevier Churchill Livingstone; 2005

The lateral longitudinal arc is formed by the calcaneus, cuboideum and fourth and fifth metatarsal bones. The support of this arc is the calcaneus and the lateral head of the metatarsal.

The transverse arc is formed by a base of five metatarsal, cuboid and cuneiform bones. The arc is maintained by the cuneiform while the stability is played by the ligaments and tendons of the m. Peroneus longus. [2]

## Feet can be divided into three functional segments:

1. Anterior segment consisting of 5 metatarsal os and 14 phalangeal os.
2. The medial segment consists of 5 tarsal os.
3. The posterior segment consisting of the talus and calcaneus

Bones in the legs experience growth or ossification starting at birth to adulthood. At birth the foot consists of approximately the same amount of bone and soft tissue. When adults 90% of the foot mass is bone. Ossification occurs varies from birth to 12 years of age while fusion occurs between 11-22 years of age. Structural changes at birth are called congenital abnormalities while structural changes in growth can be caused by abnormal pressure from various sources [3]

## Foot Measurement

Legs can be checked and profiled. In addition to measuring the curvature of the foot, it can also assess the pressure or surface area of the foot which is in direct contact with the ground / base. Technological advances affect the checks carried out. Manual measurement up to computer technology can now be done.

## Anthropological Measurement

Anthropological measurements of foot profiles include measurement of os naviculare height, angular measurements, measurements using calipers, measurements using digital photography and radiographic measurements. [4-7]

## Footprint Measurement

Measurements using footprints are a simple way to show plantar profiles. Research subjects stood on a brightly colored chalk / powder and then stood on dark paper or vice versa. Foot prints on paper are then analyzed. [1]

Foot prints are the basis for determining the arcus index. Staheli arcus index is used in children by comparing the medial plantar region and the posterior plantar region. [1] [7]

## DISCUSSION

At present the use of footprints is very advanced to foot imaging. There are special tools or mattresses that are connected with special programs that can be installed on the computer. The subject releases footwear and then stands on the mat. The computer will record foot prints and other data on the foot profile such as the pressure on both feet and the surface area of the foot in contact with the base. The tool was called MatScan.

MatScan is a tool and program that consists of a scanner and digital programs that have been inserted into a computer that can show plaque segments and foot pressure in the research subject. MatScan is a tool and production program for Tekscan, Inc. from America. The results in the form of an overview of foot scanning in complete 2-dimensional form along with the axis and foot pressure lines.

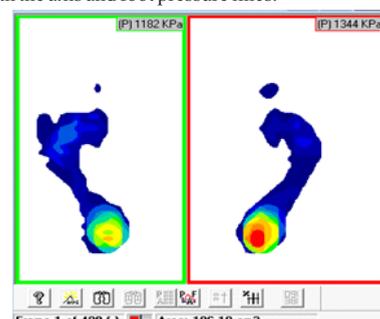


Figure 2: MatScan Result

Sources: author primary data, from MatScan program

There is several way to measure foot, traditional and modern way. Several researches cobine two methode oe even try to make advantage

of each method. Using MatScan, we will be able to measure foot arch then foot type and further we can measure foot pressure in significant area.

The subject had to release their footwear and socks, so the bare foot contacts the MatScan. After a ten seconds in fair stand pose, we can see if the data is representative or not, so we can ask the subject to repeat the procedure or the test was finished. In our computer screen that had been installed MATScan and MatScan program, we can see the data about subject foot characteristic then we can analyze the data. This is a modern, non-invasive and simple way to measure our foot

### CONCLUSIONS

The Foot mainly used in standing, walking and running in our daily activities. Foot had some characteristics that lead to arch type and foot type. Now there is a modern, non-invasive and simple way to measure our foot. This program called MatScan, that can show the foot arch, foot type and further, the foot pressure. The foot type can be analyzed for basis data and its relation to any problem related to the foot.

### REFERENCES:

- [1] Marieb EN, Hoehn K. Human Anatomy and Physiology. 7th Ed. Benjamin Cummings; 2007
- [2] Standring S. Gray's Anatomy: the Anatomical Basis of clinical Practice. 39th Ed. Elsevier Churchill Livingstone; 2005
- [3] Cailliet R. Foot and Ankle Pain. 2nd Ed. Singapore: F.A Davis Company; 1992.
- [4] Nilsson MK, Friis R, Michaelse MS, Jakobsen PA, Nielsen RO. Classification of the Height and Flexibility of the Medial Longitudinal Arch of the Foot. *Journal of Foot and Ankle Research* 2012, 5:3.
- [5] Pohl M, Farr L. A Comparison of Foot Arch Measurement Realibility using Both Digital Photography and Calliper Methods. *Journal of Foot and Ankle Research* 2010, 3:14.
- [6] Cobb SC, James RC, Hjertstedt M, Kruk J. A Digital Photographic Measurement for Quantifying Foot Posture-Validity, Reliability and Descriptive Data. *Journal of Athletic Training*. 2011;46(1): 20-30.
- [7] Murley GS, Menz HB, Landorf KB. A Protocol for Classifying normal- and flat-arched Foot Posture for Research Studies Using Clinical and Radiographic Measurement. *Journal of Foot and Ankle Research* 2009, 2:22.