

Pediatric & Adolescent Flat foot

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Pediatric Flat Foot

- "Flat foot is defined subjectively as a wt bearing foot with an abnormally low or absent longitudinal arch." –Vincent Mosca
- Only height of arch within a population was taken into account.
- No mention of determinants like pain or disability
- Banwell & Colleague(2018) systematic review: There is no universally accepted criteria for diagnosing pediatric flat foot found within existing literature.



outcomes of this review indicate that the FPI - 6, Staheli arch

of paediatric foot posture measurement in future research.

index or Chippaux-Smirak index should be the preferred method



Synonym

- Pes planus
- Pes plano abducto valgus

• Recurrent talotarsal joint dislocation(RTTJD)





• Flexible and Rigid

Congenital/Adolescent and Adult onset



What is flat feet

- **Triplanar deformity**
- Coronal: Heel valgus
- Saggital: Arch/Midfoot collapse
- Axial: Forefoot abduction
- Late stage: Forefoot supination





Clinical presentation

- Cosmetic
- Parents concern- ask child specifically about his/her sports performance
- Recurrent sprain/Instability look for atrophic calf, spur on talar neck (coalition)

Flat foot itself is a symptom, PAIN IS



Clinical assesment

- Foot posture Index
- Calf and hamstring tightness(Silfverskiold test), Hip version
- Ankle and stj rom
- Forefoot neutrality
- Single heel rise test
- Jack test
- Ligament laxity-Beighten's criteria





Pathological progression

-Achilles contracture

-Saggital plane motion occur more at STJ rather ankle joint

-Later fibular- calcaneal impingement

-Finally, deltoid attenuation causing valgus ankle.

Radiology





Radiological assessment (For planning the treatment)

Coronal plane

View : Hindfoot alignment

Variable: Tibio-calcaneal angle

Normal : 0-5 deg valgus





Tranverse plane

View : Foot AP weight bearing

Variables:

1.Talonavicular coverage angle(TNC)

Normal : 0-7 deg

2.Talus 2nd metatarsal angle(T2MA)

Normal: <16 deg





Saggital plane

View : Foot lateral

Variables:

- 1. Dorsal curve
- 2. Lower border of navicular
 - and medial cuneiform.
- 3. Talar declination angle

Normal: 20-25 deg





Saggital plane cont.

4. Meary angle

Normal: -4 to +4 deg

5. Talocalcaneal angle

Normal 25 to 45 deg

6. Calcaneal Pitch

Normal: 20-30 deg





Also look for

Lateral view

- Spur on talus neck(Lateral view)
- Short talar neck(Lateral view)
- TalocalcanealCoalition(Ring or C sign)
- Calcaneo-navicular coalition (Anteater sig

Medial Oblique view

Calcaneo-navicular coalition(Medial Oblique view)









Pediatric Flexible flat foot

- Do we need to treat?
- Do we need to look deeper?
- What if instability is allowed to be continued?



Foot alignment

Q. Can we be confident of painfree adulthood?





Early 40s

Asymptomatic Teenager Early 70s

Slide courtesy: Dr Ratna Johari, Mumbai





Slide courtesy: Dr Ratna Johari, Mumbai



Foot and Pelvis

> Hum Mov Sci. 2011 Jun;30(3):566-73. doi: 10.1016/j.humov.2010.11.011. Epub 2011 Apr 2.

Effects of calcaneal eversion on three-dimensional kinematics of the hip, pelvis and thorax in unilateral weight bearing

Hiroshige Tateuchi 1, Osamu Wada, Noriaki Ichihashi

Induced hyperpronation of foot initiates a segmental chain reaction, shank and thigh as mediators- leads to anterior pelvic tilt



The Relationship Between Foot and Pelvic Alignment While Standing

> by Sam Khamis¹, Gali Dar², Chava Peretz¹, Ziva Yizhar³

> > the

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Gait & Posture

The mechanical relationship between the rearfoot, pelvis and low-back

Karine Duval ^{a, b} 兴 四, Tania Lam ^{a, b}, Dave Sanderson ^a

posterior tional tendon dysfunction

tioiai tenuon

Slide courtesy: Dr Ratha Johari, Mumbai D Vanni, F G Usuelli, M Guelfi, V Salini

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Kenichiro Arai ¹¹, Stacie I Ringleb, Kristin D Zhao, Lawrence J Berglund, Harold B Kitaoka, Kenton R Kaufman



OR

- Vast majority of flat foot during childhood will become normal foot during adulthood
- A sizeable no. with persistent flat foot during adult hood will behave as normal foot

• There are studies which says no disabilities



Eastern Mediterranean Health Journal, Vol. 12, Nos 1/2, 2006

Flat foot among Saudi Arabian army recruits: prevalence and risk factors M.M. Abdel-Fattah,¹ M.M. Hassanin,² F.A. Felembane² and M.T. Nassaane²

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Army Foot Survey. An Investigation of Foot Ailments in Canadian Soldiers. By Colonel R. I. Harris, M.C., R.C.A.M.C., and Major T. Beath, R.C.A.M.C. 8^{1/2} × 11 in. Pp. 416, with 114 illustrations and many charts, etc. In typescript. 1949. Ottawa : National Research Council of Canada.

<u>No disability or</u> <u>complaints</u>

Arch Height and Lower Limb Pain: An Adult Civilian Study

Molly T. Hogan M.D.*, Lynn T. Staheli, M.D. First Published January 1, 2002 | Research Article | Find in PubMed

https://doi.org/10.1177/107110070202300108



Confused?

Don't worry- Every one is

• There is no long term prospective studies in the natural history of untreated FFF in regard to development of pain



Foot at risk

Spontaneous Improvement of Radiographic Indices for Idiopathic Planovalgus with Age

December 2013 · <u>The Journal of Bone and Joint Surgery</u> 95(24):e1931-8

> J Bone Joint Surg Am. 1988 Mar;70(3):407-15.

Measurements on radiographs of the foot in normal infants and children

R Vanderwilde ¹, L T Staheli, D E Chew, V Malagon

MLA development rapid in the first 5 years of age

 Lateral talus – first metatarsal angle demonstrates a decrease in the amount of plantar sag of the midfoot until 8 years of age

Slide courtesy: Dr Ratna Johari, Mumbai

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Development of the Child's Arch

Nathaniel Gould, M.D., *‡ Morey Moreland, M.D., * Richard Alvarez, M.D., * Saul Trevino, M.D., * and James Fenw Burlingt See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/44691698

Are the feet of obese children fat or flat? Revisiting the debate

Article in International Journal of Obesity - January 2011 DOI:10.1086/jo.2010.119-Season Publied

- 75 obese / 75 non obese
- Analysis- age 6



- All- irrespective of their BMI, displayed a midfoot plantar fat pad
- Thickness of this fat pad ranging from 2.9 to 6.9 mm.
- Plantar fat pad does not disappear in the juvenile foot after developmental changes in the medial arch contour (contrast to speculation in literature)

Slide courtesy: Dr Ratna Johari, Mumbai



> Foot (Edinb). 2008 Sep;18(3):142-9. doi: 10.1016/j.foot.2008.03.003. Epub 2008 May 19.

What is the best method for child longitudinal plantar arch assessment and when does arch maturation occur?

Andrea Naomi Onodera ¹, Isabel Camargo Neves Sacco, Eliana Harumi Morioka, Priscila Saraiva Souza, Márcia Regina de Sá, Alberto Carlos Amadio

- Multiple footprint indices
- Maturation MLA continues after 6 years of age,
- Slower velocity until 10 years of age
- At which time the **majority** of the children's footprints had reached 'normal', with minimal variation

Slide courtesy: Dr Ratna Johari, Mumbai



What are the limitations/risks with observation?

Q. Wait – till when?

Do we wait till development of pain for misaligned feet?

Q. Imbalance of forces and impact on cartilage?







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Pediatric Foot at risk

- Symptoms including pain while walking or standing,
- postural fatigue, or
- Cramping sensation in the foot or arch.
- Night cramps, lower back or knee pain, or sedentary preference may
- TA contracture
- "Significant malalignment"

Significantly Abnormal Radiological angles

ORTHOPEDIC EXCELLENCE IN FOOT CARE

Orthosis :

• Can something below the

calcaneus realign and stabilize the

bone above it?

• Evidence? Zero









Exercise

• Foot spiral dynamic exercise





Really?

- What is this going to do?-Deformity is internal
- Is there any evidence ?
- The muscles are already working hard, are we going to suggest to work them harder?
- Calf stretch has positive effects but pathology doesn't change



Non- surgical interventions: Current evidence

Too scarce to result in definitive conclusions about

the non-surgical interventions for pediatric flatfoot



Foot and Ankle Surgery olume 26, Issue 4, June 2020, Pages 449-456

Does the long-term use of medial arch support insole induce the radiographic structural changes for pediatric flexible flat foot? — A prospective comparative study

Jun Young Chesi, Dong Joo Lee, Seung Joo Kim, Jin Soo Suh 🔍 🕮



ANALE

Trusted evidence. Informed decisions. Better health.

RESEARCH ARTICLE

The effectiveness of non-surgical intervention (Foot Orthoses) for paediatric flexible pes planus: A systematic review: Update

Sindhrani Dars*, Hayley Uden, Helen A. Banwell, Saravana Kumar

School of Health Sciences, Sansom Institute for Health Research, University of South Australia, Adelaide, Australia

Slide courtesy: Dr Ratna Johari, Mumbai

Surgical Options



- Extra Osseous talo tarsal stabilization
- Lateral column lengthening
- Medial displacement calcaneal osteotomy
- Cotton osteotomy
- Soft tissue procedures- TAL/Strayers



Gastroc Recession



Tripple Hemisection of Achilles







Cotton's Osteotomy

Dorsal open wedge osteotomy

of medial cuneiform

- Reserved for fixed forfoot supination
- Appearance of arch gets better.





Extra Osseous talo Tarsal Stabilization











Our Approach should begin with a conservative reversible option, prior to a irreversible more aggressive procedure.



Thank You



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Delhi Foot

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