# SHORT FEMUR LENGTH

## FOR EFW WORKING GROUP- NOV 2019

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# Background

- FL is only routine long bone measurement
  - *Many scanning guidelines recommend the systematic documentation of the presence and symmetry of all extremities*

- Considerations short FL in mid-second trimester
  - Normal variant greater majority ( ~ two-thirds)
  - Significant FPR up to 13% noted on re-measurement
  - Fetal growth restriction
  - Aneuploidy, Skeletal Dysplasia
  - Other

# Hypothesis : Why Short FL in mid trimester?

- Etiologies are likely multifactorial
- Some Hypothesis include:
  - Early adaptive response to chronic hypoxia and placental dysfunction
  - Disorder of vascular origin such as pregnancy induced hypertension or pre-eclampsia
  - Alteration in secretion of growth factors
  - FGF (fibroblast growth factor) receptor may be altered

# Define short FL

- Short FL
  - Definition is below the 5th percentile which roughly corresponds to below the -2SD
  - Prospective Danish population study, the 5th percentile corresponded to the mean minus 1.645 SD, led authors to suggest that cutoff value closer to -2 SD instead of the 5th percentile should be considered to minimize overdiagnosis
    - Isolated short FL at the 2nd mid-trimester anatomic scan associated with a higher risk of chromosomal anomalies, in particular trisomy 21, and a higher risk for delivery of a small for gestational age infant and early preterm delivery
- Markedly shortened FL
  - In Kurtz et al a markedly short FL (≥5 mm below the -2 SD line [equivalent to >-4.3 SD]) was associated with a high likelihood of a skeletal dysplasia, whereas a mildly shortened FL (within 4 mm of the -2 SD line [between -2 and -4 SD below the mean]) in combination with normal interval growth was unlikely to be associated with skeletal dysplasia

Association of isolated short femur in the mid-trimester fetus with perinatal outcome. Weisz B, David AL, Chitty L, Peebles D, Pandya P, Patel P, Rodeck CH Ultrasound Obstet Gynecol. 2008;31(5):512. Usefulness of a short femur in the utero detection of skeletal dysplasias. Kurtz et al. Radiology 1990;177(1) 197.

# Short FL – Non-Isolated

- Literature is limited to retrospective studies
- Isolated short FL is associated with FGR
  - *40% Papageorghiou, 2008*
    - *Details: <5th percentile, Severe IUGR defined as AC < 5th percentile with abnormal UA Doppler requiring delivery before 37wk*
    - *High risk severe IUGR requiring PTB accompanied by PET in 1/3*
    - *Short FL and association of aneuploidy depend on prevalence, thus this population which had all NT found no isolated cases with T21*
    - *Non-isolated short FL were 1/3 of this group*
  - *39% Todros 2004*
    - *Details: < 10%ile, retrospective 86 cases with overall 32.5% normal, 46.5% structural abnormality, 21% SGA*
  - *43% Vermeer 2013*
    - *Details: < 5th percentile,, 112 cases with 78% isolated short FL*
    - *Non-isolated 6 aneuploidy, 12 MFA, 1 genetic*
    - *Isolated 43% IUGR with LR 1.2*

# Isolated Short Femur

D'ambrosio, Valentina, et al. "**Midtrimester isolated short femur** and perinatal outcomes: A **systematic review and meta-analysis.**" *Acta obstetricia et gynecologica Scandinavica* 98.1 (2019): 11-17.

- Singleton pregnancies 18-28 weeks with **isolated short** FL <5th percentile
- 6 retrospective studies, total 3078 cases, control of 222,303 (normal FL)
  - **14.2% IUGR or SGA prevalence vs 5.2% controls, odds ratio ~ 4x**
    - 438/3078
  - Higher incidence low BW 22.10% vs control group: 8.57%, odds ratio 3.24
  - Higher incidence of low APGAR, fetal demise, NICU admission, neonatal death
- Conclude:
  - Significant association short FL, IUGR, SGA & adverse perinatal outcome
  - Conservative counsel as 61% normal outcome
    - Consider closer monitor maternal BP, increase fetal surveillance
    - If placental dysfunction Doppler may aid distinguish “inherent short FL” vs at risk group
    - Need larger prospective trials
      - Limitations: sample size study group 1.4%; although same definition short FL used different biometric charts
      - Could not exclude entirely other reasons for referral

# Next Steps:

- Review maternal/parental history, serum tests & markers FGR
- Re-measure to confirm short FL ( 13% FPR)
- Measure all long bones
- Define pattern over time ( 3-4 weeks)
  - Normal interim growth albeit along line below normal percentiles but along same growth curve may be constitutional
  - If FL over this interval falls further from the mean, consider severe FGR or skeletal dysplasia
  - Mildly shortened femur is between -2D and -4SD below mean for GA
  - Markedly shortened femur is > 4 SD below mean for GA higher association with skeletal dysplasia

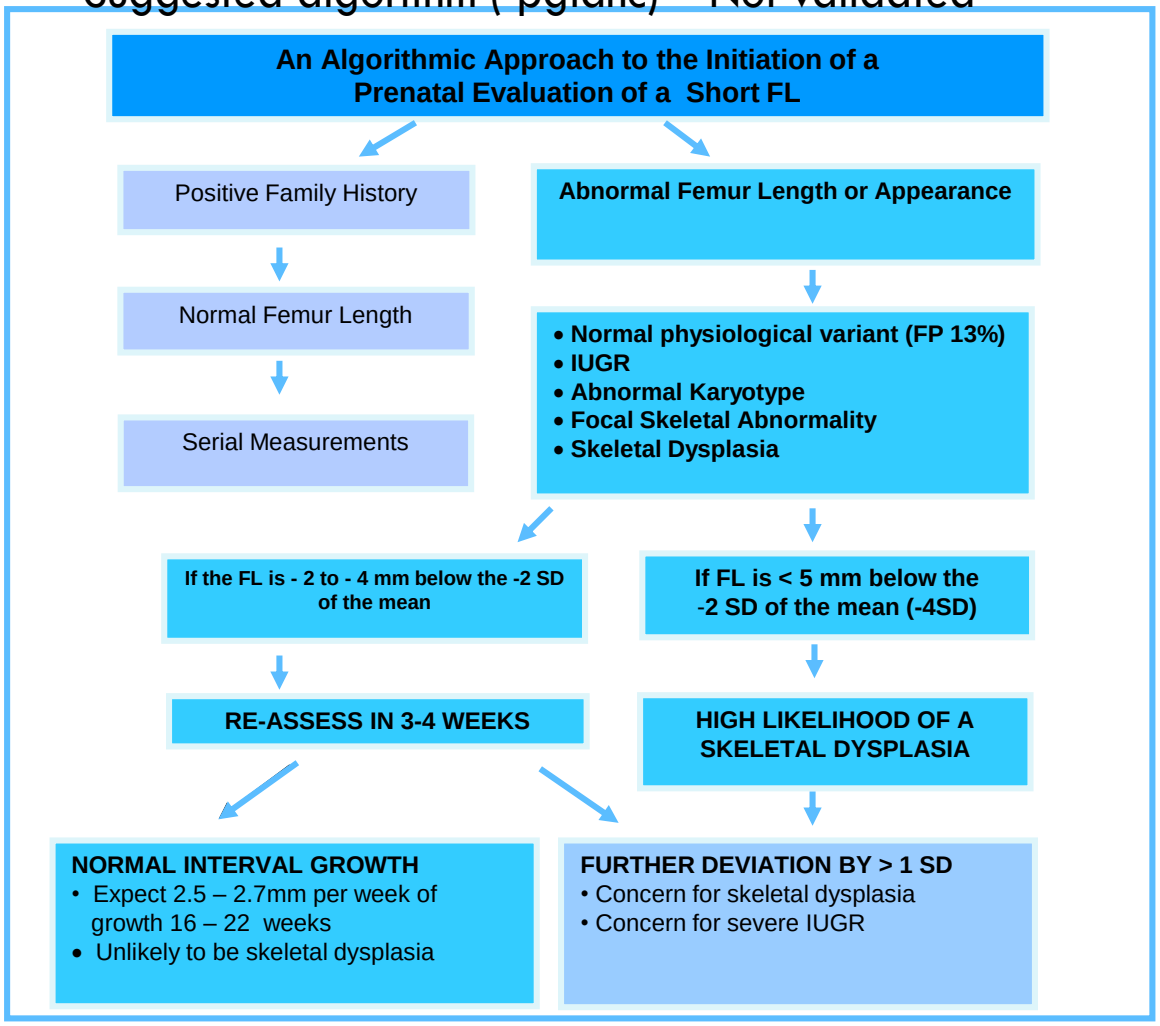
Consider referral to center with expertise

https://www.uptodate.com/contents/approach-to-prenatal-diagnosis-of-the-lethal-skeletal-dysplasias?search=lethal%20skeletal%20dysplasia&source=

# Conclusions: Isolated short FL at time mid-second trimester study

- Associated with an increased risk SGA, IUGR, adverse perinatal outcome in the range of 3-4x
- Consider increased surveillance for maternal hypertension and fetus well being
- Need larger prospective trials to refine our algorithms and management protocols

# Suggested algorithm ( pglanc) – Not validated



General Reference

https://www.uptodate.com/contents/approach-to-prenatal-diagnosis-of-the-lethal-skeletal-dysplasias?search=lethal%20musculoskeletal&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1#H478122598

# THANK YOU.

Please address questions and/or referrals pertaining to potential fetal skeletal dysplasia to phyllis.glanc@sunnybrook.ca