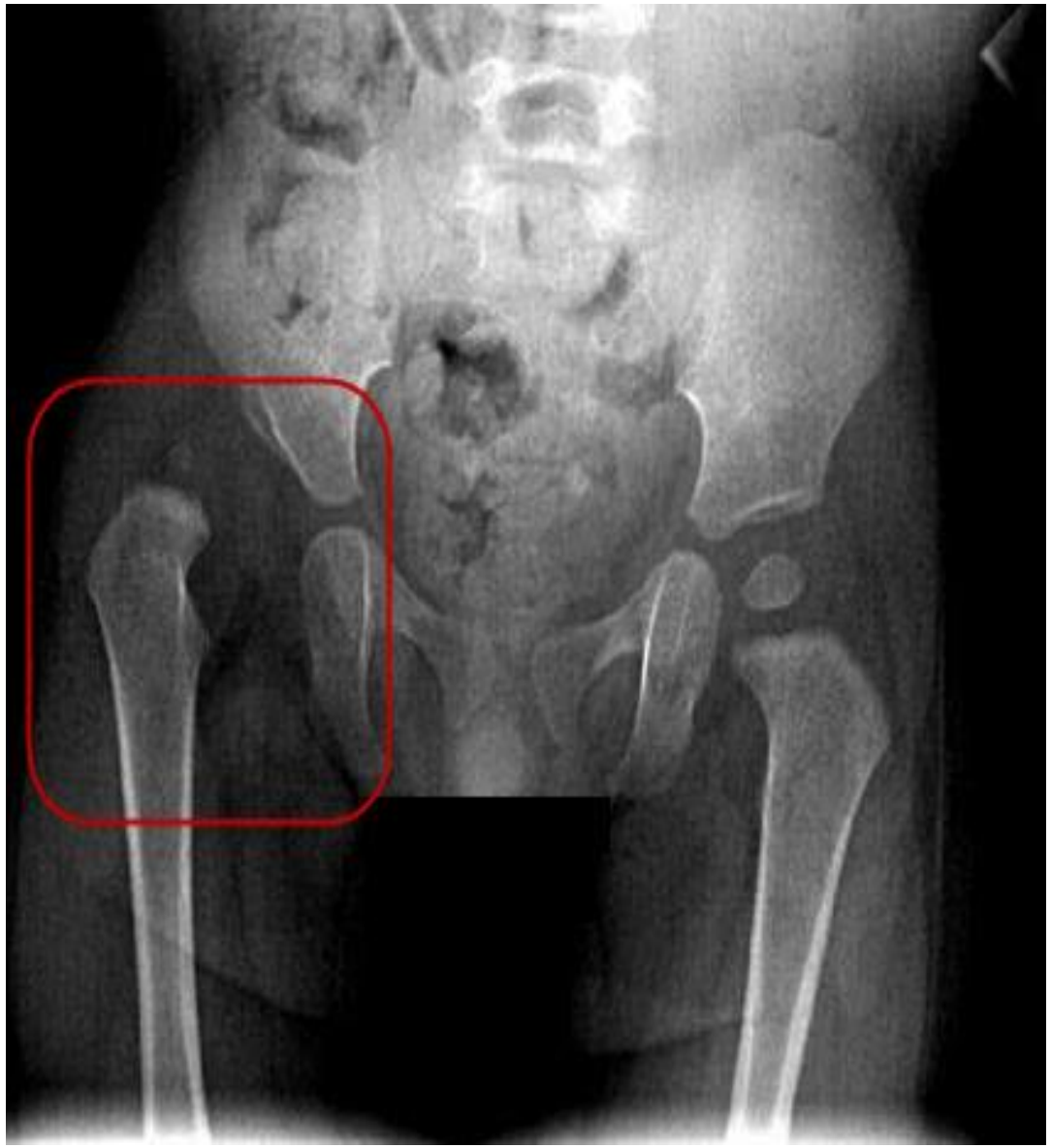
C25- Hip Dysplasia in Infants



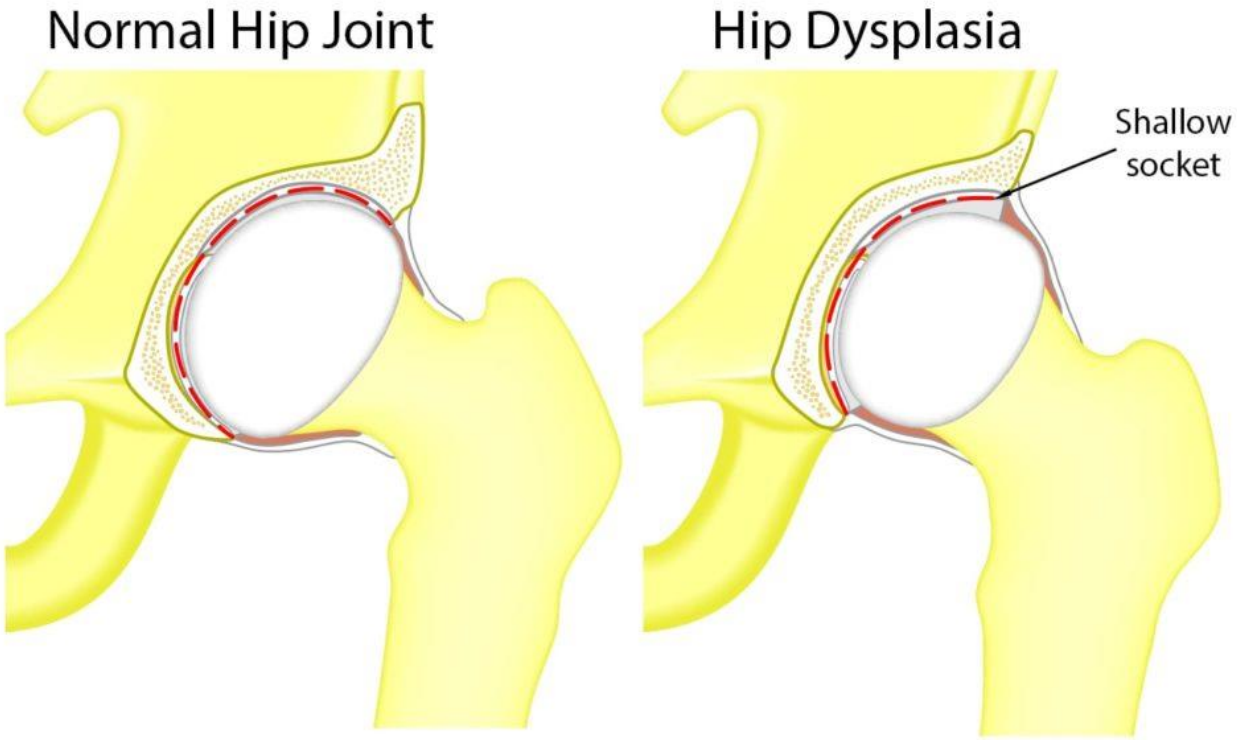
X-ray Screening - International Hip Dysplasia Institute. (2020, August 10). International Hip Dysplasia Institute . https://hipdysplasia.org/x-ray-screening/

Objectives

- Define what is hip dysplasia and how is it diagnosed?
- Risk factors are associated with the development
- Discuss what imaging is used in the diagnosis process
- Treatment options available for hip dysplasia

What is Hip Dysplasia

- Also known as **DDH-Developmental Hip Dysplasia**
- Occurs when the acetabulum doesn't develop properly and is too shallow to cover the femoral head
- It is not just a congenital malformation but also a developmental disturbance
- If left untreated it can lead to arthritis in the hip and affect knee and ankle as well.

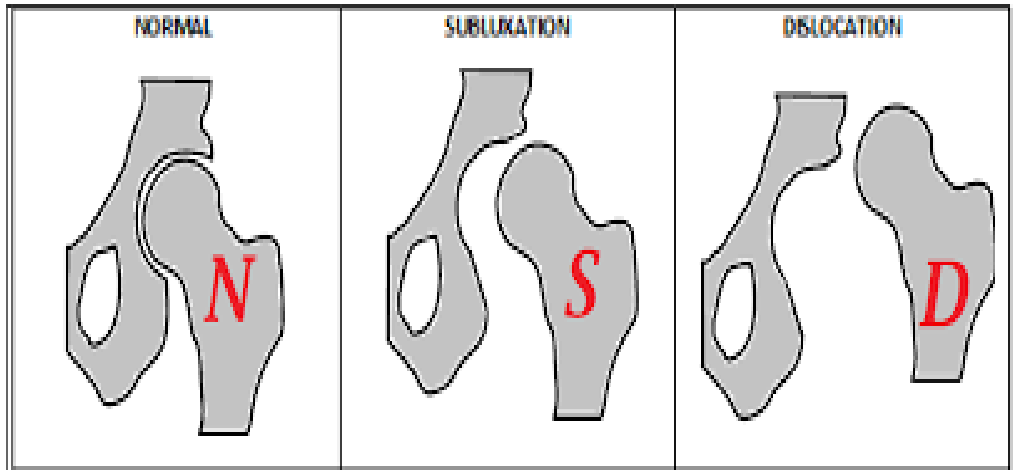


Kennedy, A. (2022, May 9). *All About Hip Dysplasia*. Advanced Ortho and Spine. https://advancedorthoandspine.com/orthopaedics/all-about-hip-dysplasia/

Subluxation vs Dislocation

Dislocation- the complete (100%) loss of articular congruity, no part of the articular surfaces of the bones contributing to the joint are touching each other (Glick, 2019)

Subluxation- the partial (<100%) loss of articular congruity, some part of the articular surfaces of the bones contributing to the joint are touching each other (Glick, 2019)



Developmental-Dysplasia-of-the-Hip – OrthoPaedia. (n.d.). https://www.orthopaedia.com/developmental-dysplasia-of-the-hip/

Maneuvers used in suspected cases

- Typically performed in pediatrician offices
- 2 different maneuvers can be used to identify hip instability and dislocation
  - **Ortolani maneuver-”**Clinicians will feel a jerk or clunk if the hip is dislocated. However, "hip clicks" are clinically” insignificant without instability (Nandhagopal et al, 2024)
  - **Barlow maneuver-** A clunk or jerk is felt if the hip can be dislocated. This maneuver should be performed gently, as forceful adduction can cause instability (Nandhagopal et al, 2024)
- If abnormal findings are concluded the patient will have imaging to confirm the diagnosis.

Imaging Used

- Ultrasound
- X-ray
- CT- Computed Tomography
- MRI-Magnetic Resonance Imaging

Ultrasound

- Ultrasound is used on babies up until 3 months who have not developed femoral epiphyses. Once developed ultrasound can no longer provide complete information (Bankaoğlu, 2019).
- Used to visualize acetabular dysplasia, hip dislocation, femoral head anatomy.
- To identify femoral head coverage by the acetabulum, a minimum of 50% and depth of the acetabulum known as the alpha angle. An alpha angle that is greater than 60˚ is considered normal. Are typically used on newborns to 4 months (Nandhagopal, et al, 2024).

X-Ray

- Used for children 6 months and older, x-rays are typically used to aid in the diagnosis since femoral head nuclei usually appear from 4-6 months. There are a multiple different lines that are used within the pelvis to determine abnormal hip findings.

    - Hilgenreiner line- A horizontal line through the right and left triradiate cartilage; the head of the femur should be inferior to this line (Nandhagopal, et al, 2024)
    - Perkin line - Perpendicular line to the Hilgenreiner line through a focus at the lateral side of the acetabulum. The femoral head should be medial to this line (Nandhagopal, et al, 2024).
    - Shenton line- A Smooth arc that connects the femoral neck to the superior margin of the obturator foramen. Any disruption indicates an abnormality (Nandhagopal, et al, 2024).
    - Acetabular index-The intersection between the Hilgenreiner line and a line drawn tangential to the lateral ossific margin of the roof of the acetabulum. The standard index is <35° at birth and <25° at the age of 1 year. (Nandhagopal, et al, 2024)
    - The center- edge angle of Wiberg-Formed by the Perkin line and a line coming from the femoral head's center to the acetabulum's lateral edge. This measurement is reliable in patients older than 5 years old. (Nandhagopal, et al, 2024)

CT

- Shows detailed images of the hip to help assess the shape of the bones and joints
- “CT is more commonly used postoperatively after the patient has been placed in a cast to define the success of reduction” (Starr, et al, 2014).
- Capability to investigate the conformity of the femoral head to the acetabular cavity, the lack of any deterioration in image quality in cases of plaster cast fixation, and the ability to measure rotation angles. (Bankaoğlu, 2019).
- As seen in the figure 1 “Postoperative CT image was obtained to evaluate relocation of left hip after iliac and femoral varus osteotomy” (Starr, et al, 2014).

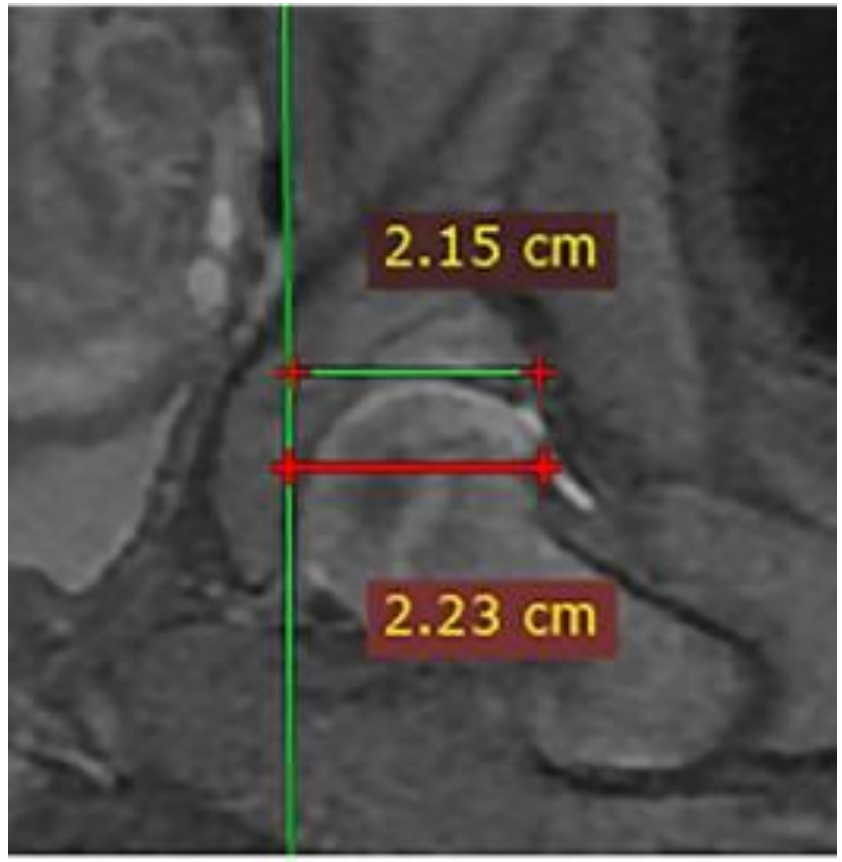
Figure 1

Starr, V., & Ha, B. Y. (2014). Imaging Update on Developmental Dysplasia of the Hip With the Role of MRI. *American Journal of Roentgenology*, *203*(6), 1324–1335. https://doi.org/10.2214/ajr.13.12449

MRI

- No radiation exposure required
- Best imaging to evaluated the soft tissue and joints
- Most commonly used for post-reduction images to evaluate the change and development after braces and casts have been used.
- As seen in figure 2 ”Measurement of cartilaginous acetabular head index. Measurement of cartilaginous acetabular head index (CAHI) of the affected hip in a DDH patient after close reduction and spica casting: on the FS PDWI coronal image showing the maximal diameter of the femoral head, a vertical line was drawn from the innermost edge of the femoral head cartilage, the distance between the line and a line perpendicular to the outermost edge of the acetabular cartilage was measured, and another distance between the line and a line perpendicular to the outermost edge of the femoral head cartilage was also measured “ (Meng, et al, 2021).

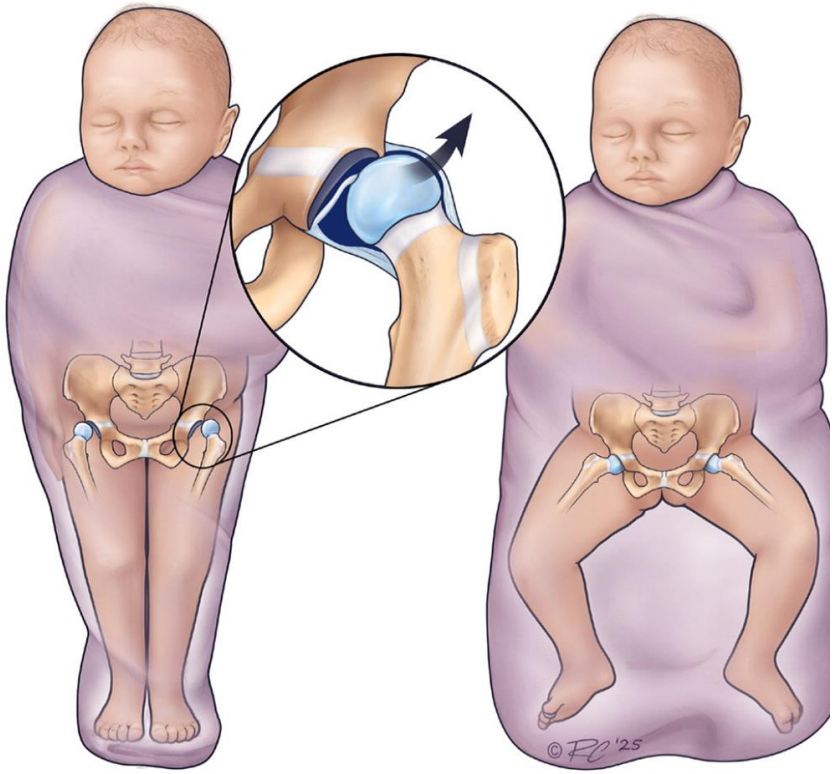
Figure 2



Meng, X., Yang, J., & Wang, Z. (2021). Magnetic resonance imaging follow-up can screen for soft tissue changes and evaluate the short-term prognosis of patients with developmental dysplasia of the hip after closed reduction. *BMC pediatrics*, *21*(1), 115. https://doi.org/10.1186/s12887-021-02587-2

Risk factors

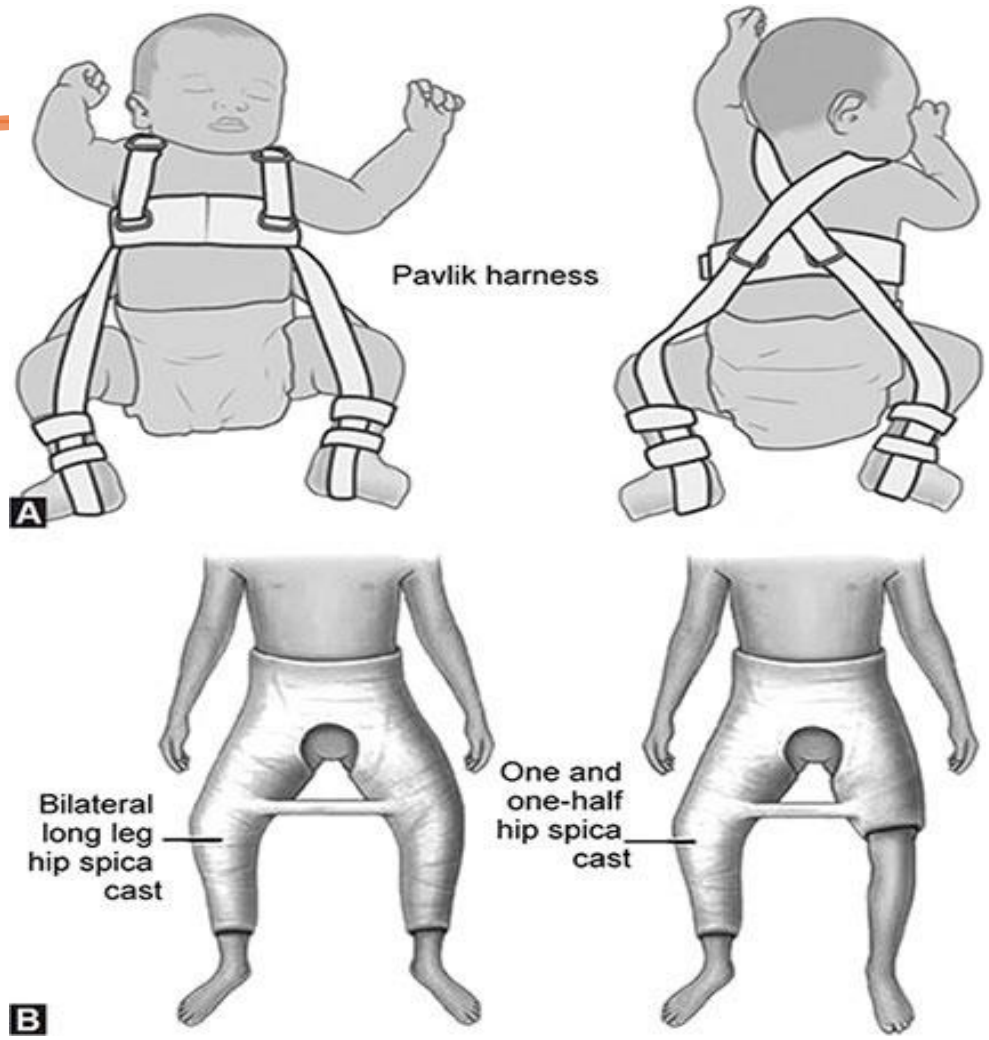
- Swaddling infants in the adducted and extended position
- Family history of hip dysplasia
- In utero restriction
- Breech position in the last trimester
- Gender- girls are 2-4 times more likely to develop than boys
- Post-term gestation
- First born child



Kim, A. R., Kim, K. P., & Covey, C. J. (2025). Developmental Dysplasia of the Hip. *American Family Physician*, *112*(5), 546–552. https://www.aafp.org/pubs/afp/issues/2025/1100/hip-dysplasia.html

Treatment Options

- Pavlik harness is the most common treatment option but it does require frequent clinical follow up and follow up imaging.
- “Patients with DDH between 6 and 24 months or with failed Pavlik harness treatment within 6 months are treated with either conservative or surgical treatment modalities, such as closed reduction (CR) with spica casting and femoral osteotomies. CR and spica casting are the most utilized conservative treatment” (Meng, et al, 2021)
- Surgery is always the last resort when the harnesses have failed with the combination of open reduction with femoral/ pelvic osteotomy (Gulati, 2013)



Parul Datta. (2017). *Pediatric Nursing (As Per Inc Syllabus)*.

Conclusion

- The diagnosis of hip dysplasia can have both congenital and developmental delays.
- Can cause arthritis if not treated and lead to other problems within the lower extremity.
- Ortolani and Barlow maneuvers can be utilize in suspected cases of HHD and imaging such as, Ultrasound, X-ray, CT, MRI will be used to confirm the diagnosis.
- Many risk factors are associated with hip dysplasia
- The Pavlik harness is the most common treatment option. While surgery can be performed it is typically the last resort.

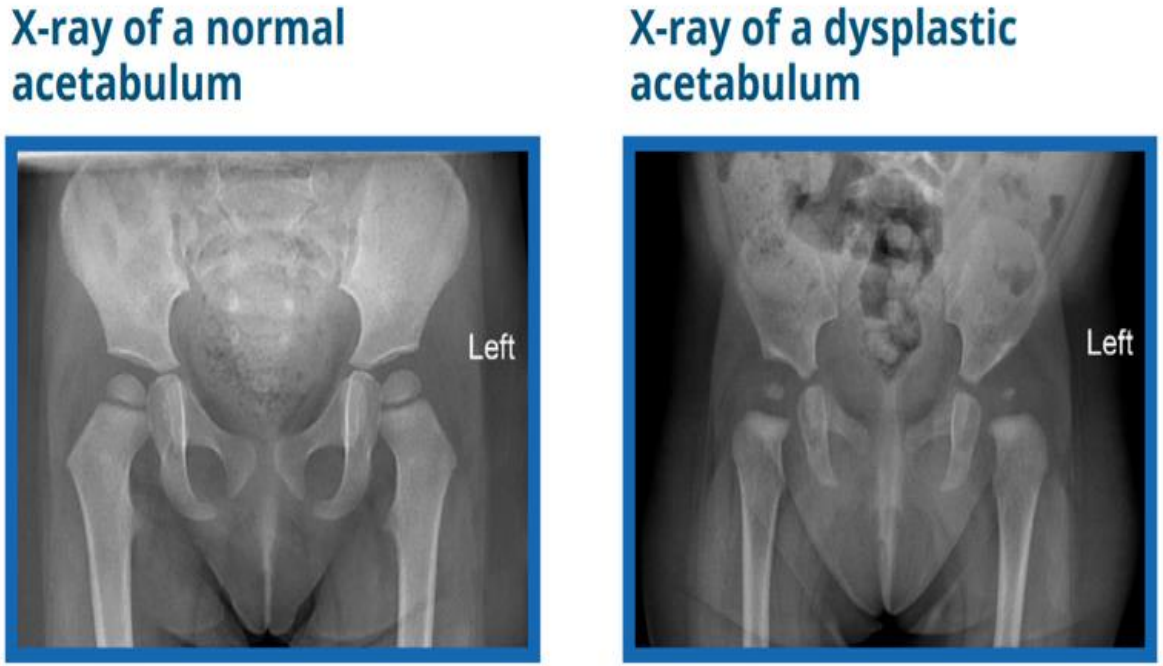


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Image References

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