

## **Developmental Dysplasia of the Hip**

Developmental dysplasia of the hip (DDH) or otherwise known as congenital dislocation of the hip (CDH) is a developmental (ongoing) process, which can often go undetected at birth. At birth every child undergoes range of motion assessment of the hips to identify the presence of this condition. When undetected at this time it may manifest itself in an altered gait pattern or pain in another region, which has over taken in a compensatory manner. The origin can be subdivided into **physiologic** and **mechanical**.

### **Aetiology**

#### **Physiologic**

The majority of DDH births have ligamentous laxity, this predisposes to hip instability, which can result in the associated dislocation. Maternal hormones (relaxin) at the time of birth are thought to further aggravate this environment.

There is a strong familial link where the incidence is reported to be as high as 6-17%, male-female if one parent had the condition. The risk to the next child can rise to as much as 40%.

#### **Mechanical**

Environmental factors such as the position the hips develop and mature in can result in DDH. Breech presentations, first pregnancies and in utero posture/pressure are considered high factors in this condition.

#### **Prevalence**

It is more commonly present in females with a ratio of: 9:1 Female: Male

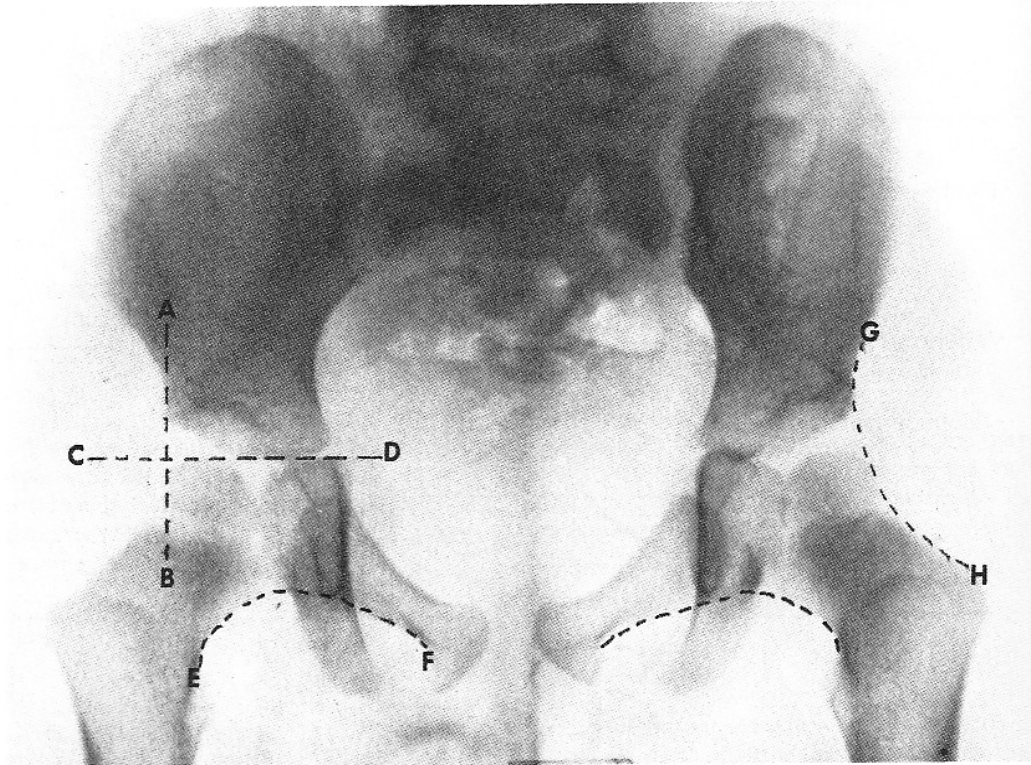
It is present in higher percentages in families of Italian, Israeli or Japanese decent although no significant cause has linked them. It is also present in higher percentages amongst Marfan's and Ehlers- Danlos syndromes thought to linked with the soft tissue laxity allowing a less secure bony environment and hence the increased incidence of dislocation/subluxation.

### Clinical signs

1.	Restricted abduction and external rotation of the hip/s. (less than 60 degrees)
2.	There are accentuated and asymmetric skin folds on the buttock and posterior aspect of the thigh.
3.	Galeazzi's sign. Child lies supine with hips/knees in a flexed position with feet on the couch. If the knee level is asymmetrical this is a positive Galeazzi's sign. In cases of bilateral involvement this sign is absent.
4.	Barlow's maneuver. This test can dislodge the hip from the acetabulum when found to be positive. It is considered unethical and inadvisable by many, although still practiced. It involves: from a supine position, a downward pressure placed on a flexed hip and knee in the direction of adduction, internal rotation combined with laterally directed pressure.
5.	Ortolani's sign. The child lies supine with the hips and knees flexed. The thigh is lifted anteriorly then and abduction/external rotation force is applied. A positive sign creates a CLUNK noise representative of the head of the displaced femur moving into contact with the acetabulum.
6.	If missed at birth it may manifest itself in the older child in the form of a positive trendelenburg sign or trendelenburg gait or abductory lurch.

Valmassy (1996:pp234-235)

## Diagnostics



**Figure 11.2** Normal hips of a 2-year-old child. Note: (1) Proper position for femoral epiphysis is in lower inner section of quadrant *AB-CD*, (2) Shenton's line *EF* is a natural unbroken curve, (3) normal curve *GH* from ilium to femur (4) symmetrical and equal size of femoral heads, and (5) normal cupping and formation of acetabular cavities.

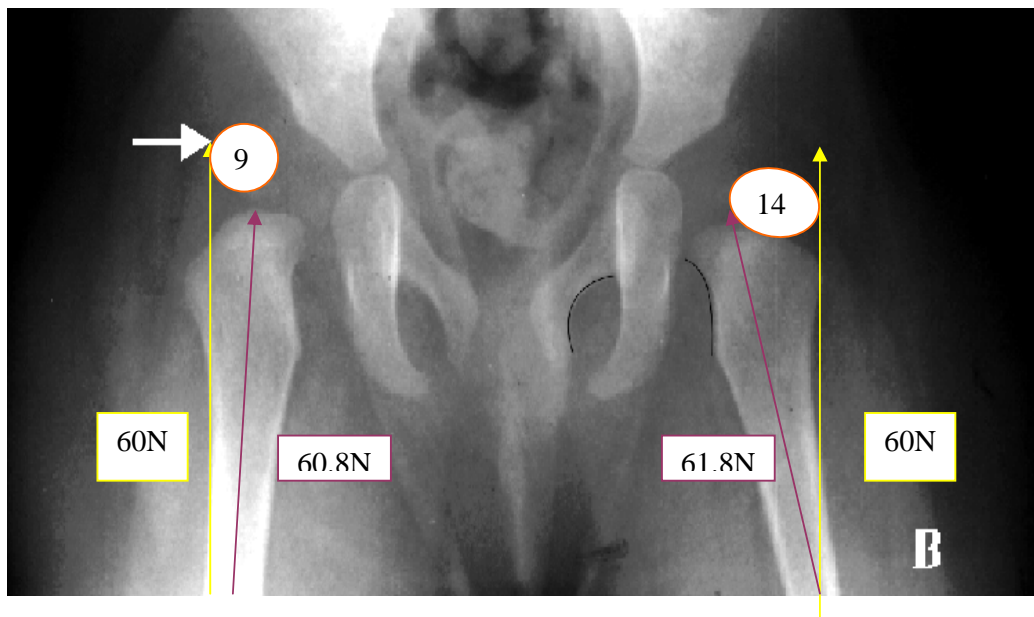
Tax (1980:pp156-157)

When clinical examination highlights the likelihood of this condition it is further checked with x-ray or ultrasound to confirm diagnosis. The normal presentation and checks are on the above picture. To reduce early exposure to X-ray ultrasound is now the preferred choice of diagnosis. It has been suggested among the paediatric field, that diagnostic scanning should be performed on cases at high risk of DDH even if they passed the clinical examination.

### **Biomechanical environment**

A joint's stability is its resistance to displacement. It is dependent on: the shape of the structure; its ligamentous arrangement; other support mechanisms like fascia tendon and aponeuroses and muscular contractions. Excessive mobility can sacrifice important stability. Bartlett (1997:pp27-28).

In this case of DDH where surgeries may need to be performed, it is necessary to assess and approximate these forces. Combining information from scans, angles measured from X-ray, Childs weight and bone length may reduce the likelihood of complications following these procedures. Eg the use of splints can impair the femoral head blood flow and lead to its necrosis. Pre and post surgery scan /x-ray may improve such occurrence.



<http://www.szote.u-szeged.hu/izulet/aizul3a.htm>

↑ Ground reactive force

↑ Femoral shaft reaction force

○ Angle between midline of femoral shaft and ground reaction force

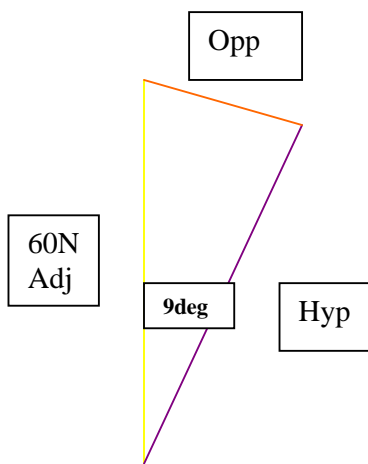
Prepared by Elaine Yule  
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Assuming this child is walking and that equal weight is going down each leg the following calculation can be made. If this child had presented to the clinic with an altered gait pattern or pain there would possibly be unequal weight distribution down each limb. Two sets of scales placed under base and angle of gait may indicate the differing loads or the F scan mat system would provide this information also.

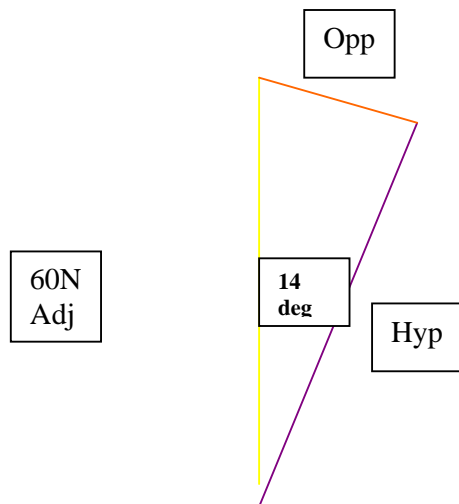
### Calculations

#### Right limb



Cosine Rule:  
 $60 = \text{Hypotenuse} \times \cos 9$   
 Therefore:  
 $\text{Hypotenuse} = 60 / \cos 9 (0.98)$   
 $= 60.8\text{N}$   
 =====

#### Left limb



Cosine Rule:  
 $60 = \text{Hypotenuse} \times \cos 14$   
 Therefore:  
 $\text{Hypotenuse} = 60 / \cos 14 (0.97)$   
 $= 61.8\text{N}$   
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**Reference:** Bartlett, R. (1997) Introduction to sports Biomechanics. New York.E&FN Spon.

Tax, HR. (1980) Podopaediatrics. Baltimore, USA. Williams and Wilkins.

Valmassy, RL. (1996) Clinical biomechanics of the lower extremities. St Louis, Missouri, USA. Mosby Inc.