



REVIEW ARTICLE

Dysplasia in the development of the hip[☆]

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Abstract Developmental dysplasia of the hip (DDH) causes anatomical changes that cause early coxarthrosis. Although risk factors have been determined, the aetiology and physiopathology remains exactly unknown. Neonatal screening with physical examination and ultrasound have been established in order to diagnose this disease early in life. A diagnosis in the first months of life is essential as it enables a normal hip to form and prevent the appearance of early coxarthrosis. Treatment principles are to be able to reduce the hip without provoking avascular necrosis of the femoral head, and to normalise the acetabular development. Knowledge of the orthopaedic and surgical options is essential in order to achieve success in the treatment.

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Displasia del desarrollo de la cadera

Resumen La displasia del desarrollo de la cadera provoca cambios anatómicos que dan lugar a una coxartrosis precoz. La etiología y la patofisiología de la displasia de cadera no se conocen con exactitud, aunque se han determinado factores de riesgo. Se han establecido programas de despistaje neonatal clínicos y ecográficos que lleven a un diagnóstico precoz de esta afección. Un diagnóstico en los primeros meses de vida es fundamental porque permite obtener una cadera normal y evitar la aparición de una coxartrosis precoz. El tratamiento debe conseguir reducir la cadera, evitando la aparición de una necrosis avascular de la cabeza femoral, y normalizar el desarrollo del acetábulo. Existen opciones ortopédicas y quirúrgicas que deben ser conocidas para lograr un éxito en el tratamiento.

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Introduction

The term developmental dysplasia of the hip (DDH) includes a wide spectrum of abnormalities of the acetabulum and the proximal femur, including isolated dysplasia, subluxation and dislocation of the femoral head (Fig. 1).^{1–4} In dysplasia, there is an inadequate development of the acetabulum, the femoral head or both, although there is also a concentric

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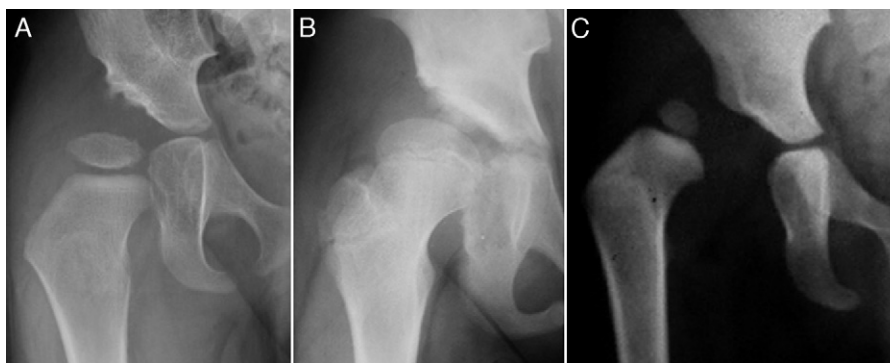


Figure 1 Anteroposterior pelvic radiograph showing acetabular dysplasia (A), hip subluxation (B) and hip dislocation (C).

relationship between the 2 articular surfaces. However, in subluxated hips, although there is contact between both articular surfaces, the femoral head is not centred on the acetabular cavity.⁵ In the case of dislocation the femoral head is completely out of the acetabulum.⁶

Anatomy

Normal hip

The hip consists of the acetabulum, the femoral head and the soft tissues comprising the joint capsule, the labrum, the *ligamentum teres* or round ligament and pulvinal tissue. The acetabulum is a hemispherical cavity formed by the acetabular cartilage, triradiate cartilage, ischium and ilium. The acetabular cartilage continues medially as the triradiate cartilage and together they form the acetabular cartilage complex.⁷ Both separate the ilium, ischium and pubis. The acetabular cartilage forms the outer two-thirds, while the triradiate cartilage, ilium and ischium form the non-articular medial third. The triradiate cartilage is responsible for the growth of the acetabulum and the innominate bone, maintaining the relationship with the growth of the femoral head.⁸ Concavity of the acetabulum is developed by the presence of the convex femoral head.⁹

Within the acetabulum we find the pulvinal; fibrofatty tissue covering its non-articular part.⁷ The round ligament (*ligamentum teres*) joins the femoral head to the acetabular floor. On the periphery of the acetabulum is the labrum, a triangular and circumferential fibrocartilage which increases the depth of the acetabulum.² The relative size of the labrum with respect to the femoral head is greater during childhood than in adult life, reflecting the importance of the labrum in hip stability during paediatric age.² The labrum is located throughout the entire periphery of the acetabulum except for the lower region, where the transverse ligament is situated. The joint capsule is inserted into the outer side of the ilium bone, immediately adjacent to the labrum.

For its part, the proximal femur is formed only by cartilage at birth. A cartilaginous isthmus connects the femoral and trochanteric growth plates along the lateral edge of the femoral neck. The ossification centre of the femoral head appears at about 6 months of age, whilst the ossification

centre of the greater trochanter does so at 5–6 years of age. There is a femoral anteversion at birth which decreases with growth. A mean femoral anteversion of 31° at 1 year of life has been described, which decreases to 15° at 16 years of age.¹⁰ The cervicodiaphyseal angle also decreases with age, going from a mean value of 136° at 1 year of life to a mean value of 127° at 18 years of age.⁴

Dysplastic hip

A series of changes of variable magnitude take place in the acetabulum, proximal femur and soft parts of dysplastic hips. These changes occur over time due to age and load supported, and involve adaptive changes in the joint. There is a flattening of the acetabulum along with an increase of the thickness of its bony floor. Pulvinal fat, round ligament, labrum and joint capsule become hypertrophied and the transverse ligament becomes inverted.³ The abnormal pressure of a dislocated or subluxated femoral head on the labrum causes hypertrophy of the fibrocartilage and forms fibrous tissue. This voluminous labrum is called limbus and is often everted and adhered to the inner side of the joint capsule.³ The labrum may also be inverted in dislocated hips, thus preventing their reduction.

In some cases there is a crest, known as neolimbus, in the posterosuperior part of the articular cartilage, which is formed by a thickening of the acetabular hyaline cartilage.³ The neolimbus appears in response to excentric pressure by the femoral head and separates 2 cavities: the innermost part corresponds to the primary acetabulum, whilst the outer part is part of the secondary acetabulum. While the primary acetabulum is hypoplastic due to the absence of stimuli from the femoral head,⁹ the secondary acetabulum, formed by the posterosuperior quadrant of the acetabulum, the everted labrum and the joint capsule, holds the subluxated femoral head.³ The neolimbus does not represent an obstacle for reduction and disappears spontaneously once the hip has been reduced.

Regarding the proximal femur, there is a shortening of the femoral neck in hip dysplasia, as well as a deformity of the head and a delay in the appearance of the secondary ossification nucleus.¹¹ Although the existence of *coxa valga* is widely accepted, some authors maintain that the opposite is true and that the proximal femur adopts an arrangement

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