Role of ultrasound in screening of developmental dysplasia of the hip joints in newborns

Essay

Submitted for partial fulfillment of

Master Degree (M.Sc.) in Radio-diagnosis

By

Mohammed Magdy Mahmoud El Banhawi

M.B.B.CH, Ain Shams University

SUPERVISORS

Prof. Dr. Mohsen El-Sayed Khalil

Professor of Radio diagnosis

Faculty of Medicine

Cairo University

Dr. Randa Kaddah

Assistant professor of Radio diagnosis

Faculty of Medicine

Cairo University

Faculty of Medicine

Cairo University

2012

Acknowledgement

*Thanks to **ALLAH**, who is always helping me in all my life.*

*I'm greatly indebted to **Professor Dr. Mohasen Khalil**, Professor of Radiodiagnosis, Faculty of Medicine, Cairo University, for detailed supervision, advices and guidance throughout the whole work.*

*My sincere appreciation goes to **Dr. Randa Kaddah**, Assisstant professor of Radiodiagnosis, Faculty of Medicine, Cairo University, for her kind supervision, valuable advices and generous help.*

Moahammed El banhawy, 2012

Abstract

The hip is at risk as the fetal lower limb rotates medially. A dislocation at this time is termed teratologic. All elements of the hip joint develop abnormally. The hip muscles develop around the 18th gestational week. Neuromuscular problems at this time, such as myelodysplasia and arthrogryposis, also lead to teratologic dislocations. During the final 4 weeks of pregnancy, mechanical forces have a role. Conditions such as oligohydramnios or breech position predispose to DDH. Postnatally, infant positioning such as swaddling, combined with ligamentous laxity, also has a role before 1970, radiological examination of the hip was based on conventional radiography, and scintigraphy. Later, computed tomography (CT) and magnetic resonance (MR) imaging were introduced, but due to the deep location of the hip joint, ultrasound (US) examination has always had a relatively limited role in the assessment of hip pathologies.

Key word: CT-MR-US- hip joints- -Technique 51

Table of contents pages

List of tables

List of figures and Tables

Page

List of Tables

Introduction and Aim of Work

Introduction

The hip is a synovial, ball-and-socket type joint formed by the head of the femur and acetabulum. The acetabulum fits tightly around the head of the femur. The hip sacrifices degree of movement for additional stability. **(Huston and Brandser, 2004)**

The term developmental dysplasia of the hip (DDH) refers to an abnormal relationship between the femoral head and the acetabulum. (**Woollacott, 2005)**

It may be congenital or may develop during infancy and/or childhood. It refers to dysplasia of the acetabulum (deficient development) or instability of the hip. **(Herring, 2002)**

It is generally accepted that the early detection of DDH can enable less invasive and potentially more effective corrective procedures (**Woollacott, 2005)**

Currently, there are a number of strategies available for early detection and treatment of DDH. Clinical screening includes ascertainment of medical history and clinical examination. Ultrasound imaging (US) techniques allows the visualization of the femoral head and acetabular cartilage at a very young age and can detect abnormal positioning, instability and dysplasia. (**Anand, et al. 2011)**

Currently the two widely accepted methods of ultrasound examination are the static method of Graf and the dynamic method of Harcke. Examination by ultrasound is indicated in infants with abnormal clinical examination or who are at increased risk for DDH. Whether all infants should be examined in a screening programs are a subject of debate. Ultrasound is more sensitive than clinical examination. **(Christopher, et al 2004)**

The use and timing of US as a screening test for infant hips is an ongoing focus for debate. Although it has become an accepted tool for diagnosis and monitoring the development and treatment of DDH, the diagnostic accuracy of US for DDH in the screening population has not been fully investigated. (**Woollacott, et al. 2005)**

Aim of work

To highlight the role of ultrasound in screening of newborns with suspicious clinical diagnosis of developmental dysplasia of hip joints.

Normal Hip Development and Anatomy of Hip Joint

Normal Hip Development

The hip joint begins to develop at about the seventh week of gestation, when a cleft appears in the mesenchyme of the primitive limb bud. These pre-cartilaginous cells differentiate into a fully formed cartilaginous femoral head and acetabulum by the 11^{th} week of gestation. If there is failure in normal embryogenesis of the hip, the consequence is a major anomaly. **(John et al, 2008).**

At birth the femoral head and the acetabulum are mainly cartilaginous, with a thin rim of fibrocartilage called the labrum. ***(Nerys et al, 2005)***.

The hyaline cartilage of the acetabulum is continuous with the triradiate cartilages, which divide and interconnect the three osseous components of the pelvis (the ilium, ischium, and pubis).The surface of the acetabular cartilage, which abuts the bone of the pelvis, is made up of epiphyseal cartilage in the shape of a hemisphere and functions as a major growth plate. Growth of this epiphysis is essential for acetabular development, and any damage to the peri-acetabular area may induce a growth disturbance. The limbus also contributes significantly to the development of acetabular depth.

The proximal femur has a complex and often misunderstood growth pattern. In the neonate, the entire upper femur is a cartilaginous structure in the shape of a femoral head and greater and lesser trochanters.

It is composed of the following structures:

1. Bone structures (femoral head and acetabulum),
2. Fibro-cartilaginous structures (acetabular labrum),
3. Cartilage layers covering the hip joint,
4. Capsular-ligamentous structures,
5. Synovial joint,
6. Muscles and tendons,
7. Synovial bursa,
8. Neurovascular structures

1-Bone structures

The acetabulum is a cup-shaped cavity located on the outside of the pelvis into which the ball-shaped head of the femur fits, and it is surrounded by a circular bone flap called the acetabular edge. Of the inner surface of the acetabulum, only the most peripheral portion, i.e. the lunate surface, is used in the articulation, while the central portion, the acetabular pit, accommodates the round ligament extended between the acetabulum and the femoral head, surrounded by adipose tissue and vascular structures.

The femoral head is round and in the center of the head there is a small depression called the fovea capitis femoris to which the round ligament is attached. It is supported by the anatomical neck which is situated at an angle of about 130^{o} to the axis of the femoral shaft in the coronal plane. At the base of the neck there are two trochanters (the greater trochanter and the lesser trochanter) where the peri-articular muscles are inserted. **(Molini, et al.2011)**