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Acetabular Development in relation to Congenital Dislocation of the Hip

Thesis Submitted for partial fulfillment of M.D. in orthopaedics

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1999

Acknowledgment

- I would like to express my sincere appreciation and gratitude to Prof. Dr. ***Galal Eldin Kazem,*** for his continuous help, encouragement and guidance.

- I am deeply indebted to Prof. Dr. ***M Osama Hegazy***, for his valuable kind supervision, constant help, and his continuous encouragement.

- I am much obliged to Prof. Dr. ***Mohsen A Mashhoor***, for his meticulous supervision and help.

- I would like to express my sincere gratitude to Dr. ***Gamal A Hosny,*** for his valuable advice, wise guidance, and constant help throughout this work.

- Lastly I would like to thank all my colleagues in ***Matareya Teaching Hospital***, for their help and assistance in collection of cases, management, and follow up.

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Introduction

Introduction

Congenital dislocation of the hip (CDH) remains one of the most difficult disorders to understand and treat in the entire orthopaedics. Congenital dislocation of the hip is often a misleading term that usually refers to any manifestation of the hip instability ranging from neonatal instability to established dislocation.

The term developmental dislocation of the hip (DDH) is now preferred over CDH since many cases have been reported in which the child examination was normal at birth and later was founed to be subluxated or dislocated. **Wenger, 1992.**

In congenital hip dislocation (CDH), the normal relationship between femoral head and acetabulum is lost and incongruity, joint instability, and acetabulum and femoral head distortion result. The articular surface deteriorates, and pain degenerative joint disease develops.

Congenital dislocation of the hip (CDH) generally includes subluxation and dysplasia as well as dislocation of the hip. The term "Subluxation" denotes

Congenital dislocation of the hip is more common in firstborn children than in subsequent siblings. The family history of congenital dislocation of the hip increases the likelihood of this condition to approximately 10%.Ethnic background plays some role in the congenital dislocation of the hip is more common in Caucasian children than in black children. Other reported examples include the high incidence among the Navajo Indians and the relatively low incidence among the Chinese. A strong association also exists between congenital dislocation of the hip and other musculoskeletal abnormalities, such as skull and facial abnormalities, congenital torticollis, metatarsal adductus and talipes calcaneovalgus. **Beaty, 1987.**

CDH is more common in some families, with **Wynne-Davies (1970)** noting that the relatives of children with hip dysplasia had lax ligaments and slightly shallow acetabulae, as compared to normal controls.

Ethnic factors play a role with an incidence of 25 – 50 cases per thousand in Lapps and North American, Indians and an extremely low incidence in Chinese and black Africans.

Development & embryology of the acetabulum

Development and embryology of the acetabulum

Undoubtedly, the stability of the hip joint is influenced by the conformation and orientation of the acetabular cavity in relation to the upper end of the femur. **Sainton** in **1893** observed that the acetabulum was a more shallow cavity at the time of birth than at any subsequent time and that stability of the joint correspondingly was more dependent at this stage on the integrity of the soft tissues. It was confirmed by anthropometric measurements that the human acetabulum was more shallow at birth than at earlier fetal life and that full cover of the femoral head was not attained until about three years of age **Tachdjian, 1982.**

The orientation of the acetabulum implies the situation of its cavity in relation to the vertical, sagittal, and horizontal planes. When measured in the anatomic position, the acetabulum usually faces a little forward (anteversion) and downward (inclination). At 11 weeks of fetal development, acetabular inclination averages 70 degrees (20degrees from the horizontal plane or cartilaginous acetabular angle),and from this period of fetal development on it remains practically constant throughout growth.

(muscular activity) or a local degenerative process **Watanabe, 1974**. It is at this period of gestation that the acetabular socket is at its deepest relative to the femoral head **Ippolito, et al., 1984**.

The peripheral nervous system develops in a cephalocaudal direction and is completely formed before active muscular contraction begins. In the lower limbs, active hip flexion and adduction (iliopsoas) are followed by knee extension (quadriceps), knee flexion (femoral biceps) and later by foot movements. **Watanabe, 1974** suggested that the hip may first be dislocatable in the 11-week old fetus because by then the joint cavity has formed and the hip flexors have become active

Appositional growth and remodelling allow the capacity, diameter, and depth of the acetabulum to increase reciprocally with the enlarging and maturing femoral head **Plaster, et al., 1991**. Growth of the acetabulum in fetal and postnatal life occurs predominantly at the triradiate cartilage. This expanding structure consists of three growth plates at the junctions of the ilium, ischium, and pubis; which fuse completely between the ages of 12 and 14 years. **O'Hara, 1989**. The lateral acetabular ring epiphysis contributes to

dysplasia, subluxation and dislocation of the hip. **Akbas et al., 1995.**

The hip joint arises as a single block of tissue at about 4 to 5 weeks gestational age. At 2 months after fertilization (30 mm crown lump length), (the end of the embryonic and beginning of the fetal period), the hip joint has been completely formed in cartilage and its blood supply established. The acetabulum is formed by the fusion of the cartilagenous ilium and ischium and these in turn by fusion with the pubis in the adult proportions of two-fifths ischium, two-fifths ilium and one–fifth pubis. By 20 weeks of gestation, the fetus is completely formed and the femoral shaft and the acetabulum are ossifying.

The femoral head and the greater trochanter remain cartilagenous and will stay in this form until 3 to 6 months postpartum when the secondary ossification center of the femoral head appears radiographically. The neck-shaft angle, angle of anteversion or retroversion, acetabular oreintation and acetabular depth all change during fetal development but normal values and relevance to congenital abnormalities are controversial subjects. The blood supply to the femoral head changes during early childhood from many small branches to