Modern Trends in Perthes' Disease

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مقدمة توطئة للحصول على درجة الماجستير في جراحة العظام

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(بسم الله الرحمن الرحيم)

قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم.

(صدق الله العظيم)

البقرة آية (32).

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LCPD	Legg-Calvé-Perthes' disease.
CE angle	Center- edge angle.
HLA	Human Leukocytic Antigen.
IGF1	Insulin-like Growth Factor.
T4	Thyroxin Hormone.
TSH	Thyroid stimulating Hormone.
TFPI	Tissue Factor Pathway Inhibitor.
ESR	Erythrocyte Sedimentation Rate.
V-line	Vertical line.
MRI	Magnetic Resonance Imaging.
CT	Computerized Tomography.
Tch-99	Technetium-99.
AP	Anteroposterior.
LCPS	Legg-Calvé-Perthes'Syndrome.

Introduction

Perthes' disease, (Legg- Calvé- Perthes' disease) is a self limiting condition of the hip in children and it is characterized by avascular necrosis that affects the ossification center of the femoral capital epiphysis which is ultimately resorbed and replaced by new bone resulting in a variable degree of deformity and restricted joint motion and this occurs during the process of revascularization and may lead to degenerative arthritis in young adult life **(1)**.

The initial credit for the description of the disease has been given by **Legg, Calvé , Perthes** and **Waldenström** . In(**1883**) **Thomas** , **Baker** , and **Wright** described patients with supposed hip joint infection that resolved without surgery that was probably Perthes' disease. In (**1897) Maydl** in Prague reported this condition and thought it was "a satellite of congenitally dislocated hip" . In (**1909)** when roentgenography became available to the clinician , **Waldenström** thought the disease was a from of "tuberculosis" . In (**1909**) **Arthur Legg** presented a paper concerning five children with a limp after injury .He published this paper in (**1910**)and called this an "obscure affection of the hip ". He thought that injury caused flattening of the head because of the pressure . In that same year **Jacques Calvé** in France reported 10 cases of a non-inflammatory , self-limiting condition that healed by flattening of the weight-bearing surface. He thought the cause of this was an abnormal or delayed osteogenesis . He saw coxa vara and increased head size , and on physical examination the patients had decreased abduction . In (**1910**) **George Perthes** in Germany reported six cases one bilateral of what he called "arthritis deformans juveniles ". He thought the case was inflammation. In (**1913**) **Perthes** was the first to describe the histology of the disease . He reported on a 9 years old boy who had symptoms for 2 years, after excising a piece of the head, he believed that this was an osteochondritis, not a tubercular process. In (**1920**) **Waldenström** suggested the term "coxa plana" to make the disease more in line with other deformities such as coxa vara and coxa valga . The first radiographic classification was proposed by **Waldenström** in (**1922**) , when he followed 22 patients until they had completed growth. From (**1923**), the disease became concerned to Perthes' disease **(2)** **(Fig.1)**.

The optimal treatment of Perthes' disease remains a challenge for the managing physician . Various treatment strategies have been used ranging from observation to surgical intervention. Regardless of the treatment modality used, the current goals are to obtain containment of femoral head within the acetabulum and to maintain a good range of motion at hip joint , to prevent deformity and incongruity of the hip and delay the onset of degenerative joint disease in later adult life **(3)**.

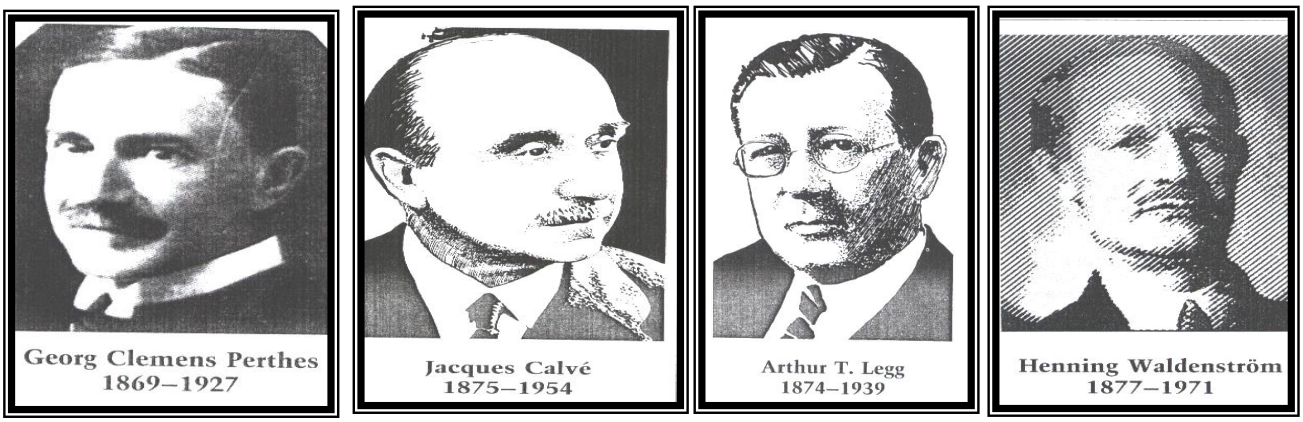

Fig.1: Georg Clemens Perthes , Jacques Calvé , Arthus T. Legg & Henning Waldenström **(4).**

Anatomy and Biomechanics Of Pediatric Hip

Vascular Anatomy

(I) Arterial supply

The arteries of femoral head have been studied by several investigators as ***Trueta*** [(5)] **,** ***Crock*** [(6)] **,*Chung*** [(7)] **and others** .

Trueta [(5)] made historical review of the vasculature of the head and neck of the human femur during growth, In his paper he mentioned notes of ***Hyrtl*** **in 1846** who mentioned that the round ligament in children had vessels that did not enter the femoral head , a belief which denied the contention by ***Palletta*** in 1820 that these vessels played an important part in supplying the femoral head .

Trueta [(5)] examined 46 specimens of the upper end of the femur during growth. He gave a concise picture of the modifications of the vasculature of the human femoral head from birth to maturation ; he concluded that , there are five main phases:-

Phase(1) At Birth : vessels coming from lateral side of the head proceed horizontally towards its medial side while other vessels emerge almost vertically from the top of the ossified shaft . Vessels are seen coming from the round ligament , but they are not constant .

Phase (2) Infantile :" from 4 months to 4 years." The predominant blood flow arises from the metaphyseal vessels crossing the area later to be occupied by the growth plate; the lateral epiphyseal vessels are also important, but there are no penetrating vessels coming from the ligamentum teres even if in the early days some large vessels are seen to enter the head from this source, they disappear .

Phase(3) Intermediate:" from about 4 to 7 years." The epiphyseal plate has established a firm barrier between epiphysis and metaphysis. The metaphyseal blood flow decreases to become negligible , or nearly so , while the round ligament has not yet provided vessels penetrating the epiphysis. During these years the only source of blood to the epiphysis comes from the lateral epiphyseal vessels, all of them tightly grouped on the lateral aspect of the head. This might explain the occurrence of Legg-Calvé-Perthes disease at this age group as the only real source , the lateral epiphyseal vessels , may become obstructed by trauma or inflammation .

Phase(4) Pre-adolescent:"9 or 10 years**".** Here , while the growth plate acts as a closed barrier to the vessels , the arteries from the ligamentum teres finally reach the depth of the epiphysis and become anastomosed to other vessels , all of which are branches of the lateral epiphyseal arteries .

Thus at this stage the epiphysis receives blood from two main sources situated at the greatest possible distance from each other .

Phase (5) Adolescence: Here, the barrier of the epiphyseal plate begins to break down and vascular anastomosis crosses over, bringing in to being the final or adult stage of the circulation, where the epiphyseal and round ligament vessels are joined again to those of the metaphysis, giving to the femoral head the vascular interwoven pattern [(5)] .

Crock [(6)] described the arteries of the proximal end of the femur, based on a three plane analysis and on standard anatomical terminology as follows: