Treatment of Slipped Capital Femoral Epiphysis: A Critical Review of Literature

Essay

Submitted for partial fulfillment of Master Degree in

Orthopaedic Surgery

Presented by

Ahmed Salah Zaki Hussein

M.B., B.Ch.

Ain Shams University

Supervised by

Professor: Tarek Hassan Abdelaziz

Professor of Orthopaedic Surgery

Faculty of Medicine

Ain Shams University

Dr. Amr Farouk Mohamed

Lecturer of Orthopaedic Surgery

Faculty of Medicine

Ain Shams University

Faculty of Medicine

Ain Shams University

2015

Contents

List of Abbreviations

AVN : Avascular necrosis.

AP : Anteroposterior.

BL-SCFE : Bilateral Slipped Capital Femoral Epiphysis.

BMI : Body Mass Index.

BP : Blade plate.

CT : Computed tomography.

dGEMRIC : Delayed gadolinium-enhanced MRI of cartilage.

EF : External fixation.

ER : External rotation.

ESA : Epiphyseal Shaft Angle.

ESWT : Extracorporeal Shock Wave Treatment.

FAI : Femoroacetabular Impingement.

FVFG : Free vascularized fibular graft.

Gd- DPTA : Gadopentetate dimeglumine.

HHS : Harris hip score.

HO : Heterotopic Ossification.

IF : Internal fixation.

LEA : Lateral epiphyseal arteries.

MAC : Multi-axial correcting.

MAC EF : Multi-axial correcting external fixation device.

MRI : Magnetic resonance imaging.

OA : Osteoarthritis.

PAO : Peri-acetabular osteotomy.

PFO : Proximal Femoral Osteotomy.

PTA : Posterior Tilting Angle.

ROM : Range Of Motion.

SCFE : Slipped Capital Femoral Epiphysis.

SCO : Subcapital Corrective Osteotomy.

SDO : Surgical dislocation osteochondroplasty.

SHD : Surgical Hip Dislocation.

THA : Total hip arthroplasty.

THR : Total hip resurfacing.

US : Ultrasonography.

List of tables

List of Figures

List of Figures

Acknowledgments

*First of all, thank **God** to whom I relate any success in my life.*

*I would like to express my deepest gratitude to **Prof. Dr. Tarek Hassan Abdelaziz,** Professor of Orthopaedic Surgery, Faculty of Medicine, Ain shams University for his supervision, valuable advice throughout this work.*

*Also I would like to express my deepest gratitude to **Dr. Amr Farouk Mohamed**, Lecturer of Orthopaedic Surgery, Faculty of Medicine, Ain Shams University for his kind help, guidance and support.*

*Finally, I would like also to thank my **Family** for their great support.*

✍ *Ahmed Salah Zaki Hussein*

Introduction

Slipped capital femoral epiphysis (SCFE) is a common pediatric hip condition, characterized by anterior and superior displacement, through the physis, of the proximal femur relative to the proximal femoral epiphysis. One of the most devastating potential complications of this condition is avascular necrosis (AVN) of the femoral head. [1]

Clinical classifications:

There are two main classifications, the first of which based on the duration of symptoms (Temporal classification); SCFE was considered "acute" if the duration of symptoms was less than 3 weeks, as "acute-on-chronic" if symptoms were present intermittently for more than 3 weeks with a recent exacerbation, and as "chronic" if symptoms had been constantly present longer than 3 weeks. The other classification ***Loder*** focuses on the severity of symptoms as an indicator for mechanical stability; with the stable/unstable classification, hips that allowed walking without or with crutches were defined as stable and those that did not allow walking as unstable. [2]

Radiological classifications:

Another classification according to the extent of slip is the ***Southwick*** classification, which is based on lateral head-shaft angle and places slip into three categories: mild (<30°), moderate (30-60°) and severe (>60°).[3]

The aim of treatment in SCFE is to prevent further slip and decrease incidence of osteoarthritis.[4]

Based on favorable outcomes from long-term studies, the standard treatment for mild SCFE has become in situ pinning or in situ one-screw fixation.[5]

The most common intertrochanteric osteotomies for SCFE have been described by Southwick and Imhäuser. Long-term studies suggest that these osteotomies may decrease the risk of osteoarthritis. While Barmada, described an extracapsular (base of neck osteotomy) which was popularized by Kramer et al. This osteotomy corrects the head-shaft and neck-shaft angles while preserving the anatomy of the proximal femur. Unfortunately, only a moderate degree of deformity correction can be achieved by the Barmada/Kramer procedure, which limits its use in preventing severe osteoarthritis.[6]

Subcapital Dunn's osteotomy, where a cuneiform wedge osteotomy is performed at the head-neck junction performed (at the level of the slip deformity) allows for the greatest degree of correction, but also carries the greatest risk for AVN, as the blood supply is in close proximity (i.e., the posterior superior retinaculum contains the blood supply). [6]

As a result, this technique has been modified and combined with an open surgical dislocation approach with a greater focus on protecting the blood supply to the epiphysis via developing an extended posterosuperior retinacular flap with subperiosteal exposure of the femur known as the (modified) Dunn's procedure by Ganz .[6]

Aim of the Work

The aim of this essay is to review the literature regarding the treatment of SCFE with particular emphasis on the results of different treatment modalities.

Pathogenesis of SCFE

Before the turn of the **20th century**, the diagnosis of slipped capital femoral epiphysis (SCFE), as the condition now is understood, was not known. It was noted that a common problem with those wishing to trace the history of medical disorders: ‘‘Various names have been applied…to these injuries, such as disjunction, divulsion, epiphyseal detachment or separation, juxta-epiphysial fracture and separation, epiphyseal diastasis.’’ In addition, the diagnosis in preradiographic times was frequently imprecise or uncertain.[7]

Incidence:

Slipped capital femoral epiphysis (SCFE) affects one in 5000 to 10,000 children, with substantial variability among ethnic groups. The epidemiology and physical characteristics of the patients who sustain stable SCFEs have been well studied and recently updated.[8]

These studies suggest the age of onset is declining for all slips from a mean of 12.9 to 12.1 years from 1983 to 2000 (median year). Sex distribution favors males at a ratio of 1.4:1 up to 2:1.Further, children with stable SCFEs continue to be overweight or obese.[8]

As the international epidemic of childhood obesity continues to grow, an increasing number of children are

developing SCFE. Evidence suggests SCFE is occurring in greater overall numbers, in children at increasingly younger ages, and in the form of bilateral SCFE (BL-SCFE) to a greater degree than historically reported.[9]

Risk factors such as age, sex, ethnicity, body mass index (BMI), and geographic and seasonal variations have been linked to the development of SCFE in general. Several studies have related obesity to bilateral-SCFE but these studies used a different definition of obesity than the current gold standard of age and sex/specific BMI .[9]

Patients who initially present with a unilateral SCFE have a risk of developing a contralateral slip that ranges anywhere from 20% to 60%.[10]

A better understanding of risk factors for BL-SCFE could help resolve the ongoing controversy surrounding the role of prophylactic pinning of the contralateral hip in patients presenting with unilateral SCFE (UL-SCFE), especially if a simple measure such as weight reduction could spare patients with UL-SCFE the risks of a second slip or the complications of prophylactic pinning.[9]

Etiology:

The etiology of slipped capital femoral epiphysis (SCFE) is multifactorial, involving a number of mechanical and biochemical factors.[11]