

LOOSENING IN TOTAL HIP ARTHROPLASTY

Essay

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Introduction

INTRODUCTION

Total hip arthroplasty continues to be an extremely successful procedure with ever widening indications (*Thomas- BJ 1996*).

Since the pioneering work of *Wiles – Haboush – Charnley* and others the goal of total hip arthroplasty has remained the same, to obtain a durable painless and functioning hip in those people affected with severely limiting arthritic conditions (*John- J 1990*).

Loosening has emerged as the most serious long term complication of total hip arthroplasty and most common indication for revision (*James – W 1992*).

Mjoberg et al (1984) defined loosening as the presence of instability and/or migration. The term instability is used for bone-prosthetic component displacement shown in two x-rays taken in loaded and unloaded positions. The term migration is used to describe displacement shown as time passes; this is done by taking serial and spaced x-rays; they should be in a loaded position.

Our essay entails the study of loosening phenomenon in total hip arthroplasty, pointing out the possible etiology pathogenesis, management and prevention.

General Consideration

- ***Applied biomechanics***
- ***Types of T.H.A***

APPLIED BIOMECHANICS

Total hip components must withstand many years of cyclic loading equal to at least 3-5 times body weight and at times they may be subjected to overloads as much as 10-12 times the body weight (Amastutz *et al* , 1975).

Therefore, a basic knowledge of the biomechanics of hip & of T.H.A is necessary to properly perform the procedure, to successfully handle the problems that may arise during & after surgery, to intelligently select the components, and to council patients concerning their physical activities.

Forces acting on the hip :

The ratio of the length of the lever arm of the body weight to that of abductor musculature is about 2.5 : 1 [Fig. 1]. Therefore the force of the abductor musculature must approximate 2.5 times the body weight to maintain the pelvis level when standing on one leg.

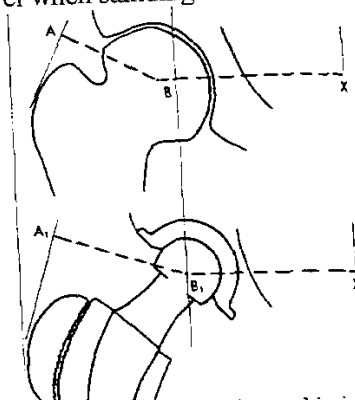


Fig. (1) Lever arms acting on hip joint

Moment produced by body weight applied at body's center of gravity, X, acting on lever arm, B-X, must be counterbalanced by moment produced by abductors, A acting on shorter lever arm, A-B

General Consideration

It is the cyclic loading forces acting in different planes and occurring more than a million times a year that tends to bend, rotate and loosen the stem of the prosthesis and probably contributes to the loosening of acetabular cup (*Andriacchi et al 1976*) [Fig. 2].

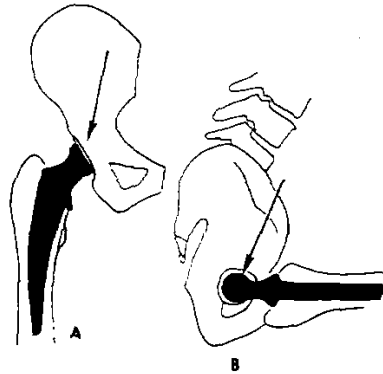


Fig. (2) Forces producing torsion of stem.

Forces acting on coronal plane (A) deflect stem medially
Forces acting on sagittal plane (B) deflect stem posteriorly

How to decrease the force acting on the hip? Through basic knowledge of the biomechanics of the hip and T.H.A we can decrease the forces acting on the femoral component and accordingly decrease the chance of failure through the following measures (*Bartel et al 1985*):

- Decrease body weight lever arm by centralization of the head by deepening the acetabulum. Thus the moment produced by body weight is decreased and the counter balancing force that the abductor mechanism must exert is also decreased.