Constrained liner in total hip Arthroplasty

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Abstract

the possibility for developing much higher stresses at the shell-bone or liner-shell interface, also it decreased range of motion before impingement compared to the non-constrained component with possible adverse effects on polyethylene wear and osteolysis.Various modes of failure were reported; Type I: in the shell-bone interface, Type II: in the shell-liner interface, Type III: the locking mechanism, Type IV: bipolar-femoral head interface. In primary hip arthroplasty, its incidence has been reported to be between 0.6% and 9.9%. With revision surgery, it can be as high as 20%.

Keywords

THA- Arthroplasty-ESR- ASIS-(PIF-ROM).

Contents

List of Abbreviations

ASIS	Anterior Superior Iliac Spine
AP	Anteroposterior
BW	Body weight
CFN	Common fibular nerve
CM	Centimeter
Co-Cr	Cobalt-Chromium
CRP	C-Reactive Protein
ESR	Erythrocyte Sedimentation Rate
F_{AB}	Force required by the abductor musculature
Hb	Haemoglobin
HHS	Harris Hip Score
IQR	Interquartile range
JRF	Joint Reaction Force
MM	Millimeter
Nm	Newton/meter
PE	Polyethylene
PIF-ROM	Prosthetic Impingement-Free Range Of hip Motion
ROM	Range Of Motion
SN	Sciatic nerve
SRN	Sivash Russin Noiles
SPSS	Statistical Package for Social Sciences
S-ROM	Standard Range of Motion
THA	Total Hip Arthroplasty
TN	Tibial nerve
UHMWPE	Ultra High Molecular Weight Polyethylene
VHD	Vertical Head Displacement
WBC	White Blood Count
WS	Walking Stick

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Introduction

Dislocation is one of the most common and distressing early complications of total hip arthroplasty. The reported incidence of dislocation ranges from 0% to 10% after a primary arthroplasty and from 10% to 25% after a revision arthroplasty. A wide variety of predisposing causes and associated factors have been suggested [(1)].

Nonsurgical treatment of the initial dislocation with a cast or brace is successful in approximately two thirds of patients. However, when surgical treatment is required for recurrent dislocation, satisfactory results have been achieved in only 60% of hips using a wide variety of techniques. Additionally, the chance of success is even less when a precise etiology cannot be determined. It is for these situations that constrained components have been considered [(2)].

By definition, constrained total hip arthroplasty components include a mechanism that locks the prosthetic femoral head into a polyethylene acetabular component. A thorough understanding of the design features of constrained components in total hip arthroplasty, indications for their use, and results and complications is essential for the effective application of this technique [(3)].

The use of constrained total hip arthroplasty components has been limited. Sivash first reported on his constrained prosthesis

in1963 in Moscow, at a conference on tuberculosis of bones and joints [4].

The use of a constrained acetabular component in total hip arthroplasty is indicated for recurrent dislocation of the hip due to soft-tissue insufficiency (capsular or abductor musculature) that is not amenable to repair or augmentation. If the abductor mechanism has been resected, then reconstruction with a constrained system may be required. Component malposition, loosening, or wear should be treated by revision of one or both components [5].

However, recurrent dislocation due to a chronic nonunion of the greater trochanter, with severe and irreparable loss of abductor muscle function, may be an indication for use of the constrained component. The use of constrained liners has been reported to help reduce the incidence of dislocation in at-risk total hip patients [6].

The constrained liner is used where more conservative soft tissue tensioning alternatives, such as femoral neck lengthening, component positioning and lateralized acetabular components, may not be effective [7].

Neurologic spasticity may seem to be an attractive indication for the use of this component, but Root et al [8] in reporting the results of

total hip arthroplasty without constrained components performed in patients with cerebral palsy, found that only 2 of 15 patients had a recurrent dislocation, and both had component malposition [8].

The prophylactic use of constrained components in primary or revision total hip arthroplasty is controversial. Because good data are lacking, constrained acetabular liners should not be used routinely in these situations [9].

Theoretically, constrained acetabular components should transfer the forces that would otherwise lead to dislocation to the locking mechanism, the liner-shell interface, or the bone-prosthesis (or bone cement) interface. If the hip center is shifted laterally, which may occur with either of the two available constrained components, these forces may be increased. The reported results of constrained components have demonstrated four types of failure: loosening of the acetabular component; dissociation of the constrained liner from the shell (with redislocation); material failure (breakage) or disengagement of the constraining ring (with or without redislocation); and dissociation of a modular femoral head from its neck. An additional potential mode of failure is excessive wear of a thin acetabular liner interface [10].