Seminars in Arthroplasty 26 (2015) 131–135

Available online at www.sciencedirect.com

ScienceDirect

www.elsevier.com/locate/semanthroplasty

The causes and management of hip instability: An algorithmic approach

Glenn D. Wera, MD[a,*], Nick T. Ting, MD[b], Mario Moric, MS[c], Scott M. Sporer, MD[c], Joshua J. Jacobs, MD[c], Wayne G. Paprosky, MD[c,d], and Craig J. Della Valle, MD[c]

[a]University Hospitals Case Medical Center, Case Western Reserve University, 11100 Euclid Avenue Cleveland, OH 44106-5043
[b]OrthoCarolina, 2001 Vail Ave, Suite 200 Charlotte, NC 28207
[c]Rush University Medical Center, 1611 W Harrison Suite, 300, Chicago, IL 60612
[d]Central DuPage Hospital-Cadence, Winfield, IL 60190

ARTICLE INFO

Keywords:
total hip arthroplasty
dislocation
instability
constrained liner
dual mobility

ABSTRACT

Instability or dislocation after total hip arthroplasty continues to be one of the most prevalent complications and modes of failure of this largely successful operation. The purpose of this article is to describe a systematic algorithm for evaluation and treatment of the unstable total hip arthroplasty as well as review current literature and controversies surrounding the dislocating total hip arthroplasty.

Published by Elsevier Inc.

1. Introduction

Total hip arthroplasty is among the most prevalent operations performed in the United States with 332,000 cases performed in 2010 alone [1]. The procedure is largely recognized as cost-effective with high rates of patient satisfaction [2,3]. However, like many reconstructive procedures there is a significant revision burden after total hip arthroplasty. US Medicare data suggest an overall 3.9% dislocation rate [4] with instability being the 3rd most common indication for revision surgery [5]. Furthermore, revision total hip arthroplasty is associated with larger clinical and economic impact than total knee arthroplasty [6]. Due to the prevalence and clinical impact of unstable total hip arthroplasties, an understanding of etiology and appropriate treatment for unstable total hips is essential.

The options for managing unstable total hip arthroplasties range from closed reduction to operative intervention with single- or both-component revisions. Additionally multiple bearing options such as large heads, dual mobility, and constrained liners may play a role in the management of the unstable total hip arthroplasty. With so many component options and strategies to manage these perplexing cases we published a 6-part classification and management algorithm in 2012 [7]. The purpose of this review is to highlight the benefits of this strategy while also discussing some of the controversies that have emerged with respect to managing the unstable total hip.

2. Acetabular component malposition

Classically, the ideal position of the acetabular component is 40° of abduction and 15° of anteversion [8]. However, there is a great deal of controversy about expert surgeons' ability to place the cup in the ideal position, if it even exists. Moreover, patient factors and emerging technologies may influence the cup positioning in primary total hip arthroplasty.

* *Corresponding author at:* Cleveland Veterans Affairs Medical Center, 10701 East Blvd, Cleveland, OH 44106.
E-mail address: gwera@yahoo.com (G.D. Wera).

http://dx.doi.org/10.1053/j.sart.2015.09.006
1045-4527/Published by Elsevier Inc.

Low-volume surgeons and obese patients have both been shown to increase the risk for component malpositioning in total hip arthroplasty [9]. Similarly, low-volume surgeons, minimally invasive (MIS) approaches, and obesity are all linked to acetabular component malposition [10].

Nevertheless, many experts question whether acetabular malposition alone is directly linked with instability [11]. In the unstable total hip arthroplasty however, we recommend repositioning the acetabular component in cases where it is clearly out of position. In our study of 75 chronically unstable hips, 33% of the cases were linked to acetabular component malposition. Interestingly, there was a significant protective effect against re-dislocation in patients who underwent acetabular component revisions ($P < 0.015$) [7]. Therefore, while the ultimate or ideal acetabular component position is under renewed debate we recommend repositioning the cup in cases of unstable hips with malpositioned acetabular components.

3. Femoral component malposition

Femoral component malposition can also be the underlying cause of instability after total hip arthroplasty. In cases of instability where the stem has subsided secondary to undersizing or a fracture, the strategy of performing a femoral revision in which the appropriate length, offset, and version are restored is a useful strategy. However, a radiographic analysis with plain films typically will not clearly demonstrate the femoral component anteversion [12]. Current research on improving the plain radiographic assessment of the femoral component such as the modified Budin method can be helpful in confirming femoral component malposition in some cases [13]. However, the version of the femoral prosthesis with respect to the trans-epicondylar axis on a CT scan is the most helpful if version of the femoral stem is in question prior to revision (Fig.). The incidence of femoral component malposition as the cause of instability is low (8%) and the surgeon should be prepared to revise the cup as well in such cases [7]. Our recommendation is to revise the femoral component in cases of unstable total hip arthroplasties with misaligned femoral components.

4. Abductor insufficiency

Abductor insufficiency is a major prognosticator of instability following total hip arthroplasty. The abductor mechanism is a complex composed primarily of the greater trochanter and gluteus medius muscle. Its absence may be the result of multiple surgical exposures, greater trochanter nonunion, or superior gluteal nerve injury [14]. Current investigations have implicated adverse local tissue reactions (ALTR) in association with metal-on-metal prostheses or taper degradation as a cause of abductor insufficiency and subsequent instability [15,16]. In cases of revision total hip arthroplasty, abductor deficiency remains the second highest risk factor for dislocation second only to a past history of instability [17].

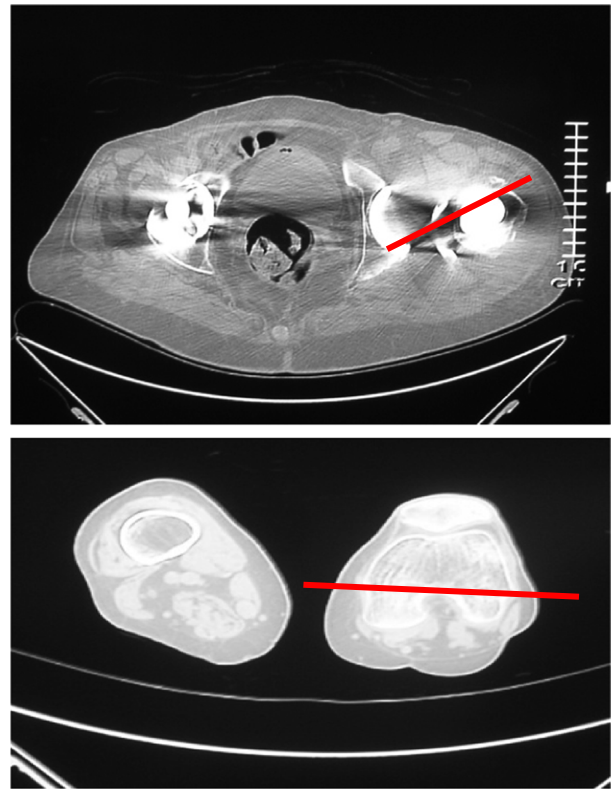

Figure – Type II Instability: this combined CT scan of the femoral neck and trans-epicondylar axis demonstrates retroversion of the femoral prosthesis. Courtesy of Craig J Della Valle, MD.

Insufficiency of the abductor mechanism is a strong indication for a constrained liner as large heads are often unsuccessful in this scenario [18]. However, high failure rates or poor durability are a limitation of these implants and they should be used with caution. Moreover, constrained liners do not compensate for component malposition and all aspects of the reconstruction (including component version and soft tissue tension) must be optimized when they are used [19]. Additionally, some challenging cases with poor bone stock such as Paprosky class IIIb defects are contraindications to a constrained liner due to risk of acute catastrophic acetabular shell loosening. In these cases we recommend a dual mobility or unconstrained tripolar construct that can be converted to a constrained liner in the event of future instability. Nevertheless, constrained liners are an important option for managing unstable total hips with well-aligned components, chronic instability, and a deficient abductor mechanism.

5. Impingement

Impingement remains an important but less prevalent etiology of total hip arthroplasty instability [20]. In these cases we recommend removal of sources of impingement whether they are bony or soft tissue while also upsizing the bearing couple in order to increase the overall stability of the hip construct. Furthermore, the surgeon should be prepared for persistent instability even after removing the sources of