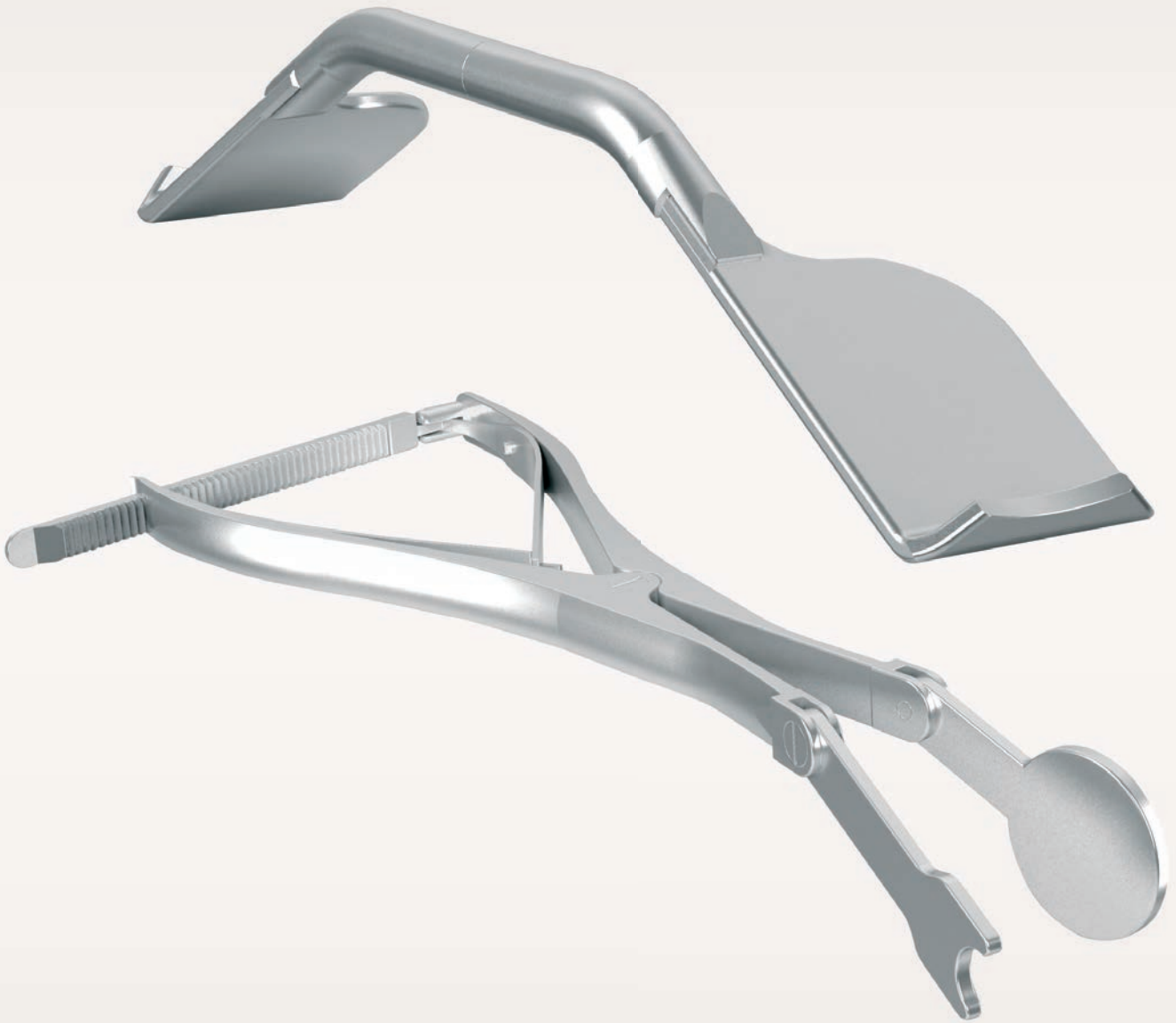


Design Rationale and Surgical Technique



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## Design Rationale

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# GLOBAL ENABLE Design Rationale

The GLOBAL ENABLE glenoid exposure system is designed to simplify glenoid exposure during primary and reverse shoulder arthroplasty. GLOBAL ENABLE provides a step-by-step methodology for glenoid exposure with consideration for challenging exposure situations. The retractor set includes eight retractors designed for Access, Protection, and Control.

Throughout the glenoid exposure process, three functions are highlighted for their contribution to Access, Protection, and Control. Used together with the GLOBAL ENABLE glenoid exposure system, these three steps will improve the ability to gain consistent glenoid exposure.

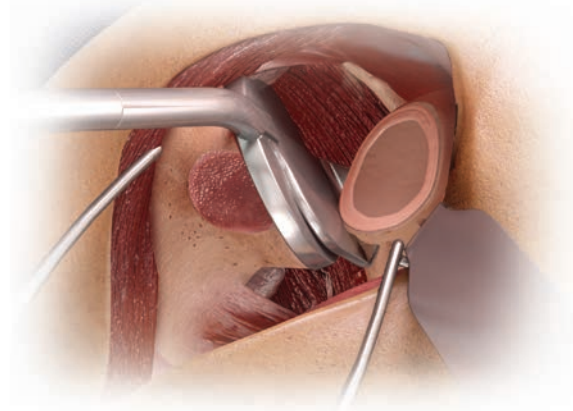
## Access **A** *Soft Tissue Release*

GLOBAL ENABLE retractors are designed to aid the surgeon during recommended soft tissue releases while helping to protect other soft tissue and neurovascular bundles. Proper and adequate soft tissue releases enhance access to the glenoid fossa.



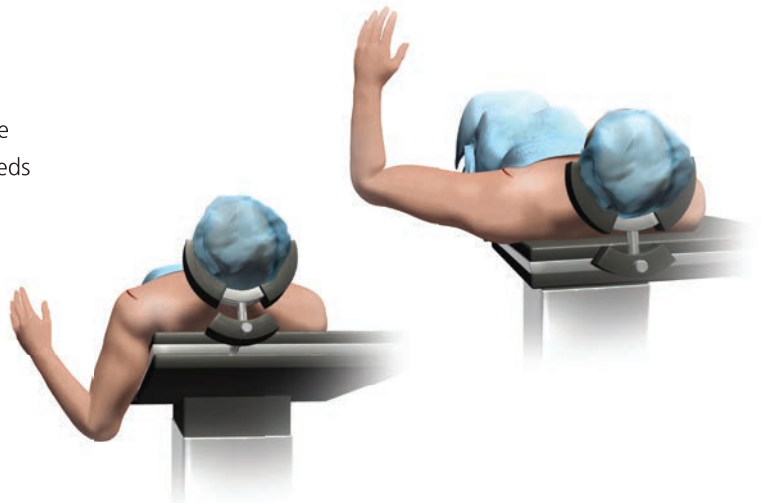
## Protection **P** *Retractor Placement*

GLOBAL ENABLE retractors have been designed to simplify glenoid exposure. When placed in the recommended positions, GLOBAL ENABLE retractors protect key tissues in the shoulder and allow for optimal displacement of soft tissue and bone to better expose the glenoid.



## Control **C** *Arm Positioning*

GLOBAL ENABLE retractors are designed to be used in conjunction with arm position to control soft tissue and bone for a simplified glenoid exposure technique. The surgeon needs to be able to fully adduct and extend the arm to optimise control during glenoid exposure.



# GLOBAL ENABLE Retractors – Key Features

## **Blunt Point Gelpi – Control**

The Blunt Point Gelpi (2245-10-001) is a self-retaining retractor with blunted ends that is designed to retract soft tissue without damaging it. The Blunt Point Gelpi is used to control soft tissue throughout shoulder replacement surgery and is frequently used to open the deltopectoral interval.



## **Reverse Hohmann – Protection**

The Reverse Hohmann (2245-10-040) is designed to protect soft tissue and neurovascular structures, specifically the axillary nerve, during recommended soft tissue releases. Additionally, it can be used to retract soft tissue and muscle in large, bulky patients.



## **Anterior Glenoid Neck Retractor – Protection**

The Anterior Glenoid Neck Retractor (2810-17-000) is designed to protect the subscapularis and anterior capsule after the subscapularis tendon has been released. In larger patients, it is used to protect the pectoral muscle and surrounding tissue.



## **Medium Acromial Retractor – Control**

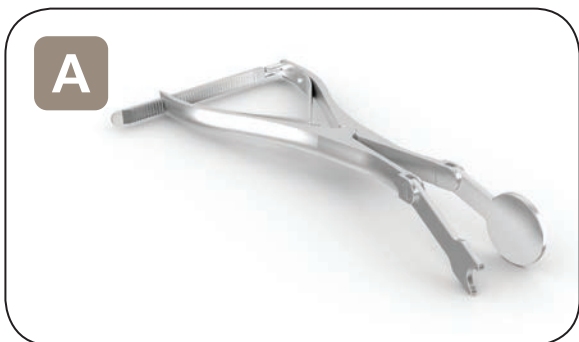
The Medium Acromial Retractor (2810-03-000) is designed to be used to control soft tissue in large, bulky patients as well as control and dislocate the humerus out of the shoulder joint before humeral head resection.





#### **Modified Sonnabend – Access**

The Modified Sonnabend (2245-10-042) is an exclusive retractor found only in the GLOBAL ENABLE set. It is designed with a 6 mm lip to retract the humerus posteriorly after humeral head resection. This offset greatly increases access to the glenoid.



#### **Proximal Humerus Spreader – Access**

The Proximal Humerus Spreader (2245-10-100) is designed to give the surgeon access to the glenoid without interference. The Proximal Humerus Spreader has a flat plate that rests on the humerus osteotomy surface and a saddle that is placed on the base of the coracoid. As the spreader is engaged it retracts the humerus posteriorly to the glenoid, increasing access to the glenoid. This helps the surgeon to prepare the glenoid surface more easily.



#### **Small Pectoral Retractor – Control**

The Small Pectoral Retractor (2245-10-008) is designed to control and position the deltoid muscle laterally and superiorly. The Small Pectoral Retractor is used throughout the glenoid exposure process and is especially useful in large, bulky or muscular patients. Bilateral flares on the blade help to reduce the risk of soft tissue damage.



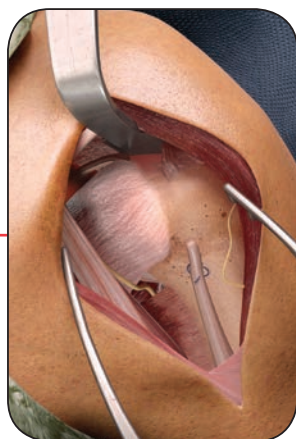
#### **Forked Retractor – Access**

The Forked Retractor (2307-86-002) is designed to increase access to the glenoid for patients with smaller anatomic features. The forks of the retractor are placed on the inferior/posterior wall of the glenoid and used to displace the humerus. A centre cut out in the retractor provides better access to the glenoid during instrument use or placement.

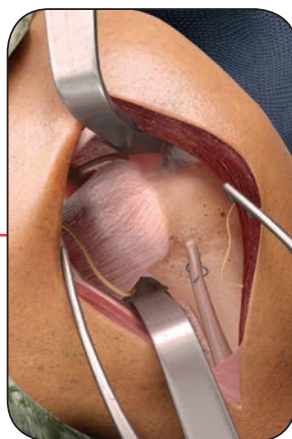
# Key Exposure Steps



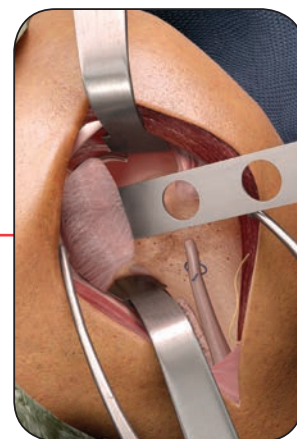
1. Deltopectoral Approach



2. Biceps Tenodesis

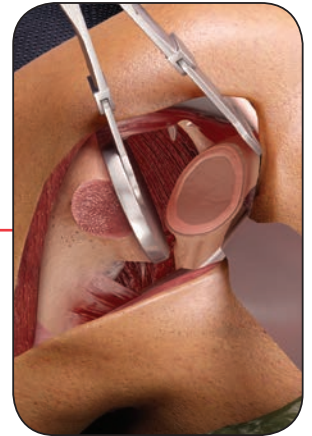


3. Axillary Nerve Protection

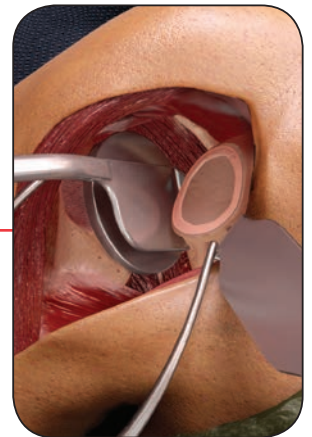


4. Subscapularis Tendon Release

8. Final Glenoid Exposure



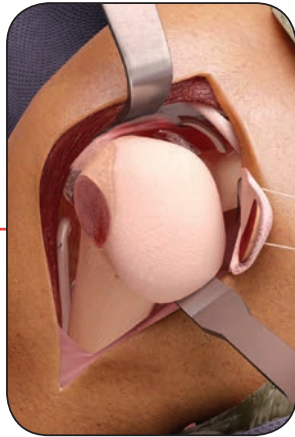
Option 1  
Proximal Humerus Spreader



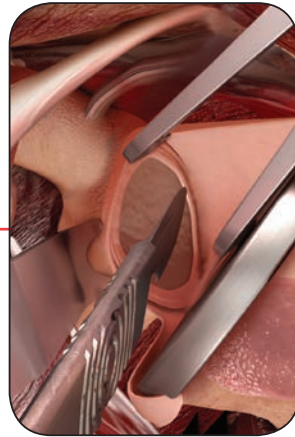
Option 2  
Modified Sonnabend



5. Anterior and Inferior  
Capsule Release



6. Humeral Head Dislocation  
and Resection



7. Posterior Capsule Release



*Glenoid Exposure Simplified*

# Surgical Technique



Figure 1

A number of surgical techniques are available to inform surgeons about methods and sequence of steps recommended for shoulder arthroplasty. This technique will focus on the key steps for optimal glenoid exposure.

## **Patient Positioning, and Preparation**

Place the patient in the beach chair position. The involved shoulder should extend laterally over the edge of the table so the arm can be brought into full extension and adduction (Figure 1). This range of motion allows for optimal control of the humeral head throughout the procedure. An interoperative arm positioning device is recommended to hold the arm in position during the surgery.



# Surgical Technique

## **Deltopectoral Approach**

GLOBAL ENABLE instruments were designed to be used for both primary and reverse shoulder arthroplasty using a deltopectoral approach (Figure 2). As the deltopectoral interval is identified and separated, the **Blunt Point Gelpi** is used to separate and retract the deltoid and pectoralis major (Figure 3).



Figure 2

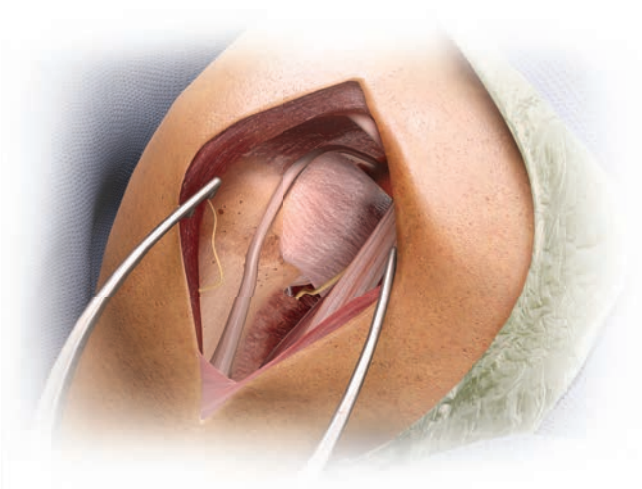


Figure 3

# Surgical Technique



Figure 4

A **Small Pectoral Retractor** or **Reverse Hohmann** can be placed over the top of the humeral head and under the acromion, pulling the upper part of the deltoid posteriorly (Figure 4). This allows the evaluation of the rotator cuff as the humerus is controlled by extending and internally rotating the arm. The upper 25% of the clavicular head of the pectoralis major tendon can be released to allow increased displacement of the humerus inferiorly during later steps of the procedure. Do not release the coracoacromial ligament as it acts as a stabiliser after primary shoulder replacement is complete.

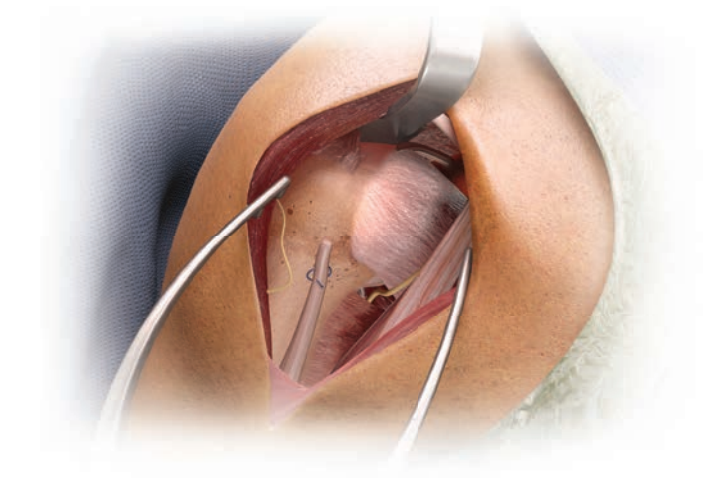


Figure 5

## **Biceps Tenodesis**

The biceps tendon can limit glenoid exposure by acting as a tether. Tenodesis the biceps tendon to soft tissue just distal to the bicipital groove (Figure 5). This should be done prior to resecting the proximal biceps thereby allowing the biceps to be tenodesed under its normal tension and length. The biceps tendon can be removed from the bicipital groove and released from its glenoid attachment to remove the portion proximal to the tenodesis site.

# Surgical Technique

## Axillary Nerve Protection

Use your finger to identify the axillary nerve. It is tensioned differently from the muscle tissue surrounding it.

Introduce a **Reverse Hohmann** above the latissimus dorsi tendon and below the joint capsule. This can be done by initial blunt dissection with a small Cobb elevator and a sponge (Figure 6). The Reverse Hohmann both protects the axillary nerve during capsule dissection and helps to define the inferior aspect of the joint.

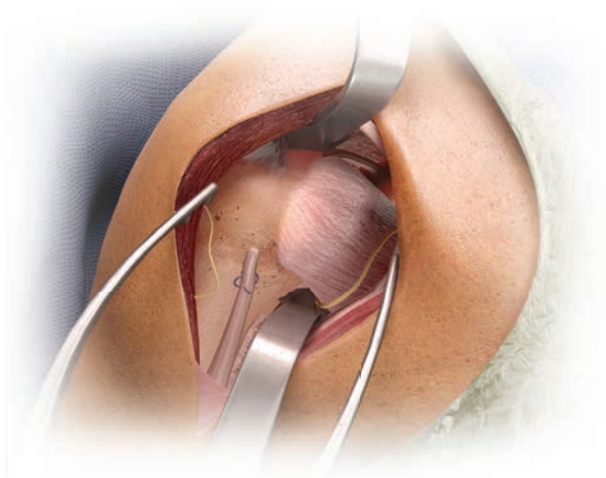


Figure 6

## Subscapularis Tendon Release

Internally rotate the arm to better visualise the lesser tuberosity and the subscapularis attachment site.

Introduce the saw blade or a sharp curved 12 mm osteotome at the interval created at bicipital groove and the insertion site of the subscapularis. Resect approximately 4-5 mm of the lesser tuberosity to include the entire insertion site footprint of the tendon. The osteotomy can be facilitated by passing a small haemostat through the rotator interval and using it to “hook” the subscapularis and anterior capsule as it inserts on the lesser tuberosity. A saw blade or osteotome can then be directed at the midpoint of the haemostat jaws. This will allow consistent resection of the lesser tuberosity and prevent removal of too much anterior humeral bone stock (Figure 7).

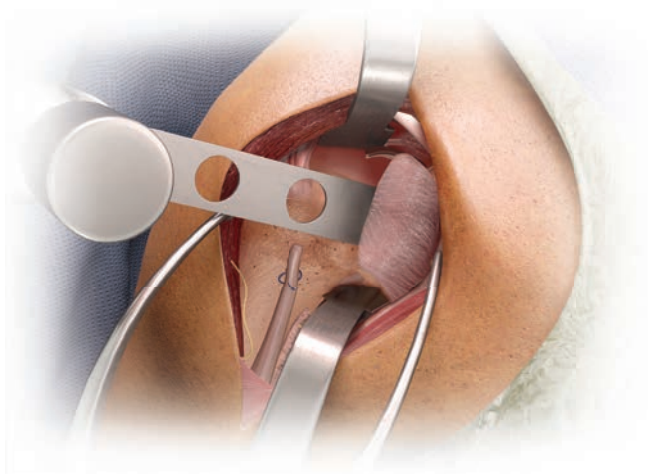


Figure 7

# Surgical Technique

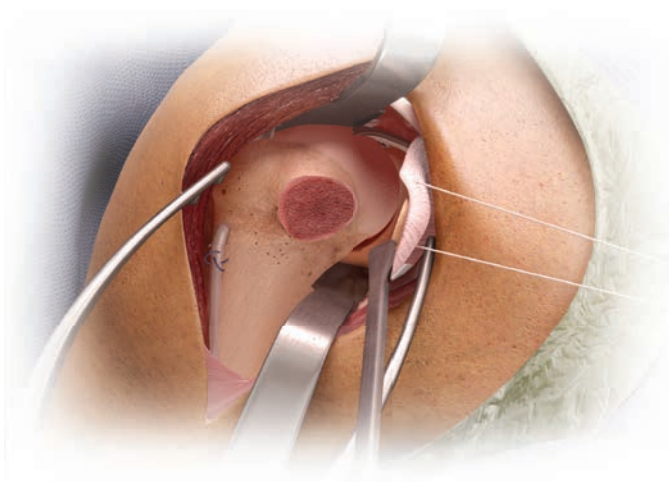


Figure 8

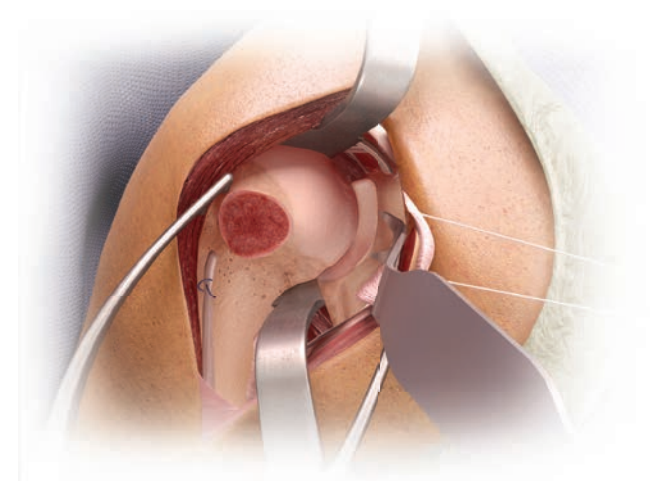


Figure 9

## **Anterior and Inferior Capsule Release**

Using blunt dissection, the anterior capsule can be separated from the subscapularis (Figure 8). Release the coracohumeral ligament from the base of the coracoid.

Place the **Anterior Glenoid Neck Retractor** on the anterior rim of the glenoid and use it to retract and protect the subscapularis. Resect the anterior capsule in its entirety from the glenoid insertion site to the anterior inferior capsule (Figure 9).

With the axillary nerve protected by the **Reverse Hohmann**, release the inferior capsule to the 6 o'clock position on the humeral head. The capsule attaches to the humeral head at both the anatomic neck and the surgical neck of the humerus.

If exposure is compromised and the entire anterior/inferior capsule cannot be seen, then excision of the capsule should wait until after the humeral head is released.

***Note:** Failure to sufficiently release the capsule from the humeral neck to its posterior inferior area will make it very difficult to bring the head up and out of the glenoid fossa. Additionally, insufficient release of the capsule will inhibit glenoid exposure.*

Once the capsule is released, any inferior osteophytes should be removed. This can be performed with a rongeur or a curved osteotome. Inferior osteophytes can be better visualised by externally rotating the arm. Inferior osteophyte removal allows the identification and complete resection of the humeral head and optimises glenoid exposure.

# Surgical Technique

## Humeral Head Dislocation

Remove the Anterior Glenoid Neck Retractor and place the Medium Acromial Retractor between the humeral head and the glenoid fossa and dislocate the humerus by externally rotating the arm (Figure 10).

Place a medium size retractor on the inferior part of the humeral head and continue to bring the arm into full external rotation. The entire humeral head should now be visible, with all capsular tissues removed from around the neck to provide optimal exposure (Figure 11).

*Note: It is important to fully visualise the rotator cuff insertion site superiorly and posteriorly since this will identify the anatomic neck circumferentially and will permit the surgeon to resect the entire humeral head.*

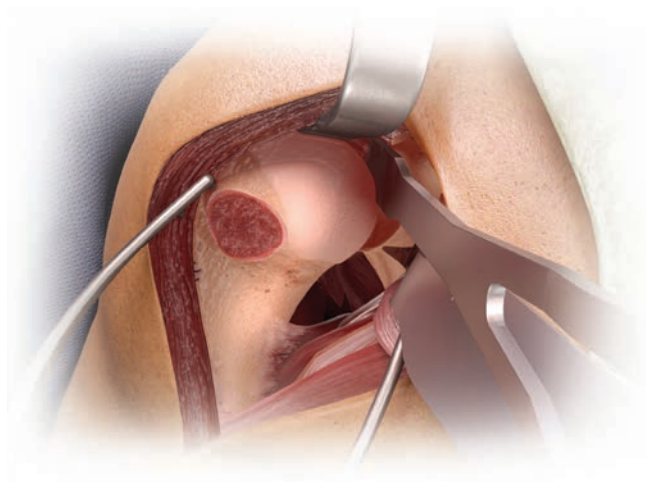


Figure 10

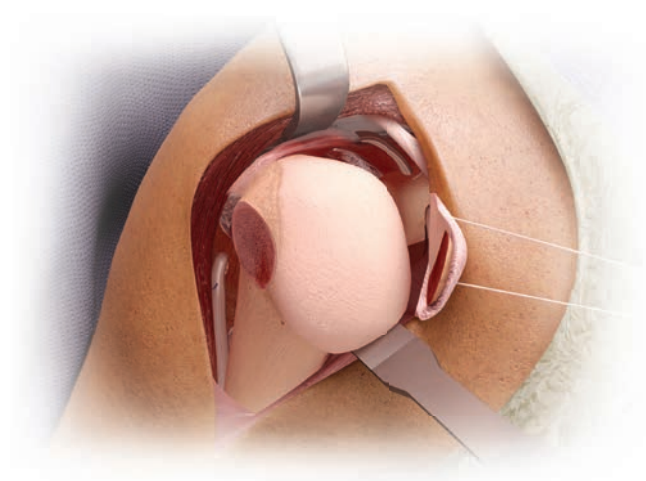


Figure 11

## Humeral Head Preparation

Consult the surgical technique corresponding to the shoulder arthroplasty product you are using for details regarding humeral head resection and canal preparation.



**GLOBAL | AP™**  
ADJUSTABLE PROSTHESIS



**DELTA | XTEND™**  
REVERSE SHOULDER SYSTEM

# Surgical Technique

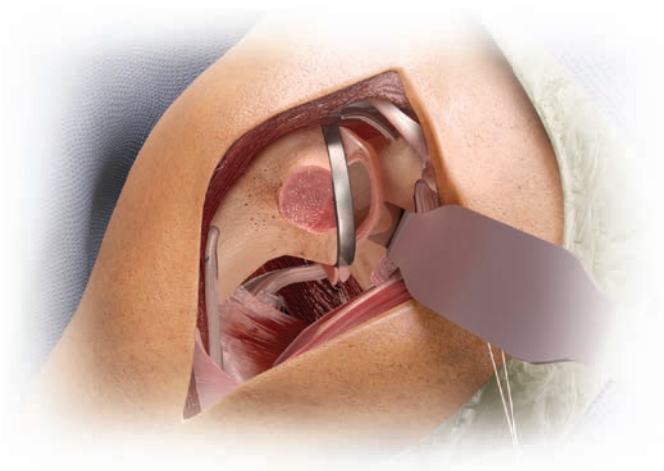


Figure 12

## Posterior Capsule Release

Before considering glenoid exposure for preparation of the glenoid, inspect the posterior aspect of the capsule and glenohumeral space. Place the **Anterior Glenoid Neck Retractor** on the anterior wall of the glenoid and retract the subscapularis and pectoralis. Then, place a metal cover plate over the humeral osteotomy surface to protect this bone surface (Figure 12).

Place the arm in a position so that the humeral osteotomy is parallel to the glenoid fossa. This is generally achieved with the forearm perpendicular to the floor with the humerus in slight abduction (Figure 13).

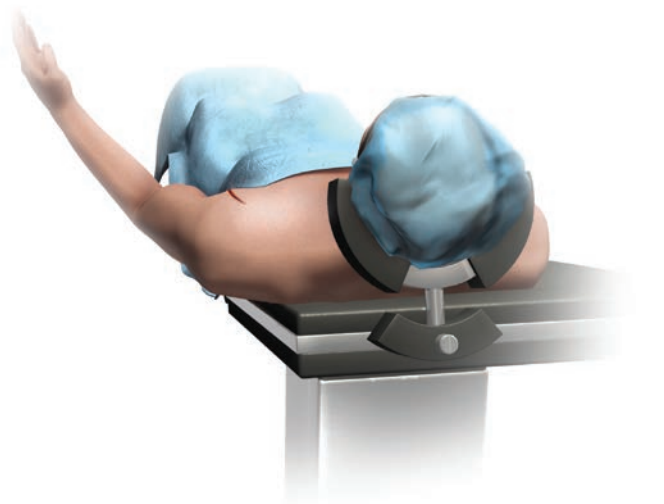


Figure 13

# Surgical Technique

Laterally displace the proximal humerus to create a space between the osteotomy surface and the glenoid and place a Shoulder Spreader (Left or Right. Order through the DePuy Synthes Trauma Representative) spreader onto the face of the glenoid and humeral osteotomy plate. Open the blades of the Shoulder Spreader and have an assistant hold the retractor to prevent rotation (Figure 14).

To retract the superficial soft tissues, use the **Blunt Point Gelpi** and a **Reverse Hohmann**. The Reverse Hohmann is placed between the remaining inferior capsule and neurovascular structures – axillary nerve and posterior humeral circumflex vessels (Figure 15).

The interval between the humerus and glenoid to the back surface of the capsule can now be seen. The posterior capsule can then be released from the posterior glenoid rim (Figure 16). With the release of the posterior capsule, the humerus is no longer attached to the glenoid fossa and can be displaced posteriorly/inferiorly for optimal glenoid exposure.

*Note: Any remaining capsular tissue may interfere with the placement of retractors on the posterior neck of the glenoid.*

## Excise Labrum

With the Shoulder Spreader in position, the posterior labrum and the remaining long head of the biceps can be seen and excised. Most importantly this step will facilitate for complete removal of the anterior/inferior capsule that helps identification and protection of the axillary nerve. Release of these tissues in this way assists in optimal exposure of the glenoid.

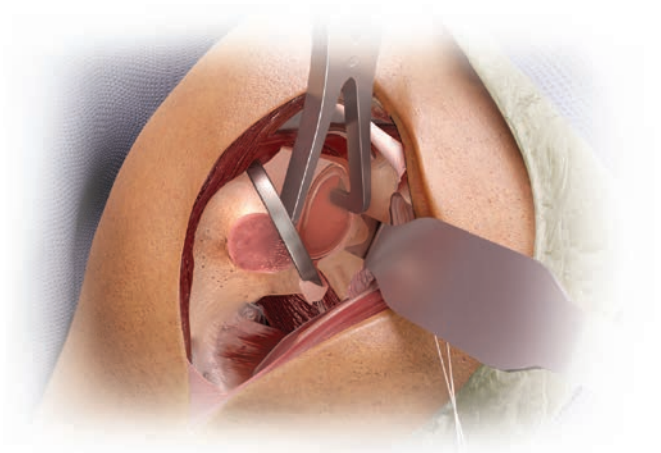


Figure 14

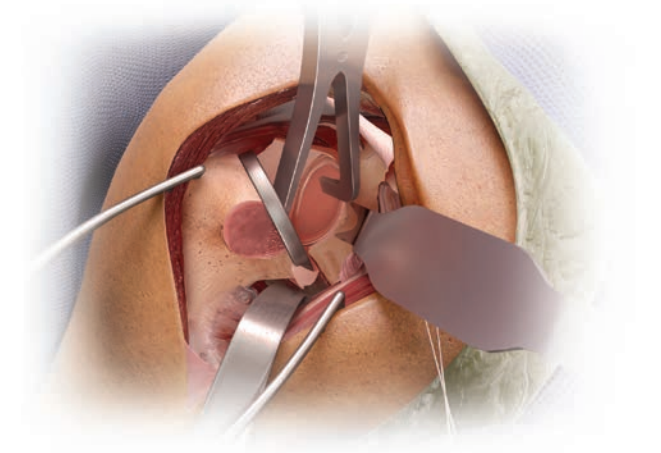


Figure 15



Figure 16

# Surgical Technique

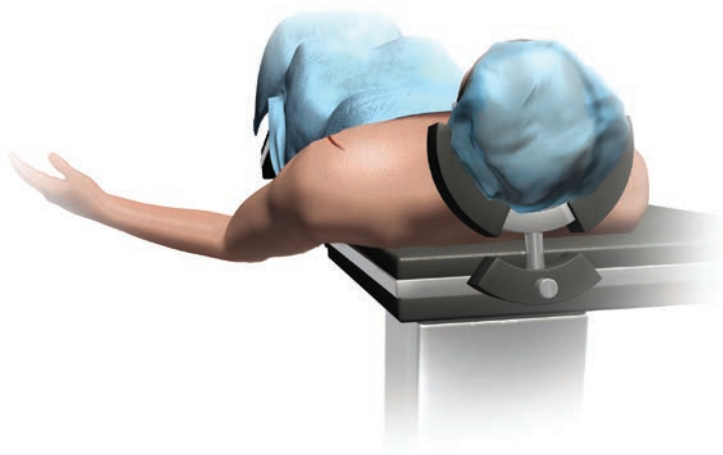


Figure 17

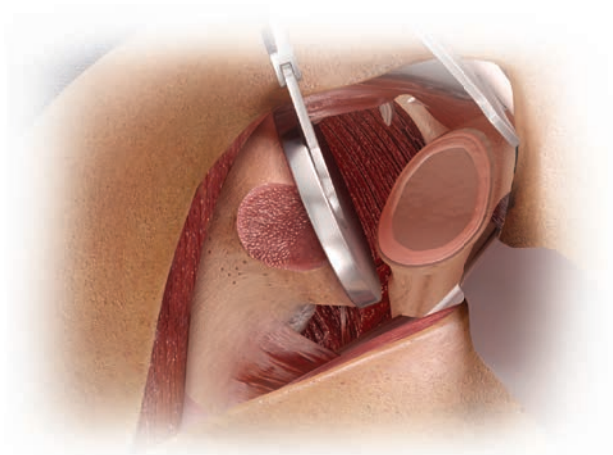


Figure 18

## Final Glenoid Exposure

Two different glenoid exposure options are available when using GLOBAL ENABLE. Choose the option most suitable based on patient type, or surgical preference.

### Option 1 – Normal Situations

The **Anterior Glenoid Neck Retractor** is placed over the anterior glenoid rim and is used to retract the subscapularis and the anterior soft tissues. The arm is then gradually positioned in extension, external rotation, and abduction (Figure 17). This positions the resected humeral head perpendicular to the face of the glenoid.

A **Proximal Humerus Spreader** is positioned with the saddle on the base of the coracoid and the cover plate on the resected surface of the humerus. When in position, the **Proximal Humerus Spreader** is opened and the humerus is displaced posteriorly and inferiorly. Combined, these two retractors provide access to the glenoid fossa for surface preparation with minimal retractor interference (Figure 18).

*Caution: Failure to position the saddle of the Proximal Humerus Spreader at the base of the coracoid may lead to a coracoid fracture.*



# Surgical Technique

## Option 2 – Challenging Situations

The **Blunt Point Gelpi** is used to retract the deltoid and pectoralis muscles. Place the **Anterior Glenoid Neck Retractor** over the anterior glenoid rim to retract the subscapularis and the anterior soft tissues. Place a metal cover plate on the resected proximal humerus. A **Modified Sonnabend** or a **Forked Retractor** is placed posterior to the glenoid rim and rests on the posterior glenoid wall.

The arm is then gradually positioned in slight extension, external rotation, and abduction while levering the posterior retractor pushing the humerus posterior to the glenoid (Figure 19). The cut surface of the humerus is perpendicular to the glenoid surface and posterior to the posterior glenoid rim. A **Reverse Hohmann** or **Small Pectoral Retractor** can be placed on the superior glenoid within the supraspinatus fossa to retract the superior part of the deltoid (Figure 20).

*Note: Excessive abduction will cause the pectoralis and latissimus to tighten, which could potentially limit glenoid exposure.*

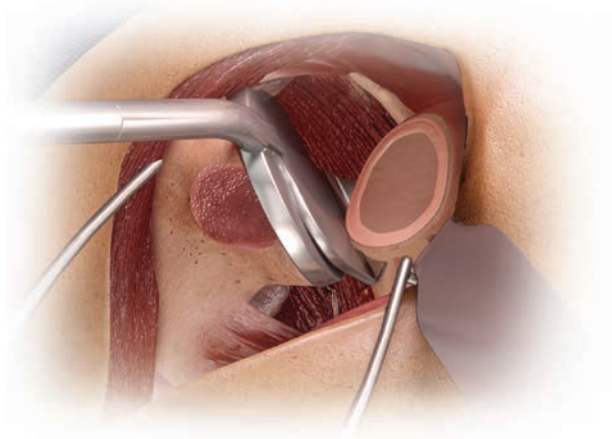


Figure 19

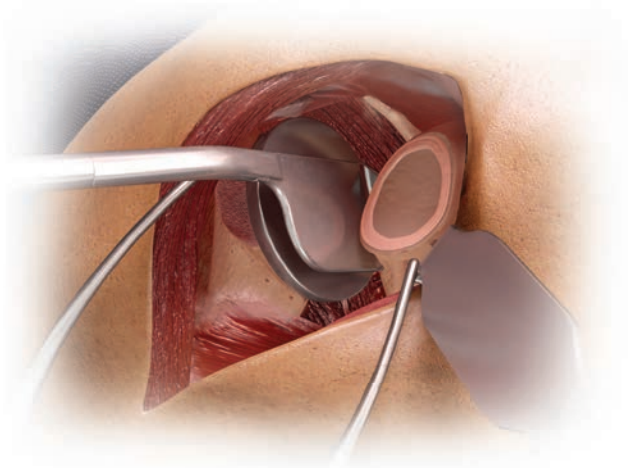
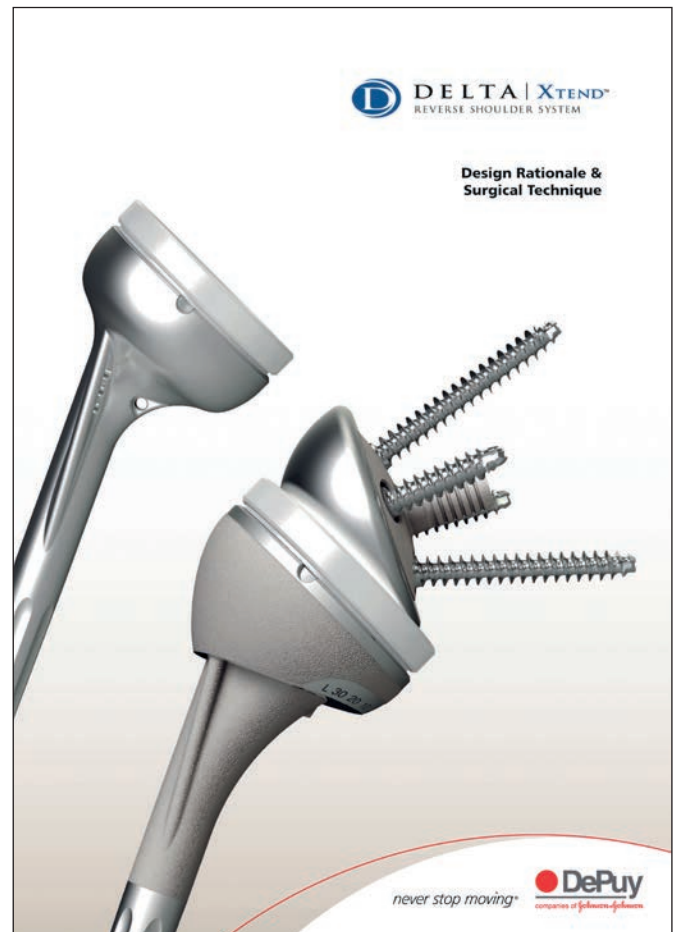


Figure 20

# Glenoid Replacement

The surgeon is now able to complete the glenoid resurfacing procedure. Please refer to the GLOBAL® APG+ Design Rationale and Surgical Technique or the DELTA XTEND™ Design Rationale and Surgical Technique for detailed device implantation information.



# Advanced Solutions



The patented GLOBAL Anchor Peg Glenoid achieves immediate stability with the three minimally cemented peripheral pegs, and provides a proven method of fixation<sup>1</sup> through an interference fit of the central peg.

## Advanced Fixation

The GLOBAL Anchor Peg Glenoid design:

- Provides a proven method of fixation<sup>1</sup>
- Addresses long-term fixation and stability concerns
- Works with the GLOBAL ADVANTAGE and GLOBAL AP Shoulder Arthroplasty Systems

## Advanced Biomechanics

DePuy Orthopaedics glenoid products have been designed with a constant 6 mm diametric mismatch between the glenoid and the humeral head component which:

- Emulates anatomic biomechanics of a healthy shoulder
- Helps optimise load transfer
- Promotes a more natural range of motion
- Helps reduce potential rim loading

## Advanced Wear Reduction

DePuy Orthopaedics offers polyethylene solutions designed for the unique demands of each joint. PREMIERON™ X-Linked Polyethylene for the shoulder is designed to balance wear reduction and mechanical integrity while maintaining oxidative stability.



GLOBAL APG+ is an advanced cannulated instrumentation system that provides accurate placement, orientation, and precise bone preparation for implantation of the GLOBAL Anchor Peg Glenoid. The instruments were designed for ease of use and heightened efficiency in the operating room by incorporating features that enhance **Versatility, Speed, and Precision** through a streamlined surgical approach. GLOBAL APG+ is designed to be used with either the GLOBAL ADVANTAGE or GLOBAL AP Shoulder Arthroplasty Systems.



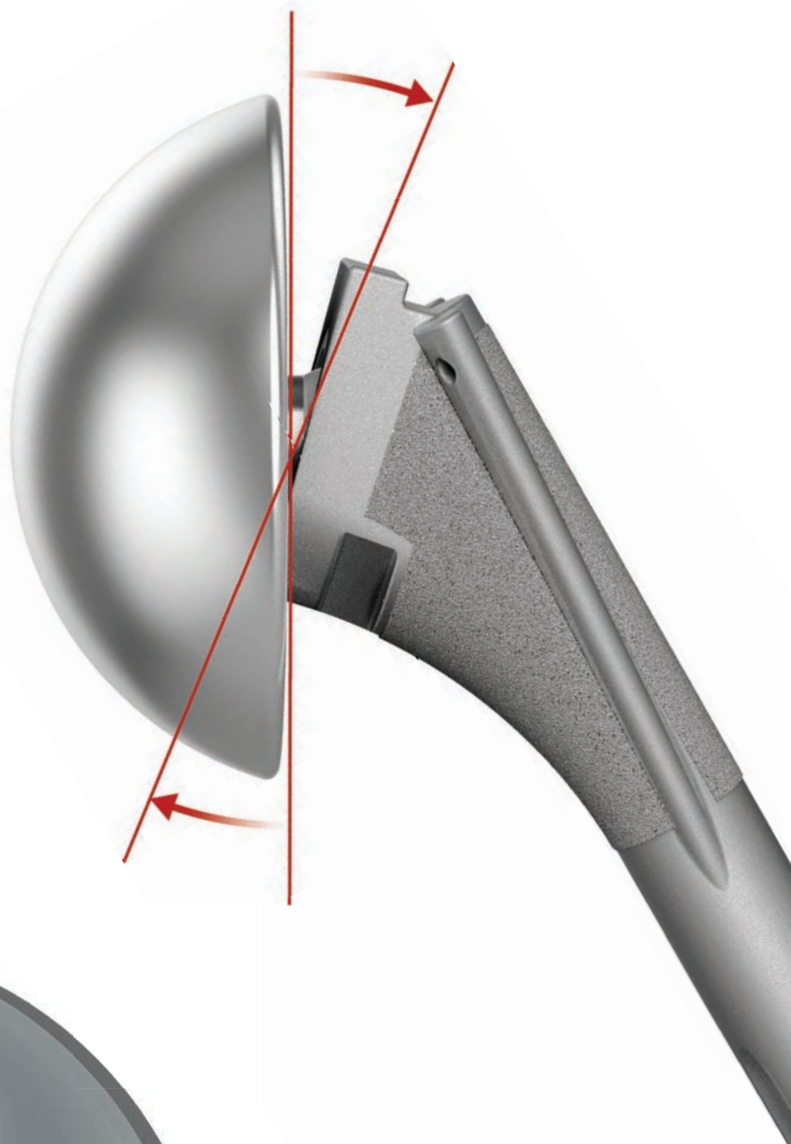
*Ease of Use*



# Advanced Solutions

The GLOBAL AP Shoulder Arthroplasty System is the next generation proximal press-fit DePuy Orthopaedics shoulder arthroplasty system that combines advanced engineering and almost 20 years of GLOBAL Shoulder clinical success.<sup>2</sup>

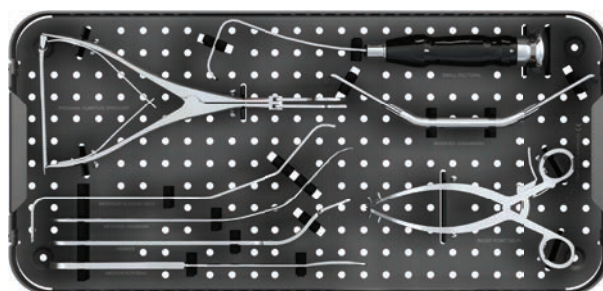
- Collarless design facilitates for anatomic reconstruction of the proximal humerus with two neck options using a single surgical technique:<sup>3</sup>
  - Fixed 135 degree neck angle for simplicity in uncomplicated arthroplasty
  - Adjustable (120-150 degree neck angle and  $\pm 15$  degrees version) for enhanced joint stability
- Titanium alloy with POROCOAT® beading for optimised cementless application<sup>4</sup>
- Low profile standard and eccentric humeral heads
- Revision long stem lengths up to 220 mm



# Product Ordering Information



<i>Cat. No.</i>	<i>Description</i>
2245-10-042	Modified Sonnabend
2245-10-001	Blunt Point Gelpi
2307-86-002	Forked Retractor
2810-03-000	Medium Acromial Retractor
2810-17-000	Anterior Glenoid Neck Retractor (Two-Prong)
2245-10-100	Proximal Humerus Spreader
2245-10-040	Reverse Hohmann
2245-10-008	Small Pectoral Retractor
2245-90-020	GLOBAL ENABLE Case
2245-90-030	GLOBAL ENABLE Top Tray
2245-90-032	GLOBAL ENABLE Bottom Tray
2236-00-300	GLOBAL ENABLE Lid
2245-90-010	GLOBAL ENABLE Case Complete



# Notes

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3. Jeong J, Bryan J, Iannotti JP. Effect of a variable prosthetic neck-shaft angle and the surgical technique on replication of normal humeral anatomy. *Journal of Bone and Joint Surgery*, 2009;91(8)1932-1941.
4. Head WC, Bauk DJ, Emerson RH Jr. Titanium as the material of choice for cementless femoral components in total hip arthroplasty *Clinical Orthopaedics and Related Research*. 1995;311(Feb)85-90.

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