MEDACTA SHOULDER SYSTEM

COMPLETE, CONVERTIBLE, INNOVATIVE

Surgical Technique

Joint | Spine | Sports Med

STEMLESS ANATOMIC SHOULDER ARTHROPLASTY

Medacta International

INDEX

1. INTRODUCTION

This surgical technique describes how to perform an anatomic stemless shoulder arthroplasty implanting a cemented pegged glenoid.

1.1 INDICATIONS OF USE

The Medacta Anatomic Stemless Shoulder Prosthesis is indicated for primary partial or total shoulder replacement in patients with an intact or reparable rotator cuff and a severe arthropathy. The humeral bone quality has to be sufficient in order to support the cementless biological fixation of the stemless metaphysis.

The patient's joint must be anatomically and structurally suited to receive the selected implant(s), and a functional deltoid muscle is necessary for the device to offer full function in vivo.

The glenoid component is intended for cemented application. The metaphyseal component is intended for cementless application.

1.2 CONTRAINDICATIONS

Total joint replacement is contraindicated in cases of:

- Local or systemic infection or sepsis
- Insufficient bone quality which may hinder the stability of the implant
- Muscular, neurological, or vascular deficiencies, which compromise the affected extremity
- Any concomitant disease and dependence that might affect the implanted prosthesis
- Materials (metals, etc.) sensitivity or allergy
- Loss of ligamentous structures that will prevent stabilisation and/or function of the device in vivo
- Non-functional deltoid muscle

1.3 PRE-OPERATIVE PLANNING

For planning purposes, standard X-rays are used. The recommended views are:

- antero-posterior view in internal rotation
- antero-posterior view in external rotation
- axillary view
- Morrison or Bernageau view

A CT-Scan with a three dimensional reconstruction is suggested. Further information on bone deficit and on muscle/capsule quality can be gathered with an MRI.

A neurological investigation could be helpful, for patient conditions assessment.

Templates could be used for planning purposes. The X-ray templates have a 115% scale; different magnifications and digital templates are also available on request.

1.4 SURGICAL APPROACH

The patient is usually placed in a beach chair position. Maintain free space for shoulder extension and adduction. Two surgical approaches are most frequently used for anatomic shoulder prosthesis: anterior (or extended delto-pectoral) approach or anterosuperior approach. Both can be used with the standard instrumentation provided, which has been optimised for the extended delto-pectoral approach. Below the basic steps of the extended delto-pectoral approach are described and referred to.

- Incision
  - an incision is made following the line of the delto-pectoral groove
  - a 10-15 cm incision is usual, but should be made in accordance with the surgical need and size of the patient
- Superficial dissection
  - the delto-pectoral fascia is encountered first; the cephalic vein is surrounded by a layer of fat and is used to identify the interval; the cephalic vein can be mobilised either medially or laterally, depending on patient factors and surgeon preference
  - fibers of the deltoid are retracted laterally and the pectoralis major is retracted medially
- Deep dissection
  - the short head of the biceps and coracobrachialis arise from the coracoid process and are retracted medially. The musculocutaneous nerve enters the biceps 5-8 cm distal to the coracoid process; care must be taken when retracting the conjoint tendon
  - the fascia on the lateral side of the conjoint tendon is incised to reveal the subscapularis; external rotation stretches the subscapularis fibers. The subscapularis may be released from its insertion on the lesser tuberosity through the tendon or via an osteotomy
  - the capsule is then incised (as needed) to enter the joint

Exposure of the humeral head can be achieved through extension, external rotation and adduction.

This operating technique is independent of the chosen approach.

2. HUMERAL RESECTION

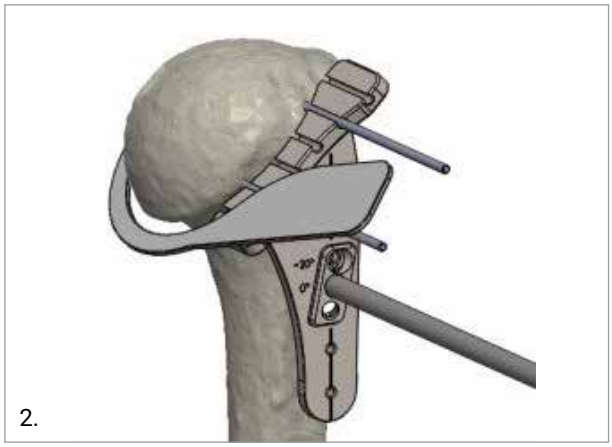
2.1 HUMERAL HEAD RESECTION

Expose the relevant landmarks such as the most medial insertion line of the supraspinatus, the bicipital groove and the estimated original location of the anatomical neck.

Position the EM Humeral Cutting Guide so that the resection plane is flush with the most medial insertion line of the supraspinatus and the shaft follows the humeral diaphysis. This will result in an approximate cut inclination of 135°.

1.

Check the cut inclination and retroversion using the Humeral Sickle and the Retroversion Rod. Once the desired position is found, fix the guide with two Ø2mm pins.


2.

Perform the cut using an oscillating saw.

2.2 HUMERAL HEAD SIZE DETERMINATION

Use the Trial Humeral Head to define the implant size. Check the coverage by positioning the Trial Humeral Head Dish over the resected bone. Choose the size that best fits the humeral anatomy. If in doubt between two sizes, it is preferable to select the smaller one.


3.

2.3 CUT PROTECTION

Place the Cut Protector on the resection plane and fix its position with the help of the two spikes. Choose the Cut Protector size and position which offer the best coverage.


4.

3. GLENOID PREPARATION AND TRIAL INSERTION

3.1 EXPOSURE OF THE GLENOID

Two different options are available to expose the glenoid:

1. External rotation and abduction of the humerus;
2. Alternatively, expose the glenoid through humeral flexion, internal rotation and slight abduction, aiming at postero-inferior dislocation of the humerus. This implies circumferential capsular resection and release of the coracohumeral ligament.

3.2 DEFINITION OF GLENOID CENTRE

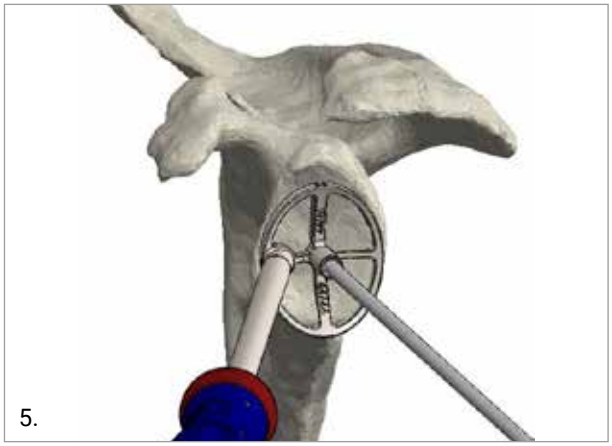
Please consider that the glenoid size to be used corresponds with the previously selected humeral head size. This leads to a diametrical mismatch of 6 mm.

If desired, the glenoid size can be increased or decreased, taking into account that this choice will affect the level of diametrical mismatch, according to the following table:

			Cemented glenoid									
	Size		40	42	44	46	48	50	52	54	56	58
		A.D.	46	48	50	52	54	56	58	60	62	64
Humeral head	40	40	6	8	10							
	42	42	4	6	8	10						
	44	44	2	4	6	8	10					
	46	46		2	4	6	8	10				
	48	48			2	4	6	8	10			
	50	50				2	4	6	8	10		
	52	52					2	4	6	8	10	
	54	54						2	4	6	8	10
	56	56							2	4	6	8
	58	58								2	4	6

A.D. = Articular Diameter

Connect the Glenoid Multi-Purpose Handle to the Anatomical Glenoid Aiming Device of the corresponding selected size. Position the assembled instrument on the glenoid vault so that the convex surface is in contact with the bone.



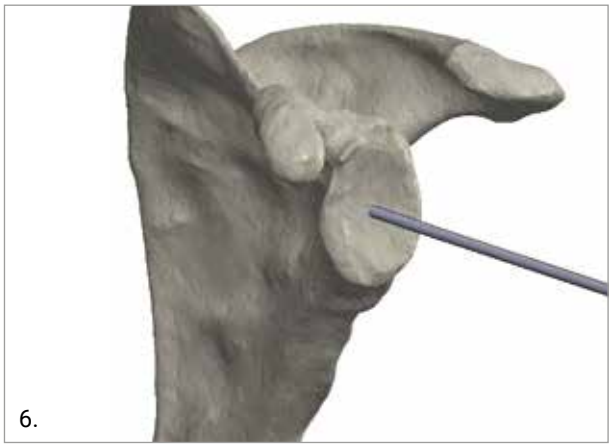
5.

The presence of osteophytes may lead to incorrect positioning. It is highly recommended to remove them before positioning the k-wire.

Fine-tune the position so that the outer profile matches the glenoid rim and assess the glenoid coverage considering that the outer profile of the Aiming Device represents the smaller indicated size.

Insert the k-wire through the central hole of the Aiming Device adjusting the drilling orientation in order to obtain the planned angular correction.

Remove the Aiming Device leaving the k-wire in place.



6.

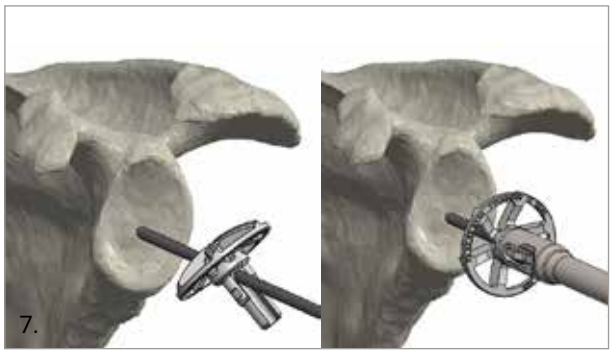
3.3 GLENOID REAMING

Select the size of the Glenoid Reamer as previously determined using the following table:

Glenoid reamer	Glenoid Implant									
	Size	40	42	44	46	48	50	52	54	56	58
	S										
	M										
	L										
	XL										

Not allowed
Recommended
Usable if desired

Slide it on the k-wire and connect it to the Reamer Handle as shown in the pictures below.



7.

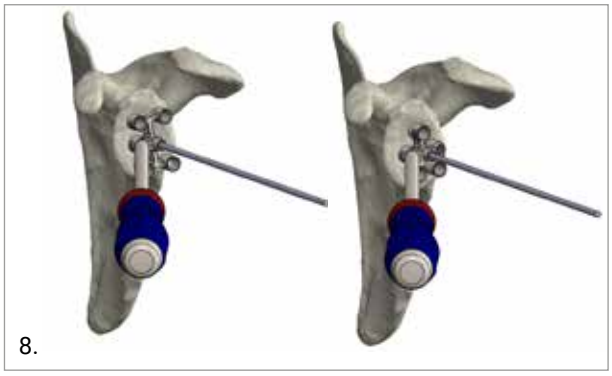
Use a power tool to ream the glenoid to the desired depth considering that the aim is to normalise the version whilst avoiding excessive thinning of the subchondral bone plate.

TIP

If the shoulder, due to exposure and/or strong soft tissues, is particularly tight and it is difficult to insert the regular anatomic glenoid reamers, use the small size reamers (Ø22, 24.5, 27 mm) provided with the instrument set. Start reaming the glenoid with the reamer Ø22 mm and incrementally increase the reamer size until the antero-postero (AP) aspect of the glenoid is completely reamed. In order to complete the supero-inferior (SI) reaming, remove the k-wire and complete the supero-inferior (SI) reaming free-hand.
In order to verify that the reaming is sufficient to welcome the glenoid final implant, the glenoid aiming device, utilized in the previous surgical step for glenoid sizing, could be used.

3.4 PERIPHERAL HOLES PREPARATION

Select the size of the Drill Guide for Pegged Glenoid as previously defined and connect it to the Glenoid Multi-Purpose Handle. Insert the Drill Guide over the k-wire and rotate it to match the glenoid orientation.

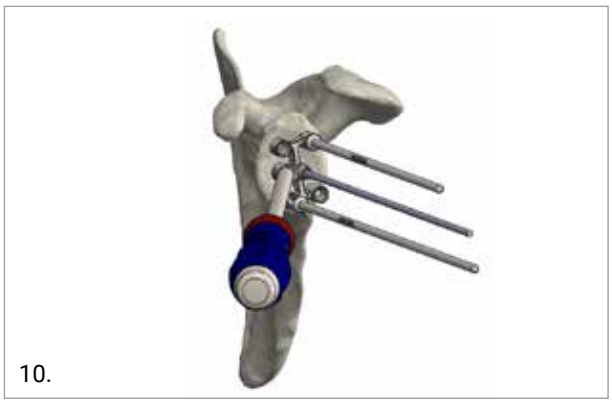


8.

Drill a Ø4.5mm hole into the supero-anterior hole using the Short Drill Bit for Peripheral Pegs and leave it in place to provide stability to the Drill Guide.

9.

Use the Long Drill Bit for Peripheral Pegs to drill the other peripheral holes

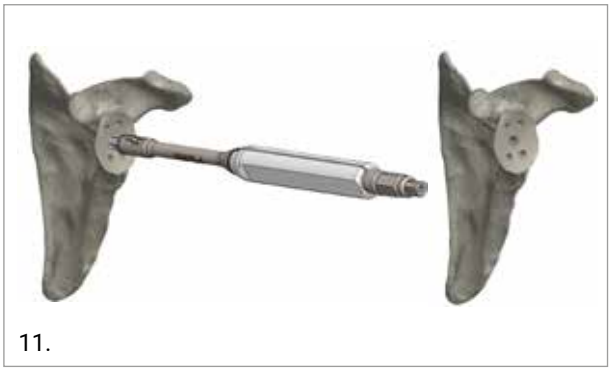


10.

Remove the Drill Bits for Peripheral Pegs, short and long, then remove the Drill Guide for Pegged Glenoid, leaving the k-wire in place.

3.5 CENTRAL HOLE PREPARATION

Connect the Central Peg Reamer to the Reamer Handle. Slide the assembled reamer over the k-wire and use a power tool to ream the glenoid until the mechanical stop is reached.



11.

3.6 TRIAL PEGGED GLENOID INSERTION

Use the Glenoid Clamp to position the Trial Pegged Glenoid and apply gentle pressure to fix it in place.

12.

4. HUMERAL PREPARATION AND TRIAL INSERTION

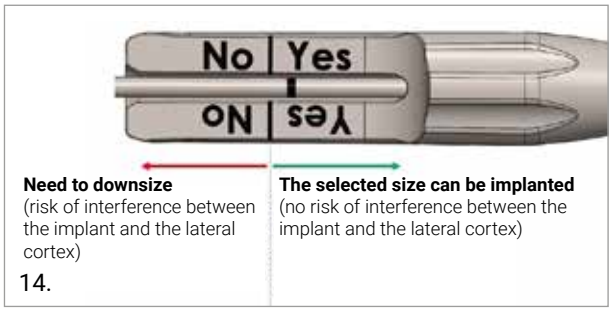
4.1 SIZING OF THE STEMLESS METAPHYSIS

Remove the Humeral Cut Protector.

Position the most appropriate size of Stemless Aiming Device on the resected humerus and insert the Ø2.5 Drill Bit until its tip is in contact with the humeral lateral cortex.

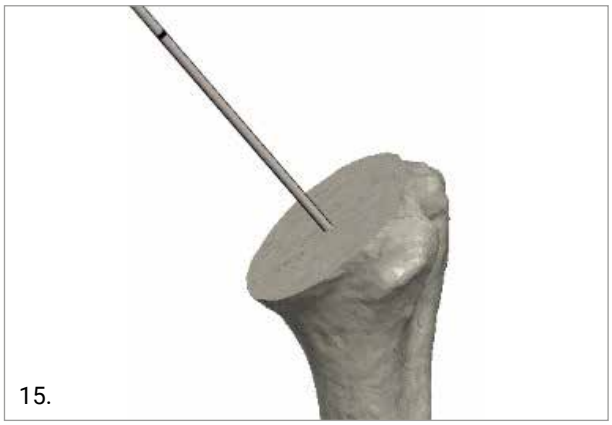
13.

The reference line on the Drill Bit indicates whether the selected size will risk interference between the implant and the humeral lateral cortex.



14.

If the selected size is confirmed to be appropriate, drill deeper so that the Drill Bit is firmly fixed in the lateral cortex. Slide back the Stemless Aiming Device along the Drill Bit.



15.

NOTE: evaluate if the humeral bone quality is sufficient before proceeding with the following steps. If not proceed following the surgical technique of the standard or short stem.

4.2 HUMERAL PREPARATION

Connect the Reamer Handle to the Stemless Reamer of the selected size and ream until the mechanical stop is reached.

16.

Slide the Fixation Screw for Stemless Metaphysis into the Puncher Impactor. Connect the Impactor to the Puncher of the selected size and fix it by tightening the Fixation Screw.

WARNING

The instrument is correctly assembled when the upper part of the Fixation Screw is in contact with the upper part of the Puncher Impactor.

17.

Prepare the fins into the reamed proximal humerus by hammering on the instrument anvil. One fin shall be directed medially paying attention that the line marked on the superior rim aims towards the lateral side of the humerus.

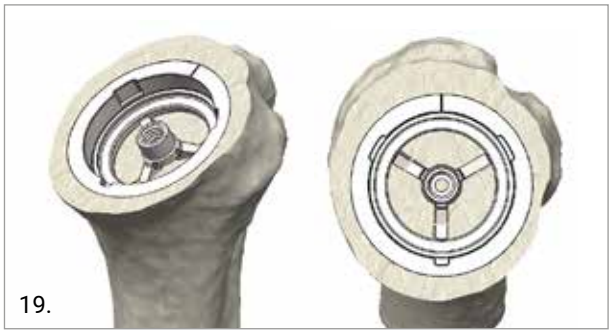
18.

The step is completed when the Puncher is flush with the humeral resection plane.

WARNING

Be aware that high impact force may damage the humerus.

Remove the k-wire and release the Puncher by unscrewing the Fixation Screw.



19.

4.3 TRIAL DOUBLE ECCENTER AND TRIAL HEAD POSITIONING

Place the Trial Double Eccenter on the Stemless Puncher. Select the size of the Trial Humeral Head Dish as previously defined and place the Trial Head Dish on the Trial Eccenter.

20.

The markings “12” on the Trial Humeral Head Dish and “A” on the Trial Eccenter have to be aligned with the line lasermarked on the Puncher to achieve a neutral position.

21.

If the coverage of the resected head is not optimal, search for the best offset using the following procedure.

Adjust the orientation of the Trial Double Eccenter using the HEX3.5 Screwdriver and simultaneously rotate the Trial Humeral Head Dish by hand.

22.

Once their position is considered satisfactory, temporarily lock the embedded screw of the Trial Double Eccenter using the HEX3.5 Screwdriver.

23.

Place the Trial Humeral Head Cap on the Trial Double Eccenter sliding the anti-rotation pin into the dedicated slot of the Trial Humeral Head Dish.

24.

Gently push the Trial Head Cap onto the Trial Humeral Head Dish to fix it in place.

25.

Perform trial reduction to assess the joint stability and ROM.

4.4 RECORD HUMERAL VALUES AND REMOVE TRIALS

Remove the Trial Humeral Head Cap.

26.

Record the position of the Trial Humeral Head Dish with respect to the Trial Double Eccenter.

27.

Remove the Trial Humeral Head Dish and record the position of the Trial Double Eccenter with respect to the Stemless Puncher..

28.

Unscrew and remove the Trial Double Eccenter.

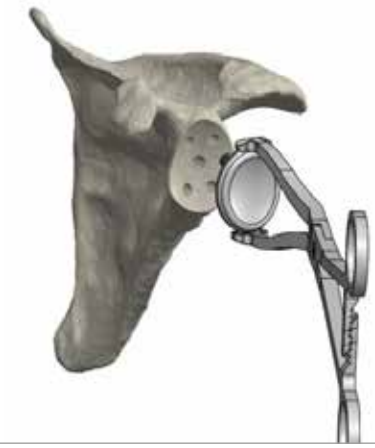
Protect the humeral cut using the Cut Protector.

5. PEGGED GLENOID IMPLANT IMPACTION

Remove the Trial Pegged Glenoid.

Prepare the bone cement and carefully insert it into the prepared holes.

Use the Glenoid Clamp to position the pegged glenoid.



29.

Connect the Glenoid Impactor Tip to the Impactor Handle and use the assembled instrument to impact the glenoid implant.

30.

6. HUMERAL IMPLANT PREPARATION AND IMPACTION

6.1 ANATOMIC STEMLESS IMPLANTS BACKTABLE ASSEMBLY

Position the selected size of the stemless metaphysis into the Backtable Assembly Block.

31.

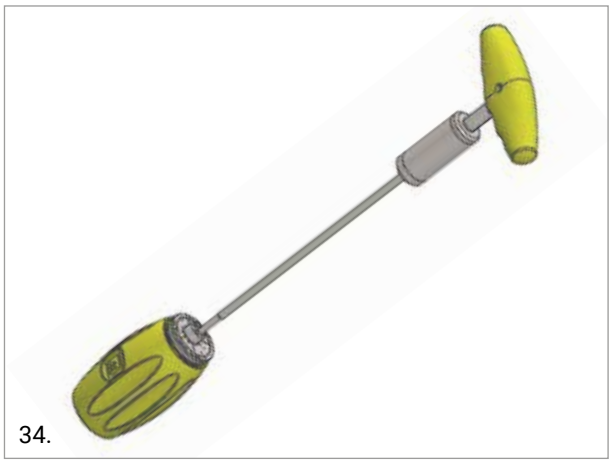
Slide the double eccenter into the stemless metaphysis aligning the previously defined letter with the line marked on the stemless metaphysis.

32.

Assemble the Impactor for Double Eccenter to the Impactor Handle and impact the eccenter using a mallet.

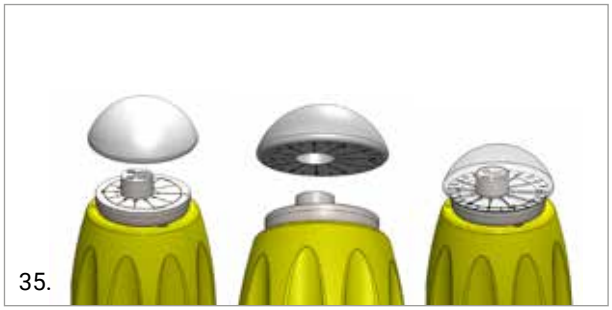
33.

Tighten the Double Eccenter Screw using the Torque Limiting Screwdriver T20 6Nm.



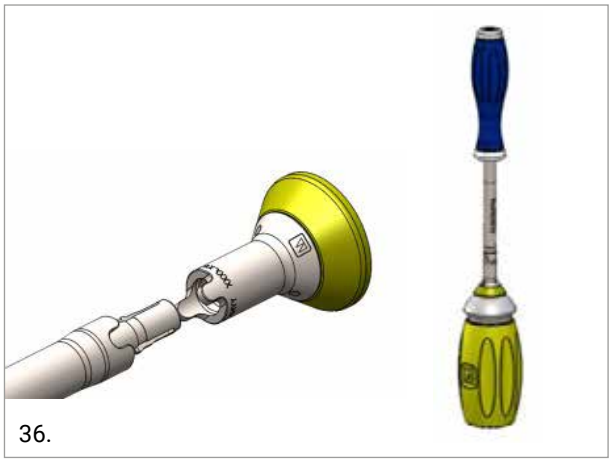
34.

Select the previously defined size of the humeral head and place it on the double eccenter aligning the markings (numbers) in the previously determined position, using the A-line on the double eccenter as a reference.



35.

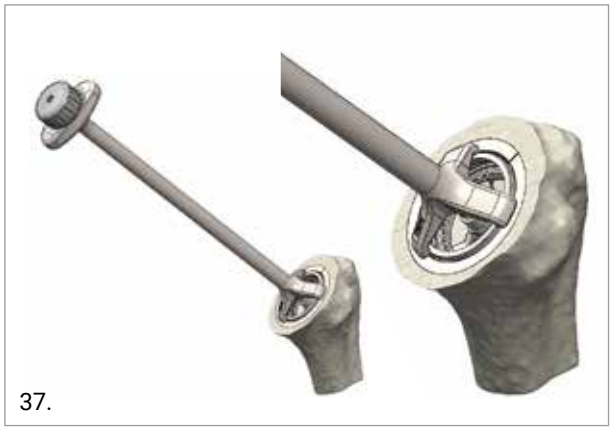
Connect the Humeral Head Impactor Tip to the Impactor Handle and use the assembled instrument to impact the humeral head on the stemless implant.



36.

6.2 HUMERAL STEMLESS IMPLANT IMPACTION

Slide the Fixation Screw for Stemless Metaphysis into the Puncher Impactor. Connect the Impactor to the Puncher and extract it.



37.

Remove the assembled stemless anatomic implant from the Backtable Assembly Block, insert it into the prepared humerus and impact it with the help of the Humeral Head Impactor.

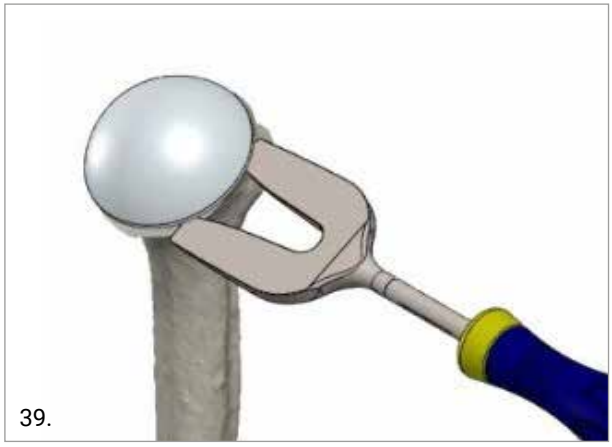
38.

Check that the humeral implant is well fixed into the humeral bone and the primary stability is sufficient.

7. REMOVAL

7.1 HUMERAL HEAD IMPLANT REMOVAL

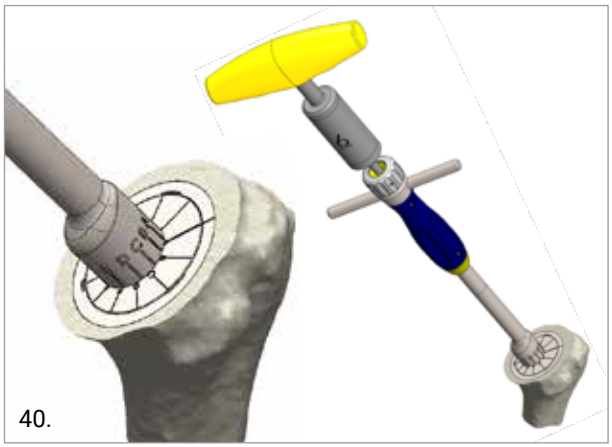
Use the Humeral Head Extractor to remove the humeral head. Insert the fork between the humeral resection and the bottom surface of the implant by slightly hammering.



39.

7.2 DOUBLE ECCENTER REMOVAL

Slide the M8 fixation screw into the Double Eccenter Positioner. Position the assembled instrument on the eccenter and lock it by screwing the M8 fixation screw. Remove the implants using the Torque Limiter Screwdriver T20 until the double eccenter detaches from the stemless metaphysis.



40.

7.3 HUMERAL STEMLESS IMPLANT REMOVAL

Use a chisel to remove the humeral stemless implant.

8. IMPLANTS AND INSTRUMENTS NOMENCLATURE

IMPLANTS

REFERENCE	DESCRIPTION	PICTURE
04.01.0235	Stemless humeral metaphysis - 1	
04.01.0236	Stemless humeral metaphysis - 2	
04.01.0237	Stemless humeral metaphysis - 3	
04.01.0238	Stemless humeral metaphysis - 4	
04.01.0239	Stemless humeral metaphysis - 5	
04.01.0240	Stemless humeral metaphysis - 6	

IMPLANTS

REFERENCE	DESCRIPTION	PICTURE
04.01.0253	Stemless double eccenter - S1/2/3	
04.01.0254	Stemless double eccenter - S4/5/6	

IMPLANTS

REFERENCE	DESCRIPTION	PICTURE
04.01.0090	Metal humeral head Ø40	
04.01.0091	Metal humeral head Ø42	
04.01.0092	Metal humeral head Ø44	
04.01.0093	Metal humeral head Ø46	
04.01.0094	Metal humeral head Ø48	
04.01.0095	Metal humeral head Ø50	
04.01.0096	Metal humeral head Ø52	
04.01.0097	Metal humeral head Ø54	
04.01.0098	Metal humeral head Ø56	
04.01.0099	Metal humeral head Ø58	

IMPLANTS

REFERENCE	DESCRIPTION	PICTURE
04.01.0128	HC pegged glenoid Ø40	
04.01.0129	HC pegged glenoid Ø42	
04.01.0130	HC pegged glenoid Ø44	
04.01.0131	HC pegged glenoid Ø46	
04.01.0132	HC pegged glenoid Ø48	
04.01.0133	HC pegged glenoid Ø50	
04.01.0134	HC pegged glenoid Ø52	
04.01.0135	HC pegged glenoid Ø54	
04.01.0136	HC pegged glenoid Ø56	
04.01.0137	HC pegged glenoid Ø58	

SCREW

REFERENCE	DESCRIPTION	PICTURE
04.01.0255	Stemless double eccenter screw	

INSTRUMENTS

REFERENCE	DESCRIPTION	PICTURE
04.01S.310	Medacta Shoulder General	
04.01S.313	Medacta Shoulder Anatomic	
04.01S.318	Medacta Shoulder Stemless	

NOTE: Some of the above instrument sets include motorized instruments with AO connection, in alternative:
04.01S.310 US: motorized instruments with Zimmer-Hall connection

9. INSTRUMENTS COLOUR CODING INSTRUCTIONS

Colour Coding for Instruments*:

- Humeral Instruments: all the dedicated humeral instruments have a yellow tag
- Glenoid Instruments: all the dedicated glenoid instruments have a red tag
- General Instruments: all the multipurpose instruments have a white tag

*= except for torque limiting screwdrivers

NOTES

Part numbers subject to change.

NOTE FOR STERILISATION

The instrumentation is not sterile upon delivery. It must be cleaned before use and sterilised in an autoclave in accordance with the regulations of the country, EU directives where applicable and following the instructions for use of the autoclave manufacturer. For detailed instructions please refer to the document "Recommendations for cleaning decontamination and sterilisation of Medacta International orthopaedic devices" available at www.medacta.com.

REDEFINING BETTER
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Stemless Anatomic Shoulder
Arthroplasty
Surgical Technique

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