Arthrex ECLIPSE™ – Stemless Shoulder Prosthesis

Surgical Technique

Arthrex®

Content

Basic Design Principle
In the treatment of glenohumeral joint disease, we understand that current resurfacing, total shoulder arthroplasty and hemiarthroplasty surgical options are not without obstacles and hazards. The former presents obvious difficulties in terms of the glenoid replacement. In addition, revision of a conventional stemmed implant often demands osteotomy of the humeral shaft with an elevated rate of morbidity. Given these issues, a modern solution for glenohumeral arthritis, especially in younger patients, is essential. The Arthrex ECLIPSE system strikes a balance between conventional resurfacing and standard stemmed devices with several key advantages:

- Individual anatomic reconstruction of the humeral head as the prosthesis is adjusted to the cortical rim of the humeral resection at the anatomical neck
- Humeral head can be positioned independently of the humeral shaft axis, which is especially important in post-traumatic arthritis situations
- Unrestricted approach to glenoid allows simple total arthroplasty
- The preserved bone in the shaft region makes it possible to switch to an anatomic or reverse prosthesis without major complications in revision cases
- Potential for less invasive exposure

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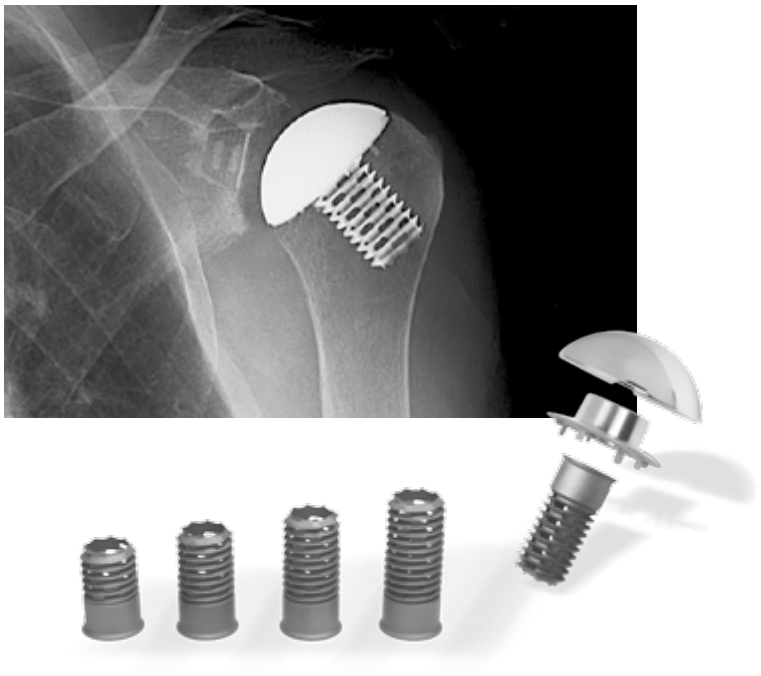
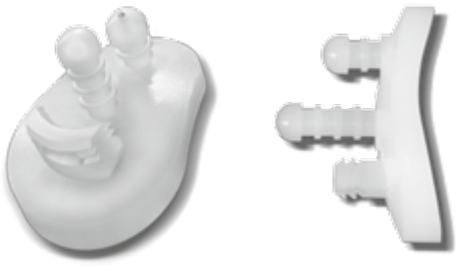


Keeled Glenoid
Keel with dual fenestration for improved cement acceptance. In addition, reverse barbs on the keel support enhanced anchoring.

Universal Glenoid™
The Universal Glenoid allows for either an anatomic or an inverse reconstruction of the glenoid. Thus an anatomic reconstruction can easily be revised with a glenosphere to an inverse prosthesis, keeping the same glenoid baseplate in place.

Pegged Glenoid
The two-peg design features a curved keel with reverse barbs and large fenestration for reliable fixation strength.



As described by Prof. Dr. med. habil. Peter Habermeyer | ATOS Clinic | Heidelberg – Munich | DE

1. Patient Positioning
The patient is placed in the beach chair (semi-sitting) position. The head and neck are secured using a ring headrest which is helpful for maintaining the head and neck position throughout the procedure. The upper body is brought to the edge of the operating room table to allow full extension of the arm, which is essential for the exposure of the proximal humerus. A folded towel is placed behind the medial border of the scapula to stabilize the position of the glenoid throughout the procedure. A sterile preparation and draping is performed on the shoulder and arm to allow full exposure and free movement of the entire limb.

2. Deltopectoral Approach
The deltopectoral incision starts above the coracoid process and terminates above the insertion of the pectoralis major on the shaft of the humerus. The skin incision often lies directly over the cephalic vein and therefore the interval between the deltoid and pectoralis major muscles. The vein is mobilized laterally. The conjoined tendon complex, consisting of the short head of the biceps and the coracobrachialis muscle, is identified. The muscular portion of the biceps (red) is the most lateral part of the conjoined tendon, with the tendinous portion (white) is just medial to the visible muscle. The approach through the clavipectoral fascia is just lateral to the “red stripe”, representing the muscular portion of the short head of the biceps. The deltoid muscle is carefully mobilized laterally and protected.

The coracoacromial ligament is maintained (not released). A thin retractor (e.g. Hohmann) is placed under the coracoacromial ligament to provide exposure to the superior aspect of the subscapularis and the humerus. The superior 1 - 2 cm of the pectoralis tendon can be released to provide additional exposure to the inferior aspect of the subscapularis and the anterior circumflex vessels. The arm is then externally rotated to further expose the boundaries of the subscapularis muscle and the tendon insertion. The superior aspect of the subscapularis tendon is at the level of the coracoid tip and can be clearly identified by excising part of the infracoracoid bursa and rotator interval capsule. The inferior border of the subscapularis tendon is at the level of the anterior circumflex vessels. This group of vessels includes the anterior circumflex artery bordered by two anterior circumflex veins. The lateral border of the subscapularis tendon is identified exactly medial to the bicipital groove.

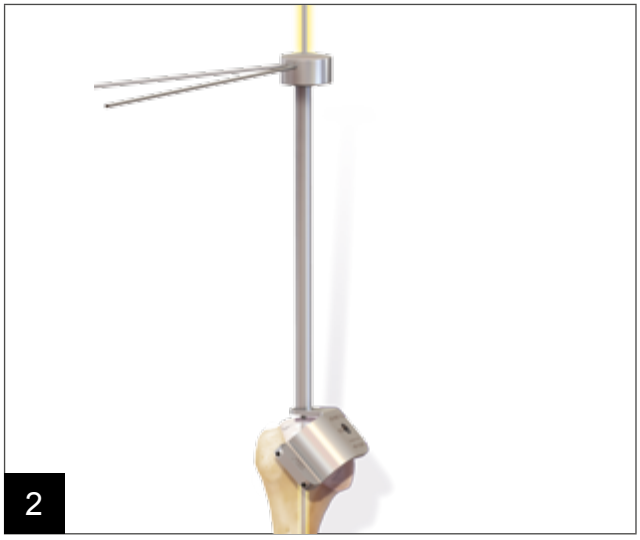
3. Subscapularis Tendon Release
For uncomplicated shoulder arthroplasty, a transtendon approach is preferred, leaving 5 mm of tendon attached to the lesser tuberosity for later repair of the tendon to both the bone and the remaining tendon. The subscapularis tendon is entirely released cranially in the rotator interval. Then the tendon is incised inferiorly, parallel to the bicipital groove, leaving a 5 mm tendon cuff. Caudally the subscapularis muscle is incised medially at the level of the ligated circumflex vessels. (CAUTION: axillary nerve!) The humerus is externally rotated to facilitate the release of the capsule from the humerus to the 6 o’clock position on the humerus. Several #2 FiberWire stitches are placed in the released tendon edge.

4. Glenohumeral Capsular Release
Once the subscapularis tendon is released from the humerus, the surgeon has an opportunity to release the anterior and inferior capsule with excellent direct visualization. This capsular release is a routine part of shoulder arthroplasty for patients with a loss of external rotation, most commonly seen in osteoarthritis patients. A ring retractor (Fukuda) is placed across the glenohumeral joint and hooked on the posterior glenoid. The retractor is used to sublux the humerus, posteriorly and laterally, placing tension in the inferior capsule. The junction between the muscular portion of the subscapularis (red) and the capsule (white) is clearly identified. The axillary nerve is generally just inferior to the muscular portion of the subscapularis or less than 1 cm from the capsule. The nerve should be identified and protected. With tension in the capsule, it is released from lateral to medial, ending at the six o’clock position on the glenoid. The anterior capsule is transected close to the glenoid, and the subscapularis is released from the neck of the scapula. Finally, the fibrous attachments from the lateral aspect of the coracoid to the subscapularis are released, completing mobilization of the subscapularis when combined with the anterior/inferior capsulotomy. This step is essential to achieving better mobility. The subscapularis tendon is then displaced medially under the coracoid process and held away from the surgical site with the Langenbeck hook retractor, ready for preparation of the humerus.

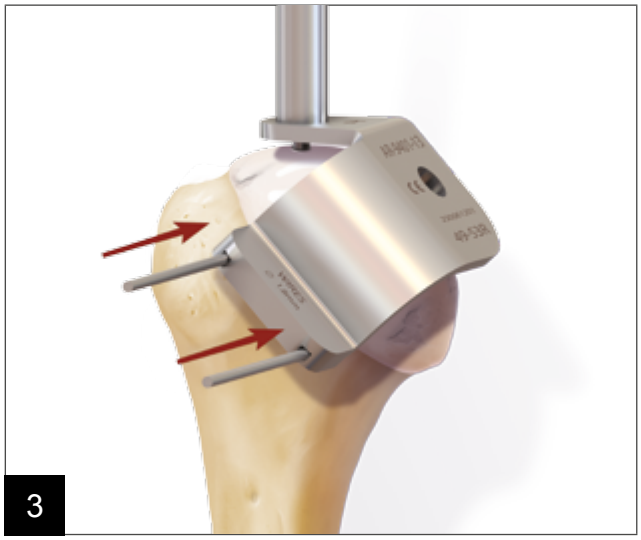
5. Humeral Head Resection
The humerus is gently dislocated from the glenoid. The arm is externally rotated until a direct view of the entire humeral articular surface is achieved. This can be facilitated by using a flat retractor medially on the anterior acetabular rim and a retractor placed above the rotator cuff. The arm is held in 90° of external rotation, 20° - 30° of extension, and adduction against the operating room table. If complete exposure of the humeral head articular surface cannot be accomplished, further capsulotomy may be necessary.

Humeral Preparation

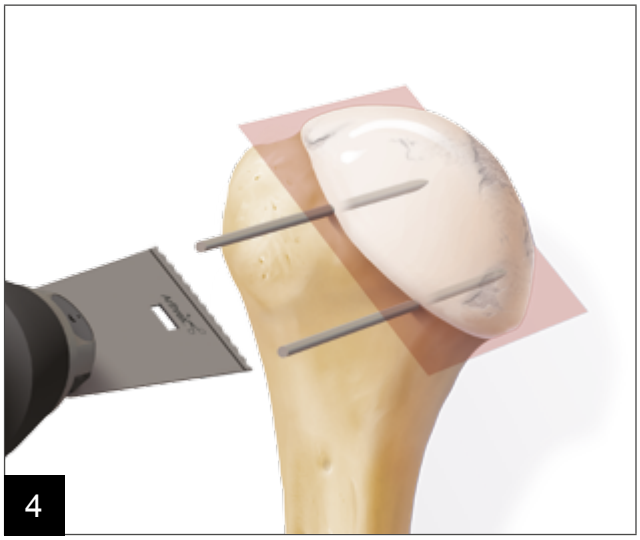
Remove osteophytes with a rongeur or small osteotome in order to identify the anatomic neck. The resection guide corresponding to the side and size of the humeral head is placed on the humeral head. To determine retroversion, version rods are placed in the guide at the 20° and/or 40° positions and aligned with the forearm with the elbow flexed 90°.*



Once the appropriate guide position has been established, the 2.8 mm Steinmann pin is advanced down the intramedullary canal of the humeral head resection guide to secure it to bone. When the size and position of the resection guide are correct, K-wires are positioned at the level of the anatomic neck.

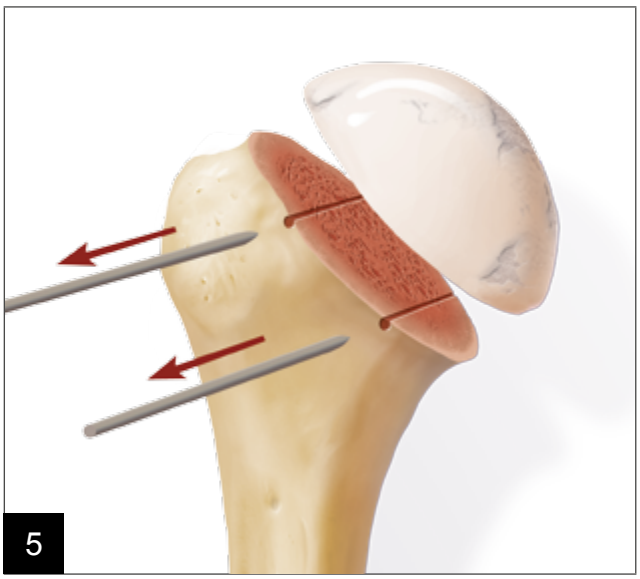


Two 1.6 mm K-wires are drilled through the holes of the humeral head resection guide until they exit the opposite cortex at the boundary of the articular cartilage.



The Steinmann pin is removed from the center of the resection guide, then the guide is disengaged from the K-wires. The humeral head is now resected with a saw, using the K-wires as a guide. The trial head is compared with the resected humeral head or cut surface of the humerus to determine the correct size.

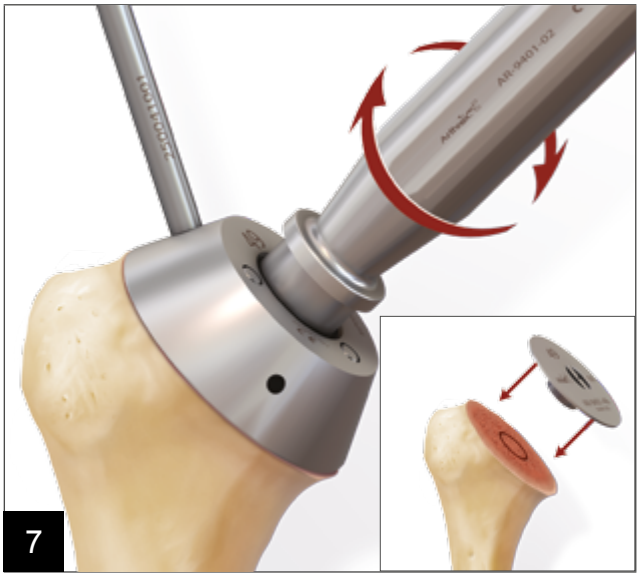
* Typically, the forearm should be visualized between the position of the two version rods so that a retroversion of approx. 30° is achieved, based on the orientation of the forearm.



The K-wires are removed using the pin extractor.

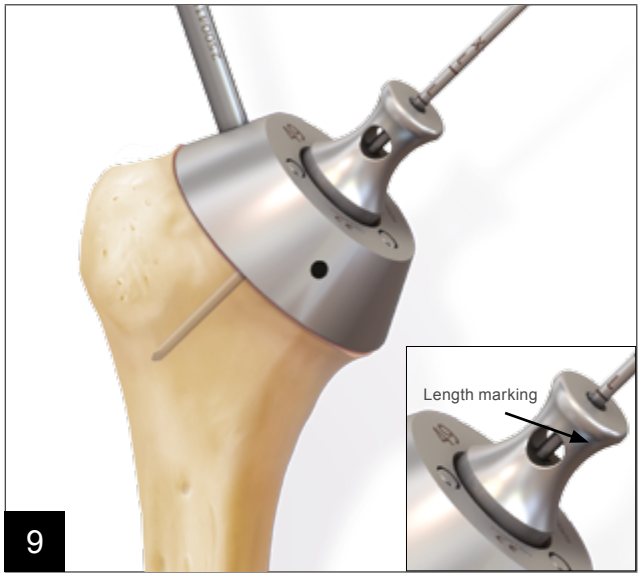
Note: If the bone quality is poor (very soft cancellous bone/osteoporosis), the procedure should be switched to a stemmed prosthesis.

Determine the size of the trunion by trialing the various drill templates. The drill template should match the resected plane of the cortical rim as closely as possible.

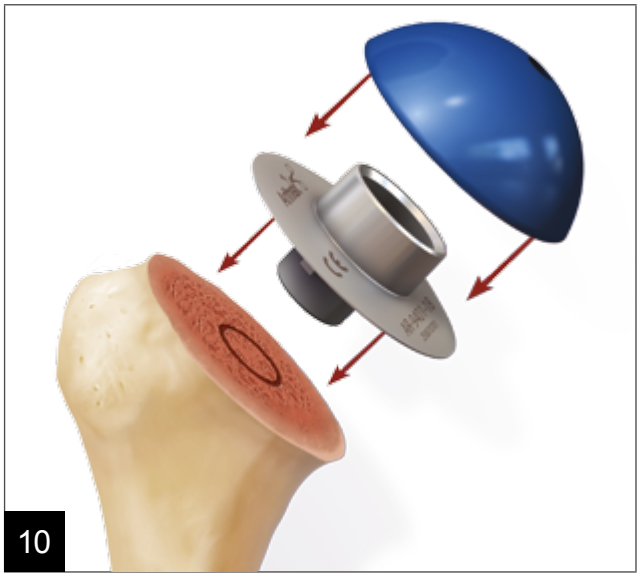


Prepare the hole for the cage screw using the hand coring reamer. In hard bone it may be necessary to use the power reamer. If a glenoid replacement is planned, the resected plane should be protected by using one of the resection protectors from the instrument set (see inset).

Place the centering device into the drill template and push it into the reamed channel in the humeral cut.



To determine the length of the cage screw, drill the graduated cage screw sizer through the centering device until it reaches the lateral cortex. The size refers to the laser marking on the pin and it is referenced off the top of the centering device. If the measurement is between two marks, choose the shorter screw. Remove the cage screw sizer after the measurement has been taken.



Optional: The trial trunion and trial head itself can be used to verify the correct size of the prosthesis. The trial head is available in the standard heights for all sizes and optionally in a 2 mm elevated version.

Note: The drill template and the centering device must be removed prior to this optional step.

Remove the drill template and place the selected trunion of the previously determined size over the centering device.

Fix the trunion to the humeral cut with the trunion impactor and mallet. Then remove the centering device.

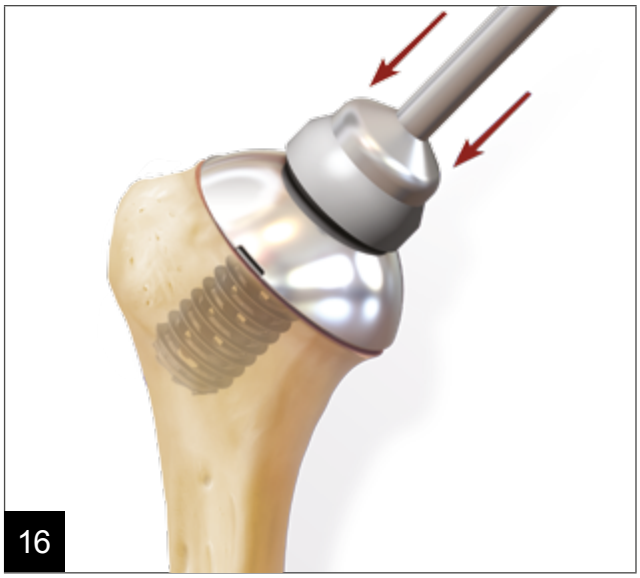
Note: The trunion should have circumferential contact with the cortical rim.

Select the appropriate cage screw according to the previous measurement (step 9). Advance it through the center of the trunion while holding the trunion tightly against the resected surface with the trunion impactor in order to ensure aligned insertion of the screw.

Fix the trunion by tightening the cage screw with the screwdriver until the head of the screw is flush with the neck of the trunion.

When the screw has been fully seated on the neck of the trunion, remove the screwdriver and trunion impactor.

Note: Do not overtighten the screw.



Select the appropriate humeral head according to the size of the trunion. The humeral head is impacted onto the trunion using the head impactor.

Note: The size of the humeral head must correspond to the size of the trunion.

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Following repositioning of the head prosthesis, the subscapularis muscle is reattached under slight abduction and external rotation of the arm. The combination of transosseously placed sutures and reattachment to the tendon stump of the subscapularis muscle on the lesser tuberosity offers a high degree of stability and pull-out strength compared with simple reattachment by means of transosseous sutures through the shaft.

To avoid suture insufficiency, #2 nonabsorbable sutures should be placed using the Mason-Allen suture technique. In tight joint situations, the reattachment is performed using pre-placed transosseous sutures against the neck of the humerus, which allows length to be gained. Otherwise, suturing the scapularis tendon under tension results in an external rotation block with dorsal translation of the implant head, and ultimately insufficiency. In cases where an external rotation deficit can be excluded, the subscapularis muscle can be sutured end-to-end with the lateral edge of the tendon.

It is recommended to suture the rotator interval without tension as an additional step. This provides additional protection for the subscapularis repair.

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The shoulder is initially immobilized for two days with a Gilchrist immobilizer and then in an abduction pillow until the end of the third postoperative week.

The first rehabilitation phase is initiated in the first two weeks and consists of the passive, pain-oriented mobilization of the shoulder at the level of the scapula up to a maximum flexion of 90°, abduction of 60°, internal rotation of 45° and external rotation of 10° via the short lever and glide joint mobilization. In addition, gentle assistive mobilization of the scapula should also be performed. Gentle isometric exercises for centering the glenohumeral joint can also be initiated close to the joint, and active movements of the hand and elbow performed. These are accompanied by muscle detoning exercises for the shoulder and neck area as well as mobilization of the neighboring joints and posture training.

Home exercises can begin with controlled pendulum exercises and assistive flexion from a supine position. This is accompanied by applications to reduce inflammation and to return the joint size to normal. Once the goals of the first phase have been achieved, the patient can progress to the second phase (approximately from the third postoperative week to the sixth). This phase focuses on mobilization and coordination training. Once the wound has closed completely, the exercises can be performed in a physiotherapy pool utilizing the flow of the water (not against the resistance of the water) under strict physiotherapeutic supervision.

The passive, pain-oriented mobilization can now be performed up to a maximum of 90° flexion, 70° abduction, 70° internal rotation and 20° external rotation with slow transition to assistive mobilization. Work can now begin on the isolated scapula fixators (especially the serratus anterior muscle and the inferior region of the trapezius muscle) as well as gentle isometric exercises for the rotator cuff with the short lever. In the later stages of this phase, if the patient does not experience any pain, the transition can be made to active mobilization and measured concentric isometric training of the rotator cuff can begin. At the end of the second phase, it should be possible to perform the hair-combing motion (retroflexion) and apron-tying motion (adduction and internal rotation) to the greater trochanter without any pain.

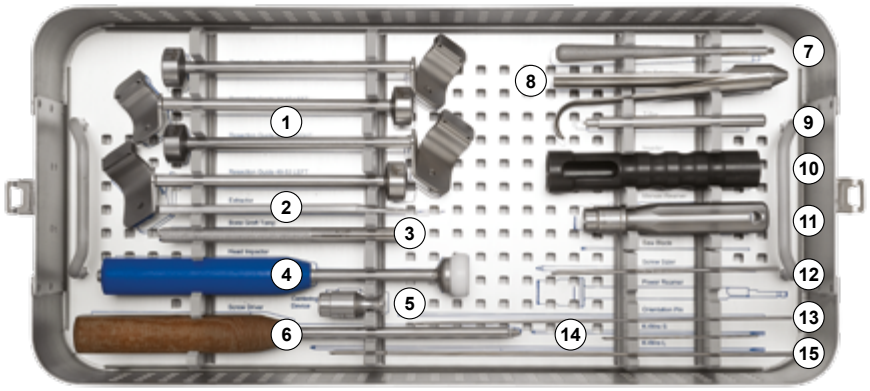
Only then should the transition to the third phase of the rehabilitation be made, which focuses on active mobilization, coordination training and strengthening (approx. from week 7 to week 12). In this phase, the passive and active range of motion can be mobilized without limitations, but taking the pain threshold into consideration. The isometrically centering exercises now transition into dynamic exercises for strengthening the rotator cuff. Stabilization exercises for the scapula are intensified with a range of starting positions. These are complemented by exercises for improving the glenohumeral rhythm in all joint positions.

As of approximately the ninth postoperative week, it is possible to step up the dynamically concentric and now also eccentric training of the rotator cuff at the level of the scapula with the exercise band and light weights, with the focus on improving coordination. These are joined by more complicated exercises in the closed chain and later also in the open chain and in the overhead position. At the end of this phase, it should be possible to perform the apron-tying motion and hands-behind-the-neck motion (external rotation with abduction) without any restrictions. Once these objectives have been achieved, the fourth phase of the rehabilitation begins with the focus on strengthening and optimization of neuromuscular control (approximately from week 12). The manual resistances are intensified in free positions (open chain) (isometrically, PNF diagonals).

The feedback from the patient with regard to the manual resistances in non-supported positions is decisive for the further progress in muscle development training (medical training therapy (MTT)). Pain and discomfort are warning signals for the patient which must be respected in terms of the intensity, scope and positions of the measures. The resistances are increased for the scapula fixators, the throracic spine extensors and the biceps and triceps. Once a balanced strength level has been established, more work- and sport-specific exercises are integrated in the rehabilitation. Everyday postures and actions are critically investigated for effects which could compromise the shoulder, and are modified if necessary. Activities involving high tensile and shear loading should be avoided.

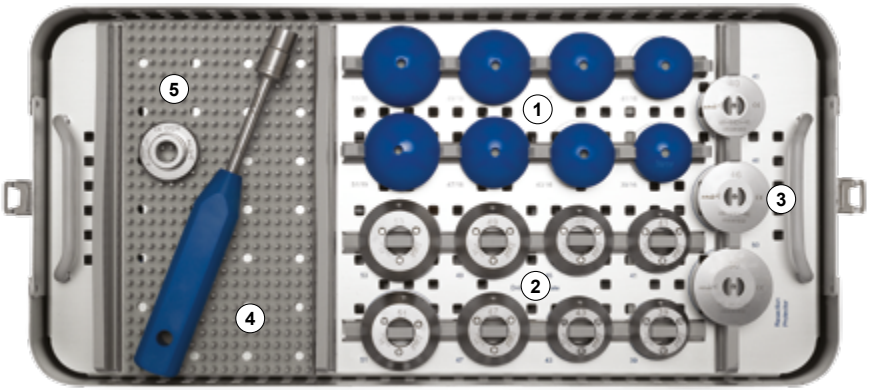
Base Tray

1	Humeral resection guides
2	Humeral head extractor
3	Bone tamp
4	Humeral head impactor
5	Centering device
6	Screwdriver
7	Drill template handle
8	Pin extractor
9	T-bar
10	Trunion impactor
11	Hand coring reamer
12	Cage screw sizer
13	Resection guide version rods
14	K-wires for resection guide
15	2.8 mm Steinmann pin for resection guide



Top Tray

1	Humeral head trials
2	Drill templates
3	Resection protectors
4	Coring reamer, long
5	Trial trunion



Glenoid Sizing Matrix

Humeral Head Diameter	Mismatch (mm)			
	Small	Medium	Large	X-Large
39	8.5			
41	7.25			
43	6	7.25		
45		6	7.5	
47		5	6.5	
49			5.5	7
51				6
53				5
55				4

Ordering Information

Product Description	Item No.
Implants	
Arthrex ECLIPSE™ trunion, 39 mm, TPS and CaP coated	AR-**9300-39CPC**
Arthrex ECLIPSE™ trunion, 41 mm, TPS and CaP coated	AR-**9300-41CPC**
Arthrex ECLIPSE™ trunion, 43 mm, TPS and CaP coated	AR-**9300-43CPC**
Arthrex ECLIPSE™ trunion, 45 mm, TPS and CaP coated	AR-**9300-45CPC**
Arthrex ECLIPSE™ trunion, 47 mm, TPS and CaP coated	AR-**9300-47CPC**
Arthrex ECLIPSE™ trunion, 49 mm, TPS and CaP coated	AR-**9300-49CPC**
Arthrex ECLIPSE™ trunion, 51 mm, TPS and CaP coated	AR-**9300-51CPC**
Arthrex ECLIPSE™ trunion, 53 mm, TPS and CaP coated	AR-**9300-53CPC**
Arthrex ECLIPSE™ cage screw, small, 30 mm	AR-**9301-01**
Arthrex ECLIPSE™ cage screw, medium, 35 mm	AR-**9301-02**
Arthrex ECLIPSE™ cage screw, large, 40 mm	AR-**9301-03**
Arthrex ECLIPSE™ cage screw, extra large, 45 mm	AR-**9301-04**
Arthrex ECLIPSE™ humeral head, 39/16	AR-**9339-16**
Arthrex ECLIPSE™ humeral head, 41/16	AR-**9341-16**
Arthrex ECLIPSE™ humeral head, 43/16	AR-**9343-16**
Arthrex ECLIPSE™ humeral head, 45/17	AR-**9345-17**
Arthrex ECLIPSE™ humeral head, 47/18	AR-**9347-18**
Arthrex ECLIPSE™ humeral head, 49/18	AR-**9349-18**
Arthrex ECLIPSE™ humeral head, 51/19	AR-**9351-19**
Arthrex ECLIPSE™ humeral head, 53/20	AR-**9353-20**
Optionally Available	
Arthrex ECLIPSE™ humeral head, 39/18	AR-**9339-18**
Arthrex ECLIPSE™ humeral head, 41/18	AR-**9341-18**
Arthrex ECLIPSE™ humeral head, 43/18	AR-**9343-18**
Arthrex ECLIPSE™ humeral head, 45/19	AR-**9345-19**
Arthrex ECLIPSE™ humeral head, 47/20	AR-**9347-20**
Arthrex ECLIPSE™ humeral head, 49/20	AR-**9349-20**
Arthrex ECLIPSE™ humeral head, 51/21	AR-**9351-21**
Arthrex ECLIPSE™ humeral head, 53/22	AR-**9353-22**
Consumables	
Arthrex ECLIPSE™ / Univers™ II shoulder head resection disposables kit	AR-**9206S**

Product Description	Item No.
Arthrex ECLIPSE™ Instrument Set Contains	
Bone graft tamp	AR-**13317**
Pin extractor	AR-**14016PE**
Arthrex ECLIPSE™ and Univers™ orientation pin for resection guide	AR-**9202**
Arthrex ECLIPSE™ and Univers™ 3D head impactor	AR-**9202-13**
Arthrex ECLIPSE™ and Univers™ 3D handle for drill template	AR-**9203-10**
Arthrex ECLIPSE™ drilling template, size 39	AR-**9400-39**
Arthrex ECLIPSE™ drilling template, size 41	AR-**9400-41**
Arthrex ECLIPSE™ drilling template, size 43	AR-**9400-43**
Arthrex ECLIPSE™ drilling template, size 45	AR-**9400-45**
Arthrex ECLIPSE™ drilling template, size 47	AR-**9400-47**
Arthrex ECLIPSE™ drilling template, size 49	AR-**9400-49**
Arthrex ECLIPSE™ drilling template, size 51	AR-**9400-51**
Arthrex ECLIPSE™ drilling template, size 53	AR-**9400-53**
Arthrex ECLIPSE™ coring reamer	AR-**9401-02**
Arthrex ECLIPSE™ coring teamer, long	AR-**9401-02L**
Arthrex ECLIPSE™ screwdriver	AR-**9401-03**
Arthrex ECLIPSE™ trunion impactor	AR-**9401-05**
Arthrex ECLIPSE™ cage screw sizer	AR-**9401-08**
Arthrex ECLIPSE™ centering device	AR-**9401-09**
Arthrex ECLIPSE™ resection guide, small, left	AR-**9401-10**
Arthrex ECLIPSE™ resection guide, small, right	AR-**9401-11**
Arthrex ECLIPSE™ resection guide, large, left	AR-**9401-12**
Arthrex ECLIPSE™ resection guide, large, right	AR-**9401-13**
Orientation pin for resection guide	AR-**9202**
Arthrex ECLIPSE™ and Univers™ II humeral head extractor	AR-**9401-17**
Arthrex ECLIPSE™ trial trunion	AR-**9401-18**
T-bar for Arthrex ECLIPSE™ coring reamer	AR-**9401-22**
Arthrex ECLIPSE™ resection protector, small, 40 mm	AR-**9401-40**
Arthrex ECLIPSE™ resection protector, medium, 46 mm	AR-**9401-46**
Arthrex ECLIPSE™ resection protector, large, 50 mm	AR-**9401-50**
Arthrex ECLIPSE™ trial head, 39/16	AR-**9439-16**
Arthrex ECLIPSE™ trial head, 41/16	AR-**9441-16**
Arthrex ECLIPSE™ trial head, 43/16	AR-**9443-16**
Arthrex ECLIPSE™ trial head, 45/17	AR-**9445-17**
Arthrex ECLIPSE™ trial head, 47/18	AR-**9447-18**
Arthrex ECLIPSE™ trial head, 49/18	AR-**9449-18**
Arthrex ECLIPSE™ trial head, 51/19	AR-**9451-19**
Arthrex ECLIPSE™ trial head, 53/20	AR-**9453-20**

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