# ELBOW PROSTHESIS

## Humeral Implant
- **Ref.** Component information
  - DKY181 Humeral implant small right
  - DKY182 Humeral implant medium right
  - DKY183 Humeral implant large right
  - DKY184 Humeral implant small left
  - DKY185 Humeral implant medium left
  - DKY186 Humeral implant large left

## Spool
- **Ref.** Component information
  - DKY201 Spool small anterior offset right
  - DKY202 Spool small anterior offset left
  - DKY203 Spool medium anterior offset right
  - DKY204 Spool medium anterior offset left
  - DKY205 Spool large anterior offset right
  - DKY206 Spool large anterior offset left
  - DKY207 Spool large + anterior offset right
  - DKY208 Spool large + anterior offset left
  - DKY221 Spool small posterior offset right
  - DKY222 Spool small posterior offset left
  - DKY223 Spool medium posterior offset right
  - DKY224 Spool medium posterior offset left
  - DKY225 Spool large posterior offset right
  - DKY226 Spool large posterior offset left
  - DKY227 Spool large + posterior offset right
  - DKY228 Spool large + posterior offset left
  - DKY211 Spool small centered offset right
  - DKY212 Spool small centered offset left
  - DKY213 Spool medium centered offset right
  - DKY214 Spool medium centered offset left
  - DKY215 Spool large centered offset right
  - DKY216 Spool large centered offset left
  - DKY217 Spool large + centered offset right
  - DKY218 Spool large + centered offset left

## Standard Ulnar Stem
- **Ref.** Component information
  - DKY071 Standard ulnar stem small right
  - DKY072 Standard ulnar stem medium right
  - DKY073 Standard ulnar stem large right
  - DKY075 Standard ulnar stem small left
  - DKY076 Standard ulnar stem medium left
  - DKY077 Standard ulnar stem large left

## Short Ulnar Stem
- **Ref.** Component information
  - DKY081 Ulnar stem small right
  - DKY082 Ulnar stem medium right
  - DKY083 Ulnar stem large right
  - DKY085 Ulnar stem small left
  - DKY086 Ulnar stem medium left
  - DKY087 Ulnar stem large left

## Ulnar Cap
- **Ref.** Component information
  - DKY067 Ulnar cap small
  - DKY068 Ulnar cap medium
  - DKY069 Ulnar cap large

## Radial Components
- **Ref.** Component information
  - DKY056 Radial head small
  - DKY057 Radial head medium
  - DKY058 Radial head large
  - DKY059 Radial head large +
  - DKY061 Radial stem diam. 6.5 mm
  - DKY062 Radial stem diam. 5 mm

## Anatomic Spool
- **Ref.** Component information
  - DKY161 Anatomic spool small, right
  - DKY162 Anatomic spool small +, right
  - DKY163 Anatomic spool medium, right
  - DKY164 Anatomic spool medium +, right
  - DKY165 Anatomic spool large, right
  - DKY166 Anatomic spool large +, right
  - DKY171 Anatomic spool small, left
  - DKY172 Anatomic spool small +, left
  - DKY173 Anatomic spool medium, left
  - DKY174 Anatomic spool medium +, left
  - DKY175 Anatomic spool large, left
  - DKY176 Anatomic spool large +, left

## Humeral Screw
- **Ref.** Component information
  - DKY191 Humeral screw small, small +
  - DKY192 Humeral screw medium, medium +
  - DKY193 Humeral screw large, large +

## Ulnar Bushing
- **Ref.** Component information
  - DKY120 Ulnar bushing small, right
  - DKY121 Ulnar bushing medium, right
  - DKY122 Ulnar bushing large, right
  - DKY123 Ulnar bushing small, left
  - DKY124 Ulnar bushing medium, left
  - DKY125 Ulnar bushing large, left

## Ulnar Restrictor
- **Ref.** Component information
  - EBO101 Ulnar restrictor Ø 24
  - EBO102 Ulnar restrictor Ø 13

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Latitude®

Surgical Technique

Elbow Prosthesis

Latitude®

Surgical Implants

161, rue Lavoisier. Montbonnot. 38334 Saint-Ismier Cedex. France. Tel.: 33 (0)4 76 61 35 00. Fax: 33 (0)4 76 61 35 33. www.tornier.com
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Radial broaches

- Trial radial stem - Ø 5 mm
  Ref. MKY116
- Trial radial stem - Ø 6.5 mm
  Ref. MKY117

Ulnar radial trial parts

- Trial ulnar short stem
  Small size, right Ref. MKY107
  Medium size, right Ref. MKY108
  Large size, right Ref. MKY110
  Large size, left Ref. MKY112

- Trial ulnar standard stem
  Small size, right Ref. MKY125
  Medium size, right Ref. MKY126
  Medium size, left Ref. MKY127
  Large size, right Ref. MKY129
  Large size, left Ref. MKY130

- Torque handle
  Ref. MKY121

- Torque screwdriver adaptor
  (hexagon 2.5 mm)
  Ref. MKY122

- Trial ulnar cap
  Small size Ref. MKY113
  Medium size Ref. MKY114
  Large size Ref. MKY115

Spare M5 ulnar screw implant
Ref. DKY066

Ulnar cup lug bending tool
Ref. MKY124

Trial radial head
- Small size Ref. MKY055
- Medium size Ref. MKY056
- Large size Ref. MKY057
- Large + size Ref. MKY134

- Triceps on jig
  Right size Ref. MKY135
  Left size Ref. MKY136

- Triceps on bell saw jig
  Ref. MKY137

- Humeral component extractor
  Ref. MKY147

- Trial radial head impactor
  Ref. MKY118

- Ulnar stem extractor
  Ref. MWA118

- Cement insert restrictor
  Ref. MKY149

The Latitude® surgical technique has been developed in conjunction with:
Shawn O’Driscoll, MD, PhD (Mayo Foundation), Ken Yamaguchi, MD (Washington University, Barnes Jewish Hospital)
Graham King, MD, MSc (University of Western Ontario)
1. DESIGN RATIONALE

The Latitude® Elbow is the first 3rd generation elbow prosthesis. It features a true anatomical reconstruction of the joint, modular components, and is adaptable to a wide range of indications.

The Latitude® Elbow is designed to reproduce the patient’s anatomy; thus to restore the natural kinematics of the elbow. Its unique instrumentation facilitates a step by step procedure that now makes elbow arthroplasty accurate, precise and reproducible.

The Latitude® Elbow offers maximum flexibility in elbow reconstruction.

DESIGN GOALS
- Distinctive right and left anatomical components.
- Precision instrumentation.
- Intraoperative flexibility to utilize linked or unlinked.
- Accurate implant positioning referenced on the flexion-extension axis.
- Ease of assembly.
- Optimal bone preservation.
- Anatomic distribution of loads on polyethylene.

CLINICAL OBJECTIVES
- Latitude for use in a wide range of indications.
- Latitude to reproduce patient flexion-extension axis.
- Total Latitude to use either unlinked or linked.
- Latitude to reconstruct the radio-humeral joint.
- Hemi Elbow Prosthesis.
2. ANATOMICAL DESIGN VALIDATION

A comprehensive review of the literature, as well as a morphological study on a large number of cadaver specimens, was conducted. Osseous structures were digitized to obtain:

- Geometry of articular surfaces.
- Location of diaphyseal axis compared to these surfaces.
- Key parameters such as epicondyle diameter, condyle and trochlear distance, offset and flexion-extension axis.
- Anatomical size.

STUDY RESULTS

1 Humerus

- The capitellum is spherical and the center axis of the trochlea is aligned with the center of the capitellum. The mean flexion axis is 6° of valgus (range 2° to 9°) (fig. 01).

- The flexion-extension axis has a variable offset relative to the axis of the diaphysis, varying between 4 and 8 mm with a mean of 6 mm (fig. 02). This variability necessitates a modular design with different articular offsets.

- There is a consistent relationship between the distance from the center of the capitellum to the trochlear groove and the diameter of the capitellum. The distance varies from 15 mm to 22.4 mm with a mean of 19 mm (fig. 03).

- The placement of the Latitude elbow is based on the normal flexion-extension axis.
- 3 sizes of stem and 4 sizes of spool (small, medium, large, large +).
- Different articular offsets (anterior, posterior and centered) with respect to the humeral diaphysis.
2. ANATOMICAL DESIGN VALIDATION

The humeral stem has medial and lateral fins to prevent intramedullary rotation. The anterior flange accepts bone graft to help prevent posterior migration. The posterior aspect of the flange has a textured surface to enhance bone ongrowth (fig. 04). The spool is secured to the stem with a cannulated screw that allows for the passage of sutures to attach soft tissues for initial stabilization.

Humeral spools have been designed with a concave barrel shaped trochlea to preserve linear contact throughout 7° of valgus/varus movement with the ulnar component (fig. 05).
2. ANATOMICAL DESIGN VALIDATION

2 Ulna

- The morphology of the sigmoid facets provides congruent surface contact around the flexion axis in full valgus. The average position of the elbow flexion axis is at 105° from the ulnar diaphyseal centerline (fig. 06).
- The flexion-extension axis is located between 12 mm to 17 mm anterior to the diaphyseal axis with a mean of 15 mm (fig. 07).

- The placement of the Latitude ulnar component is based on the flexion-extension axis.
- 3 sizes of stems and 2 lengths (standard and short figs 08 and 09).
- The Latitude ulnar stem is designed with an optional cap so that the components can be unlinked or linked.

The geometry of the standard stem has been designed to replicate the natural bow of the ulna thus diminishing stresses on the cortical wall. (fig. 08).

The polyethylene surfaces of the ulnar components have been designed to facilitate an anatomic distribution of joint reactive forces.

The Latitude Total Elbow offers intraoperative flexibility. The decision to use the implant in a "linked" or "unlinked" mode is made following the examination of the surrounding soft tissues. The ulnar cap has been designed to capture the humeral component to convert the implant to a linked semi-constrained device.

In the event that an unlinked construct was initially performed and a linked revision is desired to correct instability, a complete elbow revision is not required. The surgeon can easily add the ulnar cap through a minimally invasive incision transforming the prosthesis from unlinked to linked.
3 Radial head

- The radial head is a key anatomical structure of the elbow. Sixty percent of compressive loads are transferred across the radio-humeral joint (fig. 10) Morrey et al, JBJS 70-A 1988.

- Without the radio-humeral joint, loading on the ulno-humeral joint is increased contributing to the risk of instability and premature wear.

- The placement of the Latitude elbow radial component is based on the flexion-extension axis.
- 4 sizes of heads (Ø 18, 20, 22 and 24 mm) and 2 stem diameters (5.0 mm and 6.5 mm).

The Latitude® Elbow radial component enables the surgeon to maintain the radio-humeral joint when anatomical alignment is adequate. The radial component has been designed to replicate the radio-ulnar articulation. The radial component is a bipolar design with +/- 10° of motion to balance load transfer (fig. 11).

The cobalt chrome ring of the radial head component articulates with the polyethylene of the ulnar component (fig. 12).
3. PRECISION INSTRUMENTATION

The Latitude® Elbow instruments bring precision and reproducibility to elbow arthroplasty in the setting where there has been some preservation of normal anatomy. The instruments are designed to offer a reproducible step-by-step procedure. Each jig uses anatomic landmarks to insure replication of the natural anatomy. The flexion-extension axis is easily determined. The humeral, radial and ulnar surgical steps are based on this reference point.
1 Indications for use

- Primary or secondary osteoarthritis and rheumatoid arthritis
- Correction of functional deformities
- Revision procedures where other treatments or devices have failed
- Treatment or fractures that are unmanageable using other techniques
- Same indications for Latitude Anatomic (Hemi Elbow Prosthesis)
- The prosthesis is for cemented use only

2 Contraindications

Refer to the instruction for use delivered with the implant.
Addendum

The assembly between the Latitude stem and spool has been enhanced in 2007. As a consequence, Latitude 2nd Generation spools are incompatible with Latitude 1st Generation stems.

However, the 2nd generation humeral components (stem and spool) are compatible with the rest of the current components e.g. ulnar stems, ulna caps, radial heads, radial stems.

Thus, should a Latitude 1st generation humeral component be necessary:

- full revision of the humeral components (stem, spool, screw) with Latitude 2nd generation humeral components is recommended,
- The spool and screw revision only is still possible. In that instance, please contact the Custom Products Department 6 weeks before surgery.

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<table>
<thead>
<tr>
<th>Latitude 1st Generation (not available anymore)</th>
<th>Latitude 2nd Generation</th>
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<tbody>
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<td>Humeral stem</td>
<td>Spool</td>
</tr>
<tr>
<td>DKY001 to DKY003</td>
<td>DKY201 to DKY208</td>
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<tr>
<td>DKY006 to DKY008</td>
<td>DKY211 to DKY218</td>
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<tr>
<td>Humeral screw</td>
<td>DKY221 to DKY228</td>
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<tr>
<td>DKY128 to DKY130</td>
<td>Anatomic spool</td>
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<td></td>
<td>DKY161 to DKY166</td>
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<td></td>
<td>DKY171 to DKY176</td>
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Incompatibility
5. LATITUDE ANATOMIC SURGICAL TECHNIQUE (Hemi Elbow Prosthesis)

- Refer to pages 11 to 22 for the Latitude Anatomic surgical technique (fig. 13).

  Note
  The Latitude Anatomic Prosthesis does not take spool offset into consideration.

- Refer to page 33 for the cement and bone graft technique
- Refer to page 36 for the suture technique and closure.

Note
The Latitude Anatomic Prosthesis components are:

- Humeral stem (the one used for Total Elbow Prosthesis) DKY181 to DKY186 (fig. 14).

- Anatomic spool (different than the one used for the Total Elbow Prosthesis) (fig. 15):
  - DKY161 to DKY166
  - DKY171 to DKY176.
Patient position
The patient may be positioned in a lateral decubitus position or a supine position based upon surgeon preference. It is important to have full mobility of the elbow during the procedure. A sterile tourniquet is employed.

Incision
A straight incision is made approximately 15 centimeters in length and centered just lateral to the medial epicondyle and just medial to the tip of the olecranon (fig. 16a).

Full thickness medial and lateral flaps are elevated on the deep fascia (fig. 16b).

Ulnar Nerve transposition
The medial aspect of the triceps mechanism is identified and the ulnar nerve is isolated using loupe magnification (fig. 16c). The medial intermuscular septum is excised.

The ulnar nerve is mobilized and transposed anteriorly into the subcutaneous tissue (fig. 16d). It is carefully protected throughout the remainder of the procedure.
6. EXPOSURE

Triceps Management
Management of the triceps mechanism is at the surgeon's discretion.
Common procedures include splitting the triceps centrally, elevating it from medial to lateral, or from lateral to medial.
The triceps attachment to the ulna is released by dividing Sharpey's fibers.

Alternative approaches include dividing the triceps tendon proximal to the olecranon. The continuity of the triceps tendon can be maintained when the distal humerus is bone deficient using a triceps sparing approach.

Triceps splitting approach
The triceps tendon is split centrally ascending 8 cm proximal from the tip of the olecranon.
The tendon is then reflected medially and laterally off the olecranon by dividing Sharpey's fibers.
The medial and lateral portions of the tendon are kept in continuity with the flexor carpi ulnaris and anconeus respectively. The humeral attachments of the medial and lateral collateral ligaments and their overlying flexor and extensor muscle origins are sharply divided off the medial and lateral epicondyles to facilitate joint subluxation.
The ligament origins are marked with a colored suture to facilitate subsequent reattachment.
7. HUMERAL PREPARATION

Size the humeral condyle with colored anatomical spools and gauges (small, medium, large, large +).

- Start by comparing the anatomical spool to the patient’s capitellum (fig. 17a).

- Then verify that the spool fits exactly into the ulna and is perfectly aligned with the radial head (fig. 17b).

- The size of the capitellum may be confirmed with the gauge (fig. 17c).

Choose the final implant size based on these measurements. This determination will be used throughout the procedure.

TIP
Should the patient’s humeral condyle size fall between two anatomical sized trial spools, pick the smaller one for the remainder of the procedure.

Instruments to use

- Anatomical spool
- Capitellum radii gauge
7. HUMERAL PREPARATION

1. Flexion-extension axis determination

Mark the center of the flexion-extension axis on the capitellum side with the capitellum radii gauge with the 3 mm self-drilling pin to reference the proper position of the drilling guide on the flexion-extension axis (fig. 18). The location of the axis is typically at the site of attachment of the lateral ligaments to the lateral epicondyle. If the capitellum is imagined to be a circle when viewed from the lateral side, the flexion-extension axis is located at the center point of this circle. The circular gauge is a useful tool to visually estimate this location.

**Note**
The key to a successful outcome is the accurate determination of the flexion-extension axis.

Remove the central portion of the distal humerus (trochlea, sulcus and lateral ridge) to the proximal aspect of the olecranon fossa with either an oscillating saw or large rongeur (fig. 19).

**Instruments to use**
- Stabilization pin
- Drilling guide
Position the flexion-extension axis drill guide on the distal humerus. It should sit with an approximate angle of 45° anteriorly (fig. 20a & 20b).

**TIP**
The assembled drill guide should appear to be pointed approximately 45° anterior to the coronal plane. (fig. 20b).

The cannulated screw should be placed over the drill hole previously marked on the capitellum.

The medial notch of the guide assembly is placed on the anterior and inferior portion of the medial epicondyle at approximately 45° anteriorly.

The center of the medial notch should be roughly at the center of the medial ridge of the trochlea such that an axis pin would appear to exit at the anterior and inferior edge of the medial epicondyle's intersection with the trochlea (fig. 20a).

Drill the flexion-extension axis and then remove the guide (fig. 20c).

As a check, reinsert the flexion-extension pin to confirm correct alignment (fig. 21).
7. HUMERAL PREPARATION

Open the medullary canal with a high speed burr (fig. 22a).

After burring, use the T-handle reamer to shape the medullary canal (fig. 22b).

The T-handle reamer should be inserted up to the intersection of the predetermined implant size marked on the shaft and the flexion-extension axis (fig. 23).

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2 Humeral Offset Determination

Insert the pointed intramedullary alignment rod into the shaft of the humerus.
Anterior to the rod, insert the flexion-extension axis pin through the previously drilled holes (fig. 24a).

Select the offset gauge of the previously determined humeral size (small, medium, large). Determine spool offset by placing offset gauge between the flexion-extension axis pin and the intramedullary alignment rod (fig. 24b).

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Instruments to use

- Humeral diaphysis reamer
- Burr
- Flexion/extension axis pin
- Medullary alignment rod
- Offset determining gauge
7. HUMERAL PREPARATION

Using and interpreting the offset gauge

Starting with the thickest portion of the offset gauge, slide it along the intramedullary alignment rod. If this portion can be inserted in between the flexion-extension axis pin and the alignment rod, then the offset is ANTERIOR (fig. I).

If the thickest portion cannot be inserted, rotate the gauge and try inserting the thinnest portion of the gauge. If it fits in between the axis and the alignment rod, then the offset is CENTERED (fig. II).

If the thinnest portion of the gauge cannot be inserted, then the offset is POSTERIOR (fig. III).

3 Humeral Distal Preparation

Assemble the appropriate size humeral trochlea cutting block to the trochlear cutting guide support with the assembly screw. Do not fully tighten the assembly screw at this time (fig. 25a).

Position the cutting guide on the flexion-extension axis pin and align with the medullary alignment rod as shown (fig. 25b).

Instruments to use

Offset determining gauge  Flexion/extension axis pin  Humeral trochlea cutting block
Humeral trochlea cutting guide support  Assembly screw
7. HUMERAL PREPARATION

Adjust the cutting guide by sliding the distal humeral cutting block to make firm contact with the posterior humerus and then firmly tighten the assembly screw (fig. 26c).

Medial-lateral placement of the humeral trochlea cutting block is completed by inserting the diaphysis aiming guide through the block and engaging it onto the medullary alignment rod.

Using the 3 mm diameter drill bit, drill 2 holes at the inferior portion of the humeral trochlea cutting block and place 2 stabilizing pins as shown (fig. 27).

**TIP**
Size and side designations on all instruments always face the surgeon.

Remove the cutting support, the flexion-extension axis pin and the intramedullary alignment rod. Drill with the 3 mm drill bit through the remaining holes on the cutting block as shown (fig. 28). Take care to avoid damaging anterior structures.

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**Instruments to use**

- Diaphysis aiming guide
- Humeral trochlea cutting guide support
- Assembly screw
- Humeral trochlea cutting block
- Stabilization pin
- Drill bit
7. HUMERAL PREPARATION

Slide the cutting block off the stabilizing pins and remove them with the pin puller (fig. 29).

Lack of anatomical landmark

In the absence of anatomical landmarks on the trochlea, use the modified humeral cutting guide.

Assemble the cutting block to the "No trochlea" support noting either right or left with the assembly screw.

Slide the completed assembly over the medullary alignment rod until the flexion/extension line figured on the block is correctly positioned.

Remove the bony bridge between the drill holes with a straight osteotome, microsaggital saw or rongeur as necessary (fig. 30).

If the medial trochlea has been excised, mark where the flexion-extension axis was, using a marking pen.

Smooth the cut surface with a humeral broach or burr (fig. 31).

Instruments to use

- Stabilization pin
- Pin puller
- Diaphysis aiming guide
- Medullary alignment rod
- Humeral diaphysis canal broach
7. HUMERAL PREPARATION

Using the correct size and side capitellum cutting guide, position it in the trochlear cut as shown (fig. 32).

Insert the flexion-extension axis pin through both the axis and the cutting guide to stabilize and align the jig. Make distal and anterior capitellar cuts with an oscillating saw on the marked surface as shown (fig. 33).

**Broach the humeral canal with the starting broach** and then proceed sequentially to the selected size of the humeral component (fig. 34a).

**TIP**
The indication of side right or left should point posteriorly so that it can be read by the surgeon (fig. 34b).

**Instruments to use**
- Capitellum cutting guide
- Flexion/extension axis pin
- Humeral diaphysis canal broach
7. HUMERAL TRIAL STEM

1. Select the appropriate size humeral trial stem either right or left (fig. 35).

<table>
<thead>
<tr>
<th>Spool - Total Elbow Prosthesis &amp; Latitude Anatomic</th>
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</thead>
<tbody>
<tr>
<td>SMALL</td>
</tr>
<tr>
<td>SMALL</td>
</tr>
<tr>
<td>MEDIUM</td>
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<tr>
<td>MEDIUM</td>
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</table>

2. Select the corresponding spool (side, size and offset) according to the following table (fig. 36).

<table>
<thead>
<tr>
<th>Spool - Total Elbow Prosthesis &amp; Latitude Anatomic</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMALL</td>
</tr>
<tr>
<td>SMALL PLUS (Anatomic only)</td>
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<tr>
<td>MEDIUM</td>
</tr>
<tr>
<td>MEDIUM PLUS (Anatomic only)</td>
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<tr>
<td>LARGE</td>
</tr>
<tr>
<td>LARGE PLUS</td>
</tr>
</tbody>
</table>

Position the round part (capitellum) of the spool on the left for a left trial/on the right for a right trial stem. Place the appropriate size trial humeral screw from medial to lateral. Tighten using the 4.5 mm hex screwdriver.
7. HUMERAL TRIAL STEM

Position the trial stem assembly in the humeral shaft.

Use the impactor to seat the implant flush with the bone (fig. 37).

(fig. 37)

Instruments to use

- Trial humeral stem
- Trial spool
- Trial humeral screw
- Impactor
- 4.5 hexagonal screwdriver
In cases where the triceps has been preserved, refer to page 37 for ulnar preparation with the triceps on jig.

- Components required to assemble the ulnar cutting guide:
  - Cutting guide.
  - Sliding block.
  - Forearm axis guide.
  - 3 locking screws: flat/trochar/cannulated (Ø 2 mm).

- Choose the appropriate size and side cutting guide.
- Assemble the cutting guide as shown (see assembled cutting guide fig. (38a-d)).

1. Slide the block onto the cutting guide.
   (fig. 38a)

2. Screw the forearm axis guide into the cutting guide.
   (fig. 38b)

3. Screw the desired type screws (cannulated, trochar or flat) into the cutting guide.
   (fig. 38c)

4. Insert the selected spool on the cutting axis.
   (fig. 38d)

**TIP:** A flat screw is preferred for the sliding block to sit on the flat spot of the ulna.

**Instruments to use**

- Ulnar/radial cutting guide
- Ulnar/radial cutting guide sliding block
- Anatomical spool
- Locking screw
- Tightening screws
- Forearm positioning guide
8. ULNAR PREPARATION (triceps splitting approach)

1 Radio-Ulnar Cutting guide Positioning

Position the cutting guide on the ulna and radial head (fig. 39). The correct positioning of the guide is secured with the three stabilizing screws.

Screws are positioned:
- on the proximal olecranon.
- on the flat posterior surface.
- on the lateral side of the ulna.

Tighten the 3 stabilizing screws with the 4.5 mm hex screwdriver.

First, tighten the posterior screw on the flat spot of the ulna to ensure that the spool will sit correctly in the sigmoid cavity of the olecranon.

Then tighten the remaining two screws.

Make sure that the forearm axis guide points towards the ulnar styloid (fig. 40a).

Make sure that the anatomical spool seats properly into the ulna and is anatomically aligned with the radial head (fig. 40b).

TIP
The correct positioning of the jig is essential to ensure proper radial head and ulnar resection.

Instruments to use

- Anatomical spool
- Ulnar/radial cutting guide
Resect the radial head with an oscillating saw (fig. 41). From lateral to medial.

With the appropriate size bell saw, cut the ulna. The cut is completed when the collar of the saw sits on the lateral ring (fig. 42). Ensure the ulnar nerve is protected.

**Note**
Slot thickness is 1.4 mm.

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**Instruments to use**

- Anatomical spool
- Ulnar/radial cutting guide
- Bell saw
8. ULNAR PREPARATION (triceps splitting approach)

The jig is removed.

Lateral view after all cuts have been completed (fig. 43)

**TIP**
Irrigate the bell saw continuously while cutting to prevent overheating.

Attach the handle to the appropriate size (S/M/L) and side (R/L) ulnar diaphysis drill guide (fig. 44a).

Place the drill guide in the sigmoid cut and drill the ulnar canal with the 4.5 mm drill bit to the depth of the mark corresponding to the size of the implant (fig. 44b).

The tip of the olecranon can be removed with a rongeur if necessary.

*Note*
*The position of the guide should be aligned as shown with reference to the tip of the coranoid and olecranon.*

**Instruments to use**

- Ulnar diaphysis axis drill guide
- Ulnar diaphysis axis drill guide handle
- Ulnar diaphysis axis drill bit
2 Ulnar canal Broaching

Broach the ulnar diaphysis canal beginning with the starting broach and broach sequentially to the desired size (fig. 45).

Insert the broach in the ulnar canal respecting the radial inclination of the shaft. (fig. 46). Use the orientation of the flat spot on the posterior surface of the ulna to assist in correctly rotating the ulnar broach.

Instruments to use

Ulnar broaches
8. ULNAR PREPARATION (triceps splitting approach)

Broach until the apex of the fin is in contact with the bone (fig. 47a).

*Note*
*Do not broach beyond this point.*

Burr slightly the olecranon to facilitate seating of the trial and implant (fig. 47b).

Should a standard ulnar stem be desired, ream the canal for the final implant with the ulnar reamer (fig. 47c) or a flexible boring.

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3 Ulnar canal reaming for standard stem

Assemble the reamer to the handle.

Gently ream the canal making sure not to penetrate the lateral or dorsal cortex (fig. 47c). Flexible reamers (not included), can be used if preferred.

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**Instruments to use**

- Ulnar broaches
- Ulnar reamer handle
- Ulnar reamer
9. ULNAR TRIAL AND RADIUS PREPARATION

ULNAR TRIAL

Select the appropriate ulnar trial according to side, size and desired length.

Position the trial stem in the ulnar canal and then seat it flush with the ulna using the impactor (fig. 48a-b).

Instruments to use

- Trial ulnar stems
- Impactor
- Trial radial stem impactor
RADIUS PREPARATION AND TRIAL

Screw the trial handle to the radial broach/trial stem (fig. 49).
(fig. 49)

Starting with the 5 mm radial broach, tap the handle until the collar of the broach seats on the resected surface. If a larger stem is desired, broach next with the 6.5 mm broach (fig. 50).

Upon completion, unscrew the handle leaving the broach seated in the canal (fig. 51a).

Using the same color code, select the appropriate size trial radial head and place the trial head on the stem (fig. 51b).

TIP
The radial head trial seats freely on the stem and is not a snap fit.

Instruments to use

- Impactor
- Trial radial stem impactor
- Trial radial stem
- Trial radial head
10. TRIAL AND REDUCTION

The trial components can be placed unlinked or linked.

1 Unlinked

Reduce the humeral and ulnar components (fig. 52). Perform the initial trial reduction by placing the triceps in its anatomic position. The elbow should articulate through a full ROM, testing for stability, articular tracking, axis of rotation and range of motion.

If the trial reduction is satisfactory, remove the trial components and prepare the elbow for the final implants. If the trial reduction is not satisfactory, check that the trial implants are correctly positioned and that no soft tissue impingement has occurred.

In case of an unstable elbow, use the trial cap to link the implant.

2 Linked

Assemble the trial ulnar cap as shown (fig. 53a-d) to the ulnar stem and tighten the trial locking screw. Confirm appropriate component placement and perform another trial reduction.

Perform the initial trial reduction by placing the triceps in its anatomic position. The elbow should articulate through a full ROM, testing for stability, axis of rotation and range of motion.

If the trial reduction is satisfactory, remove the trial components and prepare the elbow for the final implants.

If the trial reduction is not satisfactory, check that the trial stems sit properly on the bone and that no soft tissue impingement has occurred.
If the radial head articulates congruently with the capitellum, a radial head component should be employed.

If maltracking of the radial head is evident, component positioning should be adjusted. If maltracking persists, a radial head replacement should not be performed.

After the trial reduction is complete, remove the trial stems. To remove the trial radial stem, screw the radial trial handle into the screw hole of the radial trial stem. Gently tap with a mallet to extract the stem. Remove the ulnar trial stem using the ulnar stem extractor tool (fig. 54).

To remove the humeral component, grasp the humeral trial spool with the humeral extractor clamp (fig. 55). Then gently tap retrograde and remove the component.
11. FINAL IMPLANT ASSEMBLY

After all trial components have been removed, lavage and dry all medullary canals. Cement restrictors should be considered.

**ASSEMBLY OF FINAL COMPONENTS**

The humeral stem (side and size) is assembled to the appropriate spool (side, size and offset). The implant humeral screw (cannulated) is firmly tightened with the 4.5 mm hex screwdriver (fig. 56a-c). Check that the spool sits properly on the humeral component.

**CEMENT TECHNIQUE**

Insert a cement restrictor in each canal thanks to cement restrictor inserter. Using a cement gun, antibiotic laden bone cement is injected retrograde into the humeral canal, and antegrade into the ulnar and radial canals. The stems of the ulnar and radial components are precoated with cement to improve the implant cement bond. The components are placed into position, removing all excess cement, particularly around the bipolar radial head component. Depending on preference, the radial and ulnar components can be cemented first and then the humerus or all three can be cemented simultaneously.

**TIP**

When using the radial head component, cement both radial head and ulnar stem at the same time. To ensure that both components are seated at the same level, use the trial humeral stem and spool as a visual guide to correct insertion (fig. 57).

**Anterior Flange Bone Graft**

A cancellous bone fragment from the resected bone of the distal humerus is fashioned to fit between the humeral shaft and the anterior flange of the humeral component. The bone graft is wedged firmly in place (fig. 58).

**Unlinked**

- The supplied ulnar screw is left in the ulnar component.
- Proceed with ligament repair and closure.
Linked

- Cement each component according to the technique described. Wait until cement has set. Leave protecting ulnar screw in its component to prevent cement from coming in contact with the threads. Avoid any movement of the elbow while the cement is setting as movement decreases the bond of cement to the components.
- Assemble the 2.5 mm screwdriver with the torque handle.
- When cement has completely set, remove the protecting ulnar screw with the 2.5 mm hex screwdriver and discard.
- Reduce humeral and ulnar components to approximately 140° of flexion, insert ulnar cap into the ulnar stem (fig. 59).

- Tighten the screw until the torque release is reached (fig. 60).
Using the tab bending tool and a mallet (fig. 61a), bend the cap tab over the screw (fig. 61b).

Instruments to use

- Cement restrictor inserter
- Torque handle
- Torque screwdriver adaptator
- Ulnar cap lug bending tool
- Mallet
1 Suture technique

Using #1 Fiberwire™, Krackow sutures are placed in the medial and lateral collateral ligaments and common flexor and extensor origins respectively. Utilizing suture passer, the sutures are drawn through the cannulated humeral screw in the implant and tied. The suture ends are passed around the ulna and tied to prevent elbow subluxation in the postoperative period. The triceps is repaired to the olecranon using #5 Ethibond™ suture with locking Krackow technique. Drill holes are placed in the ulna to ensure a strong postoperative repair.

2 Postoperative recommendations

- Unlinked TEA
  The elbow is splinted at 60° in a well padded splint for 24-48 hours depending on skin quality. Active flexion and gravity assisted extension is performed with forearm in neutral rotation. Active extension is avoided for 6 weeks to protect the triceps repair. Prosupination is performed with the elbow in flexion.
  A collar and cuff or sling is used between exercises for the first 6 weeks. Extension splinting at night may be used to assist in regaining elbow extension after four weeks. Light strengthening is initiated 10 weeks postoperatively.

- Linked TEA
  The elbow is splinted in full extension with a well padded splint for 24-48 hours. Active flexion and prosupination is performed without restriction. Gravity assisted extension is used to protect the triceps repair for 6 weeks. If a triceps sparing approach was used, active extension is permitted immediately postoperatively. Light strengthening is initiated 10 weeks postoperatively.
  Night extension splinting is initiated immediately postoperatively to maximize elbow extension.

Instruments to use

Fiberwire™ is a trademark from Arthrex, FL.
Ethibond™ is a trademark from Johnson & Johnson, NJ.
Latitude Elbow Prosthesis Surgical Technique UCLT101
ASSEMBLY

14. RADIO-ULNAR TRICEPS ON CUTTING GUIDE

- Components required to assemble the triceps on ulnar cutting guide:
  - Triceps on cutting guide.
  - Sliding screw support.
  - Forearm axis guide.
  - 4 locking screws: flat/trochar/cannulated (Ø 2 mm).
- Choose the appropriate side cutting guide, one size fits all.
- Assemble the cutting guide as shown (see assembled cutting guide fig. (64a-d).

1. Screw the forearm axis guide into the cutting guide.
2. Assemble the spool support to the jig on either side depending on whether the ulnar cut is to be made from lateral or medial.
3. Slide the screw support onto the cutting guide.
4. Screw the 4 desired type screws (cannulated, trochar or flat) into the cutting guide. Insert the selected spool on the cutting axis.

The radial head cut is performed at the level of the notch on the side of the triceps on guide.

Latitude Elbow Prosthesis Surgical Technique UCLT101
15. REVISION

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**Step 1**
Remove the mantle of cement surrounding the ulnar plastic component using a burr, an osteotome or any other device.

**Step 2**
Locate the position of the assembly pin from the medial side (picture 1).

**Step 3**
Using a burr, an osteome or any other device remove the plastic to get full access to the pin (picture 2).

**Step 4**
From the lateral side, using a tapered device, such as the tab bending tool, and a hammer, gently remove the pin from the plastic/metal interface (picture 3).

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**Step 5**
Once the pin has been removed, the ulnar plastic bushing can be slide off the ulnar stem. It can be helpful to use a tapered tool and a hammer to remove the plastic part as shown on pictures 4 and 5.

**Step 6**
Position the new plastic bushing on the ulnar stem and rotate it on the slide channel until it is flush, fully engaged (picture 6).

**Step 7**
The ulnar cap **must be** assembled to the ulnar stem after revision of the plastic bushing. Indeed, the ulnar cap is the only way to secure the plastic bushing on the ulnar stem (picture 7).
### INSTRUMENTATION

#### Drilling of flexion / extension axis

**Anatomical spool**
- Small size: Ref. MKY032
- Medium size: Ref. MKY034
- Large size: Ref. MKY036
- Large+: Ref. MKY138

**Capitellum radii gauge**
- Small size: Ref. MKY002
- Medium size: Ref. MKY004
- Large size: Ref. MKY006

**Guide of flexion/extension axis**
- Ref. MKY001

**Drill of flexion/extension axis**
- Ref. MKY119

**Stabilization pin**
- Length 110 mm - Ø 3
  - Ref. MJU051

**Drill bit for flexion/extension axis - Ø 3**
- Ref. MKY061

**Reamer - Ø 3**
- Ref. MDS460

#### Offset determination

**Axis - Ø 2,8 L180 flexion/extension**
- Ref. MKY018

**Humeral diaphysis axis**
- Ref. MKY019

**Offset determining gauge**
- Small size: Ref. MKY008
- Medium size: Ref. MKY009
- Large size: Ref. MKY010

#### Humeral trochlea cut

**Humeral trochlea cutting block**
- Small size: Ref. MKY012
- Medium size: Ref. MKY013
- Large size: Ref. MKY014

**Humeral trochlea cutting guide support**
- Ref. MKY015

**Assembly screw for humeral trochlea cut**
- Ref. MKY016

**Diaphysis aiming guide**
- Ref. MKY017

**“No trochlea” humeral cutting guide support**
- Right side: Ref. MKY059
- Left side: Ref. MKY060

**Stabilization pin Ø 3 - Length 55 mm**
- Ref. MKY062

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**Latitude Elbow Prosthesis Surgical Technique UCLT101**

- Latitude Elbow Prosthesis: Ref. UCLT101

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Latitude Elbow Prosthesis Surgical Technique UCLT101
INSTRUMENTATION

**Humerus capitellum cut**

**Capitellum cutting guide**

- Small, right: Ref. MKY020
- Small, left: Ref. MKY021
- Medium, right: Ref. MKY022
- Medium, left: Ref. MKY023
- Large, right: Ref. MKY024
- Large, left: Ref. MKY025

**Humeral diaphysis canal broach**

- Starting size: Ref. MKY063
- Small: Ref. MKY026
- Medium: Ref. MKY028
- Large: Ref. MKY030

**Humeral trial parts**

**Trial humeral stem**

- Small, right: Ref. MKY080
- Small, left: Ref. MKY081
- Medium, right: Ref. MKY082
- Medium, left: Ref. MKY083
- Large, right: Ref. MKY084
- Large, left: Ref. MKY085

**Trial spool anterior offset**

- Small size, right: Ref. MKY086
- Small size, left: Ref. MKY089
- Medium size, right: Ref. MKY087
- Medium size, left: Ref. MKY090
- Large size, right: Ref. MKY088
- Large size, left: Ref. MKY091
- Large + size, right: Ref. MKY139
- Large + size, left: Ref. MKY140

**Trial spool centered offset**

- Small, right: Ref. MKY088
- Small, left: Ref. MKY101
- Medium, right: Ref. MKY099
- Medium, left: Ref. MKY102
- Large, right: Ref. MKY100
- Large, left: Ref. MKY103
- Large +, right: Ref. MKY141
- Large +, left: Ref. MKY142

**Trial spool posterior offset**

- Small, right: Ref. MKY092
- Small, left: Ref. MKY095
- Medium, right: Ref. MKY083
- Medium, left: Ref. MKY086
- Large, right: Ref. MKY094
- Large, left: Ref. MKY097
- Large +, right: Ref. MKY143
- Large +, left: Ref. MKY144

**Anatomic Spool**

- Small, right: Ref. MKY151
- Small, left: Ref. MKY152
- Medium, right: Ref. MKY153
- Medium, left: Ref. MKY154
- Large, right: Ref. MKY155
- Large, left: Ref. MKY156
- Large +, right: Ref. MKY157
- Large +, left: Ref. MKY158

**Trial humeral screw**

- Small size: Ref. MKY104
- Medium size: Ref. MKY105
- Large size: Ref. MKY106

**Hexagonal screwdriver**

- Ø 4.5 mm
  - Ref. MHG001

**Pin puller**

- Ref. MCI511

**Mallet**

- Ref. MWA122

**Osteotome**

- Ref. MDU500
INSTRUMENTATION

INSTRUMENTATION

Impactor
Ref. MKY064

Suture passer
Ref. MKY079

Base Ref. YRAD321
Insert Ref. YRAD322

Box lid
Ref. NCR001

Ulnar/radial cut

Ulnar/radial cutting guide
- Small size, right Ref. MKY040
- Small size, left Ref. MKY041
- Medium size, right Ref. MKY042
- Medium size, left Ref. MKY043
- Large size, right Ref. MKY044
- Large size, left Ref. MKY045

Tightening screw
Ø M5 - triangular tip
Ref. MKY071

Tightening screw
Ø M5 - flat tip
Ref. MKY072

Cannulated tightening screw
Ø M5
Ref. MKY052

Forearm positioning guide
Ref. MKY046

Ulnar/radial cutting guide sliding block
Ref. MKY047

Locking screw
Ref. MKY054

Bell saw

Small size Ref. MKY037
Medium size Ref. MKY038
Large size Ref. MKY039

Ulnar diaphysis drilling

Ulnar diaphysis drill guide handle
Ref. MKY048

Ulnar diaphysis drill guide
- Small size, right Ref. MKY051
- Small size, left Ref. MKY069
- Medium size, right Ref. MKY050
- Medium size, left Ref. MKY067
- Large size, right Ref. MKY049
- Large size, left Ref. MKY065

Ulnar diaphysis axis drill bit
Ref. MKY070

Ulnar broaches

Ulnar broach
- Starting size, Ref. MKY074
- Small size, Ref. MKY075
- Medium size, Ref. MKY076
- Large size, Ref. MKY077

Ulnar reamer - standard stems
Ref. MKY132

Ulnar reamer handle
Ref. MKY131
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