# Surgical Technique

## Total Elbow Prosthesis

## Latitude®

TORNIER
SURGICAL IMPLANTS

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# 1. DESIGN RATIONALE



The Latitude® Total 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® Total 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**.

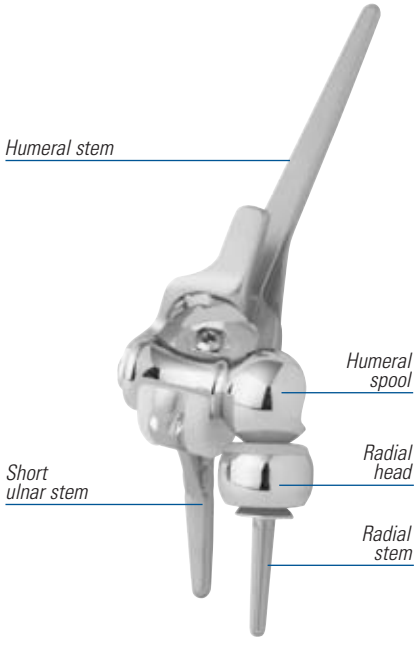
The Latitude® Total Elbow offers maximum flexibility in elbow reconstruction.

## DESIGN GOALS

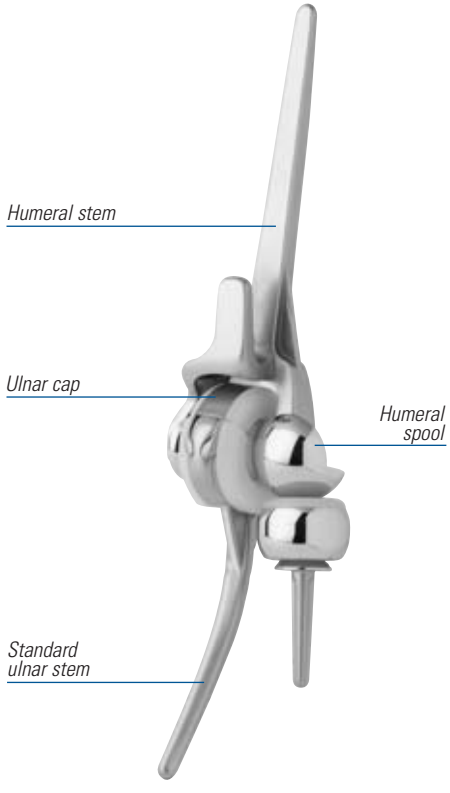
- Distinctive right and left anatomical components.
- Precision instrumentation.
- Intraoperative flexibility to utilize linked or unlinked.
- Accurate implant positioning referenced on the flexion-extension axis.
- Ease of assembly.
- Optimal bone preservation.
- Anatomic distribution of loads on polyethylene.

## CLINICAL OBJECTIVES

- Latitude for use in a wide range of indications.
- Latitude to reproduce patient flexion-extension axis.
- Latitude to use either unlinked or linked.
- Latitude to reconstruct the radio-humeral joint.




**unlinked configuration**




**linked configuration**

## 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:

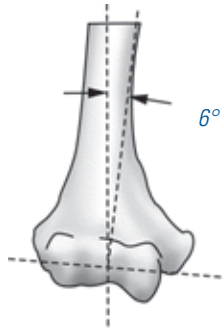
- Geometry of articular surfaces.
- Location of diaphyseal axis compared to these surfaces.
- Key parameters such as epicondyle diameter, condyle and trochlear distance, offset and flexion-extension axis.
- Anatomical size.

### STUDY RESULTS

### 1 Humerus

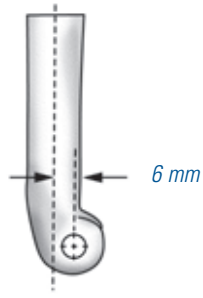
- The capitellum is spherical and the center axis of the trochlea is aligned with the center of the capitellum. The mean flexion axis is 6° of valgus (range 2° to 9°) (fig. 01).

(fig. 01)



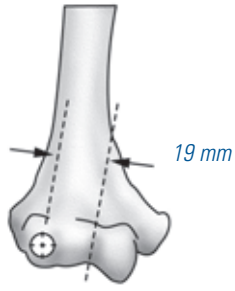

- The flexion-extension axis has a variable offset relative to the axis of the diaphysis, varying between 4 and 8 mm with a mean of 6 mm (fig. 02). This variability necessitates a modular design with different articular offsets.

(fig. 02)




- 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).

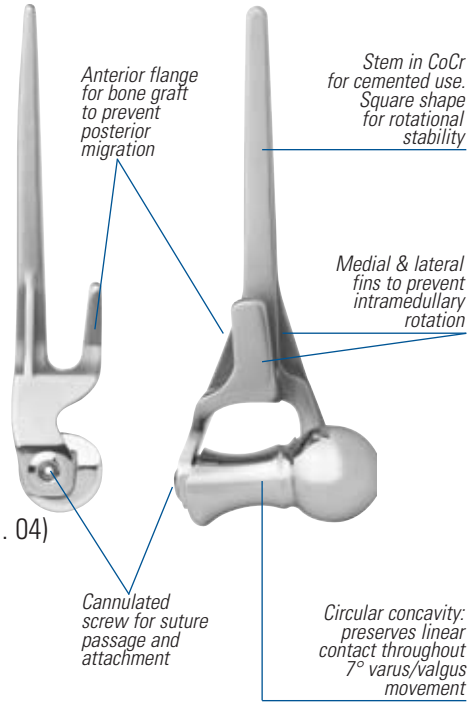
(fig. 03)




- 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.




(fig. 04)

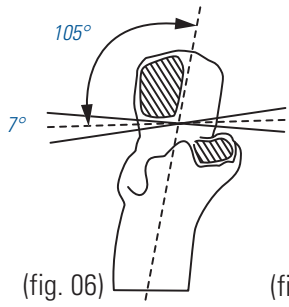
Humeral spools have been designed with a concave barrel shaped trochlea to preserve linear contact throughout 7° of valgus/varus movement with the ulnar component (fig. 05).

(fig. 05)

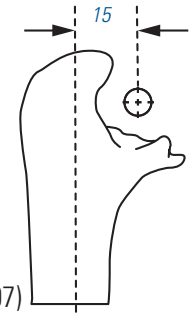
## 2. ANATOMICAL DESIGN VALIDATION

### 2 Ulna

- The morphology of the sigmoid facets provide 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).



(fig. 06)



(fig. 07)

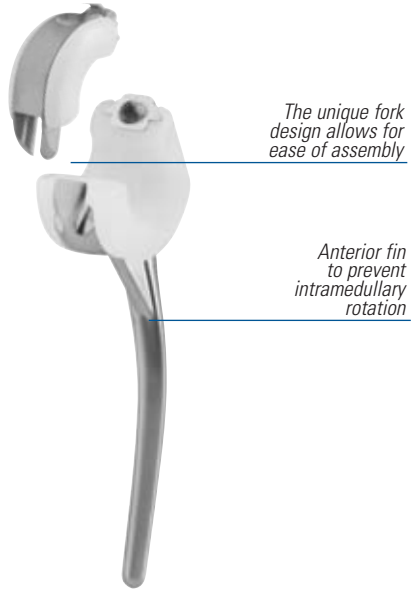
- The placement of the Latitude ulnar component is based on the flexion-extension axis.
- 3 sizes of stems and 2 lengths (standard and short figs 08 and 09).
- The Latitude ulnar stem is designed with an optional cap so that the components can be unlinked or linked.

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).

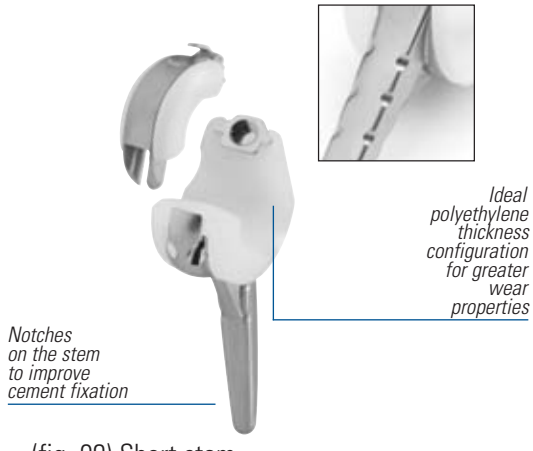
The polyethylene surfaces of the ulnar components have been designed to facilitate an anatomic distribution of joint reactive forces.

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.



(fig. 08) Standard ulnar stem



(fig. 09) Short stem

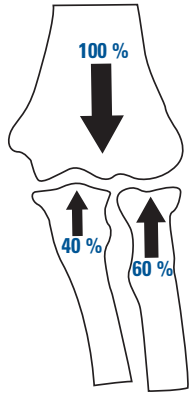
## 2. ANATOMICAL DESIGN VALIDATION

### 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.

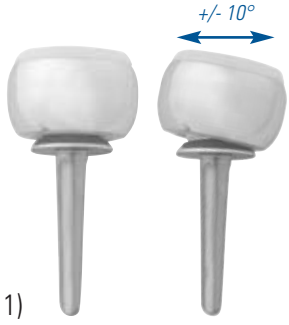
- Without the radio-humeral joint, loading on the ulno-humeral joint is increased contributing to the risk of instability and premature wear.

- 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).



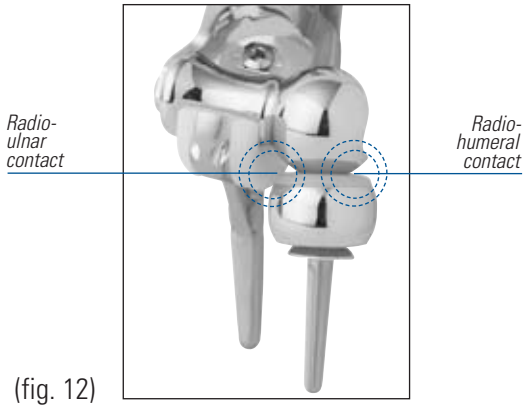
(fig. 10)

The Latitude® Total 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).



(fig. 11)

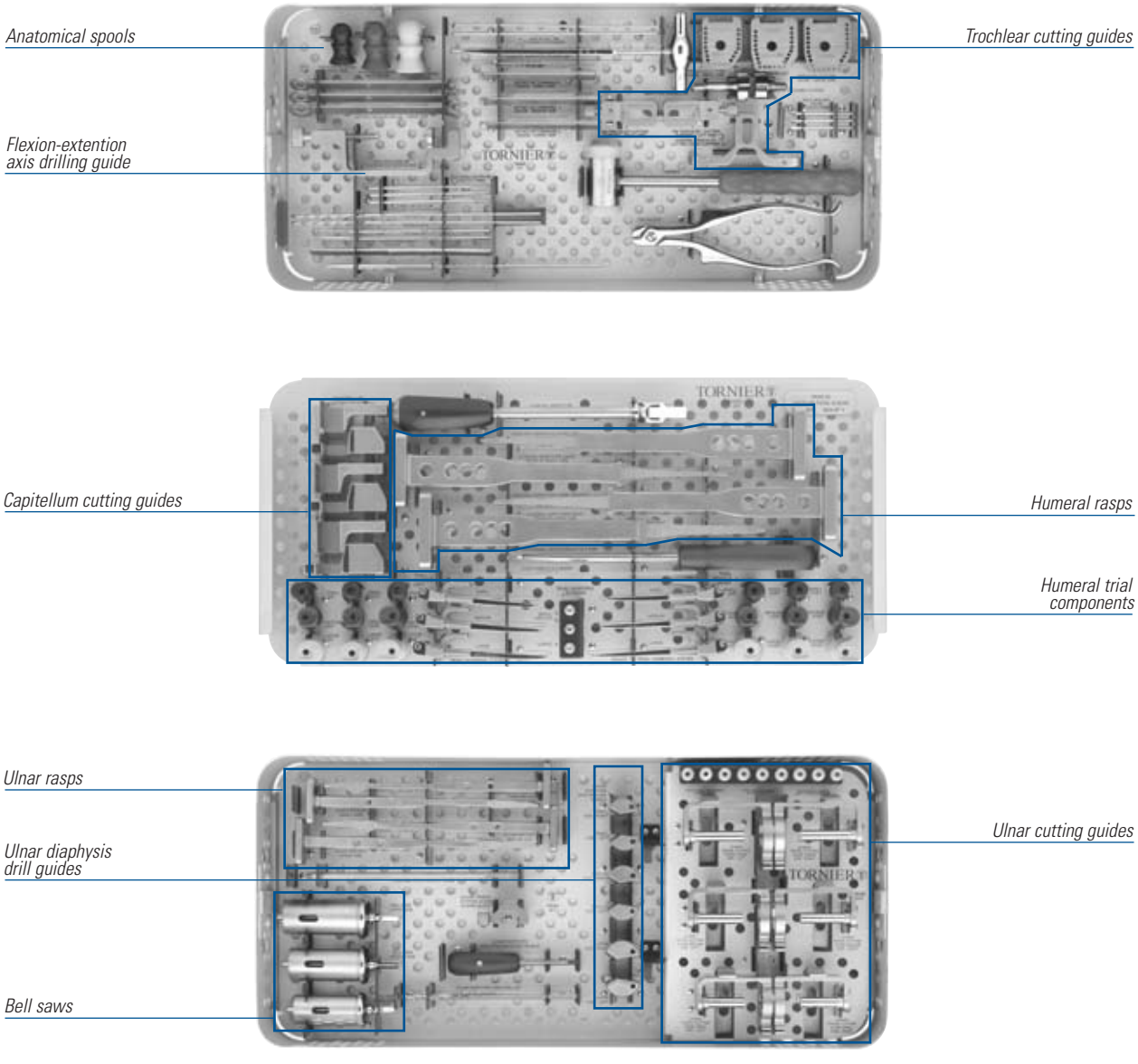
The cobalt chrome ring of the radial head component articulates with the polyethylene of the ulnar component (fig. 12).



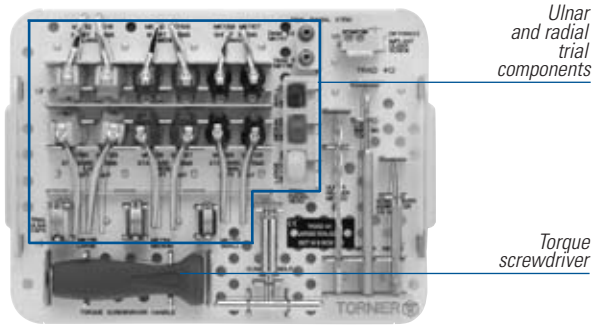
(fig. 12)

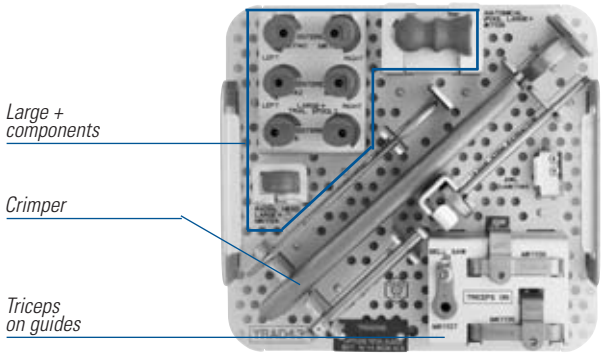
## 3. PRECISION INSTRUMENTATION

The Latitude® Total 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.



## 3. PRECISION INSTRUMENTATION




# INDICATIONS AND CONTRAINDICATIONS



## 4. INDICATIONS AND CONTRAINDICATIONS

### 1 Indications for use

The Tornier Elbow Prosthesis is intended for total elbow arthroplasty. Prosthetic replacement with this device may be indicated to relieve severe pain or significant disability following the effects of primary or secondary osteoarthritis and rheumatoid arthritis; correction of functional deformities; revision procedures where other treatments or devices have failed; treatment of fractures that are unmanageable using other techniques.
The Tornier Elbow Prosthesis is intended for cemented use only.

### 2 Contraindications

- Candidate for an alternative procedure eg. Debridement or synovectomy.
- Recent or active infection.
- Inadequate soft tissue envelope.
- Inadequate bone stock.
- Inability of the patient to comply with postoperative restrictions of an elbow arthroplasty.

## 5. EXPOSURE

### 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. 13a).

(fig. 13a)

Full thickness medial and lateral flaps are elevated on the deep fascia (fig. 13b).

(fig. 13b)

### Ulnar Nerve transposition

The medial aspect of the triceps mechanism is identified and the ulnar nerve is isolated using loupe magnification (fig. 13c). The medial intermuscular septum is excised.

(fig. 13c)

The ulnar nerve is mobilized and transposed anteriorly into the subcutaneous tissue (fig. 13d).
It is carefully protected throughout the remainder of the procedure.

(fig. 13d)

## 5. EXPOSURE

### Triceps Management

Management of the triceps mechanism is at the surgeons 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.

(fig. 13e)

### 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.

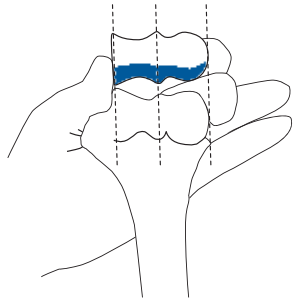
(fig. 13f)

(fig. 13g)

## 6. HUMERAL PREPARATION

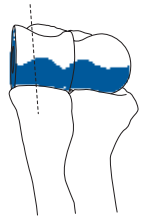
Size the humeral condyle with colored anatomical spools and gauges (small, medium, large, large +).

- Start by comparing the anatomical spool to the patient's capitellum (fig. 14a).



(fig. 14a) Anterior view

- Then verify that the spool fits exactly into the ulna and is perfectly aligned with the radial head (fig. 14b).



(fig. 14b)

- The size of the capitellum may be confirmed with the gauge (fig. 14c).

(fig. 14c)

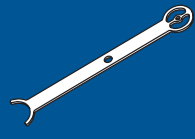
Choose the final implant size based on these measurements. This determination will be used throughout the procedure.

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



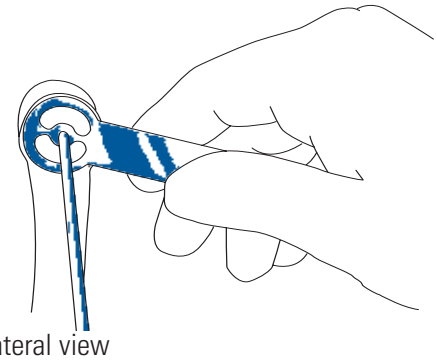
Capitellum radii gauge

# 6. HUMERAL PREPARATION



## 1 Flexion-extension axis determination

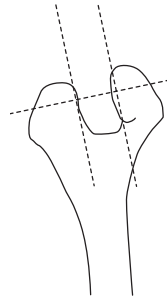
Mark the center of the flexion-extension axis on the capitellum side with the capitellum radii gauge with the 3 mm self-drilling pin to reference the proper position of the drilling guide on the flexion-extension axis (fig. 15).
The location of the axis is typically at the site of attachment of the lateral 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.



(fig. 15) Lateral view

*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. 16).



(fig. 16)

**Instruments to use**

Stabilization pin

Drilling guide

## 6. HUMERAL PREPARATION

Position the flexion-extension axis drill guide on the distal humerus. It should sit with an approximate angle of 45° anteriorly (fig. 17a & 17b).

TIP
The assembled drill guide should appear to be pointed approximately 45° anterior to the coronal plane. (fig. 17b).

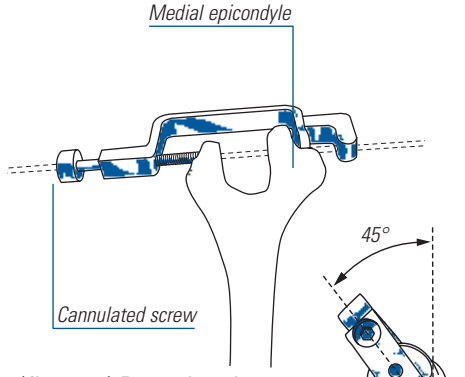
The cannulated screw should be placed over the drill hole previously marked on the capitellum.

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

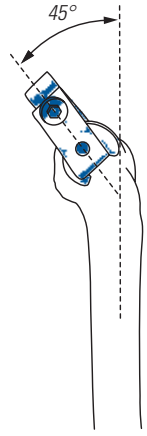
The center of the medial notch should be roughly at the center of the medial ridge of the trochlea such that an axis pin would appear to exit at the anterior and inferior edge of the medial epicondyle's intersection with the trochlea (fig. 17a).

Drill the flexion-extension axis and then remove the guide (fig. 17c).

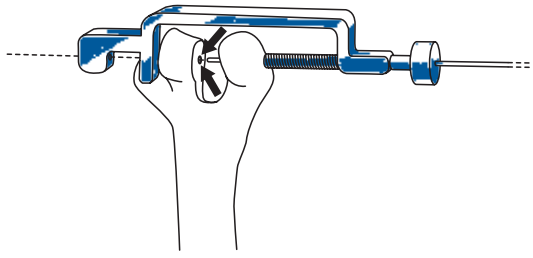
As a check, reinsert the flexion-extension pin to confirm correct alignment (fig. 18).



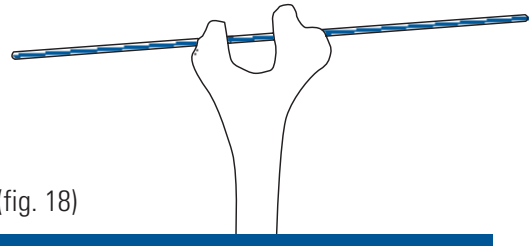

(fig. 17a) Posterior view




(fig. 17b) Medial view



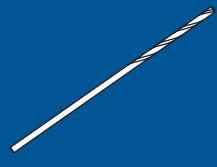
(fig. 17c) Posterior view



(fig. 18)

**Instruments to use**

Drilling guide



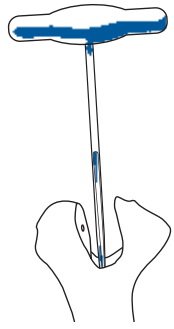
Drill bit

Axis pin

## 6. HUMERAL PREPARATION

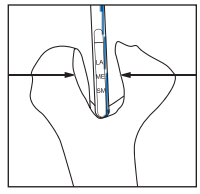
Open the medullary canal with a high speed burr.

After burring, use the T-handle reamer to shape the medullary canal (fig. 19).



(fig. 19)

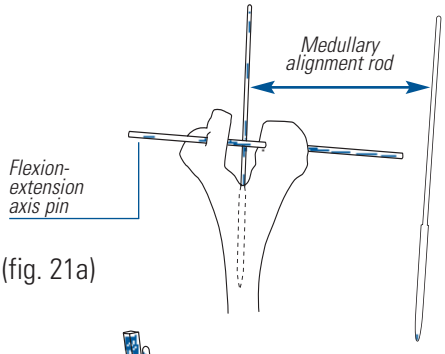
The T-handle reamer should be inserted up to the intersection of the predetermined implant size marked on the shaft and the flexion-extension axis (fig. 20).



(fig. 20)

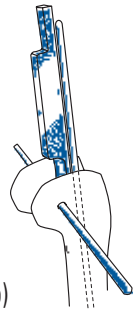
### 2 Humeral Offset Determination

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. 21a).




(fig. 21a)

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. 21b).



(fig. 21b)

**Instruments to use**

Humeral diaphysis reamer | Burr | Flexion/extension axis pin | Medullary alignment rod | Offset determining gauge

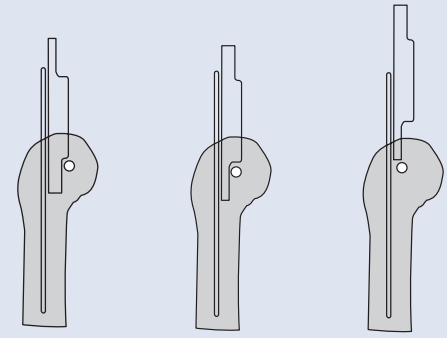
## 6. HUMERAL PREPARATION

### 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).



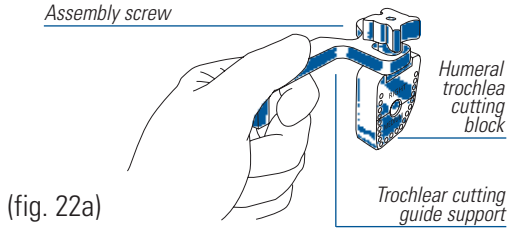
(fig. I) *Anterior offset*

(fig. II) *Centered offset*

(fig. III) *Posterior offset*

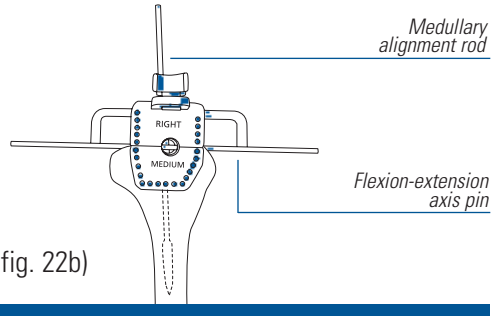
### 3 Humeral Distal Preparation

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. 22a).



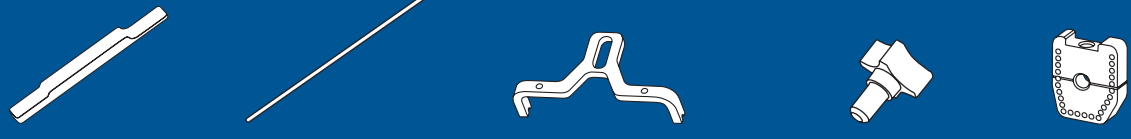

(fig. 22a)

Position the cutting guide on the flexion-extension axis pin and align with the medullary alignment rodas shown (fig. 22b).




(fig. 22b)

### Instruments to use



Offset determining gauge

Flexion/extension axis pin

Humeral trochlea cutting guide support

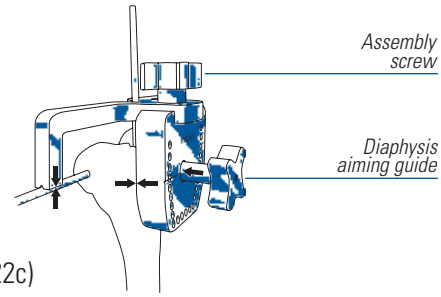
Assembly screw

Humeral trochlea cutting block

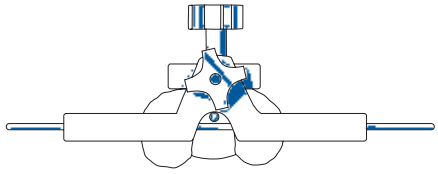
## 6. HUMERAL PREPARATION

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. 22c).

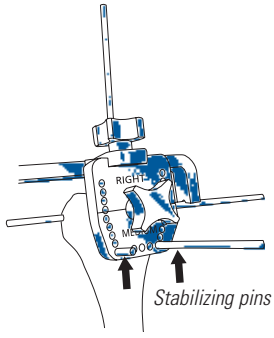
Medial-lateral placement of the humeral trochlea cutting block is completed by inserting the diaphysis aiming guide through the block and engaging it onto the medullary alignment rod.




(fig. 22c)



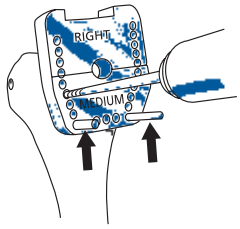
Using the 3 mm diameter drill bit, drill 2 holes at the inferior portion of the humeral trochlea cutting block and place 2 stabilizing pins as shown (fig. 23).




(fig. 23)

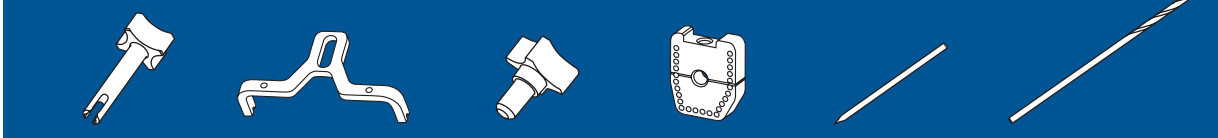
TIP
Size and side designations on all instruments always face the surgeon.

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. 24). Take care to avoid damaging anterior structures.




(fig. 24)

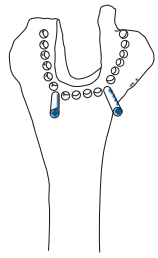
**Instruments to use**



Diaphysis aiming guide | Humeral trochlea cutting guide support | Assembly screw | Humeral trochlea cutting block | Stabilization pin | Drill bit

## 6. HUMERAL PREPARATION

Slide the cutting block off the stabilizing pins and remove them with the pin puller (fig. 25).



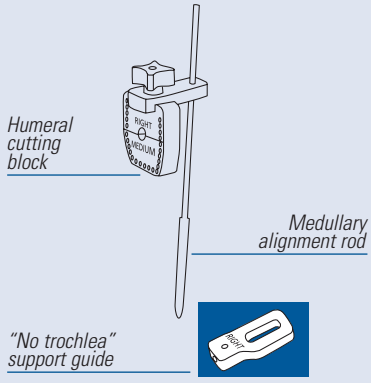
(fig. 25)

### Lack of anatomical landmark

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

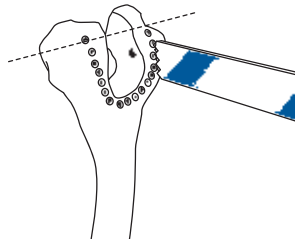
Assemble the cutting block to the "No trochlea" support noting either right or left with the assembly screw.

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



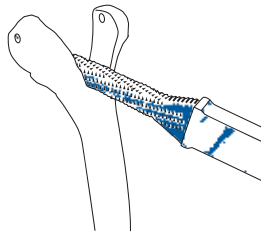

Remove the bony bridge between the drill holes with a straight osteotome, microsaggital saw or rongeur as necessary (fig. 26).

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



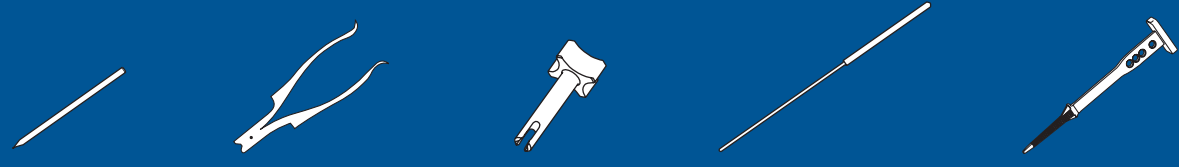
(fig. 26)

Smooth the cut surface with a humeral broach or burr (fig. 27).



(fig. 27)

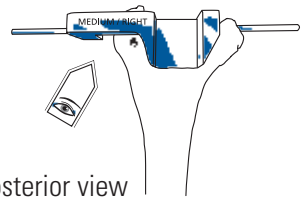
### Instruments to use



Stabilization pin | Pin puller | Diaphysis diming guide | Medullary alignment rod | Humeral diaphysis canal broach

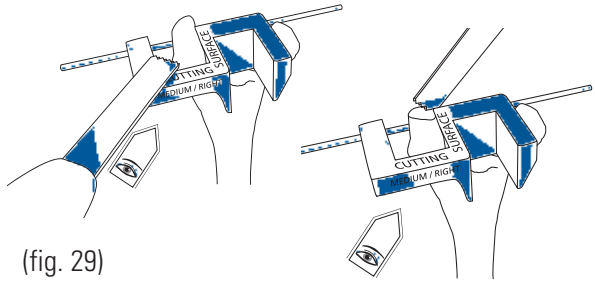
## 6. HUMERAL PREPARATION

Using the correct size and side capitellum cutting guide, position it in the trochlear cut as shown (fig. 28).



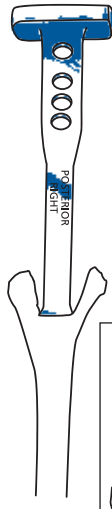

(fig. 28) Posterior view

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. 29).



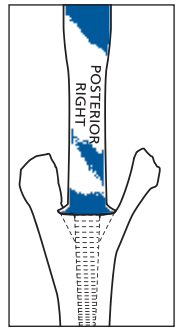

(fig. 29)

Broach the humeral canal with the starting broach and then proceed sequentially to the selected size of the humeral component (fig. 30a).



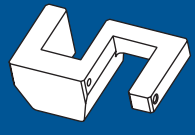

(fig. 30a)

TIP
The indication of side right or left should point posteriorly so that it can be read by the surgeon (fig. 30b).




(fig. 30b)

**Instruments to use**



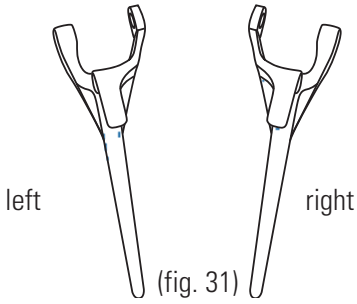
Capitellum cutting guide

Flexion/extension axis pin

Humeral diaphysis canal broach

## 6. HUMERAL TRIAL STEM

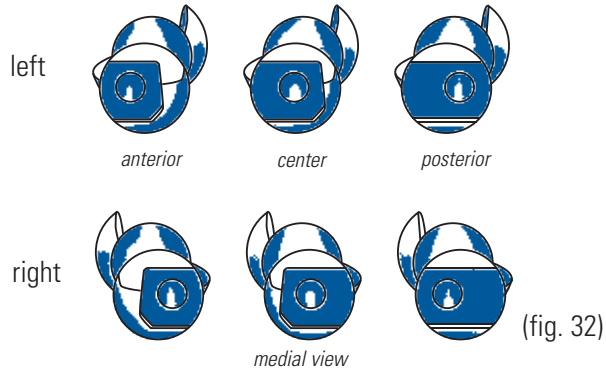
**1** Select the appropriate size humeral trial stem either right or left (fig. 31).




(fig. 31)

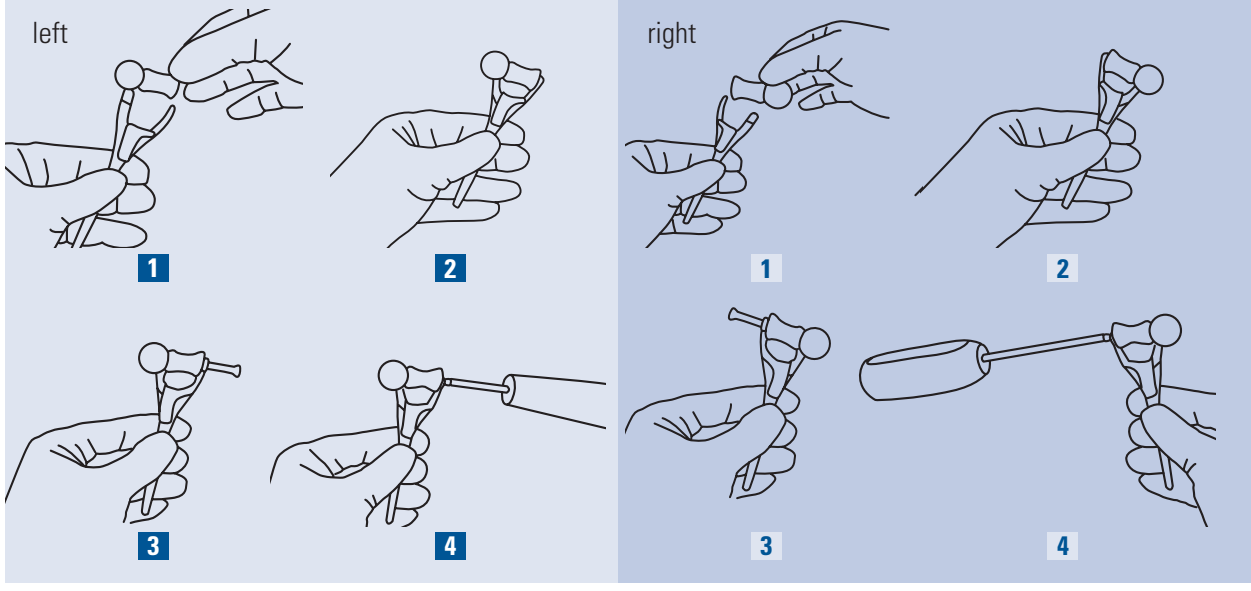
| | | Spool | | | |
|---|---|---|---|---|---|
| | | Small | Medium | Large | Large plus |
| Humeral stems | Small | ■ | | | |
| | Medium | | ■ | | |
| | Large | | | ■ | ■ |

**2** Select the corresponding spool (side, size and offset) according to the following table (fig. 32).




(fig. 32)

| | | |
|---|---|---|
| **SMALL** | **=** | **BLACK** |
| **MEDIUM** | **=** | **RED** |
| **LARGE** | **=** | **YELLOW** |
| **LARGE PLUS** | **=** | **GREEN** |

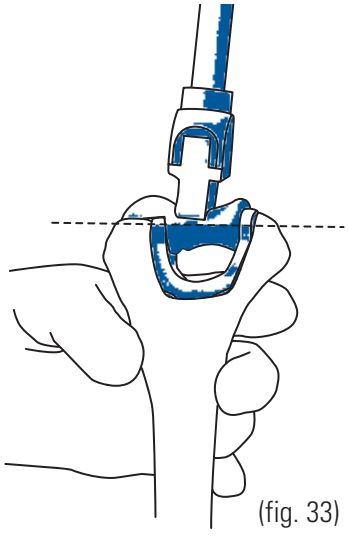

Position the round part (capitellum) of the spool on the left for a left trial/on the right for a right trial stem.
Place the appropriate size trial humeral screw from medial to lateral. Tighten using the 4.5 mm hex screwdriver.

TIP: The large+ spool is assembled with only the large humeral stem.

## 6. HUMERAL TRIAL STEM

Position the trial stem assembly in the humeral shaft.

Use the impactor to seat the implant flush with the bone (fig. 33).



(fig. 33)



**Instruments to use**

Trial humeral stem | Trial spool | Trial humeral screw | Impactor | 4.5 hexagonal screwdriver

# ASSEMBLY

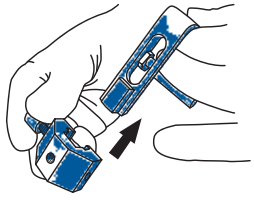


## 7. RADIO-ULNAR CUTTING GUIDE

*Note*
*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. (34a-d)).

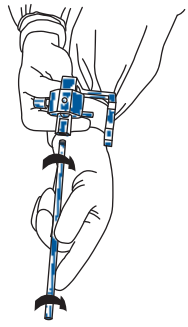
**1**



Slide the block onto the cutting guide.

(fig. 34a)

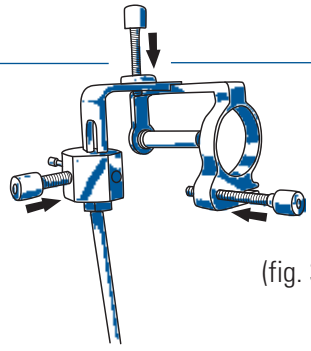
**2**



Screw the forearm axis guide into the cutting guide.

(fig. 34b)

**3**



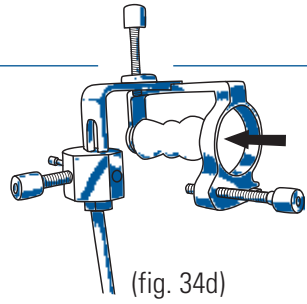
Screw the desired type screws (cannulated, trochar or flat) into the cutting guide.

(fig. 34c)

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

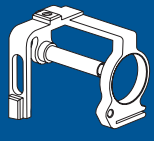
**4**

Insert the selected spool on the cutting axis.



(fig. 34d)

### Instruments to use

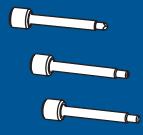


Ulnar/radial cutting guide

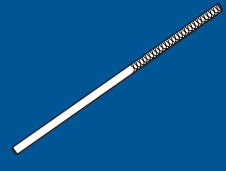
Ulnar/radial cutting guide sliding block

Anatomical spool

Locking screw



Tightening screws



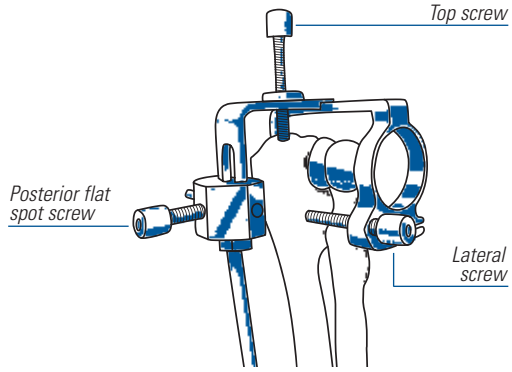
Forearm positioning guide

## 7. ULNAR PREPARATION (triceps splitting approach)

### 1 Radio-Ulnar Cutting guide Positioning

Position the cutting guide on the ulna and radial head (fig. 35). 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.




(fig. 35) Postero-lateral view

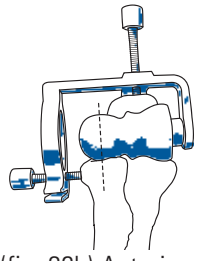
Tighten the 3 stabilizing screws with the 4.5 mm hex screwdriver.

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.

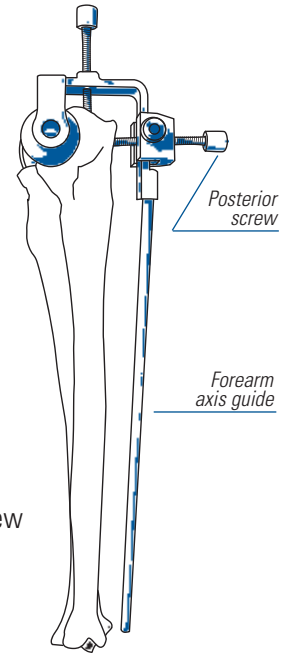
Then tighten the remaining two screws.

Make sure that the forearm axis guide points towards the ulnar styloid (fig. 36a).

Make sure that the anatomical spool seats properly into the ulna and is anatomically aligned with the radial head (fig. 36b).



(fig. 36b) Anterior view

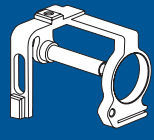



(fig. 36a) Medial view

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

**Instruments to use**

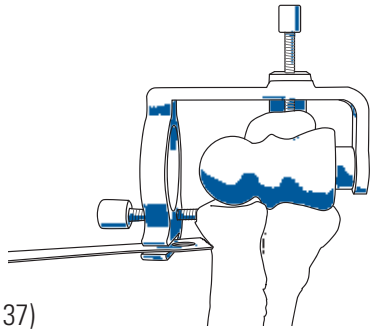
Anatomical spool



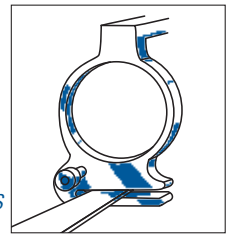
Ulnar/radial cutting guide

## 7. ULNAR PREPARATION (triceps splitting approach)

Resect the radial head with an oscillating saw (fig. 37). From lateral to medial.

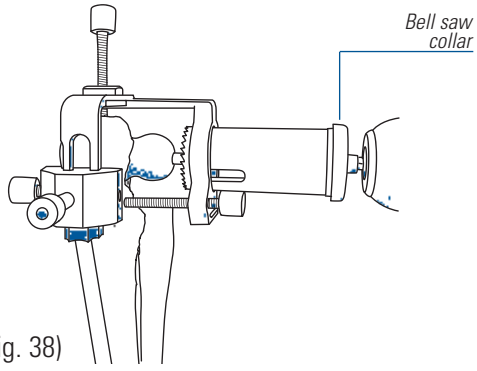


(fig. 37)



*Note*
*Slot thickness is 1.4 mm.*

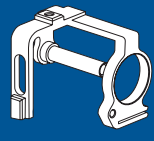
With the appropriate size bell saw, cut the ulna. The cut is completed when the collar of the saw sits on the lateral ring (fig. 38). Ensure the ulnar nerve is protected.




(fig. 38)

**Instruments to use**

Anatomical spool



Ulnar/radial cutting guide

Bell saw

## 7. ULNAR PREPARATION (triceps splitting approach)

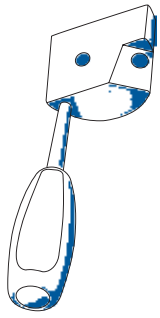
The jig is removed.

Lateral view after all cuts have been completed (fig. 39)

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

(fig. 39)

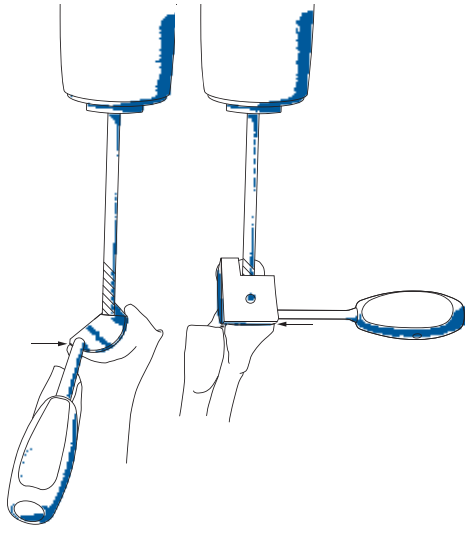
Attach the handle to the appropriate size (S/M/L) and side (R/L) ulnar diaphysis drill guide (fig. 40a).



(fig. 40a)

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. 40b).
The tip of the olecranon can be removed with a rongeur if necessary.

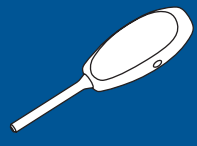
*Note*
*The position of the guide should be aligned as shown with reference to the tip of the coranoid and olecranon.*



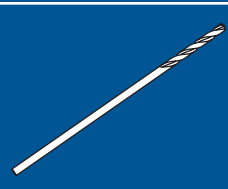
(fig. 40b)

**Instruments to use**

Ulnar diaphysis axis drill guide



Ulnar diaphysis axis drill guide handle

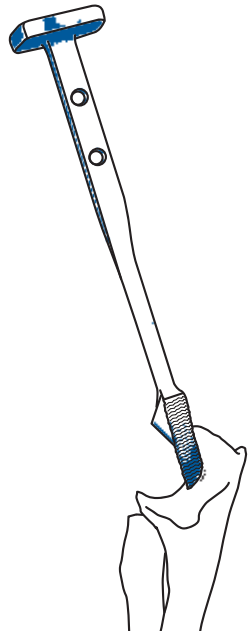


Ulnar diaphysis axis drill bit

## 7. ULNAR PREPARATION (triceps splitting approach)

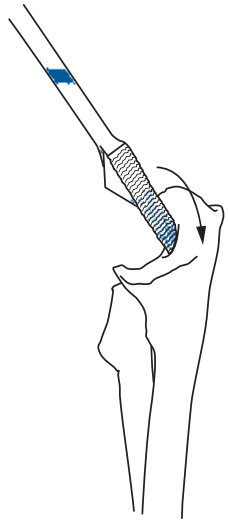
### 2 Ulnar canal Broaching

Broach the ulnar diaphysis canal beginning with the starting broach and broach sequentially to the desired size (fig. 41).



(fig. 41)

Insert the broach in the ulnar canal respecting the radial inclination of the shaft. (fig. 42). Use the orientation of the flat spot on the posterior surface of the ulna to assist in correctly rotating the ulnar broach.



(fig. 42)

**Instruments to use**

Ulnar broaches

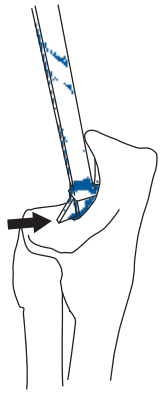
# 7. ULNAR PREPARATION (triceps splitting approach)

Broach until the apex of the fin is in contact with the bone (fig. 42a).

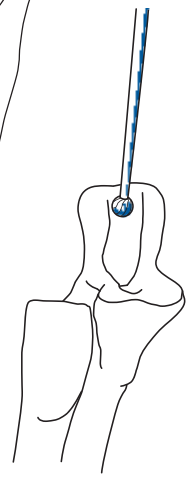
*Note*
*Do not broach beyond this point.*

Burr slightly the olecranon to facilitate seating of the trial and implant (fig. 42b).

Should a standard ulnar stem be desired, ream the canal for the final implant (fig. 42c).



(fig. 42a)

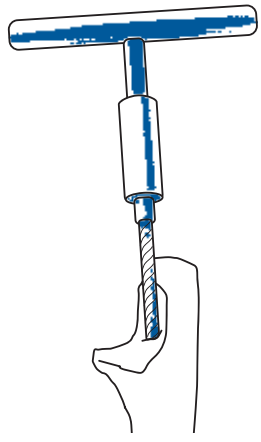


(fig. 42b)

## 3 Ulnar canal reaming for standard stem

Assemble the reamer to the handle.

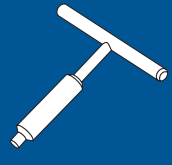
Gently ream the canal making sure not to penetrate the lateral or dorsal cortex (fig. 42c). Flexible reamers (not included), can be used if preferred.



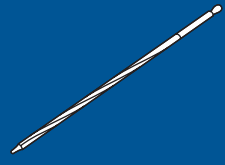
(fig. 42c)

**Instruments to use**

Ulnar broaches



Ulnar reamer handle



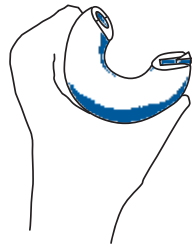
Ulnar reamer

## 8. ULNAR TRIAL AND RADIUS PREPARATION

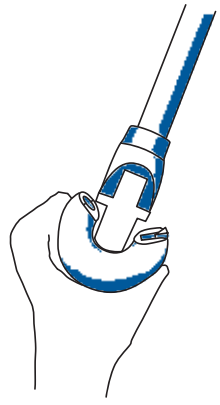
### ULNAR TRIAL

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. 43a-b).

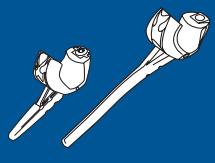


(fig. 43a)

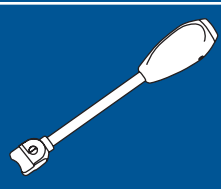


(fig. 43b)

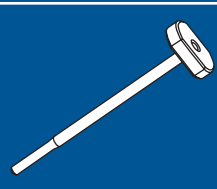
**Instruments to use**



Trial ulnar stems



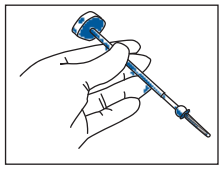
Impactor



Trial radial stem impactor

## 8. ULNAR TRIAL AND RADIUS PREPARATION

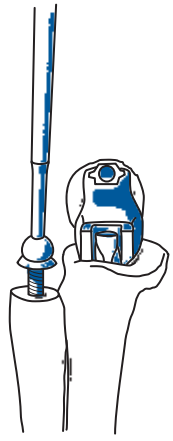
### RADIUS PREPARATION AND TRIAL



Screw the trial handle to the radial broach/trial stem (fig. 44).

(fig. 44)

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. 45).



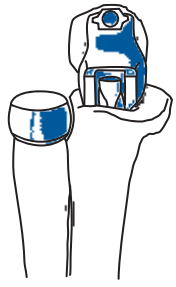
(fig. 45)

Upon completion, unscrew the handle leaving the broach seated in the canal (fig. 46a).

(fig. 46a)

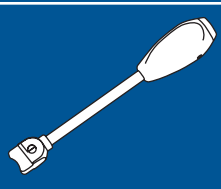
Using the same color code, select the appropriate size trial radial head and place the trial head on the stem (fig. 46b).

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

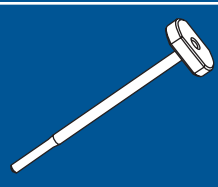


(fig. 46b)

**Instruments to use**



Impactor



Trial radial stem impactor

Trial radial stem

Trial radial head

## 9. TRIAL AND REDUCTION

The trial components can be placed unlinked or linked.

### 1 Unlinked

Reduce the humeral and ulnar components (fig. 47).
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.

(fig. 47)

### 2 Linked

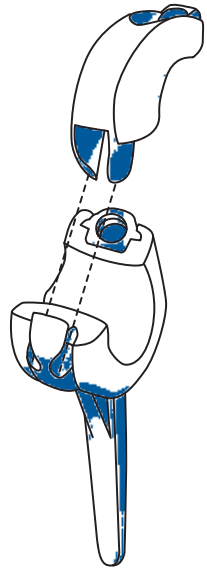
Assemble the trial ulnar cap as shown (fig. 48a-d) to the ulnar stem and tighten the trial locking screw. Confirm appropriate component placement and perform another trial reduction.

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.

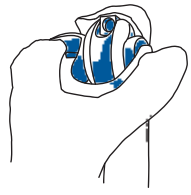
If the trial reduction is not satisfactory,
check that the trial stems sit properly on the bone
and that no soft tissue impingement has occurred.

(fig. 48a)

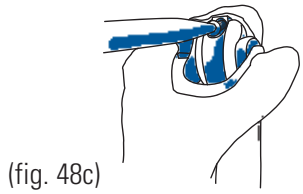


## 9. TRIAL AND REDUCTION

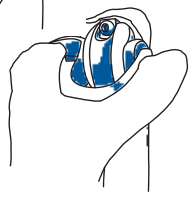
If the radial head articulates congruently with the capitellum, a radial head component should be employed.
If maltracking of the radial head is evident, component positioning should be adjusted. If maltracking persists, a radial head replacement should not be performed.



(fig. 48b)



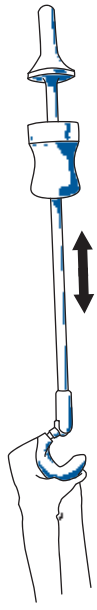
(fig. 48c)



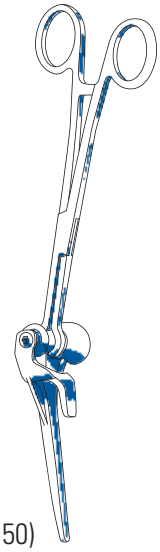
(fig. 48d)

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. 49).

To remove the humeral component, grasp the humeral trial spool with the humeral extractor clamp (fig. 50).
Then gently tap retrograde and remove the component.



(fig. 49)

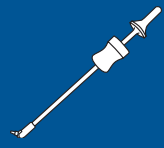


(fig. 50)

**Instruments to use**

Optional trial ulnar screw

Humeral component extractor



Ulnar stem extractor

# 10. FINAL IMPLANT ASSEMBLY

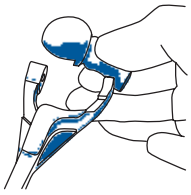
After all trial components have been removed, lavage and dry all medullary canals.
Cement restrictors should be considered.

## ASSEMBLY OF FINAL COMPONENTS

*Check that the spool sits properly on the humeral component.*

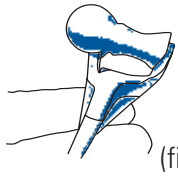
The humeral stem (side and size) is assembled to the appropriate spool (side, size and offset).
The implant humeral screw (cannulated) is firmly tightened with the 4.5 mm hex screwdriver (fig. 51a-c).
The humeral implant screw is then further secured with the crimping tool as shown (fig. 52a-b).

1



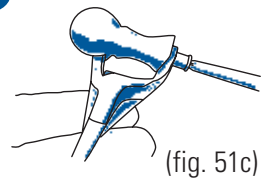
(fig. 51a)

2



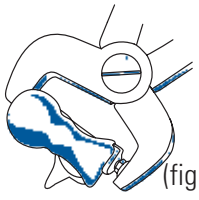
(fig. 51b)

3

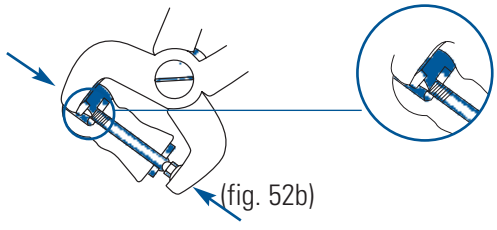


(fig. 51c)

The crimper is intended to be used after the humeral screw insertion inside the spool and before the humeral stem cementation. The round side of the crimper is inserted inside the screw head and the pointed side (the awl) is positioned in between the shaft of the screw and the humeral yoke.
Firmly squeeze the crimper to deform the screw implant interface.



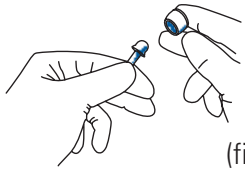
(fig. 52a)



(fig. 52b)

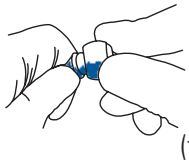
*Note*
*If the awl is dull and will not crimp properly the screw, then refer to page 42 for awl changeout instructions.*

4



(fig. 53a)

5



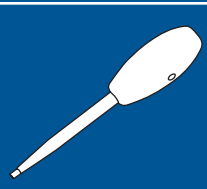
(fig. 53b)

(fig. 53c)

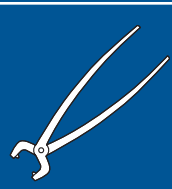
*Note*
*Do not remove and reapply head on stem as repeated assembly reduces the disassembly force.*

Assemble the radial components by snapping the head onto its stem prior to implantation (fig. 53 a-b).

**Instruments to use**



4.5 hexagonal screwdriver



Humeral screw crimping clamp

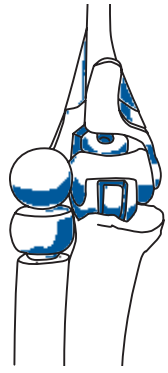
## 11. CEMENT TECHNIQUE AND BONE GRAFT

### CEMENT TECHNIQUE

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

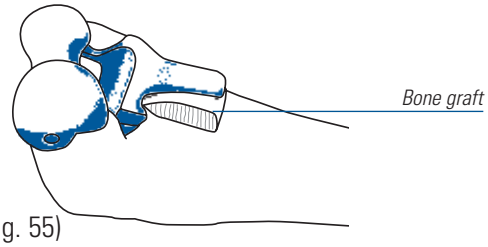
When using the radial head component, cement both radial head and ulnar stem at the same time. To ensure that both components are seated at the same level, use the trial humeral stem and spool as a visual guide to correct insertion (fig. 54).



(fig. 54)

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. 55).




(fig. 55)

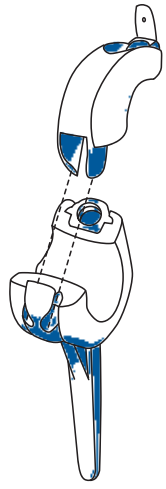
Unlinked

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

## 11. CEMENT TECHNIQUE AND BONE GRAFT

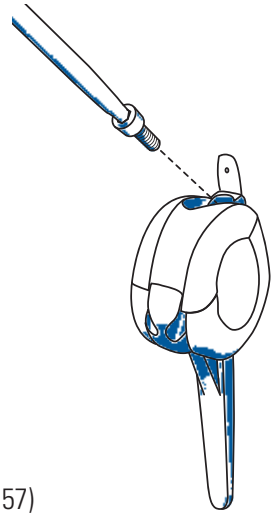
Linked

- 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 screw driver and discard.
- Reduce humeral and ulnar components to approximately 140° of flexion, insert ulnar cap into the ulnar stem (fig. 56).



(fig. 56)

- Tighten the screw until the torque release is reached (fig. 57).

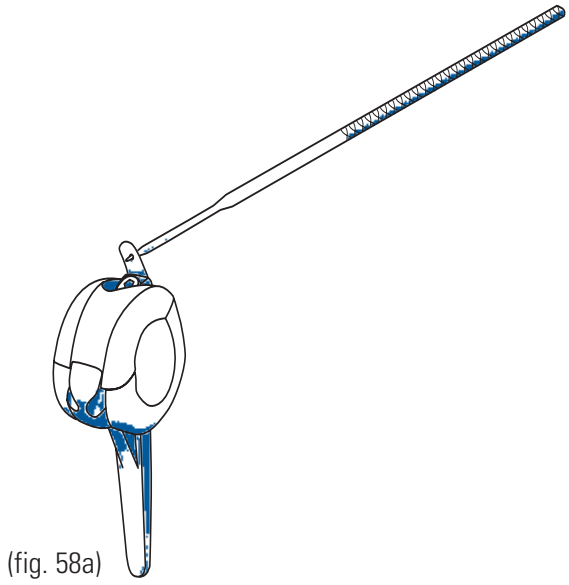


(fig. 57)

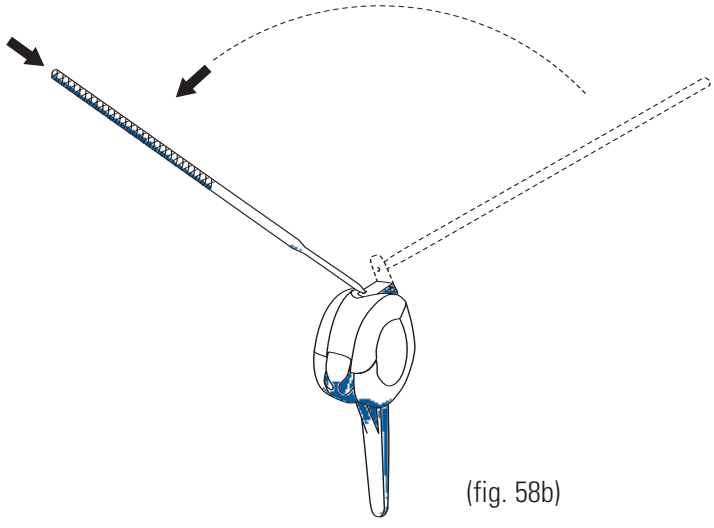
## 11. CEMENT TECHNIQUE AND BONE GRAFT



- Using the tab bending tool and a mallet (fig. 58a), bend the cap tab over the screw (fig. 58b).

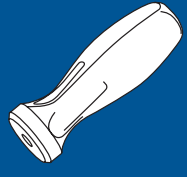


(fig. 58a)

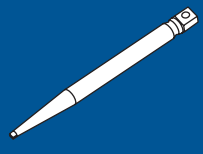


(fig. 58b)

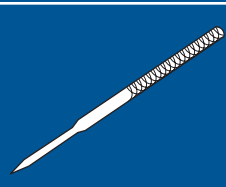
**Instruments to use**



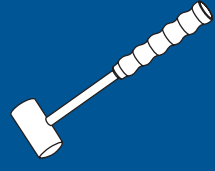
Torque handle



Torgue screwdriver adaptator



Ulnar cap lug bending tool



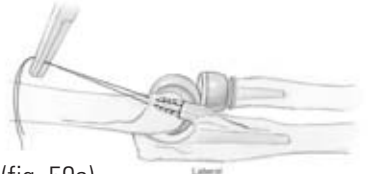
Mallet

# SUTURE TECHNIQUE AND CLOSURE

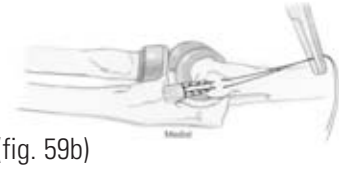
## 12. SUTURE TECHNIQUE AND CLOSURE

### 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.




(fig. 59a)




(fig. 59b)

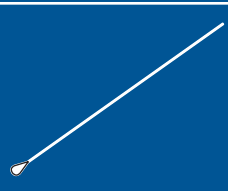
### 2 Postoperative recommendations

• 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.

(fig. 60)

• 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**



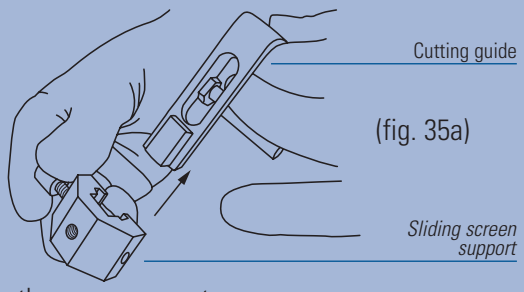
Suture passer

Fiberwire™ is a trademark from Arthrex, FL.
Ethibond™ is a trademark from Johnson & Johnson, NJ.

## 12. 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. (35a-d).

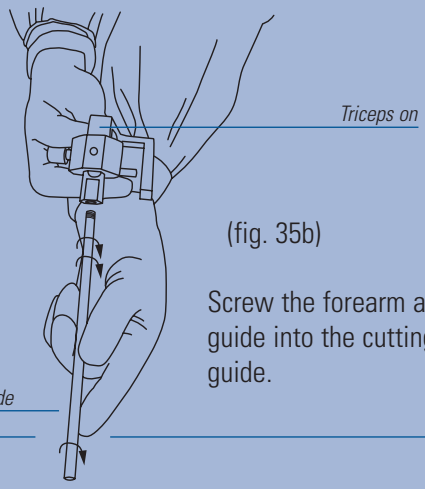
**1**




(fig. 35a)

Slide the screw support onto the cutting guide.

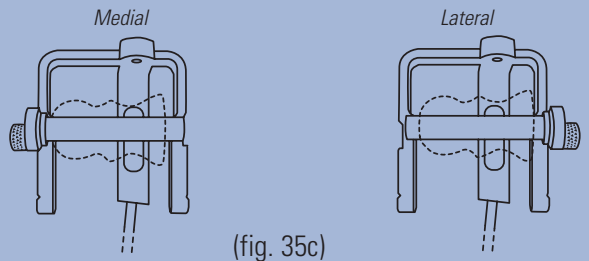
**2**



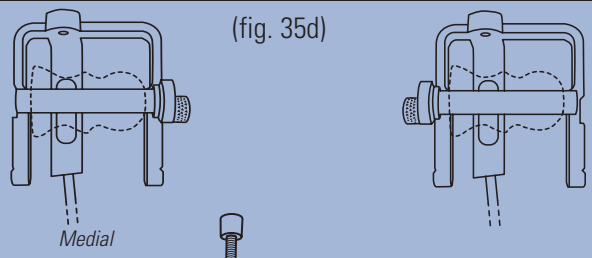

(fig. 35b)

Screw the forearm axis guide into the cutting guide.

**3**



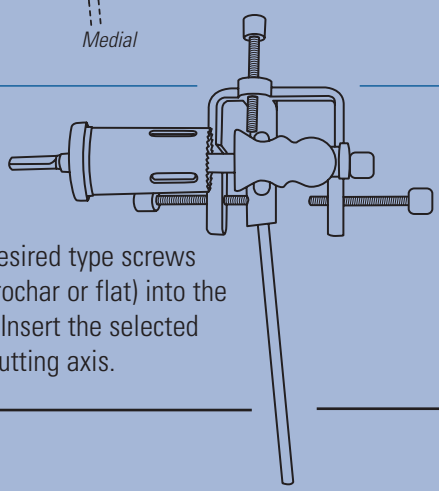

(fig. 35c)



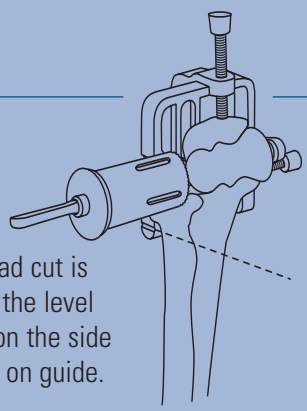

(fig. 35d)

Assemble the spool support to the jig on either side depending on whether the ulnar cut is to be made from lateral or medial.

**4**



Screw the 4 desired type screws (cannulated, trochar or flat) into the cutting guide. Insert the selected spool on the cutting axis.



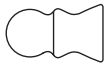
The radial head cut is performed at the level of the notch on the side of the triceps on guide.

## INSTRUMENTATION

### Drilling of flexion / extension axis

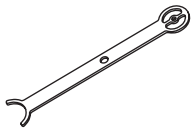
**Anatomical spool**

| | |
|---|---|
| Small size | Ref. MKY032 |
| Medium size | Ref. MKY034 |
| Large size | Ref. MKY036 |
| Large + | Ref. MKY138 |

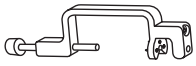


**Capitellum radii gauge**

| | |
|---|---|
| Small size | Ref. MKY002 |
| Medium size | Ref. MKY004 |
| Large size | Ref. MKY006 |



**Drilling guide of flexion/extension axis**
Ref. MKY001



**Medullary alignment rod**
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

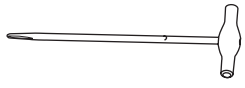


### Humeral diaphysis drilling

**Burr - Ø 6**
Ref. MKY058



**Humeral diaphysis reamer - Ø 6**
Ref. MKY007



### Offset determination

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

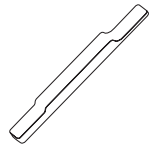


**Humeral diaphysis axis**
Ref. MKY019



**Offset determining gauge**

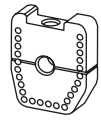
| | |
|---|---|
| Small size | Ref. MKY008 |
| Medium size | Ref. MKY009 |
| Large size | Ref. MKY010 |



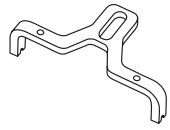
### Humeral trochlea cut

**Humeral trochlea cutting block**

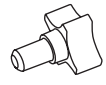
| | |
|---|---|
| Small size | Ref. MKY012 |
| Medium size | Ref. MKY013 |
| Large size | Ref. MKY014 |



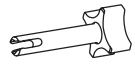
**Humeral trochlea cutting guide support**
Ref. MKY015



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

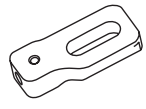


**Diaphysis aiming guide**
Ref. MKY017



**"No trochlea" humeral cutting guide support**

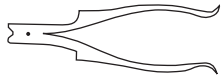
| | |
|---|---|
| Right side | Ref. MKY059 |
| Left side | Ref. MKY060 |



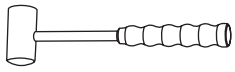
**Stabilization pin Ø 3 - Length 55 mm**
Ref. MKY062

## INSTRUMENTATION

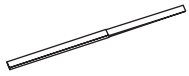
**Pin puller**
Ref. MCI511



**Mallet**
Ref. MWA122



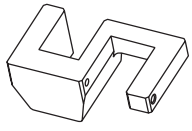
**Osteotome**
Ref. MDU500



### Humeral 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 |



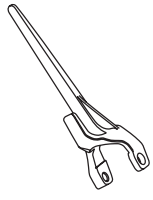
**Humeral diaphysis canal broach**

| | |
|---|---|
| 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. MKY098 |
| 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 |

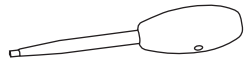
**Trial spool posterior offset**

| | |
|---|---|
| Small, right | Ref. MKY092 |
| Small, left | Ref. MKY095 |
| Medium, right | Ref. MKY093 |
| Medium, left | Ref. MKY096 |
| Large, right | Ref. MKY094 |
| Large, left | Ref. MKY097 |
| Large +, right | Ref. MKY143 |
| Large +, left | Ref. MKY144 |

**Trial humeral screw**

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

**Hexagonal screwdriver**
**Ø 4,5 mm**
Ref. MHG001



## INSTRUMENTATION

**Impactor**
Ref. MKY064

**Suture passer**
Ref. MKY079

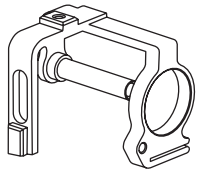
| | |
|---|---|
| Base | Ref. YRAD321 |
| Insert | Ref. YRAD322 |

**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

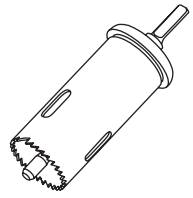


**Ulnar/radial cutting guide sliding block**
Ref. MKY047

**Locking screw**
Ref. MKY054

**Bell saw**

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

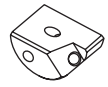


### Ulnar diaphysis drilling

**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

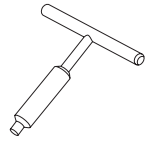
### Ulnar broaches

**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



## INSTRUMENTATION



### 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 |
| Small size, left | Ref. MKY108 |
| Medium size, right | Ref. MKY109 |
| Medium size, left | Ref. MKY110 |
| Large size, right | Ref. MKY111 |
| Large size, left | Ref. MKY112 |

**Trial ulnar standard stem**

| | |
|---|---|
| Small size, right | Ref. MKY125 |
| Small size, left | Ref. MKY126 |
| Medium size, right | Ref. MKY127 |
| Medium size, left | Ref. MKY128 |
| Large size, right | Ref. MKY129 |
| Large size, left | Ref. MKY130 |

**Torque handle**
Ref. MKY121

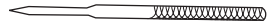
**Torque screwdriver adaptor (hexagon 2,5 mm)**
Ref. MKY122

**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

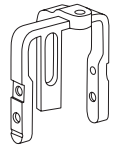


**Trial radial head**

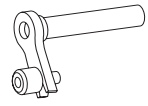
| | |
|---|---|
| Small size | Ref. MKY055 |
| Medium size | Ref. MKY056 |
| Large size | Ref. MKY057 |
| Large + size | Ref. MKY134 |

**Triceps on jig**

| | |
|---|---|
| Right size | Ref. MKY135 |
| Left size | Ref. MKY136 |



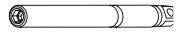
**Triceps on bell saw jig**
Ref. MKY137



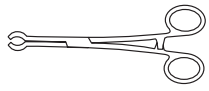
**Humeral screw crimping clamp**
Ref. MKY133

**Crimping clamp - Awl**
Ref. MKY146

**Crimping clamp - Awl adaptator**
Ref. MKY145

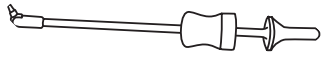


**Humeral component extractor**
Ref. MKY147



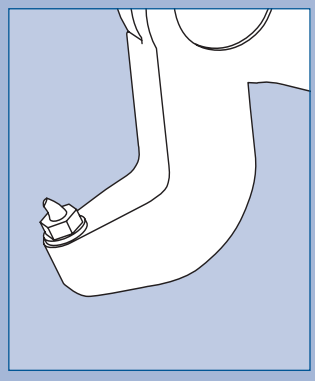
**Trial radial head impactor**
Ref. MKY118

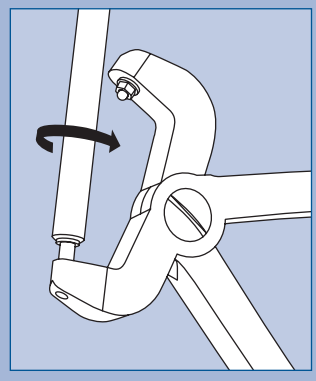
**Ulnar stem extractor**
Ref. MWA118



## INSTRUMENTATION

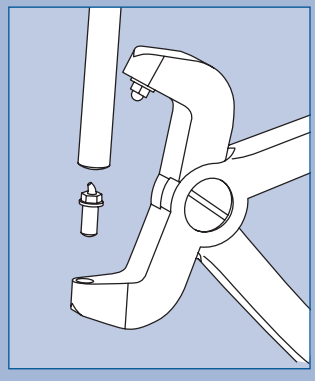
### AWL CHANGE OUT INSTRUCTIONS

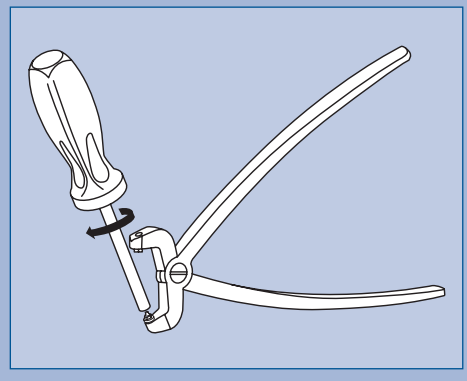

1


2

Assemble the awl adaptor (MKY145) to the torque handle (MKY121).

Unscrew the dull awl with the assembled screwdriver.
Take a new awl and screw it on the clamp until the release torque of the screwdriver is reached.


3


4

# NOTES

NOTES

# ELBOW PROSTHESIS

Latitude Total Elbow Prosthesis

## TOTAL ELBOW PROSTHESIS

### Humeral Components

| Ref. | Component information |
|---|---|
| DKY181 | Humeral component small right |
| DKY183 | Humeral component medium right |
| DKY185 | Humeral component large right |
| DKY182 | Humeral component small left |
| DKY184 | Humeral component medium left |
| DKY186 | Humeral component large left |

### Spool

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

*Anterior*

*Posterior*

*Centered*

### 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 |

For more information, call toll free 1-888-TORNIER (867-6437)
or contact your local representative

TORNIER
SURGICAL IMPLANTS

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