Lateral Resurfacing Elbow

Operative Technique

LRE system Ltd
Lateral Resurfacing Elbow

Lateral resurfacing elbow (LRE)

Design rationale

Post-mortem studies have established that elbow osteoarthritis (OA) begins in the radiocapitellar joint[1,2,3,4] and subsequent arthroscopic procedures have demonstrated that the degenerative changes may then remain largely confined to the lateral compartment of the elbow[5].

The lateral resurfacing elbow arthroplasty (LRE) was developed to address this pattern of intra-articular cartilage degeneration.

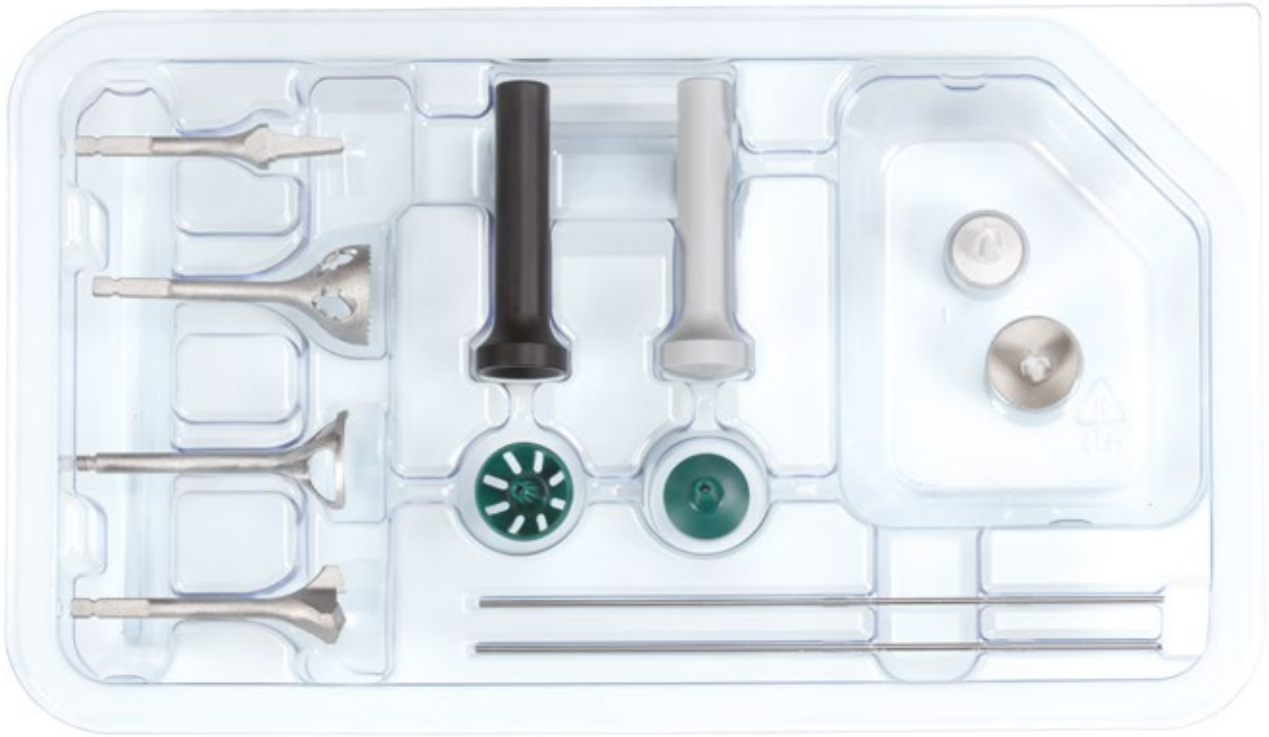
Clinical history

The LRE began to be used clinically in 2005[6] and since then the satisfactory results of the LRE obtained in the design centre[7] have been replicated by other groups in a wide range of patients including manual workers[8,9].

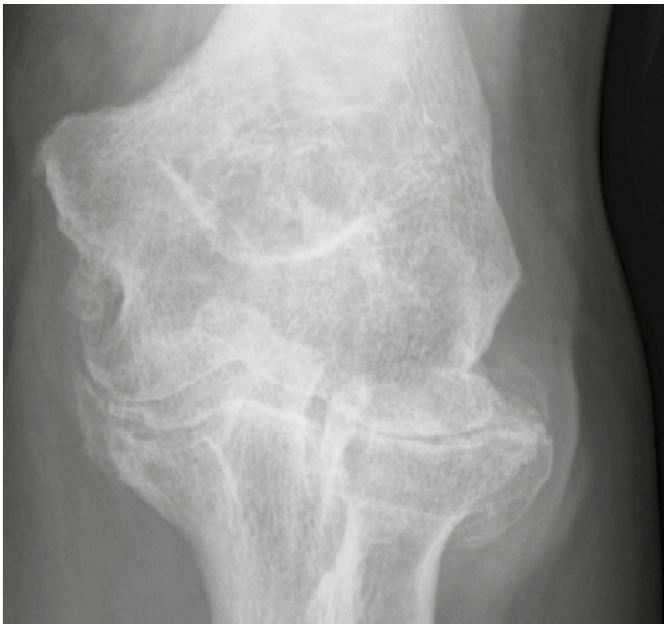
The LRE has been found to be appropriate for patients with primary OA and secondary OA due either to trauma or treated inflammatory arthropathies, in whom intra-operative observations have confirmed that the pattern of articular degeneration is similar.

The sterile procedural set

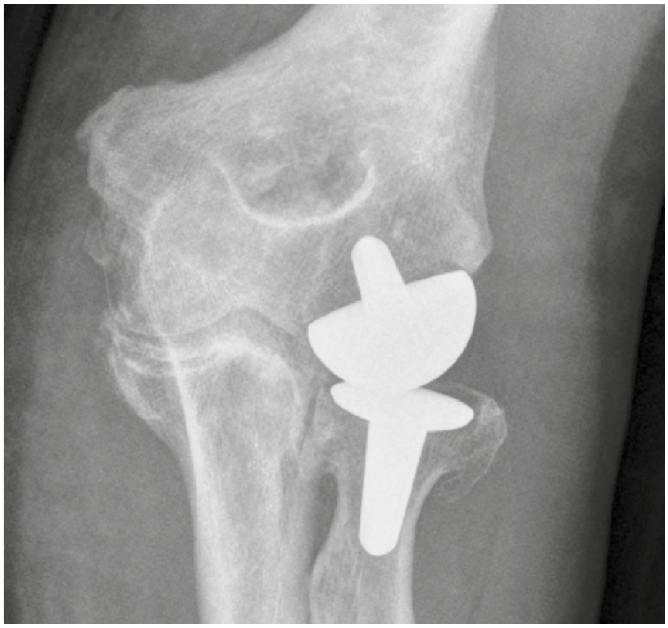
Contains the LRE components, trial components and the specific instruments required for bone preparation.



Intended use for LRE



The pre-operative x-ray of a 55 year old male patient with hypertrophic primary osteoarthritis.



The post-operative x-ray appearances 7 years following insertion of an LRE arthroplasty.

The LRE set is intended for resurfacing the radiocapitellar joint of the elbow, for patients suffering from disabling inflammatory or non-inflammatory arthritis for whom conservative therapy is no longer effective and other surgical interventions are considered inappropriate.

Indications for Use

The LRE set is intended for resurfacing of the radiocapitellar joint in patients suffering from:

1. Non-inflammatory degenerative joint disease – specifically primary osteoarthritis and post-traumatic osteoarthritis
2. Inflammatory degenerative joint disease – specifically rheumatoid arthritis

in cases where the disease condition has progressed to an extent that prevents the patient carrying out essential functions of their normal daily life, and for whom conservative therapy has failed and other currently used surgical interventions have proven insufficiently effective

Note: the LRE implants are NOT intended for use in hemiarthroplasty of the radiocapitellar joint. The radial head and capitellar resurfacing implants must be used together

Contraindications for Use

Absolute contraindications include:

1. Infection
2. Sepsis
3. Osteomyelitis
4. Radial head deficient elbow – absence of radial head due to previous excision or disease

Relative contraindications include:

1. Patient uncooperativeness, unwillingness or inability to follow instructions*
2. Osteoporosis or other conditions which could result in a weakening of the surrounding bone, such as osteomalacia
3. Rapid joint destruction, marked bone loss or bone resorption apparent radiographically
4. Metabolic disorders which could contribute to the progression of osteoarthritis or significantly impair rates of healing
5. Severe deformity that would not normally be eligible for arthroplasty
6. Obesity (use is not recommended for patients with a BMI > 30)
7. Incompetent or deficient soft tissue surrounding the bone
8. Vascular insufficiency, muscular atrophy or neuromuscular disease
9. Foreign body sensitivity: where material sensitivity is suspected or unknown, tests are to be made prior to implantation
10. Distant foci of infections which may spread to the implant site
11. Skeletal immaturity

*Patients should be warned that if they have an occupation that involves substantial lifting or excessive muscle loading then extreme demands will be placed on the elbow which may result in device failure or dislocation.

1: Surgical approach

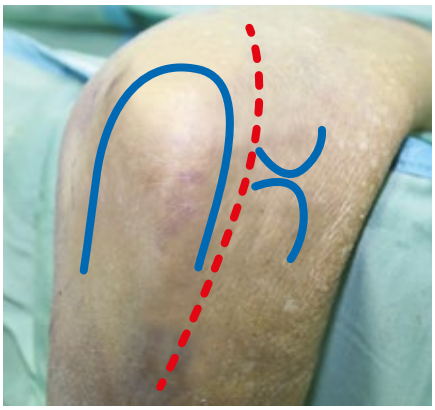
Whereas any of the described lateral surgical approaches to the elbow can be used to insert the components of the LRE we recommend the following approach particularly for patients with more advanced degenerative changes and limitation of movement as it enables arthrolysis/debridement and facilitates component alignment.

The patient is anaesthetised and placed in the lateral position.

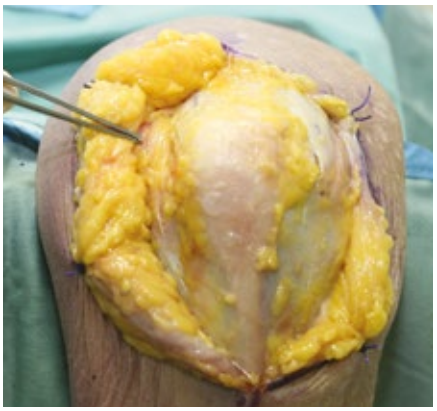
The limb is exsanguinated and a pneumatic tourniquet applied.

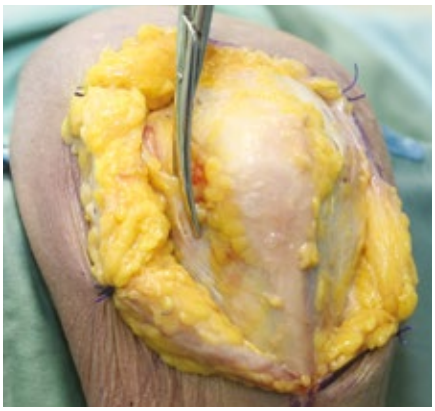
The elbow is flexed over a padded support.

Skin incision begins in the midline 8-10 cm proximal to the tip of the olecranon and is carried distally around the radial aspect to a point over the subcutaneous border of the ulna 6-8 cm distally.



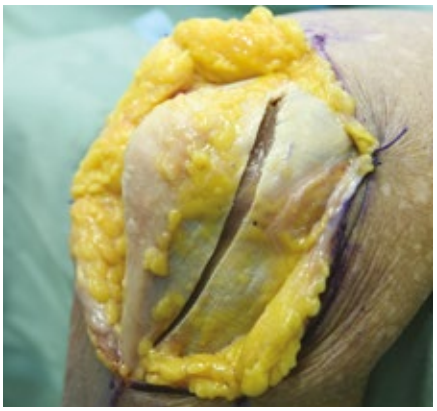
The ulnar nerve is identified and decompressed.

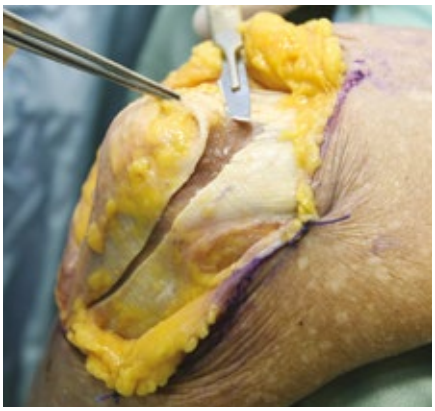




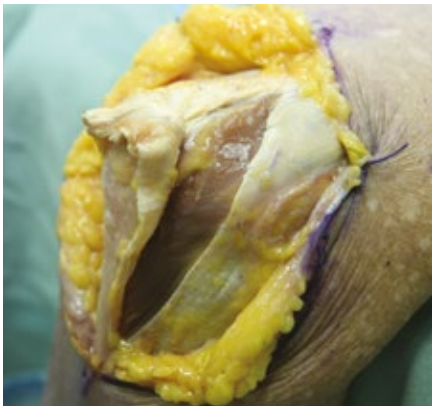
An incision is made through the deep fascia covering triceps beginning posteriorly in the mid line continuing distally through the fascia covering anconeus to the subcutaneous border of the ulna.

The deep fascia covering triceps (the 'triceps aponeurosis') is then separated from the intramuscular septum of triceps with a scalpel blade placed tangentially.

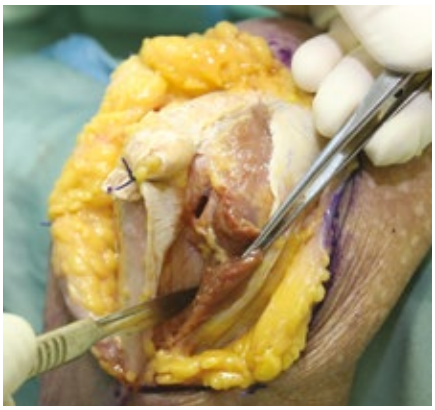




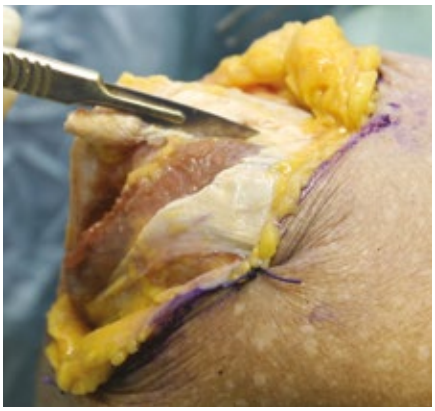
This raises a distally based flap of the triceps aponeurosis which can be conveniently retracted with a stay suture.



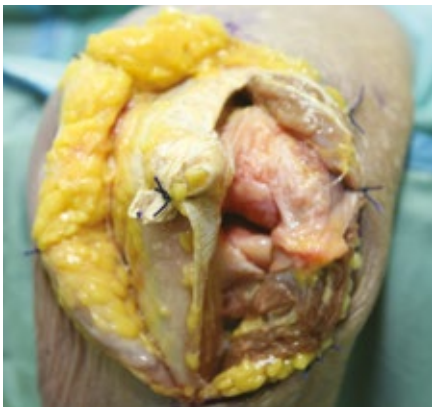
Anconeus is detached from its insertion into the subcutaneous border of the ulna beginning at its distal end. The dissection is continued proximally and the insertion of the triceps, which is in continuity with anconeus, is detached from its insertion into the tip of the olecranon.



The distal end of the lateral head of triceps is separated from the intramuscular septum with a scalpel blade directed longitudinally along the line of the muscle fibres.

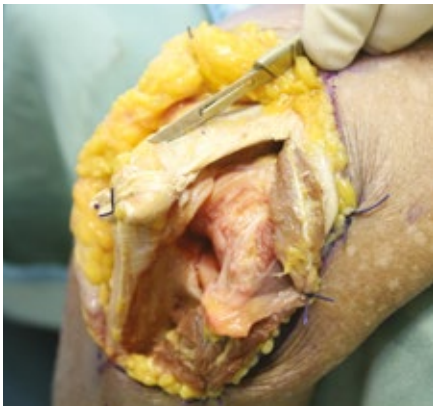


The lateral triceps and anconeus is then retracted laterally in continuity preserving the proximal based blood supply to these muscles to expose the radiocapitellar joint.

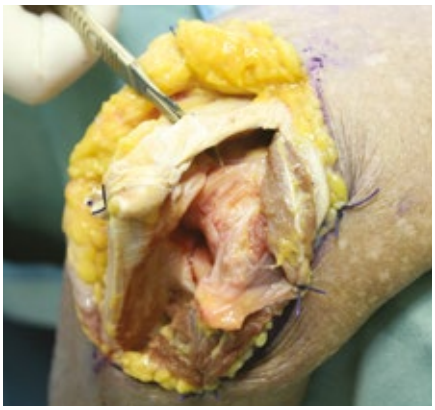


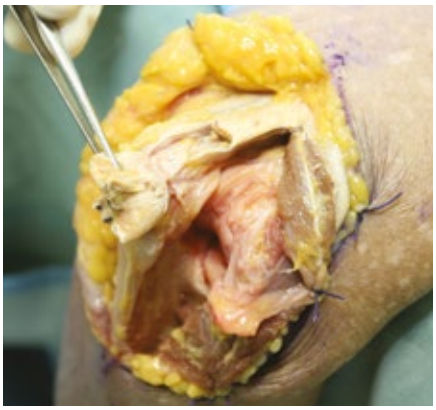
1: Surgical approach (cont)

For wider exposure, particularly in stiff elbows in order to perform arthrolysis, the distal end of the intramuscular septum of triceps is separated from the muscle fibres on its medial aspect.

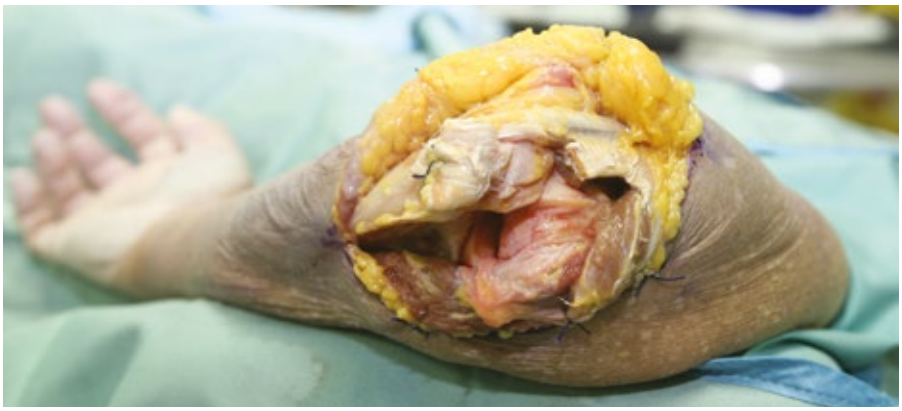


The intramuscular septum is divided transversely 2 cms proximal to its insertion into the tip of the olecranon.

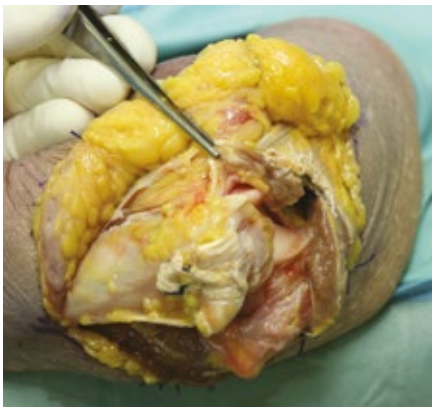


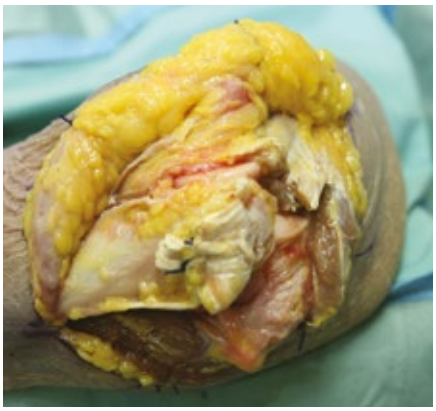


In order to complete the arthrolysis whilst protecting the ulnar nerve we recommend flexing the elbow in varus by placing the forearm and hand on top of the padded elbow support.

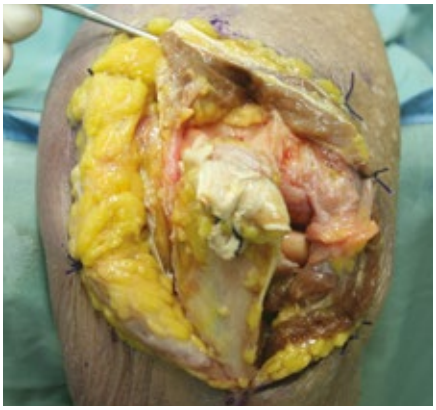


The medial fibres of triceps are separated from their insertion into the tip of the olecranon. The medial joint capsule is then incised along the joint line to the base of the coronoid process. Retracting the ulnar nerve anteriorly is recommended whilst performing medial capsulotomy.

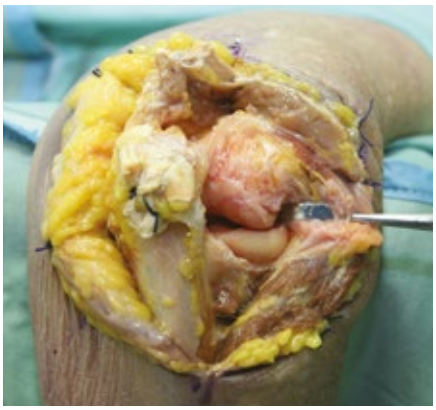




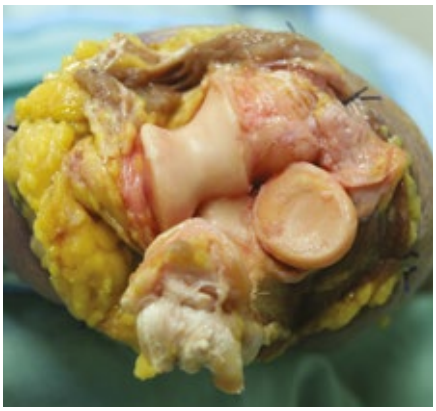
The forearm and hand are then returned to the flexed position over the padded arm rest and the reflected heads of the triceps muscle can be conveniently retracted with stay sutures.



Dislocation of the elbow is facilitated in stiff elbows by sub-periosteal elevation of the lateral joint capsule and the lateral collateral ligament origin.



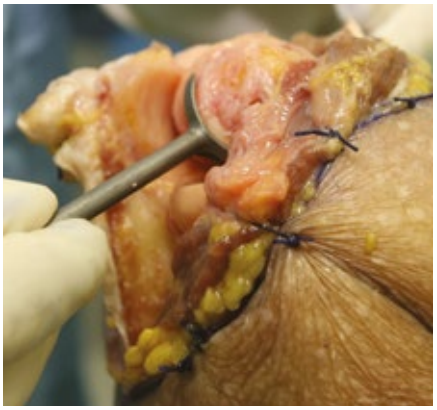
Dislocation can then be achieved by flexion and distraction of the joint. This provides a wide exposure of the articular surfaces and also provides access to the anterior compartment, if further debridement and/or loose body removal is required in patients with advanced osteoarthritis.

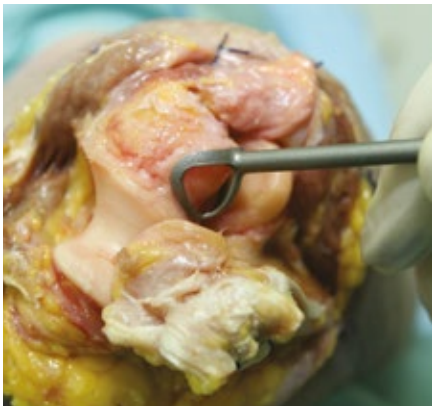


2: Bone Preparation: Capitellum

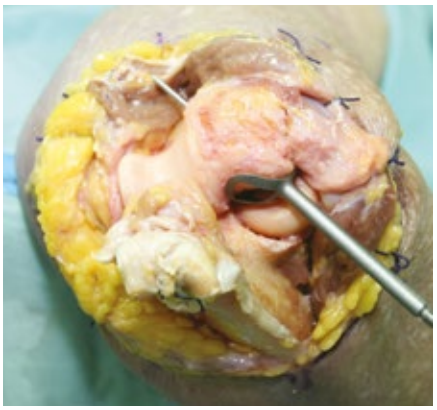
The capitellar wire guide is applied to fit flush with the articular surface of the capitellum.

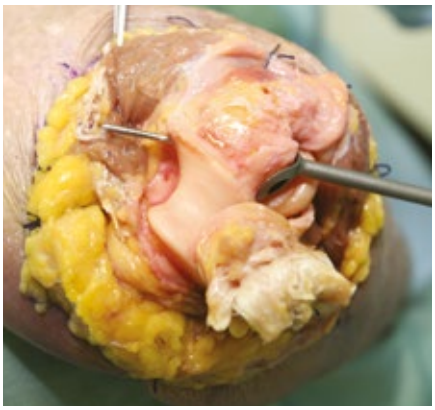
The guide should have conforming contact between its concave underside and the surface of the capitellum. The side of the guide should also be placed parallel to the edge of the capitellar articular surface.



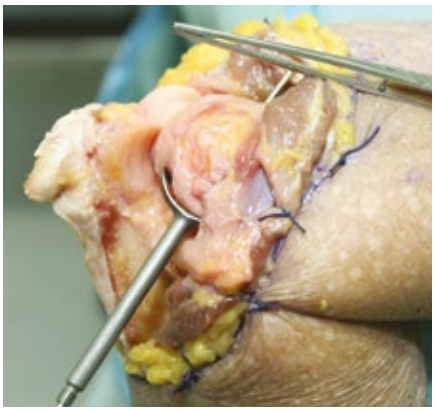


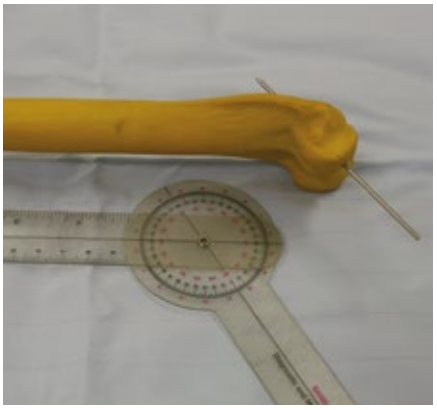
A guide wire (supplied with the instrument set) is attached to a powered wire driver and inserted until the end is seen to exit the bone at the base of the olecranon fossa.

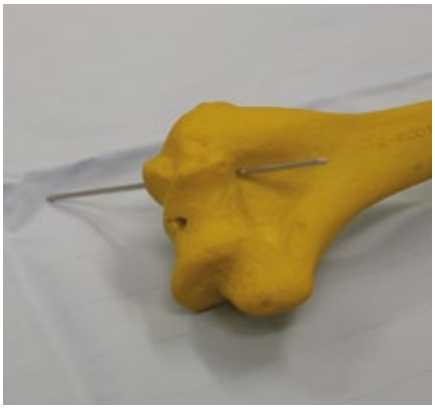




The capitellar wire guide has been designed to ensure anatomical alignment of the instruments (surface reamer and spade cutter).
Bony deformity due to severe degenerative changes may however compromise placement of capitellum wire guide. A visual check ensuring that the guide wire has been inserted 50 -60 degrees anterior to the long axis of the humeral shaft and exits through the radial aspect of the base of the olecranon fossa would then confirm accurate placement has been achieved.



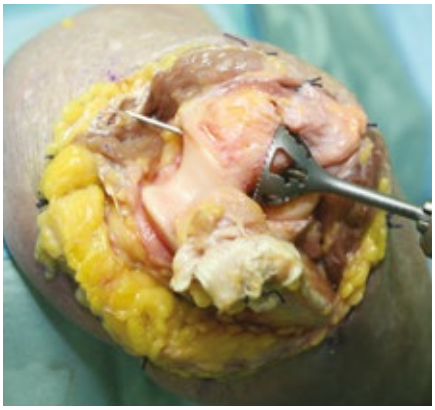


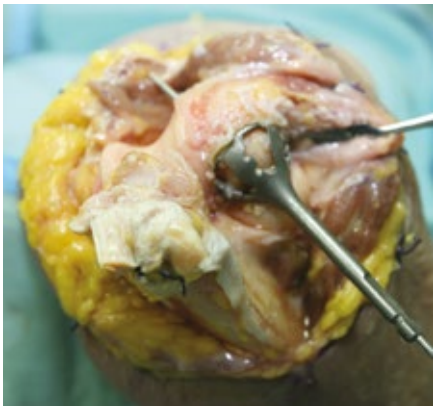


The capitellar surface cutter is attached to a powered driver, inserted over the guide wire and then reamed down to a stop.

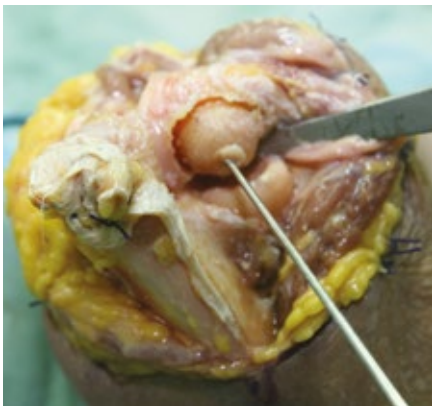
Windows in the cutter allow visual confirmation of bone contact with it.

Note: all cutting instruments use an AO quick-connect drive.

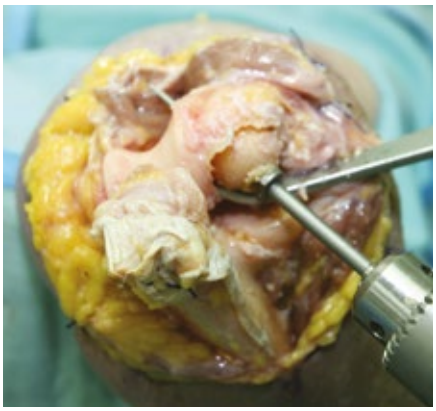




The surface cutter is removed. A raised central 'nipple' of bone corresponding to the stop on the cutter confirms adequate reaming.

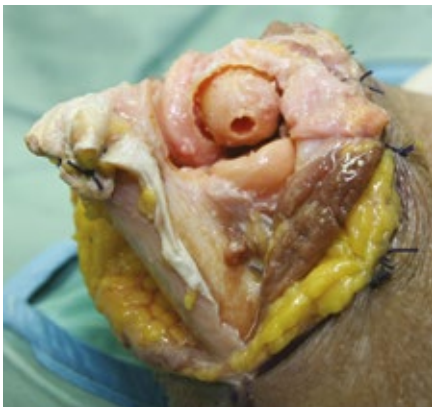


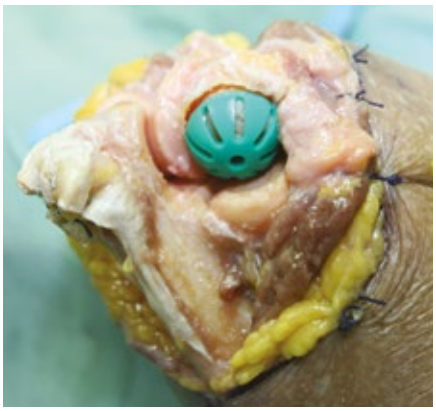
The spade cutter attached to a powered driver is inserted over the guide wire and advanced to a stop.



The spade cutter and guide wire are removed. The central peg of the trial capitellum component is inserted and the component is gently impacted using the capitellum impactor.

If visual inspection of the humeroulnar joint line during flexion and extension of the elbow does not confirm a full range of movement without distraction of the humeroulnar joint surfaces, further surface reaming of the capitellum can be performed at this stage.

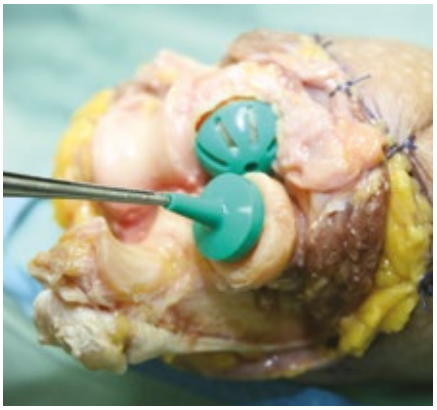


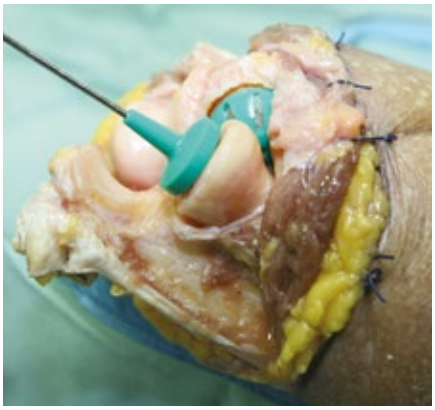


2: Bone Preparation: Radial Head

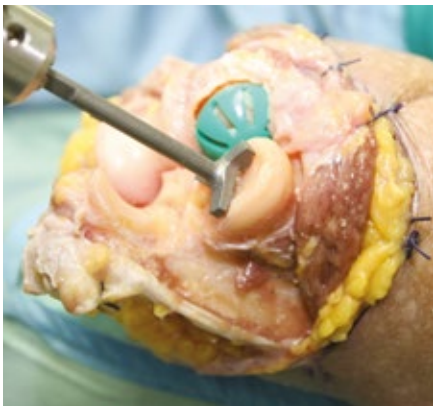
The radial head resurfacing component is positioned centrally with respect to the articular surface. As the eye can accurately identify the central point of a circle the stem of the trial component has been cannulated in order to also function as the wire guide.

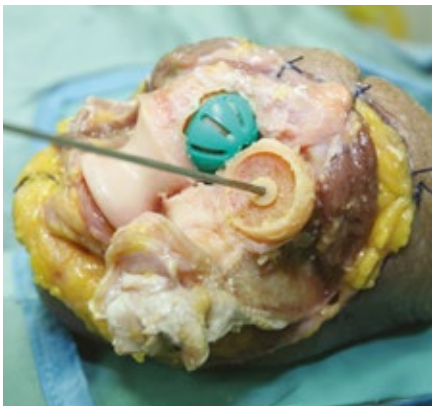
A guide wire mounted on a powered driver is inserted perpendicular into the centre of the radial head articular surface. Pronation and supination should then demonstrate that the guide wire rotates around its own axis – any minor adjustments can be made at this stage.



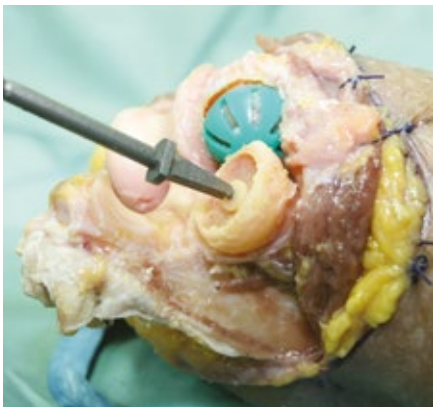


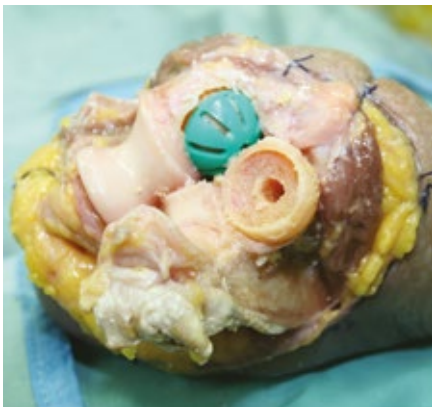
The radial head surface cutter attached to a powered driver is inserted over the guide wire and advanced to a stop. A central bony 'nipple' visible on removal of the cutter corresponding to its central stop confirms adequate bone reaming.





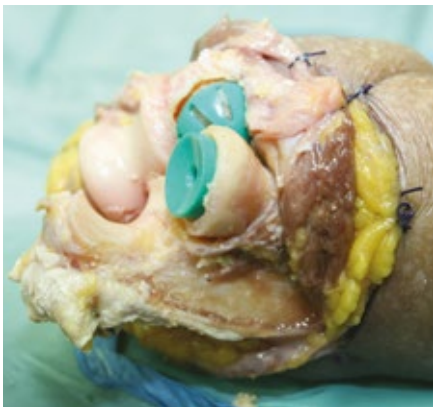
The spade cutter attached to a powered driver is inserted over the guide wire and advanced to a stop. The spade cutter and guide wire are then removed.

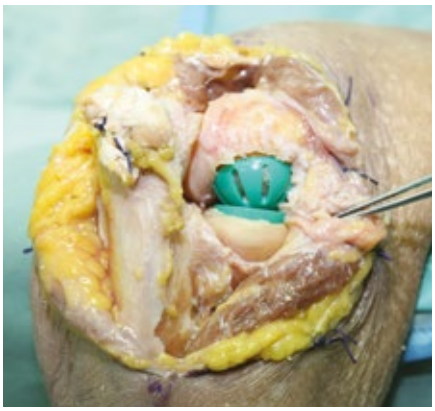




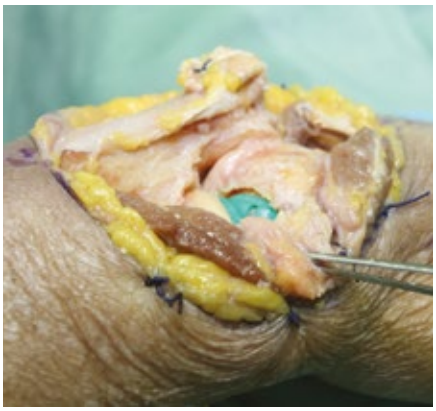
The central peg of the radial head resurfacing trial component is inserted and the component is tapped flush with the articular surface.

A trial reduction at this stage should confirm component placement without distraction of the humeroulnar joint articular surfaces.



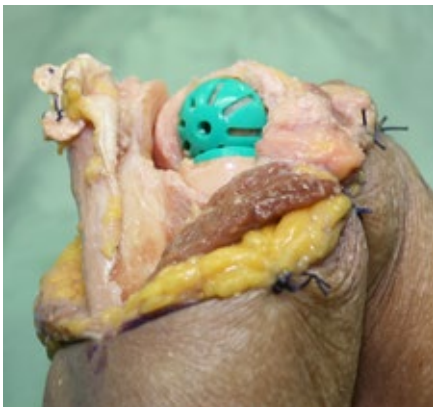


Satisfactory component placement without distraction of the humeroulnar joint (‘over-stuffing’) can be further confirmed by visual inspection of the humeroulnar joint surfaces throughout the range of flexion and extension of the elbow.



If the humeroulnar joint space appears to be widened, this can be corrected at this stage by further reaming of the radial head.

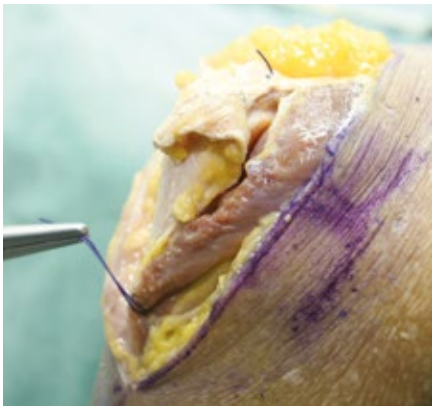
When satisfactory component placement has been confirmed, the trial components are then removed and replaced with the definitive components.



3: Soft tissue closure

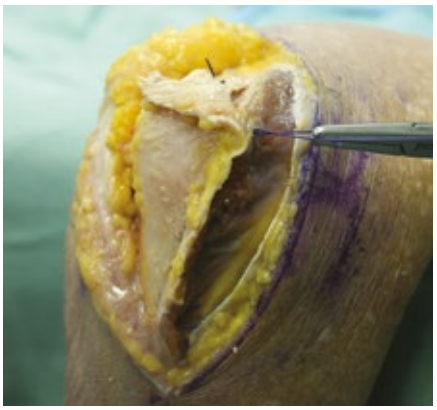
Soft tissue closure is begun by suturing the proximal cut end of the triceps intramuscular septum to its distal end which remains attached to the tip of the olecranon process.

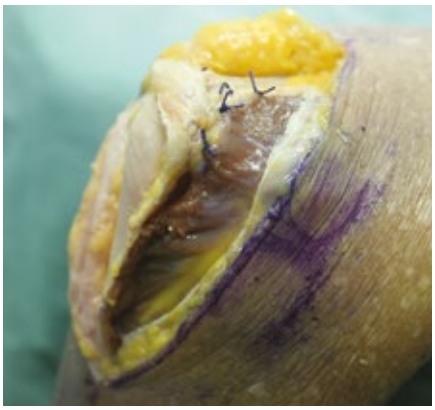
Anconeus is re-attached to its insertion into the proximal ulna with sutures passed through the muscle, then its deep fascia and back through the muscle tissue.



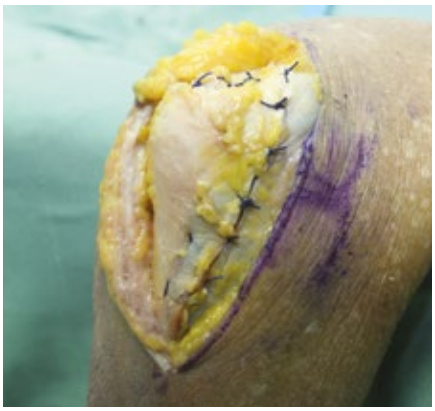
The repair is continued proximally by suturing lateral triceps to the intramuscular septum.

The medial triceps is similarly repaired to the medial edge of the intramuscular septum.





The distally based flap of the triceps fascia is sutured to its cut edge which restores the normal anatomy of the deep tissues prior to closure of the skin and subcutaneous tissues.



Postoperative Management

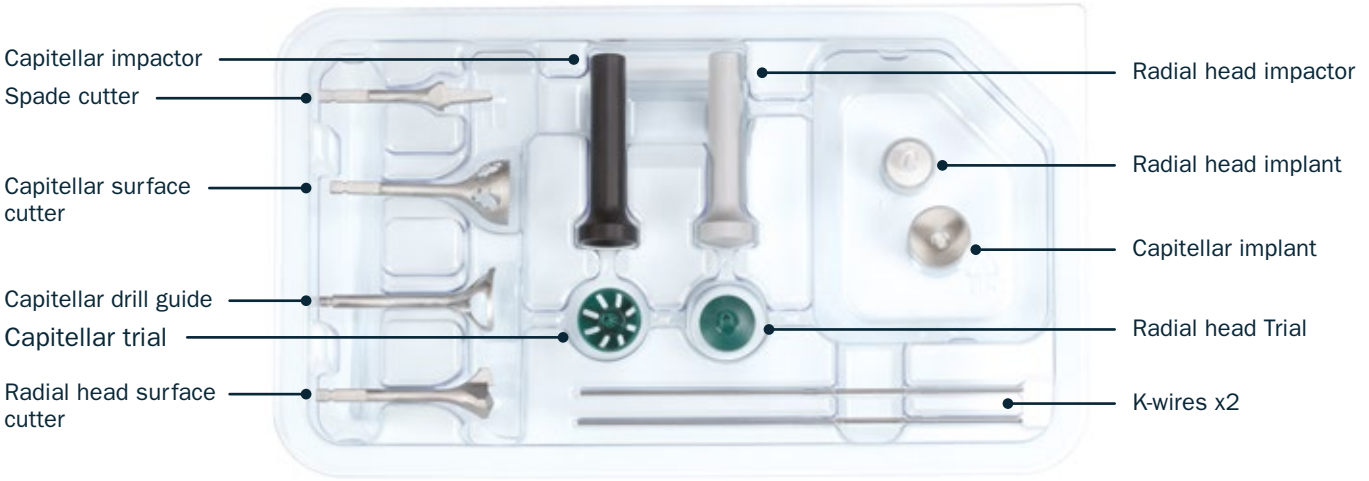
We apply a wool and crepe bandage at the end of the procedure following removal of the tourniquet.

This bandage is removed on the first post-operative day and replaced by a removable resting cast/splint supporting the elbow in 30° – 40° of flexion.

The splint is retained for 4 – 6 weeks in order to protect the triceps repair. During this time active elbow flexion and gravity assisted elbow extension is carried out under the supervision of a physiotherapist.

Unrestricted essential activities of daily life are then permitted but more vigorous activities are deferred until the patient is 3 months post-operative.

Product Information



Lateral Resurfacing Elbow Set, Small
Item number: 114476-ALL

Item No.	Description
407431	LRE K-wire with trocar, 1.8 dia x 150mm
407436	LRE capitellar drill guide, small
407441	LRE capitellar surface cutter, small
407445	LRE spade cutter, small/medium
407451	LRE capitellar component impactor
407447	LRE capitellar trial component, small
407452	LRE radial head surface cutter, small/medium
407454	LRE radial head trial component, small
407458	LRE radial head component impactor
114476	LRE capitellar component, small
114481	LRE radial head component, small

Lateral Resurfacing Elbow Set, Medium
Item number: 114477-ALL

Item No.	Description
407431	LRE K-wire with trocar, 1.8 dia x 150mm
407437	LRE capitellar drill guide, medium
407442	LRE capitellar surface cutter, medium
407445	LRE spade cutter, small/medium
407451	LRE capitellar component impactor
407448	LRE capitellar trial component, medium
407452	LRE radial head surface cutter, small/medium
407455	LRE radial head trial component, medium
407458	LRE radial head component impactor
114477	LRE capitellar component, medium
114482	LRE radial head component, medium

Lateral Resurfacing Elbow Set, Large
Item number: 114478-ALL

Item No.	Description
407431	LRE K-wire with trocar, 1.8 dia x 150mm
407438	LRE capitellar drill guide, large
407443	LRE capitellar surface cutter, large
407433	LRE spade cutter, large/extra large
407451	LRE capitellar component impactor
407449	LRE capitellar trial component, large
407432	LRE radial head surface cutter, large/extra large
407456	LRE radial head trial component, large
407458	LRE radial head component impactor
114478	LRE capitellar component, large
114483	LRE radial head component, large

Lateral Resurfacing Elbow Set, Extra Large
Item number: 114479-ALL

Item No.	Description
407431	LRE K-wire with trocar, 1.8 dia x 150mm
407439	LRE capitellar drill guide, extra large
407444	LRE capitellar surface cutter, extra large
407433	LRE spade cutter, large/extra large
407451	LRE capitellar component impactor
407450	LRE capitellar trial component, extra large
407432	LRE radial head surface cutter, large/extra large
407457	LRE radial head trial component, extra large
407458	LRE radial head component impactor
114479	LRE capitellar component, extra large
114484	LRE radial head component, extra large

Pre-operative sizing: Digital templating must be performed pre-operatively to determine the required size of implants. Contact LREsystem for details of third-party digital templating companies. LRE acetate x-ray template 407430 is also available.

Warning: Do not mix sizes of implants and instruments. Instruments are single-use only – do not reuse.

Product handling: The sterile blister and components are intended to enter the sterile surgical field as a kit. The peel-pouch surrounding the blister comprises the sterile barrier.

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Lateral Resurfacing Elbow