An extensive posterior approach of the elbow with osteotomy of the medial epicondyle

Maarten J. de Vos, MDa,*, Marc L. Wagener, MD b, Nico Verdonschot, PhD c, Denise Eygendaal, MD, PhD d

Background: This study describes a posterior approach to the elbow for placement of a total elbow prosthesis.

Methods: Release of the medial collateral ligament is achieved by performing an osteotomy of the medial epicondyle. This allows anatomic refixation of the origin of the medial collateral ligament. A description of the posterior approach is given. Standard radiographs were used to analyze the bone-to-bone refixation of the osteotomy of the medial epicondyle in 13 elbows.

Results: Radiographs showed proper bone healing in all elbows, with restoration of the anatomic origin of the medial collateral ligament.

Discussion: The described approach provides a good exposure of the elbow necessary for the placement of modern total elbow prostheses, without compromising the stability of the elbow. Refixation of stabilizing structures is relatively easy and results in an anatomic position of the ligaments.

Level of evidence: Anatomic Study, In Vivo.

Keywords: Elbow; approach; surgical exposure; prosthesis; osteotomy

For optimal placement of a total elbow prosthesis, adequate exposure of all bony landmarks of the distal humerus, the proximal ulna, and radius is essential. Many different approaches to the elbow have been described: medial, lateral, posterior, posterior transolecranon, and posterolateral. Optimal exposure of the elbow joint for placement of a total elbow prosthesis can be challenging.

The approach should provide optimal exposure, with complete dislocation of the elbow joint, but should also respect the surrounding stabilizing structures and the extensor mechanism. For the placement of a total elbow prosthesis, the posterior approach is most commonly used.

There are 3 options for management of the extensor mechanism. In the first option, the triceps remains attached to the olecranon; in the second, the triceps is reflected together with the soft tissues; in the third, the triceps is split in the midline.9 Release of the medial collateral ligament (MCL) and lateral collateral ligament (LCL) is mandatory to allow dislocation of the elbow joint. In all of the above-mentioned surgical approaches, the MCL and LCL are...
released subperiosteally or midsubstance. Refixation of these ligamentous structures in an anatomic position is essential to restore stability.

Persistent valgus instability is a well-known phenomenon, especially in unlinked total elbow prosthesis such as the Kudo and Souter-Strathclyde (Biomet Merck Ltd., Bridgend, UK; Fig. 1). One possible explanation for this valgus instability can be a nonanatomic, nonisometric repair of the MCL. Identification of the MCL during surgery can be a challenge because the MCL is just 3 cm long and 5 to 6 mm wide. In elbows with rheumatoid arthritis or post-traumatic deformities, the MCL complex is even more difficult to identify.

In addition, proper ligament-to-bone refixation, after sharp release of the MCL, can be difficult in relation to stability and in relation to isometry. A nonanatomic refixation results in a nonisometric position of the MCL, which theoretically results in instability. We have modified the sharp release of MCL to an osteotomy of the epicondyle to overcome these problems.

In the modified approach, we perform an osteotomy of the medial epicondyle instead of a sharp release of the MCL from the medial epicondyle. The osteotomy of the medial epicondyle to provide access to the elbow joint was first described by Campbell in 1932. Campbell had discovered a new approach to the elbow joint “by mere accident.” During operative refixation of a fracture of the medial epicondyle, he noticed that the radius and ulna could be easily dislocated. The modification to the traditionally described technique was also made because we believe that bone-to-bone refixation after an osteotomy heals better than a ligament-to-bone refixation after sharp release of the MCL. To our knowledge, no biomechanical or histologic study has been published to support this, although other studies suggest the same.

The aim of this study is to describe a new surgical technique of the posterior approach to the elbow joint using an osteotomy of the medial epicondyle.

Materials and methods

Surgical technique

The patient is placed in the lateral decubitus position with the arm supported as shown in Figure 2. The elbow should be able to move freely. A straight posterior incision is made longitudinally from approximately 8 cm proximal to the tip of the olecranon and 8 cm distal to the tip, along the ulna. The ulnar nerve is identified on the medial side of the elbow and mobilized.

Management of the triceps is achieved using a triceps-tongue technique, as described by Wadsworth and van Gorder. The triceps tongue is approximately 6 cm long and 1.5 to 2.0 cm wide, depending on the size of the elbow. The lateral part of the triceps tendon is kept intact, including the insertion on the intermuscular septum. The approach is extended laterally along the ulna as in the lateral J approach. The incision is extended approximately 4 cm along the lateral aspect of the olecranon (Fig. 3). The anconeus muscle is reflected from the ulna just enough to obtain a good view of the capitellum. Access to the radiohumeral joint is provided through an osteotomy of the supinator tuberosity. A step-cut incision is made on the medial side to allow easy and proper closure of the thicker, medial part of the triceps (Fig. 3).
Through an osteotomy of the supinator tuberosity, the annular ligament and the lateral ulnar collateral ligament are released from the ulna. The bone chip is mobilized (Fig. 4). The radial head alone can be dislocated. The extent of the release of the nerve depends on the extent of the inborn cubital tunnel retinaculum and native mobility of the nerve. We do not routinely perform a transposition, only a decompression. The osteotomy is done on the edge of the sulcus, with the nerve gently pulled away with a vessel loop to protect it during the osteotomy. During the closing procedure, the nerve is laid back gently into the sulcus.

Next, a small oscillating saw is used to perform an osteotomy of the medial epicondyle just lateral to the origin of the MCL, the superficial flexor digitorum muscle, and the flexor carpi ulnaris muscle (Fig. 5). The elbow can now be fully dislocated, and an optimal overview of the elbow joint is obtained. The osteotomy of
the medial epicondyle (Fig. 6) and the bone chip at the origin of the LCL are refixated with the use of nonabsorbable transosseous sutures (green). (Middle) Intraoperative photograph. (Right) The configuration of the sutures is shown in red, the ulnar collateral ligament is represented by the 2 small purple lines, and the large purple arrows represent the forces pulling at the medial epicondyle.

All elbows were clinically assessed and classified as stable in valgus direction. Postoperatively, a removable cast is applied to the elbow for 6 weeks. During this period, passive movement of the elbow is allowed under the strict supervision of a physiotherapist. Patients undergoing non–triceps-sparing techniques, such as we use, are generally restricted with a removable cast for 6 weeks and mobilization under supervision of a physiotherapist. This is in contrast to triceps-on-triceps or triceps-sparing techniques in which active assisted motion is permitted earlier.

Radiologic study

In the first 2 years after introduction of the modified approach, this surgical technique was used in 13 patients requiring a total elbow prosthesis. Standard radiographs in the anteroposterior and lateral views were made 1 year after surgery and evaluated for osseous healing of the medial epicondyle.

Results

All elbows showed radiologic healing of the medial epicondyle osteotomy in the anatomic position (Fig. 7). The medial epicondyle in 1 elbow fractured during surgery while the osteotomy was performed. This was managed
with insertion of a Kirschner wire and a cerclage wire, with proper healing as a result.

Discussion

Adequate exposure of all relevant bony structures of the elbow for placement of a total elbow prosthesis is essential and can only be achieved by complete dislocation of the elbow. To dislocate the elbow, release of the MCL is mandatory. Identification of the MCL can be a challenge, especially in elbows with severe destruction due to trauma or rheumatoid arthritis.

An osteotomy of the medial epicondyle overcomes this problem. This osteotomy should be conducted with care, with a small, sharp oscillating saw to prevent fracture of the epicondyle, especially in osteoporotic bone.

Persistent valgus instability after total elbow arthroplasty can be encountered and might be related to an inadequate or nonanatomic refixation of the MCL.

In our experience, the refixation of an osteotomy of the medial epicondyle facilitates a more anatomic reconstruction of the origin the MCL than is achieved after sharp release of the ligament. To our knowledge, no study exists in which ligament-to-bone healing is compared with bone-to-bone healing histologically. In this case series, radiographic healing of all osteotomies was seen, resulting in a stable elbow to valgus stress in all cases. The anatomic position of the osteotomized medial epicondyle was restored in all elbows.

These findings support the previously performed biomechanical research in which sharp release of the lateral stabilizing structures is compared with a release through an osteotomy of the supinator tuberosity. Increased laxity of the elbow as a result of the posterolateral approach, which includes incision of the stabilizing structures on the lateral side, was found when comparing release through an osteotomy as performed in the Wrightington approach.

Conclusion

An osteotomy of the medial epicondyle of the elbow allows dislocation of the joint, provides a good exposure of the elbow, and allows proper placement of a total elbow prosthesis. It overcomes the problem of identification of the MCL during surgery and facilitates an anatomic and stable refixation of the MCL.

Disclaimer

The authors, their immediate families, and any research foundations with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

References