Elbow Arthroscopy: The Future

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Elbow arthroscopy has made great advances since the Andrews and Carson article in 1985 [1]. Early limited indications of diagnostic arthroscopy and removal of loose bodies have expanded to include debridement of conditions such as arthritis, synovitis, and epicondylitis. As surgeons have gained familiarity with the elbow joint, instrumentation and techniques have improved. Experience gained during residency programs and fellowships is providing earlier training in arthroscopic procedures, and surgeons are emerging from training programs as experienced arthroscopists. Procedures once reserved for open cases, such as repairs of fractures and ligamentous injuries, are now being performed arthroscopically with increasing frequency. The future of elbow arthroscopy will likely continue to grow, as we do not yet know the bounds of its use. The future may include uses in arthroscopic interposition arthroplasty and prosthetic arthroplasty, as well as repairs on the medial side of the elbow.

This chapter aims to highlight current advanced arthroscopic techniques in the elbow, as well as possible future procedures on the horizon. As with most orthopaedic conditions, the indications for surgery are pain and functional impairment despite appropriate non-operative treatment. Certain acute injuries will require acute repair. The arthroscopic techniques and post-operative rehabilitation will be presented in each section.

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10.1 Arthroscopic Triceps Tendon Repair

Triceps tendon ruptures are increasingly more common as our aging patient population attempts to maintain an active lifestyle. Once a rare injury seen mostly in bodybuilders, it is now seen with increasing frequency. The triceps takes its name from the three heads which originate from the humerus and infraglenoid tubercle of the scapula. It inserts in a fan-like fashion on the posterior aspect of the olecranon and proximal ulna. Injuries of the triceps may take the form of partial or complete avulsion from the bone, intra substance muscle tears, or tears at the muscle-tendon junction.

Most patients with this injury will experience pain or a "pop" with press-type activities. This may occur during push-ups, chest press, or most commonly during bench press, when the weight-lifter loses control of the bar. Partial tears may begin with these activities, as well as during dips or overhead triceps extensions. Physical examination begins with observation for swelling and ecchymosis posterior in the elbow. A palpable gap in the extensor mechanism can often be detected in both partial and complete tears. Patients with complete tears may have a complete loss of the ability to extend the elbow against gravity, whereas those with partial or degenerative tears may retain elbow extension in a weakened, painful state. In patients with subtle tears, trying to extend the elbow from a fully flexed position reproduces pain directly over the site of the injury (i.e. triceps stress test).

Radiographs may show a small avulsion fracture off the tip of the olecranon. Diagnosis can be confirmed with magnetic resonance imaging (MRI), which may be helpful in cases of partial tears.

An arthroscopic triceps repair has previously been described by Savoie et al. [2]. The patient is placed in the prone or lateral decubitus position. Care is taken to palpate the ulnar nerve, and assure that it does not subluxate out of its groove. The initial portal is a proximal anterior medial or proximal anterior lateral portal for diagnostic arthroscopy of the anterior compartment. Many patients with this injury are very active and may be avid weightlifters. Pathology in the anterior compartment may include loose bodies or small osteophytes on the tip of the coronoid. This can be addressed before proceeding to the posterior compartment.

The initial posterior portal is a posterior central portal, located approximately 3 cm proximal to the tip of the olecranon. Care must be taken not to stray medial to midline for all posterior portals, for risk of damage to the ulnar nerve. Normally a trans-tendon portal, in most triceps avulsions this portal actually goes through the tear. Next, a posterior lateral portal is established along the lateral border of the triceps tendon. The torn triceps tendon is visualized. The arthroscope is moved to the posterior lateral portal, and the shaver is placed in the posterior central portal. The tip of the olecranon is debrided through this portal, as is the torn edge of the tendon (Fig. 10.1a–d). A central olecranon bursa portal is then established, and a double-loaded suture anchor is inserted into the tip of the olecranon. The anchor is angled toward the coronoid to avoid inadvertent penetration of the articular surface.

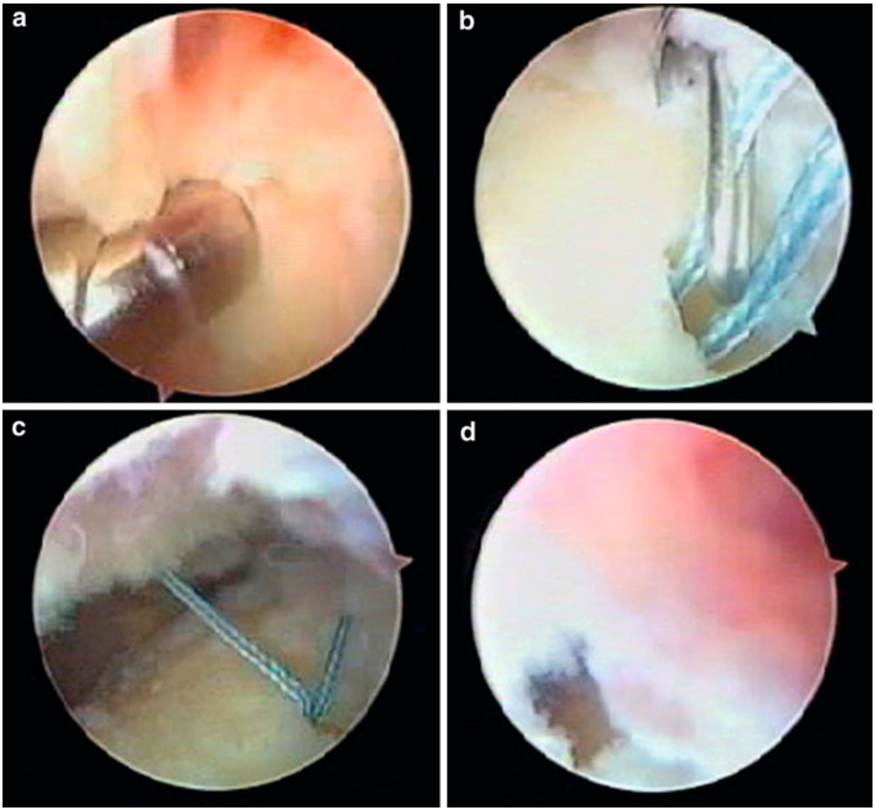

Fig. 10.1 Arthroscopic triceps repair. **a** The arthroscope and the shaver in the posterior compartment, debriding the torn edge of the triceps tendon. **b** The suture anchor is placed in the tip of the olecranon with suture shuttle retrieving suture. **c** A mattress suture has been placed in the torn triceps tendon. **d** The mattress suture has been tied subcutaneously, securing the triceps to the tip of the olecranon and sealing the joint

A retrograde suture retriever is placed percutaneously though the medial and lateral aspects of the proximal triceps tendon, retrieving the sutures from the anchor. Two mattress sutures are usually required to capture the tendon and complete the proximal part of the repair. After subcutaneous retrieval, they are tied with a sliding knot. This secures the proximal part of the tendon to the tip of the olecranon and seals the joint. The arthroscope is then placed directly into the olecranon bursa portal. The previous sutures can be left long and retrieved through the bursa portal. Crossing the sutures and incorporating them into a second knotless suture anchor more distal down the ulna creates a suture bridge construct that compresses the tendon down to the bone. In similar fashion, the first sutures can be cut, a second anchor placed more distally in the ulna, and the distal end of the triceps tendon can be tied down with simple sutures through the second anchor [3].

Post-operatively, the patient is placed into an anterior splint with the elbow in full extension. At the first post-operative visit, the patient goes into a hinged elbow brace, locked from full extension to 30° of flexion. The flexion is increased 10° per week until full range of motion is obtained at 6–8 weeks post-op, at which time the elbow brace is discontinued. Resistive exercises are initiated at 12 weeks post-op, with return to lifting and sports activities at 4–6 months.

10.2 Arthroscopic Fracture Repair

Fractures about the elbow remain a very common injury. Fractures can be very daunting, as comminution can distort the normal anatomy, major neurovascular structures are in close proximity to the joint, and post-operative stiffness is common. Arthroscopy can aid with fracture management and reduction, as it affords the surgeon a direct intra-articular view of the joint without disrupting the static and dynamic constraints about the elbow. This facilitates the reduction, limits the amount of intra-articular step-off, and avoids iatrogenic instability. Simple fracture patterns with one or two fracture fragments are very amenable to arthroscopic fixation. For complex fractures with severe comminution, open reduction and internal fixation may be more appropriate.

As with most fractures, the history will often include a traumatic injury such as a fall, sporting injury, or motor vehicle accident. The examination begins with close inspection of the involved extremity, looking for open wounds or punctate bleeding. Gentle palpation can localize pain, and crepitus of fracture fragments may be present. Gentle range of motion may reveal a block to forearm rotation or elbow flexion and extension. Pain and apprehension will likely limit the exam. Care must be taken to perform a careful neurologic examination in the case of any fracture or dislocation. The shoulder and wrist should routinely be examined. Routine radiographs of the elbow will diagnose most fractures. Computed tomography (CT) scan may be helpful to identify fracture fragments when severe comminution is present.

Simple fractures such as condylar fractures with one fracture line, capitellar shear fractures, radial head fractures with one or two fragments, and large coronoid fractures can be managed very well arthroscopically. Initially the arthroscope is usually placed in a proximal anterior medial portal to allow visualization of the lateral structures. Upon entrance into the elbow joint, abundant hematoma is encountered. A shaver placed in a proximal anterior lateral portal can be used to evacuate this hematoma and visualize the fracture line. During the initial debridement, limited use of suction is advised, as tearing in the capsule and overlying brachialis may place the radial nerve in close proximity. The tip of the shaver may be used like a probe to manipulate the fracture fragments.

For radial head fractures (Fig. 10.2a–b) and capitellar shear fractures (Fig. 10.3a–b), a Freer elevator introduced through an anterior lateral portal at the level of the radio capitellar joint can manipulate fracture fragments. Using

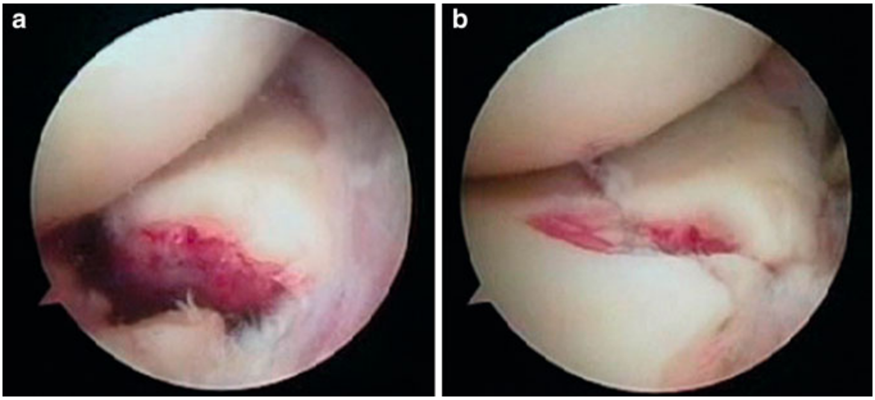

Fig. 10.2 Radial head fracture. A Mason Type II radial head fracture viewed from the proximal anterior medial portal before reduction (**a**) and after internal fixation with a headless compression screw (**b**)

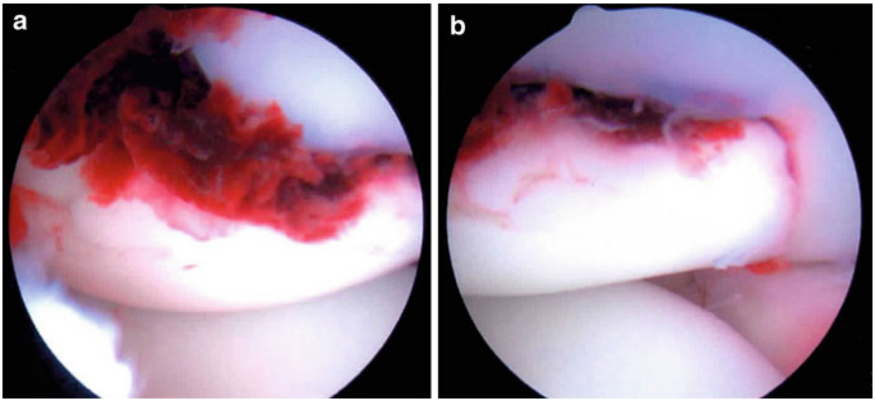

Fig. 10.3 Capitellar shear fracture. A Type I capitellar fracture (coronal shear fracture or Hahn-Steinthal fragment) viewed from the proximal anterior medial portal before reduction (**a**) and after internal fixation with headless compression screws (**b**)

arthroscopic instruments, the fracture is reduced, and provisional fixation with Kirschner wires can hold the reduction. Fluoroscopic images confirm reduction and pin placement. Headless cannulated screws can be placed over the pins for definitive fixation, from lateral to medial for radial head fractures and from posterior to anterior for capitellum fractures. The headless screws avoid articular cartilage erosion or impingement during elbow range of motion.

Rolla et al. [4] reported preliminary results for six patients who underwent arthroscopic reduction and internal fixation for radial head fractures. All patients returned to their pre-injury level of function within 6 months. Michels et al. [5]

presented 5 year follow-up data on 14 patients treated with an arthroscopic technique for Mason Type II radial head fractures. The mayo elbow performance (MEP) scores were excellent in 11 and good in three. A potential advantage of this arthroscopic technique was the observation that a single screw was usually sufficient to obtain stability.

In the case of condylar fractures of the distal humerus (Fig. 10.4a–b), the fracture line can be manipulated with the tip of the shaver or a Freer elevator. A large bone reduction clamp can be placed on the medial and lateral epicondyles to reduce the fracture and hold compression across the fracture site. Direct visualization with the scope in the anterior compartment can minimize step-off of the articular cartilage. Guide pins can be placed under fluoroscopic guidance from lateral to medial, and internal fixation performed with cannulated screws for definitive fixation. The reduction clamp should be left in place during drilling and screw placement; removing the clamp during either step could result in loss of reduction and fracture displacement.

Operative intervention for coronoid process fractures is recommended for Regan and Morrey [6] Type III fractures and any fracture that interferes with joint motion. When comminution precludes fixation, loose debris can be removed arthroscopically. Larger coronoid fractures can be treated effectively with arthroscopic techniques. The arthroscope is placed in the proximal anterior lateral portal to view the medial side of the elbow. The fracture fragments are reduced and held with a tibial anterior cruciate ligament drill guide. A guide pin can then be drilled from the posterior cortex of the ulna to engage the fracture fragment. If the fragment is of sufficient size, a single cannulated screw can be placed from posterior to anterior in the ulna to engage the fragment and maintain reduction. If the fragment is small or comminuted, two drills holes can be placed on either side of the fracture, and the fragments can be lassoed with a free suture and tied over a bone bridge on the posterior cortex of the ulna.

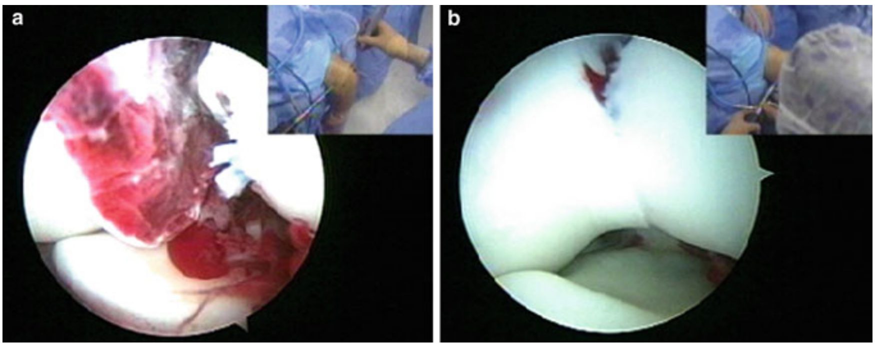

Fig. 10.4 Unicondylar Distal Humerus Fracture. A unicondylar distal humerus fracture with a single sagittal split before reduction (**a**) and after internal fixation with cannulated compression screws (**b**)

Adams et al. reported their experience with arthroscopically assisted reduction and fixation with four Type II and three Type III coronoid fractures [7]. Cannulated screw fixation was achieved antegrade over pins placed with the use of an anterior cruciate ligament guide. All five of the patients available for follow-up at an average of 2 years and 8 months had MEP scores of 100 %.

10.3 Endoscopic Biceps Repair

Tears of the distal biceps brachii tendon usually occur during forceful activity and produce a memorable event. The diagnosis is made clinically with history and physical exam. The tear occurs during eccentric contraction of the biceps muscle, such as lifting a heavy object or moving furniture. The patient will report feeling a "pop", immediate searing pain in the antecubital fossa and forearm, and developing ecchymosis over the ensuing several days. Typically, the pain markedly improves after several days. Inspection of the involved extremity will reveal ecchymosis in the antecubital fossa. A noticeable defect with proximal migration of the biceps muscle belly may or may not be noticeable, as the torn tendon may still be held in position by the lacertus fibrosus. Palpation of the anterior elbow from lateral to medial may reveal absence of the distal biceps tendon, producing a positive hook test. Range of motion will often be normal. Strength testing will often reveal deficits in resisted supination when compared to the contralateral extremity. The diagnosis is confirmed on MRI. Placing the arm in the *flexed abducted supinated* (FABS) position, as described by Giuffre and Moss, allows full-length views of the biceps brachii tendon from the musculotendinous junction to its insertion on the radial tuberosity in one or two sections [8].

Endoscopic investigation of the distal biceps tendon attachment provides dynamic assessment of the partially torn tendon through a range of motion. Viewing of the tendon through the insufflated bicipitoradial bursa provides a clear magnified view of the pathology by means of a minimally invasive procedure (Bain et al., Eames and Bain) [9, 10].

Endoscopy of the bicipitoradial bursa is performed with the patient under general anesthesia with the arm in the extended supinated position. A 2.5 cm longitudinal incision is made over the palpable biceps tendon 2 cm distal to the elbow crease. The lateral cutaneous nerve of the forearm is identified and protected. The distal biceps tendon and its bursa are identified with blunt finger dissection. The bursa is insufflated with 7–10 mL of normal saline. A small entry point is made on the radial side of the bursa at the apex for the arthroscope. The tendons are identifiable in this field of view and can be followed distally to the insertion on the radial tuberosity. The tendons can be viewed dynamically with forearm rotation or with traction applied to the biceps tendon. Careful inspection of the tendon can determine the extent, or percentage, of tendon damage. Tears involving less than 50 % of the tendon can be debrided with a motorized shaver through the same portal. A full-radius shaver without suction should be utilized.

Tears involving greater than 50 % of the tendon can be completed and repaired. A hooked electrocautery probe can complete the tear. The incision can then be extended to perform an open repair through a small incision with an endobutton, interference screw, or suture anchors into the radial tuberosity.

Sharma and MacKay [3] described an endoscopic technique for repair of complete tears using an endobutton technique. A 1.5 cm longitudinal incision is made in the midline of the anterior aspect of the arm at a point 5 cm proximal to the transverse anterior elbow crease. The ruptured end of the distal biceps tendon is delivered out of the wound. The ruptured end of the tendon is freshened and sutured to a fixed-loop endobutton. The endoscope is then placed down the tract of the distal biceps tendon and followed to its base, where the radial tuberosity can clearly be seen. The camera is removed, leaving the endoscope sheath in situ and positioned against the radial tuberosity. The sheath acts as a tissue protector for the surrounding neurovascular structures while the guide wire and reamers for the endobutton system are employed. A guide wire is placed bicortically, exiting the skin on the dorsal forearm. The endobutton reamer reams bicortically over the guide wire, followed by a 6 mm acorn reamer to ream only the near cortex. The sutures of the endobutton are loaded into the guide wire, and the guide wire is pulled out the dorsal aspect of the forearm. The endobutton is then "flipped" and can toggle on the dorsal aspect of the radius. Button position is confirmed with fluoroscopic images, and the biceps insertion site can be viewed directly with the arthroscope.

Post-operatively, range of motion is begun early. For tendon debridement, immediate range of motion is initiated, and full activities with resistive exercises can resume at 3–4 weeks. For tendon repair, immediate range of motion is initiated, with light activities begun at 4–6 weeks. Strengthening can begin at 12 weeks post-op.

10.4 Lateral Collateral Ligament Repair

Injury to the lateral collateral ligamentous complex of the elbow can cause severe dysfunction with activities of daily living. Unlike damage to the medial ulnar collateral ligament, with pain and instability only exacerbated by athletic activities, insufficiency of the radial ulnohumeral ligament (RUHL) makes even the most mundane activities difficult. Pushing up from a chair, shaking hands, or opening a door can cause pain and instability. The recognition and treatment of posterolateral rotatory instability (PLRI) of the elbow has grown since the original description by O'Driscoll et al. [11]. Late recognition requires open reconstruction with a graft. However, in the early setting, or after an acute injury, arthroscopic repair is possible.

Patients will complain of lateral sided elbow pain and popping with activities. They often report feeling a "clunk" or a "pop" when pushing off a surface or arising from a chair. This sensation can be reproduced on physical exam by asking the patient to push up from a chair with the hands fully supinated on the armrests (i.e. chair test). Lateral instability may best be demonstrated clinically with the pivot shift test of the elbow. First described O'Driscoll et al. [11], this test performed in the supine position may elicit gross instability or pain and apprehension.

Diagnostic imaging begins with routine radiographs. Radiographs may reveal an avulsion off of the posterior humeral lateral epicondyle in acute cases. Stress radiographs or fluoroscopic images while performing a pivot shift test may show the radial head and proximal ulna moving together in a subluxated and posterolaterally rotated position. MRI of the elbow can identify a lesion in the RUHL, especially with the addition of intra-articular contrast.

The surgical treatment of posterolateral instability may be divided into distinct subgroups based on cause: acute dislocations, recurrent dislocations, and PLRI. The procedures used may also be divided into subgroups based on available tissue at the time of reconstruction: repair of ligamentous avulsion, plications of the RUHL complex with or without repair to bone, and tendon graft reconstruction.

The anatomic injury pattern associated with acute and recurrent dislocations is avulsion of the RUHL, usually off the humeral attachment. Dislocations usually respond to non-operative management. The most common complication of non-operative management of acutely dislocated elbows is stiffness, not recurrent instability. However, several subsets of patients may benefit from operative intervention: patients with a humeral avulsion fracture seen on radiographs, patients requiring a high level of function, professional athletes, those with damage to multiple areas of the joint, and those with recurrent instability who have failed non-operative management of an elbow dislocation. These patients may be candidates for an arthroscopic repair of the RUHL (Fig. 10.5a–d).

The procedure begins with establishment of a proximal anterior medial portal for the arthroscope, and diagnostic arthroscopy of the anterior compartment. Abundant hematoma will be encountered in the acute setting, and may be removed with a shaver from a proximal anterior lateral portal. Tears in the anterior capsule and brachialis will be identified. Associated fractures of the coronoid, radial head, and distal humerus may also be encountered. The annular ligament should be inspected for laxity as it courses around the radial head. The forearm can be rotated to perform an arthroscopic evaluation of posterolateral rotatory instability as the forearm fully supinates.

The arthroscope is placed in the posterior central portal, 3 cm proximal to the tip of the olecranon. Hematoma in the posterior compartment can be evacuated with a shaver placed in the proximal posterolateral portal. The medial gutter is evaluated for tears in the capsule as well as loose bodies. Then the arthroscope is advanced down the posterolateral gutter. The lateral gutter is debrided and cleared of hematoma, taking care to remain close to the ulna and avoid damage to the torn RUHL. The posterior distal humerus is also lightly debrided, and site of the avulsion of the RUHL localized. It is usually directly lateral and slightly inferior to the center of the olecranon fossa. A bare area can be easily identified at the site of the ligament avulsion.

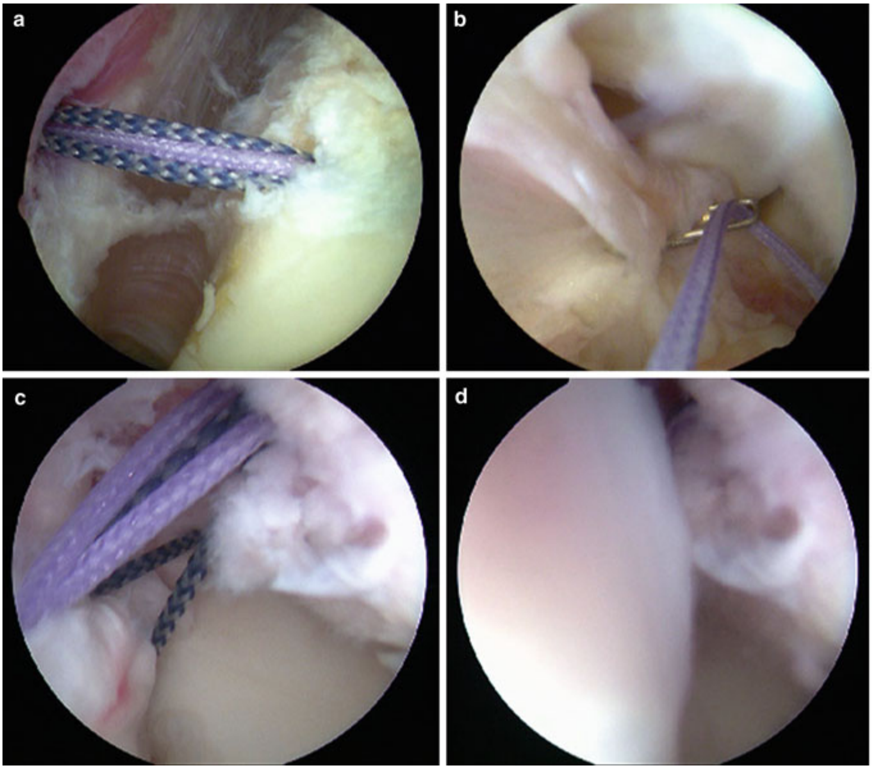

Fig. 10.5 Arthroscopic RUHL repair. **a** Suture anchor placement in the posterior humeral lateral epicondyle is shown. **b** Suture is retrieved through the torn RUHL down the lateral gutter. **c** Placement of mattress sutures in the torn RUHL is shown. **d** After tying the mattress sutures, the arthroscope is effectively pushed out of the lateral gutter as the gutter is closed down

After the avulsion site has been identified and debrided, a double-loaded suture anchor may be placed into the humerus at the origin of the RUHL. One suture at a time, the sutures are placed down the lateral gutter and retrieved to place two horizontal mattress sutures through the non-injured part of the ligament. In the setting of a bony avulsion, one set is placed around the fracture fragment and the other set distal to the fracture fragment. The sutures are tensioned with the arthroscope viewing from the lateral gutter, which should have the effect of pushing the arthroscope out of the gutter. The elbow is extended, the sutures retrieved, and the sutures are tied beneath the anconeus muscle. The ligament is lax with extension and tightens with flexion. Therefore, we recommend placing the elbow in pronation and 45–60° of flexion during tensioning to prevent over-tightening and the resultant loss of flexion.

Post-operatively, patients are placed into a posterior splint with the elbow flexed to 30°. Fluoroscopic images can confirm reduction in the splint, and the elbow can be further flexed as needed to maintain reduction. At the first post-op visit after 5–7 days, the splint is removed and the patient is placed into a hinged elbow brace that allows comfortable movement from 0 to 45° of flexion. The hinged elbow brace is discontinued at 6–8 weeks post-op, at which time full range of motion should be restored, and more aggressive exercises and strengthening can progress with physical therapy.

10.5 Bone Grafting for Osteochondritis Dissecans

Osteochondritis dissecans (OCD) is a challenging condition for the treating orthopaedic surgeon. It is common in young athletes, especially baseball players and gymnasts. The disease can cause significant pain in the young athlete, with inability to load the arm or fully extend the elbow. The pain and dysfunction often limits participation in sports.

The patient will complain of lateral sided pain in the elbow. Elbow stiffness, with loss of terminal extension, is a common finding. Mechanical symptoms of popping, catching, or grinding may be present, and may signal the treating physician to the presence of possible intra-articular loose bodies. On examination, swelling in the lateral gutter may be present. The posterolateral elbow will be tender to palpation, with point tenderness over the posterior capitellum with the elbow flexed to 90°. Range of motion will be limited when compared to the contralateral extremity, with a loss of 10–20° of terminal extension. Patients may have a positive grind test, with reproducible pain and mechanical symptom with axial load, valgus stress, and forearm rotation. This loads the radiocapitellar joint and pain is reproduced as the radial head contacts the lesion in the capitellum. Radiographs may show the lesion, and the diagnosis is confirmed with MRI. MRI arthrogram may be particularly helpful in investigating the status of the cartilage cap. If there is separation or dislodgment of the cartilage cap, contrast dye will infiltrate along the defect in the cartilage, showing the amount of displacement.

Surgery is indicated for continued pain and dysfunction after appropriate non-operative treatment has failed to provide relief. Surgery is also indicated when loose bodies are present, causing mechanical symptoms in the joint. Initial surgical management includes arthroscopic debridement of lesions and either fixation of chondral fragments, or removal of fragments followed by drilling of the base of the lesion.

OCD lesions with bone loss become a difficult problem to treat. Significant bone loss can preclude simple drilling of the lesion. Loss of the lateral aspect of the capitellum, or "shoulder" of the capitellum, can lead to containment problems and possible instability. Bone loss can be diagnosed on standard radiographs, and the amount of bone loss can be further quantified by advanced imaging with CT or MRI. Bone grafting of the defect may become necessary, and this can be performed arthroscopically.

After diagnostic arthroscopy in the anterior compartment to remove loose bodies and debride synovitis, the main portion of the procedure is performed in the posterior compartment. The arthroscope is placed in a posterior lateral portal, and advanced down the lateral gutter. Keeping the in-flow in the anterior compartment through a proximal anterior medial portal can help water flow retrograde up the lateral gutter and keep the lateral gutter expanded to enhance visualization. A 70° scope facilitates looking forward upon the capitellum to fully view the defect. Establishment of both a standard and an additional distal soft-spot portal on the posterior lateral aspect of the elbow allows instrumentation to access the OCD lesion. Increasing flexion past 90° brings the entire capitellum into view, and the two portals facilitate advanced surgery without damaging the radial head. A shaver can debride the defect, removing soft tissue debris or bony loose bodies. Once significant bone loss is confirmed, the decision is made to proceed with arthroscopic bone grafting. Several options exist for pre-contoured allograft cancellous bone plugs of varying diameter. The defect can be sized using standardized sizing templates. A bone plug 1–2 mm smaller than the size of the defect is chosen. Through the distal soft-spot portal, the correct angle can be determined. A trocar is used to remove a plug of bone from the central aspect of the defect. The allograft bone plug can then be inserted back into the capitellum, following the same angle. This bone plug can fill the defect, re-establishing the convexity of the capitellum. The bone plug can be left in situ in this position, or it can be covered with a biologic patch (Fig. 10.6a–c) or cartilage graft. (Figure 10.7a–b) shows a small posterolateral incision with a cartilage graft composed of live cartilage cells covering an allograft bone plug.

Post-operatively, the patient is placed in a hinged elbow brace for 6 weeks to off-load the lateral elbow. Early range of motion is initiated in the hinged elbow brace, while weight-bearing through the elbow is avoided. Strengthening and resistive exercises are initiated at 12 weeks. Return to play is permitted at 6 months. Repeat MRI can be obtained at 6 months to confirm incorporation of the grafts into the capitellum.

10.6 Arthroscopically Assisted Arthroplasty

Arthritis of the elbow joint can be a very debilitating condition, especially when it occurs in young adults. Osteoarthritis often causes a painless loss of motion, with crepitus caused by osteophytes and possible loose bodies. On the contrary, post-traumatic arthritis can be a painful condition with resulting stiffness and loss of motion.

When conservative measures fail to relieve symptoms of pain and stiffness, arthroscopic surgery may be an option. Ulno-humeral arthroplasty has long proved to have good results in eliminating mechanical symptoms, restoring motion, and alleviating pain. Creating a large drill hole communicating between the olecranon

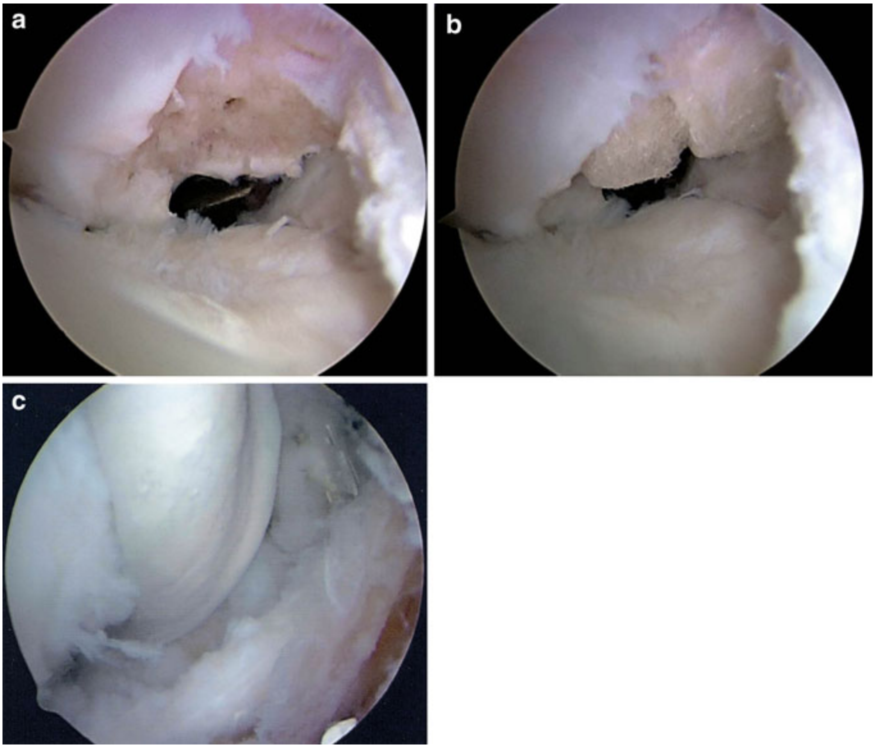

Fig. 10.6 Bone grafting for OCD. Osteochondritis dissecans of the capitellum with bone loss and loss of the lateral “shoulder” is viewed from the lateral gutter, after drilling of the lesion (**a**), after bone grafting with allograft plugs (**b**), and after biologic resurfacing (**c**)

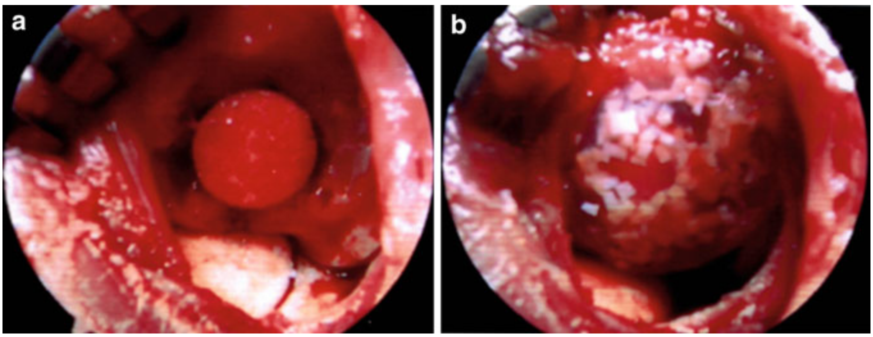

Fig. 10.7 Cartilage grafting for OCD. Osteochondritis dissecans of the capitellum is viewed through a small posterolateral incision, after bone grafting with allograft plugs (**a**), and after resurfacing with a live cartilage graft (**b**)

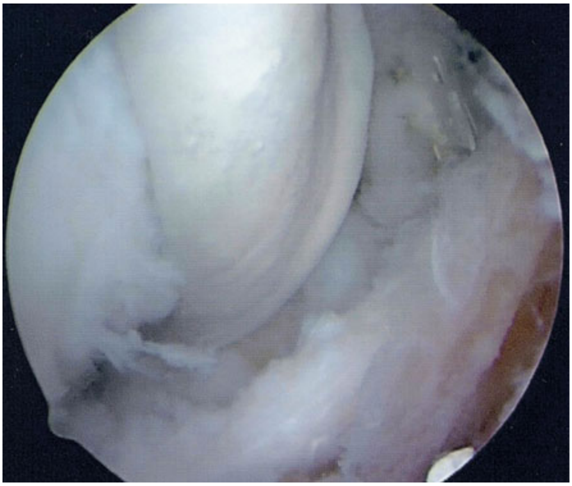

Fig. 10.8 Arthroscopic biologic resurfacing of the radiocapitellar joint is shown

fossa and coronoid fossa vents the distal humerus, removing impinging osteophytes in the anterior and posterior compartments.

In the future, arthroscopic interposition arthroplasty or prosthetic arthroplasty likely will become an option. Biologic resurfacing of the radiocapitellar joint (Fig. 10.8) may be possible through cannula systems to insert biologic grafts into the elbow joint. The graft may be secured by suturing into surrounding soft tissue or with use of suture anchors. In a similar fashion, prosthetic replacement of the radial head or capitellum may be accomplished by arthroscopic assistance through small incisions using minimally invasive techniques.

10.7 Conclusions

The field of elbow arthroscopy has advanced greatly in the past 25 years. Innovative arthroscopists continue to expand indications and develop new surgical techniques enlarging the boundaries of its use. Procedures such as fixation of fractures and ligamentous avulsions are now being performed arthroscopically with increasing frequency. It is not difficult to imagine that in the not so distant future, additional surgeries will be performed with arthroscopic assistance, such as arthroscopic interposition arthroplasty, prosthetic arthroplasty, and ligamentous repairs on the medial side of the elbow. The creative and intelligent minds of current arthroscopic surgeons will continue to push the envelope and develop new operative techniques until elbow arthroscopy of the future becomes reality.

References

1. Andrews JR, Carson WG (1985) Arthroscopy of the elbow. Arthroscopy 1985(1):97–107
2. Savoie FH III, Field LD, O'Brien MJ (2010) Arthroscopic triceps repair. In: Savoie FH III, Field LD (ed) AANA advanced arthroscopy, the elbow and wrist.: Saunders Elsevier, Philadelphia: 132–135
3. Sharma S, MacKay G (2005) Endoscopic repair of distal biceps tendon using an endobutton. Arthroscopy 21:897
4. Rolla PR, Surace MF, Bini A, Pilato G (2006) Arthroscopic treatment of fractures of the radial head. Arthroscopy, 22:233 e1–233 e6
5. Michels F, Pouliart N, Handelberg F (2007) Arthroscopic management of mason type II radial head fractures. Knee Surg Sports Traumatol Arthrosc 15:1244–1250
6. Regan W, Morrey B (1989) Fractures of the coronoid process of the ulna. J Bone Joint Surg Am 71:1348–1354
7. Adams JE, Merton SM, Steinmann SP (2007) Arthroscopic-assisted treatment of coronoid fractures. Arthroscopy 2007(23):1060–1065
8. Giuffre BM, Moss MJ (2004) Optimal positioning for MRI of the distal biceps brachii tendon: flexed abducted supinated view. AJR Am J Roentgenol 182:944–946
9. Bain GI, Johnson JL, Turner PC (2008) Treatment of partial distal biceps tendon tears. Sports Med Arthrosc 16:154–161
10. Eames MHA, Bain GI (2006) Distal biceps tendon endoscopy and anterior elbow arthroscopy portal. Tech Shoulder Elbow Surg 7:139–142
11. O'Driscoll SW, Bell DF, Morrey BF (1991) Posterolateral rotatory instability of the elbow. J Bone Joint Surg Am 73:440–446