CQ HAND + UPPER LIMB
SPECIALIST ORTHOPAEDIC SURGEON

EVIDENCE SUMMARY

Elbow Arthroscopy

Overview

- Elbow arthroscopy is not without complications and morbidity despite being a minimally invasive procedure and advances made in surgical technique [1].
- The available evidence supports the use of elbow arthroscopy in the management of the majority of conditions where it is currently used [2].
- Patients treated arthroscopically benefit from additional diagnostic techniques, improved visualization of the elbow joint, the ability to address coexisting intra-articular pathologic conditions, and minimal soft tissue injury with no clinical consequences in outcomes [3].
- Elbow arthroscopy has become a safer and more effective treatment modality for several elbow pathologies due to advances in equipment and surgical technique [5].
- Elbow arthroscopy has evolved from a diagnostic tool to a therapeutic procedure with expanded indications, though it requires careful attention to surgical anatomy and patient selection to avoid neurovascular complications [6].
- Predominantly low-level evidence studies demonstrate varying complication rates (median 3%, range 0%-71%) and reoperation rates (median 2%, range 0%-59%) after elbow arthroscopy [10].
- Elbow arthroscopy has expanded indications for diagnosing and treating acute trauma, including radial head fractures and instability, provided patients are carefully selected and neurovascular risks are managed with proper technique [12].
- Pediatric elbow arthroscopy performed by an experienced surgeon using a standardized technique for a wide variety of elbow conditions has an acceptable complication rate that is similar to rates in the previously published literature on elbow arthroscopy in the pediatric and adult populations [15].
- A significant proportion of pediatric patients needed subsequent surgery in the following years after elbow arthroscopy [15].
- Elbow arthroscopic debridement for primary degenerative osteoarthritis results in statistically significant and clinically relevant improvement in elbow range of motion and clinical outcomes with low complication and reoperation rates [23].
- Elbow arthroscopic surgery is a relatively safe procedure with low complication rates [31].

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Anatomy & Pathophysiology

BONY ANATOMY AND JOINT STRUCTURE

- The elbow is a trocho-ginglymoid joint consisting of medial and lateral articulations that afford bony stability [37].
- The ulnohumeral joint is formed by the trochlea articulating with the greater sigmoid notch of the ulna, creating a highly congruent hinged or trochoid portion of the elbow joint [37].
- The bare area of the greater sigmoid notch of the ulna is devoid of cartilage [37].
- The coronoid process has medial and lateral facets that buttress the trochlea anteriorly [37].
- The sublime tubercle is located just distal and medial to the coronoid and provides the attachment site for the anterior bundle of the medial ulnar collateral ligament (MUCL) [37].
- The radiocapitellar joint is formed by the capitellum and radial head [37].
- The proximal radioulnar joint (PRUJ) is formed by the radial head articulating with the lesser sigmoid notch of the ulna [37].
- The annular ligament holds the radius in close approximation to the ulna at the PRUJ [37].
- The radial head is a concave elliptical structure covered with articular cartilage along the radiocapitellar joint and approximately 270° of its articular margin [37].
- The distal humeral articular surface is angled 30° from the longitudinal axis of the humerus [37].
- The axis of rotation of the distal humerus is 5° to 7° angulated in the coronal plane to the epicondylar axis, with the medial side more distal than the lateral side [37].
- This coronal angulation accounts for the change in valgus carrying angle to a more varus position as the elbow is flexed [37].
- There is a high correlation between the size of the radius and capitellum in the same individual, which is useful for surgical planning when one structure is destroyed [37].
- The olecranon allows for a broad attachment site of the triceps posteriorly [37].
- The ulna medially bends approximately 8° at 8 cm from the tip of the olecranon [37].
- The articulation to the tip of the coronoid is approximately 30° from the long axis of the ulna in the sagittal plane [37].
- The articular surface of the distal humerus is angled 30 degrees anterior to the humeral shaft axis [40].
- The distal humerus consists of medial and lateral columns [40].
- The normal range of elbow flexion/extension is 0 to 150 degrees [40].
- The normal forearm pronosupination is 80 to 85 degrees in each direction [40].
- The functional range of motion is 30 to 130 degrees flexion/extension and 50 degrees pronosupination [40].
- The normal valgus carrying angle is 5 to 10 degrees for men and 10 to 15 degrees for women [40].
- In full extension, 60% of axial load is transmitted through the radiocapitellar joint [40].

- On cross-section, the humerus is circular at the mid-shaft but flared and flattened at the distal end [42].
- The trochlea has a 300-degree arc of cartilage [42].
- The medial column diverges from the humeral shaft at a 45-degree angle, and the lateral column diverges at a 20-degree angle [42].
- With the elbow in 90 degrees of flexion, the medial condyle, lateral condyle, and olecranon form a palpable triangle [42].

LIGAMENTOUS ANATOMY AND STABILITY

- Elbow stability is conferred by bony articular anatomy and ligamentous structures on the medial and lateral sides [17].
- The three primary stabilizers of the elbow are the ulnohumeral articulation, the medial ulnar collateral ligament (MUCL), and the lateral ulnar collateral ligament (LUCL) complex [17].
- Secondary stabilizers include the radiocapitellar articulation, the common flexor tendon, the common extensor tendon, and the joint capsule [17].
- The MUCL is comprised of the anterior bundle, posterior bundle, and transverse ligament [36].
- The anterior bundle of the MUCL is the strongest component and the primary restraint to valgus stress [36].
- The anterior bundle is further subdivided into anterior and posterior bands, which provide reciprocal function with the anterior band tight in extension and the posterior band tight in flexion [36].
- The anterior oblique ligament of the MUCL complex is the primary stabilizer to valgus stress [18].
- The MUCL originates on the posterior medial epicondyle and inserts on the sublime tubercle of the medial coronoid process [40].
- The posterior bundle of the MUCL is the primary restraint to valgus stress with the elbow in maximal flexion [40].
- Stability in full extension is provided by the MUCL, joint capsule, and ulnohumeral articulation [40].
- The LUCL complex originates at the geometric center of the radiocapitellar articulation, 10.7 mm from the lateral epicondyle [36].
- The LUCL inserts 3.3 mm from the apex of the supinator crest [36].
- The lateral epicondyle is the origin of the lateral extensor musculature and the LUCL complex [37].
- The medial epicondyle forms the attachment site for the origins of the flexor pronator mass [37].

PATHOANATOMY AND SPECIFIC CONDITIONS

- Valgus extension overload syndrome involves chondrosis, osteophyte development on the posteromedial olecranon and humerus, and loose bodies [18].
- During throwing, the olecranon is repeatedly driven into the olecranon fossa, exerting shear forces on the medial aspect of the olecranon tip and the olecranon fossa, which may cause cartilage injury and osteophyte development [18].

- Medial ligamentous laxity commonly exacerbates valgus extension overload syndrome [18].
- Olecranon resection increases valgus angulation and medial collateral ligament (MCL) strain during valgus stress [18].
- Overaggressive olecranon resection may result in valgus instability of the elbow [18].
- Osteoarthritis of the elbow is characterized by osteophyte formation, capsular contracture, and loose bodies, often with relative preservation of the joint space [28].
- Periarticular hypertrophic osteophytes act as a mechanical block at the end ranges of flexion and extension in elbow osteoarthritis [28].
- Osteoarthritis typically involves the radiocapitellar joint articular cartilage preferentially, with relative preservation of the ulnohumeral articular surfaces [28].
- In elbow osteoarthritis, joint spaces at the ulnohumeral joint are usually preserved, while those at the radiocapitellar joint are mildly narrowed [28].
- Osteochondritis dissecans (OCD) of the capitellum is caused by repetitive microtrauma to the vulnerable epiphysis, which has a tenuous blood supply [53].
- Repetitive loading of the lateral compartment of the elbow results in subchondral bone degeneration causing cartilage fragmentation in OCD [53].
- Lateral epicondylitis is an angiofibroblastic hyperplasia of the extensor carpi radialis brevis (ECRB) tendon, a noninflammatory, dysvascular degenerative process caused by repetitive microtrauma [53].
- Intrinsic causes of elbow stiffness include articular damage or malunion, intraarticular hardware, and loose bodies [50].
- Extrinsic causes of elbow stiffness include a contracted joint capsule and ligaments, heterotopic ossification, prominent hardware, and skin contracture [50].
- In posttraumatic or postsurgical stiff elbows, the joint space is usually contracted and the capsule is scarred down to the bones [50].
- In posttraumatic or postsurgical stiff elbows, the anterior soft tissues are usually contracted, which may alter the locations of the median and radial nerves [50].
- Ulnar neuropathy is present in up to 50% of patients with elbow osteoarthritis [28].
- The normal elbow has a range of motion from 0° to 140° from extension to flexion and 75° to 85° in pronation and supination respectively [17].
- A functional arc in each plane is 100° for flexion and extension and forearm rotation [17].
- The anterior humeral line should pass through the center of the axis of rotation to avoid loss of flexion or extension during reconstructive efforts [37].
- The triceps has a broad tendinous insertion into the olecranon posteriorly [42].
- Anteriorly, the brachialis inserts on the coronoid process and the tuberosity of the ulna [42].
- The radial head lines up in its lesser sigmoid, or radial notch, with the annular ligament surrounding it [42].
- The supinator-extensor muscle group attaches to the lateral epicondyle, which is slightly proximal and lateral to the capitellum [42].

- The ulnar nerve passes through the cubital tunnel at the medial column of the elbow [42].
- The ulnar nerve enters the anterior forearm by traveling between the two heads of the flexor carpi ulnaris [42].
- MRI findings of structural changes in the elbow predict injuries and surgery in major league baseball pitchers [24].
- Common findings on 3-Tesla elbow MRI in asymptomatic professional baseball pitchers include collateral ligament thickening and ulnar nerve abnormalities [24].

Classification

- The purpose of this review is to enable orthopedic surgeons initiating elbow arthroscopy to approach it more safely and easily by describing history, setup, and indications [4].
- As greater experience is gained and technology advances, arthroscopy will play more of a role in treatment of elbow disorders [7].
- The majority of the top 50 cited articles in elbow arthroscopy comprised case series exhibiting Level IV or V evidence [8].
- A significant proportion of patients from a large cohort of elbow arthroscopy patients visited the ED at least once in the 90 days following surgery [9].
- Recent advances in arthroscopic instrumentation and techniques have led to growing interest in arthroscopic treatment of elbow osteoarthritis [14].
- Elbow arthroscopy can be safely performed with proper knowledge and application of anatomy around the elbow when making portals and understanding at-risk areas beyond the capsule when working within the joint [16].
- Elbow arthroscopy has become a valid and safe option for the diagnosis and treatment of both acute and chronic elbow instability, allowing for the management of soft tissue lesions and associated intra-articular bone or cartilage lesions with minimal disruption [20].
- Among 205 patients who underwent elbow arthroscopy, heterotopic ossification (HO) was a minor complication of elbow arthroscopy, with a prevalence rate of 6.3%, and was usually located on the medial compartment of the elbow [32].

Clinical Presentation

EPIDEMIOLOGY AND DEMOGRAPHICS

- Primary osteoarthritis of the elbow affects 2% of the population [28].
- The average age of presentation for primary elbow osteoarthritis is 50 years, with a range of 20 to 70 years [28].
- Men are affected by primary elbow osteoarthritis more often than women, with a 4:1 ratio [28].

- Hand dominance and strenuous manual labor are associated with primary osteoarthritis of the elbow [28].
- Secondary causes of elbow osteoarthritis include trauma, osteochondritis dissecans, and synovial osteochondromatosis [28].

HISTORY AND SYMPTOMATOLOGY

- Patients with valgus extension overload syndrome report posteromedial elbow pain that occurs during the deceleration phase of throwing as the elbow reaches terminal extension [18].
- Pain from valgus extension overload syndrome may also occur during the acceleration phase of throwing [18].
- Patients with medial collateral ligament (MCL) injuries report medial elbow pain during the acceleration phase of throwing [60].
- Pain from MCL injuries may occur only when throwing at more than 50% to 75% of maximal effort [60].
- Acute MCL injuries may present suddenly with a pop, sharp pain, and inability to continue throwing [60].
- Patients with elbow osteoarthritis typically present with loss of terminal extension and flexion [28].
- Patients with elbow osteoarthritis report painful catching, clicking, or locking of the elbow [28].
- Pain from elbow osteoarthritis is typically noted at the end ranges of motion and not through the midrange [28].
- Night pain is not typical for elbow osteoarthritis; if present, an inflammatory cause should be considered [28].
- Patients with lateral epicondylitis report pain lifting things from a bag with a pronated hand, turning doorknobs, taking milk from the fridge, shaking hands, taking a laptop out of a bag, or bumping the lateral elbow [63].
- Patients with medial elbow tendinopathy report pain washing the face or carrying objects with the arm in a supinated position [63].
- Patients with ulnar neuritis report that the ring and small finger go to sleep when the elbow is flexed, such as while reading in bed or waking them up at night [63].
- Patients with posterolateral rotatory instability report a feeling of giving way or instability when pushing out of a chair with their arms [63].
- Patients with radial tunnel syndrome report extensor musculature “forearm aching” [63].
- Patients with cutaneous neuritis report burning or radiating pain, sometimes described as wanting to “cut the arm off” [63].
- Patients with osteochondritis dissecans (OCD) of the capitellum may report gradual loss of motion with or without pain, and catching and locking if loose bodies are present [63].
- Patients with partial biceps tendon tear report pain in the lateral arm with resisted supination [63].
- Patients with snapping triceps report pain with flexion accompanied by a pop or snap, often with tingling into the fingers if the ulnar nerve is involved [63].

- Patients with MABCN neuroma or neuritis report localized pain or burning with an area of hypersensitivity over an area of injury or prior surgery [63].
- Patients with median nerve compression report vague forearm pain that may radiate from the hand to the forearm [63].
- Patients with ulnohumeral arthritis report painful range of motion through the midarc with or without a load [63].
- A thorough history is invaluable to understanding the type of disease process and the degree that the condition affects the patient [54].
- Understanding whether a patient has pain throughout the arc of motion or only at terminal limits is of paramount importance [54].
- Identifying associated mechanical symptoms or instability is of paramount importance [54].
- Associated conditions such as cubital tunnel syndrome must be considered and evaluated to provide optimal recommendations on management [54].

PHYSICAL EXAMINATION FINDINGS

- Elbow stability is determined by primary and secondary stabilizers [17].
- The three primary stabilizers are the ulnohumeral articulation, the medial ulnar collateral ligament (MUCL), and the lateral ulnar collateral ligament (LUCL) complex on the medial and lateral sides respectively [17].
- Secondary stabilizers are the radiocapitellar articulation, the common flexor tendon, the common extensor tendon, and the joint capsule [17].
- The anterior oblique ligament of the MCL complex is the strongest and is the primary stabilizer to valgus stress [18].
- The anterior oblique ligament originates on the anterior-inferior edge of the medial epicondyle and inserts on the sublime tubercle of the ulna [18].
- Valgus torque generated at the elbow during throwing maneuvers is highest in the late cocking and early acceleration phases of throwing [18].
- The surrounding elbow musculature, specifically the flexor digitorum superficialis and flexor carpi ulnaris, provide a dynamic stabilizing force across the elbow joint [60].
- Crepitus and tenderness over the posteromedial olecranon may be noted in patients with valgus extension overload syndrome [18].
- Pain is reproduced when the elbow is forced into extension in patients with valgus extension overload syndrome [18].
- Elbow flexion contracture may be seen in patients with valgus extension overload syndrome [18].
- Physical examination findings in capitellum OCD include lateral elbow tenderness, crepitus, and often a 15° to 20° flexion contracture [18].
- Point tenderness can be noted at the MCL or toward its insertion sites in patients with MCL injuries [60].

- Valgus instability is tested with the patient's elbow flexed between 20° and 30° to unlock the olecranon from its fossa as valgus stress is applied [60].
- The milking maneuver is performed by having the patient or the examiner pull on the patient's thumb to create valgus stress while the patient's forearm is supinated and the elbow is flexed beyond 90° [60].
- A subjective feeling of apprehension, instability, or localized pain at the MCL during the milking maneuver indicates injury [60].
- The moving valgus stress test is a modification of the milking maneuver where valgus stress is applied while the elbow is moved through an arc of flexion or extension [60].
- A subjective feeling of apprehension, instability, or localized pain at the MCL during the moving valgus stress test indicates injury [60].
- Pain with resisted wrist or long finger extension elicits lateral elbow tendinopathy [63].
- The tennis elbow shear test elicits lateral elbow tendinopathy [63].
- Direct palpation of the ECRB origin elicits lateral elbow tendinopathy [63].
- The laptop test elicits lateral elbow tendinopathy [63].
- Direct palpation of the flexor-pronator tendon origin elicits medial elbow tendinopathy [63].
- The face press examination elicits medial elbow tendinopathy [63].
- The server tray examination elicits medial elbow tendinopathy [63].
- Resisted flexion tests elicit medial elbow tendinopathy [63].
- The moving valgus test elicits medial elbow tendinopathy, with pain typically between 30° and 60° flexion [63].
- Direct palpation or percussion (Tinel test) elicits cutaneous neuritis [63].
- Wrist flexion and forearm pronation elicit radial tunnel syndrome [63].
- The rule of nines test elicits radial tunnel syndrome [63].
- Weakness and pain with resisted long finger extension elicit radial tunnel syndrome [63].
- Direct palpation elicits lateral elbow tendinopathy [63].
- Pain with pronosupination or flexion and extension elicits trauma [63].
- The RC load test, which involves pain with pronation and resisted extension, evaluates radiocapitellar arthrosis [63].
- The RC load test, which involves pain with pronation and resisted extension, evaluates OCD or osteonecrosis [63].
- Direct palpation of the radial tuberosity with the arm in pronation elicits crepitus and pain in partial biceps tendon tear [63].
- Palpation with flexion elicits snapping triceps [63].
- Direct palpation/Tinel test elicits ulnar neuritis or neuropathy [63].
- The milking maneuver evaluates MUCL strain, tear, or instability [63].
- The moving valgus stress test evaluates MUCL strain, tear, or instability [63].

- The valgus extension overload examination evaluates valgus extension overload [63].
- The arm bar examination evaluates valgus extension overload [63].
- The gravity assisted varus grind test evaluates varus posteromedial rotatory instability [63].
- Direct palpation and valgus stress or moving valgus stress tests evaluate trauma to the medial epicondyle or condyle fracture [63].
- Palpation or Tinel test evaluates MABCN neuroma or neuritis [63].
- Palpation or Tinel test evaluates median nerve compression [63].
- Forearm rotation is relatively preserved until later in the disease process of elbow osteoarthritis [28].
- Pain is usually felt at the end ranges of flexion and extension rather than throughout the arc in elbow osteoarthritis [28].
- Inspection should check for prior surgical incisions and joint effusion at the lateral soft spot in elbow osteoarthritis [28].

IMAGING FINDINGS

- Plain radiographs remain the hallmark and best screening test for elbow evaluation [17].
- Standard AP and lateral radiographs should be obtained for elbow osteoarthritis [28].
- Radiographs of elbow osteoarthritis typically show osteophyte formation at the coronoid process (anterior and medial), coronoid fossa, radial fossa, radial head, olecranon tip, and olecranon fossa [28].
- Joint spaces at the ulnohumeral joint are usually preserved in elbow osteoarthritis [28].
- Joint spaces at the radiocapitellar joint are mildly narrowed in elbow osteoarthritis [28].
- Loose bodies may be evident on radiographs of elbow osteoarthritis, and radiographs typically underestimate the number present [28].
- CT with two-dimensional reconstruction and three-dimensional surface rendering best visualizes posteromedial olecranon osteophytes and/or loose bodies in valgus extension overload syndrome [18].
- MRI may be most helpful in evaluating associated injuries including partial or complete tears of the MCL in valgus extension overload syndrome [18].
- AP, lateral, and axillary views should be obtained to assess for joint space narrowing, osteophytes, and loose bodies in MCL injuries [60].
- Valgus stress radiographs with the elbow in 20° to 30° of flexion and the forearm in full supination may be used to measure medial joint line opening in MCL injuries [60].
- Greater than 3 mm of medial joint line opening on valgus stress radiographs has been considered diagnostic for valgus instability [60].
- Conventional MRI can help identify thickening within the MCL from chronic injury or more obvious full-thickness tears [60].
- Magnetic resonance arthrography enhanced with intra-articular gadolinium improves the diagnosis of partial undersurface tears of the MCL [60].

- Dynamic ultrasonography can help detect increased laxity with valgus stress in MCL injuries, though diagnostic quality is operator dependent [60].
- Ultrasonography-guided diagnostic injection evaluates cutaneous neuritis [63].
- MRI evaluates posterolateral rotatory instability [63].
- CT with 3D reconstruction evaluates trauma [63].
- CT with 3D reconstruction evaluates radiocapitellar arthrosis [63].
- CT with 3D reconstruction evaluates OCD or osteonecrosis [63].
- MRI or ultrasonography evaluates lateral elbow tendinopathy [63].
- MRI or ultrasonography evaluates medial elbow tendinopathy [63].
- Ultrasonography evaluates ulnar neuritis or neuropathy [63].
- CT with 3D reconstruction and MRI evaluate valgus extension overload [63].
- CT with 3D reconstruction evaluates varus posteromedial rotatory instability [63].
- Radiograph or CT with 3D reconstruction evaluates ulnohumeral arthritis [63].
- Radiograph or CT with 3D reconstruction evaluates trauma to the medial epicondyle or condyle fracture [63].
- Ultrasonography evaluates snapping triceps [63].
- Ultrasonography evaluates MABCN neuroma or neuritis [63].
- Ultrasonography and EMG evaluate median nerve compression [63].
- Plain radiographs should be obtained during the initial workup to evaluate the articular surface and bony anatomy [54].
- CT scans with 3D reconstructions may be useful for evaluating the extent and location of disease and for surgical planning [54].
- MRI may be useful to evaluate the status of the soft tissues including the medial and lateral collateral ligamentous complexes [54].
- Electromyography and nerve conduction studies (EMG/NCS) may be useful to evaluate the degree of nerve compression and contribution to elbow pain and/or dysfunction [54].

Investigations

- Plain radiographs (AP, lateral, and oblique views) are the hallmark and best screening test for elbow evaluation [17].
- Serial radiography is used as follow-up when heterotopic ossification is present [44].
- Computed tomography (CT) is helpful for assessing malunion architecture, the location and pattern of osteophytes, and loose bodies [44].
- Three-dimensional CT is used to check for heterotopic ossification [44].
- CT is beneficial when joint incongruity or abnormal bony anatomy is present [44].

- CT is not necessary when elbow stiffness is entirely soft-tissue related [44].
- CT can be helpful in identifying mineralized intra-articular loose bodies or delineating the anatomy of a complex intra-articular fracture [45].
- CT with two-dimensional reconstruction and three-dimensional surface rendering best visualizes posteromedial olecranon osteophytes and loose bodies in valgus extension overload syndrome [18].
- Magnetic resonance imaging (MRI) is the imaging modality best suited for evaluating soft-tissue structures in the elbow, including ligaments, tendons, cartilage, and nerves [45].
- Conventional MRI sequences should be obtained in all three planes using T1-weighted and fluid-sensitive sequences (STIR or T2-weighted with fat suppression) [45].
- Magnetic resonance arthrography (MRA) is particularly beneficial in the evaluation of osteochondral lesions, loose bodies, and ulnar collateral ligament (UCL) injury in a throwing athlete [45].
- Coronal MRI studies should be obtained along a line connecting the medial and lateral epicondyles [45].
- Sagittal MRI studies should be perpendicular to the coronal studies [45].
- 3-Tesla MRI units generate high signal-to-noise ratios and better show normal anatomy than 1.5-Tesla units, but may show mild signal alterations in tendons, ligaments, and nerves that are not symptomatic [45].
- Ultrasonography is most useful for evaluating the distal biceps and the common flexor and extensor tendons [45].
- Ultrasonography allows dynamic imaging, which may be useful in evaluating for ulnar nerve subluxation or a snapping triceps [45].
- MRI may be most helpful in evaluating associated injuries, including partial or complete tears of the medial collateral ligament (MCL), in valgus extension overload syndrome [18].
- MRI can be used to evaluate ligaments and tendons in elbow stiffness, but is rarely indicated [44].
- The evaluation of the elbow requires an intimate understanding of anatomy, biomechanics, and diagnostic tests [17].
- Physical examination should focus on uncovering underlying pathologic conditions in primary and secondary stabilizers [17].
- The physical exam is directed by history and the location of pain in the anterior, posterior, medial, or lateral aspect of the elbow [17].
- Electromyography/nerve conduction velocity studies should be performed if there is any question about neurologic dysfunction in elbow stiffness [44].
- Assessment for ulnar nerve subluxation should be performed in elbow stiffness, as subluxation is a relative contraindication for arthroscopic procedure due to possible iatrogenic nerve injury [44].
- Neurovascular status should be documented before and after elbow reduction in acute dislocation [46].
- Plain AP and lateral radiographs are necessary to document congruent reduction after acute elbow dislocation [46].
- Oblique views may be useful to identify periarticular fractures in acute elbow dislocation [46].
- CT is useful to identify associated osseous injury in acute elbow dislocation [46].

- CT or MRI should be considered with incongruous reduction to identify potential incarcerated osteocartilaginous fragments in acute elbow dislocation [46].
- Bedside needle arthroscopy is described as the initial diagnostic and therapeutic step in the management of suspected bacterial arthritis of a native elbow [67].
- Arthroscopy provides improved visualization of the elbow joint and the ability to address coexisting intra-articular pathologic conditions in chronic elbow instability [3].
- Diagnostic elbow arthroscopy is used for removal of osteophytes on the posteromedial aspect of the olecranon, removal of loose bodies, and débridement of chondromalacia in valgus extension overload syndrome [18].
- Routine diagnostic arthroscopy preceding ulnar collateral ligament reconstruction does not significantly reduce the proportion or rate of subsequent surgery for other valgus extension overload conditions [68].

Treatment

- Patients with stiff elbows who underwent arthroscopic arthrolysis achieved satisfactory clinical outcomes very early postoperatively [11].
- Overall, patients saw improvement in elbow ROM after arthroscopic elbow capsular release, but many still had residual symptoms from their underlying disease [13].
- Pediatric elbow arthroscopy performed by an experienced surgeon using a standardized technique for a wide variety of elbow conditions has an acceptable complication rate that is similar to rates in the previously published literature on elbow arthroscopy in the pediatric and adult populations; however, a significant proportion of patients needed subsequent surgery in the following years [15].
- Arthroscopy is emerging as an invaluable tool for diagnosing and treating elbow pathology, offering advantages such as less scarring, decreased risk of infection, and less postoperative pain [19].
- Excision of unreconstructible radial head fractures can be performed arthroscopically [51].
- Patient positioning for elbow arthroscopy is based primarily on surgeon preference, with options including supine, modified supine, lateral decubitus, and prone positions [61].
- The modern concept of arm suspension from the supine position keeps the arm in 90° of shoulder abduction and 90° of elbow flexion [61].
- Advantages of the supine position include simplified airway access, familiar orientation, and ease of conversion to an open procedure [61].
- Disadvantages of the supine position include elbow instability during the procedure and difficult access to the posterior compartment [61].
- The modified supine position suspends the arm over the chest with the elbow in 90° of flexion while the forearm, wrist, and hand are secured in a commercially available mechanical holder [61].
- The modified supine position facilitates easy arm adjustment, providing access to both the anterior and posterior compartments of the elbow [61].

- The modified supine position decreases the risk of injury to the anterior neurovascular structures by allowing them to drop away from the anterior capsule [61].
- In the lateral decubitus position, the patient is positioned laterally on a beanbag with the surgical arm flexed to 90° and suspended over a well-padded post, with joint distraction provided by a weight attached to the hand [61].
- Advantages of the lateral decubitus position include improved arm stability, posterior elbow access, and relatively easy airway management [61].
- Disadvantages of the lateral decubitus position include orientation challenges from reversed anatomic landmarks and difficult access to the anterior compartment [61].
- In the prone position, the arm is suspended off the table in an arm holder with the arm in 90° of shoulder abduction and the elbow in 90° of flexion [61].
- Advantages of the prone position include natural traction, easy access to the posterior compartment, and a theoretically increased space between vascular structures and the anterior capsule [61].
- Disadvantages of the prone position include the necessity for general anesthesia, difficult airway access, reversed anatomy, and poor access to the anterior compartment [61].
- It is crucial to assess the elbow for access to each compartment and to portal sites before starting the procedure [61].
- Pressure on the antecubital fossa should be avoided to decrease the risk of injury to anterior neurovascular structures [61].
- A tourniquet is placed as proximal on the arm as possible and can be insufflated as needed [61].
- Additional peripheral nerve block combined with a postoperative nerve block catheter in arthroscopic arthrolysis in cases of elbow stiffness may be an opportunity to enhance postoperative outcomes by achieving better functional ROM, perhaps through reduced postoperative pain [66].

Complications

- Elbow arthroscopy is associated with complications and morbidity despite being a minimally invasive procedure [1].
- A significant proportion of patients visited the emergency department at least once within 90 days following elbow arthroscopy [9].
- Systematic reviews of predominantly low-level evidence studies demonstrate varying complication rates after elbow arthroscopy, with a median of 3% and a range of 0%-71% [10].
- Reoperation rates after elbow arthroscopy vary, with a median of 2% and a range of 0%-59% [10].
- Pediatric patients undergoing elbow arthroscopy by an experienced surgeon using a standardized technique had a complication rate of 3.7% [15].
- The reoperation rate for pediatric patients undergoing elbow arthroscopy was 12% [15].
- A significant proportion of pediatric patients required subsequent surgery in the years following elbow arthroscopy [15].

- The complication rate for pediatric elbow arthroscopy is similar to rates previously published in both pediatric and adult populations [15].
- Elbow arthroscopic debridement for primary degenerative osteoarthritis is associated with low complication and reoperation rates [23].
- Elbow arthroscopic surgery is considered a relatively safe procedure with low complication rates [31].
- Heterotopic ossification (HO) is a minor complication of elbow arthroscopy with a prevalence rate of 6.3% [32].
- Heterotopic ossification after elbow arthroscopy is usually located on the medial compartment of the elbow [32].
- Overall complication rates were lower following arthroscopic approaches compared to open approaches in a cohort of ABOS Part II candidates [34].
- Elbow arthroscopy has historically been associated with complication rates as high as 20% [58].
- The most common complication of elbow arthroscopy is neurovascular injury [58].
- Neurovascular injuries in elbow arthroscopy result from surgeon inexperience, poor technique, and lack of knowledge of elbow anatomy [58].
- Insults causing neurovascular or other injuries in elbow arthroscopy include compression from cannulas, fluid extravasation into surrounding soft tissues, local anesthesia, and laceration with the scalpel or cannula [58].
- Most neurovascular injuries in elbow arthroscopy are transient and resolve without residual deficit [58].
- Improved surgeon training, better understanding of elbow anatomy, and surgical technique standardization have increased the safety of elbow arthroscopy [58].
- Most complications in modern elbow arthroscopy, including wound healing issues and infection, are ubiquitous to arthroscopy of other joints [58].
- There is an increased risk of postoperative infection in patients receiving an intra-articular steroid injection at the end of elbow arthroscopy [58].
- Intra-articular steroid injection at the end of elbow arthroscopy is not recommended due to infection risk [58].
- Nerve injuries are exceedingly rare in elbow arthroscopy, with reported transient nerve injury rates ranging from 1.7% to 2.0% [58].
- No substantial association has been found between complication rate and surgical complexity in elbow arthroscopy, including procedures such as complete synovectomy, radial head resection, osteocapsular arthroplasty, and medial epicondylectomy [58].
- Other known complications of elbow arthroscopy include articular cartilage injury, synovial fistula formation, instrument breakage, and tissue injury secondary to tourniquet use [58].
- The average mention rate for risk factors across studies reporting complication rates after elbow arthroscopy was 31% [65].
- Non-modifiable risk factors are mentioned more often than modifiable ones in studies reporting complication rates after elbow arthroscopy [65].

- Life-changing complications such as deep infection and permanent nerve injury do occur in elbow arthroscopy [71].
- Surgeons must strive to minimize patient exposure to life-changing complications by mastering indications, anatomy, and technique [71].
- Significant increases in postoperative infection risk after arthroscopy of the ankle, knee, hip, shoulder, or elbow are associated with intraoperative intra-articular corticosteroid injection (CSI) administration [72].
- Significant increases in postoperative infection risk after arthroscopy of the ankle, knee, hip, shoulder, or elbow are associated with preoperative CSI administration within 4 weeks of surgery [72].
- Significant increases in postoperative infection risk after arthroscopy of the ankle, knee, hip, shoulder, or elbow are associated with a BMI >30 [72].
- Significant increases in postoperative infection risk after arthroscopy of the ankle, knee, hip, shoulder, or elbow are associated with diabetes [72].
- Significant increases in postoperative infection risk after arthroscopy of the ankle, knee, hip, shoulder, or elbow are associated with smoking tobacco [72].

Recovery

- A significant proportion of patients visited the emergency department at least once in the 90 days following elbow arthroscopy [9].
- Complication rates following elbow arthroscopy vary widely, with a median of 3% and a range of 0%-71% [10].
- Reoperation rates following elbow arthroscopy vary widely, with a median of 2% and a range of 0%-59% [10].
- Arthroscopic debridement for primary degenerative osteoarthritis results in statistically significant and clinically relevant improvement in elbow range of motion and clinical outcomes with low complication and reoperation rates [23].
- Good mid-term functional outcomes are demonstrated following debridement arthroplasty of the arthritic elbow [35].
- Serial assessment of patients with primary elbow osteoarthritis who underwent arthroscopic osteocapsular arthroplasty showed clinical outcomes improved from preoperative assessment to short- and medium-term follow-up [64].
- Range of motion decreased between short- and medium-term follow-up in patients with primary elbow osteoarthritis who underwent arthroscopic osteocapsular arthroplasty [64].
- Arthroscopic elbow contracture release can improve function and range of motion, although outcomes may vary based on preoperative patient characteristics [29].
- Arthroscopic capsular release of the elbow is effective for restoring a functional arc of motion in the short term in most patients with extrinsic contractures [33].

- Patients saw improvement in elbow range of motion after arthroscopic elbow capsular release, but many still had residual symptoms from their underlying disease [13].
- Professional baseball players saw an improvement in several performance metrics after elbow arthroscopy [69].

Key Evidence

- [L3] Elbow arthroscopy is not without complications and morbidity despite being a minimally invasive procedure and advances made in surgical technique. [1] (10.1177/17585732241249393)
- [L4] The available evidence supports the use of elbow arthroscopy in the management of the majority of conditions where it is currently used. [2] (10.1016/j.arthro.2011.10.007)
- [L4] Patients treated arthroscopically benefit from additional diagnostic techniques, improved visualization of the elbow joint, the ability to address coexisting intra-articular pathologic conditions, and minimal soft tissue injury with no clinical consequences in outcomes. [3] (10.1016/j.arthro.2013.08.016)
- [L5] The purpose of this review is to enable orthopedic surgeons initiating elbow arthroscopy to approach it more safely and easily by describing history, setup, and indications. [4] (10.5397/cise.2023.01032)
- [L5] Elbow arthroscopy has become a safer and more effective treatment modality for several elbow pathologies due to advances in equipment and surgical technique. [5] (10.5435/00124635-200810000-00003)
- [L5] Elbow arthroscopy has evolved from a diagnostic tool to a therapeutic procedure with expanded indications, though it requires careful attention to surgical anatomy and patient selection to avoid neurovascular complications. [6] (10.1177/03635465990270022401)
- [L5] As greater experience is gained and technology advances, arthroscopy will play more of a role in treatment of elbow disorders. [7] (10.1016/j.arthro.2007.08.008)
- [L4] The majority of the top 50 cited articles in elbow arthroscopy comprised case series exhibiting Level IV or V evidence. [8] (10.1016/j.jisako.2024.04.011)
- [L3] A significant proportion of patients from a large cohort of elbow arthroscopy patients visited the ED at least once in the 90 days following surgery. [9] (10.1016/j.jseint.2024.03.015)
- [L4] Predominantly low-level evidence studies demonstrate varying complication rates (median 3%, range 0%-71%) and reoperation rates (median 2%, range 0%-59%) after elbow arthroscopy. [10] (10.1016/j.arthro.2023.04.015)
- [L1] Patients with stiff elbows who underwent arthroscopic arthrolysis achieved satisfactory clinical outcomes very early postoperatively. [11] (10.1016/j.jse.2024.06.009)
- [L5] Elbow arthroscopy has expanded indications for diagnosing and treating acute trauma, including radial head fractures and instability, provided patients are carefully selected and neurovascular risks are managed with proper technique. [12] (10.1016/j.hcl.2004.07.003)
- [L4] Overall, patients saw improvement in elbow ROM, but many still had residual symptoms from their underlying disease after arthroscopic elbow capsular release. [13] (10.1177/23259671231190381)

- [L5] Recent advances in arthroscopic instrumentation and techniques have led to growing interest in arthroscopic treatment of elbow osteoarthritis. [14] (10.1016/j.jhsa.2017.05.023)
- [L4] Pediatric elbow arthroscopy performed by an experienced surgeon using a standardized technique for a wide variety of elbow conditions has an acceptable complication rate that is similar to rates in the previously published literature on elbow arthroscopy in the pediatric and adult populations; however, a significant proportion of patients needed subsequent surgery in the following years. [15] (10.1016/j.asmr.2024.100952)
- [L5] Elbow arthroscopy can be safely performed with proper knowledge and application of anatomy around the elbow when making portals and understanding at-risk areas beyond the capsule when working within the joint. [16] (10.1016/j.arthro.2024.05.001)
- [L5] Arthroscopy is emerging as an invaluable tool for diagnosing and treating elbow pathology, offering advantages such as less scarring, decreased risk of infection, and less postoperative pain. [19] (10.1016/j.hcl.2009.05.009)
- [L5] Elbow arthroscopy has become a valid and safe option for the diagnosis and treatment of both acute and chronic elbow instability, allowing for the management of soft tissue lesions and associated intra-articular bone or cartilage lesions with minimal disruption. [20] (10.1016/j.jseint.2022.12.001)
- [L1] Elbow arthroscopic debridement for primary degenerative osteoarthritis results in statistically significant and clinically relevant improvement in elbow range of motion and clinical outcomes with low complication and reoperation rates. [23] (10.1016/j.arthro.2017.08.247)
- [L4] Arthroscopic elbow contracture release can improve function and range of motion; however, outcomes may vary based on preoperative patient characteristics. [29] (10.1016/j.jseint.2026.101621)
- [L1] The results of this study showed that elbow arthroscopic surgery is a relatively safe procedure with low complication rates. [31] (10.1177/23259671221137863)
- [L4] Among 205 patients who underwent elbow arthroscopy, HO was a minor complication of elbow arthroscopy, with a prevalence rate of 6.3%, and was usually located on the medial compartment of the elbow. [32] (10.1177/03635465231198862)
- [L5] Arthroscopic capsular release of the elbow is effective for restoring a functional arc of motion in the short term in most patients with extrinsic contractures. [33] (10.5435/00124635-201105000-00004)
- [L3] Overall rates of complication were lower following arthroscopic approaches in this cohort of surgeons. [34] (10.1177/23259671261425647)
- [L1] This systematic review demonstrated good mid-term functional outcomes following debridement arthroplasty of the arthritic elbow. [35] (10.1016/j.arthro.2020.09.005)
- [L4] Serial assessment of patients with primary elbow OA who underwent arthroscopic OCA showed that the clinical outcomes improved from preoperative assessment to short- and medium-term follow-up, although ROM decreased between short- and medium-term follow-up. [64] (10.1177/23259671231162398)
- [L2] The average mention rate for risk factors across studies reporting complication rates after elbow arthroscopy was 31%, with non-modifiable risk factors mentioned more often than modifiable ones. [65] (10.1016/j.arthro.2024.02.004)

- [L3] Additional peripheral nerve block combined with a postoperative nerve block catheter in arthroscopic arthrolysis in cases of elbow stiffness may be an opportunity to enhance postoperative outcomes by achieving better functional ROM, perhaps through reduced postoperative pain. [66] (10.1016/j.jseint.2024.10.009)
- [L4] This surgical guideline describes bedside needle arthroscopy as the initial diagnostic and therapeutic step in the management of patients with suspected bacterial arthritis of a native shoulder, elbow, wrist, knee, and ankle. [67] (10.1016/j.eats.2022.05.011)
- [L1] Routine diagnostic arthroscopy preceding ulnar collateral ligament reconstruction does not significantly reduce the proportion or rate of subsequent surgery for other valgus extension overload conditions. [68] (10.1016/j.jse.2021.08.004)
- [L3] After elbow arthroscopy, professional baseball players saw an improvement in several performance metrics. [69] (10.1177/03635465261424876)
- [L5] Elbow arthroscopy is mostly safe and effective, but life-changing complications such as deep infection and permanent nerve injury do occur; surgeons must strive to minimize patient exposure to these events by mastering indications, anatomy, and technique. [71] (10.1016/j.arthro.2023.06.011)
- [L3] Significant increases in postoperative infection risk in patients who underwent arthroscopy of the ankle, knee, hip, shoulder, and elbow were noted with intraoperative intra-articular CSI administration or preoperative CSI administration within 4 weeks of surgery, BMI >30, diabetes, and smoking tobacco. [72] (10.1177/03635465261429468)

References

[1] 30-Day complications, operative time, and overnight admission following elective elbow arthroscopy. *Shoulder & Elbow*. 2024. DOI: 10.1177/17585732241249393

[2] Evidence-Based Indications for Elbow Arthroscopy. *Arthroscopy*. 2012. DOI: 10.1016/j.arthro.2011.10.007

[3] The Role of Arthroscopy in Chronic Elbow Instability. *Arthroscopy*. 2013. DOI: 10.1016/j.arthro.2013.08.016

[4] Basic to advanced elbow arthroscopy: the history, basic set up, and indications. *Clinics in Shoulder and Elbow*. 2024. DOI: 10.5397/cise.2023.01032

[5] Elbow Arthroscopy. *Journal of the American Academy of Orthopaedic Surgeons*. 2008. DOI: 10.5435/00124635-200810000-00003

[6] Arthroscopy of the Elbow. *The American Journal of Sports Medicine*. 1999. DOI: 10.1177/03635465990270022401

[7] Elbow Arthroscopy: Where Are We Now?. *Arthroscopy*. 2007. DOI: 10.1016/j.arthro.2007.08.008

[8] It is time to move forward: a bibliometric analysis of top 50 cited articles in elbow arthroscopy. *Journal of ISAKOS*. 2024. DOI: 10.1016/j.jisako.2024.04.011

[9] Emergency department utilization after elbow arthroscopy. *JSES International*. 2024. DOI: 10.1016/j.jseint.2024.03.015

[10] Wide Range in Complication Rates Following Elbow Arthroscopy in Adult and Pediatric Patients: A Systematic Review. *Arthroscopy*. 2023. DOI: 10.1016/j.arthro.2023.04.015

[11] Does tranexamic acid reduce elbow swelling and improve early function following arthroscopic arthrolysis? A double-blind randomized controlled trial. *Journal of Shoulder and Elbow Surgery*. 2024. DOI: 10.1016/j.jse.2024.06.009

[12] Arthroscopic management of elbow trauma. *Hand Clinics*. 2004. DOI: 10.1016/j.hcl.2004.07.003

[13] Incidence of Repeat Elbow Capsular Release After Arthroscopic Elbow Capsular Release. *Orthopaedic Journal of Sports Medicine*. 2023. DOI: 10.1177/23259671231190381

[14] Arthroscopic Management of Elbow Osteoarthritis. *The Journal of Hand Surgery*. 2017. DOI: 10.1016/j.jhsa.2017.05.023

[15] Pediatric Patients Who Underwent Elbow Arthroscopy Had an 86% Return-to-Sport Rate, a 12% Reoperation Rate, and a 3.7% Complication Rate. *Arthroscopy, Sports Medicine, and Rehabilitation*. 2024. DOI: 10.1016/j.asmr.2024.100952

[16] Elbow Arthroscopy: Pearls to Avoid Nerve Injuries. *Arthroscopy*. 2024. DOI: 10.1016/j.arthro.2024.05.001

[17] Orthopaedic Knowledge Update 13 Ebook Without Multimedia. Anatomy, Biomechanics, Physical Examination, and Imaging of the Elbow > Summary and Conclusions.

[18] Aaos Comprehensive Orthopaedic Review 3. Elbow Injuries in the Athlete* > III. Valgus Extension Overload Syndrome and Posterior Impingement.

[19] The Emerging Role of Elbow Arthroscopy in Chronic Use Injuries and Fracture Care. *Hand Clinics*. 2009. DOI: 10.1016/j.hcl.2009.05.009

[20] The role of arthroscopy in instability of the elbow. *JSES International*. 2023. DOI: 10.1016/j.jseint.2022.12.001

[23] Arthroscopic Debridement for Primary Degenerative Osteoarthritis of the Elbow Leads to Significant Improvement in Range of Motion and Clinical Outcomes: A Systematic Review. *Arthroscopy*. 2017. DOI: 10.1016/j.arthro.2017.08.247

[24] Orthopaedic Knowledge Update Sports Medicine 6. Magnetic Resonance Imaging of the Elbow > Annotated References.

[28] Aaos Comprehensive Orthopaedic Review 3. Arthritis and Arthroplasty of the Elbow > I. Osteoarthritis.

[29] Preoperative risk factors associated with patient outcomes following arthroscopic elbow contracture release. *JSES International*. 2026. DOI: 10.1016/j.jseint.2026.101621

[31] Complications of Elbow Arthroscopic Surgery: A Systematic Review and Meta-analysis. *Orthopaedic Journal of Sports Medicine*. 2022. DOI: 10.1177/23259671221137863

[32] Prevalence, Timing, Locational Distribution, and Risk Factors for Heterotopic Ossification After Elbow Arthroscopy. *The American Journal of Sports Medicine*. 2023. DOI: 10.1177/03635465231198862

[33] Arthroscopic Management of the Stiff Elbow. *American Academy of Orthopaedic Surgeon*. 2011. DOI: 10.5435/00124635-201105000-00004

[34] Arthroscopic Versus Open Elbow Debridements Among ABOS Part II Candidates: A Decline in Arthroscopic Volume yet Fewer Complications After Arthroscopic Procedures. *Orthopaedic Journal of Sports Medicine*. 2026. DOI: 10.1177/23259671261425647

[35] A Systematic Review of Arthroscopic Versus Open Debridement of the Arthritic Elbow. *Arthroscopy*. 2020. DOI: 10.1016/j.arthro.2020.09.005

[36] Orthopaedic Knowledge Update 13 Ebook Without Multimedia. Anatomy, Biomechanics, Physical Examination, and Imaging of the Elbow > Annotated References.

[37] Orthopaedic Knowledge Update 13 Ebook Without Multimedia. Anatomy, Biomechanics, Physical Examination, and Imaging of the Elbow > Anatomy > Bony Anatomy.

[40] Miller S Review Of Orthopaedics. SECTION 16 PATELLAR TRACKING IN TOTAL KNEE ARTHROPLASTY > ELBOW.

[42] A Lange Medical Book Current Diagnosis Treatment In Orthopedics Fifth Edition. **2Musculoskeletal Trauma Surgery** > **INJURIES AROUND THE ELBOW**.

[44] Aaos Comprehensive Orthopaedic Review 3. Elbow Stiffness* > IV. Evaluation.

[45] Orthopaedic Knowledge Update Sports Medicine 6. Magnetic Resonance Imaging of the Elbow > Introduction.

[46] Aaos Comprehensive Orthopaedic Review 3. Acute and Recurrent Elbow Instability* > III. Acute Dislocation.

[50] Green S Operative Hand Surgery. Arthroscopic Release of the Stiff Posttraumatic or Postsurgical Elbow.

[51] Rockwood And Green S Fractures In Adults. 39: Elbow Dislocations and Terrible Triad Injuries > Arthroscopic Excision of Radial Head Fragments: Preoperative Planning Checklist > Open Radial Head Excision: Preoperative Planning Checklist.

[53] Orthopaedic Knowledge Update Sports Medicine 6. Elbow Arthroscopy and the Thrower's Elbow > Specific Procedures.

[54] Orthopaedic Knowledge Update 13 Ebook Without Multimedia. Elbow Degenerative Conditions and Nerve Disorders > Evaluation.

[58] Orthopaedic Knowledge Update Sports Medicine 6. Elbow Arthroscopy and the Thrower's Elbow > Complications.

[60] Aaos Comprehensive Orthopaedic Review 3. Elbow Injuries in the Athlete* > II. Medial Collateral Ligament Injuries.

[61] Orthopaedic Knowledge Update Sports Medicine 6. Elbow Arthroscopy and the Thrower's Elbow > Patient Positioning.

[63] Orthopaedic Knowledge Update 13 Ebook Without Multimedia. Anatomy, Biomechanics, Physical Examination, and Imaging of the Elbow > Biomechanics > Clinical Examination.

[64] Serial Changes in Clinical Outcomes After Arthroscopic Osteocapsular Arthroplasty for Primary Elbow Osteoarthritis: A Medium-term Follow-up Study. *Orthopaedic Journal of Sports Medicine*. 2023. DOI: 10.1177/23259671231162398

[65] Does Literature on Elbow Arthroscopy Put Complications Into Perspective?. *Arthroscopy*. 2024. DOI: 10.1016/j.arthro.2024.02.004

[66] A comparative analysis of short-term results in range of motion following arthroscopic arthrolysis with vs. without peripheral nerve block in cases of elbow stiffness. *JSES International*. 2025. DOI: 10.1016/j.jseint.2024.10.009

[67] Needle Arthroscopy for Bacterial Arthritis of a Native Joint: Surgical Technique for the Shoulder, Elbow, Wrist, Knee, and Ankle Under Local Anesthesia. *Arthroscopy Techniques*. 2022. DOI: 10.1016/j.eats.2022.05.011

[68] Routine diagnostic arthroscopy with elbow ulnar collateral ligament reconstruction does not reduce the need for future valgus extension overload–related surgeries: a systematic review and meta-analysis. *Journal of Shoulder and Elbow Surgery*. 2022. DOI: 10.1016/j.jse.2021.08.004

[69] Elbow Arthroscopy and the Risk of Future Ulnar Collateral Ligament Surgery in Professional Baseball Pitchers. *The American Journal of Sports Medicine*. 2026. DOI: 10.1177/03635465261424876

[71] *Editorial Commentary:* Avoiding Complications in Elbow Arthroscopy: Know the Indications, Learn the Anatomy, and Master a Safe Technique. *Arthroscopy*. 2023. DOI: 10.1016/j.arthro.2023.06.011

[72] Risk Factors for Infection After Ankle, Knee, Hip, Shoulder, or Elbow Arthroscopy: A Systematic Review and Meta-analysis. *The American Journal of Sports Medicine*. 2026. DOI: 10.1177/03635465261429468

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