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Radiologic Evaluation and Diagnostic Considerations in Anterior Elbow Dislocation

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Abstract

Background: Anterior elbow dislocation is a rare injury, accounting for a small minority of elbow dislocations, and is frequently associated with high-energy trauma and complex structural damage. Its rarity contributes to diagnostic uncertainty and challenges in management, particularly when compared with more common posterior dislocation patterns.

Aim: This article aims to provide a comprehensive review of the radiologic evaluation, diagnostic considerations, clinical features, and management strategies of anterior elbow dislocation, highlighting key principles that optimize patient outcomes.

Methods: A narrative review approach was employed, synthesizing current evidence and clinical insights related to elbow anatomy, mechanisms of injury, epidemiology, diagnostic imaging, management options, rehabilitation protocols, and prognosis. Special attention was given to differentiating anterior elbow dislocation from other traumatic elbow conditions.

Results: Anterior elbow dislocation typically results from a fall onto a flexed elbow with an anteriorly directed force and is commonly associated with fractures, ligamentous disruption, and neurovascular injury. Accurate diagnosis relies on meticulous clinical assessment and appropriate radiographic imaging, including standard elbow views and adjunct imaging when indicated. Early closed reduction remains the cornerstone of management in acute cases, followed by short-term immobilization and early mobilization. Surgical intervention is reserved for unstable, chronic, or fracture-associated dislocations. Delayed treatment and prolonged immobilization are strongly associated with stiffness and functional limitation.

Conclusion: Timely recognition, prompt reduction, careful neurovascular assessment, and structured rehabilitation are critical for optimizing outcomes in anterior elbow dislocation. Multidisciplinary coordination enhances recovery and minimizes complications.

Keywords: Anterior elbow dislocation; elbow trauma; radiologic evaluation; joint instability; rehabilitation; neurovascular injury.

Introduction

The elbow joint is recognized as one of the most commonly dislocated large joints in clinical practice and constitutes the most frequently dislocated large joint among the pediatric population. Despite this high overall incidence, anterior elbow dislocation remains an uncommon injury pattern in both adults and children, accounting for a very small proportion of all elbow dislocations [1]. This rarity contributes to diagnostic and management challenges, as anterior dislocations differ in mechanism, associated injuries, and clinical implications when compared with the more prevalent posterior dislocation patterns. Anatomically, the elbow is a complex synovial hinge joint formed by the articulation of the distal humerus with the proximal radius and ulna. Joint stability depends on the congruity of these osseous structures in combination with a robust network of ligamentous and capsular components. Dislocations of the elbow are classified according to the positional relationship of the proximal ulna relative to the distal humerus. In the context of anterior elbow dislocation, the proximal ulna is displaced anteriorly in relation to the humeral trochlea, and this displacement may occur either with or without concomitant anterior translation of the proximal radius. This distinctive displacement pattern reflects the specific forces applied to the joint at the time of injury and differentiates anterior dislocations

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from other directional variants. The mechanism underlying anterior elbow dislocation typically involves a fall onto a flexed elbow, during which a direct anteriorly directed force is transmitted to the proximal ulna [2]. This mechanism contrasts with that of posterior dislocations, which more commonly result from falls onto an extended upper limb. The flexed position of the elbow at impact, combined with anteriorly applied force, disrupts the stabilizing soft tissue structures and allows anterior displacement of the forearm bones. Due to the substantial force required to produce this injury pattern, anterior elbow dislocations are frequently associated with additional structural damage.

Clinically, elbow dislocations are broadly categorized as either simple or complex, depending on the presence of associated fractures. Simple dislocations involve disruption of capsular and ligamentous structures without osseous injury, whereas complex dislocations are characterized by fractures of the distal humerus, proximal ulna, proximal radius, or adjacent anatomical structures [1]. Anterior elbow dislocations are most often considered complex injuries because of their strong association with fractures, reflecting the high-energy mechanisms typically responsible for their occurrence. Management principles for elbow dislocations emphasize prompt recognition and immediate intervention. Initial treatment generally consists of urgent closed reduction followed by appropriate stabilization to restore joint congruity and minimize the risk of long-term complications. Surgical intervention is indicated in cases complicated by persistent or recurrent instability, associated fractures requiring fixation, or evidence of neurovascular compromise. Early and appropriate management is critical to optimize functional outcomes and reduce the likelihood of chronic instability, stiffness, or neurovascular sequelae.

Etiology

Understanding the etiology of anterior elbow dislocation and its related complications requires a detailed review of elbow anatomy and the structural relationships that maintain joint stability. The elbow is a complex joint formed by the articulation of three bones, namely the humerus, ulna, and radius. The distal humerus constitutes the upper component of the elbow joint and expands medially and laterally to form the medial and lateral epicondyles. These epicondyles serve as key attachment sites for ligamentous and muscular structures that contribute to joint integrity. The distal articular surface of the humerus is composed of the trochlea and the capitellum, which articulate with the greater sigmoid notch of the proximal ulna and the radial head, respectively [3]. This precise articulation allows coordinated flexion, extension, and rotational movements of the forearm. The proximal ulna plays a central role in elbow stability. The olecranon forms the posterior portion of the proximal ulna and constitutes the posterosuperior segment of the greater sigmoid notch [3]. This structure engages with the trochlea during elbow extension and functions as a bony restraint against posterior displacement. In contrast, the coronoid process forms the anterior portion of the greater sigmoid notch and provides a critical anterior buttress to the elbow joint. It serves as an attachment site for the brachialis muscle and the anterior bundle of the medial collateral ligament, both of which are essential for resisting anterior translation of the ulna during loading. On its lateral aspect, the proximal ulna contains the lesser sigmoid notch, also referred to as the radial notch, which articulates with the radial head and permits forearm rotation.

Beyond osseous anatomy, the soft tissue structures surrounding the elbow are fundamental to maintaining joint congruency and resisting displacement forces. The annular ligament encircles the radial head and forms part of the joint capsule, securing the radius against the ulna during pronation and supination. The joint capsule itself attaches anteriorly to the coronoid process and posteriorly to the olecranon. When the elbow is in extension, this capsular structure contributes significantly to varus and valgus stability by limiting excessive joint opening [4]. Ligamentous support is further reinforced by the medial and lateral collateral ligament complexes. The medial ulnar collateral ligament is a primary stabilizer against valgus stress and is composed of anterior, posterior, and transverse bands. This ligament originates from the medial epicondyle of the humerus and inserts at the base of the coronoid process, providing resistance to forces that tend to open the medial aspect of the joint [5]. On the lateral side, the lateral collateral ligament complex provides resistance to varus stress and consists of the lateral ulnar collateral ligament, annular ligament, and radial collateral ligament [3]. The lateral ulnar collateral ligament extends from the lateral epicondyle to the supinator crest of the ulna and plays a critical role in maintaining posterolateral stability. The radial collateral ligament supports the radial head by linking the lateral epicondyle to the annular ligament, completing a stabilizing network that preserves elbow alignment under physiological and traumatic loads.

Epidemiology

Anterior elbow dislocation is an uncommon clinical entity and represents a small fraction of elbow dislocations encountered in both emergency and orthopedic practice. Epidemiological data indicate that this injury accounts for approximately 2.6% of all reported elbow dislocations, highlighting its relative rarity when compared with posterior and posterolateral dislocation patterns [6]. The low incidence of anterior elbow dislocation is largely attributed to the specific biomechanical conditions required to produce this injury, as well as the inherent osseous and ligamentous stability of the elbow joint.

The majority of elbow dislocations occur following low- to moderate-energy trauma, such as falls onto an outstretched hand, which typically result in posterior displacement of the ulna relative to the humerus. In contrast, anterior elbow dislocation generally requires a high-energy mechanism combined with an atypical position of the elbow at the time of injury. Most commonly, the elbow must be flexed, and a substantial anteriorly directed force must be applied to the proximal ulna to overcome the stabilizing constraints of the olecranon, coronoid process, joint capsule, and collateral ligaments. This unique combination of force direction and joint positioning explains the infrequent occurrence of this dislocation pattern within the general population.

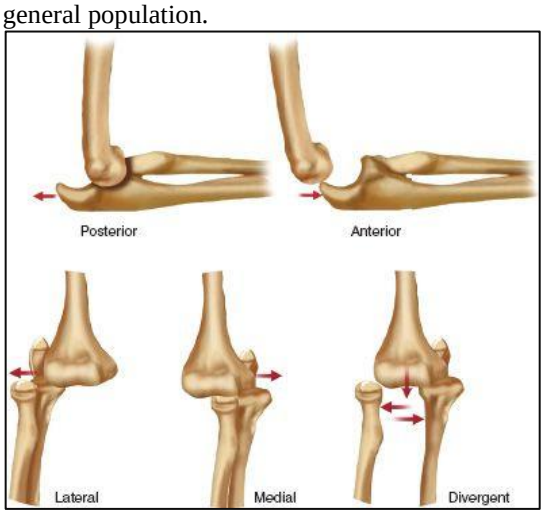

Fig. 1: Elbow Dislocation.

Although elbow dislocations as a whole are more common in children than in adults, anterior elbow dislocations remain rare across all age groups. When they do occur, they are often associated with significant trauma, such as motor vehicle collisions, sports-related injuries, or high-impact falls. In pediatric patients, the presence of open physes and relatively more elastic soft tissues may alter injury patterns, yet anterior displacement remains uncommon even in this population. In adults, decreased ligamentous elasticity and higher bone density further reduce the likelihood of isolated anterior dislocation without associated fractures. From an epidemiological perspective, anterior elbow dislocations are frequently classified as complex injuries due to their strong association with fractures of the distal humerus, proximal ulna, or radial head. This association further limits the number of cases identified as isolated anterior dislocations in large clinical series. Consequently, most published data consist of small case series or isolated case reports rather than large cohort studies. The rarity of this injury underscores the importance of heightened clinical awareness, as delayed recognition or misclassification may increase the risk of complications and adversely affect functional outcomes [6].

History and Physical

Anterior elbow dislocation, similar to other forms of elbow dislocation, typically arises following a clearly identifiable traumatic event. Patients often report a mechanism involving a fall onto an outstretched upper limb or exposure to high-energy trauma, such as that sustained during motor vehicle accidents or significant occupational or sports-related injuries. These mechanisms generate sufficient force to disrupt the stabilizing osseous and soft tissue structures of the elbow, resulting in anterior displacement of the proximal forearm. The clinical presentation is usually acute and dramatic, reflecting the severity of the injury. From a symptomatic perspective, patients commonly complain of intense pain localized to the affected elbow and forearm, accompanied by an immediate inability to actively move the joint. Functional impairment is pronounced, and even minimal attempts at motion typically exacerbate pain. Visible deformity of the elbow may be apparent on inspection, although its prominence can vary depending on the patient's body habitus, the degree of displacement, and the presence of associated swelling or soft tissue injury [7]. In some cases, the deformity may be subtle, necessitating careful comparison with the contralateral elbow during examination. A thorough and focused history is essential to guide clinical decision-making. The examiner should determine whether the patient has a prior history of elbow dislocation, ligamentous injury, or other trauma involving the affected joint, as previous injury may predispose the elbow to instability or influence management strategies. Particular attention should be directed toward symptoms suggestive of neurovascular involvement. Patients should be questioned about new-onset numbness, tingling, weakness, or altered sensation in the hand or forearm, as anterior elbow dislocations carry a risk of injury to adjacent nerves and vascular structures. Assessment of neurovascular status is critical, as evidence of compromise can significantly alter the urgency and approach to reduction and may necessitate prompt surgical intervention. In addition, the clinician should evaluate associated injuries by inquiring about head trauma, loss of consciousness, or pain in other anatomical regions, especially in cases involving high-energy mechanisms. This information helps determine the need for additional diagnostic workup and multidisciplinary evaluation. A complete medical history, including congenital musculoskeletal abnormalities and current medications that may affect bleeding risk or healing, should also be obtained to ensure safe and effective management of the injury [8].

Evaluation

The evaluation of a patient with suspected anterior elbow dislocation begins with careful inspection and a comprehensive physical examination. The clinician should first observe the patient's overall condition and assess for signs of associated trauma, particularly in cases involving high-energy

mechanisms. Visual inspection of the injured upper extremity should focus on identifying deformity, swelling, ecchymosis, skin disruption, or evidence of an open fracture. Palpation should then be performed systematically along the entire limb, including adjacent joints and long bones, to detect tenderness, crepitus, or additional injuries that may coexist with the elbow dislocation. Assessment of the injured extremity must include evaluation of the soft tissues and compartment integrity. Each muscular compartment should be palpated to determine whether it remains soft and compressible. A tense or firm compartment raises concern for evolving compartment syndrome, a limb-threatening condition that requires immediate surgical intervention. In such cases, neurovascular findings are often compromised, and delay in recognition can result in permanent functional impairment. Vascular assessment is therefore a critical component of the initial evaluation and should include inspection of skin color, palpation of skin temperature, assessment of radial and ulnar pulses at the wrist, and evaluation of capillary refill in the fingers [9].

Neurological examination should be conducted in parallel with vascular assessment. Sensory function is evaluated by testing light touch along the distribution of major peripheral nerves, while motor function is assessed by asking the patient to perform specific movements. The median and ulnar nerves are most frequently affected in elbow dislocations. Median nerve integrity can be assessed by testing sensation over the palmar surface of the thumb and index finger and by evaluating the patient's ability to oppose the thumb. Ulnar nerve function is examined by assessing sensation over the palmar aspect of the fourth and fifth digits and by observing finger abduction and adduction strength [10]. Any deficit in sensation or motor power suggests nerve involvement and necessitates urgent specialist evaluation. Following completion of the physical examination, radiographic assessment is essential to confirm the diagnosis and identify associated injuries. Standard imaging should include anteroposterior, lateral, and oblique views of the elbow. In addition, radiographs of the forearm, wrist, and shoulder should be obtained to exclude concomitant fractures or joint injuries. This comprehensive approach ensures accurate diagnosis and guides appropriate management decisions [9][10].

Treatment / Management

Management of anterior elbow dislocation is guided by the timing of presentation, the presence of associated injuries, and the stability of the joint following reduction. Early recognition and prompt intervention are critical to relieve pain, restore anatomy, and prevent long-term complications affecting elbow function. When patients present within three weeks of injury, closed reduction remains the preferred initial management strategy. Early reduction reduces soft tissue tension, alleviates pain and swelling, and decreases pressure on surrounding neurovascular structures. Because of the unique displacement pattern, anterior elbow dislocations require specific modifications to standard reduction techniques used for more common posterior dislocations [11]. In most cases, intravenous sedation is required to achieve adequate muscle relaxation and allow safe manipulation of the joint. Once sufficient sedation is obtained, longitudinal traction is applied to the affected limb. Optimal reduction is usually achieved with the participation of two clinicians, one applying steady traction to the forearm while the other provides counter-traction at the level of the humerus. Reduction is performed by gradually flexing the elbow while maintaining traction and applying a controlled downward force to the proximal forearm, guiding the ulna back into its anatomic relationship with the distal humerus [12]. The maneuver must be performed gently, as excessive force can exacerbate soft tissue injury or result in iatrogenic fractures.

Following reduction, careful reassessment of the elbow is essential. Joint stability should be evaluated through passive range-of-motion testing as well as varus and valgus stress examinations. An elbow that remains unstable after reduction is significantly more likely to require operative intervention than one that demonstrates stability. Neurovascular status must also be reassessed immediately after reduction to ensure restoration or preservation of arterial flow and nerve function. A posterior long-arm splint is then applied with the elbow flexed at approximately 90 degrees to maintain reduction and support healing. Postreduction radiographs should be obtained after splint application to confirm satisfactory alignment and exclusion of newly identified fractures. Closed reduction is not without risk, particularly in subacute cases where soft tissue contracture and localized osteoporosis may be present. In these situations, forceful manipulation increases the likelihood of fracture during the reduction attempt, underscoring the importance of meticulous and controlled technique [13]. Radiographic and clinical indicators of elbow instability must be carefully evaluated. Instability is suggested by widening of more than 1 mm at the ulnohumeral joint during valgus stress testing, widening exceeding 1.5 mm at the radiocapitellar joint during varus stress testing, recurrent dislocation, or the presence of the drop sign. The drop sign refers to an increased ulnohumeral distance of approximately 4 mm on a lateral elbow radiograph, indicating persistent instability after reduction [14]. When these features are present, stabilization using trans-olecranon K-wire fixation or a spanning external fixator is recommended to maintain joint congruity.

Patients should be maintained in a splint and reevaluated within 5 to 10 days following reduction [10]. During follow-up, the elbow should be reassessed for stability, range of motion, and

neurovascular integrity. If imaging reveals an associated fracture or if clinical instability persists, operative management becomes necessary. Conversely, if the elbow demonstrates stability, early initiation of controlled range-of-motion exercises is encouraged. Prolonged immobilization is associated with significant elbow stiffness, and immobilization beyond three weeks markedly reduces the likelihood of regaining full motion. After approximately 21 days of immobilization, restoration of complete elbow range of motion becomes increasingly difficult despite rehabilitation efforts [15]. When anterior elbow dislocations remain untreated for more than three weeks, closed reduction is typically unsuccessful, and open reduction is required. Chronic dislocations are often associated with shortening of the triceps muscle and significant contracture of periarticular soft tissues, which mechanically obstruct closed reduction. The goals of open reduction include lengthening of the triceps tendon using V-Y or Z-plasty techniques, release of contracted medial and lateral collateral ligaments, excision of the radial-humeral horn formed by subperiosteal new bone, and decompression or anterior transposition of the ulnar nerve when indicated. Once reduction is achieved, joint stabilization is commonly accomplished through placement of K-wires across the ulnohumeral and radiocapitellar articulations [13].

An alternative strategy involves the use of a hinged external fixator without formal collateral ligament reconstruction. In neglected elbow dislocations, Ivo et al reported favorable functional outcomes using hinged external fixation alone, demonstrating that ligament reconstruction may not always be required to achieve satisfactory stability and motion [16]. Ligament reconstruction is generally reserved for specific clinical scenarios, including acute injuries in high-demand athletes, high-grade ligament tears, and cases of chronic elbow instability. When reconstruction is performed, it is typically protected with a hinged external fixator for approximately eight weeks to allow controlled motion while maintaining stability. The role of ligament reconstruction remains debated. Proponents argue that failure to reconstruct damaged collateral ligaments may predispose patients to persistent instability once motion is restored. Opponents counter that non-anatomic ligament reconstruction may restrict motion and increase the risk of degenerative changes within the joint, potentially accelerating the development of posttraumatic arthritis [17]. Decision-making should therefore be individualized, considering patient age, functional demands, chronicity of injury, and intraoperative findings. In cases of severely neglected anterior elbow dislocations persisting beyond six months, joint-preserving options may no longer be feasible. Such patients may require interposition arthroplasty using fascia lata, elbow arthrodesis, or total elbow arthroplasty to restore function and alleviate pain [18][19]. These advanced interventions are typically reserved for patients with severe stiffness, joint incongruity, or degenerative changes that preclude stable reduction and meaningful motion.

Differential Diagnosis

Anterior elbow dislocations are rare and are most often identified through a combination of clinical assessment and radiographic confirmation. Nevertheless, acute elbow pain following trauma can result from a wide spectrum of injuries, many of which share overlapping clinical features. For this reason, a thorough differential diagnosis is essential to avoid misdiagnosis, delayed treatment, or inappropriate management. Careful consideration of alternative conditions is particularly important because anterior elbow dislocations are far less common than other traumatic elbow pathologies. Posterior elbow dislocation represents the most frequent type of elbow dislocation and must be carefully distinguished from anterior displacement. Posterior dislocations typically result from a fall on an outstretched hand with the elbow extended and present with a characteristic posterior prominence of the olecranon. Radiographic evaluation readily differentiates posterior from anterior dislocation by demonstrating the direction of ulnohumeral displacement. Failure to recognize the correct dislocation pattern may lead to inappropriate reduction maneuvers and increased risk of complications. Fractures around the elbow joint constitute another major category in the differential diagnosis. Radial head or neck fractures commonly occur following axial loading through the forearm and may present with pain, swelling, and restricted forearm rotation rather than gross deformity. Olecranon fractures often result from direct trauma or forceful contraction of the triceps and are associated with posterior elbow pain and loss of active extension. Distal humerus fractures, including supracondylar and intercondylar types, may mimic dislocation clinically due to swelling, deformity, and limited motion, particularly in high-energy trauma. Coronoid process fractures are especially important to identify, as they are frequently associated with elbow instability and may coexist with dislocations or ligamentous injuries [19].

Ligamentous injuries should also be considered, particularly in patients with pain and instability but without clear radiographic evidence of dislocation. Sprains or ruptures of the medial or lateral collateral ligaments can produce valgus or varus instability and may present localized tenderness and apprehension during stress testing. In some cases, elbow instability may occur without frank dislocation, especially in athletes or patients with prior elbow trauma. Tendon injuries represent additional diagnostic considerations. Distal biceps tendon rupture typically presents with anterior elbow pain, weakness in forearm supination, and a palpable defect. Triceps tendon avulsion presents with posterior elbow pain and inability to extend the elbow against resistance. Both conditions can be confused with

dislocation in the acute setting due to pain and functional limitation. Neurovascular injuries may occur in isolation or in association with osseous or ligamentous trauma. Injury to the brachial artery can present with diminished pulses or ischemic signs, while involvement of the median, ulnar, or radial nerves may cause sensory or motor deficits that require prompt recognition. Finally, soft tissue conditions such as elbow joint effusion, hemarthrosis, muscle contusion, or strain may produce pain and swelling without structural instability. Accurate differentiation among these conditions requires integration of the injury mechanism, meticulous physical and neurovascular examination, and appropriate imaging. Plain radiographs form the initial diagnostic modality, with computed tomography or magnetic resonance imaging reserved for complex injuries or equivocal findings. This comprehensive approach ensures precise diagnosis and guides optimal management [18][19].

Prognosis

The long-term outcome following an anterior elbow dislocation largely depends on the complexity of the injury, the presence of associated fractures, and the duration of immobilization. Among the most frequently reported sequelae is the loss of terminal extension, which is a limitation in the final degrees of elbow straightening. Patients with simple anterior elbow dislocations, without associated fractures or ligamentous compromise, generally have a favorable prognosis. These individuals often regain a full range of motion after structured rehabilitation, provided that early mobilization is initiated and no complications arise [20]. Conversely, patients with complex anterior elbow dislocations, particularly those associated with fractures, soft tissue damage, or neurovascular involvement, are more likely to experience persistent limitations. Immobilization extending beyond three weeks contributes significantly to decreased elbow mobility and the development of stiffness. Even with optimal care, the loss of 10° to 15° of terminal extension is commonly observed. This limitation can affect functional tasks requiring full extension, such as reaching or lifting objects, and may persist indefinitely if early intervention is not implemented [20]. Neurovascular injuries further influence prognosis. Patients who sustain median or ulnar nerve neuropraxia may experience delayed recovery of motor and sensory function, though most neuropraxias resolve over time with conservative management. However, cases involving nerve entrapment, particularly in association with fractures, may require surgical intervention to optimize functional outcomes. The integrity of collateral ligaments also plays a role; persistent ligamentous insufficiency can lead to chronic instability, increasing the risk of redislocation and long-term functional impairment [20]. Overall, prognosis improves with early recognition, prompt reduction, careful neurovascular monitoring, and timely initiation of rehabilitation. Early intervention mitigates the risk of prolonged stiffness, preserves joint congruity, and enhances functional recovery. In patients who receive delayed treatment or present with complex injuries, outcomes are less predictable, emphasizing the importance of individualized treatment plans and close follow-up. Patients should be counseled about realistic expectations, including the potential for minor, permanent limitations in terminal extension despite successful treatment.

Complications

Anterior elbow dislocations share many complications with other forms of elbow dislocation, with heterotopic ossification and post-traumatic stiffness being among the most common. Heterotopic ossification refers to abnormal bone formation within periarticular soft tissues, which can develop when immobilization extends beyond three weeks. This process often contributes to reduced joint mobility, particularly limiting terminal extension. Structured physical therapy focusing on progressive range-of-motion exercises can help prevent or minimize the functional impact of stiffness, although complete recovery of extension may not always be achievable [21]. Persistent elbow instability is another frequently encountered complication. Varus instability is particularly common due to insufficiency or rupture of the lateral collateral ligament. Clinically, instability may manifest as discomfort, apprehension, or recurrent subluxation during motion. Management may initially include splinting in pronation to offload the lateral ligament; however, persistent instability or high functional demands may necessitate surgical repair to restore mechanical stability [20]. Neurovascular compromise is a critical concern following anterior elbow dislocation. The ulnar, median, and radial nerves are most vulnerable, with ulnar neuropraxia being the most frequent. Median nerve involvement occurs less commonly but may be aggravated by concomitant fractures causing entrapment, which often requires surgical exploration. Most neuropraxias resolve with observation, though persistent deficits require careful monitoring. Brachial artery injury is rare, typically associated with open or severe fracture-dislocations. Restoration of pulses usually occurs following reduction; failure to restore perfusion warrants immediate surgical evaluation to prevent ischemic complications [22]. Other complications may include residual pain, recurrent dislocation, chronic joint laxity, and post-traumatic arthritis. Recognition and management of these complications depend on prompt reduction, careful post-reduction monitoring, and adherence to rehabilitation protocols. Awareness of potential complications informs prognostic counseling and guides the multidisciplinary care approach.

Postoperative and Rehabilitation Care

Early rehabilitation is essential to restore elbow function and optimize long-term outcomes

following anterior elbow dislocation. Evidence consistently demonstrates that initiating range-of-motion exercises soon after reduction is associated with improved recovery, while immobilization beyond three weeks increases the risk of stiffness and painful restriction of motion [23]. Early interventions focus on preventing joint contractures, maintaining muscle tone, and restoring functional mobility. Rehabilitation typically progresses in stages. Initial exercises include controlled flexion and extension of the elbow, wrist mobilization to prevent stiffness in adjacent joints, and hand grip strengthening to maintain distal function. Forearm pronation and supination are incorporated to restore rotational movements, while isometric biceps curls and progressive triceps extension exercises support periarticular muscle strength without compromising healing tissues [24]. The intensity and complexity of exercises are gradually increased based on the patient's tolerance and joint stability, with guidance from a physical or occupational therapist experienced in upper extremity rehabilitation. Effective rehabilitation relies on a coordinated, multidisciplinary approach. Therapists must communicate progress and challenges to the orthopedic team, ensuring exercise plans align with healing status and any surgical repairs. Patient adherence and understanding of the rehabilitation plan are equally important, as compliance directly affects functional recovery. The ultimate goals are to restore a functional range of motion, maintain strength, prevent recurrent instability, and enable independent performance of daily activities.

Patient Education

Patient education is crucial in preventing long-term functional deficits following anterior elbow dislocation. Patients should understand that elbow stiffness is a common sequela and that active participation in rehabilitation significantly influences outcomes. Education should emphasize the difference between normal and functional range of motion: normal elbow motion extends from 0° to 150°, whereas functional elbow motion typically spans 30° to 130° [25]. Patients should be encouraged to achieve at least the functional range to maintain independence in activities of daily living. Education should also address adherence to prescribed exercises, precautions to avoid re-injury, and recognition of signs of complications, including persistent swelling, numbness, or instability. Counseling on realistic expectations, particularly for patients with complex injuries or prolonged immobilization, helps align recovery goals and reduces frustration during rehabilitation [25].

Enhancing Healthcare Team Outcomes

Effective management of anterior elbow dislocations relies on coordinated interprofessional care. Emergency clinicians or orthopedic surgeons perform reduction while excluding fractures, compartment syndrome, or neurovascular compromise. Nurses monitor post-reduction status, provide education, and ensure safe discharge planning. Physical and occupational therapists guide rehabilitation, emphasizing joint mobility, muscle strengthening, and functional recovery. Pharmacists optimize pain and anti-inflammatory management. Structured communication, including thorough documentation, handoffs, and follow-up planning, ensures all team members remain informed. Ethical considerations include engaging patients in shared decision-making and emphasizing adherence to therapy. When teams operate cohesively, patients benefit from improved safety, reduced complications, accelerated functional recovery, and enhanced long-term outcomes.

Conclusion:

Anterior elbow dislocation represents a rare but clinically significant orthopedic injury that requires a high index of suspicion for accurate diagnosis. Unlike the more common posterior elbow dislocation, the anterior variant typically occurs following high-energy trauma and is frequently associated with fractures, ligamentous disruption, and potential neurovascular compromise. These factors contribute to the complexity of management and underscore the importance of early and precise evaluation. Radiographic imaging plays a central role in confirming the diagnosis, assessing joint alignment, and identifying associated injuries that influence treatment decisions. Prompt closed reduction remains the primary intervention in acute cases and is essential for relieving pain, restoring joint congruity, and preventing secondary neurovascular injury. Post-reduction assessment of joint stability and neurovascular status is crucial, as residual instability or associated fractures often necessitate surgical intervention. Equally important is early initiation of rehabilitation. Evidence consistently demonstrates that prolonged immobilization leads to stiffness, loss of terminal extension, and diminished functional outcomes. A structured, multidisciplinary approach involving orthopedic surgeons, rehabilitation specialists, nurses, and patients themselves is fundamental to recovery. With early recognition, appropriate intervention, and adherence to rehabilitation protocols, most patients can achieve satisfactory functional outcomes, although mild residual limitations in range of motion may persist. This highlights the need for patient education, realistic expectations, and diligent follow-up care.

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