

## Abstract:

Joint dislocations occur in the pediatric population and frequently present to the emergency department. Varying degrees of skeletal maturity and the differences of each individual joint mean that management of dislocations requires a unique set of skills. A thorough understanding of classification systems and anatomy is necessary for effective communication with orthopedic consultants as well as in avoiding pitfalls. Knowledge of the likely mechanisms of injury involved can aid in a targeted evaluation and correct diagnosis. Emergency department management, follow-up, and potential complications are all important for the emergency care provider to effectively treat these injuries. Dislocations of the shoulder, elbow, hip, knee, and patella are among the most commonly encountered injuries in children and are reviewed here.

## Keywords:

Orthopedics; Injury; pediatrics; shoulder dislocation; elbow dislocation; hip dislocation; knee dislocation; patella dislocation

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# Joint Dislocations in the Pediatric Emergency Department

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Orthopedic injuries are among the most common reasons for emergency department (ED) presentation in the pediatric population. Although joint dislocations constitute only a fraction of these injuries in children, the ED care provider must be familiar with their presentation, evaluation, and management. The anatomy and physiology of the pediatric skeleton present unique challenges, with high risk for injury to the physis and potential growth impairment. In this article, we will review the epidemiology, anatomy, evaluation, and management of pediatric joint dislocations in the ED.

## SHOULDER DISLOCATION

### Demographics

Between the first and second decades of life, the incidence of shoulder dislocation rises from 0.9 to 39.7 per 100 000.<sup>1-3</sup> With advancing age, these injuries tend to occur progressively disproportionately in males, with an incidence ratio of 2.64. Sports-related injuries are the most common cause, typically football, basketball, and hockey, accounting for 48 to 57% of all dislocations.<sup>4-8</sup> In pediatric patients, 14% of dislocations are considered atraumatic, caused by a force not expected to dislocate a shoulder, as compared with 1% in adults.<sup>8</sup>

### Anatomy

The glenohumeral joint is one of the most mobile joints in the body, an allowance made at the expense of stability. The glenoid

articulates only minimally with the humeral head in any given position, with the glenoid labrum contributing 50% of the total depth of the joint, serving to stabilize the humeral head by forming a seal around it. Other static and dynamic stabilizers include the joint capsule, anterior and posterior glenohumeral ligamentous complexes, and the muscles of the rotator cuff.<sup>9</sup>

### Classification

The humerus can become displaced from the glenoid in the anterior, posterior, and inferior directions. True dislocation occurs when the surfaces of the humeral head and glenoid fossa are completely out of contact, in contrast to subluxation in which some point of contact remains between them.

### Mechanism and Presentation

Anterior glenohumeral dislocation constitutes 95% of all shoulder dislocations and is most commonly caused by a force applied to the abducted, externally rotated, and extended arm, or alternatively a blow to the posterior humerus or fall onto an outstretched hand.<sup>10</sup>

Posterior dislocations are 15 to 20 times less common than anterior dislocations.<sup>11</sup> They are traumatic in approximately two thirds of cases, caused by a blow to the anterior shoulder or axial loading of an adducted and internally rotated arm. They can also be due to violent contractions of the internal rotator muscles during seizure or electrocution.

The clinical presentation of each type of dislocation will vary; but in every instance, a full neurovascular examination is crucial, with emphasis on the axillary nerve, brachial plexus, and distal perfusion of the affected limb. Examination of an anteriorly displaced shoulder will demonstrate a slightly abducted and externally rotated arm. Range of motion (ROM) will be limited in internal rotation, and the patient will be resistant to active and passive movement. Prominence of the acromion will be apparent, with loss of the normal rounded appearance of the shoulder and fullness of the deltopectoral groove (Figure 1).<sup>10,12</sup> Examination findings in posterior dislocation can be subtle in comparison, and this, along with an atypical history, results in delayed recognition in 50 to 79% of patients.<sup>11</sup> For example, ROM may be relatively preserved and humeral displacement less grossly apparent. Usually, the patient holds the arm in adduction and internal rotation and is unable to externally rotate. Physical examination will demonstrate prominence of the posterior shoulder with flattening anteriorly and prominence of the coracoid process. Posterior



**Figure 1.** Anteriorly dislocated shoulder.

displacement of the humeral head will most often result in its impaction onto the glenoid rim.<sup>13</sup>

### Inferior Dislocation

Inferior dislocation, or "luxatio erecta," occurs in approximately 0.5% of cases of shoulder dislocations and is caused by forceful hyperabduction of the arm or axial loading with the arm fully abducted, for example, a person falling and grasping an object above his head. On examination, the patient will hold the arm above his head, unable to adduct. Fully 80% of these patients will have bony or soft tissue complications, and 60 % will have neurological involvement.<sup>14</sup> These are also the most likely shoulder dislocations to have associated arterial damage, with absent radial pulse apparent in 3% of cases.

### Imaging

Plain film radiographs should be obtained pre-reduction and postreduction (Figure 2A and B). Prereduction radiographs should include anteroposterior (AP) and lateral views, as well as 1 additional view. The lateral view will show the direction of the displacement and can be especially helpful in minimally displaced dislocations.<sup>12</sup> The use of 3 views improves the detection rate considerably.<sup>1,3,11,12,15,16</sup> The outlet ("Neer's") view visualizes the base of the coracoid and acromial vault, whereas the apical oblique ("Garth's") view shows posterosuperior Hill-Sachs lesions and allows evaluation of the anterior part of the glenoid.<sup>12</sup> The scapular Y view is used commonly but requires painful positioning of the affected shoulder. A postreduction AP radiograph should be obtained to verify replacement of the humeral head and to identify any fractures missed on initial imaging.<sup>12</sup>

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