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Nursemaid's Elbow Reduction

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ABSTRACT
Nursemaid's elbow, also known as radial head subluxation, is a common childhood orthopedic injury that can easily be diagnosed and reduced by the advanced practice nurse. It is most common in children 1–4 years of age and typically occurs as the result of a pulling mechanism on an outstretched arm. This leads to subluxation of the radial head at the annular ligament. The child subsequently refuses to use the affected arm, leading the caregiver to present for evaluation. This article explores epidemiology, pathophysiology, clinical presentation, reduction techniques, and parent education.
Key words: annular ligament, nursemaid's elbow, pediatric, pulled elbow, radial head, reduction, subluxation

NURSEMAID'S ELBOW, also known as radial head subluxation (RHS), pulled elbow, or temper-tantrum elbow, is a common pediatric orthopedic injury. Nursemaid's elbow classically occurs when there is a pulling mechanism on a child's outstretched arm but can also occur from other mechanisms such as falls, playing rough, or getting dressed (Rudloe, Schutzman, Lee, & Kimia, 2012). Axial traction on a pronated forearm is the most common documented mechanism (Ulici, Herdea, Carp, Nahoi, & Tevanov, 2019). Generally, the child will report pain in the forearm, refuse to use the affected extremity, holding it in a position of comfort at the side with the elbow flexed and wrist pronated, without evidence of swelling or deformity (Ulici et al., 2019). Commonly, the situation culminates in an emergency department or office visit with chief complaint of "they won't use their arm" and parental concern for fracture or some other injury.

Nursemaid's elbow is a clinical diagnosis and typically does not require radiographs or involve adverse sequelae. Prompt recognition of RHS and manual reduction via either hyperpronation or supination–flexion maneuvers lead to regained function of the arm and relief of pain. This article explores epidemiology, pathophysiology, clinical presentation, physical examination findings, management and reduction techniques, parent education, and follow-up.

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EPIDEMIOLOGY

Nursemaid's elbow is the most common pediatric upper extremity injury and results in over 20,000 emergency department visits in the United States annually (Pirruccio, Weltsch, & Baldwin, 2019). Nursemaid's elbow occurs most commonly among children 1–4 years of age (Vitello, Dvorkin, Sattler, Levy, & Ung, 2014). The mean patient age experiencing RHS was found to be 27 months in a study by Schunk (1990) and 28.6 months by Vitello et al. (2014). Several theories exist for the increased incidence in this younger age group, including that children in this age range are more likely to have an arm pulled by a parent, have a smaller radial head in relation to the shaft, and the annular ligament in children is thinner (Vitello et al., 2014). Affected age ranges have been documented as young as under 6 months and as old as 11 years (Schunk, 1990; Vitello et al., 2014). Studies have shown a slight predominance in females at 59% (Schunk, 1990; Vitello et al., 2014). It is unclear whether this is related to behavioral or anatomic differences. The left arm is more frequently involved, thought to be related to most adults being right handed and holding the child by the left hand and the faster development of muscle strength in the child's dominant right arm helping prevent injury (Irie, Sono, Hayama, Matsumoto, & Matsushita, 2014; Vitello et al., 2014). Most patients with RHS were found to be above the 75th percentile for weight (Vitello et al., 2014). Recurrence of RHS is common, occurring in about 25% of patients (Wong, Troncoso, Calello, Salo, & Fiesseler, 2016).

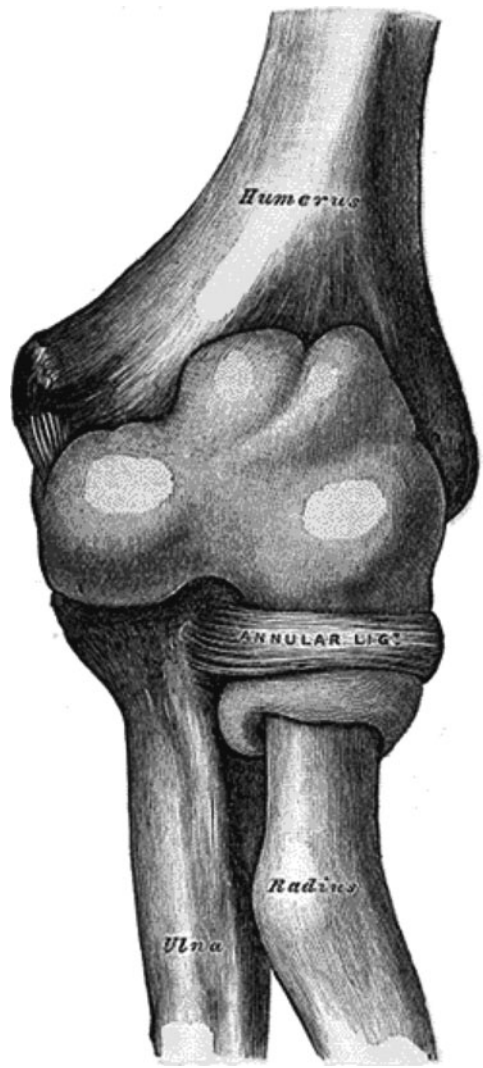

Figure 1. Elbow anatomy depicting annular ligament.

PATHOPHYSIOLOGY

The radial head is surrounded by the annular ligament, which helps keep the radius in place during forearm rotation (see Figure 1). In children, this ligament can have some laxity up until about the age of 6 years when it thickens (Pirruccio et al., 2019). Additionally, the radius of children has a shape similar to a pole, without a head or neck, up until about 7 years of age, making it prone to easy dislocations (Irie et al., 2014). When subjected to axial traction with the wrist pronated and elbow extended (a common hand-holding position), the radial head slips through the annular ligament (subluxation), causing the ligament to become entrapped in the radiohumeral joint (Ulici et al., 2019). This subluxation leads to pain and limited range of motion.

CASE STUDY

A 2-year-old boy presents to the emergency department with his parents with chief complaint of "arm pain." Parents report he was playing on the edge of the couch, and as he was about to fall, father grabbed him by the left wrist to break his fall. This prevented him from striking the ground and he immediately cried. They initially attributed the crying to him being scared but realized over the past few hours he was not using his left arm. When they would touch or manipulate the arm, he seemed to have some pain they think was either in his elbow or wrist. They deny any bruising or swelling. He has not had any prior orthopedic injuries. He is calm and in no distress in the examination room, holding his left arm in a neutral position in his lap. On examination there are no obvious external signs of trauma. The extremity is warm and well perfused. He will use his hand to grasp things but does not reach up to grab a toy he is interested in and tries to do so with the unaffected arm instead. He is hesitant with examination of the left arm and seems to wince some with palpation of the elbow over the radial head.

CLINICAL PRESENTATION

Classic presentations for nursemaid's elbow involve a parent pulling on a child's arm, generally to protect them or during play. A parent may have been playing with the child, swinging them by the arms, and then notices that they are not using the arm afterwards. Another common history is an adult or older child was holding the child by the hand and either pulled them away from a potentially dangerous situation or the child drops away from an adult that is holding their hand during a temper-tantrum, causing the pulling mechanism and subsequent refusal to use the extremity.

Although axial traction is considered the classic and most common mechanism of injury, it is not universal (Wong et al., 2016). Nonpull mechanisms of RHS include falls, rolling over in bed with the arm caught, wrestling or rough play, dancing, and sometimes the mechanism remains unknown (Rudloe et al., 2012). It is important to take a thorough history and ensure the mechanism of injury is consistent with nursemaid's elbow. If the history or examination is not consistent with RHS, or if significant swelling, ecchymosis, or deformity is present, fracture or other etiology should be considered. Fracture of the elbow or forearm would be the primary differential diagnosis the nurse practitioner should consider. Additionally, any time a child presents with an orthopedic injury, the nurse practitioner should be sure to rule out nonaccidental trauma as a possible differential.

Children with RHS are typically in no distress, although they may be somewhat anxious in the examination environment depending on age. The affected arm is typically held at the side, in a pronated position with the elbow flexed. The child will refuse to use the arm and often expresses pain with movement or manipulation of the elbow (Ulici et al., 2019).

Allowing the child to sit in the parent's lap can lead to improved cooperation and a better examination. If the child is fussy, one can evaluate the unaffected arm first to be better able to discern pain during examination of the affected extremity. Additionally, one can ask the parent to palpate the extremity to determine whether crying is indicative of pain versus anxiousness with examination. The examination should include palpation of the entire extremity, from the clavicle down. Offering a toy or some other desired item they must reach for can also help evaluate range of motion and pain. Anticipated physical examination findings may involve some tenderness upon palpation of the radial head but no obvious signs of trauma such as significant edema, deformity, or ecchymosis.

DIAGNOSTICS

Imaging is not typically necessary if the history is consistent with RHS. Wong et al.

(2016) report many clinicians advocate that radiographs should be reserved for atypical cases or suspected fractures. The patient history is typically sufficient to diagnose and treat with closed reduction as long as there is no clinical suspicion for fracture (Pirruccio et al., 2019). The presence of swelling, ecchymosis, deformity, or severe pain with examination should lead the clinician to order radiographs prior to any reduction attempt to rule out fracture. Additionally, if initial reduction attempts of presumed RHS are not successful, it would be prudent to obtain imaging to rule out other causes of arm pain and decreased mobility.

TREATMENT

A simple closed reduction maneuver typically resolves most cases of RHS. Providing analgesia with ibuprofen upon patient arrival and before reduction can help reduce procedural pain. Parents should also be provided education on suspected RHS and anticipatory guidance on treatment. The two most commonly utilized reduction techniques will be discussed here. They include hyperpronation (HP) and supination–flexion (SF). Multiple studies have shown HP to be superior to SF in regard to first attempt success (Bexkens, Washburn, Eygendaal, van den Bekerom, & Oh, 2017; Makin & Vison, 2017; Spiegel & Kleist, 2018).

Hyperpronation involves one hand holding the elbow applying firm pressure to the radial head and the other hand holding the distal forearm (Ulici et al., 2019). The forearm is then rotated inward (pronated) with the child's thumb pointing downward (Bexkens et al., 2017) (see Figure 2 and Video, Supplemental Digital Content, available at: http://links.lww.com/AENJ/A41). Supination–flexion is done by holding the elbow and wrist in the same manner and then outwardly rotating (supinating) the forearm (see Figure 3) followed by flexion of the elbow as shown in Figure 4 (Bexkens et al., 2017). Success of either reduction method is predicted by a click (Schunk, 1990). This

Figure 2. Hyperpronation technique.

click is typically felt over the radial head and indicates that the radial head has reentered the annular ligament (Ulici et al., 2019).

Bexkens et al. (2017) completed a systematic review and meta-analysis comparing SF

Figure 3. Spination-flexion technique. Step 1 Supination.

Figure 4. Supination-flexion technique. Step 2 Flexion.

and HP maneuvers in reduction of RHS and found the HP technique more effective than the SF maneuver in manually reducing RHS in young children. Makin and Vinson (2017) suggested HP as the preferred first reduction attempt of RHS followed by either HP or SF if there was failure of first attempt and suggest attempts should be separated by 10–15 min. Ulici et al. (2019) found HP to be more successful than SF and suggested it be used as a first reduction maneuver in treating RHS. A 2017 Cochrane review of manipulative interventions for reducing RHS included nine trials, eight of which compared SF to pronation, and found that the pronation method may be more successful in first attempt reduction of RHS. However, it cited methodological limitations and concluded that the evidence was of low quality (Krul, van der Wouden, Kruithof, van Suijlekom-Smit, & Koes, 2017).

Reduction may be deemed successful when the child begins to use the affected extremity. This typically occurs within 10 min of reduction but can be longer. Some studies have related this to length of time from subluxation to reduction (Schunk, 1990). There is no need for immobilization or sling after reduction. While not harmful, there is typically no need for ongoing oral analgesia or supportive care with ice after successful reduction. Patients may return to regular activity as tolerated.

COMPLICATIONS

The most common complication of RHS is recurrence and this should be discussed with parents. Preventative measures include educating parents on not pulling the child by the arm. If left untreated, RHS may lead to functional disability of the elbow; thus, it is important to recognize this diagnosis and appropriately reduce the radial head to its proper anatomic position in a timely manner (Miswan, Othman, Effendi, Ibrahim, & Rozali, 2017). Indications for referral include inability to reduce a suspected nursemaid's elbow with negative radiographs. Should this occur, the limb may be splinted and outpatient orthopedic referral provided.

DISCHARGE EDUCATION

Parents should be educated on the cause of injury and risk of recurrence. If the injury was caused by the parent, they will often feel guilty and should be given reassurance that this is a common childhood injury. No specific follow-up care is necessary unless recurrence is suspected. Complications are rare. Given the increased risk of recurrence, parents may be educated on reduction maneuvers that they may use at home should the injury recur. However, this is not discussed well in the literature.

CONCLUSION

Radial head subluxation, or nursemaid's elbow, is a common pediatric orthopedic complaint that typically presents with the classic story of a pull mechanism on an

outstretched arm, although other mechanisms can also cause this injury. The peak age of incidence is 27–28 months, with the left arm more often affected and females more commonly than males. The diagnosis is clinical and after obtaining a thorough history and doing a physical examination to ensure there is no risk of a possible fracture, the injury can be reduced with a simple hyperpronation or supination–flexion maneuver. Radiographs are not typically indicated unless there is clinical suspicion for fracture. Hyperpronation has been found to be superior in successful first reduction attempt and less perceived pain as compared with supination–flexion. Recurrence is common and parents should be provided education on preventative measures to avoid future recurrence. No specific follow-up is indicated after successful reduction, which is indicated by return of mobility.

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