The pulled elbow: a review article
DJ Broomfield and I Maconochie
Trauma 2004; 6: 255
DOI: 10.1191/1460408604ta319oa

The online version of this article can be found at:
http://tra.sagepub.com/cgi/content/abstract/6/4/255

Published by:
SAGE Publications
http://www.sagepublications.com

Additional services and information for Trauma can be found at:

Email Alerts: http://tra.sagepub.com/cgi/alerts

Subscriptions: http://tra.sagepub.com/subscriptions

Reprints: http://www.sagepub.com/journalsReprints.nav

Permissions: http://www.sagepub.com/journalsPermissions.nav

Citations (this article cites 5 articles hosted on the SAGE Journals Online and HighWire Press platforms):
http://tra.sagepub.com/cgi/content/abstract/6/4/255#BIBL
The pulled elbow: a review article

DJ Broomfield\textsuperscript{a} and I Maconochie\textsuperscript{b}

The pulled elbow is the most common dislocation in childhood and as such represents a significant proportion of childhood injuries presenting to an accident and emergency department. In this article, we bring together the available research in discussing its pathophysiology, diagnosis, investigations and management.

Key words: pulled elbow; upper limb dislocations in childhood

Introduction

The pulled elbow is the most common dislocation of childhood (Broadhurst and Buhr, 1959) and has been long recognized; Hippocrates and Celsus according to Van Arsdale had ‘referred to the matter’ (Van Arsdale, 1889).

Definition

Fournier first defined the pulled elbow in 1671 as ‘an incomplete dislocation by elongation of the radius with a resultant separation of the joint surfaces’ (Fournier, 1671). Duverney (1751) described the escape of the radial head below the annular ligament, associated with a tear of the annular ligament.

Although ‘pulled elbow’ is the most commonly used term, the other synonyms used reflect either the mechanism of injury (nursemaids elbow, temper tantrum elbow), the aetiology (subluxation of the head of the radius) or the symptomalogy (painful pronation, La Pronazione Dolorosa) (Siliquini, 1963), as well as a number of eponyms (Goyrands injury, Malgaignes injury) (Malgaigne, 1847).

Incidence

In St Mary’s paediatric accident and emergency department in the first year of opening, there were 101 cases of pulled elbow out of a total of approximately 16 500 attendances; Salter and Zaltz (1971) reported 112 cases in a year in Toronto Sick Children’s hospital (this was not given as a proportion of the total number of children seen). Snellman (1959) reported 1000 cases over a period of 12 years and Jongschaap et al. (1990) reported an annual incidence of 1.2%, 162 children from a population presenting to accident and emergency of 13 500.

Both Illingworth (1975) and Salter and Zaltz (1971) pointed out that as pulled elbow can resolve spontaneously, the true incidence may not be reflected by considering the literature based on children presenting to hospital.

There is a peak incidence in the 1–3-year age group, the injury being uncommon in the over fives (Illingworth, 1975); there are case reports (Newman reported it in three cases) in children under the age of six months (Newman, 1985). It has been described in the literature in an adult patient (Adeniran and Merriam, 1994) but pulled elbow cannot be produced in adult cadaveric studies (Salter and Zaltz, 1971).

There is not a clear gender difference in the incidence; some authors have found it to be more common in boys (Salter and Zaltz, 1971; Snellman, 1959) and others in girls (Illingworth, 1975; Jongschaap...
et al., 1990); all agreed that it is more frequent in the left arm.

**Mechanism of injury**

There is sudden traction of the hand or the forearm, when the elbow is extended and the forearm pronated. This can occur when an adult is holding the child’s hand and the child pulls away, if the child is picked up or swung by the arm or if the child’s arm is suddenly snatched.

**Pathophysiology**

Studies replicating the pathophysiology in cadavers (Salter and Zaltz, 1971; Stone, 1916) have shown that pulled elbow only occurs when the arm is in a certain position. The radial head is larger in diameter than the radial neck and is oval. The head differs by approximately 1 mm between the sagittal and the coronal diameters. The annular ligament is weakly attached to the periosteum of the radial neck in under five-year olds; this attachment is much stronger in older children hence its infrequent occurrence.

When traction is applied to the supinated forearm, owing to the increase in the contour of the anterior aspect of the radial head and neck, the annular ligament is unable to ride over the radial head, as a result it rucks up against the anterior aspect of the radial head; in cadaveric studies pulled elbow with the arm in supination was not (Salter and Zaltz, 1971) replicable. When traction is applied to the forearm in pronation, there is a partial tear of the annular ligament; as the radius continues to be pulled, the head slips partially through the tear. The proximal portion of the annular ligament then becomes interposed between the radial head and the capitellum (Figure 1). If the annular ligament does not pass beyond the equator of the radial head it can be reduced by supination. However, if it does (an effect known as ‘button holing’) then the elbow cannot be reduced.

**History**

There is usually a history of sudden traction on the child’s hand or arm, this may be associated with an audible click. The child will usually cry out in pain, appear in obvious discomfort and will be reluctant to use the affected arm. The pain may be poorly localized or be localized to another joint in the upper limb (Illingworth, 1975).

**Examination**

The child usually carries the arm limply, holding it pronated and extended. There may be point tenderness over the anterolateral aspect of the radial head; however, the pain may be poorly localized and therefore a full examination of the upper limb must be performed including the clavicle, shoulder and wrist as well as the

*Trauma* 2004; 6: 255–259
elbow itself. On examination the child will resist attempts at supination of the forearm. Hypermobility occurs more frequently in children with pulled elbow compared to the general population (Amir et al., 1990).

**Investigation**

The diagnosis is a clinical one and with a clear history, X-rays are superfluous. X-rays are only useful to exclude fracture around the elbow in cases of diagnostic uncertainty, but it should be noted that fractures of the upper limb occur in 6% of patients presenting with suspected pulled elbow (Kaplan and Lillis, 2002).

X-ray studies have been carried out in patients with a pulled elbow (Mehara and Bahn, 1995). Mehara

---

**Figure 2**  Supination method of reduction of pulled elbow

**Figure 3**  Pronation method for reduction of pulled elbow

*Trauma* 2004; 6: 255–259
described ‘the proximal radial length’ which is the distance between two lines, the first line joining the margins of the proximal radial epiphysis and the second being at the level of the prominent point of the coronoid. This study showed that the proximal length was increased prior to manipulation, returning to normal afterwards. One caveat is that manipulation of the forearm in obtaining an X-ray might in itself be curative.

Ultrasound has also been used in the diagnosis by comparing the radiocapitellar distance on the affected and the normal sides (Kosuwon et al., 1993).

**Treatment**

There are two main techniques: supination and pronation.

**Supination**

Explain the procedure to the parents and obtain the child’s confidence. Hold the child’s hand or wrist with one hand. The other hand supports the elbow and simultaneously palpates the radial head. The wrist should then be supinated and the elbow extended at

![Algorithm for the management of pulled elbow (Sankar, 1999)](Image)

**Figure 4** Algorithm for the management of pulled elbow (Sankar, 1999)

*Trauma* 2004; 6: 255–259
the same time. Then the elbow is flexed with maintaining the forearm in supination (Figure 2).

**Pronation**

The wrist is pronated and the elbow is extended together, after which the elbow is flexed whilst maintaining the forearm in pronation (Figure 3).

The pronation technique has been reported as being more likely to be successful and less painful (Lewis).

With both techniques an audible click may be felt. In her study of 100 children, Illingworth (1975) found that 96% required only a single manipulation.

**Reasons for failure**

The commonest reasons for failure of reduction of the pulled elbow are listed in Table 1 (Kaplan and Lillis, 2002).

Occasionally a pulled elbow is irreducible and requires operative reduction. Triantafyllou (1992) described the case of a child who required open reduction of a pulled elbow as the annular ligament had become trapped between the radial head and the capitellum. The management of pulled elbow in an accident and emergency setting was summarized by Sankar (1999) in the form of an algorithm (Figure 4).

**Subsequent management**

Recurrence rates vary from 5% (Snellman, 1959) to 30% (Illingworth, 1975) and therefore all consultations should include parent education, including the risk of redislocation. For children who have recurrent dislocations, telephone consultation and reduction by the parents has been successful (Kaplan and Lillis, 2002).

**Conclusion**

This is a common condition which occurs predominantly in the preschool child. It requires a thorough history and examination to exclude other conditions but it can be managed by simple manipulation in the majority of cases.

**References**


Siliquini, PL. 1963. La pronazione dolorosa, Minerva. *Ori op 14*: 481.


*Trauma* 2004; 6: 255–259

---

**Table 1** Reasons for failed reduct–pulled elbow

<table>
<thead>
<tr>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorrect reduction technique</td>
</tr>
<tr>
<td>Local swelling</td>
</tr>
<tr>
<td>Haemorrhage around the annular ligament</td>
</tr>
<tr>
<td>Delayed presentation (&gt;12 h post injury)</td>
</tr>
<tr>
<td>Complete tear of the annular ligament</td>
</tr>
<tr>
<td>Button holing of the radial head through the annular ligament</td>
</tr>
</tbody>
</table>

© 2004 SAGE Publications. All rights reserved. Not for commercial use or unauthorized distribution.