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CASE REPORT

Irreducible pulled elbow followed with supervised neglect and ultrasonography: Two case reports

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ABSTRACT

Pulled elbow (PE) is one of the most common upper limb injuries in children. The success rate of manipulation for PE ranges from 74 to 99%, with a favorable prognosis. However, the diagnosis of PE is often determined by the typical injury pattern, and there is a lack of diagnostic certainty. In recent years, ultrasonography has been used for the diagnosis of PE; however, it is still not a commonly used modality for the diagnosis. Moreover, manual reduction of PE is often difficult, and there is no consensus on the management of the elbow when the reduction maneuver fails. Further, it is unclear whether surgery or external immobilization is necessary. We followed two cases of irreducible PE with ultrasonography without aggressive treatment such as surgery or external immobilization. Both cases were initially irreducible, but spontaneous reduction was confirmed by ultrasonography seven days after injury in one case and nine days after injury in the other case. To the best of our knowledge, this is the first report of cases of irreducible PE in which the patients were carefully followed by ultrasonography without external immobilization or other intervention, and spontaneous resolution was confirmed. Although careful follow-up is necessary as ultrasonography may show no normalization in the radiocapitellar joint immediately after reduction, supervised neglect without external immobilization could be an optional treatment for irreducible PE and reduce unnecessary surgery.

Keywords: Pulled elbow, supervised neglect, ultrasonography.

Pulled elbows (PEs) are among the most common upper limb injuries in children and are typically caused by a sudden pull on the forearm and interposition of the torn annular ligament in the radiohumeral joint.[1] The injured child usually holds the upper extremity in a pronated and extended position, refuses to move it, and may complain of pain over the wrist and elbow. The typical presentation of PE is arm pain with a history of pulled arm, and it is generally managed by a reduction maneuver without radiographic examination.[2]

The success rate of manipulation for PE ranges from 74 to 99%, with a favorable prognosis.[3-5] However, PE is often difficult to reduce manually, and rarely, surgery is required.[6-8] Conversely, some cases of PE are thought to spontaneously reduce between onset and consultation. Therefore, immediate surgery in cases that cannot be reduced is not advisable, and there are no reports on the management after the reduction maneuver fails.

In this article, we report two cases of irreducible PE that were followed with supervised neglect, a management strategy involving careful observation without external immobilization using ultrasonography (USG).

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CASE REPORT

Case 1– A four-year-old girl was admitted to the clinic with the complaint of left upper limb pain

after falling from a step. The patient underwent an X-ray examination, but no fractures or other serious abnormalities were found. The pain persisted on the following day and she avoided moving her arm. Therefore, her arm was immobilized with a splint in the pronated position, and she was referred to our hospital. The patient refused to move her left hand by herself. Anterior USG of the left elbow revealed that the annular ligament and supinator muscle were entrapped in the radiohumeral joint (Figure 1a). Ultrasonography of the right elbow revealed no inclusions in the radiohumeral joint and no swelling of the supinator (Figure 1b). The elbow could not be reduced by pronation and supination maneuvers, and the patient was supervised without elbow immobilization for one week, after which, the elbow pain spontaneously improved with no limitation in the range of motion. Anterior USG still revealed thickening of the supinator muscle, although no entrapment to the radiohumeral joint was observed (Figure 1c). Written informed consent was obtained from the parent of the patient.

Case 2– A three-year-old girl experienced pain in the left upper limb and stopped moving it after her mother pulled her left hand. She visited a nearby clinic and no obvious abnormalities were found on the X-ray examination on her left elbow. She was diagnosed with PE and manipulation was performed; however, there was no improvement. The next day, the patient's symptoms did not improve, and she was referred to our hospital two days after the injury with her left arm immobilized with a splint. Her left forearm was pronated, and she did not attempt to move it due to pain. Anterior USG showed an entrapped supinator, confirming the diagnosis of PE (Figure 2a). Ultrasonography of the right elbow revealed no inclusions in the radiohumeral joint and no swelling of the supinator (Figure 2b). The patient underwent pronation and supination maneuvers, but no reduction was achieved. She was subsequently managed with supervised neglect without any immobilization. Four days later, the pain and limitation of the range of motion improved, and USG revealed no entrapment of the supinator muscle in the radiohumeral joint (Figure 2c), but the swelling in the muscle persisted. One week later, the swelling also significantly improved (Figure 2d). Written informed consent was obtained from the parent of the patient.

We followed the two cases for a short-term period, as we did not consider that long-term follow-up was necessary due to the characteristics of the disease.

DISCUSSION

The usual pathophysiological mechanism of a PE involves longitudinal traction on the arm while the elbow is extended with the forearm pronated. Salter and Zaltz[1] reported that a sudden traction on the extended and pronated arm produces a transversal tear in the distal attachment of the annular ligament to the neck of the radius that allows the radial head to temporally migrate distally and slide through the tear.

Hyperpronation or supination-flexion maneuvers are used for reduction. Kimura[9] reported that the supinator muscle plays a very important role in reduction in both maneuvers. The success rate of manipulation for PE is between

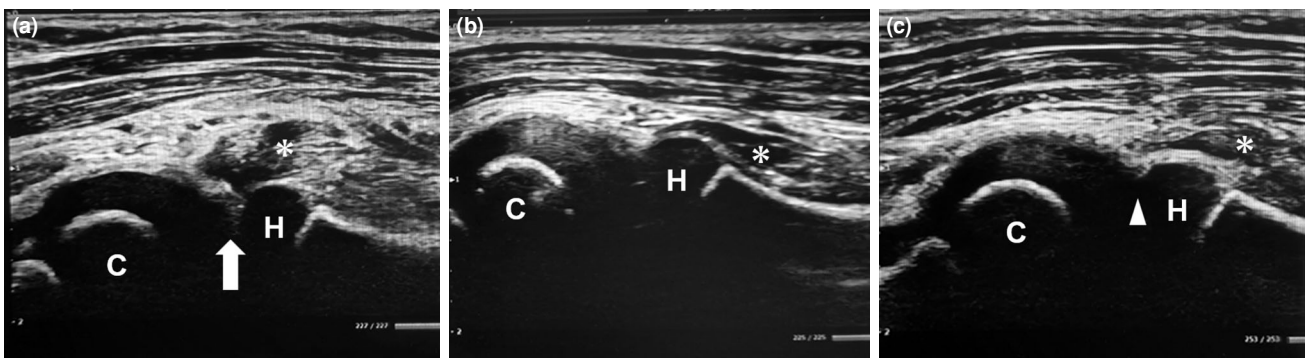


FIGURE 1. (a) Ultrasonographic findings of the left elbow at initial examination. The supinator muscle (*) is entrapped in the radiohumeral joint, and the joint space is enlarged (white arrow). **(b)** Ultrasonographic findings of the right elbow. No inclusions in the radiohumeral joint and no swelling of the supinator muscles are noted. **(c)** Ultrasonographic findings of the left elbow one week after initial examination. The joint space enlargement has resolved (white arrow head).
C: Capitellum; H: Radial head; * Supinator muscle.

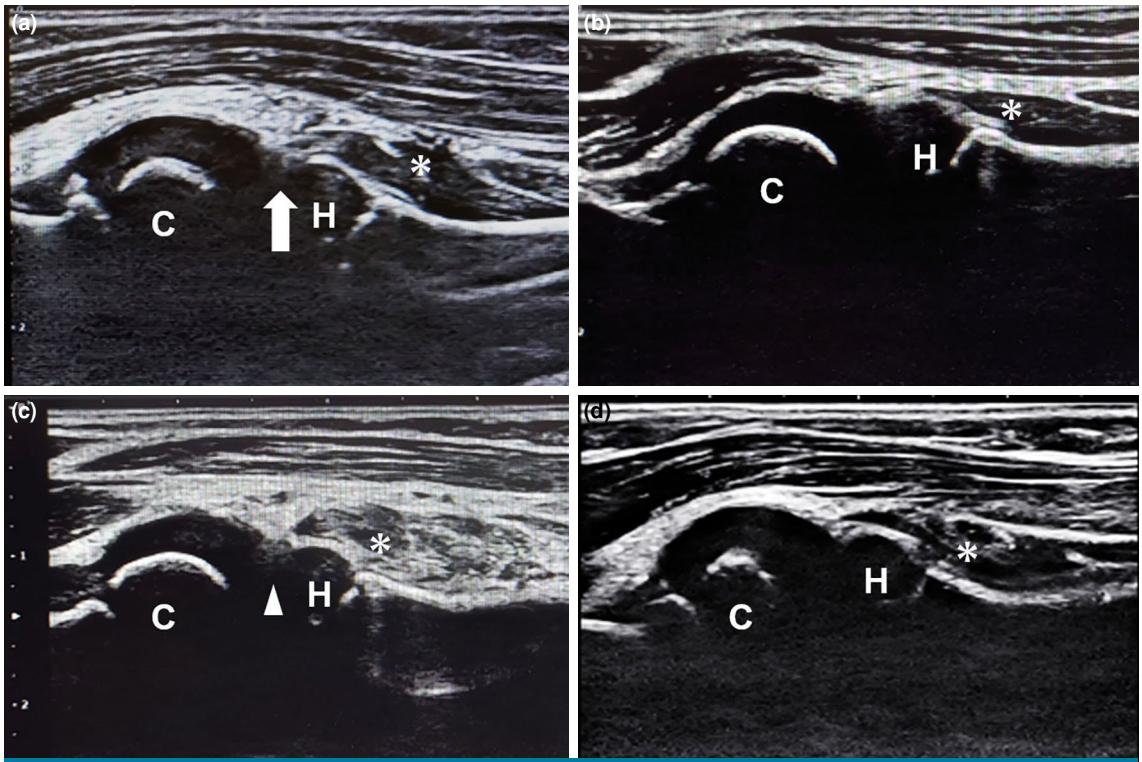


FIGURE 2. (a) Ultrasonographic findings of the left elbow at initial examination. The supinator muscle (*) is swollen and entrapped in the radiohumeral joint, and the joint space is enlarged (white arrow). **(b)** Ultrasonographic findings of the right elbow. No inclusions in the radiohumeral joint and no swelling of the supinator muscles are noted. **(c)** Ultrasonographic findings of the left elbow 4 days after initial examination. The joint space enlargement has resolved (white arrow head), but the supinator muscle is still swollen. **(d)** Ultrasonographic findings of the left elbow 11 days after initial examination. The swelling has significantly improved.
C: Capitellum; H: Radial head; * Supinator muscle.

74 and 99%, but occasionally fails, and in rare cases, surgery is required.

However, a PE often heals spontaneously between the time of injury and medical examination. Further, although there is a report stating that immobilization with supination for a few days after manual reduction reduces the recurrence rate,[10] there is no report on its necessity before manipulation or on the optimal method of managing the elbow when the reduction maneuver fails. In other words, there is no consensus regarding the need for external immobilization until the reduction is performed.

Both patients in the current report were allowed a certain degree of movement under supervised neglect without external fixation; the permitted movement provided the necessary force for spontaneously reducing the elbow. Although we have not compared the results of our cases with those with elbow immobilization, our two cases demonstrated that, even in irreducible PE that cannot be treated by manual reduction, spontaneous reduction can be achieved with supervised neglect alone, without external immobilization. Rather, performing surgery immediately for irreducible PE may lead to overtreatment.

The diagnosis of PE is typically based on typical injury pattern and clinical findings, but X-ray examinations should also be considered to rule out differential diagnoses such as fractures or abuse trauma.[11] On the other hand, the use of USG for the diagnosis of elbow injuries has increased, and its usefulness has been highlighted in recent years.[12-16] Lee et al.[17] reported the "hook sign," an USG finding characteristic of PE, with 100% specificity.[17,18] However, only a few studies have reported the USG evaluation of the post-reduction progress of a PE.[19] In our two cases, we reliably diagnosed PE and evaluated the course of treatment using USG. The USG evaluation showed that the supinator muscles did not completely improve even after the

release of the radiohumeral joint entrapment for approximately one week after the reduction.

To the best of our knowledge, this is the first report of cases of irreducible PE in which the patients were carefully followed by USG without external immobilization or other intervention, and spontaneous resolution was confirmed.

In conclusion, USG is useful in diagnosing PE and confirming the reduction of the elbow. External immobilization seems not always to be necessary in cases of irreducible PE. Supervised neglect without external immobilization could be an optional treatment for irreducible PE, and it suggested that even when elbow reduction is difficult, emergency surgery is not necessary, rather may lead to overtreatment.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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