CASE REPORT

Case report: congenital dislocation of the radial head –a two-in-one approach [version 1; peer review: 2 approved, 1 approved with reservations]

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Abstract

Background: Congenital dislocation of the radial head of the elbow is rare. It is genetically transmitted in some cases and is often associated with syndromes, such as Nail-Patella syndrome, antecubital pterygium and ulnar dysplasia. About two thirds are posterior, with the remainder being either anterior (15%) or lateral (15%). The natural history of the condition is that symptoms are relatively benign, with only some limitation of motion and deformity. Treatment either involves early attempts at reconstruction or delayed intervention at skeletal maturity with radial head excision. We evaluated the radiographic and functional results of a two-in-one procedure (radial shortening and open reduction) in the treatment of congenital dislocation of the radial head of an eight year old girl.

Objective: To describe a technique for easy reduction and maintenance of normal radiocapitellar joint anatomy in cases of congenital dislocation of the radial head.

Method: We have introduced one modification to the Sachar's method of open reduction by adding radial shortening. This can be described as a 'two incision approach' with the first incision for the radial shortening and the second for the open reduction of the radiocapitellar joint. The radial shaft was osteotomised first before we performed the radial head relocation. Then the overlapping part of radial shaft was trimmed. It was stabilized with a transarticular K wire fixation.

Results: At one year follow up, the elbow is stable with no valgus or fixed flexion deformity. Supination has increased to 40 degrees from zero degrees. An X-ray showed reformation of the radial head with good congruity of the radiocapitellar joint and correction of the radial bow.

Conclusion: As far as the authors are aware, this is the first report of congenital dislocation of the radial head being treated by radial

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shortening and open reduction of radiocapitellar joint through a two incision approach (two-in-one approach). This paper describes this new technique, which we implemented for easy reduction maintenance of normal radiocapitellar joint anatomy.

Keywords

Congenital dislocation of the radial head; Valgus deformity; Open reduction; Reconstruction; Two in one approach

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Report of a new method of treatment

An eight year old, otherwise healthy girl, born out of non consanguineous marriage presented in 2012 with swelling of her left elbow joint, valgus deformity, limitation of movement, and occasional pain. The patient had no previous history of trauma or significant illness. Her elbow was apparently normal until the age of 4 years. At this point her mother noticed swelling and progressing deformity. On physical examination the radial head was dislocated posterolaterally and was not reducible. There was cubitus valgus (30 degrees) and 15 degrees of fixed flexion deformity. She had full flexion at her elbow but no supination of her forearm.

An X-ray showed posterior dislocation of the radial head with a domed articular surface. McLaughlin's line had not bisected the capitellum. The radius was bowed anteriorly and was relatively longer in relation to ulna. The capitulum was hypoplastic and flat. There was no evidence of any previous fracture (Figure 1). An MRI showed posterior dislocation of the radial head and formation of a pseudo-joint with the adjacent margin of the ulna (Figure 2). Due to relative radial lengthening and radial bow, it would have been difficult to reduce the radial head in the radiocapitellar joint. Hence we planned for reconstruction surgery by radial shortening and open reduction of the radiocapitellar joint through two incisions. Pre-operative templating was done to assess the amount of shortening required for the easy reduction and maintenance of adequate joint space.

Operative technique

The novel two incision/two-in-one technique described here involves one modification to the Sachar's method¹ of open reduction by adding a radial shortening step. Under tourniquet, we performed the surgery through a two incision approach. The first incision on the anterior aspect of the proximal forearm was for radial shortening (Henry approach) and the second incision on the lateral part of the elbow was for open reduction of the radiocapitellar joint (Kocher's approach). The proximal radial shaft was osteotomised first before we performed the radial head relocation to facilitate the reduction, which reduces the risk of osteonecrosis². Then the overlapping part of radial shaft was trimmed with a bone nibbler, similar to the procedure of femoral shortening in the treatment of a dysplastic dislocated hip joint³. The radial shaft was stabilized by a transradiocapitellar fixation with a 1.8 mm K wire with the elbow in flexed position.

Post-operatively, the elbow was immobilized with an above elbow plaster splint, in 90° of flexion, for six weeks at which point the K-wire was removed and the elbow was mobilized. The patient was further managed with controlled elbow movement exercises and physiotherapy for the next three months to improve the range of movement and muscle strength.

At one year follow up in 2013, the patient's elbow was stable with no valgus or fixed flexion deformity. Supination had increased to 40 degrees from zero degrees. An X-ray showed reforming of the radial head articular surface with good congruity of the radiocapitellar joint with no deformity of the radial shaft (Figure 3).

Figure 1. Pre-operative X-ray showing congenital radial head dislocation with the radius bowed anteriorly. The capitulum is hypoplastic.

Discussion

Congenital dislocation of the radial head is the most common congenital elbow abnormality¹ and usually occurs in association with other conditions (60% of the time), but can also occur in isolation⁴. The more common associated conditions include lower extremity anomalies, scoliosis, mental retardation, and nail-patella and Klippel-Feil syndromes⁵. The condition is usually bilateral, but some unilateral cases have been described^{5,6}. When unaccompanied by other radial or systemic conditions, it is almost always bilateral. The majority of radial head dislocations are posterior (65% of cases), followed by anterior (~15%) and lateral (~15%)⁷. It is often not noted until

Figure 2. Immediate post-operative X-ray with radial shortening and fixation with plate and screws. The radial bow is corrected. The radial head is fixed with a transarticular pin.

the age of four or five at which time some limitation of motion or deformity becomes evident⁷. Our case is an isolated unilateral congenital dislocation of the radial head noted at the age of four years.

In our case, we anticipated difficulty in reducing the radial head to the radiocapitellar joint, due to relative radial lengthening and radial bow. Hence we planned for reconstruction surgery by radial shortening and open reduction of the radiocapitellar joint through two incisions. Pre-operative templating was done to assess the amount of shortening required for the easy reduction and maintenance of adequate joint space.

The dislocation of radial head and its associated features are now believed to be triggered by failure of development of a normal capitulum, which deprives the developing radial head of the contact pressure required for normal development and results in malformation of the radiocapitellar joint⁸. The symptoms are relatively benign, with only some limitation of motion and deformity⁹. Early

Figure 3. One year follow up showing remodeling of the radial head.

radiographic findings are subtle due to the absence of the capitulum and radial head ossification centers⁹. Before radial head ossification (~ five years) a line drawn along the shaft of the radius should normally bisect the capitellum ossification center (McLaughlin's line) but did not in this case¹⁰.

McFarland (1936)¹¹ described the radiological signs which he believed distinguished the congenital from the traumatic in unilateral dislocations. However the convex radial head, flattening of the capitellum and anterior angulation of the ulna are regarded as characteristic of congenital dislocation are clearly seen as a result of the injury as well¹².

Generally, patients become symptomatic by adolescence and are treated by radial head resection. Surgery at an earlier age with open reduction and ligament reconstruction may offer advantages over late radial head resection¹. Early reconstruction may prevent the long term complication of pain, loss of motion, deformities and osteochondral loose bodies¹³. Ideally the care of congenital dislocation

of the radial head would involve open reduction and restoration of normal anatomy. The logic is that if the radial head can be reduced early, the deformity of the capitellum and the forearm may not occur or remodel with growth¹³.

We agree with De Boeck¹⁴ that reconstruction of the annular ligament seems unnecessary, and that unreduced radial head dislocations, therefore, may be treated by simple open reduction and fixation for six weeks with a transarticular pin. This is why the annular ligament was not reconstructed in our case. Although much of the literature refers to the treatment of radial head dislocation by means of an ulnar osteotomy, as described by Hiramaya and coworkers¹⁵, the main indication of this procedure is the presence of residual deformity of the ulna or radius with a concave radial head articular surface¹⁶. In our case there was no deformity of the ulna, but there was lengthening of the radius with a domed radial head.

We were cautious not to excise the radial head in our case because of the risk of secondary subluxation of the distal radio-ulnar joint due to proximal migration of the radius¹⁷. We believe on the basis of our results that surgical correction is fully justified in irreducible dislocation of the radial head. We also believe that shortening of the radius would have been necessary to achieve reduction in cases where there is radial lengthening.

Conclusion

No reported case of congenital dislocation of the radial head treated by radial shortening and open reduction of the radiocapitellar joint

through two incision approaches (two-in-one approach) has hitherto been available, as far as the authors are aware. This paper describes such a case, where we used this technique for the easy reduction of the radiocapitellar joint in order to maintain normal joint anatomy.

Consent

Consent was obtained from the patient and her mother for the novel technique to be conducted. We also obtained the consent from them for use of their information and images for publication in this article.

Author contributions

Raju Karuppal: Described the idea of this novel technique and performed the surgery, post operative evaluation, design, writing and editing of the case report. Anwar Marthya: Planning of the surgery, analysis and interpretation of the result, design and editing of the manuscript. Rajendran V. Raman: Interpretation of result and editing of manuscript. Sandhya Somasundaran: Interpretation of the results, writing and editing of the manuscript. All authors critically revised the manuscript and approved the final manuscript for publication.

Competing interests

No competing interests were disclosed.

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Positive points:

The article is well designed and authored mentioning the surgical management of a rare congenital entity. The case report and surgical steps are clearly described. As per the report, early reduction of the radial head helps in better remodeling of the radio-capitellar joint similar to early reduction of hip in developmental dysplasia of the hip.

Some of my queries and suggestions are as follows:

1. Even though, authors are unaware of radial shortening and open reduction of the radiocapitellar joint through two incisions to the best of their knowledge, I wish to draw their attention to the paper by [Hui Taek Kim in Journal of Paediatric Orthopaedics](#). On 3 elbows with congenital dislocation of radial head (2 patients) they did open reduction of radial head through a posterior approach and radial shortening through a midshaft approach.
2. As the natural history of congenital dislocation of the radial head is benign, the readers would be interested and benefited to know what are / were the indications for surgical intervention in these / this case. Authors could discuss briefly about situations where surgical management is not needed.
3. Even though, authors have mentioned about MRI findings (figure 2), the article does not carry any MRI picture. This minor mistake might be rectified and the role of MRI, if any, in the management of congenital dislocation of the radial head could be discussed in brief.
4. Anatomic relationship between ulnohumeral, radio-capitellar and proximal radio-ulnar joint must be maintained in a skeletally immature patient for normal development to occur. It would be worthwhile if authors can mention about the status of ulno-humeral and proximal radio-ulnar joints in the pre and post operative radiographs.
5. Readers would be interested to know if any rotation of the proximal fragment was done to

improve supination before transfixation with K wire and plate fixation.

6. It would be worth mentioning in the 'operative technique' about fixation of the osteotomy site with plate and screws.
7. What was the position of the forearm in the cast postoperatively?
8. Cadaveric studies have shown that the annular ligament is the most important ligament in stabilizing the radial head and the proximal radio-ulnar joint during all phases of rotation while the interosseous membrane contribute significantly only during the terminal phase of supination. So the claim made by authors that annular ligament reconstruction is not needed warrants further justification.
9. The main problem in congenital dislocation of the radial head is the hypoplasia of capitulum and the mismatch between the dome shaped radial head and capitulum and alteration in the radial neck-head angle leading to re-dislocation/subluxation. It would be more informative if the authors could provide a lateral view of the elbow at final follow up to show the maintenance of the reduction and remodeling of the radio-capitellar joint.
10. At one year follow up, the radiograph shows a positive ulnar variance. Authors could mention about the function of the wrist as well.
11. It would be worth mentioning that a longer follow up is required to know the final outcome of the surgery as the child is skeletally immature.

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 03 September 2015

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Apart from the rarity, the case report attempts to convey that the treatment options available for congenital dislocation of radial head are either early reconstruction or late radial head excision and the former is ideal.

But the fact of the matter is that, this is not in alignment with established evidence. "A congenitally dislocated radial head is irreducible manually or surgically because of adaptive changes in the soft

tissues and the absence of normal surfaces for articulation with the ulna and humerus. Consequently, open reduction of the dislocation and reconstruction of the annular ligament in childhood are not advised. Any impairment of function usually is caused by restriction of rotation of the forearm; in children, physical therapy to improve this motion is the only treatment indicated. If pain persists into adulthood, the radial head and neck can be excised." Campbell's Operative Orthopaedics, 12e.

Though not recommended by standard textbooks, if a reconstruction is planned as in the present report, annular ligament reconstruction is necessary as per available literature. De-Boeck's recommendations against this in case of chronic acquired isolated radial head dislocations do not seem to be applicable for congenital dislocations. Further more, as per Sachar, reconstruction is better than radial head excision in adulthood only if it is performed before 2 years.

Figure 2 is not a MRI picture. Do MRIs have any role in determining whether a rotation osteotomy is to be done or not? How can we measure cubitus valgus angle in patients with fixed flexion deformity? A detailed explanation on method of pre operative templating may help curious surgeons.

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 13 August 2014

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This is a nicely presented case report of the relatively uncommon condition of congenital elbow dislocation. The authors describe the rationale of management and the surgical technique with clarity. They also provided evidence of follow up. The discussion is nicely written, providing information regarding the background of the condition they treated, putting the reader, who is not a specialist in the field, in the correct context.

I approve the article's indexation. Its current version could be further improved if the authors provided clinical pictures of the patient's forearm postoperatively in different positions, indicating for example the ability to perform supination/pronation movements (if such photos were available).

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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