J Shoulder Elbow Surg (2019) 28, 1468–1475

ELSEVIER

Journal of Shoulder and Elbow Surgery

www.elsevier.com/locate/ymse

Idiopathic anterior dislocation of the radial head: symptoms, radiographic findings, and management of 8 patients

Muneaki Abe, MD, PhD[a,*], Hozumi Kumano, MD, PhD[a], Akihiko Kinoshita, MD[a], Atsushi Yokota, MD, PhD[b], Katsunori Ohno, MD, PhD[b]

[a]*Department of Orthopedic Surgery, Shiroyama Hospital, Habikino, Japan*
[b]*Department of Orthopedic Surgery, Osaka Medical College, Takatsuki, Japan*

Background: Radial head dislocation may occur during trauma or in association with congenital diseases, or it may be developmental or idiopathic. Reports of idiopathic dislocation of the radial head have been scarce. The symptoms, radiographic findings, and management of idiopathic dislocation of the radial head have not been well described in the literature.

Methods: During the past 28 years, we have encountered 8 cases of idiopathic anterior dislocation of the radial head (mean patient age, 12.5 years). In only 1 case did the patient and/or the patient's parents recall any preceding trauma or injury to the affected limb. Patients' complaints included a bulging mass, pain, and limited elbow flexion. Radiographically, the shape of the radial head was flat or slightly convex. Seven of the patients were treated with open reduction of the radial head and angulation osteotomy of the ulna. The other patient's radial head was stabilized without osteotomy.

Results: The mean postoperative follow-up period was 4.5 years. In patients whose elbow flexion was limited before surgery, improvement to more than 125° occurred. The bulging mass in the cubital fossa disappeared. None of the patients complained of disability during activities of daily living or sports participation. Radiographically, the radial head remained in the reduced position in all patients in whom open reduction of the radial head with angulation osteotomy of the ulna was performed.

Conclusions: We have described the symptoms, radiographic characteristics, and treatment of idiopathic anterior dislocation of the radial head. Open reduction of the radial head combined with angulation osteotomy of the ulna yielded favorable results both clinically and radiographically.

Level of Evidence: Level IV; Case Series; Treatment Study

Keywords: Radial head; dislocation; idiopathic; children; open reduction; angulation osteotomy of the ulna; etiology

Anterior dislocation of the radial head may occur during trauma[5] or in association with congenital diseases.[16] Developmental anterior dislocation of the radial head is defined as any dislocation that results from maldevelopment of the forearm,[11] multiple exostosis,[7] solitary osteochondroma of the ulna[2] or radius,[13] and/or muscle

Our institutional review board approved this retrospective study (Shiroyama Hospital, No. 2017-007).

*Reprint requests: Muneaki Abe, MD, PhD, Department of Orthopedic Surgery, Shiroyama Hospital, 2-8-1, Habikino, Habikino City, Osaka, 583-0872, Japan.

E-mail address: ort001@osaka-med.ac.jp (M. Abe).

1058-2746/$ - see front matter © 2019 Journal of Shoulder and Elbow Surgery Board of Trustees. All rights reserved.
https://doi.org/10.1016/j.jse.2019.02.031

imbalance around the elbow.[6] In contrast, idiopathic dislocation of the radial head occurs spontaneously. Reports of this entity have been scarce, however,[9,15,17] and no etiology has been established. During the past 28 years, we have encountered 8 cases of idiopathic anterior dislocation of the radial head, which were treated with open reduction of the radial head and, if needed, angulation osteotomy of the ulna. We describe the characteristics of our cases, the treatment applied, and the results. In addition, we searched for any identifiable causes of anterior dislocation of the radial head.

Methods

Between March 1990 and February 2018, we encountered 8 cases of idiopathic anterior dislocation of the radial head. For this report, we retrospectively reviewed the clinical data from each patient's records, including outpatient and inpatient charts, and his or her images, including plain radiographs.

The patients' ages at surgery ranged from 9 years 1 month to 16 years 3 months (average, 12 years 5 months) (Table I). There were 5 boys and 3 girls. The right side was involved in 6 patients and the left side in 2. Of the 8 patients, 5 had been playing sports when the dislocation occurred: baseball in 1, gymnastics in 2, table tennis in 1, and handball in 1. In 7 of 8 cases, the patients and their parents did not recall any preceding trauma or injury to the affected limb. The exception was case 2, described later as an illustrative case report.

The chief complaints of the patients included a bulging mass in the cubital fossa (2 cases), a bulging mass in the cubital fossa and pain during motion (2 cases), and pain and limited elbow flexion (4 cases) (Fig. 1, *A, B*). These complaints began about 3 months to 3 years 8 months (mean, 1 year 8 months) before the patients visited our hospital (Table I). Flexion of the elbow was markedly limited in 4 cases (cases 2, 5, 7, and 8), although none of the patients had loss of extension (Table I). Pronation and supination of the forearm were not restricted except in case 2. The carrying angle of the affected elbow was obviously increased in 1 patient (case 1), as is often seen with a neglected Monteggia fracture. In contrast, the carrying angle of the affected elbow was similar to that on the opposite side in the other 7 cases. We believe the reason for this difference is that the degree of anterior dislocation of the radial head observed in our cases was not as conspicuous as in neglected cases of Monteggia fractures. Details regarding elbow motion are shown in Table I. We confirmed that there was no skeletal abnormality and no family history in any of the 8 cases.

Radiographically, the radial head was seen to be dislocated anteriorly in all cases. The radial head appeared to be flat on the radiographs in 5 cases and slightly convex on those of the other 3 (Figs. 2, *D*, and 3, *A*). A hypoplastic capitellum,[16] which is often present in a congenital dislocation, was not apparent in any of our 8 cases. The ulnar bow sign[10] was found in 1 case (case 5). Thickening of the middle third to distal third of the anterior cortex of the ulna[4] was found in 6 cases (Fig. 1, *A*).

In each of the 8 cases, we decided to reduce the dislocated radial head to alleviate the patient's discomfort. Surgically, we

Table I Patient data before surgery

Patient No.	Age at surgery	Sex	Affected side	Chief complaint	Symptom duration	ROM, °			Radiographic findings			
						Elbow extension /flexion	Forearm supination /pronation	Carrying angle (opposite site)	Thickening of ulna	Ulnar bow sign	Shape of radial head	Osteotomy of ulna
1	16 yr 3 mo	M	R	Pain and bulging	3 yr 8 mo	20/135	90/80	14 (8)	No	No	Convex	10° of angulation, 6 mm of lengthening
2	13 yr 9 mo	M	R	Pain and limited flexion	3 yr 2 mo	8/109	90/60	8 (8)	Yes	No	Convex	10° of angulation, 10 mm of lengthening
3	9 yr 1 mo	F	R	Bulging in cubital fossa	3 yr 1 mo	20/150	90/90	17 (16)	No	No	Flat	15° of angulation
4	11 yr 4 mo	F	L	Bulging in cubital fossa	4 mo	0/150	90/90	13 (11)	Yes	No	Flat	Not performed
5	10 yr 10 mo	M	R	Pain and limited flexion	10 mo	5/90	90/85	10 (10)	Yes	Yes	Flat	13° of angulation
6	12 yr 7 mo	F	L	Pain and bulging	3 mo	20/130	90/80	13 (14)	Yes	No	Flat	15° of angulation
7	13 yr 5 mo	M	R	Pain and limited flexion	8 mo	15/110	90/90	15 (15)	Yes	No	Convex	15° of angulation
8	13 yr 1 mo	M	R	Pain and limited flexion	1 yr 2 mo	0/100	90/80	3 (3)	Yes	No	Flat	10° of angulation

ROM, range of motion; *M*, male; *F*, female; *R*, right; *L*, left.

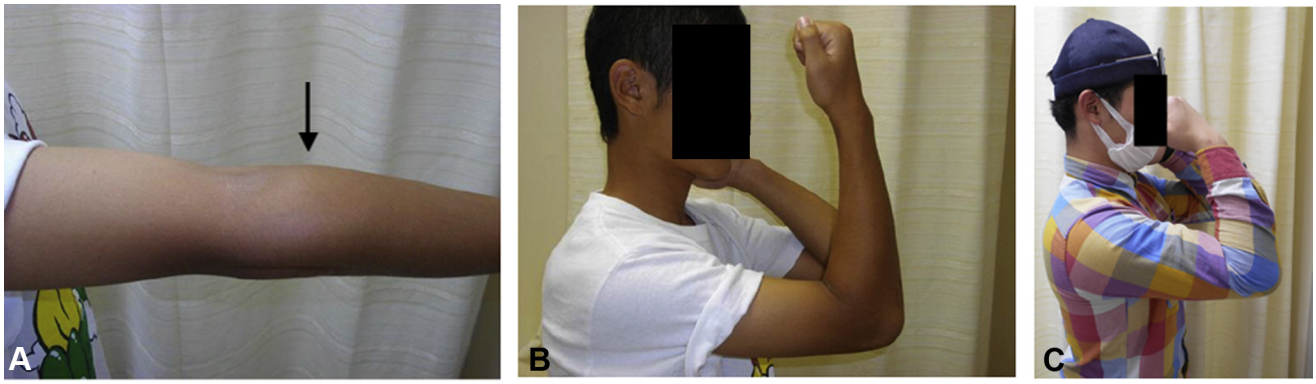

Figure 1 Macroscopic findings in case 8. (**A**) Bulging mass (↓) in cubital fossa. (**B**) Limited elbow flexion before surgery. (**C**) Improved elbow flexion after surgery.

evaluated the humeroradial joint first to confirm dislocation of the radial head and to determine the state of the annular ligament. In most of the cases, there was some damage to the cartilage of the radial head, although the proximal face of the radial head, facing the capitellum, maintained its concavity and was not as convex as it seemed on the radiographs (Fig. 4, *B*). In cases of limited flexion, the radial fossa of the distal humerus was filled with reactive and proliferated bone tissue. We therefore resected the bone tissue and later used it to fill the space of the osteotomy site. In all cases, the annular ligament was preserved and interposed between the capitellum and radial head (Fig. 4, *A*). We then reduced the radial head through the disrupted annular recess or by cutting the annular ligament temporarily in cases in which the radial head was not reducible through the disrupted annular recess. After reduction, we checked whether the radial head was stable during pronation and supination. In 1 case (case 4), the radial head was stable after repair of the annular ligament, precluding the need for osteotomy. In the other 7 cases, however, the radial head was not stable when the forearm was pronated (n = 6) or supinated (n = 1). We therefore performed angulation (10°-15°) osteotomy of the ulna (Table I) and used dynamic compression plates in 5 cases and reconstruction plates in 2. In 2 cases, lengthening of the ulna (6 mm in case 1 and 10 mm in case 2) was required, which was accomplished with iliac bone grafts (Fig. 2, *E*). In the other 5 cases, we used local bone (eg, reactive ossification in the radial fossa) (Fig. 3, *B*). Finally, we repaired the annular ligament in cases in which it had been cut temporarily to reduce the radial head. After completion of these procedures, we confirmed stable reduction of the radial head with the naked eye (Fig. 4, *C*) and on radiographs.

Postoperatively, a long arm plaster cast was applied for 3 to 6 weeks, with the forearm positioned in slight supination. After cast removal, we recommended range-of-motion (ROM) exercises (flexion/extension for the elbow and supination/pronation for the forearm) to the patients. At 2 to 3 months (mean, 2.7 months) after cast removal, the patients reported that their elbow and forearm ROM was the same as or better than that before surgery. Because the patients were young, the plate was removed within 7 to 15 months (mean, 10 months) after surgery.

Results

All patients were followed up clinically. For the 3 patients (cases 1, 3, and 4) without in-person follow-up, we later obtained data from their outpatient charts and radiographs obtained at their last visit. The mean follow-up period was 4 years 5 months (range, 1 year 10 months to 9 years 1 month) (Table II).

Postoperative radiographs showed that the reduced position of the dislocated radial head had been maintained in 7 of 8 patients. The exception was case 4, in whom the radial head had remained in the reduced position for 3 months postoperatively but then gradually subluxated. Fortunately, the elbow and forearm of this patient displayed full ROM, and no bulging mass was palpable at 2 years 9 months after surgery. In addition, she did not complain of any pain or disability during activities of daily living (ADLs). Therefore, we did not consider further treatment.

The range of flexion of the elbow in 4 patients (cases 2, 5, 7, and 8) whose flexion was limited before surgery improved by more than 125°. Although flexion in 4 cases was not the same as that on the normal side, the patients did not complain of any disability during ADLs or sports participation. Forearm rotation was measured and was nearly the same as that on the opposite side in all patients except cases 2 and 5 (Table II). None of the patients complained of restricted elbow or forearm motion during ADLs. In addition, bulging in the cubital fossa had disappeared in all cases, and the carrying angle was nearly the same as that on the other side (Table II). We confirmed that there was nothing remarkable in the shoulders of any of the 8 patients.

Illustrative case report

Case 2

A 13-year-old boy was referred to us with a history of pain when throwing an object and limited flexion of the right elbow for 3 years 2 months. The patient had experienced fracture of the radius and ulna in the distal diaphysis at 8 years of age (Fig. 2, *A*). He had undergone closed reduction with percutaneous pinning at a local orthopedic clinic (Fig. 2, *B*). It had been confirmed radiographically that there was no dislocation of the radial head at the time of the injury or after reduction (Fig. 2, *C*). During the first 2 years

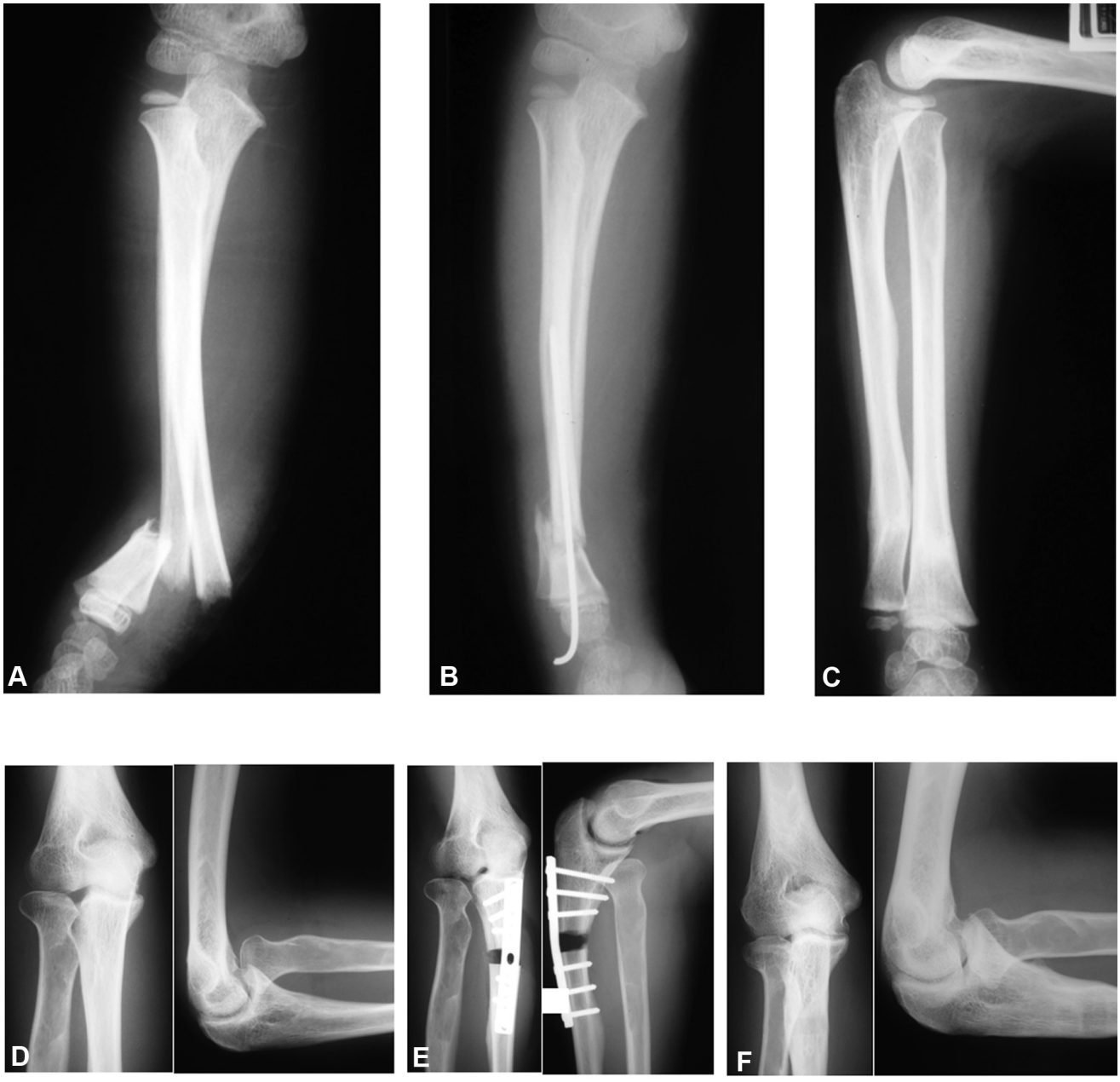

Figure 2 Case 2. (**A**) Radiograph at the time of fracture of the forearm bones. Dislocation of the radial head is not seen. (**B**) Radiograph at the time of closed reduction with percutaneous Kirschner wire fixation. (**C**) Radiograph 6 months after reduction. No deformity of the forearm bones is noted, and the radial head is in its anatomic position. (**D**) Preoperative radiographs show anterior dislocation of the radial head. The proximal shape of the radial head is convex. (**E**) Radiographs during surgery show 10° of angulation and 10 mm of lengthening of the ulna with plate fixation. Later, the lengthened part is filled with iliac bone graft. (**F**) Radiographs at follow-up show that the reduction of the radial head is maintained.

after the fracture, the patient had not complained of pain in the right elbow. Later, however, at the age of 10 years 7 months, he noticed pain in his right elbow while throwing. Approximately 3 years 10 months later, at the age of 13 years 9 months, he was referred to us.

Physical examination revealed a bulging mass in the anterolateral region of the right cubital fossa. In addition, flexion of the right elbow was limited to 109°. Extension of the right elbow and supination of the right forearm were normal, as was the carrying angle of the elbow. However, pronation of the right forearm was restricted to 60° (Table I). Radiographs of the elbow revealed anterior dislocation of the radial head, appearing to have a convex shape (Fig. 2, *D*).

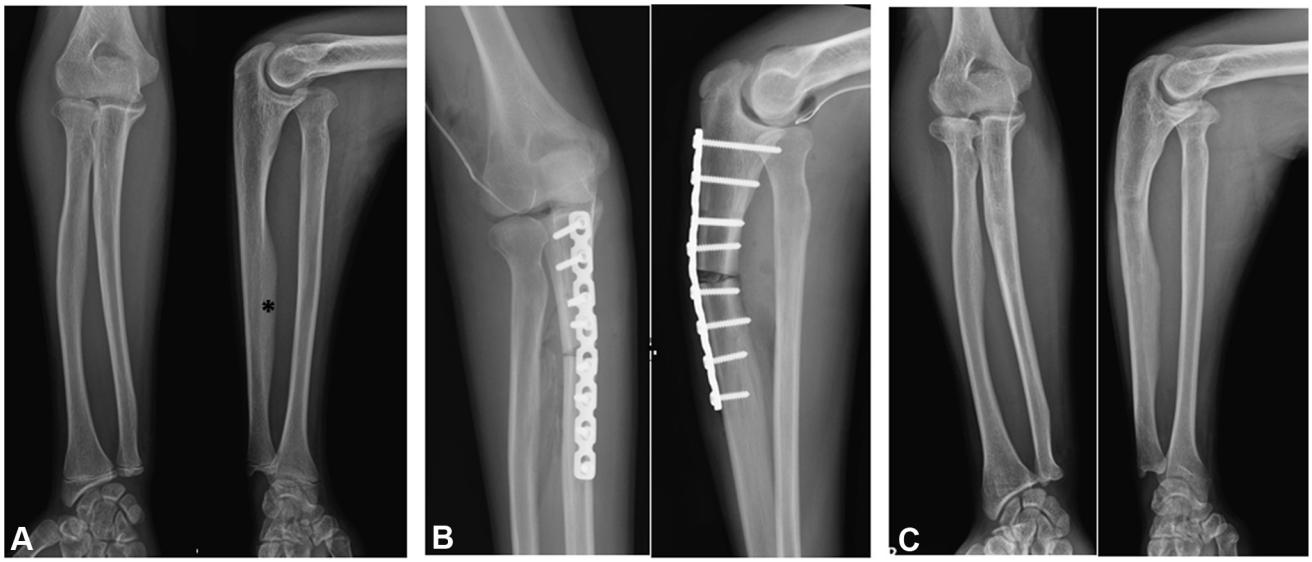

Figure 3 Radiographic course in case 8. (**A**) Radiographs before surgery show an anteriorly dislocated flat radial head and thickening of the middle third of the anterior cortex of the ulna (*). (**B**) Radiographs immediately after open reduction of the radial head with angulation osteotomy of the ulna. The space of the osteotomy site is filled with bone chips from the radial fossa of the distal humerus. (**C**) At 5 years 8 months after surgery, the radial head is still in a reduced position.

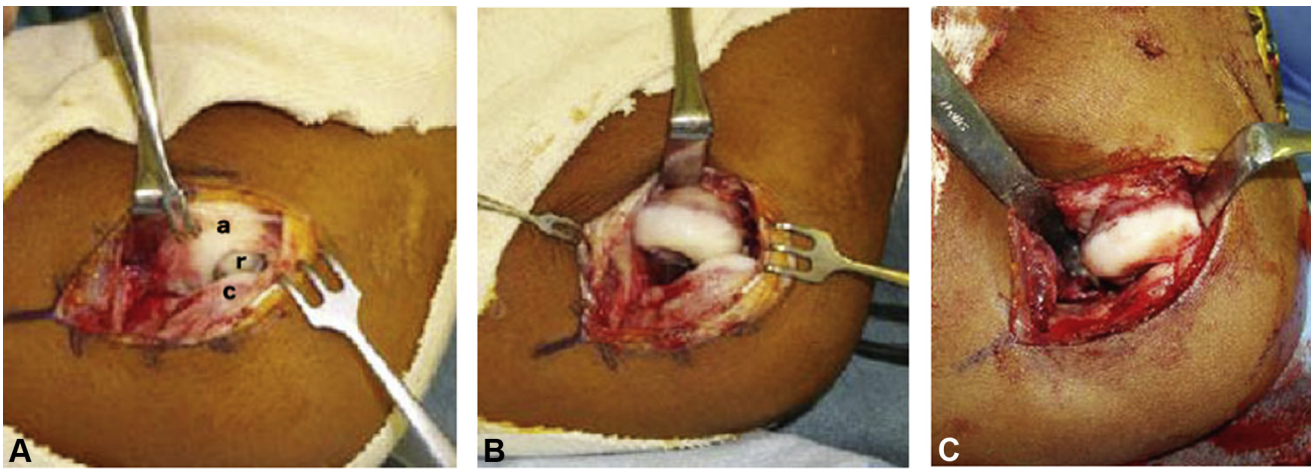

Figure 4 Intraoperative photographs of case 8. (**A**) The interposed intact annular ligament (*a*) and anteriorly dislocated radial head (*r*) are seen through the disrupted annular recess. *c*, capitellum. (**B**) Anteriorly dislocated radial head and concave shape of radial head, which had appeared flat on radiographs. (**C**) After angulation osteotomy, the radial head is in a reduced position.

Although we were unable to identify a cause of the dislocation, we decided to reduce the radial head (described in the ''Methods'' section) (Fig. 2, *E*). The course after surgery was uneventful. The bulging mass and pain in the cubital fossa disappeared, and flexion of the right elbow increased. Improvement of the patient's elbow ROM is shown in Table II. His outpatient record at 5 years 7 months after the operation indicated that he reported no pain around the affected elbow and no disability during ADLs or sports participation. Radiographs at that time showed the radial head remained in its reduced position (Fig. 2, *F*).

Case 8

A 13-year-old boy presented with a 14-month history of limited motion of the right elbow. He complained of difficulty fastening the top button of his shirt and pain during flexion. Neither he nor his parents recalled an injury to the right elbow joint. Physical examination showed bony bulging in the antecubital fossa (Fig. 1, *A*) and a 40° elbow flexion limitation compared with that on the opposite side (Table I; Fig. 1, *B*). Both supination and pronation, as well as the carrying angle, were the same as those on the other side. No joint laxity or other associated abnormalities were found. Radiographs showed anterior dislocation of the

Table II Patient data after surgery

Patient No.	Duration after operation	State of radial head	ROM, °		
			Extension/flexion (opposite side)	Supination/pronation (opposite side)	Carrying angle (opposite side)
1	2 yr 3 mo	Reduced	8/140 (10/140)	90/90 (90/90)	8 (8)
2	5 yr 7 mo	Reduced	5/125 (5/140)	80/60 (90/80)	10 (10)
3	1 yr 10 mo	Reduced	15/140 (15/140)	90/80 (90/70)	17 (15)
4	2 yr 9 mo	Subluxated	0/150 (10/150)	90/90 (100/90)	13 (13)
5	6 yr 1 mo	Reduced	0/130 (0/140)	90/65 (90/90)	10 (10)
6	3 yr 4 mo	Reduced	−5/135 (15/135)	90/80 (90/90)	15 (15)
7	9 yr 1 mo	Reduced	0/130 (10/140)	90/90 (90/90)	20 (17)
8	5 yr 8 mo	Reduced	0/130 (10/140)	90/80 (90/80)	0 (0)

ROM, range of motion.

radial head, a flat shape of the radial head, and thickening of the anterior ulnar cortex (Fig. 3, *A*).

Given the diagnosis of idiopathic anterior dislocation of the radial head, open reduction of the radial head with angulation osteotomy of the ulna was performed. During the operation, the annular ligament was found to be interposed between the capitellum and radial head (Fig. 4, *A*). We tried to reduce the radial head through the disrupted annular recess, but our attempt was unsuccessful. We therefore cut the annular ligament and reduced the radial head. After reduction, the radial head was stable in supination but unstable in pronation (Fig. 4, *B*). Hence, we further performed a 10° angulation osteotomy of the ulna (Fig. 3, *B*). After osteotomy, the radial head had stabilized in both supination and pronation (Fig. 4, *C*).

Postoperatively, the elbow was immobilized in a plaster cast for 4 weeks, with the elbow positioned in 90° of flexion and the forearm in 30° of supination. After cast removal, the patient was encouraged to perform active ROM exercises. The postoperative course was uneventful. Flexion of the elbow improved, and bulging in the cubital fossa disappeared. At the last follow-up, 5 years 8 months after surgery, elbow flexion had improved to 130° (Fig. 1, *C*) and the patient remained asymptomatic. Details of his ROM before and after surgery are shown in Tables I and II. Radiographs showed that the radial head remained in its reduced position (Fig. 3, *C*).

Discussion

Although dislocation of the radial head may occur in association with a Monteggia fracture, isolated dislocation of the radial head is rare.[11] In pediatric trauma cases, isolated dislocation of the radial head may occur in association with plastic bowing of the ulna.[10] Aside from trauma cases, isolated dislocation of the radial head may occur in association with congenital diseases.[16] In the case of congenital dislocation, bilateral dislocation is likely, and posterior dislocation is more common than anterior dislocation.[12] Other than these dislocations, anterior dislocation of the radial head may occur developmentally or idiopathically. In the case of developmental dislocation, the cause is maldevelopment of the radius or ulna,[11] exostosis of the ulna[2] or radius,[13] and/or muscle imbalance around the elbow.[6]

Idiopathic dislocation occurs spontaneously or without having any apparent cause. Our literature search found only 3 reports.[9,15,17] Southmayd and Ehrlich[15] reported 3 cases of idiopathic posterior subluxation of the radial head in patients aged 7, 11, and 14 years. They noted that all 3 patients complained of pain during elbow motion and limited forearm rotation. Radiographically, the radial head had dislocated posteriorly but articulated partly with the capitellum in all 3 cases. The authors found no causative history or factors associated with the dislocated radial head in any of the 3 cases.

Lancaster and Horowitz[9] described a case of idiopathic lateral subluxation of the radial head. Their 23-year-old patient complained of pain and limited forearm rotation. Radiographically, the radial head appeared deformed but without a dome shape and without a hypoplastic capitellum, which are often seen with congenital dislocation. The patient had no other skeletal abnormalities and no history of trauma. Accordingly, the authors concluded that dislocation was idiopathic, not congenital.

In contrast, Zenezini et al[17] reported a case of anterior dislocation of the radial head in a 6-year-old girl. They concluded that the cause of dislocation was ectopic dysplasia of the annular ligament (unperforated and interposed in the humeroradial articulation).

Our 8 cases had no skeletal abnormalities, and their symptoms (bulging mass, pain, and/or limited flexion of the elbow) first appeared 3 months to 3 years 8 months before the patients visited us. Although radiographs did not show a hypoplastic capitellum, the findings suggested a flat or convex shape of the radial head. At surgery, the radial head faced the capitellum and was seen to have maintained its concavity, suggesting that the dislocation was not congenital. Except in case 2, neither the patients nor their

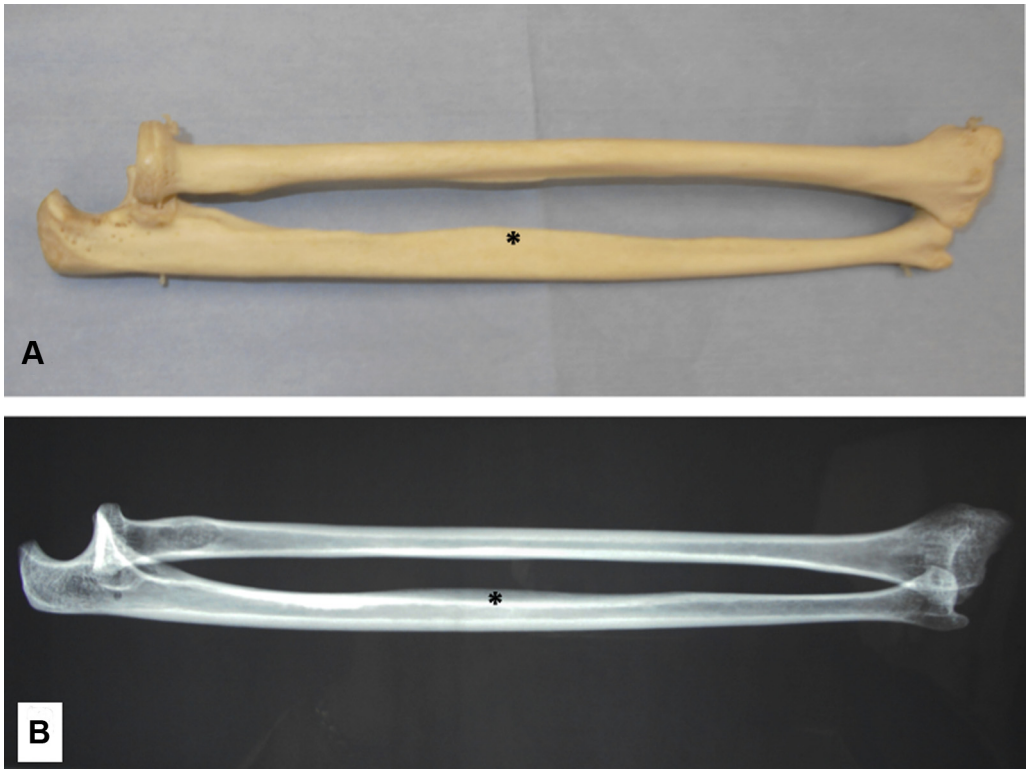

Figure 5 Photograph (**A**) and radiograph (**B**) of bleached human forearm bone. The protuberance of the anterior ulnar cortex is marked (*).

parents recalled any trauma. In case 2, we confirmed that dislocation of the radial head did not exist at the time of the patient's injury or after fracture reduction. Therefore, we concluded that trauma was not the cause of the dislocation. At surgery, we confirmed that the annular ligament was not dysplastic and was positioned between the dislocated radial head and the capitellum. These findings are similar to those seen with a Monteggia fracture-dislocation.[3]

With respect to terminology, there was a question of whether ''idiopathic'' or ''chronic'' could be appropriately applied to our 8 cases. As already mentioned, although the surgical findings were similar to those seen with a Monteggia fracture-dislocation, we could not identify any obvious cause of the radial head dislocation. Therefore, we concluded that ''idiopathic'' was the appropriate terminology. The word ''chronic'' is usually used to describe a neglected dislocation caused by trauma. Hence, we deemed ''idiopathic'' the appropriate designation for describing the pathology in our patients.

Amako et al[4] reported a case of developmental anterior dislocation of the radial head. They concluded that the cause of dislocation was thickening of the anterior cortex of the ulna. In addition, they stated that, because the radius is likely to abut while crossing the ulnar protuberance during rotation of the forearm, the annular ligament may become lax with time. However, during surgery, we observed that the annular ligament was not lax. Radiographically, we found thickening of the anterior cortex of the ulna in 6 of 8 cases. If thickening of the ulnar cortex is a cause of anterior dislocation of the radial head, patients should hear or feel a clicking sound or pain in the mid forearm during pronation and supination. None of our patients complained of such a feeling during forearm motion. To confirm the incidence of this thickening of the ulnar cortex, we evaluated the radiographs of patients with fractures of the forearm or children with Monteggia fractures. Thickening of the ulnar cortex was observed in 29 of 68 cases (42.6%). We also checked bleached human forearm bones. As shown in Figure 5, a protuberance of the ulnar cortex was observed at the attachment of the interosseous membrane in 46 of 53 bleached bones (86.8%). These findings suggest that thickening of the ulnar cortex is not the cause of anterior dislocation of the radial head.

For treatment, Southmayd and Ehrlich[15] and Lancaster and Horowitz[9] recommended resection of the radial head. Zenezini et al[17] removed the dysplastic annular ligament and preserved the immature radial head. Resection of the radial head might be the easiest procedure to perform to alleviate symptoms associated with chronic dislocation or a complicated fracture of the radial head. This procedure, however, may cause elbow instability and proximal migration of the radius.[3,14] Therefore, we did not

consider it for our young patients. Hirayama et al[8] reported favorable results after performing angulation and elongation osteotomy of the ulna for chronic dislocation of the radial head in children. We had had a successful experience treating a neglected Monteggia lesion by reducing the radial head with angulation osteotomy of the ulna.[1] Therefore, we attempted this procedure in all patients except case 4. In all patients, the results were satisfactory and the reduction of the radial head has been maintained postoperatively.

Conclusion

We have reported 8 cases of idiopathic dislocation of the radial head. As we could find no obvious cause of the dislocation in our patients, we concluded that it was idiopathic. The treatment chosen was based on that used for chronic dislocation of the radial head (ie, open reduction of the radial head combined with angulation osteotomy of the ulna). It was a good choice for idiopathic dislocation of the radial head as it yielded favorable clinical and radiographic results.

Acknowledgment

The authors thank Nancy Schatken, BS, MT(ASCP), from Edanz Group (www.edanzediting.com/ac), for editing a draft of this article.

Disclaimer

The authors, their immediate families, and any research foundations with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

References

1. Abe M, Ishizu T. Surgical treatment for neglected Monteggia lesion. Orthop Surg Traumatol 1993;36:119-30 [in Japanese].
2. Abe M, Koyama S. Developmental anterior dislocation of the radial head caused by solitary osteochondroma of the proximal ulna. J Shoulder Elbow Surg 1998;7:66-70.
3. Abe M, Kumano H, Kinoshita A, Hirofuji S. Irreducible dislocation of the radial head associated with pediatric Monteggia lesions. J Am Acad Orthop Surg Glob Res Rev 2018;2:e035. https://doi.org/10.5435/JAAOSGlobal-D-17-00035
4. Amako M, Masada K, Ohno H, Inamori Y, Hara T. Developmental dislocation of the radial head. J Shoulder Elbow Surg 1994;3:170-2.
5. Bado JL. The Monteggia lesion. Clin Orthop Relat Res 1967;50:71-86.
6. Cummings RJ, Jones ET, Reed FE, Mazur JM. Infantile dislocation of the elbow complicating obstetric palsy. J Pediatr Orthop 1996;16:589-93.
7. Fogel GR, Mcelfresh EC, Peterson HA, Wicklund PT. Management of deformities of the forearm in multiple hereditary osteochondromas. J Bone Joint Surg Am 1984;66:670-80.
8. Hirayama T, Takemitsu Y, Yagihara K, Mikita A. Operation for chronic dislocation of the radial head in children. J Bone Joint Surg Br 1987;69:639-42.
9. Lancaster S, Horowitz M. Lateral idiopathic subluxation of the radial head. Clin Orthop Relat Res 1987;214:170-4.
10. Lincolm TD, Mubarak SJ. Isolated traumatic radial head dislocation. J Pediatr Orthop 1994;14:454-7.
11. Little KJ, Cornwall R. Pediatric elbow dislocations. In: Morrey BF, Sanchez-Sotelo J, Morrey ME, editors. Morrey's the elbow and its disorders. 5th ed. Philadelphia: Elsevier, ISBN 978-0-323-34169-1; 2018. p. 327-40.
12. Mardam-Bey T, Ger E. Congenital radial head dislocation. J Hand Surg Am 1976;4:316-20.
13. Niu XF, Yi JH, Hu J, Xiao LB. Chronic radial head dislocation caused by a rare solitary osteochondroma of the proximal radius in a child: a case report and review of the literature. BMC Res Notes 2015;8:131. https://doi.org/10.1186/s13104-015-1095-y
14. Schiffern A, Bettwieser SP, Porucznik CA, Grim JR, Tashjian RZ. Proximal radial drift following radial head resection. J Shoulder Elbow Surg 2011;20:426-33. https://doi.org/10.1016/j.jse.2010.11.008
15. Southmayd W, Ehrlich MG. Idiopathic subluxation of the radial head. Clin Orthop Relat Res 1976;121:271-4.
16. Vuillermin C. Congenital abnormalities of the elbow. In: Morrey BF, Sanchez-Sotelo J, Morrey ME, editors. Morrey's the elbow and its disorders. 5th ed. Philadelphia: Elsevier, ISBN 978-0-323-34169-1; 2018. p. 237-52.
17. Zenezini M, Longo M, Bignardi C. Idiopathic dislocation of the radial head (an unusual, unpublished, anatomopathological findings). Chir Organi Mov 1980;66:127-32 [in Italian].