Introduction

- We observed an unusual type of volar Barton fracture in adolescents and performed open reduction and internal fixation of the distal fragment, using a plate for adults as a buttress plate in consecutive adolescent patients.
- We report the radiological and clinical outcomes after follow-up for at least 3 years.

Methods

- March 2008 to February 2014, 14 consecutive adolescents were treated by buttress plating.
- Their mean age at the time of injury was 14.1 years. All of the fractures were metaphyseal fractures in the coronal plane and typical Salter-Harris II fractures in the sagittal plane.
- After accurate reduction of the distal fragment, a cortical screw was inserted in the proximal diaphysis until the maximum compressive force was obtained against the distal fragment. Then, one or two locking screws were added adjacent to the initial cortical screw. No screw fixation was performed in the distal fragment area.

Results

- All evaluations were done at least 3 years postoperatively with a mean follow-up of 53.2 months. In adolescents with a closed physis (n=8), the mean radial inclination, volar tilting, and ulna variance were 21.1 ± 1.64°, 11.5 ± 1.07°, and −0.25 ± 0.71 mm, respectively.
- In adolescents with an open physis (n=6) at final follow-up, the mean values were 23.8 ± 1.94°, 9.2 ± 2.32°, and −1.83 ± 0.75 mm, respectively.
- The radiological parameters of the distal radius were not significantly different from the normal values in either open or closed physes. The flexion–extension arc was 139.64 ± 6.34°, the pronation–supination arc was 158.57 ± 10.64°, and grip strength was 28.57 ± 5.89 kg and all were satisfactory compared to the normal side.

Conclusion

- A volar Barton type injury can occur in adolescents involving the physis, and the buttress plating that is used in adults is also a useful treatment method for adolescents.
- However, there is little information on this injury and it was difficult to compare treatment outcomes to other methods.
- A larger, multi-centre, prospective comparative study is necessary to investigate this further due to the rarity of this injury.

Figure 1. A 10-year-old adolescent complained of left wrist pain immediately after falling from a table (case 5). (A) The initial anteroposterior and lateral radiographs showed a volarly displaced metaphyseal fracture suggesting a physeal injury. (B) Three-dimensional computed tomography (CT) revealed the overall fracture pattern and displaced fragments. (C) Sagittal CT showed the definitive Salter-Harris II injuries.

Figure 2. In a 15-year-old boy (case 6), buttress plating was performed using a volar locking plate manufactured for distal radius fractures in adults. An initial diaphyseal screw (asterisk) was inserted compressing the distal fragment and then other locking screws were inserted to maintain the compressive effect.

Figure 3. The ulnar variance was measured using the distances between the most proximal physis points in both the radius and ulna, in an adolescent with an open physis at final follow-up. The plate was removed.

Figure 4. The closed physis in a typical volar Barton pattern in a 17-year-old boy, was visible on CT. The shearing force was presumed to be transmitted to the intra-articular area via a physeal that was more solid than in adolescents. This patient was not included in the current study.