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Osteochondritis dissecans of the glenoid in adolescent baseball players: a report of 4 cases

Kenta Takatsuji, MD [a], Yoshikazu Kida, MD, PhD [b,*], Ryuhei Furukawa, MD, PhD [c], Hisakazu Tachiiri, MD, PhD [d], Yusuke Kobayashi, MD [b], Toru Morihara, MD, PhD [e], Kenji Takahashi, MD, PhD [b]

[a] Department of Orthopaedics, Fukuchiyama City Hospital, Kyoto, Japan
[b] Department of Orthopaedics, Graduate School of Medical Science, Kyoto Prefectural University of Medicine, Kyoto, Japan
[c] Orthopaedics, Rakuwakai Marutamachi Hospital, Kyoto, Japan
[d] Department of Orthopedic Surgery, Tachiiri Orthopedic Clinic, Kyoto, Japan
[e] Rakuwakai Marutamachi Rehabilitation Clinic, Kyoto, Japan

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Osteochondritis dissecans (OCD) is more common in the elbows and knees, but rare in the glenoid.[6,7] The translucent, fragmentation, or loose body stage based on plain radiography is the classification of elbow OCD.[15] Generally, conservative treatment is the most common choice for a stable lesion in the translucent or fragmentation stages; surgery is the most common choice for an unstable lesion as in the loosening stages.[14]

In knee OCD, the radiographic stages are classified into three stages: focal lucency, attached fragment, and detached fragment, based on the bone trabecula abnormalities. The first choice of treatment for stable OCD is nonoperative treatment. Symptomatic and stable OCD that fails to heal with nonoperative treatment and unstable OCD require surgical treatment.[1]

For OCD of the glenoid, both conservative and surgical treatments have been reported.[2,4,8–10,12,16–18,20–23] However, the treatment strategy for OCD of the glenoid for overhead athletes is inconsistent. Here, we report the treatment of 4 cases of OCD of the glenoid in baseball players.

Case report

Case 1

A 14-year-old male right-handed baseball infielder experienced pain in his right shoulder while throwing. X-ray showed a radiolucent lesion on the articular surface of the glenoid (Fig. 1, *A*). Computed tomography (CT) revealed a 3 mm × 15 mm lesion, 1 mm deep, at the posteroinferior aspect of the glenoid (Fig. 1, *B* and *C*). We diagnosed OCD of the glenoid and instructed him to stop throwing. Three months after the first visit, CT images showed improvement in the lesion (Fig. 2, *A* and *B*), and the patient resumed pitching without pain. Six months after the initial examination, CT showed that the lesion had healed (Fig. 2, *C* and *D*).

Case 2

A 14-year-old male right-handed baseball infielder presented with a one-month history of right shoulder pain during throwing. X-ray showed a translucent sign in the posterior aspect of the glenoid (Fig. 3, *A*). CT showed a defect in the bone at the posterosuperior area of the glenoid (Fig. 3, *B-D*). Magnetic resonance imaging (MRI) revealed a sclerotic change in the subchondral bone of the glenoid (Fig. 3*E*). We advised him to rest and to stop throwing. Four months after the initial examination, CT showed no subchondral bone separation and a tendency for restoration (Fig. 4, *A* and *B*). Eight months after the initial examination, CT confirmed that the lesion had healed (Fig. 4, *C* and *D*).

No institutional review board approval was required for this case report.

* Corresponding author: Yoshikazu Kida, MD, PhD, Department of Orthopaedics, Graduate School of Medical Science, Kyoto Prefectural University of Medicine, Kawaramachi- Hirokoji, Kamigyo-ku, Kyoto, 602-8566, Japan.
E-mail address: kida@koto.kpu-m.ac.jp (Y. Kida).

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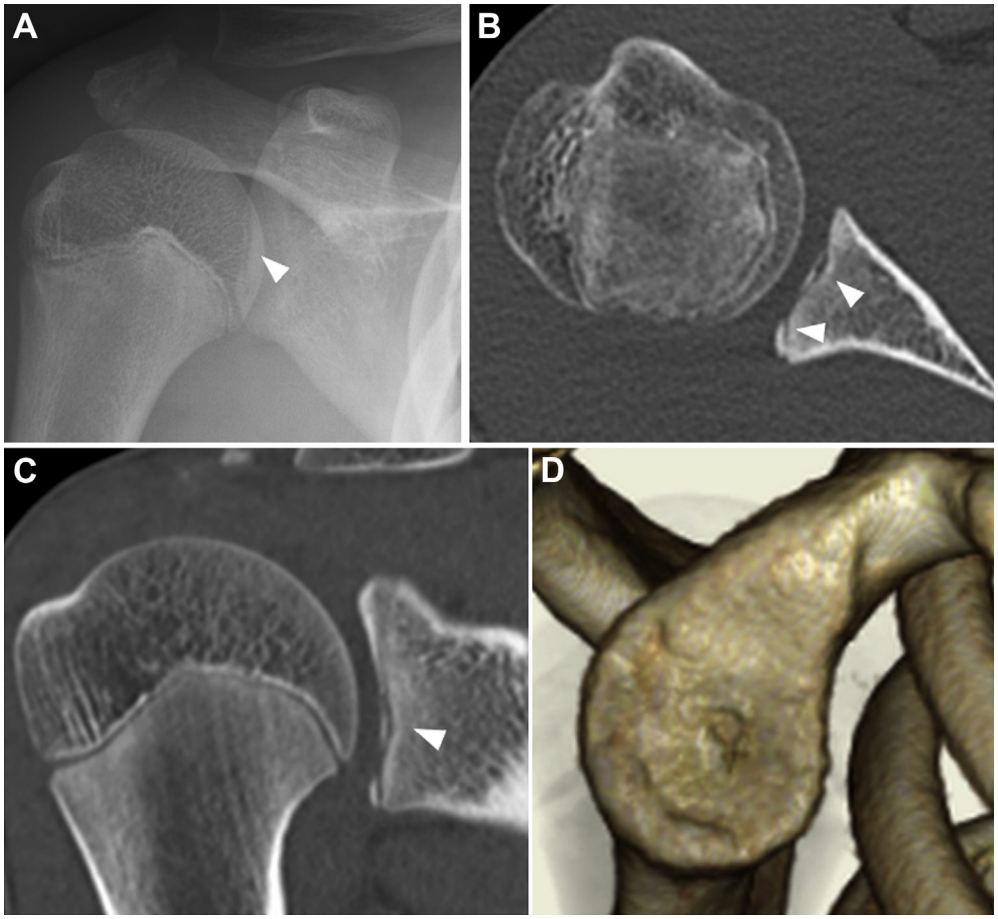

Figure 1 Anteroposterior radiograph (**A**) and computed tomography (**B, C, D**) of the right shoulder showed a radiolucent lesion (*arrowheads*) on the surface of the glenoid.

Case 3

A 15-year-old male right-handed baseball catcher reported a one-month history of right shoulder pain when throwing a ball. X-ray showed an osteosclerotic change at the posterior margin of the glenoid (Fig. 5, *A*). CT and MR images showed fragmentation and sclerotic changes in the lesion (Fig. 5, *B–D*, *E*). We instructed him to stop throwing, and the pain subsided after one month. The lesion did not show any tendency to healing but he returned to baseball without symptoms. Four months after the initial examination, CT showed no repair of the lesion, but there were no symptoms (Fig. 6, *A* and *B*). He continued to play baseball without symptoms until the final observation two and a half years after his initial diagnosis.

Case 4

A 17-year-old male left-handed baseball pitcher reported pain in his left shoulder that he had been experiencing in the last one year while pitching. He received conservative therapy from a local physician, but the pain persisted despite being treated conservatively. X-ray showed a radiolucent defect of the glenoid (Fig. 7, *A*). CT and MRI revealed a sclerotic change in the subchondral bone of the posterosuperior aspect of the glenoid (Fig. 7, *B-D*, *E*). The lesion showed sclerotic change and was not healing with conservative treatment. Considering the patient's desire to play baseball as soon as possible, we performed arthroscopic surgery. Arthroscopic findings showed no fissure in the cartilage surface of the glenoid but revealed softening in the posterosuperior aspect of the glenoid (International Cartilage Repair Society: ICRS stage II) (Fig. 8, *A*). There was no loosening of the lesion.

Microfracture was performed by drilling the lesion with a 1.5 mm K-wire from the articular side to the depth of the subchondral bone (Fig. 8, *B*). Three months after the surgery, CT showed remodeling of the lesion (Fig. 9, *A* and *B*), and the patient was allowed to start pitching. Six months postsurgery, CT revealed that the lesion was completely healed (Fig. 9, *C* and *D*), and he made a complete return to sports.

Discussion

OCD of the glenoid is a rare condition. Repeated minor trauma on the glenoid surface has been thought to play an important role in the development of OCD of the glenoid, as OCD of the glenoid has been more common in the dominant hand in pitching athletes.[2,4,8,10,12,16,17,20–22] Shimizu et al reported that the stress distributions in the posteroinferior and posterosuperior segments of the glenoid surface in baseball players were greater than those in nonathletic people.[19] Most cases of OCD of the glenoid in baseball players have been reported to be in the posterior region of the glenoid.[2,4,8,10,12,16,17,20–22]

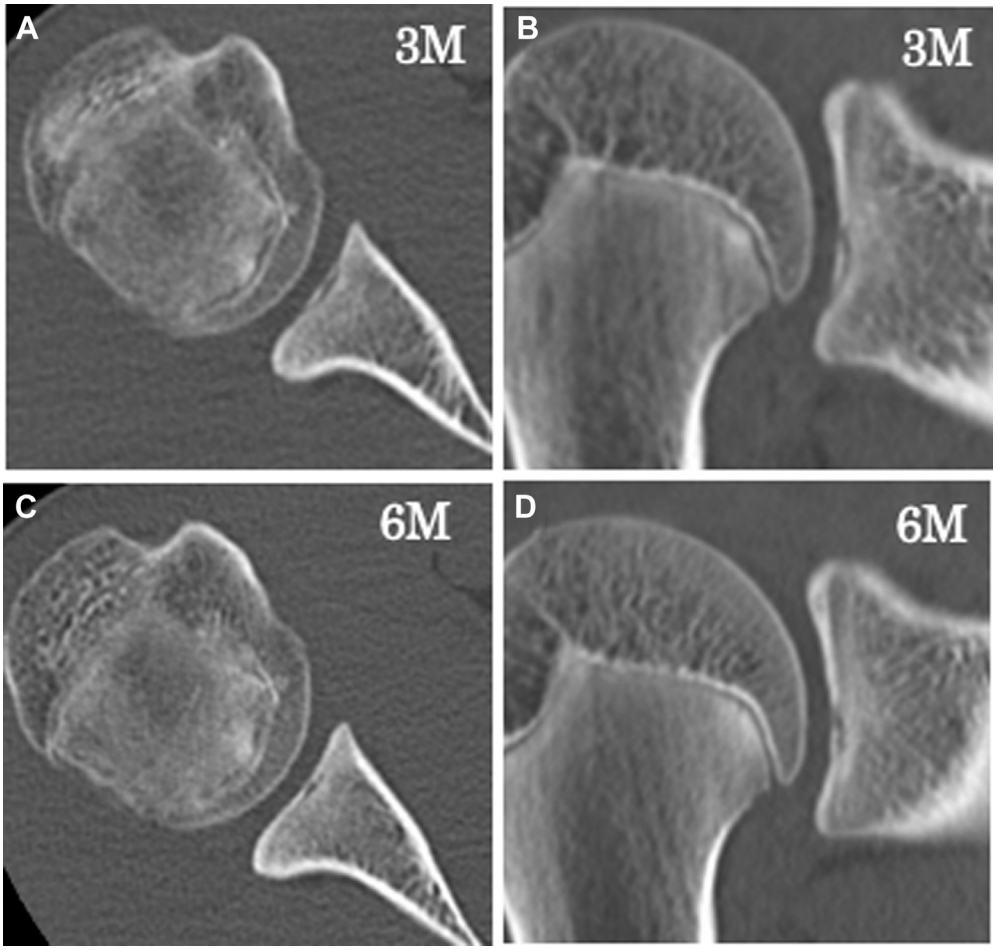

Figure 2 Computed tomography 3 months (**A, B**) and 6 months (**C, D**) after the first visit showed improvement in the lesion.

Suzuki et al hypothesized that the anterior band of the inferior glenohumeral ligament pushed the humeral head posteriorly, creating a shearing and compression force on the glenoid and resulting in OCD.[20]

Nishinaka et al postulated that the instability of the glenohumeral joint increased the shearing force to the glenoid and caused OCD of the glenoid.[16] In this study, no instability of the glenohumeral joint was observed in all cases, but the lesion was found in the posterior region of the glenoid, which was thought to be caused by the shearing and compression forces of the humeral head caused by the pitching load.

According to Minami et al, OCD is generally classified into three stages: translucent, fragmentation, and loose body, based on plain radiography.[15] Dipaola et al reported 4 stages of OCD based on MRI findings.[5] For OCD of the elbow, conservative treatment is selected in the translucent and the fragmentation stages, and surgical treatment tends to be performed in the loosening stages.[14] Surgical treatment of OCD of the glenoid has been reported, including microfracture, osteocartilage excision, bone peg grafting, and autogenous osteochondral plugs, but there is no consistent treatment strategy for OCD of the glenoid (Table I).

In this study, favorable results were obtained with conservative treatment in cases 1 and 2. We considered that the load on the glenoid was reduced by the athletes refraining from pitching and that lesion healed occurred because they were relatively young and the lesions were in the early stage. In case 3, the lesion had not been completely repaired with conservative treatment. We thought this was for two reasons; first, the epiphysial lines around his shoulder were almost closed; second, the patient did not stop playing sports. The patient was able to continue playing baseball without pain, but he will need to be followed up in the future. In case 4, there was no improvement in symptoms with conservative treatment and the lesion did not heal, thus arthroscopic surgery was indicated. Osteocartilage excision with microfracture,[22] bone peg grafting,[20] and the use of autogenous osteochondral plugs[21] have been reported as treatment options for unstable OCD lesions. In this case, arthroscopic findings showed no cracks on the glenoid surface and revealed softening of the focal area. As the lesion was relatively stable, only microfracture surgery was performed. The patient was able to return to his former competitive level of baseball as a pitcher, and the lesion completely repaired. We consider microfracture surgery as a useful treatment for advanced lesions resistant to conservative treatment.

The secondary ossification centers of the upper-third of the glenoid surface develop between the ages of 8 and 10 years, and the secondary ossification centers for the inferior two-thirds of the glenoid develop around 14–15 years of age. Complete fusion of

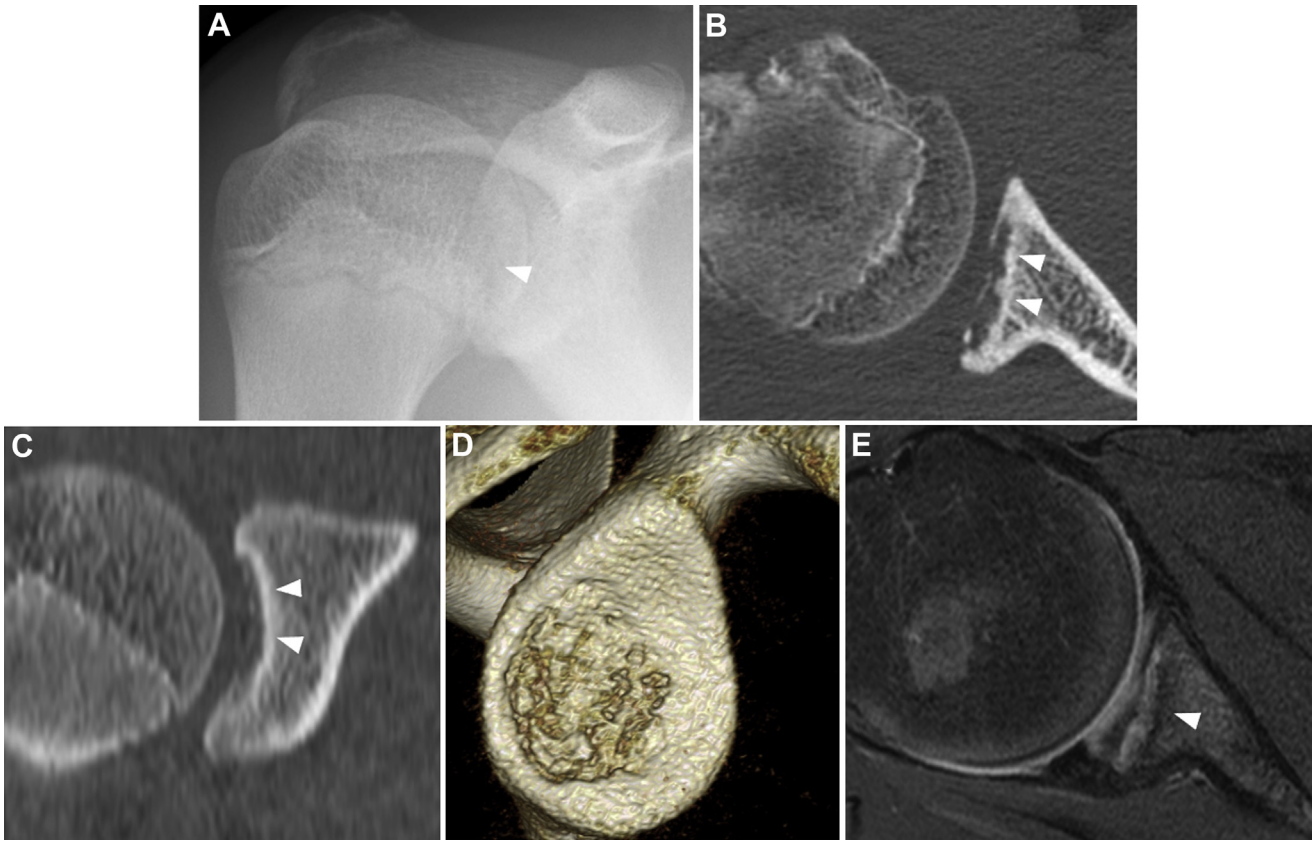

Figure 3 Anteroposterior radiograph of the right shoulder showed a translucent sign (*arrowhead*) in the glenoid (**A**). Computed tomography (**B, C, D**) showed a defect (*arrowheads*) in the bone of the glenoid. Axial T2-weighted magnetic resonance imaging (**E**) demonstrated a high intensity area (*arrowhead*) in the subchondral bone of the glenoid.

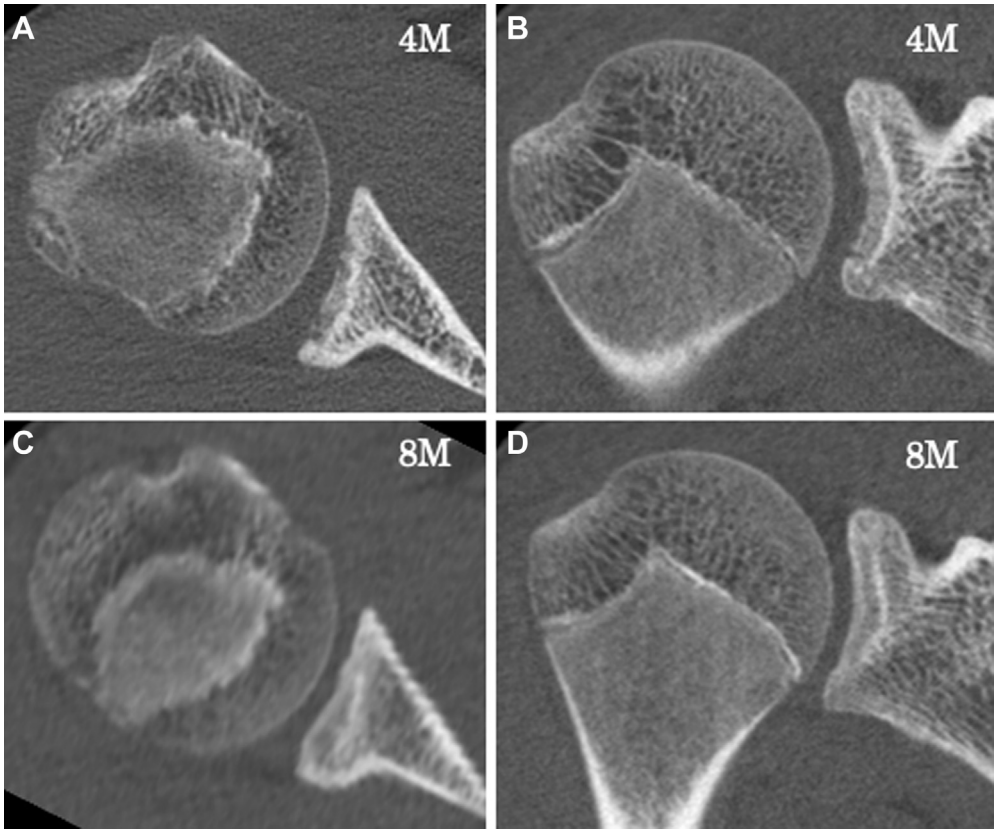

Figure 4 Computed tomography 4 months (**A, B**) and 8 months (**C, D**) after the first visit showed restoration in the lesion.

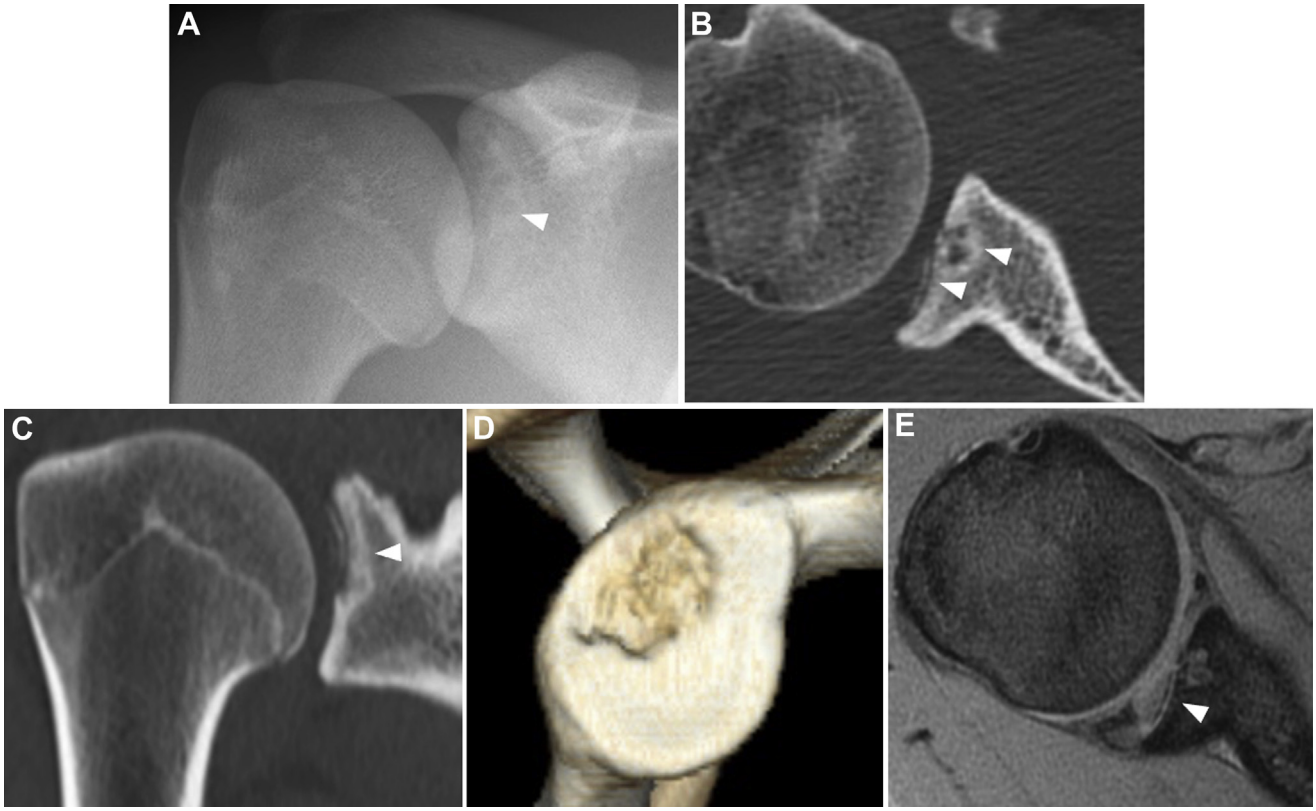

Figure 5 Anteroposterior radiograph of the right shoulder showed an osteosclerotic change (*arrowhead*) in the glenoid (**A**). Computed tomography (**B, C, D**) showed a fragment and sclerotic change (*arrowheads*) in the glenoid. Axial T2-weighted magnetic resonance imaging (**E**) demonstrated a high linear signal (*arrowhead*) at the subchondral bone of the glenoid.

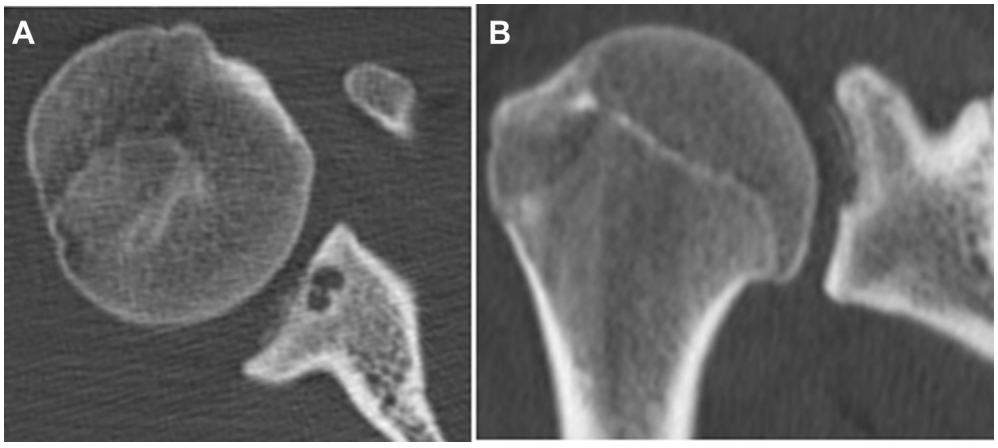

Figure 6 Computed tomography 4 months after the first visit (**A, B**) showed no change in the lesion.

both epiphyses occurs at 16–18 years of age.[13] Conservative therapy has been successful in young patients before secondary ossification is complete. For lesions after secondary ossification is complete, we need to consider a treatment plan to evaluate the status of the articular cartilage surface.

In Dipaola's MRI staging scale, stages I and II are classified as stable, while stages III and IV are classified as unstable.[5]

Maruyama, Kida et al have determined whether OCD lesions in the elbow are stable or unstable according to CT and MRI and how to decide treatment strategy for these lesions.[11,14]

Our treatment strategy is as follows:

We first evaluate whether the lesion is stable or unstable by CT or MRI. When the lesion is stable, we recommend conservative treatment. Surgical treatment is selected when conservative

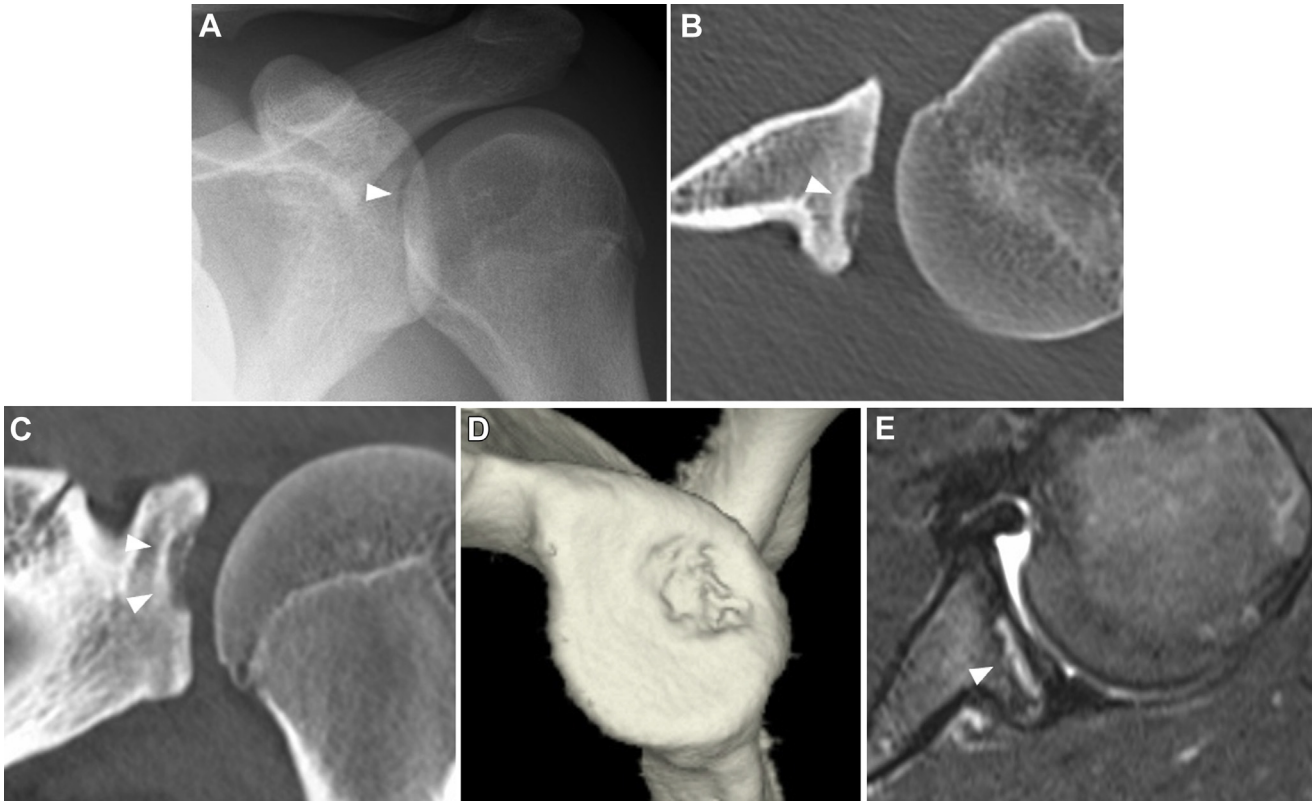

Figure 7 Anteroposterior radiograph of the right shoulder showed a translucent sign (*arrowhead*) in the glenoid (**A**). Computed tomography (**B, C, D**) showed a sclerotic change (*arrowheads*) in the subchondral bone of the glenoid. Axial T2-weighted magnetic resonance imaging (**E**) demonstrated a high signal area (*arrowhead*) at the subchondral bone of the glenoid.

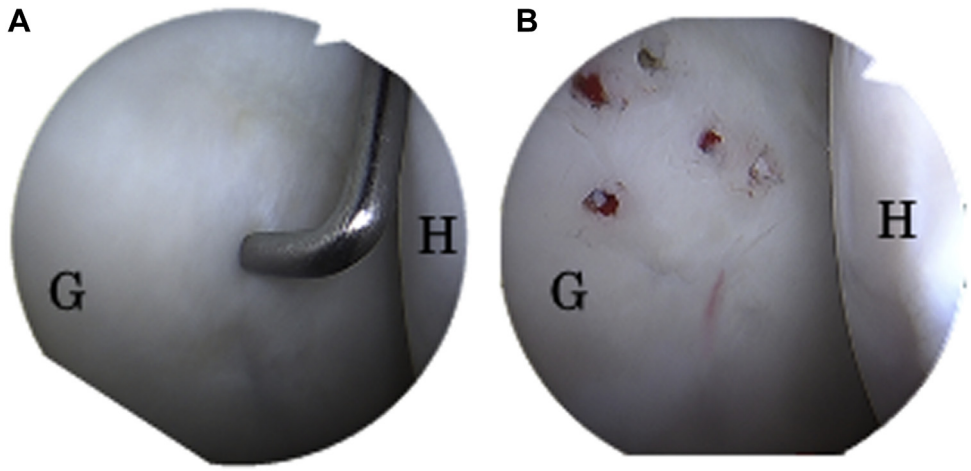

Figure 8 Viewed from the anterior portal. (**A**) There is no fissure in the cartilage surface, but there is softening in the posterosuperior aspect of the glenoid. (**B**) Five drillings were performed to a depth of bleeding at 5 mm intervals in the softening lesions. G = glenoid, H = humeral head.

treatment has failed or when the lesion is unstable. The surgical procedure is determined by the condition of the articular cartilage based on the ICRS OCD classification.[3] Arthroscopic drilling or microfracture surgery of the subchondral bone of OCD lesions is selected for ICRS I and II, and arthroscopic débridement or osteochondral autograft transplantation, depending on the size of the lesion, for ICRS III and IV (Fig. 10)

Conclusion

We reported 4 cases of OCD of the glenoid. Two patients, who were relatively young and had a translucent or an early sclerotic lesion, returned to competition and the lesions improved after conservative treatment. One young patient, who had a fragmentation lesion that was free of pain, returned to competition with

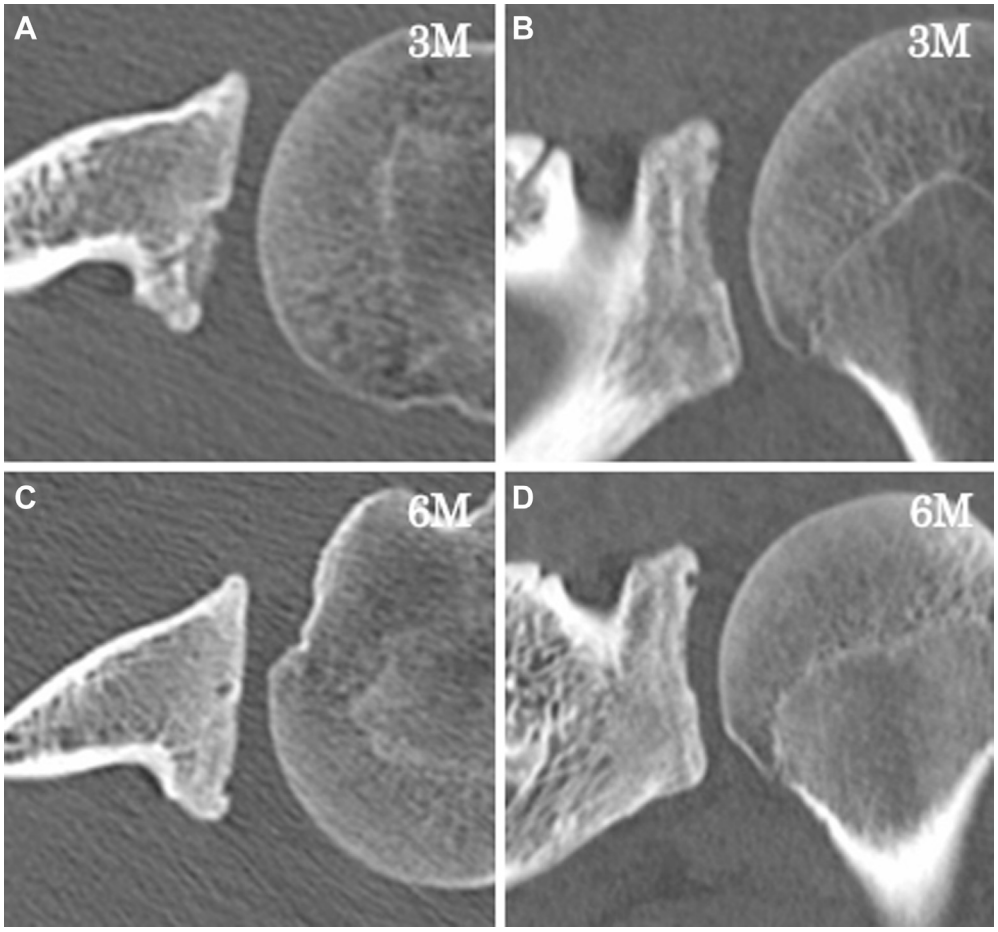

Figure 9 Computed tomography 3 months after surgery (**A, B**) showed restoration of the lesion and 6 months after surgery (**C, D**) showed complete healing.

conservative treatment, but complete restoration of the lesion was not achieved. One patient with advanced lesion resistant to conservative treatment underwent microfracture surgery, and he was able to return to the same level of competition as before and the lesion healed completely. No consistent treatment strategy for OCD of the glenoid has yet been reported. We propose a treatment strategy depending on the lesion stage, based on imaging and surgical findings.

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Conflicts of interest

The author, their immediate family, and any research foundation 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.

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Patient consent

Obtained.

Table I
Reports of OCD of the glenoid in baseball player

Age (years)	Gender	Laterality	Dominant side	Lesion site	X-ray*	MRI†	ICRS	Comorbidity	Treatment	Return to sport	Follow-up period	First author	Publication data
16	Male	Right	Right	Posterior superior	Translucent	II	I	No	Only arthroscopy	2 years and 4 months	4 years and 6 months	Akutsu	1996
31	Male	Left	Left	Posterior superior	Normal	III	II	SLAP (type II), ssp tear, internal impingement	Thermal shrinkage and labrum repair and debridement of cuff tear	8 months	8 months	Nishinaka	2002
19	Male	Right	Right	Posterior inferior	Sclerotic	II	II	Loosening of the posterior capsule	Thermal shrinkage of the posterior capsule	4 months	1 year and 2 months	Suzuki	2003
20	Male	Right	Right	Anterior superior	Loosening	IV	IV	No	Remove loose body and microfracture	1 year	1 year	Rossi	2006
22	Male	Right	Right	Posterior superior	Sclerotic	III	IV	No	Remove loose body and microfracture	4 months	4 months	Koike	2008
20	Male	Right	Right	Posterior superior	Sclerotic	II	I	No	Bone peg grafting	4 months	6 months	Utashima	2010
14	Male	Right	Right	Posterior inferior	No data	II	-	No	Conservative	5 months	5 months	Fujisawa	2013
17	Male	Right	Right	Posterior inferior	No data	III	I	SLAP (type II), internal impingement	Microfracture	6 months	6 months		
18	Male	Right	Right	Posterior superior	Normal	II	III	No	Debridement and microfracture	6 months	9 months	Coats	2014
16	Male	Right	Right	Posterior	Normal	II	-	No	Conservative	8 months	2 years	Grau	2016
19	Male	Right	Right	Posterior superior	Translucent	III	III	No	Autogenous osteochondral plugs	8 months	3 years	Tsujino	2018

SSP, supraspinatus muscle; *SLAP*, superior labrum anterior posterior.
* Stage of X-ray is according to Minami's staging classification.
† Stage of MRI is according to Dipaola's staging classification.

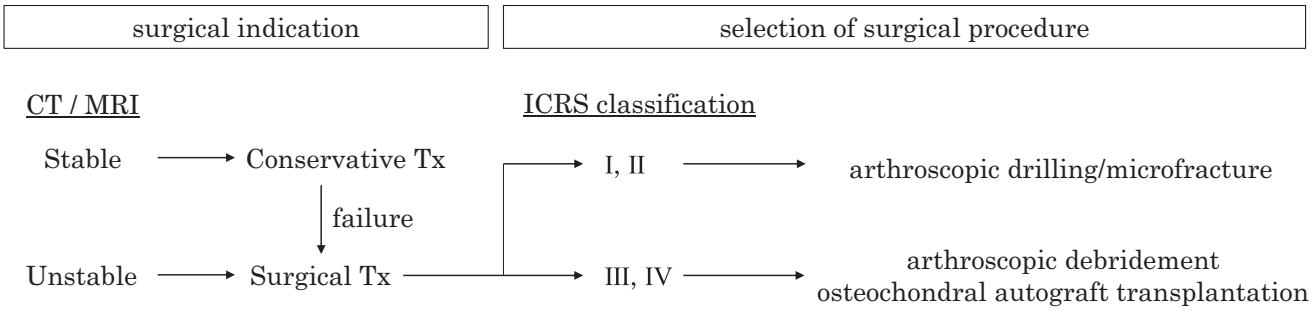

Figure 10 Our treatment strategy for the OCD of the glenoid.

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