Current Concepts

Nonarthroplasty Treatment of Glenohumeral Cartilage Lesions

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Abstract: Treatment of young, active persons with symptomatic cartilage lesions of the glenohumeral joint represents a significant challenge. Diagnosis of glenohumeral chondral defects is not always straightforward and effective treatment requires familiarity with a number of techniques. Low-demand individuals may accept palliative therapy in the form of arthroscopic debridement as a temporizing solution. However, younger, high-demand individuals require a careful, stepwise approach that includes reparative, restorative, and reconstructive strategies. Reparative strategies use marrow-stimulation techniques to induce formation of fibrocartilage. Restorative tactics attempt to replace damaged cartilage with hyaline or hyaline-like tissue using osteochondral or chondrocyte transplantation. Large lesions that are not candidates for reparative or restorative procedures can be approached using reconstruction methods such as biologic resurfacing. This review examines causes of chondral injury in the glenohumeral joint, discusses diagnostic strategies, and presents a practical framework including palliative, reparative, restorative, and reconstructive options with which one can formulate a treatment plan for these patients. **Key Words:** Glenohumeral—Cartilage lesion—Arthritis—Shoulder.

Degenerative processes affecting the glenohumeral joint are not uncommon, and may produce significant morbidity in up to 20% of elderly persons.[1] Prosthetic resurfacing of the humerus and glenoid has become the treatment of choice for many of these patients, and the volume of shoulder hemiarthroplasty and total shoulder arthroplasty has risen steadily in the United States, doubling from 10,000 cases a year to more than 20,000 cases a year over the past decade.[2] Many patients obtain durable pain relief and increased functionality as a result of prosthetic resurfacing. Nevertheless, the results of both traditional hemiarthroplasty and total shoulder arthroplasty in younger people with glenohumeral cartilage loss have not been encouraging.[3] The young, active patient with symptomatic cartilage loss in the glenohumeral joint is not an ideal candidate for total shoulder arthroplasty and poses a challenge in terms of providing lasting pain relief and optimizing functionality. This review focuses on the surgical treatment of glenohumeral cartilage lesions outside of traditional arthroplasty, specifically discussing palliative, reparative, restorative, and reconstructive treatment options and offers an algorithm for patients with glenohumeral cartilage loss.

INCIDENCE AND ETIOLOGY

The incidence rate of Outerbridge grade II-IV lesions as noted during arthroscopic evaluation of the shoulder has been estimated at 5%.[4,5] The spectrum of articular cartilage abnormalities in the glenohumeral joint includes idiopathic focal defects, chondrolysis, post-traumatic defects, osteochondritis dissecans (OCD), avascular necrosis, postsurgical cartilage abnormalities, and osteoarthritis.

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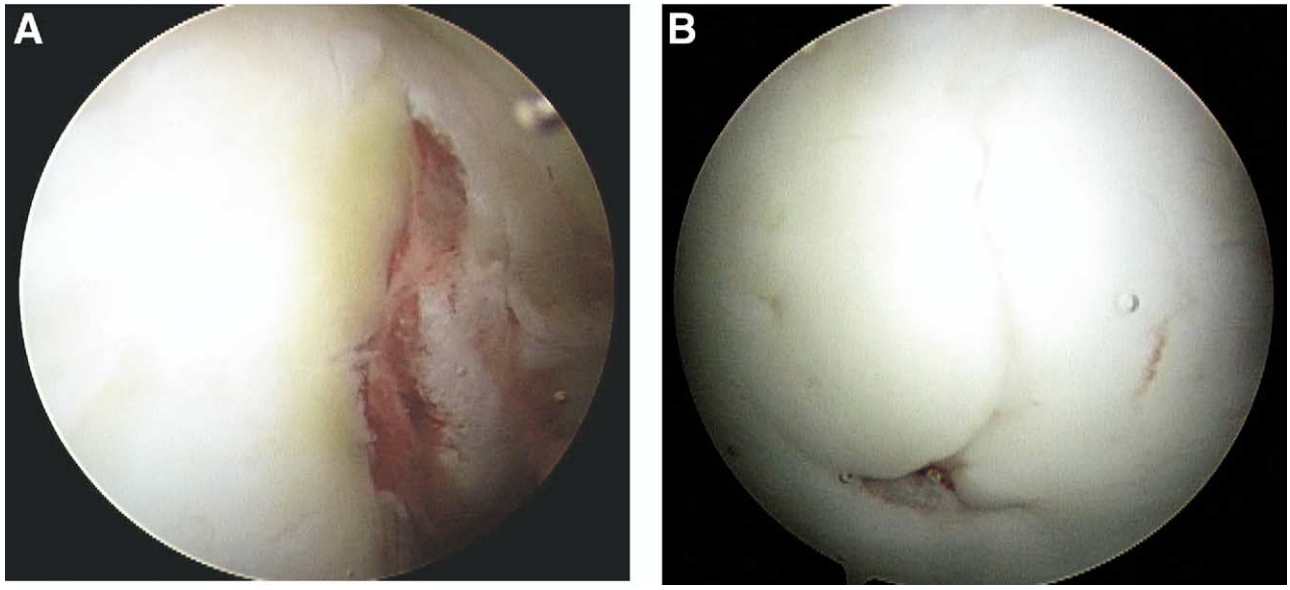

Figure 1. (A) Arthroscopic image shows a large Hill-Sachs lesion following initial anteroinferior dislocation in a 17-year-old football player. (B) Image from the same patient shows chondral injury adjacent to but not directly part of the Hill-Sachs lesion.

Both acute and recurrent shoulder instability have a well-documented association with glenohumeral cartilage lesions.[3,6-10] A large percentage of first-time dislocations result in either a chondral shear injury or an osteochondral compression fracture of the posterolateral humeral head, as classically described by Hill and Sachs in 1940 (Fig 1).[11]

With respect to acute injury, investigators have reported the prevalence of chondral shear injuries and Hill-Sachs lesions among index anterior glenohumeral dislocations to range from 47% to 100% of cases.[7,9,10,12] As an osteochondral defect, the Hill-Sachs lesion can be an independent contributor to recurrent instability, as well as a source of significant discomfort.[13] What remains unclear from these studies are both the acute and long-term effects of these instability-related cartilage injuries. The natural history of the Hill-Sachs lesion or chondral shear injury occurring at the time of index dislocation is unknown.

Cameron and his colleagues[8] reviewed 422 cases from a mixed population of anterior, posterior, and multidirectional instability and found a significant and positive correlation between preoperative glenohumeral osteoarthritis (defined as presence of glenoid or humeral Outerbridge grade III or IV lesions) and time to surgery.[8] In another large retrospective study, Buscayret et al.[6] looked at a series of 570 cases of anterior instability and found an 8.4% prevalence rate of preoperative glenohumeral arthritis, positively correlated with 5 independent factors: time to surgical stabilization, presence of the Hill-Sachs lesion, presence of a glenoid rim impaction fracture, age at time of index dislocation, and presence of a rotator cuff tear.[6] Furthermore, Buscayret's study suggests that the presence of cartilage injury (Hill-Sachs lesion or glenoid rim impaction fracture) at the time of the index instability episode may portend development of glenohumeral arthritis.

Recurrent shoulder instability and procedures used to treat recurrent instability have also been correlated with glenohumeral cartilage pathology. Both anatomic reconstructive procedures such as the open Bankart technique, and nonanatomic reconstructions such as the Putti-Platt, Bristow, and Magnuson-Stack procedures have a well-documented association with glenohumeral arthrosis, known in the context of nonanatomic reconstruction as "capsulorrhaphy arthropathy."[1]

Rotator cuff pathology has also been associated with the presence of articular cartilage pathology in the shoulder. Gartsman and Taverna[14] reported a 13% prevalence of cartilage lesions in a series of 200 patients with full-thickness tears of the rotator cuff.[14] However, only 5% of patients had what were considered in the study to be "major" lesions, defined as areas of exposed bone $\geq$150 mm^2. Paley et al.[15] reported a 17% prevalence of osteochondral lesions of the humeral head in a series of 41 high-level overhead