Management and Surgical Options for Articular Defects in the Shoulder

Bryan M. Saltzman, MD, Timothy Leroux, MD,
Brian J. Cole, MD, MBA*

KEYWORDS

• Shoulder • Glenohumeral • Chondral • Cartilage • Defects • Articular
• Autologous chondrocyte implantation • Osteochondral autograft

KEY POINTS

- The natural history of isolated, full-thickness chondral lesions of the glenohumeral joint is less clear than those of the knee or ankle.
- Often, the diagnosis can be difficult to make clinically because of vague, nonlocalized complaints, and a history and physical examination similar to other common shoulder pathologies.
- It is imperative that the surgeon obtain as much information as possible from the clinical evaluation so as to avoid treatment of an incidental, truly asymptomatic lesion.
- No firm consensus exists as of yet on the most appropriate operative treatment options for glenohumeral focal articular defects.
- Possible treatment measures include arthroscopic debridement, microfracture, autologous chondrocyte implantation, osteochondral allograft, and osteochondral autograft transfer, as well as biologic resurfacing or metallic replacement.

INTRODUCTION

Isolated, full-thickness chondral lesions of the glenohumeral joint are a significant pathology encountered by laborers, athletes, and the elderly.[1] They may be a result of genetic and/or degenerative changes to the joint, posttraumatic lesions, postoperative changes, loose bodies, osteonecrosis (iatrogenic, corticosteroid or alcohol use), shoulder instability or microinstability, inflammatory arthritis, osteoarthritis, infection, intra-articular pain pump placement, rotator cuff arthropathy, or osteochondritis dissecans.[2–4] The incidence of 5% to 17%[5] is less common than the knee joint, likely

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Department of Orthopedic Surgery, Rush University Medical Center, 1611 West Harrison Street, Suite 300, Chicago, IL 60612, USA
* Corresponding author.
E-mail address: brian.cole@rushortho.com

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related to weight bearing and impact loading that is less in the shoulder joint. This is probably why many are well-tolerated and asymptomatic.[6] Diagnosis of full-thickness chondral defects can be challenging, and the outcomes following nonoperative and operative treatment less predictable.[2] Additionally, the natural history of full-thickness chondral lesions in the shoulder is less clear than those of the knee or ankle.[7]

The management of focal chondral lesions of the glenoid or humerus remains challenging.[8,9] These defects have a limited capacity to heal because of a lack of direct vascular supply and direct access to undifferentiated, pluripotent cells to assist with native healing capacity.[10] Thus, many treatment options have been refined to provide pain relief, create reparative tissue, or restore the articular surface.[8] Although shoulder arthroplasty is a reliable option for those with more diffuse degenerative changes, it can impose significant, debilitating activity restrictions for a younger individual and includes a limited implant life span. Joint-preserving procedures are therefore particularly important to identify for those young patients with focal cartilage defects with continued pain and decreased function.

CLASSIFICATION

No specific classification scheme pertains to articular lesions in the shoulder; as such, the Outerbridge system,[11] as is used to describe lesions in the knee, is conventionally used for the glenohumeral joint as well. In this, Grade 0 refers to normal cartilage, grade I is softening of the articular cartilage, grade II involves fibrillation of half the depth of the articular surface, grade III involves fissuring of more than half of the articular surface depth, and finally grade IV is full-thickness cartilage loss to the subchondral bone. Descriptive characteristics are otherwise pertinent, including location (humerus or glenoid), position (peripheral or central), size, depth, and degree of containment.

GLENOHUMERAL ARTICULAR ANATOMY

The anatomy of the glenohumeral joint can make evaluation and treatment of articular defects difficult. The mean articular depth of the glenoid fossa cartilage is 1.88 mm and that of the humerus cartilage is 1.24 mm.[12] The glenoid articular cartilage is thickest along the periphery and tapers toward the bare area in the center where no cartilage is present. By contrast, the humeral head chondral surface is thickest in the center (at approximately 1.2–1.3 mm thick) and thins to less than 1 mm at the periphery.[13] Knowledge of these characteristics is important when considering on patient imaging or arthroscopic evaluation whether a defect in the cartilage is present, or if it is just the native patient anatomy. In addition, the geometry of the glenohumeral joint is such that the glenoid radius of curvature is within 2 to 3 mm of the humeral head so that they remain relatively congruent with the interposed chondral surfaces and labral rim.[3] Glenoid version (1.5° retroversion) and inclination (4.2° superiorly) are important to consider for as well for approaching the joint surgically.[14]

HISTORY AND PHYSICAL EXAMINATION

A thorough history should be obtained in any patient presenting to the office with shoulder pain and concern for the etiology being an articular cartilage defect. Often the diagnosis can be difficult to make clinically because of vague, nonlocalized complaints and a history and physical examination similar to other common shoulder pathologies.[7] Because of the complex nature of the shoulder joint anatomy, careful