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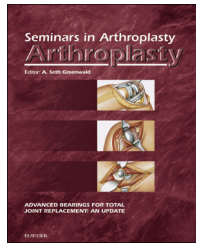

Arthroscopic biologic total shoulder resurfacing—Are you kidding?

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ABSTRACT

The treatment of large, bipolar osteochondral lesions of the glenohumeral joint in young, active patients is challenging. When conservative treatment fails to provide acceptable results, restorative and reconstructive options are often considered. Despite its success in relieving pain and restoring function, total shoulder arthroplasty has significant drawbacks for young patients. One surgical option is an all-arthroscopic osteochondral total shoulder resurfacing using fresh osteochondral allografts. By using an arthroscopic approach, damage to surrounding structures, including the subscapularis, is minimized, resulting in decreased morbidity and rehabilitation required after surgery when compared to standard total shoulder arthroplasty.

1. Introduction

The treatment of large, bipolar osteochondral lesions of the glenohumeral joint in young, active patients is challenging. When conservative treatment, as described by McCarty and Cole's algorithm [1], fails to provide acceptable results, restorative and reconstructive options are often considered. Unfortunately, large defects are not amenable to restorative procedures such as microfracture and autologous chondrocyte implantation (ACI). Despite its success in relieving pain and restoring function [2], total shoulder arthroplasty (TSA) has significant drawbacks for young patients, which include glenoid loosening [2] due to osteolysis [3], the production of polyethylene wear particles [3], and the need for revision surgery [2]. Glenohumeral arthrosis may result in significant pain, loss of function, and diminished quality of life [4], especially for young, active patients.

One surgical option for the treatment of shoulder arthritis and larger focal defects in younger patients is an all-arthroscopic osteochondral total shoulder resurfacing using fresh osteochondral allografts (OCGs). Humeral grafts are taken from a humeral head, while glenoid grafts are taken from the medial tibial condyle or distal tibial plafond. This procedure is performed entirely through the rotator interval and provides biologic resurfacing of the damaged glenohumeral joint, which preserves bone stock and leaves open the possibility of later conversion to standard TSA (Fig. 1). By using an arthroscopic approach, damage to surrounding structures, including the subscapularis, is minimized, resulting in decreased morbidity and rehabilitation required after surgery as compared to standard TSA.

2. Basis for the development of the procedure

Osteochondral lesions of the glenohumeral joint may be caused by trauma, infection, avascular necrosis, osteochondritis dissecans, osteoarthritis, inflammatory arthridities,

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Figure 1 – This postoperative radiographic image demonstrates biologic replacement of the glenohumeral joint surface in a 51-year-old manual laborer. A portion of the inferior humeral neck osteophyte remains and has been inconsequential clinically.

idiopathic chondrolysis, rotator cuff arthropathy, or iatrogenic injury [1,5], which may include the effects of intra-articular pain pumps [6–8], radiofrequency devices [9–12], and prominent anchors [13,14], leading to the phenomenon of post-arthroscopic glenohumeral chondrolysis (PAGCL). Humeral head articular cartilage has a thickness of 1.2–1.3 mm centrally and is less than 1-mm thick peripherally [15], making it especially prone to injury when compared with the thicker articular cartilage found elsewhere in the body [2]. The diagnosis of osteochondral defects that are true causes of pain is difficult due to the presence of other pain generators in the region [2], including the biceps tendon, labrum, and rotator cuff. The incidence of symptomatic Outerbridge grade II–IV cartilage injuries found at the time of arthroscopy has been reported at between 5% and 17% [16,17], and many more chondral lesions are found incidentally [2]. At present, the natural history of chondral lesions of the glenohumeral joint is unknown, although it is believed that unipolar lesions will eventually progress to become bipolar lesions [2].

Several treatment options are available for young patients with mild to moderate glenohumeral joint defects. Young patients with fewer demands may do well with debridement and microfracture. Even deeper and larger unipolar lesions have been successfully treated using osteochondral allograft, and Romeo et al. [18] have published a case report of ACI performed on a 16-year-old baseball player, which resulted in full, painless range of motion at 1-year follow-up. Osteochondral allograft has been shown to produce good results in the shoulder [19,20], as well as in the ankle [21,22], hip [23], and knee [24–32]. Non-arthroplasty options for biologic resurfacing include interpositional anterior shoulder capsule, autogenous fascia, Achilles tendon allograft [33], and lateral meniscal allograft [3,34,35], as well as off-label uses of xenograft and human-skin allograft [2].

3. Surgical technique—Arthroscopic biologic total shoulder resurfacing

The prime surgical candidate is a young patient who is healthy, has a flexible osteoarthritic shoulder, a good rotator cuff, a centered glenohumeral joint, and severe arthritis. The surgery is performed with the patient in the beach-chair position. A standard posterior portal is used to introduce the inflow cannula into the glenohumeral joint, and an anterior portal is placed through the rotator interval using the outside-in technique. Special attention must be paid to the skin incision for anterior portal placement, as this will need to measure 20–25 mm to allow for the passage of instrumentation and allograft (Fig. 2). The glenohumeral joint is debrided initially to aid in instrumentation and visualization. A suture is passed through the biceps tendon using a penetrating device and is retrieved out of the anterior portal for soft tissue tenodesis after the completion of the resurfacing procedure. The entire rotator interval must then be debrided with an arthroscopic shaving device to enable instrumentation of the glenohumeral joint.

3.1. *Humeral head preparation*

Arthroscopic total shoulder resurfacing is performed using specially developed targeting and reaming guides. After the joint has been prepared, the 25-mm humeral head-targeting guide is inserted through the anterior portal and centered over the articular surface of the humeral head. Once the

Figure 2 – In addition to the standard portal placement, an anterior incision must be made to accommodate passage of the grafts through the rotator interval. (Color illustration of figure appears online.)