Biologic Options for Glenohumeral Arthritis

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KEYWORDS

• Glenohumeral arthritis • Biologic • Interposition • Injections • Allograft

KEY POINTS

- Biologic options for glenohumeral arthritis include intra-articular injections and several forms of allograft arthroplasty.
- Intra-articular injections of hyaluronic acid and platelet-rich plasma (PRP) seem to be well tolerated and safe.
- The efficacy of hyaluronic acid in young patients with glenohumeral arthritis is uncertain.
- The evidence for PRP injections in glenohumeral arthritis is limited.
- There is limited evidence for success of allograft interposition arthroplasty.

INTRODUCTION

Biologic options for glenohumeral arthritis include intra-articular injections as well as allograft interposition arthroplasty. The objective of these treatments is reduction in pain and maintenance or improvement in function, while delaying or avoiding the need for total joint arthroplasty. In young patients with glenohumeral arthritis, this is of particular importance: these patients may have lifestyles that accelerate wear rates, making pain, glenoid component loosening, and early revision significant risks.

INTRA-ARTICULAR INJECTIONS

Several options for biologic intra-articular injections exist, including hyaluronic acid (HA) and autologous platelet-rich plasma (PRP).

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Hyaluronic Acid

Basic science

HA is naturally present in synovial fluid, highly concentrated at the articular cartilage surface. In high concentrations, HA increases the viscosity and elasticity of synovial fluid, thereby allowing it to act not only as a lubricant but also as a shock absorber in synovial joints, protecting the cartilage against shear and compressive forces.[1–3] HA may also have chondroprotective effects, because it stimulates production of metalloproteinase inhibitors and also inhibits neutrophil-mediated cartilage degeneration. Another beneficial effect of HA is reduction of nerve sensitivity associated with pain in the joint.[1,2]

In the natural history of osteoarthritis, the concentration of HA decreases.[2] This decrease in concentration leads to a corresponding loss of viscosity and elasticity and thus the mechanical benefit of synovial fluid. Also, the chondroprotective and analgesic effect of HA is lost.

The original rationale of viscosupplementation was restoration of the viscoelasticity of synovial fluid. However, it is also thought to augment the flow of synovial fluid and inhibit degradation of endogenous HA.[1,4] Restoring viscoelasticity and augmenting synovial fluid flow should, in theory, lead to an overall decrease in joint pain and increase in function.

HA is produced from either avian-derived molecules or bacterial biological fermentation. It is also available in varying molecular weights.[5] A meta-analysis by Altman and colleagues[5] explored the effect of differing molecular weight and production method on pain reduction and adverse effects following intra-articular HA injection in knee osteoarthritis. HA products greater than 3000 kDa were more effective in reducing pain and also associated with significantly fewer discontinuations because of treatment-related adverse events than products less than 1500 kDa. Acute injection site reactions and effusion were significantly higher in avian-derived products, although both avian-derived and biological fermentation injections had similar discontinuation rates. Thusly, individual HA products may in fact have differing clinical outcomes depending on production methods.

Efficacy in glenohumeral osteoarthritis

The evidence for viscosupplementation in glenohumeral osteoarthritis is limited, particularly in young patients. In a randomized controlled trial by Blaine and colleagues,[3] 660 patients with persistent shoulder pain due to glenohumeral arthritis, rotator cuff tears, and/or adhesive capsulitis were randomized to receive either 5 weekly intra-articular injections of HA (500–730 kDa), 3 weekly injections of HA followed by 2 weekly injections of phosphate-buffered saline (PBS), or 5 weekly injections of PBS. The primary end point of the study was a reduction in shoulder pain during movement as assessed by the patient using a 100-mm visual analogue scale (VAS) at the 13-week follow-up. The secondary end point was maintenance of this improvement through 26 weeks.

The primary end point of this study was met by all 3 groups, with no significant difference between the 2 active treatment groups and the control. However, at 26 weeks, both active treatment groups had significant ($P<.05$) improvements in the VAS compared with the control group. In subgroup analysis, it was found that patients with osteoarthritis had borderline significant improvements in the VAS at 13 weeks and clearly significant pain reduction at 26 weeks. There was no difference between the active groups and control group in patients without osteoarthritis.[3] Therefore, viscosupplementation may benefit individuals with glenohumeral osteoarthritis, but not with rotator cuff tears or adhesive capsulitis.

Another randomized controlled trial was performed by Kwon and colleagues.[6] This trial enrolled only patients with glenohumeral osteoarthritis, randomizing 300 patients