Current Management of Shoulder Stiffness

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GENERAL CONCEPT

Frozen shoulder is a common disorder which is characterized by pain and loss of movement. Its cause is poorly understood and its management is disputed. The symptoms are generally self-limiting over one to three years. The prevalence was found to be slightly greater than 2% in the general population. It is more common in women and between the ages of 40 and 60 years. Recurrence is unusual and both shoulders are affected in between 6% and 34% of cases. This condition may be primary or secondary. Zuckerman and Cuomo have separated secondary into intrinsic, extrinsic and systemic categories. Conditions associated with frozen shoulder included upper limb trauma, diabetes, cardiac surgery or disease, pulmonary disease, stroke, hyperlipidemia, or treatment with matrixmetalloproteinase inhibitor. The natural history is one of eventual recovery through three symptom-related phases. The initial phase (freezing phase) is associated with an insidious onset of pain increasing in severity over a period ranging from a few weeks to nine months. During this "freezing" phase, the shoulder loses active and passive movement. The second "frozen" phase may last from four to nine months, during which the pain begins to abate leaving global stiffness of shoulder. The final "thawing" phase sees the return of movement towards normal over a period of five to 26 moths. Undoubtedly, there may be many who suffer a mild form of the condition but recover quickly and do not seek medical attention.

The macroscopic pathological changes are contracture of the capsule and coracohumeral ligament. Microscopically, both inflammatory and fibrotic processes have been described. Lundberg showed that there was an increase in glycosaminoglycans and a decrease in glycoproteins, specifically hyaluronic acid. Rodeo et al suggested that transforming growth factor beta and platelet derived growth factor may be involved and act as a continual stimulus in the inflammatory and fibrotic process. Bunker et al determined whether there was an abnormal expression or secretion of cytokines, growth factors and MMPs in tissue samples from 14 patients with frozen shoulder using the reverse transcription polymerase chain reaction (RT/PCR) technique and to compare the findings with those in tissue from four normal control shoulders and from five patient with Dupuytren's contracture. Tissue from frozen shoulders demonstrated the presence of mRNA for a large number of cytokines and growth factors although the frequency was only slightly higher than in the control tissue.

THE MANAGEMENTS OF PRIMARY FROZEN SHOULDER

Conservative: Simple exercise programmes together intra-articular injectionsly, nerve

blockade and hydrodistension have been introduced more recent.

Surgical: Surgical intervention, either open or arthroscopic, aims to release the contracted tissue to gain movement and relieve pain. (Ozaki et al, Omari and Bunker, Segmuller et al, Ogilvie-Harris et al, Warner et al) Good to excellent results were usually obtained with either open or arthroscopic surgical release in a small number of patients who have had failed conservative treatment for primary frozen shoulder.

CONCOMITANT TREATMENT OF ROTATOR CUFF LESIONS WITH STIFFNESS

There were few reports regarding the management of rotator cuff tears and associated adhesive capsulitis. If the patient has a rotator cuff tear and secondary shoulder stiffness, some authors suggest that the shoulder stiffness shoulder be managed initially because a rotator cuff repair is a "shoulder-tightening" procedure and may increase stiffness postoperatively. However, patients usually need to wait a significant length of time for the improvement of shoulder motion before the rotator cuff tears can be repaired. In addition, the symptoms of adhesive capsulitis may not be relieved, especially in the presence of rotator cuff lesions. It thus becomes a challenging task when the orthopedic doctors face patients who have rotator cuff tears and refractory adhesive capsulitis. Based on previous satisfactory results on similar patients, we began to prospectively treat patients with rotator cuff tears and refractory adhesive capuslitis concomitantly.

A combined procedure of manipulation, intra-articular distension, extensive extra-articular release, anterior acromioplasty, and rotator cuff repair was performed on forty-three patients (forty-seven shoulders) who were available for follow-up for a minimum of two years. Ten patients (eleven shoulders) had diabetes mellitus and thirty-three patients (thirty-six shoulders) were non-diabetic. Partial tear of the rotator cuff was noted in twenty-seven shoulders, complete tears in fifteen shoulders, and massive tears in five shoulders. A functional score of Constant and Murley was used to evaluate the overall surgical results, the results between patients with an without diabetes mellitus, and the results among different types of rotator cuff tears. At a mean ((SD) of 48.55(17.79 months (range, twenty-four to eight-five months) after the operation, each patient had a significant improvement in subjective score, objective score, and strength score as well as in the total score of Constant and Murley ($p<0.001$). There was no statistical difference in postoperative total Constant scores between patients with or without diabetes mellitus ($p=0.123$). Comparison of the scores among the three types of rotator cuff tears revealed that all had a significant improvement in the total scores of Constant and Murley ($p<0.001$ for a partial cuff tear, $p=0.001$ for a complete tear, and $p=0.043$ for a massive tear), but patients with partial tears of the rotator cuff had significantly better total scores than did those with complete tears ($p=0.018$) or massive tears ($p=0.041$). Satisfactory results were obtained with 89.4% of our patients. Tissue contracture in response to cytokines, inflammatory cell products, and platelet-derived growth factor has been proposed as a pathogenic mechanism for primary frozen shoulder. We believe that a similar mechanism may be involved in the development of secondary adhesive capsulitis associated with rotator cuff tears. Through our method of

extensive lysis of the adhesions and treatment of rotator cuff tears, the cascade pathway of cytokines inducing fibroplasias and adhesion may be blocked because the long term results are good, with no recurrence in our series.

EXCESSIVE EXPRESSION OF PROINFLAMMATORY CYTOKINES IN SHOULDER STIFFNESS

Reviewing literature, it is possible that the underlying pathology in shoulder stiffness is synovial inflammation with subsequent fibrosis. Specific cytokines are known to be involved in the inflammatory and fibrotic processes. Subacromial symovium from 6 patients of rotator cuff tears with shoulder stiffness, 6 patients of rotator cuff tears without shoulder stiffness were obtained. Total RNA was isolated and mRNA expression of proinflammatory cytokines were assessed by semiquantitative RT-PCR. Expression of IL-1β and IL-6 was significantly higher in patients with shoulder stiffness. IL-1β may drive a proinflammatory response with induction of COX2, MMP-1 and -3, which may underscore production of MMPs that causes matrix destruction and a loss of tendon biomechanical properties. Persistent and excessive expression of IL-1β and IL-6 in adhesive subacromial synovium associating shoulder stiffness may have detrimental effect on the underlying rotator cuff. Control of IL-1β induction may block a cascade of events leading to tendon destruction and loss of biomechanical integrity and may be critical to protect tendon from pathologic processes.