Effect of sodium hyaluronate on healing of the damaged enthesis in rabbits

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INTRODUCTION

The injection of the sodium hyaluronate is one of the available conservative therapies for the osteoarthritic knees or periarticular shoulders. The previous studies demonstrated its functions of the anti-inflammation and restoration of chondral defects. Some reports showed it to protect the tendon from adhering after a surgery; however it has not unfortunately arrived at clinical use. Recently, the orthopaedic surgeons and sports medical therapists have paid much attention to the pathology and treatment of the damaged fibrocartilaginous enthesis, because they have discussed the significant cause of most overuse injuries in sports activities is the damage to its avascular organ. In addition, they have experienced enough the difficulty of treating it. The fibrocartilage has the structure that looks like the articular cartilage. Therefore, we assume that the sodium hyaluronate is effective in it damaged.

The aim of the present study is to provide the effect of the sodium hyaluronate in the damaged fibrocartilage from rabbit models.

METHODS

All subjects were 30 Japanese white rabbits which are 20-weeks-old and weighting mean 3.0 kg in our study. The experiments were made according to the stipulations of the Ethics Committee for Experimental Animals of Nara Medical University. Referring to the previous study by Kobayashi et al., the quadrangle defect of 1 mm x 4 mm was made at the center of 1 mm proximal position from the humeral attachment of the supraspinatus tendon as the rotator cuff damaged model. It corresponded to the uncalcified fibrocartilage zone of the enthesis. This was known the critical portion of the rotator cuff tear and all disorders of other enthesis. It excised until a humeral head was exposed. The subacromial bursa closed with an absorbable suture. The injection of the sodium hyaluronate performed into the subacromial bursa similarly to the clinical administration for the shoulder periartthritis.

1. Distribution of the fluorescein-labeled sodium hyaluronate injected for the damaged enthesis

The right shoulders were made the fibrocartilaginous defect and the left one were just cut and sutured the subacromial bursa as contralateral controls in 12 rabbits. Immediately after operation, both shoulders received the intrabursal injections of 0.5 ml fluorescein-labeled sodium hyaluronate (MW is 170 x 10^3) diluted by the twice. Two were killed at 15 mins, 6 hrs, 1, 3, 5 and 7 days after the injection. The humeral enthesis of the supraspinatus tendon, including the subacromial bursa was taken from both shoulders as a bone-tendon complex. All tissues were fixed in 10% neutral buffered formal saline, decalcified, dehydrated and embedded in paraffin. The tissues were longitudinally sectioned at 5 µm and observed with the fluorescent microscopy.

2. Histological analysis for the restorative process at the damaged enthesis injected with the sodium hyaluronate

Both shoulders were made the fibrocartilaginous defect in 18 rabbits as well as former operation. The right shoulders were taken the intrabursal injection of 0.5 ml sodium hyaluronate (MW is 190 x 10^3) (SH group) and the left one were injected with 0.5 ml sterile saline as contralateral controls (control group). Three were killed at 3, 7, 14, 28, 56 and 84 days. The bone-tendon complex was removed from the humeral enthesis in both shoulders. All were fixed, decalcified, dehydrated, embedded and sectioned at 5 µm. The slides were stained with alcin blue, haematoxylin & eosin, or with Masson’s trichrome or toluidine blue. The histological sections stained with alcian blue and toluidine blue were immunolabelled with collagens (types I, II and III) and the undifferentiated mesenchymal cells were immunolabelled with α1(I) and α1(III) procollagen mRNA by in situ hybridization.

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REFERENCES
