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Original Article

Influence of corticoids on healing of the rotator cuff of rats – biomechanical study☆,☆☆

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ABSTRACT

Objective: to compare healing strength of the infraspinatus tendon of rats with corticoid inoculation, regarding maximum tension, maximum force and rupture force, after injury and experimental repair.

Methods: a total of 60 Wistar rats were subjected to tenotomy of the infraspinatus tendon, which was then sutured. Before the surgery, they were divided into a control group (C) inoculated with serum and a study group (S) inoculated with corticoids over the tendon. After repair, the rats were sacrificed in groups of 10 individuals in the control group and 10 in the study group at the times of one week (C1 and S1), three weeks (C3 and S3) and five weeks (C5 and S5). The rats were dissected, separating out the infraspinatus tendon with the humerus. The study specimens were subjected to a traction test, with evaluation of the maximum tension (kgf/cm^2), maximum force (kgf) and rupture force (kgf), comparing the study group with the respective control groups.

Results: among the rats sacrificed one week after the procedure, we observed greater maximum tension in group C1 than in group S1. The variables of maximum force (kgf) and rupture force did not differ statistically between the groups investigated. In the same way, among the rats sacrificed three weeks after the procedure, group C3 only showed greater maximum tension than group S3 ($p = 0.007$), and the other variables did not present differences. Among the rats sacrificed five weeks after the procedure (C5 and S5), none of the parameters studied presented statistical differences.

Conclusion: we concluded that corticoid diminished the resistance to maximum tension in the groups sacrificed one and three weeks after the procedure, in comparison with the respective control groups. The other parameters did not show differences between the study and control groups.

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Influência do corticoide na cicatrização do manguito rotador de ratos – Estudo biomecânico

Palavras-chave:
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Biomecânica
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RESUMO

Objetivo: comparar a resistência da cicatrização, com relação a tensão máxima, força máxima e força de ruptura, do tendão infraespinhal de ratos submetidos a inoculação de corticoides após a lesão e a reparos experimentais.

Métodos: foram submetidos 60 ratos Wistar a tenotomia do tendão infraespinhal e suturados. Previamente à cirurgia foram divididos em grupo controle (C), inoculados com soro, e grupo de estudo (E), inoculados com corticoides sobre o tendão. Após o reparo os ratos foram sacrificados em grupos de 10 indivíduos do grupo controle e 10 do grupo de estudo em intervalos de uma semana (C1 e E1), três semanas (C3 e E3) e cinco semanas (C5 e E5). Os ratos foram dissecados com a separação do tendão infraespinhal do úmero. As peças de estudo foram submetidas a teste de tração e avaliadas – tensão máxima (kgf/cm^2), força máxima (kgf) e força de ruptura (kgf) – e comparando os grupos de estudo com os grupos controle.

Resultados: dentre os ratos sacrificados com uma semana observamos maior tensão máxima do grupo C1 em comparação com o grupo E1. As variáveis força máxima (kgf) e força de ruptura (kgf) não diferiram estatisticamente entre os grupos pesquisados. Da mesma forma, nos ratos sacrificados com três semanas o grupo C3 mostrou apenas resistência maior na tensão máxima em comparação com o grupo E3 (p = 0.007). As demais variáveis não apresentaram diferenças. Nos ratos sacrificados com cinco semanas (C5 e E5), nenhum dos parâmetros estudados apresentou diferenças estatísticas.

Conclusão: a inoculação com corticoide sobre o manguito rotador levou a diminuição da resistência a tensão máxima da cicatriz pós reparo cirúrgico experimental em uma e três semanas em comparação com os respectivos grupos controle. Os demais parâmetros não tiveram diferença entre os grupos de estudo e os grupos controle.

Introduction

Rotator cuff disease is frequently seen in medical practice. It comprises a spectrum of conditions ranging from an inflammatory process in the tendon to complete rupture of the rotator cuff.[1,2]

Subacromial infiltration of corticoid is a treatment option in cuff injuries in patients with low functional demands and also as a therapeutic resource for temporary pain relief in active patients.[1,3–5]

Gray and Gottlieb[6] studied the prognostic factors for rotator cuff repair and showed that use of three or more preoperative infiltrations of corticoids was related to a higher repair failure rate. Likewise, Watson[7] demonstrated that the more frequent the use of corticosteroids was, the worse the result was, particularly from the fourth infiltration onwards, and recommended that surgery should be performed before the fourth infiltration. In another evaluation, Björkenheim et al.[8] showed that, among the cases of failure of surgical repair of rotator cuff injuries, 63% of the patients had received three or more corticoid injections. The remaining 37% had had two injections or less.

Furthermore, experimental studies on animals have shown histological changes and diminished resistance in tendons that were subjected to corticoid exposure.[9–15] There is also evidence that corticoid use may alter the resistance of the tendon repair.[16,17] Studies that have assessed the influence of corticosteroids on the rotator cuff have used undamaged tendons from rats or partially torn tendons.[12–15]

The present study was justified by the need to obtain objective data that might determine whether corticoid use might compromise the healing of surgical repairs to the rotator cuff.

The objective of this study was to evaluate the resistance of healed infraspinatus tendons from rats that were exposed to corticosteroids at different times (one, three and five weeks after suturing).

Materials and methods

This project was submitted for approval by the ethics committee for animal research of Positive University.

Sixty female rats of the Wistar lineage of the species *Rattus norvegicus* were used. The mean weight of the rats was 300 g and their mean age was three months. The animals were kept in collective cages in the vivarium of Positive University, with free access to water and commercial feed. Throughout the experimental period, the environmental conditions of light, temperature and humidity in the rooms were controlled via a digital panel, which maintained a photoperiod of 12 h, temperature range from 18 to 22 °C and relative air humidity of 65%.

The rats were operated in groups of 20 animals per working day. It was standardized that only the right side would be operated. An incision of 1 cm was made in the lateral rim of the