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## SCIENTIFIC ARTICLE

# The effect of intra-articular levobupivacaine on shoulder cartilage at different doses—experimental study

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### KEYWORDS

Glenohumeral joint;  
Chondrolysis;  
Levobupivacaine

### Abstract

**Background and objectives:** In this study it was aimed to examine the histological and morphometric effects on cartilage structure of intra-articular application of levobupivacaine to the shoulder joint.

**Methods:** 20 New Zealand adult male rabbits, 35 shoulders were used for the study and prepared in 5 groups of 7. These groups were defined as Groups L1, L2, L3 and L4 which were right shoulders administered with 0.25% and 0.5% levobupivacaine, Group C which were left shoulders as the control group and Groups S1 and S2 which were left shoulders administered with 0.9% saline. On the 2nd and 15th days the animals were sacrificed, the glenohumeral joints were evaluated macroscopically then cartilage samples were taken. These samples were evaluated with Mankin score, and histomorphometrically by measuring the thickness of the cartilage between the superficial cartilage layer and the tidemark and the thickness of calcified cartilage between the tidemark and the subchondral bone.

**Results:** Macroscopically, on the 15th day the joint fluid was seen to have reduced in all the groups. After microscopic evaluation, the highest Mankin score (mean:  $3.14 \pm 2.1/14$ ) was in the L4 group (15th day 0.5% levobupivacaine) and was found to be statistically significant ( $p < 0.05$ ). No statistically significant difference was determined between the other groups.

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## PALAVRAS-CHAVE

Articulação  
glenoumeral;  
Condrolise;  
Levobupivacaína

**Conclusions:** Histologically, as the highest Mankin score was in the L4 group, this indicates that in a single intra-articular injection of levobupivacaine a low concentration should be selected.  
**Level of evidence:** Level 5, animal study.

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## O efeito de levobupivacaína intra-articular sobre a cartilagem do ombro em doses diferentes—estudo experimental

### Resumo

**Justificativa e objetivo:** Neste estudo o objetivo foi examinar os efeitos histológicos e morfométricos sobre a estrutura da cartilagem da aplicação intra-articular de levobupivacaína em articulação do ombro.

**Métodos:** Trinta e cinco ombros de 20 coelhos New Zealand, machos e adultos, foram usados para o estudo e divididos em cinco grupos de sete. Os grupos foram definidos como L1, L2, L3 e L4, consistindo em ombros direitos nos quais levobupivacaína a 0,25% e 0,5% foi administrada; o Grupo C, consistindo em ombros esquerdos foi o grupo controle; grupos S1 e S2, consistindo em ombros esquerdos receberam solução salina a 0,9%. Os animais foram sacrificados no segundo e no décimo quinto dia; as articulações glenoumerais foram avaliadas macroscopicamente e, em seguida, amostras de cartilagem foram coletadas. As amostras foram avaliadas com o escore de Mankin e, histomorfometricamente, medindo-se a espessura da cartilagem entre a camada superficial e a "linha da maré" (tidemark) e a espessura da cartilagem calcificada entre a tidemark e o osso subcondral.

**Resultados:** Macroscopicamente, observou-se no décimo quinto dia que o líquido articular havia reduzido em todos os grupos. Após a avaliação microscópica, o maior escore de Mankin (média:  $3,14 \pm 2,1/14$ ) foi observado no grupo L4 (15º dia levobupivacaina a 0,5%), considerado estatisticamente significativo ( $p < 0,05$ ). Nenhuma diferença estatisticamente significativa foi determinada entre os outros grupos.

**Conclusões:** Histologicamente, como o maior escore de Mankin foi observado no Grupo L4, isso indica que em uma única injeção intra-articular de levobupivacaína, uma concentração baixa deve ser selecionada.

**Nível de evidência:** Nível 5, estudo em animais.

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## Introduction

Despite better current understanding of pain mechanisms and recorded developments in treatment, clinicians remain inadequate in the management of postoperative pain control and the majority of patients have complaints of pain following surgery.<sup>1</sup> Insufficient pain treatment is one of the elements affecting the recovery process of the patient and by extending the hospital stay, has a negative effect on morbidity and mortality rates. The most important aim in the treatment of postoperative pain is to provide effective analgesia without causing any serious side effects. Therefore, to avoid side effects of high doses of morphine, which is the gold standard, pre-emptive analgesia, peripheral nerve blocks, wound site infiltration and multimodal analgesia programmes have been developed. In this context, intra-articular injections are one of the most popular techniques.

The use of local anaesthetic by intra-articular single injection or continuous infusion are widely used pain

management methods in shoulder and knee joint surgery.<sup>2,3</sup> They are used to obtain both perioperative analgesia and local and regional anaesthesia.<sup>4-7</sup> The local anaesthetic which is most frequently used intra-articularly is bupivacaine.<sup>8</sup> The injection of different doses of intra-articular bupivacaine has been shown to be an effective local anaesthetic agent in intraoperative anaesthesia and postoperative analgesia.<sup>4,9-12</sup> However, in in vitro studies, there has been reported to be a chondrotoxic effect of bupivacaine associated with dose and time and this has been the reason for its limited use.<sup>13-17</sup>

In previous voluntary human trials, levobupivacaine has been shown to be as effective as bupivacaine providing a longer and strong analgesic effect and with lower cardiac and central nervous system toxicity.<sup>18-21</sup> However, there are a limited number of studies showing the intra-articular use of levobupivacaine in shoulder and knee arthroscopy.<sup>22-24</sup>

It was aimed in this study to examine histologically and morphometrically, the effects on the cartilage structure of

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