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## SCIENTIFIC ARTICLE

# Effects of local anesthetics on wound healing

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### KEYWORDS

Local anesthesia;  
Wound tension  
strength;  
Levobupivacaine;  
Bupivacaine;  
Lidocaine;  
Prilocaine

### Abstract

**Introduction:** Local anesthetic infiltration is used widely for post-operative analgesia in many situations. However the effects of local anesthetics on wound healing are not demonstrated clearly. This study planned to evaluate the effects of lidocaine, prilocaine, bupivacaine and levobupivacaine on wound healing, primarily on wound tensile strength and on collagen ultra-structure.

**Methods:** This study was conducted on male Sprague Dawley rats. On days 0, 8th, 15th, and 21st, all animals were weighed and received a preincisional subcutaneous infiltration of 3 mL of a solution according the group. Control saline, lidocaine 7 mg.kg<sup>-1</sup>, prilocaine 2 mg.kg<sup>-1</sup>, bupivacaine 2 mg.kg<sup>-1</sup> and levobupivacaine 2.5 mg.kg<sup>-1</sup>. The infiltrations were done at the back region 1.5 cm where incision would be performed at the upper, middle and lower part along the midline, under general anesthesia. Wound tensile strengths were measured after 0.7 cm × 2 cm of cutaneous and subcutaneous tissue samples were obtained vertical to incision from infiltrated regions. Tissue samples were also obtained for electron microscopic examination. Evaluations were on the 8th, 15th and 21st days after infiltration.

**Results:** There was no difference between groups in the weights of the rats at the 0th, 8th, 15th and 21st days. The collagen maturation was no statistically different between groups at the 8th and 15th days. The maturation scores of the B and L groups at the 21st day was significantly lower than the Group C (1.40, 1.64 and 3.56; respectively). The wound tensile strength was no statistically different between groups at the 8th and 15th days but at the 21st day the Groups B and LVB had significantly lower value than Group C (5.42, 5.54 and 6.75; respectively).

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## PALAVRAS-CHAVE

Anestesia local;  
Força tênsil da  
ferida;  
Levobupivacaína;  
Bupivacaína;  
Lidocaína;  
Prilocaína

**Conclusion:** Lidocaine and prilocaine do not affect wound healing and, bupivacaine and levobupivacaine affect negatively especially at the late period.

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## Efeitos dos anestésicos locais na cicatrização de feridas

### Resumo

**Introdução:** A infiltração de anestésico local é amplamente utilizada para analgesia pós-operatória em muitas situações. No entanto, os efeitos dos anestésicos locais na cicatrização de feridas não foram demonstrados claramente. Neste estudo planejamos avaliar os efeitos de lidocaína, prilocaína, bupivacaína e levobupivacaína sobre a cicatrização de feridas, principalmente sobre a força tênsil da ferida e a ultraestrutura do colágeno.

**Métodos:** Este estudo foi realizado em ratos machos da linhagem Sprague Dawley. Nos dias 0, 8, 15 e 21, todos os animais foram pesados e receberam uma infiltração subcutânea pré-incisional de 3 mL de uma solução, de acordo com a designação dos grupos: Grupo C recebeu salina (controle); Grupo L recebeu lidocaína (7 mg.kg<sup>-1</sup>); Grupo P recebeu prilocaína (2 mg.kg<sup>-1</sup>); Grupo B recebeu bupivacaína (2 mg.kg<sup>-1</sup>); Grupo LVB recebeu levobupivacaína (2,5 mg.kg<sup>-1</sup>). As infiltrações foram feitas na região posterior a 1,5 cm de onde a incisão seria realizada na parte superior, média e inferior ao longo da linha média, sob anestesia geral. A força tênsil da ferida foi medida após amostras de 0,7 × 2 cm de tecido cutâneo e subcutâneo serem obtidas das regiões infiltradas, verticalmente à incisão. Amostras de tecido também foram obtidas para exame microscópico eletrônico. As avaliações foram realizadas nos dias 8, 15 e 21 após a infiltração.

**Resultados:** Não houve diferença entre os grupos em relação ao peso dos ratos nos dias 0, 8, 15 e 21. A maturação do colágeno não foi estatisticamente diferente entre os grupos nos dias 8 e 15. Os escores de maturação dos grupos B e L no dia 21 foram significativamente inferiores aos do Grupo C (1,40, 1,64 e 3,56, respectivamente). A força tênsil da ferida não foi estatisticamente diferente entre os grupos nos dias 8 e 15, mas no dia 21, os grupos B e LVB apresentaram valores significativamente menores que o Grupo C (5,42, 5,54 e 6,75, respectivamente).

**Conclusão:** Lidocaína e prilocaína não afetam a cicatrização de feridas, enquanto bupivacaína e levobupivacaína afetam negativamente, especialmente no período tardio.

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## Introduction

Normal wound healing consists of 4 phases: hemostasis, inflammation, proliferative, and remodeling. Collagen production begins on the 3rd day and continues for 3 weeks. Collagens released from fibroblasts and their cross-linkage enhances wound tension strength. Local anesthetic infiltration is used widely both for post-operative analgesia and in performing many surgical operations.<sup>1</sup> However the effects of local anesthetics on wound healing are not revealed clearly yet, despite the studies in literature.<sup>1-6</sup> Because, different results are reported for the effects of local anesthetic agent on wound healing in the literature.<sup>1-6</sup> In the studies about the effects of local anesthetics on wound healing, generally wound tensile strength, tissue hydroxyproline level, amount of collagen fiber and fibrotic index are used.<sup>1,4,6</sup> In our review of English literature we did not find any study showing collagen fiber ultrastructure. In this study, we planned to present the effects of local anesthetics which

are used widely in clinics such as lidocaine, prilocaine, bupivacaine and levobupivacaine on wound healing, primarily on wound tensile strength and of collagen ultrastructure.

## Methods

This study was conducted at the Karadeniz Technical University Surgical Research Center, using rats from Karadeniz Technical University Surgical Research Center after approval by the Karadeniz Technical University Animal Care and Local Ethics Committee (Approval Number: 2013/47). This study was conducted on 50 male Sprague Dawley rats with a mean weight of 330 ± 20 g (10–12 weeks). During the study all rats were kept in metal cages – 1 rat per cage – 12 h in illuminated and 12 h in dark environment at normal room temperature (21 ± 2 °C) and humidity (40–60%) and were fed with standard rat feed and tap water. Rat care in cage was performed regularly with daily controls. All rats in the study were treated humanely in accordance with "Guide for

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