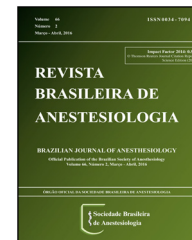




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SCIENTIFIC ARTICLE

Randomized prospective study of three different techniques for ultrasound-guided axillary brachial plexus block

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KEYWORDS

Axillary brachial plexus block;
Ultrasound;
Perineural technique;
Perivascular technique;
Vascular puncture

Abstract

Introduction: Randomized prospective study comparing two perivascular techniques with the perineural technique for ultrasound-guided axillary brachial plexus block (US-ABPB). The primary objective was to verify if these perivascular techniques are noninferior to the perineural technique.

Method: 240 patients were randomized to receive the techniques: below the artery (BA), around the artery (AA) or perineural (PN). The anesthetic volume used was 40 mL of 0.375% bupivacaine. All patients received a musculocutaneous nerve blockade with 10 mL. In BA technique, 30 mL were injected below the axillary artery. In AA technique, 7.5 mL were injected at 4 points around the artery. In PN technique, the median, ulnar, and radial nerves were anesthetized with 10 mL per nerve.

Results: Confidence interval analysis showed that the perivascular techniques studied were not inferior to the perineural technique. The time to perform the blockade was shorter for the BA technique (300.4 ± 78.4 s, 396.5 ± 117.1 s, 487.6 ± 172.6 s, respectively). The PN technique showed a lower latency time (PN - 655.3 ± 348.9 s; BA - 1044 ± 389.5 s; AA - 932.9 ± 314.5 s), and less total time for the procedure (PN - 1132 ± 395.8 s; BA - 1346.2 ± 413.4 s; AA - 1329.5 ± 344.4 s). BA technique had a higher incidence of vascular puncture (BA - 22.5%; AA - 16.3%; PN - 5%).

Conclusion: The perivascular techniques are viable alternatives to perineural technique for US-ABPB. There is a higher incidence of vascular puncture associated with the BA technique.

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PALAVRAS-CHAVE

Bloqueio plexo
braquial via axilar;
Ultrassom;
Técnica perineural;
Técnica perivascular;
Punção vascular

Estudo prospectivo randomizado de três diferentes técnicas para o bloqueio do plexo braquial via axilar guiado por ultrassom

Resumo

Introdução: Estudo prospectivo randomizado, compara duas técnicas perivascularares com a técnica perineural para o bloqueio do plexo braquial via axilar guiado por ultrassom (BPVA-USG). Objetivo primário foi verificar se essas técnicas perivascularares são não inferiores à técnica perineural.

Método: Foram randomizados 240 pacientes para receber as técnicas: abaixo da artéria (TA), ao redor da artéria (TR) ou perineural (PN). O volume de anestésico usado foi 40 ml de bupivacaína 0,375%. Em todos os pacientes, fez-se o bloqueio do nervo musculocutâneo com 10 ml. Na técnica TA, injetaram-se 30 ml abaixo da artéria axilar. Na técnica TR, injetaram-se 7,5 ml em quatro pontos ao redor da artéria. Na técnica PN, os nervos mediano, ulnar e radial foram anestesiados com 10 ml por nervo.

Resultados: Análise dos intervalos de confiança mostrou que as técnicas perivascularares estudadas não são inferiores à técnica perineural. A técnica TA apresentou menor tempo para o bloqueio ($300,4 \pm 78,4$ seg; $396,5 \pm 117,1$ seg; $487,6 \pm 172,6$ seg; respectivamente). A técnica PN apresentou menor tempo de latência (PN - $655,3 \pm 348,9$ seg; TA - $1044 \pm 389,5$ seg; TR - $932,9 \pm 314,5$ seg) e menor tempo total de procedimento (PN - $1132 \pm 395,8$ seg; TA - $1346,2 \pm 413,4$ seg; TR $1329,5 \pm 344,4$ seg). A técnica TA apresentou maior incidência de punção vascular (TA - 22,5%, TR - 16,3%; PN - 5%).

Conclusão: As técnicas perivascularares são opções viáveis à técnica perineural para o BPVA-USG. Ressalta-se maior incidência de punção vascular associada à técnica TA.

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Introduction

The ultrasound-guided technique for axillary brachial plexus block (ABPB) ensures the needle correct placement regarding the plexus, reduces the need for high volume and concentration of local anesthetic when it is injected around the nerves.¹⁻³ With this ultrasound-guided technique, known as perineural technique, the local anesthetic is deposited around the brachial plexus terminal branches in the axilla. Although effective, this technique may be difficult to apply by anesthesiologists in training, particularly because of the difficulty in locating the radial nerve despite the use of ultrasound due to its position in relation to the artery.⁴ Moreover, to apply this technique, the needle is repositioned a few times to reach the nerve structures, which increases the chance of paresthesia during the procedure.

The use of ultrasound in regional anesthesia has provided a redefinition for accomplishing some blockades, allowing the application of optional techniques to perform the same blockade. For axillary route, in order to facilitate the blockade and decrease the number of times the needle is repositioned during its accomplishment, ultrasound-guided techniques with the local anesthetic application only around the axillary artery were described in the literature.⁵⁻⁷ These techniques were apparently as effective as the perineural technique without altering the procedure time and decreased the incidence of paresthesia during the blockade.⁵⁻⁷ However, the perivascular technique increased the risk of inadvertent vascular puncture.^{6,7}

Thus, in order to reduce the blockade procedure duration, without altering the time and success rate and ensuring patient safety, our group intended to compare two techniques of perivascular injection with the perineural technique for ABPB, all guided by ultrasound. Consequently, we tested the hypothesis that the perivascular techniques are not inferior to the standard perineural technique regarding axillary brachial plexus block (BPVA) success. Blockade time, latency time, total procedure time, and vascular puncture incidence for each technique were recorded.

Case series and method

The study was approved by the Ethics Committee of our institution under the number 296,974 and registered in clinicaltrials.gov under the code NCT02073383.

Inclusion criteria were age over 18 and below 65 years; provision of written informed consent; indication for brachial plexus block for candidates undergoing anesthesia for elective hand surgery; ASA I or II, according to the American Society of Anesthesiology; and body mass index (BMI) $< 35 \text{ kg m}^{-2}$. Exclusion criteria were cognitive impairment or active psychiatric condition, infection at the puncture site, coagulopathy, and history of allergy to bupivacaine.

After patient's inclusion, demographic data were recorded and routine monitoring was performed for surgical procedure, with electrocardiography, noninvasive blood

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