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SCIENTIFIC ARTICLE

Axillary local anesthetic spread after the thoracic interfacial ultrasound block – a cadaveric and radiological evaluation

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Serratus anterior block;
Intercostal block;
Axillary dissection;
Inter costo brachial nerve block;
Inter fascial thoracic block

Abstract
Background: Oral opioids analgesics have been used for management of peri and postoperative analgesia in patients undergoing axillary dissection. The axillary region is a difficult zone to block and does not have a specific regional anesthesia technique published that offers its adequate blockade.
Methods: After institutional review board approval, anatomic and radiological studies were conducted to determine the deposition and spread of methylene blue and local anesthetic injected respectively into the axilla via the thoracic inter-fascial plane. Magnetic Resonance Imaging studies were then conducted in 15 of 34 patients scheduled for unilateral breast surgery that entailed any of the following: axillary clearance, sentinel node biopsy, axillary node biopsy, or supernumerary breasts, to ascertain the deposition and time course of spread of solution within the thoracic interfascial plane in vivo.

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Results: Radiological and Cadaveric studies showed that the injection of local anesthetic and methylene blue via the thoracic inter-fascial plane, using ultrasound guide technique, results in reliable deposition into the axilla. In patients, the injection of the local anesthetic produced a reliable axillary sensory block. This finding was supported by Magnetic Resonance Imaging studies that showed hyper-intense signals in the axillary region.
Conclusions: These findings define the anatomic characteristics of the axillary region block, and underline the clinical potential of these novel blocks.

PALAVRAS-CHAVE
Anestesia axilar;
Bloqueio serrátil anterior;
Bloqueio intercostal;
Esvaziamento axilar;
Bloqueio do nervo intercostobraquial;
Bloqueio torácico interfascial

Dispersão axilar de anestésico local após bloqueio interfascial torácico guiado por ultrassom - estudo radiológico e em cadáver

Resumo
Justificativa: Os analgésicos orais à base de opiáceos têm sido usados para o manejo da analgesia nos períodos peri e pós-operatório de pacientes submetidos à linfadenectomia axilar. A região axilar é uma zona difícil de bloquear e não há registro de uma técnica de anestesia regional específica que ofereça o seu bloqueio adequado.
Métodos: Após a aprovação do Conselho de Ética institucional, estudos anatômicos e radiológicos foram realizados para determinar a deposição e disseminação de azul de metileno e anestésico local, respectivamente injetados na axila via plano interfascial torácico. Exames de ressonância magnética foram então realizados em 15 de 34 pacientes programados para cirurgia de mama unilateral envolvendo qualquer um dos seguintes procedimentos: esvaziamento axilar, biópsia de linfonodo sentinela, biópsia de linfonodo axilar, ou mamas supranumerárias, para verificar a deposição e tempo de propagação da solução dentro do plano interfascial torácico *in vivo*.
Resultados: Estudos radiológicos e em cadáveres mostraram que a injeção de anestésico local e azul de metileno via plano interfascial torácico usando a técnica guiada por ultrassom resulta em deposição confiável na axila. Em pacientes, a injeção de anestésico local produzido um bloqueio sensorial axilar confiável. Esse achado foi corroborado por estudos de ressonância magnética que mostraram sinais hiperintensos na região axilar.
Conclusões: Esses achados definem as características anatômicas do bloqueio da região axilar e destacam o potencial clínico desses novos bloqueios.

Introduction

Patients who undergo axillary surgery suffer variable postoperative discomfort and pain.[1] Until today, there is no ultrasound-guided regional anesthesia technique that provides adequate blockade of the axillary compartment. Thoracic paravertebral block (TPVB) is the main regional anesthetic technique used in breast surgery,[2,3] but it does not provide analgesia from the anterior and lateral chest wall, such as the supraclavicular nerves (C4–C5), the lateral pectoral nerve [LPn] (C5–C6), medial pectoral nerve [MPn] (C8–T1) and medial brachio-cutaneous nerve [MBCn] (C8–T1).[4] The chronic pain that occurs after axillary dissection (AD), often results from inadequate treatment of acute postoperative pain.[5–7]

As described by Moore and Dalley,[8] the axilla has 4 walls, 3 of which are muscular Fig. 1. The cutaneous sensory innervation of the axilla is supplied by the intercostobrachial nerves (ICBn) and medial brachio-cutaneous nerve (MBCn).

In the present report, we will discuss three thoracic interfascial ultrasound-guided approaches.[9–13] These techniques have been recently described, with encouraging effects on blockade of the neural afferents of the chest wall, in spite of the few samples reported.[8–11] However, the detailed anatomic characteristics and the spread of LA in these interfascial ultrasound-guided blocks have not yet been determined. We hypothesize that LA injection into the interfascial plane of the antero-lateral chest wall; will produce enough spread into the axillary fascia, due the inter-fascial connection of the muscles that form the axillary wall. This may help in reducing acute postoperative pain in patients undergoing axillary dissection and may become an alternative to other techniques used to provide analgesia after breast surgery. We consider these inter-fascial blocks easy techniques: they are superficial blocks and the echo-anatomy is simple to understand.[9–11,13–17]

The Pec's block,[14] appears to be particularly useful for patients who have breast expanders placed during reconstructive breast cancer surgery or subpectoral prostheses.[13]

The Serratus-Intercostal Fascial Block (SIFB) anterior,[15] involve injecting the LA between the Serratus Anterior muscle and the External Intercostal muscle. The efficacy of

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