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Systematic review

Are preoperative experimental pain assessments correlated with clinical pain outcomes after surgery? A systematic review

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HIGHLIGHTS

- Most studies included in this review showed moderate to high risk of bias.
- Most QST variables showed no consistent correlations with pain after surgery.
- Responses to pain above the pain threshold showed more consistent correlations.

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ABSTRACT

Background: Pain after surgery is not uncommon with 30% of patients reporting moderate to severe postoperative pain. Early identification of patients prone to postoperative pain may be a step forward towards individualized pain medicine providing a basis for improved clinical management through treatment strategies targeting relevant pain mechanisms in each patient. Assessment of pain processing by quantitative sensory testing (QST) prior to surgery has been proposed as a method to identify patients at risk for postoperative pain, although results have been conflicting. Since the last systematic review, several studies investigating the association between postoperative pain and more dynamic measures of pain processing like temporal summation of pain and conditioned pain modulation have been conducted.
Objectives: According to the PRISMA guidelines, the aim of this systematic review was to evaluate whether assessment of experimental pain processing including measures of central pain mechanisms prior to surgery was associated with pain intensity after surgery.
Methods: Systematic database searches in PubMed and EMBASE with the following search components: QST, association, and postoperative pain, for studies that assessed the association between QST and pain after surgery were performed. Two authors independently reviewed all titles and abstracts to assess their relevance for inclusion. Studies were included if (1) QST was performed prior to surgery, (2) pain was assessed after surgery, and (3) the association between QST and pain after surgery was investigated. Forty-four unique studies were identified, with 30 studies on 2738 subjects meeting inclusion criteria. The methodological quality of the include studies was assessed and data extraction included study population, type of surgery, QST variables, clinical pain outcome measure and main result.
Results: Most studies showed moderate to high risk of bias. Type of surgery investigated include 7 studies on total knee replacement, 5 studies on caesarean section, 4 studies on thoracic surgery, 2 studies on herniotomy, 2 studies on hysterectomy/myomectomy, 1 study on tubal ligation, 1 study on gynecologic laparoscopy, 1 study on arthroscopic knee surgery, 1 study on shoulder surgery, 1 study on disc herniation surgery, 1 study on cholecystectomy, 1 study on percutaneous nephrolithotomy, 1 study on molar surgery, 1 study on abdominal surgery, and 1 study on total knee replacement and total hip replacement. The majority of the preoperative QST variables showed no consistent association with pain intensity after surgery. Thermal heat pain above the pain threshold and temporal summation of pressure pain were the QST variables, which showed the most consistent association with acute or chronic pain after surgery.

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Conclusions: QST before surgery does not consistently predict pain after surgery. High quality studies investigating the presence of different QST variables in combination or along with other pain-related psychosocial factors are warranted to confirm the clinical relevance of QST prior to surgery.
Implications: Although preoperative QST does not show consistent results, future studies in this area should include assessment of central pain mechanisms like temporal summation of pressure pain, conditioned pain modulation, and responses to pain above the pain threshold since these variables show promising associations to pain after surgery.

Contents

1. Introduction

Pain after surgery is not uncommon and 30% of patients experience moderate to severe postoperative pain [1,2]. High postoperative pain intensity has consistently been associated with an increasing risk of chronic pain [3–5], and 10–50% of patients with acute postoperative pain develop chronic pain [6]. Early identification of patients prone to severe postoperative pain may be a step forward towards individualized pain medicine providing a basis for improved clinical management of postoperative pain through improved preemptive analgesia strategies targeting relevant pain mechanisms in each patient or by reducing the number of surgeries causing more pain than relief.

Assessment of pain processing by quantitative sensory testing (QST) prior to surgery has been proposed as a method to identify patients at risk [7–10]. QST is a psychophysical method using standardized mechanical, electrical, and thermal stimuli to assess sensory and pain perception [11]. Several different aspects of perception can be assessed for each modality including detection threshold, pain threshold, pain intensity, and pain tolerance. Moreover, central pain processing in humans can reliably be assessed by measures of temporal summation of pain (TSP) [12] and conditioned pain modulation (CPM) [13].

The association between postoperative pain and pain processing assessed before surgery has previously been investigated by 3 systematic reviews [14–16] with the latest systematic review including 15 studies published in 2011 [14]. Although some QST variables showed some consistency with postoperative pain, the authors concluded that more research including other QST variables was required to establish whether a correlation between preoperative pain processing and postoperative pain truly does exist. Since the last systematic review, a series of studies investigating the association between postoperative pain and pain processing have been published and several studies have demonstrated an association between postoperative pain and measures of more central pain processing [9,17,18]. Preoperative assessment of temporal summation predicted postoperative chronic pain after total knee replacement surgery [9], and less efficient CPM assessed before surgery predicted chronic pain in patients after thoracotomy [7] and abdominal surgery [19].

Thus the primary aim of this systematic review was to investigate the association between postoperative pain and preoperative assessment of experimental pain processing including measures of central pain mechanisms. The findings and the implications for use of QST to identify patients at-risk for postoperative pain as well as the implications for future research in this area will be discussed.

2. Methods

According to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [20], this systematic review investigated the association between preoperative pain processing and pain intensity after surgery.

2.1. Search strategy

In October 2016, we searched PubMed and EMBASE for original articles investigating the association between preoperative pain