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## REVIEW ARTICLE

### Pain after sternotomy – review



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Pain;  
Sternotomy;  
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#### Abstract

**Background and objective:** Adequate analgesia after sternotomy reduces postoperative adverse events. There are various methods of treating pain after heart surgery, such as infiltration with a local anesthetic, nerve block, opioids, non-steroidal anti-inflammatory drugs, alpha-adrenergic agents, intrathecal and epidural techniques, and multimodal analgesia.

**Content:** A review of the epidemiology, pathophysiology, prevention and treatment of pain after sternotomy. We also discuss the various analgesic therapeutic modalities, emphasizing advantages and disadvantages of each technique.

**Conclusions:** Heart surgery is performed mainly via medium sternotomy, which results in significant postoperative pain and a non-negligible incidence of chronic pain. Effective pain control improves patient satisfaction and clinical outcomes. There is no clearly superior technique. It is believed that a combined multimodal analgesic regimen (using different techniques) is the best approach for treating postoperative pain, maximizing analgesia and reducing side effects.

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#### PALAVRAS-CHAVE

Dor;  
Esternotomia;  
Analgésia  
pós-operatória

#### Dor após esternotomia – revisão

#### Resumo

**Justificativa e objetivo:** Analgesia adequada após esternotomia reduz eventos adversos no pós-operatório. Várias modalidades estão disponíveis para tratamento da dor após cirurgia cardíaca: infiltração com anestésico local, bloqueio de nervos, opioides, anti-inflamatórios não esteroidais, agentes alfa-adrenérgicos, técnicas intratecais e epidurais e analgesia multimodal.

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**Conteúdo:** Foi feita uma revisão sobre epidemiologia, fisiopatologia, prevenção e tratamento da dor após esternotomia. Também foram discutidas as diversas modalidades terapêuticas analgésicas, com ênfase em vantagens e desvantagens de cada técnica.

**Conclusões:** A cirurgia cardíaca é feita principalmente por esternotomia média, que resulta em dor significativa no pós-operatório e uma incidência não insignificante de dor crônica. O controle efetivo da dor melhora a satisfação dos pacientes e os desfechos clínicos. Nenhuma técnica é claramente superior. Acredita-se que um regime analgésico combinado multimodal (com várias técnicas) seja a melhor abordagem para tratar a dor pós-operatória, o que maximiza a analgesia e reduz os efeitos colaterais.

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## Introduction

Due to the large number of cardiac surgeries annually performed and correlation between adequate control of postoperative pain and improved clinical outcomes, anesthesiologists must defend and improve the various current analgesic techniques.<sup>1</sup>

Poststernotomy pain is a complication of cardiac surgery. The incidence, characteristics, and clinical course of pain are not well understood. It is important to determine the incidence and nature of poststernotomy pain for prevention and treatment of pain syndrome.<sup>2</sup>

Poorly controlled pain is associated with sympathetic nervous system activation and increased hormonal response to stress. This response may contribute to the multiple postoperative adverse events, including myocardial ischemia, cardiac arrhythmias, hypercoagulability, pulmonary complications, and increased rates of delirium and wound infection.<sup>3-6</sup> Furthermore, severe pain reduces patient satisfaction, delays the onset of walking, and is associated with the development of postoperative chronic pain.<sup>7</sup>

Inadequate sputum, atelectasis, and pneumonia also occur due to pain. Immobilization by pain causes deep venous thrombosis, which in turn may result in pulmonary thromboembolism. Pain is also a stress factor and causes myocardial infarction, insomnia, and demoralization.<sup>8</sup>

Pain can be classified as acute or chronic, somatic or visceral, and nociceptive or neuropathic. It occurs when tissue injury activates the pain receptors (nociceptors) located in peripheral nerves. During surgery, several procedures can cause tissue trauma, such as incision, coagulation, stretching or shrinkage. There is production and release of substances including prostaglandins and bradykinin, which are pain mediators.<sup>9</sup>

Pain may be associated with many surgical interventions, including incision, saphenous vein removal, pericardiotomy or chest tube insertion, intraoperative dissection and retraction of tissue, among others.<sup>10</sup>

The evaluation and qualification of acute pain can be very variable and depend on the interval between assessments, as well as the instrument used to quantify. Several scales are

used in clinical practice to measure pain, including numeric scale, visual analog, verbal, and facial expression, among others. Some scales are more suitable than others for particular patient populations. The facial expression scale can be used both for patients unable to communicate verbally and patients with tracheostomy.<sup>1</sup>

## Epidemiology

Postoperative pain treatment is important because it is an unavoidable problem involving about 80% of patients undergoing any surgery. Pain is subjective and perceived differently by each patient. However, an inadequate control of pain is common due to fear of side effects of analgesics, both among surgeons and patients.<sup>10</sup>

Despite widely publicized, postoperative pain remains underestimated. Several studies have shown that despite the best treatment results, many patients still suffer from moderate to severe postoperative pain.<sup>11,12</sup>

In a study assessing the intensity of expected pain after most surgical procedures and identifying the procedures in which the current pain therapy is insufficient, 115,775 patients were evaluated in 578 surgical centers. On the first postoperative day, the patients were asked about the most severe pain since surgery, through a verbal numeric scale (0–10). The authors concluded that the 40 procedures with the highest pain scores (mean of 6–7) included 22 orthopedic surgeries or limb trauma. Patients reported high pain scores after minor surgeries, including appendectomy, cholecystectomy, hemorrhoidectomy, and tonsillectomy, while other major surgeries, such as abdominal, resulted in lower pain scores, often due to adequate epidural analgesia.<sup>13</sup>

Studies have described the incidence, severity and risk factors for poststernotomy acute pain. In a study of patients undergoing coronary artery bypass graft, patients were evaluated for four days after surgery. The patients reported more pain than expected: 49% reported severe pain at rest, 78% complained of severe pain when coughing and 62% during movement.<sup>14</sup>

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