

CARDIAC SURGERY VIA MEDIAN STERNOTOMY

SUMMARY RECOMMENDATIONS

Notes on PROSPECT recommendations

PROSPECT provides clinicians with supporting arguments for and against the use of various interventions in postoperative pain based on published evidence and expert opinion. Clinicians must make judgements based upon the clinical circumstances and local regulations. At all times, local prescribing information for the drugs referred to must be consulted.

Pain after cardiac surgery via median sternotomy and aims of the PROSPECT review

Pain after median sternotomy can be debilitating and difficult to treat ([Lahtinen 2006](#); [Kelava 2020](#)). Furthermore, inadequately managed pain may increase the risk of postoperative pulmonary complications, cardiac complications and long-term complications such as poststernotomy pain syndrome ([Szelkowski 2015](#); [Bordoni 2017](#)).

The aim of this PROSPECT review ([Maeßen 2023](#)) was to evaluate the available literature about the effects of analgesic, anaesthetic and surgical interventions on pain after cardiac surgery via median sternotomy, and to develop evidence-based, procedure-specific recommendations for pain management.

The unique PROSPECT methodology is available at <https://esraeurope.org/prospect-methodology/>. The methodology considers clinical practice, efficacy and adverse effects of analgesic techniques.

Literature databases were searched up to November 2020.

Summary of recommendations and key evidence

Summary of recommendations and key evidence for pain management in patients undergoing cardiac surgery via median sternotomy

Pharmacological treatment

A combination of paracetamol and NSAID is recommended pre-operatively or intra-operatively, and should be continued into the postoperative period, unless there are contra-indications

- Procedure-specific evidence supports the use of paracetamol ([Mamoun 2016](#); [Douzjian and Kulik 2016](#); [Arslan 2018](#)) and NSAIDs ([Rapanos 1999](#); [Dhawan 2009](#); [Koizuka 2004](#); [Kulik 2004](#)) as basic analgesics
- COX-2 specific inhibitors could not be recommended due to lack of evidence and safety concerns (more wound infections after 14 days of continuous use) ([Ott 2003](#); [Nussmeier 2005](#))
- Recent evidence on NSAID-related adverse events indicates that this is related to their prolonged use at higher doses and/or in inappropriate patient populations. Short courses of nonselective NSAIDs may be relatively well tolerated in this patient population ([Chang 2021](#))
- It is suggested that the risk of acute kidney injury or increase in the incidence of cardiac adverse events with a short duration of NSAID use after cardiac surgery is low ([Chang 2021](#))
- A systematic review questioned common concerns about NSAID-induced bleeding ([Bongiovanni 2021](#))

Intra-operative magnesium and dexmedetomidine infusions may be considered as adjuncts, particularly when basic analgesics are not administered

- Importantly, it is not clear if combining dexmedetomidine and magnesium would provide superior pain relief as compared with either drug alone. The optimal combination of these agents and their dosing remains unclear ([Shanthanna 2021](#))
- Studies of dexmedetomidine reported analgesic benefit, but basic analgesics were not administered ([Abdel-Meguid 2013](#); [Hashemian 2017](#); [Priye 2015](#); [Aziz 2011](#); [Anvaripour 2018](#))
- A concern with dexmedetomidine is the associated prolonged bradycardia and hypotension, which may extend into the postoperative period ([Demiri 2019](#)). Also, dexmedetomidine can cause airway obstruction, and increase the risk of postoperative hypoxia ([Lodenijs 2019](#))
- Magnesium is often used in cardiac surgery for its antiarrhythmic properties. Studies in this systematic review found analgesic benefits with use of magnesium ([Ahmad](#)

[2018](#); [Bolcal 2005](#); [Ferasatkish 2005](#); [Mostafa 2011](#); [Steinlechner 2006](#)); however, basic analgesics were not used

- Similar to dexmedetomidine, magnesium can potentiate hypotensive effects of other adjuncts and potentiate neuromuscular blockade and increase the risk of residual paralysis ([Soave 2009](#)). Therefore, careful consideration is needed when using dexmedetomidine and magnesium, particularly in patients at risk of haemodynamic instability

Opioids should be reserved for rescue analgesia

Regional analgesic strategies

Parasternal block/surgical wound infiltration is recommended

- Evidence supporting parasternal block/surgical wound infiltration was provided by several studies, but none of these used basic analgesics ([Saeidi 2011](#); [Doğan Baki 2016](#); [Ozturk 2016](#); [Barr 2007](#); [McDonald 2005](#))

Non-pharmacological therapies

Non-pharmacological therapy, such as music and massage, is recommended as adjunct to pharmacological therapy

- Procedure-specific evidence for music ([Voss 2004](#); [Sendelbach 2006](#); [Jafari 2012](#)) and massage ([Boitor 2015](#); [Boitor 2018](#); [Alameri 2020](#); [Braun 2012](#); [Cutshall 2010](#); [Nerbass 2010](#); [Albert 2009](#); [Mitchinson 2007](#)) indicates that these approaches have the potential to enhance the analgesic effects of pharmacological interventions without inducing any harm

COX, cyclooxygenase; NSAID, non-steroidal anti-inflammatory drug.

Interventions that are NOT recommended

Analgesic interventions that are not recommended for pain management in patients undergoing cardiac surgery via median sternotomy.

Intervention	Reason for not recommending
COX-2 specific inhibitors	Limited procedure-specific evidence and safety concerns
Gabapentinoids	Inconsistent procedure-specific evidence
Ketamine	Lack of procedure-specific evidence
Epidural analgesia	Inconsistent evidence, safety concerns
Intrathecal opioids	Inconsistent evidence, safety concerns
Lidocaine infusion	Lack of procedure-specific evidence
Nefopam	Lack of procedure-specific evidence
Methadone	Limited procedure-specific evidence
Kinesio tape	Limited procedure-specific evidence
Preoperative physiotherapeutic instructions	Lack of procedure-specific evidence
Acupuncture	Limited procedure-specific evidence
Classical chest physiotherapy	Lack of procedure-specific evidence
Hypnosis	Limited procedure-specific evidence
Aromatherapy (lavender oil)	Lack of procedure-specific evidence
Reiki	Lack of procedure-specific evidence
Psychological interventions	Limited procedure-specific evidence
Early extubation	Lack of procedure-specific evidence

Overall PROSPECT recommendations table

Overall recommendations for peri-operative pain management in patients undergoing cardiac surgery via median sternotomy

Intra-operative	<ul style="list-style-type: none"> • Paracetamol and NSAIDs (if no contraindications) • Consider dexmedetomidine, intravenous infusion, as adjunct particularly when basic analgesics are not administered • Consider magnesium, intravenous infusion, as adjunct particularly when basic analgesics are not administered • Parasternal block/surgical wound infiltration • Non-pharmacological therapy such as music and massage, as adjunct to pharmacological therapy
Postoperative	<ul style="list-style-type: none"> • Paracetamol and NSAIDs (if no contra-indications) • Opioids as rescue analgesia

NSAIDs, non-steroidal anti-inflammatory drugs.

PROSPECT publication

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Pain management after cardiac surgery via median sternotomy: A systematic review and procedure-specific postoperative pain management (PROSPECT) recommendation.

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[PROSPECT recommendations for cardiac surgery via median sternotomy-infographic](#)



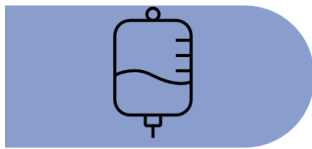
Recommendations for sternotomy

Systematic review and procedure-specific postoperative pain management recommendations



Systemic (basic) analgesia

Systemic analgesia should include paracetamol and non-steroidal anti-inflammatory drugs (NSAID) administered pre-operatively or intra-operatively and continued postoperatively, unless contraindicated.



Analgesic adjuncts

Intra-operative intravenous infusions of magnesium or dexmedetomidine may be considered, especially when basic analgesia is not administered.



Regional techniques

Parasternal block/wound infiltration.



Non-pharmacological therapies

Music and massage are recommended as adjuncts.

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