# *CRANIOTOMY*

## *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 craniotomy and aims of the PROSPECT review

Craniotomy can lead to intense postoperative pain, especially in the first two days (Santos 2021; Chowdhury 2017; Vacas 2017; Vadivelu 2016). Such poorly controlled pain may aggravate neurosurgical comorbidities and increase the length of hospital stay (Galvin 2019).

The aim of this guideline (Mestdagh 2023) is to provide clinicians with an evidence-based approach to pain management after craniotomy that should improve postoperative pain relief.

The unique PROSPECT methodology is available at https://esraeurope.org/prospect-methodology/. The recommendations are based on a procedure-specific systematic review of randomised controlled trials, systematic reviews and meta-analyses, in which the evidence is critically assessed for current clinical relevance, and efficacy and adverse effects of analgesic techniques. The approach balances the invasiveness of the analgesic interventions with the degree of pain after surgery and considers the use of simple, nonopioid analgesics, such as paracetamol and NSAIDs, as baseline analgesics.

The literature search period was 1 January 2010 to 30 June 2021.

## Summary of recommendations and key evidence

| Summary of recommendations and key evidence for pain management in patients undergoing craniotomy | |
|---|---|
| **Pharmacological treatment** | Systemic analgesia should include paracetamol and NSAIDs, administered pre-operatively or intra-operatively and continued postoperatively<br>• Peri-operative paracetamol and NSAIDs or COX-2 selective inhibitors are considered as the 'basic analgesic regimen' (Joshi 2019)<br>• Overall, evidence regarding paracetamol supported a weak analgesic and opioid-sparing effect in craniotomy (Greenberg 2018; Artime 2018; Sivakumar 2018; Burbridge 2019; Dilmen 2016; Galvin 2019; Ghaffarpasand 2020)<br>• Evidence regarding NSAIDs or COX-2 selective inhibitors (both single dose and administration on a scheduled basis) supported significant analgesic and opioid-sparing effects in craniotomy (Dilmen 2016; Galvin 2019; Ghaffarpasand 2020; Williams 2011; Güneş 2011; Rajkiran 2022; Molnár 2015; Yadav 2014; Tsaousi 2017)<br>• NSAIDs in combination with paracetamol resulted in enhanced analgesia (Williams 2011; Molnár 2015; Yadav 2014)<br>• Currently, there is no evidence that potential side effects of NSAIDs outweigh their benefits, except when contraindicated, such as in patients with significant renal impairment<br>• A recent meta-analysis (Bongiovanni 2021) concluded that NSAIDs are not associated with clinically important bleeding, consistent with other retrospective and cohort studies in craniotomy |
| | Intra-operative dexmedetomidine infusion is recommended, as it is associated with reduced postoperative pain<br>• Caution with regards to cardiovascular effects is warranted<br>• Potential adverse events including haemodynamic effects and sedation can influence recovery<br>• Intra-operative dexmedetomidine has shown a positive effect on both pain and opioid consumption in craniotomy (Pathapradas 2020; Peng 2015; Song 2016; Yun 2017; Rajan 2016; Sriganesh 2019; Tsaousi 2017) |
| | Opioids should be reserved as rescue analgesia in the postoperative period<br>• Opioid-induced side effects such as nausea, vomiting and sedation are unwanted, and because opioids can interfere with early neurologic |

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| | examination, they should be used as rescue analgesia in case of severe pain and not as routine analgesia (Vacas 2017) |
| **Regional analgesic strategies** | Either incision-site infiltration (ISI) or scalp nerve block (SNB) is recommended as regional analgesic technique<br>• Ten RCTs demonstrated the analgesic efficacy of SNB, administered either pre-operatively or postoperatively (Yang 2019; Yang 2020; Tuchinda 2010; Raksakietisak 2018; Can 2017; Akcil 2017; Carella 2020; Hussien 2020; Rigamonti 2020; Hwang 2015). These findings are supported by previous systematic reviews and meta-analysis, with an analgesic effect in the first 6 postoperative hours and a moderate opioid-sparing effect (Galvin 2019; Hansen 2011; Wardhana 2019; Akhigbe 2017; Guilfoyle 2013)<br>• The risks associated with SNB include local anaesthetic toxicity, transient facial nerve palsy and inadvertent subarachnoid injection (Vacas 2017)<br>• ISI is widely used for craniotomies. Three RCTs showed positive effects on both pain scores and opioid consumption, but only one RCT used baseline analgesia (Yang 2019; Akcil 2017; Song 2015)<br>• Either SNB or ISI with long-acting local anaesthetic is recommended, but ISI may have a more limited duration of analgesia than SNB, although there are not enough studies comparing the two techniques to recommend one over the other<br>• Considering the lack of data on the combination of techniques and high vascularisation of the scalp, combining the two techniques is not recommended due to the risk of local anaesthetic toxicity |

COX, cyclooxygenase; ISI, incision-site infiltration; NSAIDs, non-steroidal anti-inflammatory drugs; SNB, scalp nerve block.

## Interventions that are NOT recommended

Analgesic interventions that are not recommended for pain management in patients undergoing craniotomy.

| Intervention | Reason for not recommending |
|---|---|
| Flupirtine | Limited procedure-specific evidence |
| Metamizole | Lack of procedure-specific evidence |
| Gabapentinoids | Additional benefit is questionable and concerns about side effects |
| Intra-operative use of magnesium sulphate | Limited procedure-specific evidence |
| Intra-operative use of lidocaine | Limited procedure-specific evidence |
| Postoperative subcutaneous sumatriptan | Lack of procedure-specific evidence |
| Pre-operative vitamin D | Lack of procedure-specific evidence |
| Bilateral maxillary block | Lack of procedure-specific evidence |
| Superficial cervical plexus block | Lack of procedure-specific evidence |
| Hyaluronidase as adjuvant | Limited procedure-specific evidence |
| Dexamethasone as adjuvant | Limited procedure-specific evidence |
| Clonidine as adjuvant | Limited procedure-specific evidence |
| Dexmedetomidine as adjuvant | Limited procedure-specific evidence |

## Overall PROSPECT recommendations table

| Overall recommendations for pain management in patients undergoing craniotomy | |
|---|---|
| **Pre-operative/ Intra-operative** | • Paracetamol<br>• NSAIDs<br>• Either scalp block or incision-site infiltration<br>• Intravenous dexmedetomidine infusion<br>• If basic analgesia is not possible, acupuncture |
| **Postoperative** | • Paracetamol and NSAIDs<br>• Opioids as rescue |

NSAIDs, non-steroidal anti-inflammatory drugs.

## PROSPECT publication

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**Pain management after elective craniotomy: A systematic review with procedure-specific postoperative pain management (PROSPECT) recommendations.**

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PROSPECT recommendations for craniotomy – infographic