Pain following craniotomy

A craniotomy is associated with significant postoperative discomfort. Standardized pain management and enhanced recovery after surgery (ERAS) protocol could improve patient-reported outcomes and lower medical expenses.

The aim of a study is to prospectively assess the effectiveness of an ERAS protocol for neurosurgery in the treatment of postoperative pain following elective craniotomies.

A total of 128 patients were assigned to the ERAS group and received care in accordance with the neurosurgical ERAS regulations, while 130 other participants were assigned to the control group and received traditional postoperative assistance. The participants' postoperative pain ratings using the numerical rating scale (NRS) were this study's main outcome of interest. The verbal NRS uses the numbers 0 to 10, with 0 indicating no sensation of pain and 10 indicating the most severe pain. On postoperative day (POD) 1, the patient's postoperative pain level at the surgical site was evaluated using the NRS. This was repeated every day until the patient either reported feeling no sensation of pain or was discharged home.

The mean value of pain on the day of surgery was 4.43 ± 0.43 and 4.72 ± 0.68 for patients in the ERAS and control groups, respectively. The pain values were higher in the control group compared to the ERAS group. However, the difference was not statistically significant ($p = 0.478$). The mean value of pain on POD1 was 3.13 ± 0.21 and 4.45 ± 0.95 for patients in the ERAS and control groups, respectively. These pain values were higher in the control group compared to the ERAS group, and the difference was statistically significant ($p = 0.011$). The mean value of pain on POD2 was 2.86 ± 0.3 and 4.33 ± 0.37 for patients in the ERAS and control groups, respectively. The values of pain were higher in the control group compared to the ERAS group, and the difference was statistically significant ($p = 0.003$). The mean value of pain on POD3 was 2.33 ± 0.52 and 4.04 ± 0.15 for patients in the ERAS and control groups, respectively. The pain values were higher in the control group compared to the ERAS group. The difference was meaningful statistically ($p < 0.001$). The mean value of pain on POD4 was 2.26 ± 0.9 and 2.84 ± 0.13 for the ERAS and control groups, respectively. However, the difference was not statistically significant ($p = 0.274$). The ERAS group had a significantly higher proportion of participants rating their pain between 1 and 3 (68.9%) and a lower proportion rating their pain between 4 and 7 (28.2%), compared to the control group ($p < 0.001$). Differences in the highest pain ratings (8-10) between the groups were not statistically significant. The duration of hospital stay, beginning from surgery to discharge, was lesser among study participants in the ERAS group, and this finding was statistically significant ($p < 0.001$).

The findings of this study imply that the ERAS protocol may aid pain management following elective craniotomies. Additionally, the ERAS protocol decreased the overall expense of medical care and the cumulative/postoperative length of hospital stay [1)].

Pain following craniotomy can compromise recovery. Several pharmacological interventions have been used to prevent pain after craniotomy; however, there is currently a lack of evidence regarding which interventions are most effective.

The objectives are to assess the effectiveness of pharmacological interventions for prevention of acute postoperative pain in adults undergoing brain surgery; compare them in terms of additional analgesic requirements, incidence of chronic headache, sedative effects, length of hospital stay and

adverse events; and determine whether these characteristics are different for certain subgroups.

Galvin et al. searched MEDLINE, Embase, CINAHL, CENTRAL, Web of Science and two trial registries together with reference checking and citation searching on 28th of November 2018.

They included blinded and non-blinded, randomized controlled trials evaluating pharmacological interventions for the prevention of acute postoperative pain in adults undergoing neurosurgery, which had at least one validated pain score outcome measure.

They used standard Cochrane methodological procedures. They calculated mean differences for the primary outcome of pain intensity; any pain scores reported on a 0 to 100 scale were converted to a 0 to 10 scale.

They included 42 completed studies (3548 participants) and identified one ongoing study. Nonsteroidal anti-inflammatories (NSAIDs) Nonsteroidal antiinflammatory drugs (NSAIDs) reduce pain up to 24 hours (0 to 6 hours, MD -1.16, 95% CI -1.57 to -0.76; 12 hours, MD -0.62, 95% CI -1.11 to -0.14; 24 hours, MD -0.66, 95% CI -1.18 to -0.13; 6 studies, 742 participants; all high-quality evidence). Results for other outcomes were imprecise (additional analgesic requirements: MD 1.29 mg, 95% CI -5.0 to 2.46, 4 studies, 265 participants; nausea and vomiting RR 1.34, 95% CI 0.30 to 5.94, 2 studies, 345 participants; both low-quality evidence). Dexmedetomidine reduces pain up to 12 hours (0 to 6 hours, MD -0.89, 95% CI -1.27 to -0.51, moderate-quality evidence; 12 hours, MD -0.81, 95% CI -1.21 to -0.42, low-quality evidence). It did not show efficacy at 24 hours (MD -0.08, 95% CI -0.32 to 0.16; 2 studies, 128 participants; low-quality evidence). Dexmedetomidine may decrease additional analgesic requirements (MD -21.36 mg, 95% CI -34.63 to -8.1 mg, 2 studies, 128 participants, low-quality evidence). Results for other outcomes were imprecise (nausea and vomiting RR -0.43, 95% CI 0.06 to 3.08, 3 studies, 261 participants; hypotension RR 0.5, 95% CI 0.05 to 5.28, 3 studies, 184 participants; both low-quality evidence). Scalp blocks may reduce pain up to 48 hours (0 to 6 hours, MD -0.98, 95% CI -1.66 to -0.3, 10 studies, 414 participants; 12 hours, MD -0.95, 95% CI -1.53 to -0.37, 8 studies, 294 participants; 24 hours, MD -0.78, 95% CI -1.52 to -0.05, 9 studies, 433 participants, all low-quality evidence; 48 hours, MD -1.34, 95% CI -2.57 to -0.11, 4 studies, 135 participants, very low-quality evidence. When studies with high risk of bias were excluded, significance remained at 12 hours only. Scalp blocks may decrease additional analgesia requirements (SMD -1.11, 95% CI -1.97 to -0.25, 7 studies, 314 participants). Results for other outcomes were imprecise (nausea and vomiting RR 0.66, 95% CI 0.33 to 1.32, 4 studies, 165 participants, very low-quality evidence). Scalp Infiltration may reduce pain postoperatively but efficacy was inconsistent, with a significant effect at 12 and 48 hours only (12 hours, MD -0.71, 95% CI -1.34 to -0.08, 7 studies, 309 participants, low-quality evidence; 48 hours, MD - 1.09, 95% CI -2.13 to - 0.06, 3 studies, 128 participants, moderate-quality evidence). No benefit was observed at other times (0 to 6 hours, MD -0.64, 95% CI -1.28 to -0.00, 9 studies, 475 participants, moderate-quality evidence; 24 hours, MD -0.39, 95% CI -1.06 to 0.27,6 studies, 260 participants, low-quality evidence. Scalp infiltration may reduce additional analgesia requirements MD -9.56 mg, 95% CI -15.64 to -3.49, 6 studies, 345 participants, very low-quality evidence). When studies with high risk of bias were excluded, scalp infiltration lost the pain benefit at 12 hours and effects on additional analgesia requirements, but retained the pain-reducing benefit at 48 hours (MD -0.56, 95% CI -1.20 to -0.32, 2 studies, 100 participants, very low-quality evidence). Results for other outcomes were imprecise (nausea and vomiting, RR 0.74, 95% CI 0.48 to 1.41, 4 studies, 318 participants, low-quality evidence). Pregabalin or gabapentin may reduce pain up to 6 hours (2 studies, 202 participants), MD -1.15,95% CI -1.66 to -0.6, 2 studies, 202 participants, low-quality evidence). One study examined analgesic efficacy at 12 hours showing significant benefit. No analgesia efficacy was shown at later times (24 hours, MD -0.29, 95% CI -0.78 to -0.19; 48 hours, MD - 0.06, 95% CI -0.86 to 0.77, 2 studies, 202 participants, low-quality evidence). Additional analgesia requirements were not significantly less (MD -0.37 (95% CI -1.10 to 0.35, 3 studies, 234 participants, low-quality evidence). Risk of nausea and vomiting was

significantly reduced (RR 0.51, 95% CI 0.29 to 0.89, 3 studies, 273 participants, low-quality evidence). Results for other outcomes were imprecise (additional analgesia requirements: MD -0.37, 95% CI -1.10 to 0.35, 3 studies, 234 participants, low-quality evidence). Acetaminophen did not show analgesic benefit (0 to 6 hours, MD -0.35, 95% CI -1.00 to 0.30; 12 hours, MD -0.51, 95% CI -1.04 to 0.03, 3 studies, 332 participants, moderate-quality evidence; 24 hours, MD -0.34, 95% CI -1.20 to 0.52, 4 studies, 439 participants, high-quality evidence). Results for other outcomes remained imprecise (additional analgesia requirements, MD 0.07, 95% CI -0.86 to 0.99, 4 studies, 459 participants, high-quality evidence; length of hospitalizations, MD -3.71, 95% CI -14.12 to 6.7, 2 studies, 335 participants, moderate-quality evidence).

There is high-quality evidence that Non-steroidal antiinflammatory drugs reduces pain up to 24 hours postoperatively. The evidence for reductions in pain with dexmedetomidine, pregabalin or gabapentin, scalp blocks, and scalp infiltration is less certain and of very low to moderate quality. There is low-quality evidence that scalp blocks and dexmedetomidine may reduce additional analgesic requirements. There is low-quality evidence that gabapentin or pregabalin may decrease nausea and vomiting, with the caveat that the total number of events for this comparison was low [2].

1)
Abhinav K, Jadhav D, Andar UB, Karmarkar V, Agrawal R, Agrawal A. Management of Post-craniotomy Pain in Elective Cases: A Randomized Controlled Trial. Cureus. 2023 Sep 29;15(9):e46189. doi: 10.7759/cureus.46189. PMID: 37905293; PMCID: PMC10613341.
2)
Galvin IM, Levy R, Day AG, Gilron I. Pharmacological interventions for the prevention of acute postoperative pain in adults following brain surgery. Cochrane Database Syst Rev. 2019 Nov 21;2019(11). doi: 10.1002/14651858.CD011931.pub2. Review. PubMed PMID: 31747720.