Facial Pain Evaluation on Post-Orthognathic Surgery Patients: A Scoping Review

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Abstract

Post-surgery acute pain, especially after orthognathic surgery, is a debilitating experience for patients as it significantly affects their mastication function. Evaluating facial pain is crucial to provide adequate pain treatment for post-orthognathic patients. This systematic review aims to assess acute facial pain in post-orthognathic surgery patients.

We screened research articles published in the last decade that evaluated pain experienced by post-orthognathic surgery patients using three search engines. After initial screening, we conducted duplication, title and abstract checking and applied inclusion and exclusion criteria to select relevant articles. We then extracted and analysed data from the final included articles.

The review included seven articles that evaluated pain in post-orthognathic surgery patients. Data analysis revealed that the visual analogue scale was the most frequently used pain scale to assess facial pain after surgery (four articles), followed by the numeric rating scale (two articles), and one article used both pain scales. The pain intensity ranged from 1 to 7.8 on a 10-point scale. Factors affecting facial pain intensity included the type and duration of surgery and pre-and post-operative analgesic medication.

The study concludes that post-orthognathic surgery patients experience varying degrees of facial pain, ranging from mild to severe, and this intensity is likely affected by several surgery-related variables.

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Introduction

A dentofacial deformity that causes a discrepancy in the relationship between the jaw and teeth, known as malocclusion, requires a combination of orthodontic treatment and orthognathic surgery.[1] Orthognathic surgery improves facial and jaw functions, including restoring masticatory function, facial appearance, and jaw stability.[2] The procedure involves a bone-cutting technique that affects fewer blood vessels and nerve structures. Patients who have undergone orthognathic surgery have reported improved quality of life.[3] Despite the positive effects of orthognathic surgery, the invasive nature of the procedure on facial muscles and periosteal tissue can cause moderate to severe acute-postoperative pain.[4] To measure the pain experienced by the patient after orthognathic surgery, a pain scale such as the Visual Analog Scale (VAS) or the Numerical Rating Scale (NRS) can be used.[5] The effectiveness of the surgical treatment is determined by how well postoperative pain is managed. Various strategies for administering analgesic drugs are employed for postoperative pain management.[3]

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Materials and methods

This scoping review was conducted following the guidelines for systematic review and meta-analysis, known as the PRISMA guidelines. The PRISMA guidelines provide a comprehensive and transparent framework for

conducting systematic reviews and meta-analyses to ensure that the review process is rigorous and that the results are reliable. The authors of this study adhered to these guidelines to ensure that their systematic review was conducted with high methodological standards. This approach enhances the validity and reliability of the findings, making the study a valuable contribution to the field of orthognathic surgery.

Selection criteria

Before searching for articles, the analysis method and criteria were established to guide the search process. The characteristics of the literature that were included in this study are as follows: 1) Articles published within the last 10 years, 2) Articles written in English and research designs that include prospective studies, retrospective studies, comparative studies, and randomized controlled trials, and 3) Articles that conduct experiments on animals were excluded. The inclusion and exclusion criteria focused on patients with ASA class I and II categories, orthognathic surgical treatment of maxilla, mandible, and bimaxillary, and subjects without drug allergies or systemic disorders. These criteria were established to ensure the selected articles were relevant to the research question and met the highest methodological standards.

Assessment of Quality and Risk of Bias

The final articles included in this study were assessed using the Joanna Briggs Institute (JBI) critical appraisal tools that utilised Boolean Operators, a search method that combines the word AND equation. A literature search was conducted on the PubMed, ScienceDirect, and Scopus databases using the keywords "pain," "postoperative," "after," "orthognathic surgery," and "scale" for the past 10 years (March 2012 - March 2022). The search was conducted between March 14, 2022, and March 23, 2022. The selected articles were evaluated thoroughly using the JBI critical appraisal tools, ensuring that only high-quality research was included in this study.

Data Extraction

The data collected from each case report included the author's name, type of surgery, pain scale used, and type of analgesic administered. The findings of the data extraction process are presented in tabular form for easy visualisation and interpretation. This approach ensures that the data collected from each article is systematically organised and easily accessible for further analysis. By presenting the results in a table format, the authors of this study have effectively summarised the relevant information, making it easier for readers to understand the trends and patterns of postoperative pain management in orthognathic surgery patients.

Results

This study involved collecting articles from electronic databases, including PubMed, ScienceDirect, and Scopus, using the keywords "pain," "postoperative," "after," "orthognathic surgery," and "scale." A total of 2,868 articles were initially obtained from the three search engines. The first screening excluded articles published over 10 years ago, resulting in 1,224 articles. The second screening process involved checking for duplicates, which led to removing 26 duplicate articles, leaving 1,198 articles.

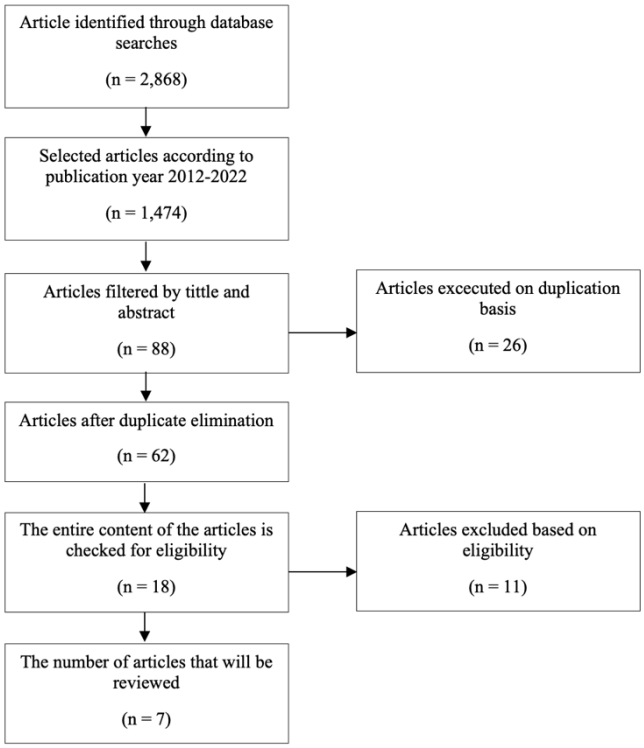

Diagram 1. PRISMA chart of data selection

The following screening process involved reviewing the titles and abstracts of the remaining articles and excluding irrelevant ones, resulting in 62 articles. Finally, a thorough evaluation of each article's overall content and research topic was conducted, leading to the

selection of 7 relevant articles to be included in this systematic review. This approach ensured that the literature analysed was relevant to the research question and met high methodological standards (diagram 1).

Critical appraisal

Table 1 presents the critical evaluation of the included systematic review articles. The evaluation process involved using the Joanna Briggs Institute (JBI) critical appraisal tools to assess the quality and relevance of each article. The criteria used for evaluation included study design, sample size, data collection methods, statistical analysis, and the validity of the study findings.

JBI Checklist Questions	Yes	No	Unclear	Not applocable
1. Is the review question clearly and explicitly stated	√			
2. Were the inclusion criteria appropriate for the review question	√			
3. Was the search strategy appropriate?	√			
4. Were the sources and resources used to search for studies adequate?	√			
5. Were the criteria for appraising studies appropriate?	√			
6. Was critical appraisal conducted by two or more reviewers independently?	√			
7. Were there methods to minimize errors in data extraction?			√	
8. Were the methods used to combine studies appropriate?	√			
9. Was the likelihood of publication bias assessed?	√			
10. Were recommendations for policy and/or practice supported by the reported data?	√			
11. Were the specific directives for new research appropriate?	√			

Table 1. Quality assessment results.

Main finding

Based on the review conducted (as shown in Table 2), the data extracted from the case reports included the authors' names, type of surgery, duration of surgery, pain scale used, pain location, initial pain score, type of analgesic administered, post-analgesic pain score, and premedication drugs. This comprehensive data collection approach ensures that all relevant information on postoperative pain management in orthognathic surgery patients is captured and analysed. By examining these variables, the authors of this study were able to identify trends and patterns in postoperative pain management strategies, providing valuable insights into the effectiveness of different pain management approaches. Table 2 illustrates that administering analgesics can reduce pain perception following orthognathic surgery. The types of analgesics provided come from NSAIDs [5–8], opioids [3,4], and non-NSAIDs [9].

No	Author/Year	Type of Study	Type of surgery	Duration of Surgery	Pain scale	Initial pain score	Type of analgetic	Post analgetic score	Premedication drug
1	Raschke et al., 2018[8]	Prospective clinical study	BSSO		NRS	5.7-6.6	Ibuprofen 800 mg given 3 times daily, Metamizole, Piritramide	4.0-4.5	Midazxolame, PONV Prophylaxis (granisetrone, dexamethasone)
2	Lee et al., 2017[7]	Randomised controlled trial	Le Fort I osteotomy, BSSRO	150 minutes	VAS	3.5	Ketorolac	2.0	
3	Chang FSC, 2019[9]	Randomised controlled trial	Le Fort I osteotomy, BSSO		NRS and VAS	4.5	Paracetamol 500 mg given thrice daily for 3 days	2.5	
4	Agbaje J, 2018[6]	Retrospective study	BSSO		VAS	3	NSAID	1	
5	Mobini A, 2018[4]	Retrospective clinical study	Le Fort I BSSO		NRS	6.3	Opioid intravenous, fentanyl	3.9	
6	Raj et al., 2021[3]	Comparative study	Bimaxillary orthognatic surgery		VAS	7	Tramadol HCL 2 mg/kg body weight	1.2	
7	Hsu HJ, 2021[5]	Comparative study	Intraoral vertical ramus osteotomy	319.68 minutes	VAS	3.59	Surgical group: NSAID	3.06	

Table 2. Data extraction result.

Discussion

Orthognathic surgery is a procedure that involves repositioning the maxilla and/or mandible, with or without repositioning of teeth, to improve function, dentofacial aesthetics, and the patient's health and quality of life. The term 'orthognathic' is derived from the Greek words “orthos,” meaning right or straight, and “gnathos,” meaning jaw.[10,11] In the journal articles reviewed from 2012 to 2022, the most commonly performed orthognathic surgeries included Le Fort I osteotomy, bilateral sagittal split osteotomy (BSSO), bilateral sagittal split ramus osteotomy (BSSRO), bimaxillary jaw orthognathic surgery, and genioplasty.[12] By identifying the most common types of orthognathic surgery, the authors could focus on the specific pain management strategies used for each procedure, providing valuable insights into the effectiveness of different approaches.

Orthognathic surgery aims to achieve optimal jaw function and improve the patient's aesthetic. However, like any surgical procedure, there are several postoperative complications

associated with this treatment, including relapse, nerve injury, temporomandibular disorder, bone necrosis, injury to teeth and periodontal tissues, changes in nasal morphology, nausea and vomiting, obstructive sleep apnea, infection/fistula, occlusal discrepancy, delayed union/nonunion, hearing loss, respiratory impairment, death, and neuropathic pain.[13] These complications can significantly impact the patient's quality of life and require careful monitoring and management to ensure a successful outcome. By identifying these potential complications, healthcare providers can implement effective measures to minimise their occurrence and provide optimal postoperative care to patients undergoing orthognathic surgery.[10]

Pain is defined as an unpleasant sensory and emotional experience that is associated with potential or tissue damage.[5] In the journals reviewed in this study, the Visual Analog Scale (VAS) and Numeric Rating Scale (NRS) were used to measure pain.[14] The VAS uses a straight line, with the far-left side marked as "no pain" and the far-right end marked as "worst pain". The length of the VAS line is typically 100 mm or 10 cm, and the information on the far-right end of the scale can vary but is always expressed in terms of the highest or most severe pain level. While the VAS line is typically horizontal, some studies have used a vertical orientation. The NRS, on the other hand, uses a numeric scale with a commonly used range of 0-10 (NRS-11).[15]

Numerous studies have reported no significant difference between the VAS and NRS scales or have demonstrated a correlation between the two.[15–17] Despite this, previous journals on oral and maxillofacial (OMF) surgery have utilized the VAS to assess pain intensity. The VAS is considered to be a reliable tool for measuring acute pain in adult patients, although the NRS is easier to use for measuring acute pain. The VAS evaluates pain not only in terms of its intensity, but also considers its character and individual perception as a recent complex experience (recent time). In contrast, the NRS assesses pain intensity in the current time. The VAS is more precise than the NRS, with scores displayed in millimeters for greater detail. However, it has been noted that elderly patients (above 70 years) may find it difficult to use the VAS due to their age, and patients who are not familiar with the VAS may also experience difficulty. Therefore, selecting a pain scale should be adapted to the patient's needs.[15,17,18]

The pain scores from the collected data ranged from 0.5 to 6.37, indicating that pain resulting from orthognathic surgery was generally mild to moderate.[19] However, it is important to note that pain scores can vary depending on various factors, with the type of orthognathic surgery being one of the key determinants of the level of postoperative pain experienced by the patient. Orthognathic surgery may cause bone trauma and muscle or periosteal tissue injury, resulting in more severe postoperative pain than other types of surgery. In a previous study by Mobini et al., higher pain intensity was reported in patients who underwent mandibular bilateral sagittal split osteotomy and bimaxillary surgery compared to those who underwent orthognathic surgery on the maxilla alone.[4]

The decrease in pain levels from using NSAIDs and non-NSAIDs demonstrates better results with NSAIDs. This may be due to the improved bone healing effects. Meanwhile, the administration of opioids clearly shows the most superior results. Opioids for pain management: Opioids, such as morphine, oxycodone, hydrocodone, and tramadol, can effectively manage moderate to severe postoperative pain following orthognathic surgery. They work by binding to opioid receptors in the central nervous system, which helps to reduce the perception of pain. Opioids can be administered in various forms, including oral, intravenous, or patient-controlled analgesia (PCA) methods.[20]

Study Limitation

Based on the information provided, some potential limitations of the study could include:

1. The limited number of studies: The study only included seven articles, which may not provide a comprehensive understanding of the topic.
2. Publication bias: The study relied on published articles, which may not represent all studies on the topic. Additionally, there may be a bias towards publishing studies with statistically significant results, which could impact the study's findings.
3. Heterogeneity: The study included various types of orthognathic surgeries, which may have resulted in heterogeneity in the findings. Additionally, there may have been differences in the pain scales used across the studies.
4. Quality of studies: The study did not provide

information on the quality of the included studies, which could impact the reliability and validity of the findings.

5. Generalizability: The study only focused on orthognathic surgery patients in the last 10 years from the databases searched, which may limit the generalizability of the findings to other patient populations or periods.

Conclusions

Based on the study's findings, it can be concluded that postoperative pain after orthognathic surgery ranges from mild to moderate. Pain scores varied among the studies and were influenced by factors such as the type of surgery, extent of bone movement, pharmacological interventions, surgical expertise, and patient pain tolerance. The study suggests the need for a long-term, prospective study with a larger sample size to assess the variation in pain scores after orthognathic surgery and to determine the most effective pharmacological or non-pharmacological interventions for reducing postoperative pain.

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Declaration of Interest

The authors report no conflict of interest.

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