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Factors Contributing to Postoperative Swelling Following Surgical Extraction of Impacted Mandibular Third Molars: A Comprehensive Review

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Abstract

This comprehensive review aims to summarize the current literature on the various factors that contribute to postoperative swelling following surgical extraction of impacted mandibular third molars. A thorough examination of the literature has identified several factors that can influence the degree and duration of postoperative swelling, including surgical technique, post-surgical management and application of biomaterialsand. This review provides a structured overview of these factors, and their clinical implications for oral and maxillofacial surgeons.

Keywords

Postoperative Swelling; Impacted Mandibular Third Molars; Clinical Implications.

1. Introduction

The extraction of impacted mandibular third molars is a common surgical procedure in dentistry. However, post-extraction swelling remains a common postoperative complication, which can lead to patient discomfort, functional impairment, and potential infection. In addition to biological effects, there will also be social impacts, such as affecting patients' social interactions. The facial swelling is more likely occurring in those patients who received impacted mandibular third molars extraction with utilizing flap operation and bone removal. The factors thought to influence the incidence of facial swelling after third molar removal include patients' age, gender, physique and oral hygiene, the type of third molar, the degree of impaction, and ease of extraction operations[1]. The understanding of the factors contributing to this swelling is crucial for the development of evidence-based surgical protocols and post-surgical management strategies, and the effect of the of biomaterials that used during the procedure.

2. Surgical Technique

Soft Tissue Management is important. Dissection of the mucoperiosteal flap, and excessive soft tissue manipulation have been shown to increase postoperative swelling due to increased trauma to the surrounding tissues. Compared with the traditional envelope flap, the minimally invasive distal triangular flap causes less pain and facial swelling in patients during the first 3 days after surgery, and can be used as one of the flap design methods for mandibular impacted third molar extraction[2]. The use of sectioning techniques during tooth removal can minimize the size of the tooth being extracted, thereby reducing the associated trauma and postoperative swelling[3]. Scholars compared the clinical effects of lingual wedge shaped coronectomy and traditional T-shaped coronectomy in extraction of horizontally impacted mandibular third molars. The lingual wedge shaped coronectomy divides the tooth tissue through lingual wedge-shaped segmentation, which can effectively remove the lingual bone resistance of the crown root and provide a gap for crown root dislocation. Using lingual wedge shaped coronectomy to remove the mandibular horizontally impacted third molar can

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shorten the surgical time, protect the lingual bone plate, reduce the occurrence of root fracture, and alleviate postoperative swelling, pain, and other reactions[4]. Another study observed the clinical effect of modified T-shaped technique for the treatment of mesially impacted mandibular third molars, the result revealed the modified T-shaped technique could alleviate swelling[5].

The extent of bone removal during the procedure also can affect postoperative swelling. Aggressive removal of bone may lead to increased blood loss and damage to the soft tissues, resulting in a higher incidence of swelling. Inadequate hemostasis during surgery can lead to postoperative hematoma formation, which is a significant contributor to postoperative swelling. CBCT-mediated ultrasonic bone knife combined with minimally invasive tooth extraction has a good effect in the treatment of impacted mandibular third molars , with short operation time, less blood loss, less inflammatory reaction, and can reduce postoperative mouth limitation and facial swelling without increasing postoperative complications, which is worthy of clinical promotion and application[6]. A study tested a digitally designed sectioning guide and evaluated its feasibility for the extraction of horizontally impacted lower third molars. But there were no signifcant diferences in postoperative pain, swelling, and trismus[7].

3. Post-Surgical Management

Post-Surgical Management is very important to the healing of the postoperative swelling following surgical extraction of impacted mandibular third molars. Firstly, the ice pack should be applied. The use of ice packs immediately after surgery has been shown to reduce postoperative swelling by limiting inflammation and reducing blood flow to the area. Secondly, Prophylactic use of antibiotics after extraction of mandibular impacted third molars can effectively reduce postoperative local pain, swelling, and degree of limited opening, and reduce the occurrence of postoperative local infections[8]. Inadequate pain management can lead to increased stress on the surgical site, which may contribute to an increase in postoperative swelling. Bromelain was comparable to diclofenac in the management of postoperative pain, swelling and trismus following impacted mandibular third molar surgery[9]. A study shows that pre-operative administration of 8mg intravenous dexamethasone is as effective as 8mg post-operative dexamethasone with no clinically or statistically significant differences in the final outcomes of the third molar surgery[10]. Local injection of dexamethasone before third molar extraction surgery, can effectively reduce the degree of swelling in the short term after operation[11,12]. Low-level laser therapy (LLLT) has been used in the field of maxillofacial surgery to reduce swelling, and pain after the orthognathic surgery, accelerate bone healing at the extraction sites, bony fracture defects, and distraction osteogenesis. And a study found that LLLT with a diode laser of wavelength 980 nm can effectively reduce pain, swelling, and trismus in the postoperative phase after surgical extraction of the mandibular impacted third molar and promote healing[13]. Aleksandra Jaro ´n and coworkers assessed the impact of using kinesio tape on the level of the postoperative swelling of soft tissues, trismus, and pain in patients undergoing the surgical extraction of an impacted mandibular third molar. They found that Kinesio tape had a significant effect on the decrease in facial swelling on the third day after surgery and a decrease in trismus and pain severity levels on the third and seventh days after surgery[14].

The appliance of Kinesio tape improves the blood and lymph flow, removing congestions of lymphatic fluid and hemorrhages. The application of Kinesio tape significantly reduced postoperative swelling, pain, and trismus[15,16]. Also, there are some dietary recommendations: Patients are advised to avoid hard and crunchy foods that may increase intra-oral pressure and cause further swelling.

4. Application of biomaterials

Pain, swelling, difficulty in opening the mouth, delayed bone tissue healing, alveolitis, and horizontal or vertical resorption of bone tissue are the main problems that impact on consequent treatment[17]. To mitigate this issue, the application of concentrated growth factors (cGF), platelet-rich fibrin (PRF),

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and chitosan sponges has gained significant attention in recent years. cGF is a biologically active substance derived from the patient's own blood. It contains a high concentration of growth factors, platelets, and fibrin, which promote tissue regeneration and reduce inflammation. When applied to the surgical site after tooth extraction, cGF can help minimize swelling and accelerate healing[18,19]. PRF is a second-generation fibrin matrix that is created by centrifuging the patient's blood. It consists of a highly concentrated mixture of platelets, leukocytes, and fibrin, which are essential for wound healing and tissue repair. Compared with platelet-rich plasma (PRP), By using PRF as a dressing after the extraction of the third molar, it is possible to reduce post-surgical swelling and accelerate the healing process[20,21]. A study found that PRF combined with autogenous bone not only can repair the distal bone defect of the second molar and significantly reduce the incidence rate of complications, but also reduce the degree of facial swelling and pain reaction improve the mouth opening limitation[22]. Advanced platelet-rich fibrin (A-PRF) follows preparation protocol of 1500 rpm for 14 minutes, in contrast to standard platelet-rich fibrin which is prepared at 3000 rpm for 10 minutes. Studies have evaluated that centrifugation speed and time have significant effect on distribution of cells related to wound healing and tissue regeneration. N. Gupta's study infers that A-PRF has enhanced the healing potential of soft tissue as well as bone in extraction socket. Apart from that it has also shown promising results in relief of immediate postoperative symptoms like swelling, pain and trismus which improves the comfort and acceptability of surgical procedures by patients. Enhanced healing and patient comfort in cost effective manner are the highlighting features of A-PRF[23]. Kim Jin-Woo, et al. compared the effectiveness of absorbable collagen sponge insertion in tooth extraction sites for socket healing of the impacted mandibular third molar.They found that placement of collagen sponge after extraction of mandibular impacted third molar reduced early stage post-operative complications and enhanced initial healing of soft tissues and periodontal defects[24]. Moemeneh Kokash et al studied the efficacy of hyaluronic acid (HA) addition to collagen, compared to collagen application alone, on the magnitude of swelling and trismus following impacted mandibular third molar surgery. They found that applying hyaluronic acid with collagen can reduce the severity of facial swelling and trismus[25].

In short, the use of cGF, PRF, and collagen sponge in the post-operative management of third molar extraction in the lower jaw can be an effective strategy to reduce post-surgical swelling and enhance healing. These materials offer advantages such as reduced inflammation, accelerated tissue regeneration, and a protective barrier for the surgical site. However, further clinical studies are needed to evaluate their long-term effects and determine their optimal application in different patient populations.

5. Conclusion

Postoperative swelling following surgical extraction of impacted mandibular third molars is a common but manageable complication. Understanding the various factors that contribute to this phenomenon is crucial for developing evidence-based surgical protocols and post-surgical management strategies. The future research directions outlined in this review have the potential to further reduce the incidence and duration of postoperative swelling while maintaining the safety and efficacy of this common surgical procedure. Continuous research and development in this area will contribute to improving patient outcomes and the overall quality of care for patients undergoing surgical extraction of impacted mandibular third molars.

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