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Mandibular third molar surgery: A review of common and uncommon complications

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Abstract

Background: Third molar surgical extraction is one of the commonest surgical procedures in oral surgery and it is associated with postoperative complications. However, some of these complications are commoner than others and they have variable impacts on the quality of life of the patients.
Objective: To review the common and uncommon complications of third molar surgery as reported in the literature.
Methods: PubMed, ScienceDirect databases, AJOL, and Google scholar literature search was done to identify related articles on complications of mandibular third molar surgical extractions. Other online materials were also reviewed. The search words used were mandibular, third molar, lower jaw, surgical extraction, common, uncommon, and complications
Results: Common complications of third molar surgery identified include; postoperative pain, swelling, trismus, infection, dry socket, inferior alveolar and lingual nerve damage, injury to the adjacent tooth, with their attendant impact on the patient's quality of life.
Conclusion: Third molar surgical extractions are associated with certain complications and some of them are unavoidable. Therefore, adequate patients' education and psychological preparation for the procedure and its sequelae are necessary.

Keywords: third molar, surgical extraction, complications.

Background

Surgical extraction of a mandibular impacted third molar surgery is one of the most commonly performed surgical procedures in oral surgery,[1] and it is associated with some complications with varying severity depending on the individual. Some of these complications are commoner than others and have serious impacts on the quality of life of the patients. Impacted third molars might remain symptom-free and would not be indicated for surgical removal. However, there is evidence that some impacted third molars are associated with pathologies such as dental caries, periodontal disease, pericoronitis, cyst/tumours, and root resorption of the adjacent tooth that makes surgery inevitable.[2-4]

The reported incidence of complications associated with third molar surgery ranges from 4.6% to 30.9%.[5-7] Sayed et al. reported an incidence rate of 3.7% for intraoperative complications and 8.3% for postoperative complications.[7]

Complications occurring intraoperatively or postoperatively can be classified as either minor or major complications. Minor complications are those sequelae that will resolve without further intervention while major complications would require further treatment and, in some cases, the damage is irreversible.[8,9]

Various risk factors have been associated with an increased incidence of complications following third molar surgery. The female gender, increased

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age, smoking, use of oral contraceptives, the nature, depth of impaction, and experience of the surgeon are some of the implicated predictors of postoperative complications.[5,6,8] Some the common complications reported in the literature include pain, swelling, trismus, infection, dry socket, and haemorrhage. Indeed, pain, swelling, and trismus are a common occurrence in third molar surgery. However, some authors do not consider pain, swelling, and trismus as complications and would not discuss them further because they are expected and typically transient.[5,6] There are, however, uncommon and rare complications that surgeons must be conversant with such as the inferior alveolar nerve damage, lingual nerve damage, fracture of the adjacent tooth, and fracture of the mandible.[5,7] The possibility of these complications occurring ought to be discussed with the patients before the surgery to enable the patient to make an informed decision to consent for the surgery, and in the contemporary litigation-prone society, the practice of the surgeon is safeguarded. Furthermore, the surgeon should be able to recognize and manage properly and timely complications that may occur.

This article is aimed at reviewing the common and uncommon complications that could attend a third molar surgery, and promoting the surgeon's consent- taking, increased acumen in recognizing and managing the complication when they do occur.

Methodology

A literature search was done using PubMed, ScienceDirect databases, AJOL, and Google scholar for studies between 2000 and 2020. The keywords imputed for the search were: complications, impacted, mandibular, third-molar, surgery, common, uncommon. Only studies published in English were included. The search resulted in 587 studies and 39 of them were selected based on the relevance to this study. Other online materials were also randomly reviewed. Common complications identified in the literature include; pain, swelling, trismus, alveolar osteitis, inferior alveolar and lingual nerve damage, infection, haemorrhage, and fracture of the adjacent tooth.

Pain

Pain is one of the expected complications of surgical extraction of the third molar and often sets in immediately the effect of local anaesthesia wears off and reaching peak levels at 6 to 12 hours postoperatively.[10] Reported pain is usually moderate in intensity and lasts for 72 hours.[1] Ayaz et al. showed that 29.3% of the patients had moderate pain on the third day, 43.4% of patients had no pain on the seventh while only 3.8% still complained of severe pain on the seventh day after the extraction.[11] The pain experienced after surgical extraction of a third molar results from an inflammatory reaction to physical injury to the tissues resulting in the sequential release of mediators from mast cells, the vasculature, and other cells.[10] The released mediators include histamine, serotonin, and later bradykinin and prostaglandins. Bradykinin given parenterally produces pain in man and the hyperalgesia associated with prostaglandin is due to its potentiation of the bradykinin effect.[10,12] Therefore, the longer the duration of the surgery, the more the amount of tissue injury leading to the production of more mediators shown by the severity of pain, swelling, and trismus.[10]

Postoperative analgesics such as paracetamol and nonsteroidal anti-inflammatory drugs, either alone or in combination with steroids and narcotics.[13,14,15] have been employed in the management of pain following M3 surgery. Bamgbose et al. reported enhanced effects of co-administered dexamethasone and diclofenac K on short-term post-operative pain and swelling, compared to diclofenac potassium alone in M3 surgery.[15] Some studies have shown that preemptive analgesia helps for better pain control in M3 surgery.[16] Ogbikaya et al. also reported that triangular flap design for the surgical extraction of a third molar gives a lesser degree and duration of postoperative complications than the envelope flap.[17]

Swelling

Postoperative swelling is an expected sequela of impacted M3 surgery that usually reaches a maximum level by the second to the third day after surgery and should subside by the fourth to the seventh day.[18] Postoperative oedema results from the accumulation of protein-rich exudates within the surrounding tissue believed largely to be a consequence of the formation of prostaglandins and other mediators of inflammation derived from membrane phospholipids, which are released

following surgery.[10]
Increased age, female gender, nature of impaction, obesity, and prolonged duration of surgery are some of the reported risk factors for postoperative swelling.[10] Some of the intraoperative measures investigated by different studies that have shown a positive effect on postoperative swelling include the use of triangular flap design,[17] and secondary closure techniques such as insertion of tube drain,[19] socket dressing,[20] sutureless technique.[1]
The use of an ice pack locally applied and head elevation seems to help reduce postoperative swelling and improve patient comfort.[18] Ibikunle et al.[21] reported significantly improved quality of life of the patients that had cryotherapy after a third molar surgery than those that did not have cryotherapy. They further advocated for cryotherapy as a viable alternative or adjunct to the other established modes of improving the quality of life of patients. Studies have also shown the beneficial effect of perioperative corticosteroids in reducing postoperative swelling.[22,23]

Trismus

Trismus is one of the triads (others are pain and swelling) of expected outcomes of M3 surgery.[14] Trismus is usually a consequence of inflammation of the masticatory muscles especially the medial pterygoid.[18] Limitation in mouth opening is most severe within the first 48 hours postoperatively with almost complete recovery by the seventh day.[14,24]
Deliverska et al. reported a strong correlation between postoperative pain and trismus, suggesting that pain may be one of the main reasons for the limitation in mouth opening after surgical extraction.[14] Increased operating time and older patients are reported risk factors for trismus after M3 surgery.[10]
Preoperative use of steroids has been reported to be of help in reducing postoperative trismus.[13,15,18] Postoperative mouth opening exercises and the use of muscle relaxants such as chlorzoxazone are also helpful in trismus management.[13]

Alveolar osteitis (AO)

Alveolar Osteitis (AO) is a postoperative pain in and around the extraction site that increases in severity at any time commonly between the first and the third day after dental extraction, accompanied by partially or totally disintegrated blood clot within the alveolar socket with or without halitosis.[25]
Incidence of AO following impacted M3 surgery range from 0.3% to 26%.[5,6] Osunde et al, reported a rather low incidence of 2.7% and attributed the reported cases as due to the use of oral contraceptives, cigarette smoking, patient's age, and level of experience of the operating surgeon.[26]
Aetiopathogenesis of AO is still poorly understood although the fibrinolytic theory proposed by Birn[27] is widely accepted. Birn[27] proposed that the presence of a bacterial infection or trauma during extraction stimulates the release of plasminogen tissue activators which result in the plasmin induction of fibrinolysis. This leads to the dislodgement of the blood clot formed after the extraction, causing a dry socket. Mamoun,[28] in an alternative hypothesis suggests that high-stress extraction puts high compressive forces on the alveolar bone surrounding the tooth, leading to the necrosis of osteoblasts lining the socket. Necrosis of the osteoblasts initiates fibrinolytic activity that lyses any blood clot formed after the extraction and the necrotic bone cells lead to an exposed socket that results in the major symptom (pain) of alveolar osteitis that lingers for several days until the bone becomes completely covered by healing epithelium.
Some of the risk factors for the development of AO include prolonged and traumatic extraction, increasing age, female gender, use of oral contraceptives, smoking, and pericoronitis.[2,41,44,45,46]
To assist in the prevention of AO, studies[29,30] have investigated measures such as perioperative mouth wash (chlorhexidine), intra-alveolar medication, improved oral hygiene, postoperative warm saline mouth rinse, and systemic antibiotics. Lately, the placement of platelet concentrates in the socket has been found to accelerate wound healing of the socket within a week.[31] The treatment of AO involves the irrigation of the socket with saline to remove debris and placement of medicated dressing that could be an antibacterial (metronidazole), topical anaesthetic (lidocaine), obtundents (zinc oxide eugenol), or a combination of the three (Alvogyl).[32]

Inferior Alveolar and Lingual nerves damage

Damage to the inferior alveolar nerve (IAN) and lingual nerve (LN) are part of the common

complications of third molar surgery that has been reported.[7] The reported range of global incidence of injury to the IAN is 0.34-8.4% while that of LN is 0-23%.[6,33-36] Osunde et al.in a study in Calabar, Nigeria, reported a low prevalence of nerve injuries to alveolar and lingual nerves of 0.6% and 0.3% respectively.[26] Olojede et al. in a study of surgical extraction of 340 impacted mandibular M3 in Lagos, Nigeria, found the incidence of IAN injury to be 2.6% and no LN nerve injury was reported.[37] The low incidence rate of nerve injury reported in Nigerian studies could be attributed to surgical technique adopted which were mainly buccal 'guttering' technique and without the raising of a lingual flap in most of the cases.[26]

Trauma to the IAN clinically present as temporary or permanent sensory disturbances (anaesthesia, paresthesia and/or dysesthesia). Patients with IAN injury presents mainly with the paresthesia of the lower lip with or without chin involvement on the ipsilateral side.[7,38] lingual nerve injury may present with alterations in taste in the anterior two thirds of the tongue making it difficult for patient to chew properly and sometimes causes tongue biting.[39].

Identified risk factors for damage to the inferior alveolar nerve include older patients, increased depth of impaction, and proximity of the third molar roots to the alveolar canal40 (which is also the most predictive factor for IAN injury).[7,33] Some of the risk factors[36,41] for a lingual nerve injury during impacted M3 surgery include lingual surgical approach, lingual plate perforation, superiorly positioned lingual nerve, and lingual flap trauma during ostectomy or tooth sectioning.

Due to the negative effect of nerve injury on the patient's quality of life and possible litigation against the surgeon,[7,40] prevention is of utmost importance. Proper clinical and radiographic assessment should be done. In the presence of identifiable risk factors such as the root of the M3 hooking on the IAN, the situation must be discussed with patient. If the M3 surgery was for prophylactic reasons, then the surgery should be deferred and the tooth kept under observation. However, if the M3 is symptomatic, surgery under general anaesthesia to surgically separate the nerve from the root will be indicted with the patient well informed that the risk of permanent damage might be a consequence of the procedure.

Fortunately, most patients with nerve injury resulting from M3 surgery will recover spontaneously. Sayed et al.[7] reported a 90% recovery rate for IAN injury within 3–6 months, with permanent neurosensory damage to the IAN and LN of 0.2% and 0.5%, respectively after a two-year follow-up period.

Infections

Infections after third molar surgery have been reported to vary from 0.8 to 10.1%.[5,6,42] This could develop either in the early or late (more than 30 days after surgical extraction) postoperative period.[42,43] Risk factors for infection include the need for bone removal or tooth sectioning, degree of impaction, surgeon experience, age of the patient, exposure of the inferior alveolar neurovascular bundle, presence of gingivitis or pericoronitis, use of antibiotics, and location of surgery (hospital versus office procedure).[5,42,44-46]

Controversies abound on the impact of perioperative or postoperative systemic antibiotics on the incidence of postoperative infection in third molar surgery. While some researchers advocate for their use[45,47,48] others posit that it is counter-productive or at best has no added effect of reducing the incidence rate.[49,50]

Post-operative infections can spread in multiple directions and to any of the contiguous structures and adjacent tissue planes including buccal space, submasseteric space, pterygomandibular space, parapharyngeal space, or submandibular space, and may produce significant airway embarrassment. It may also progress to the retropharyngeal tissues and subsequently the mediastinum, with lethal effect.[5]

The management of postoperative infection entails systemic administration of appropriate antibiotic and surgical drainage when required. A broad-spectrum antibiotic like penicillin is the first line of drugs because of the mixed nature of the infection and the presence of streptococci. When used in conjunction with metronidazole, it helps to increase coverage against anaerobic organisms.

Hemorrhage

Perioperative bleeding is a risk in all surgical procedures including impacted teeth surgery.[13,51] Bleeding from impacted third molar extraction can be classified as either intra-operative or

postoperative[2] or based on the cause, into local or systemic.[5] The incidence of unexpected hemorrhage or prolonged hemorrhage is 0.6-0.7%.[5-7,52] (prolonged or excessive bleeding is the one that persists beyond the normal time for clot formation, or up to 6–12 hours[18,51]).

The systemic causes of bleeding from impacted third molar extraction may include medication that directly or indirectly affects coagulation, coagulation disorders (Von Willebrand disease, haemophilia A), liver disease (affecting clotting factors), and hypertension.[14,51,53] The local causes include soft-tissue and vascular injury. Moreover, the distolingual aspect of the mandibular third molar is highly vascularized, and may contain an accessory artery emanating from the lingual aspect of the mandible, which tends to bleed profusely if traumatized.[14,53] Excessive hemorrhage is associated with risk factors such as distoangular impaction, deep impactions, proximity to neurovascular bundle and older patients (most likely due to the fragility of the blood vessel).[5,54,55] Undiagnosed arteriovenous malformation, which can be either low flow (venous) or high flow (arterial) is another rare secondary cause of local massive intraoperative bleeding.[5]

Local bleeding resulting from soft-tissue and vessel injury is the most common cause of postoperative hemorrhage and they are usually sufficiently controlled by biting on gauze and the patient is instructed to avoid talking or chewing for about one hour and to minimize activities for the entire day following the procedure.[51] However, persistent intraoperative bleeding control may require additional sutures to the wound and the use of other haemostatic agents like vasoconstrictor such as epinephrine 1:100,000, application of topical thrombin to the wound or the use of a packing medium, such as gelfoam or surgicel, ActCe[1], BloodSTOP, Collaplug, tranexamic acid, and bone wax. Arterial bleeding is best handled with vessel identification and ligation or cautery.[18,51,54]

Bouloux et al.[5] advised that the management of patients with hematological or underlying systemic causes should be an interdisciplinary approach with a hematologist, and they encouraged the maximal use of local measures, including the fabrication of an individually fitted dressing plate before surgery. They also suggest that antithrombotic medications, such as Coumarin (warfarin sodium) be changed temporarily to heparin during the perioperative period. Treatment of mandibular arteriovenous malformations involves either surgical excision or embolization.[5]

A detailed preoperative medical history and a meticulous clinical assessment are central to the prevention of adverse hematological sequelae. Where indicated, angiography may be essential to confirm the diagnosis and assess the extent and vascular architecture of patients with arteriovenous malformation. Oral rinse with 10mls of an antifibrinolytic agent (or fibrin-stabilizing factors) such as tranexamic acid (4.8%) solution or epsilon-aminocaproic acid (Amicar), four times daily for seven days following surgery, has been reported to attenuate oral fibrinolysis from salivary enzymes.[54,56]

Damage to adjacent teeth

The reported incidence rate for damage to adjacent teeth as a complication of third molar surgical extraction is 0.3% to 0.4%.[52] Second molar teeth with large restorations, crowns, or caries are often at risk of being damaged during the removal of third molars.[51,54] Inadvertently luxated or avulsed adjacent tooth should be repositioned and fixed in placed for 10–14 days with the least rigid fixation possible to prevent ankylosis and root resorption.[18,54]

A careful visualization of the entire operating field, judicious bone removal, and the correct use of surgical elevators with a meticulous technique are necessary to minimize the risk of trauma to the adjacent teeth.[51] It is important to discuss the likely incidence of this complication with the patient ahead of the surgery whenever the surgeon after clinical and radiological assessment perceives the possibility of its occurrence.

Mandibular fracture

Mandibular fracture as a complication of third molar surgery is considered by many authors to be very rare, with an incidence range of 0.0046% to 0.0075%.[14,57,58] Mandibular fracture may present as an intra-operative, immediate or late (usually within the first 4 weeks and referred to as pathological fracture) postoperative complication.[14] A 'cracking' noise reported by the patient is documented to be the most frequent presentation (77%) and majority

(70%) of these iatrogenic fractures occur on the left side of the patient.[14] The pathological fractures are typically located anterior to the angle of the mandibular.[59] Risk factors for mandibular fracture include; age (above than 25 years, as bone becomes brittle with age), male gender, associated pathologies (bone lesions), distoangular impaction (requires more bone removal), and relative volume of the tooth in the jaw.[58,60,61] Some authors have also suggested that patients with full dentition can produce peak levels of biting forces, that are transmitted to the weak mandible during mastication thereby resulting in a higher risk of fracture irrespective of gender.61 Mandibular fracture attributable to surgical third molar extraction can be prevented by ensuring proper instrumentation and the use of controlled force. In addition, tooth sectioning should be prioritized above excessive bone removal.[60,62] Placing the patient on a soft diet for up to 4 weeks after extraction as a follow-up precaution could be very helpful.[14,60]

Others

Other complications of third molar surgical extractions found in the literature include; temporomandibular disorders, delayed healing and wound dehiscence, displacement of lower third molars into adjacent potential spaces, soft tissue injuries (such as injuries to the neighbouring soft tissues including buccal fat pad, hematoma formation or surgical emphysema) and swallowing or aspiration of the extracted tooth or its fragments.[13]

Conclusion

Third molar surgical extractions are associated with certain complications some of which are unavoidable. Therefore, adequate patients' education and psychological preparation for the procedure and its sequelae are necessary to keep up patient's confidence for future dental care.

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