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Recent advances in management of Post operative Complications of mandibular third molar extraction: A short review

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ABSTRACT
The common complications of postoperative mandibular third molar removal include dry socket, bleeding, infection and paresthesia of the lingual or inferior alveolar nerve. These complications though mild and transient usually result in significant distress to the patient. Over the years numerous studies have been conducted to minimize and effectively manage these complications, yet no study proves the superiority of any one regimen over other. The objective of this article is to critically discuss the emerging techniques for management of postoperative complications due to mandibular third molar extraction. KEY WORDS: Third molar surgery; Complication; Mandibular third molar; Postoperative complications

I. INTRODUCTION

Complications due to third molar extractions have a high frequency and diverse range of occurrence. The postoperative complication rate for mandibular third molar extraction in many studies ranges from 4.3% to 30.9%[1-2]. The main post operative complications of mandibular third molar extraction include alveolar osteitis, infection, inferior alveolar nerve or lingual nerve paraesthesia, prolonged bleeding, hematoma, temporo-mandibular joint dysfunction, and jaw fracture. These complications are usually mild and transient, but may prolong the inflammatory response, require additional treatment or cause irreversible damage to the tissues and rarely may be life threatening. The aim of this article is to review the recent management strategies of post operative complications of third molar extraction to provide effective and comprehensive management. An extensive search was conducted of published articles in last 10 years based on keywords including 'Complications of third molar extractions, management of post operative complications after impacted tooth extraction, third molar, wisdom tooth, alveolar ostitis, inflammation after extraction, inferior alveolar nerve and lingual nerve injury etc. Based on evidence the most effective management strategies are discussed here.

INFLAMMATION

Inflammation is the response of the surgical tissues to manipulation and trauma, and is directly proportional to the tissue damage during surgery. It is evident in the form of pain, swelling and trismus. Pain, trismus and swelling should be considered as complications only if they persist beyond the normal tissue healing period; which is around 3-7 days depending on the extent of trauma. The various methods found to be effective in reducing the inflammatory response include use of anti inflammatory drugs alone or in a combination with steroids. Chen et al in a meta analysis concluded that submucosal injection of dexamethasone significantly reduces edema and early trismus after extraction of impacted molar, but there was no strong evidence to support that dexamethasone decreases pain.[3] The role of newer therapies like continuous and intermittent cryotherapy, platelet rich plasma (PRP),ozone gel application and low level laser therapy(LLLT) have been studied upon with promising results in individual studies. [4-7] Intermittent cryotherapy , ozone gel and LLLT are the recent advances supported by strong evidence in being effective for pain, swelling and trismus management.

DRY SOCKET (ALVEOLAR OSTEITIS)

Alveolar osteitis (AO) commonly known as 'Dry socket' was first described by Crawford in 1896 as 'Severe, neuralgiform, irradiating pain with partial or total disintegration of the blood clot

in the socket'.[8] It is a disturbance in healing of the extraction socket resulting in severe postoperative throbbing pain that radiates to the ear, temple and neck. Classically, the pain starts 1-3 days after extraction and may be accompanied by halitosis, lymph node involvement or swelling. The socket is usually devoid of blood clot. The reported incidence of dry socket in literature is 1% to 4% worldwide. [9]

The etiology of dry socket is poorly understood and loss of blood clot from extraction socket, excessive surgical trauma, infection, heavy smoking, use of contraceptives and factors leading to fibrinolysis at the extraction site have been suggested to cause it.

Intra operative modification to prevent dry socket discussed in literature are by minimizing the surgical trauma, using altered triangular flap, high volume lavage and confirming the presence of blood clot after extraction. [10] Medications for prevention encompass systemic/ topical antibiotics, chlorhexidine rinse, antifibrinolytic agents, platelet rich plasma, steroids, eugenol dressing. [11]

The older treatment modalities used for treatment of dry socket focuses primarily on symptomatic relief and consist of pain control with analgesics and local measures as light curettage to encourage bleeding and clot formation, chemical debridement (hydrogen peroxide) and irrigating the socket with saline. Some of the different intra alveolar medication having analgesic and sedative properties commonly used are zinc oxide euginol(ZOE), alvogyl, topical anesthetic & collagenase ointment, turmeric, GECB pastille (3%, Guaiacol, 3% Eugenol 1.6% Chlorobutanol) ,aloe vera extract, honey.[12,13]

Recent management strategies mainly focus on angiogenesis and tissue regeneration, these include platelet rich plasma (PRP) and concentrated growth factor, low intensity pulsed ultrasound therapy (LIPUS), low level laser therapy (LLLT), ozone therapy. They have also been found to help relieve pain and enhance the healing process by initiating fibro-vascular tissue invasion into the socket. [9,12]

Systemic antibiotics have also been suggested as treatment option for dry socket and few recent studies state that prophylactic use of antibiotics (penicillins or nitroimidazoles) significantly reduces the risk of dry socket in third molar extraction.[14,15] The routine use of systemic antibacterials due to development of resistant bacterial stain is controversial and should be used on the surgeon's discretion.

In a recent systematic review on 'Management of Dry Socket' Kamal et al concluded that gentle curettage with irrigation of the socket, intra alveolar medicaments as alvogyl, ZOE and oil of clove are most effective and newer management techniques focusing on tissue regeneration as LIPUS, LLLT therapy and concentrated growth factors show good results in healing and pain remission. Although literature encompasses a vast range of treatment modalities, no single effective and satisfactory strategy has been recommended and a combination of older techniques providing symptomatic relief and newer advancements leading to tissue regeneration should be researched upon for comprehensive management of dry socket.[9,16]

INFECTION

Post operative infection after third molar extraction is an uncommon complication, occurrence of which is reported to vary between 0.4- 6 %.[17] It is defined by the presence of purulent discharge in extraction socket, local abscess formation, excessive inflammation, swelling, pain, lymph node enlargement or dry socket formation. Early onset infections occur within 7 days after extraction and are reported more in younger patients, difficult extractions, extractions of both molars simultaneously. Delayed infections occur mostly due to poor oral hygiene, hematomas, collection of surgical debris and food impaction in the dead space created beneath the soft tissue distal to the second molar. The most common predisposing factors for infection mentioned in literature are difficult bony impactions with total soft tissue coverage, a lack of distal space and the surgeon's technique.[17] Management is mostly by surgical debridement and drainage and antibiotics if necessary. Amoxicillin alone or with clavulanic acid, metronidazole or clindamycin are most widely used drugs to control the infection [14,18] Prophylactic and postoperative prescription of antibiotics for preventing infection is a common practice among dental surgeons but controversial due to the risk of adverse reactions and development of antibiotic resistance. Most studies suggest use of pre-emptive antibiotic therapy with caution and only in patients subjected to ostectomy or undergoing multiple extractions due to its negative impact on antimicrobial resistance and bacterial diversity. [19, 20, 21]

POST EXTRACTION BLEEDING (HEMORRHAGE)

Hemorrhage during or after third molar surgery is relatively rare. The reported range of clinically significant bleeding as a result of third

molar extraction is reported to be 0.2% to 5.8% including both transoperative and postoperative incidents.[2]. As hemorrhage cannot be quantitatively measured Lockhart in 2003 specified certain criteria to identify post extraction bleed, which include; the bleed continues beyond 12 hours, causes the patient to contact the dental practitioner or emergency department, results in the development of a large hematoma or ecchymosis within the oral soft tissues or require a blood transfusion or hospitalization.[22]

Hemorrhage can be classified as primary bleeding, reactionary prolonged bleeding, and secondary prolonged bleeding. Primary bleeding occurs during and immediately after extraction and is usually due to trauma to the tissue during surgery or infection. Management is mostly by local haemostatic agents. When abnormal bleeding occurs few hours after extraction it is known as reactionary prolonged hemorrhage, and is mostly seen in patients on anticoagulant therapy or with systemic disease. Secondary bleeding takes place 7-10 days after extraction and is mainly due to secondary infection and rarely occurs for dental extractions. [23]

The main causes of post extraction bleed can be local or systemic. The local causes of hemorrhage are infection, traumatic extractions and tooth proximity to mandibular canal leading to laceration of the blood vessels. Systemic causes include platelet disorders, inherited or acquired coagulopathies, and medication which alter coagulation. [24] Also failure of the patient to follow post extraction instructions as refraining from spitting, rinsing, taking hot food or beverages for at least the first 24 hours may lead to hemorrhage.

A detailed medical history is a prerequisite to recognize patients with risk of hemorrhage, especially patients with known coagulopathies or history of abnormal bleeding episode. Post extraction bleed is more frequently encountered due to increasing number of patients on antiplatelet and anticoagulant medications. Detailed questioning regarding the drug dose, duration of use should be recorded and physician consultation should be obtained when required. Apart from the standard laboratory tests, specific tests as prothrombin time/international normalized ratio (PT/INR) to monitor the effect of anticoagulants as warfarin, partial thromboplastin time (PTT) for patients on heparin and platelet count for cancer patients on chemotherapy is advised. As the bleeding effect of anti- platelet medications cannot be measured accurately, it is recommended that initial dental surgery be limited to assess the bleeding.

Management of hemorrhage is both local and systemic. Local haemostatic measures are surgical (suturing) or non surgical which include pressure pack directly over the site of the surgery or bone wax, antifibrinolytic as tranexamic acid rinse, oxidized cellulose, absorbable gelatin sponges, thrombin, cyanoacrylate glue, fibrin glue and adhesives, chlorhexidine bio-adhesive gel and aminocaproic acid (EACA) to prevent clot lysis.[25,26] The role of local haemostatic is limited in patients with systemic cause for hemorrhage. Systemic intervention is required mostly in patients with underlying coagulopathy, with treatment depending on the systemic cause of bleeding. Treatment modalities include platelets, fresh frozen plasma (FFP), factor replacement therapy according to the deficiency, intranasal desmopressin, intravenous synthetic vasopressin, tranexemic acid given orally or intravenously.[23] The action of systemic agents is by inhibiting fibrinolysis or promoting coagulation.

Recent studies do not recommend temporary withdrawal or interruption of patient's anticoagulant or antithrombotic medication prior to extraction which was a common practice among dental surgeons earlier for fear of post extraction bleeding. It has been observed that although there may be increased bleeding but withdrawal may add to the risk of morbidity and mortality by increasing the thrombotic risks, especially in patients with dual antiplatelet therapy. If proper haemostatic protocols are implemented surgical extraction of third molar may be safely attempted. [27]

NERVE INJURY

The impacted mandibular third molar may lie in close proximity to the lingual, inferior alveolar, mylohyoid or buccal nerves. The inferior alveolar nerve and lingual nerve are particularly more susceptible to injury during surgical removal of impacted third molar. Most of these injuries cause transient sensory disturbance but rarely permanent paraesthesia, hypoaesthesia or dysaesthesia can occur. These sensory disturbances adversely affect the patient's speech, swallowing and mastication; thereby affecting the patients' quality of life.[28]

Inferior alveolar nerve injury is relatively rare as the nerve runs within the bony canal when in mandible in the area of third molar and for the same reason the healing and recovery is mostly quick in case of injury. The reported frequency of nerve injury during the removal of third molar is around 0.26%–8.4%. The probability of recovery

and regaining normal sensation is about 96% after 4-6 weeks and less than 1% for a persistent sensory disturbance.[29] The risk factor associated with injury to inferior alveolar nerve resulting in neurosensory deficit have been reported to be ostectomy of the bone distal to the third molar, teeth in close radiographic proximity to the mandibular canal, extraction by inexperienced surgeons and increasing patient age.[29]

The lingual nerve injury though uncommon due to impacted third molar extraction is very disabling. The incidence of temporary lingual nerve injury is estimated to vary from 0 to 37.5% whereas the incidence of permanent lingual nerve injury is estimated to vary from 0 to 2% .[30] In contrast to the inferior alveolar nerve injury, the nerve is not supported inside a bony canal so post traumatic repair within the soft tissue may be slow, misaligned and cause scar tissue formation. The anatomy of lingual nerve varies greatly and studies have been done to identify the predisposing factors which increase the risk of nerve injury. These include the depth and angulation of impaction, surgical approach using lingual flap elevation and lingual osteotomy, perforation of the lingual plate during surgery, experience of the surgeon, increased operating time, manipulation and/or detachment of the raised lingual flap and increased age of patient.[28,31] It has also been suggested that lingual nerve injury can also occur directly by a syringe needle or by localized chemical injury during injection of local anesthetic solution.[31]

The sensory disturbances for inferior alveolar or lingual nerve can be troublesome and it also constitutes one of the most frequent causes of complaints and litigation. Partial sensory loss usually shows complete recovery where as complete sensory loss suggests section or crush injury which has lesser chances of recovery. Nerve injuries are managed according to the type of injury and neuro sensory deficit. Non-surgical therapy includes LLLT, acupuncture, vitamin B12 which help in nerve regeneration. Neuropathic pain or persistent sensory impairment after 3-4months of injury requires surgical exploration and neurorrhaphy or grafting of nerve.[32] .

II. CONCLUSION

Although the literature encompasses a wide array of data supporting the individual results on treatment modalities promising enhanced healing, yet few studies prove the superiority of any one regimen over other. The disparity of interventions and different measurement scales make it difficult to compare results. Out of the recent advances for management of individual complications literature shows evidence that intermittent cryotherapy, ozone gel and LLLT are effective for managing prolonged symptoms of inflammation. Newer management strategies for dry socket focusing on angiogenesis and tissue regeneration as LIPUS, LLLT, ozone therapy and concentrated growth factors show good results in healing and pain remission. Infection of the extraction socket is still most widely managed by surgical debridement and drainage and antibiotic drugs are used only if required. Hemorrhage management is according to the underlying cause and recent studies do not recommend altering a patient's anticoagulant medication as this may add to the thrombotic risks. Recent research has proved that minor surgical procedures can be performed safely if local haemostatic measures are followed in patients taking single or dual antiplatelet therapy. Neurosensory deficit after third molar extraction is usually transient and LLLT and acupuncture is reported to be effective, if persistent then the injury should be surgically managed.

These results stating the advanced and effective management strategies should be interpreted with caution as there is significant disparity in various studies due to difference in study design and heterogeneity of the data. Considerable diversity of used evaluation methods, outcome measures and various methodological confounding factors posed serious restrictions to review the literature in a quantitative and systematic manner. This study demonstrates the need for high quality research to provide the optimal surgical technique for prevention of complications and establishing comprehensive guidelines for their management.

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