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DENTAL ACCIDENTS DURING SURGICAL PROCEDURES – A REVIEW

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ABSTRACT

Dental procedures are quite challenging which demands absolute care and attention. Negligence can happen at any stage of the procedure. 'To error is human'. However, following guidelines of standard care for any procedural setup is mandatory. Mistakes happen at every practice; the key is to identify and manage the patient at care. This review of current literature and case reports provides the background knowledge of dental accidents during surgical procedures. Dental accidents can be ingestion or aspiration of foreign body or fire or injury to adjacent tissues of the operating site. Aspiration or ingestion of foreign body, if not treated can result in severe complications, sometimes can be fatal. The majority of surgical fires occur only in head and neck surgery suggesting a greater risk for complications. Soft tissue injuries such as lacerations, cuts from sharp knives or scalpels and nerve injuries from implant placement or during nerve block are the common injuries that can occur during dental procedures. Prevention of these accidents can be best ensured by adhering to standard protocols for every individual procedure, early identification, intimating patients about the accident, management of the undesired complication. Documentation of any mishaps during the procedure would be necessary for future legal complications. Aim of this article was to review the available literature and case reports on dental accidents.

Thus, this review might provide a valuable foundation for safety standard clinical procedures, with regard for utmost care of the patient.

Keywords: Aspiration, dental accidents, dental fire, oral surgery, mishaps

INTRODUCTION

Iatrogenic accidents during routine clinical procedures are unpredictable and can occur sometimes regardless of all the possible precautions taken. These foreign objects can be of various sizes and shapes, ranging from small, large, elongated, round, sharp, and blunt, which can get wedged anywhere either in the gastrointestinal (GI) or the respiratory tract. Reported that 92.5% of the swallowed foreign bodies enter the GI tract and 7.5% of these enter trachea **[1]**. Only 10–20% cases require nonsurgical intervention, and 1% requires surgical retrieval. In cases of accidental aspiration or ingestion, early recognition and intervention is the key to prevent serious consequences **[2, 3]**.

Inferior alveolar nerve injury

The inferior alveolar nerve (IAN) originates from the mandibular branch of the trigeminal nerve and innervates teeth, muscles and other soft tissues. Inferior alveolar nerve injury occurring during the aesthetic block is one of the commonest causes of iatrogenic nerve injury, due to anatomical lack of references that produce a high failure rate. There is possibility of inducing direct lesion to the nerve bundle by placing the needle within the canal. The capability for nervous blocking using a conventional anesthetic technique against the techniques of Gow-Gates and Vazirani-Akinosi was compared by electrical testing in a study by Goldberg *et al* **[4]** and the study showed no existing significant statistical differences. On the other hand, breakage of the injecting needle during nerve block may require more complex surgery to access the fragment, which could increase the risk for injury **[5]** still it is questionable whether IAN block causes more damage to the nerve than the block itself **[6, 7]**. This type of accident is more prone to occur in anxious patients and in children after doing brisk or unexpected movements causing the complication **[8]**. For preventing these events, restless patients and children should be premeditated to diminish anxiety and to decrease unnecessary accidents. Nitrous oxide may constitute a useful method to control these cases **[9]** the use of cone beam computed tomography in assessing the relationship of IAN nerve canal to the third molar before extraction can be a useful tool to anticipate the complications **[10]**.

Injury Due to Dental Implant Surgery:

Nerve damage as a result of the placement of dental implants in the posterior mandibular region tends to be the result of poor or bad planning of cases. This is usually due to an inadequate radiological diagnosis. If planning is correct, nerve damage is highly unlikely and if it happens it is usually due to inflammation or bone remodelling occurring as a consequence of the surgical technique. In these cases, the damage usually is minimal and recovery starts after an undetermined period but that does not usually exceed a few months of time **[11]**.

The use of short implants is increasingly more widespread and today it constitutes a safe technique for the resolution of cases with widely reabsorbed maxillary ridges. Karthikeyan *et al* **[12]** performed a systematic review of publications from 1991 to 2011, considering short implants those of 7 mm or less in length, unlike most classical studies that include those with a length below 10 mm. The study concluded that in cases of severe mandibular atrophy, the use of short implants is a valid alternative. In general, when we reduce the length of implants, compensation would occur by an increase in diameter.

At present, totally mandibular edentulous patients are often planned with a reduced number of implants, sufficient to support prosthesis. Overdentures are often a convenient and effective solution **[13]** and require a minimum number (from two to six) of implants. Usually the implants are placed in the inter foraminal area away from the nerve trajectory.

Lesions Related to Third Molar Removal Surgery

Inferior alveolar nerves can get injured during surgery for removal of mandibular third molars. Moreover, it is the lesion with the greatest medico-legal consequences. Very importantly, experience of the clinician can be of great relevance to minimize the problems consequent to this nerve injury. Smith concluded that both osteotomy and odonto section, and split division lingual technique increase the risk of excessive bleeding that appears to be associated with an increased risk of temporary neurosensory defect **[14]**. They concluded that risk factors that could be considered for IAN paraesthesia are: the horizontal position of the third molar, as well as the proximity to the alveolar canal, or the lack of experience of the surgeon. Besides, they found more cases in patients aged between 26 and 30 years. Patients of older age, as well as the depth of molar inclusion can be considered high risk factors **[15]**. Darkening, deflection, root narrowing, presence of bifid apices, and narrowing of the canal are also considered significant risk factors.

Dental fire

Dental surgical fire is a subset of surgical fires, literature on surgical fires from 1949 to 2009 lists only 2 papers, one from 1964, another from 1971, specifically related to dentistry. On examining the full scope of surgical fire, one finds that the circumstances leading to and the means for preventing surgical fire have long been well-characterized. Nonetheless, they continue to occur, often with devastating **[16]** and sometimes fatal consequences **[14]**. Surgical fire has long been a peril of surgery **[17]** especially during the period when the most prevalent anaesthetics were flammable **[18]** Barker and Polson **[19]** may have been among some of the first to attempt to identify and recreate the conditions of an actual operating room fire. With the decline in use of flammable anaesthetics, the general concern for and awareness of fire safety in the operating room declined **[16]**, this awareness has yet to return to previous levels. Subsequently, the vastly increased use of laser and electrocautery **[20, 21]** equipment has reintroduced an increased risk of surgical fire, despite many long-standing safety protocols for laser equipment **[16]**. Given that lasers may not in fact offer any significant advantage over the older or are not meant to replace any thermal methods. As confirmed ignition sources, **[22]** they actually create rather than simply increase a risk of surgical fire that would not otherwise be present **[23]**.

Alternatively, it may simply be true that fewer dental surgical fire actually occur. The use of supplemental oxygen via nasal cannula is especially implicated in such fire, this may be particularly significant in paediatric dentistry, where procedural sedation is often indicated even for nonsurgical procedures, especially for children with special health care needs **[24]**. In view of this shortage of specific cases of documented dental surgical fire, then, it may be that dental procedures involving the use of supplemental oxygen circumstantially reflect a factor that promotes surgical fire risk. Some possible explanations for this risk mitigation include greater fire safety awareness by dental practitioners, ventilation of oxygen-enriched environments **[24, 25]**. In 2004 it was found that nearly 1 in 5 surgical fire resulted from cautery equipment **[26]**, and another analysis in 2006 found that 100% of examined cases were caused by an electrosurgical unit **[27]**. By 2007, surgical fire occurred frequently enough to become mainstream news and were more common than was generally assumed.

Aspiration or ingestion

Aspiration of teeth, dental prostheses and other foreign bodies is recognized as a

consequence of maxillofacial injuries and a complication during the dental procedures. The outcome ranges from minimal symptoms, to respiratory compromise, failure and even death **[28]**. On reviewing the literature, aetiology, nature of the aspirated objects, signs, symptoms and morbidity were established. An otherwise healthy 23-year-old man was prepared for surgical removal of a mesioangular, symptomatic, partially impacted lower left third molar tooth. The procedure was undertaken under local anaesthesia with complete aseptic conditions. The tooth was routinely approached through a Bucco-distal triangular flap, mesio-buccal-distal bone guttering followed by angular sectioning of the mesial half of the crown. Upon elevation of the tooth using a straight elevator, applied mesiobuccally, the patient had a gag reflex provoked by the suction tip. During its elevation followed by a dramatic release and disappearance of the tooth. The socket and the surrounding soft tissue were immediately inspected, and the surrounding environment including the suction apparatus and surgical packs was examined, but the tooth was not found **[29]**. Tooth was removed from the right middle bronchus under general anesthesia. Preoperative steroids and antibiotics were prescribed to reduce oedema and infection. The patient made an uneventful recovery. Aspirated and ingested foreign objects could pass through the gastrointestinal tract without any complications in 90% of cases, approximately 10 % of cases require endoscopic removal **[30, 31]** while still 1 % may require operation as stated by literature **[32, 33]**. Although the complication rate is between 2.4 and 5 % on using bronchoscopy for retrieval of aspirated foreign objects, it has been reported to be effective in 99% of times **[34]**.

Many factors are reported related to the aspiration and ingestion, like patients medical and mental condition, use of local anaesthesia or intravenous sedation, difficulty of access, compromised direct view, and many more **[35, 36]**. However, these factors are still in controversy. Although aspiration and ingestion of foreign objects are rare and risky complication during dental procedure, thorough documentation of the accidental aspiration and ingestion of foreign objects during dental procedure is necessary **[37, 38]**.

A 40-year-old female patient was being treated with dental implants. During the second-stage surgery, the professional was attempting to access the implant platform when the screwdriver slipped from his hands **[39]**. Consequently, the instrument was involuntary swallowed by the patient. The patient was not aware of any problems.

Her medical history reported that she had previously undergone a hemi-mandibulectomy for a malignant lesion a couple of years ago. Immediately after the episode, a surgical intervention to remove the instrument was undertaken. The screwdriver was obstructing the ileocecal valve without the possibility of being expectorated and removed.

CONCLUSION

Early recognition of high-risk factors and location of swallowed foreign bodies during any surgical procedure related to oral cavity are the keys to avoid catastrophic effects. A close monitoring of clinical signs and symptoms should be done until the foreign body aspirated /ingested is excreted or removed. The use of preventive measures such as rubber dam, gauze throat screens, or floss ligatures is an indispensable standard of care. Similar cases and conditions due regard for the state-of-the-art. This review provides the background to suggest that the practice of using intraoral suction in conjunction with the use of supplemental oxygen during dental procedures may provide a mechanism that reduces the risk of creating the conditions needed for the initiation of intraoral fires. Similarly, to evaluate the capacity of intraoral suction to delay the onset of ignition may also provide additional safety considerations or protocols to reduce the risk of dental surgery fires and surgical fires in general. In this era, dentists should be aware of a protocol not only for prevention but also for management of such iatrogenic events.

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Conflicts of interest

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