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CBCT as Diagnostic Modality in Radiographic Assessment of 3rd Molar

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ABSTRACT

3rd molar extraction is a commonly performed procedure by dental surgeons. 3rd molar extraction is performed for various reasons such as inadequate space for eruption of the molar caries pathologies resorption of root, fracture of teeth which can't be conserved. The extraction of molar sometime cause's injury to Inferior Alveolar Nerve (IAN) and maxillary sinus, so it's better to know the position of the tooth, so radio graphs are taken to see the position of the tooth and adjacent structures. Commonly used radiographs are OPG and CBCT but nowadays CBCT is widely used due to its advantages and applications. Some classifications associated with CBCT of third molar are given to assess proximity of root apices with Inferior Alveolar Canal (IAC). CBCT has advantage when compared to conventional and panoramic radio graphs. The accuracy is superior when compared to Ortho Pantomo Gram (OPG) and radiation exposure is less when compared conventional Computed Tomography (CT). The major drawback of panoramic radiographs is they produce 2 dimensional images of 3 dimensional object bur CBCT produces 3D images. The IAC position and the mandibular 3rd molar position is often related so the classification according to the canal's position and the according to the position of mandibular 3rd molar in CBCT is described. Furthermore the consequences of the IAN injury and principles of CBCT are discussed.

Key words: Inferior alveolar nerve, Ortho pantomo gram, Computed tomography, Inferior alveolar canal

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INTRODUCTION

Surgically extracting the 3rd molar tooth is the procedure most widely recognized by faciomaxillary specialists. Preoperative examinations that primarily examine the morphologies of the 3rd molar, as well as its relationships with adjacent tissues, should not be used to make surgical decisions [1-3]. Regular intraoral radiography or maybe an Ortho pantomo gram are common preoperative imaging examinations. Computed Tomography (CT) is now a standard technique for providing sharp images that may be used in clinical application, thanks to later advancements in clinical design innovation [4-7]. The clinical value of preoperative CT assessments in 3rd molar tooth surgical treatment has recently been addressed. Just like the case with any surgery, this removal may likewise be related with specific intricacies. Perhaps the most genuine injury that might happen. Damage to the IAN during mandibular 3rd molar tooth evacuation might result in succeeding neurosensory damage on the base lip and jaw line, with an unfavourable result and patient welfare has a big influence. Accordingly, assess the situation of the 3rd molar tooth and build up its ties with the IAC in the pre-usable phase, fully intent on limiting danger of injury to the nerve [8-10]. All-encompassing radiography, which gives just two-dimensional data, is the most normal demonstrative imaging methodology utilized for this reason. Nonetheless, with the developing utilization of CBCT in dentistry, and by and large, including 3rd molar tooth removal, it started to be the test of best option, to the detriment of all-encompassing radiography, disregarding any inquiry regarding cost and radiation portion.

LITERATURE REVIEW

Why do we extract the 3rd molar tooth?

The 3rd molar tooth has to be removed when there is insufficient space for eruption into the retro molar room, between the 2nd molar and the ramus of mandible. It might result in an erupted 3rd molar, causing a fold of gingival tissue surrounding the evicted tooth to some extent, or a pericoronal pocket, which could lead to pericoronitis. Asymptomatic pericoronal tissue related to a substantial incidence of squamous metaplasia was seen in the affected teeth, as well as proliferative movement

[11-13]. Even though teeth affected by pericoronal tissue may cause painful arrangement or odontogenic growth. Other reasons for extraction of third molar may be orthodontic reasons, risk of pathologic changes and pathologies such as dentigerous cyst, ameloblastoma, resorption of adjacent molar, periapical pathologies severe caries, fractured teeth which cannot be conserved, supernumerary teeth.

3rd molar tooth surgery complication

To avoid the sinus gap, the relationship seen between maxillary 3rd tooth and the maxillary sinus must be thoroughly assessed prior to surgery. Expulsion of the mandibular 3rd molar teeth might put patients at risk for genuine neurosensory abnormalities, especially if the Lingual Nerve (LN) and the (IAN) are affected [14-16]. Ultimately, if the 3rd molar tooth is completely or to some extent affected in the alveolar bone, bone guttering and odontectomy are needed. Such carefully intrusive methods might cause postoperative agony, edema, and restricted opening or versatility of the mouth because of muscle spasms [17-19]. Complications of medical procedure likewise incorporate alveolar ostetiits, postoperative disease, discharge, Oro-Antral Communication (OAC), harm to adjacent teeth, dislodged teeth, and root fractures.

Hazard factors associated with nerve damage

Mechanical aggravations from cautious intervention are thought to create LN and IAN nerve injury, which are influenced by a number of segment, anatomic, and treatment related elements [20,21], Due to specific issues during a medical procedure, reduced bone flexibility, or an increased incidence of dental hyper cementosis the risk of damage increases with the patient's age. Furthermore, advanced age may lead to injured nerve fibres having a lower healing capacity. Furthermore, those over the age of 65 who show signs of sclerotic change are more likely to develop pathologic osteomyelitis around the impacted tooth [22,23]. Because there is less space in between the IAC and the mandibular 3rd molar, the risk of damage is increased with a more slender mandible. Teeth angle, the presence of a proximal shadow, and the quantity of impaction are all anatomic risk factors for medical procedure injury, all of which are connected to the necessity for careful treatment. Infusion of local sedation, mucoperiosteal entry point and height of the mucoperiosteal fold, bramble use during alveolar bone evacuation and tooth segment, nerve extension during a medical procedure, and unintentional cracks of the lingual cortical bone of the mandible are all treatment related danger factors. Imaging investigations prior to surgery can be used to reduce the risk of nerve damage [24-26]. Ultrasonography must be used to identify LN since the location of the nerve in mandible prevents Computed Tomography imaging from identifying it. Because the IAN is positioned within in the IAC, it may be checked in a nonlinear manner through the IAC's radiographic analysis. Preoperative radiography evaluation, in particular, can be utilised to assess whether IAN trauma risk factors occur prior to mandibular 3rd molar removal or by providing more information on the interaction between the mandibular 3rd molar and the IAC [27,28].

Radiological evaluation

There are number of different radiographic procedures which can be used before such a 3rd molar dental procedures. Intra-oral radiography provides specialists with point by point knowledge regarding structures at the concealed area. It incorporates CBCT and Ortho pantomo gram.

Intra oral periapical radiograph and OPG is broadly utilized during treatment making arrangements for 3rd molar tooth medical procedure since it empowers evaluation of the 2D connection between the tooth and the IAC. CT is expensive and causes more radiation exposure than CBCT. CBCT is more affordable and has less radiation exposure thus becomes a wiser choice when compared to other modalities.

CBCT assessments empower simple evaluation of 3D anatomic connections between the 3rd molar tooth and neighbouring designs and encompassing tissues, just as for identification of the psychological foramen and bifid IAC [29-32]. Furthermore, if the 3rd molar tooth disengages during a medical operation, the CBCT image can be used to identify the disjoined teeth. Acquisition mechanics and geometric configuration for the CBCT technique are theoretically simple. CBCT imaging is performed using a rotary gantry or C-arm supporting an x-ray source and reciprocating area detector. A divergent x-ray source, collimated as a cone, or more commonly, as a pyramid, is directed through the Region of Interest (ROI) within the maxillofacial region, and the residual attenuated photons strike the detector on opposite side. When the gantry is activated, data is collected from a series of successive exposures as the gantry revolves around a specific rotational axis cantered within the ROI of the patient. The trajectory arc is ideally 360 degrees but can vary from 180-720 degrees.

Classification of impacted 3rd molar tooth using "CBCT"

Information of specific connection between the 3rd molar tooth and the IAC is one pivotal this information is important since it shows regions where bone evacuation must be made safe and hazard zones where extra attention is necessary. Locations where bone removal should be done safely, as well as areas where great care is important. As of late, CBCT is broadly utilized in clinical work because of its 3D capacity. CBCT not only displays the 3D structures of surrounding teeth and tissues, but also provides reconstructive images on axial, coronal, and sagittal slices [29-32].

When compared towards the foundations of the 3rd molar tooth, the position of the IAC is defined as follows:

Class I: IAC is found on the apical aspect of the mandible (Apical position).

Class II: IAC is found on the buccal aspect of the jaw (Buccal position).

Class III: IAC is found on the lingual aspect of the mouth (Lingual position).

Class IV: IAC is located between the roots of the mandible (Interradicular position).

Each class's interaction between the 3rd mandibular tooth and IAC is classified into four categories.

- The 3rd mandibular tooth is not in touch with the IAC.
- A white line runs between the 3rd mandibular tooth and the IAC.
- A defective white line connects the 3rd mandibular molar to the IAC.
- The 3rd mandibular molar enters the IAC.

The entry profundity of the roots classifies the vertical position of the mandibular 3rd molar tooth and the IAC into two conditions:

Classification in buccolingual views. Divided in three classes A,B,L.

One rare group is named as uncommon and was subdivided in four classes.

In the subclasses, subclass 3 and subclass 4 were considered as "with proximity".

The situation with the lingual bone plate was surveyed by the presence or the absence of a fenestration or a cortical diminishing (record "F" mean the presence of a fenestration or diminishing of the lingual bone plate) [33].

Different situations and features of the IAC: Subclasses

Uncommon class

- U_1 apex is completely surrounded by the cortical mucosa of the IAC.
- U_2 IAC runs through the roots without closed or merged apex.
- U_3 IAC passes between roots with close or fused apexes.
- **U_4 plexiform canal:** There is no discernible radiation canal.

DISCUSSION

To restrict the quantity of entanglements during mandibular 3rd molar tooth removal, a few orders have been created. Since for a preoperative assessment of specific connection between the underlying foundations of the IAN and the mandibular 3rd molar tooth might support foreseeing, and conceivably staying away from tangible hindrance, more up-to-date characterizations zeroed in there has been some discussion about the relationship between the 3rd molar tooth and IAC [34,35]. Panoramic X-rays are the first tool for evaluating this relationship. Because of the proof they just produce a 2 dimensional picture of a 3 dimensional physical reality, if the radiological marker on all-encompassing radiography shows that there is an intimate relation between the 3rd molar teeth and IAC, it has been suggested that further testing with registered tomography checks be undertaken. However, the demerits of conventional Computed Tomography (CT) are that the patient receives a higher dosage of X-rays [36-41]. CBCT appears to be a low-dose, optimum 3D imaging method for resolving the complexity of the anatomical structures' connection. CBCT coronal slices would properly depict the state of lingual bone plate that shields LN during the removal of 3rd molar tooth. Knowing the path of canal up to 3rd molar teeth can help determine surgical strategy and forces to be used during dislocation, tooth cutting, or osteotomy. To reduce potential of injury to IAN, several treatment techniques have been suggested. The crown was entirely separated while the roots of the alveolar fossa were preserved throughout especially on the buccal side, IAN debilitations are increased. The mandibular canal's cortication condition is a reliable indication of IAN injury during 3rd molar tooth extraction. When IAC cortical defect was found, this foundation establishes the validity of determining if course with closest association are on the buccal, apical, or lingual aspects (Classes: B, A, and L). The presence or absence of the cortical covering distinguishes subclass 2 from subclass 3. The crown of the tooth is separated and extracted while roots are preserved in a coronectomy. The residual roots were about 3 mm beneath the alveolar bone level, and the mesh was immaculate. If the 3rd molar tooth contacts the IAC. The absence of cortication during 3rd molar tooth extraction must be recognized as a posing a considerable risk of IAN damage.

CONCLUSION

Dental radiographic imaging has changed thanks to computed tomography (CBCT) technology, which allows dentists to treat their patients more effectively. The major consequence of 3rd molar extraction is the injury to the IAN that may cause serious complications. CBCT gives the radiographs in all three planes as well as 3Dimensional construction so it's quite easy to interpret and prevent the consequences. As CBCT causes less radiation exposure to x-ray radiation than CT and conventional radiographs.

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