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Review Article

A literature review on different diagnostic techniques used in oral and maxillofacial surgery

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ABSTRACT

Radiographs are one of the most important diagnostic tools in diagnosing and treatment planning of the patient along with the clinical examination of the patient for a dental disease. There are different imaging techniques used in oral and maxillofacial surgery which are having their own significance. Normal routine diagnostic approaches used in oral and maxillofacial surgery as well as in other specialty of the dentistry are normal intra oral peri apical radiography, OPG and radio visiography. Apart from these techniques some advanced techniques can also be employed in the diagnosis and treatment planning of the dental patient, techniques such as cone beam computed tomography, magnetic resonance imaging etc. All these techniques are having their own significance of use.

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1. Introduction

History stated that x rays are developed by William roentgen. Now a days radiological diagnostic tools has become necessity in the field of medical and dental diagnosis and treatment planning. Without radiological diagnosis it is very much difficult to diagnose any medical or dental problem with specific diagnosis. There occur a major progress in the field of dental radiology with evolution from intra oral peri apical view to extra oral radiology. Extra oral radiology helps in providing the clinician a single radiological image of both the jaws i. e. maxillary as well as mandibular jaw bones as well as other oro dental structures in a single film. To visualize the minimum or minute bony changes intra oral peri apical view can be used.¹⁻³

The image produced by intra oral and extra oral radiography only provide the image in two dimensional view and is not able to provide the information of the neighbouring vestibular structure, these information of the

surrounding vestibular structure is provided by the use of three dimensional view. There are some limitations of the two dimensional radiography such as repeated exposure to the patient, magnification of the image may occur, there are chances of image distortion, superimposition of the image might occur with the usage of two dimensional radiography. To avoid these limitations and if clinician need to have visualization of vascular structure too, one should go for three dimensional radio graphical tools.⁴⁻⁶

Under two dimensional radiography most commonly used approach are intra oral peri apical view for the diagnosis of any pathological change in the pulpal region of the tooth, to check the occurrence of caries or spread of caries, to check for periodontal health of the tooth, to check any peri apical infection of the teeth. The nature and specific diagnosis required for the patient develops the only basis of which type of radiography technique is required. Every patient is different from each other so a specific radiographic technique should be employed in accordance to the patient need for the treatment. The radiographic information should be added up along with the clinical information to come to

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a specific diagnosis and treatment plan for the patient.^{7,8}

2. Different Type of Radiographic Techniques

2.1. Intra oral peri apical radiography

One of most commonly employed two dimensional imaging technique in dentistry. It is most commonly used to check any peri apical infection, extent of periapical infection from carious tooth or from necrotic pulp, it is used to check the number of canals a tooth is having, peri apical radiograph is used to check the bony changes near the specific tooth, bone morphology around the tooth or can also be used to check the bone loss around the tooth. Sometimes a complete series of full mouth radiographs are also prescribed for an oral checkup. A series of full mouth radiographs comprises of 20 intra oral peri apical views along with 4 bite wing radiographs with it means (a total of sixteen intra oral peri apical radiographs plus four bite wing radiographs are used). Intra oral peri apical view works on two different principles) the paralleling angle technique in which the film is stood parallel to the long axis of the tooth and the central x ray beam is aimed to the right angle to the tooth or the teeth as well as aimed right angle to the film, ii) the bisecting angle technique, in which the radiographic film is held as close as possible to the palatal or the lingual side of the tooth, in this technique the film and the tooth forms an angle with its apex point where the film has been held and is in contact with the teeth, central ray beam is directed to the apex of the tooth.^{9,10}

2.2. Ortho pantograph

Ortho pantograph also known as panoramic radiography. Ortho pantographs are most commonly used in capturing the maxillary and the mandibular both the jaws in a single film, ortho pantograph are also used in capturing the temporomandibular joint, helps in capturing the third molars, where intra oral peri apical radiographic film is difficult to place, it also helps in determining the extent of any bony pathological condition clearly. The only drawback of ortho pantogram is image magnification and along with it, it is not able to record the fine anatomical details. Ortho pantograph are commonly used in oral and maxillofacial surgery to check the extent of bony pathology, to check the architecture of the bone, to check the position of the third molar along with the neurovascular surrounding structure. ortho pantogram is advised to check the relationship of the maxillary teeth with maxillary sinus (to check the close proximation of the maxillary teeth with the maxillary sinus) during the process of surgical extraction, to check the close proximity of the maxillary sinus from the edentulous ridge in case of implant placement, in the diagnosis of temporomandibular joint diseases, to check the extent of any swelling, helps in the diagnosis of odontogenic and non odontogenic tumors, evaluation of alveolar crest following

trauma.¹¹⁻¹⁵

2.3. Computed tomography

Hounsfield in the year of 1974 discovered the computed tomography, now a days it is most commonly used in the diagnosis of pathology related to oral and maxillofacial region. Its main advantage is that it helps in removing the super imposition of the images of the surrounding tissue, it provides very good quality of bone images and hence used most commonly in the diagnosis of the bony tissue. It is used in the field of oral surgery in diagnosing the exact representation of root fracture, to check the presence of any cystic lesion and to mark the cystic lining clearly, computed tomography can be used in the exact positioning of the impacted tooth, it helps in checking any vascular tissue around the impacted tooth. Temporomandibular disorders can also be diagnosed by the C T, as it helps in determining the position of the condyle, helps in determining the erosive fracture of the joint, helps in determining the ankylosis of the joint and also helps in determining the developmental abnormalities related to the temporomandibular joint.

2.4. Tuned aperture computed tomography

Webber and colleagues developed tuned aperture computed tomography helps in diagnosing the bony defects. It is capable of producing true three dimensional data from any number of arbitrary oriented two dimensional projection. Literature revealed that TACT helps in determining the vertical root fracture of the tooth more easily and clearly. Tuned aperture computed tomography also helps in determining the osseous defects or normal architecture of the bone for the process of implant placement.

2.5. Cone beam computed tomography

CBCT is most commonly used in the field of oral surgery in diagnosis and treatment for implant placement, it helps in determining osseous defects in the alveolar bone, it helps in determining the normal architecture of neurovascular bundle around the bony tissue, it helps in providing the three dimensional view of the alveolar bone, exact dimension of the alveolar bone where implant can be places in the compromised site area, it can provide the exact relationship of any pathology to the surrounding bone, it can tell the exact extent of any bony lesion or pathology. It helps in determining the orbital fracture, it helps in determining the disorders related to temporomandibular jaw.

2.6. MRI

Magnetic resonance imaging is helpful in the field of oral and maxillofacial surgery. It helps in determining the abnormalities or pathologies related to the soft tissue in oral and maxillofacial region. The prime use of magnetic

resonance imaging in the field of dentistry is in oral surgery, it is used in the diagnosis of the soft tissue abnormalities like it is helpful in diagnosing SCC of the tongue, it is very helpful in diagnosing soft tissue pathology of the salivary gland.

2.7. Ultra sound

It can be used in the diagnosis of both hard and soft tissue abnormalities. It does not produce any harmful ionizing radiation. It helps in detecting the muscular structure more clearly than computed tomography. Guidance provided by ultrasound helps in prevent injuring to the facial nerve during the biopsy of the parotid gland.^{8–15}

3. Conclusion

There are different diagnostics aids used in oral surgery for the proper diagnosis of the disease. One should have a thorough knowledge of all the techniques before employing the patient.

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5. Conflict of Interest

None.

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