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RADIOLOGICAL SCREENING OF IMPACTED WISDOM TEETH IN HUSM

Dissertation submitted in partial fulfillment for the Degree of Bachelor of Health Science in Medical Radiation

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2004

CERTIFICATE

This is to certify that this dissertation entitled

"RADIOLOGICAL SCREENING OF IMPACTED WISDOM TEETH IN HUSM"

is the bonafide record of research work undertaken by

Mr. Davendran s/o Tangaya

during the month period of September 2003 to April 2004 under my supervision

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ABBREVIATIONS AND DEFINITIONS OF TERMS

ABBREVIATIONS:

HUSM = Hospital University Science of Malaysia.

CT = Computed Tomography.

MRI = Magnetic Resonance Imaging.

RN = Registration Number.

SPSS = Statistical Package for Social Science.

TMJ = Temporomandibular Joint.

IAN = Inferior Alveolar Nerve.

VCT = Volumetric Computed Tomography.

DEFINITIONS OF TERMS:

Impaction = Impaction is defined as a cessation of the eruption of a tooth caused by a clinically or radio graphically detectable physical barriers in the tooth eruption path or by an ectopic position of the tooth.

Mesioangulation = A wisdom tooth may grow at an angle towards the other teeth. This type of impaction is called as a mesioangular impaction.

Transverse = A wisdom tooth facing the other teeth transversely is said to be transversally impacted.

Medioversion = A wisdom tooth facing the other teeth transversely but erupts at an angle towards the buccal cavity is called a medioversion impaction.

Distoangulation = A wisdom tooth which erupts at an angle away from the other teeth is said to be distoangularly impacted.

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RADIOLOGICAL SCREENING OF IMPACTED WISDOM TEETH IN HUSM

ABSTRACT

Introduction

Impacted third molars are developmental pathologic medical deformities characteristic of a modern civilization. Impaction of third molars is seldom found in medieval populations. It is well established that radiographs are an important diagnostic input for assessing and treatment planning of the dental patient, whether symptomatic or asymptomatic. Radiography does in most instances provide more information with regards to the impacted third molars than clinical examination alone, especially of the very important relationship between the roots of the mandibular third molar and the mandibular canal.

Aim

The aim of this research study is to evaluate the four selected types of radiographs; Skull X-ray, Paranasal Sinuses X-ray, TMJ X-ray and mandible X-ray which is believed could give the maximum possible coverage of the wisdom teeth presence, if any, its impaction and its surroundings. From this evaluation then, the association for the presence of wisdom tooth or impacted wisdom tooth with other parameters governing it (gender, age, caries, orientations and angulations) is found out. Also the frequency of these parameters is evaluated to compare the diagnostic present of wisdom teeth in each type of radiograph. This is done, to give an answer for the question whether the selected radiological views will provide any valuable information.

Material and methods

A series of 4 different approaches of extra-oral radiographs of different procedures from HUSM radiology archives involving as many as 50 samples for each type of imaging involving; PA of skull, TMJ, paranasal sinuses, and mandible radiographs views was selected. The collective data was then transfers to SPSS version11.0 for statistical analysis.

Results

For the testing of association, there is a very highly significant association between the age group of patients and the presence of wisdom tooth in the skull imaging. Other that, it is also found that there is a significant association between the gender and presence of wisdom tooth in the mandible imaging. Expect for both of this association, all other testing of association gave non significant association or relationship.

Where else for the testing of frequency, there is few notable, high frequencies were observed. Off this, it is found that most of the impacted tooth in this research study was those of unerupted impacted wisdom tooth with the mean value of 34.9%. Then, it is also noted that, the mesioangulation type of impaction is the most observed type of impaction in this study with a mean value of 68.1%. Finally, with 87.3% mean value for the presence of caries on wisdom tooth, it is understood that there is very low probability of caries presence on wisdom tooth.

Conclusions

Holistic radiological imaging of the wisdom tooth requires integration of scientific knowledge based on anatomical-radiological-clinical close linkage and clinical professionalism based on awareness and competence of the subject thus leading to unprecedented knowledgeable health sciences teamwork.

INTRODUCTION

Wisdom teeth

Wisdom teeth are the last of the adult or permanent dentition to develop into the oral cavity. They are the third molar or grinding teeth and are situated posterior to the dental arches or fauces and are closely related to the retromolar pad. It is because they are the last teeth to develop that they can be left without space to erupt and become impacted. The wisdom teeth come in behind the 2nd molars (if there is room for them and they are aligned properly) usually during a person's late teens or early twenties. A person will have four wisdom teeth: upper left third molar, upper right third molar, lower left third molar, and lower right third molar. Their existence can be a factor causing crowding (malocclusion) in a developing dentition. Very occasionally they can be associated with other pathology in the jaw, such as odontogenic cysts and ameloblastoma tumor (Shear, 1983).

Although literatures have indicated a reduction in the size of the human jaw during the course of human evolution, human beings still retain the same number of teeth (Donald Enlow, 1976). The change in jaw size of modern humans is related to the discovery and use of fire to prepare food, and the development of crude tools, such as blades, to process food. As the need for a powerful jaw vanished, the jaw anatomy became smaller thus forcing the teeth to became crowded. The space required for the proper growth of wisdom teeth is no longer available. (The modern human mouth was suggested to be too small to accommodate wisdom teeth, which make their appearance in young adults between the ages of 17-20 (Bjork & Skieller, 1972).

Impaction of third molars is seldom found in medieval populations (Braband, 1967; Sagne, 1976). In a study on the anatomy of mandibular third molar roots Engström and Sagne, (1980), reported that there was an increase in the complexity of root anatomy in contemporary population material as compared with medieval material, and a close proximity to the mandibular canal was far more often found in the present-day individuals. Their explanation for this difference was the reduction in jaw dimensions and space for the mandibular third molar in modern day man. This trend may continue. In a study comparing material from two recent decades, mandibular third molars in dental college students in the 1990's were more often positioned at an abnormal angle and close to the mandibular canal than molars in students in the 1970's (Tanaka, *et al.*, 1999). There has also been an increase in the health awareness in the population as a whole, where discomfort following wisdom-tooth eruption is thought to be a pathological phenomenon, rather than a normal consequence of a large tooth emerging into a rather limited space. This has led to frequent "prophylactic" removals of almost symptomless third molars with no consideration of their ability to erupt and become useful for the patient or the risks of complications following surgery.

The morphology of the third molar is very varied, and because of the often limited space where the third molar develops, the morphology is almost as vivid as it is manifold (Nordenram, 1986, Shafer, *et al.*, 1983). Overall third molar crown morphology is similar to that of the second molar, but the root morphology is more varied and a united root complex or supernumerary roots are more common than in the second molar.An impacted tooth is not a pathological phenomenon per se. About 20% of the normal population has one or several impacted teeth, 50% being third molars, the mandibular third molars being dominant (Nordenram, 1986). In one study on middle-aged women in Sweden, 8% had impacted teeth and 85% of those teeth were third molars (Ahlqwist & Gröndahl, 1991).

Third molars are followed radiographically for several years instead of a prophylactic removal at young age (Hattab, 1997; Ventä, *et al.*, 2000; Ventä *et al.*, 2001; Ventä, 1993; Ventä and co-workers, 1997; Ventä and Schou, 2001; Ventä and Schou, 2001) performed several studies to assessed whether lower third molars will erupt. They made the so-called "Third molar eruption predictor" (US patent 5,816,814), which is a model that is used to predict whether a mandibular third molar will erupt or stay impacted. The authors also claimed that this predictor has an accuracy rate about 80%.

Between countries some differences in the management of asymptomatic mandibular third molars have been found. Dentists in Hong Kong were more prone to extract than their counterparts in Glasgow, but no such difference was found between Sweden and the United Kingdom (Knutsson, *et al.*, 2001; Singh, *et al.*, 1996).

Distoangulated mandibular third molars were also found to increase the risk of acute disease (acute pericoronitis and illness of patients) 3.6 times that of other angulations in another study (Ventä, *et al.*, 1993). Ahlqwist and Gröndahl, (1991) reported a longitudinal study on pathology of third molars in middle-aged Swedish women and found that 85% of pathology found initially was radiographically unchanged 12 years later. It can be extracted from these studies that mandibular third molars are more frequently associated with pathological changes than the maxillary ones. It is also clear that particular characteristics of third molar morphology and position are associated with a higher risk for developing pathology.

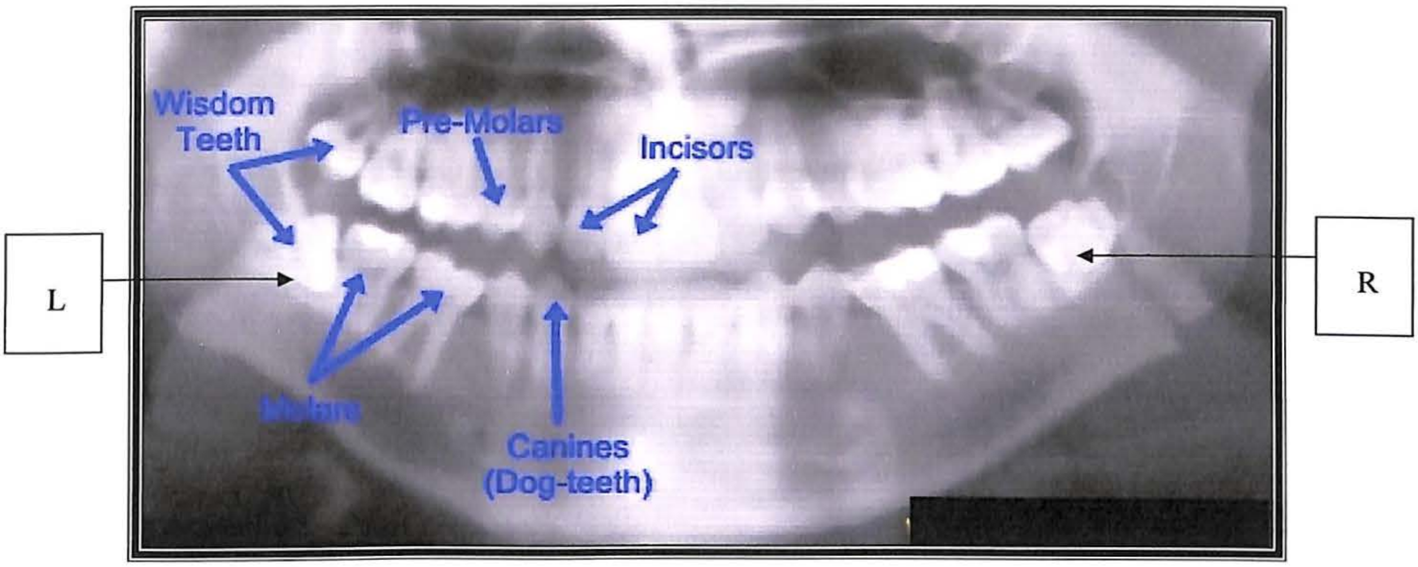

Figure 1: Orthopantograph photomicrograph revealing the present of wisdom teeth

R = Mesioangulated L = Lateroversion

Impacted Teeth

A malposed tooth is one that is not in its normal position. Malposed teeth that remain unerupted can only be evaluated by radiological examination. Impaction occurs where there is prevention of complete eruption into a normal functional position of one tooth by another, due to lack of space (in the dental arch), obstruction by another tooth or development in an abnormal position.

The tooth of the normal permanent dentition that are more often impacted are in order of decreasing frequency; the mandibular third molar, maxillary third molar, maxillary canine, mandibular canine, mandibular premolar and maxillary premolar (Edward C. Stafne (1963). This was supportedby various literatures that the overwhelming majority of impacted wisdom teeth involve third molars, followed in frequency by maxillary canines and mandibular second premolars (Mead, 1930), Aitasalo, Letrtinen, Sala, (1972), Grows, Lortor, (1985).

An impacted tooth may be:

Completely impacted: when entirely covered by soft tissue and partially or completely covered by bone within the bony alveolus

Partially erupted: when it has failed to erupt into a normal functional position. Impaction is defined clinically and radio graphically. It has temporal and positional properties. It is possible for a tooth to be at or beyond the occlusal plane and still be impacted. As the word eruption is used in two senses (a process and an event) clinical emergence is preferred to describe the event of clinical appearance in the oral cavity. Eruption as a physiological process is normally associated with root development and is complete well before apex closure. The terms unerupted and partially erupted are commonly applied to normally developing as well as impacted teeth, the two states being separated by the event of clinical emergence. It is important that impaction is clearly distinguished from normal development.

Figure 2: Photomicrograph to classify various impactions position of third mandibular molars (wisdom teeth). A-vertical position, B-mesioangulation, C-Horizontal/Transverse, D-Distoangulation and E-Bucco-lingual angulation.

Radiography

The initial examination of the patient before undergoing any third molar removal includes a clinical inspection and radiography investigation. Radiography does in most instances provide more information than clinical examination alone, especially of the very important relationship between the roots of the mandibular third molar and the inferior alveolar or mandibular canal. One of the most common radiographic examinations used for third molar evaluation is the panoramic image (Faculty of General Practitioners UK, 1998; Rushton, *et al.*, 1999a; White & Pharoah, 2000). In a single acceptable contrast radiograph the surgeon can be provided with information's of all third molars presence, their position in the jaw, and in most cases the number of roots, root morphology and the proximity of the mandibular molar or its root to the mandibular canal. All this information in one exposure with a minimal radiation dose is perhaps the reason for the wide spread popularity of panoramic radiography before clinical attempt of any third molar removal. In some cases, intraoral radiographs or extra-oral equipment with the same possibilities taken with various horizontal or vertical angulations may be an adjunct to panoramic radiography in the treatment planning before third molar removal.

Panoramic Radiography

The history of panoramic radiography has been well documented. In a thesis, Molander (1996) gives an overview of the history of panoramic radiography and the development, function and utility of the panoramic radiograph. The fathers of modern panoramic radiography were acknowledged to be Heckmann (1939) and Paatero (1949). Today, panoramic units are used worldwide to get an overview of the teeth, jaws and temporo-mandibular joints and the maxillary sinuses (Rushton & Horner, 1996; White &

Pharoah, 2000). Although panoramic radiography has been used over the years for caries detection and periodontal evaluation, it is not thought to be the radiographic examination of choice for detection of these diseases entities (Rushton & Horner, 1996; White & Pharoah, 2000), intraoral radio dental bitewing is a better choice. Panoramic radiography is on the other hand widely used and accepted as the radiograph of choice before deciding on third molar removal (Faculty of General Practitioners UK, 1998; White & Pharoah, 2000). In a booklet on selection criteria for dental radiography by the Faculty of General Practitioners in the UK (1998), panoramic radiography was suggested as to be the most appropriate radiographic examination at the time of deciding whether or not a third molar should be removed.

Digital panoramic radiography

The first digital panoramic systems were introduced in the early 1990s, in the USA by McDavid and co-workers (1992, 1993) and in Japan by Arai and co-workers (1992). During the last decade, techniques for digital panoramic radiography have been further developed, and in recent years solid state direct digital x-ray units (CCD-based systems) and photostimulable phosphor plate systems (PSP) to be used with conventional panoramic units have been available on the market where they seem to have been well accepted. Kashima and co-workers (1990); Kashima and co-workers (1990); Kashima and co-workers (1995) were among the first to use a PSP system in digital panoramic radiography, and PSP systems have been on the market longer and investigated more than the CCD-based systems (Farman, *et al.*, 1997; Hassfeld, *et al.*, 1995). There is only little information on the usage of the digital systems in different parts of the world. In Denmark, only few dental clinics are equipped with a digital panoramic system or a combination of panorama and cephalostat, while some more are available in Norway (Wenzel & Gotfredsen, 2000; Wenzel & Møystad, 2001a; Wenzel & Møystad, 2001b).

Dental X-ray

A dental x-ray revealed the picture of the whole intact teeth, its surrounding alveolar bones and soft tissue that is taken using radiation. People with oral diseases or injuries to the mouth, teeth or jaw usually require X-rays. Routine X-rays investigation are also used to screen healthy people for localized tooth decay and periodontal disease. The X-rays are usually taken in a dental office using a dental x-ray machine. This machine allows the dentist to position it for the best view of individual teeth and supporting bone. First, a soft dental film is placed inside the mouth. The x-ray machine is positioned outside the cheek to project the image of the teeth onto the film. The film is developed using special chemicals to reveal the black and white "negative" image.

At present, new exciting development to X-ray imaging include the introduction of digital radiography, in which the film is now digitally processed. Other types of X-rays may require special machines and different procedures. These X-rays are used with orthodontics, or endodontics that focuses on crooked roots or badly aligned teeth.

Dental X-rays of excellent contrast should revealed information pertaining to: tooth decay, bone loss or regression due to periodontal disease, abscesses, or a pocket of pus formation surrounded by swollen periodontium, cysts, or a closed sac filled with fluid or semisolid matter, the absence of certain teeth, problems with the way new teeth will erupt, other problems affecting the teeth and gums (Edward C. Stafne, (1963); White & Pharoah, (2000).

X-ray

X ray, is an invisible, highly penetrating electromagnetic radiation of much shorter wavelength (higher frequency) than visible light. The wavelength range for X rays is from about 10-8 m to about 10-11 m, or from less than a billionth of an inch to less than a trillionth of an inch; the corresponding frequency range is from about 3 Å~ 1016 Hz to about 3 Å~ 1019 Hz (1 Hz = 1 cps)(Wells, 1997).

Applications of X-Rays

Most applications of X-rays are based on their ability to pass through solid matter. This ability varies with different substances; e.g., wood and flesh are easily penetrated, but denser substances such as lead and bone are more opaque. The penetrating power of each X-rays radiation also depends on their energy source and capabilities. The more penetrating X-rays, known as hard X-rays, are of higher frequency and are thus more energetic, while the less penetrating X-rays, called soft X-rays, have lower energies. X-rays that have passed through a body provide a visual image of its interior structure when they strike a photographic plate or a fluorescent screen; the darkness of the shadows produced on the plate or screen depends on the relative opacity of different parts of the body (Wells, 1997).

Photographs made with X-rays are known as radiographs or skiagraphs. Radiography has applications in both medicine and industry, where it is valuable for diagnosis and nondestructive testing of products for defects. Fluoroscopy is based on the same techniques, with the photographic plate replaced by a fluorescent screen; its advantages over radiography in time and cost are balanced by some loss in sharpness of the image. X-rays are also used with computers in CAT (computerized axial tomography) scans to produce cross-sectional images of the inside of the body (Wells, 1997).

Another use of radiography is in the examination and analysis of paintings, where studies can reveal such details as the age of a painting and underlying brushstroke techniques that help to identify or verify the artist. X-rays are used in several techniques that can provide enlarged images of the structure of opaque objects. These techniques, collectively referred to as X-ray microscopy or microradiography, can also be used in the quantitative analysis of many materials. One of the dangers in the use of X-rays is that they can destroy living tissue and can cause severe skin burns on human flesh exposed for too long a time. This destructive power is used in X-ray therapy to destroy diseased cells (Wells, 1997).

History of Radiography

X-rays were discovered in 1895 by Wilhelm Conrad Roentgen (1845-1923) who was a Professor at Wuerzburg University in Germany. Working with a cathode-ray tube in his laboratory, Roentgen observed a fluorescent glow of crystals on a table near his tube. The tube that Roentgen was working with consisted of a glass envelope (bulb) with positive and negative electrodes encapsulated in it. The air in the tube was evacuated, and when a high voltage was applied, the tube produced a fluorescent glow. Roentgen shielded the tube with heavy black paper, and discovered a green colored fluorescent light generated by a material located a few feet away from the tube. He concluded that a new type of ray was being emitted from the tube. This ray was capable of passing through the heavy paper covering and exciting the phosphorescent materials in the room. He found the new ray could pass through most substances casting shadows of solid objects. Roentgen also discovered that the ray could pass through the tissue of humans, but not bones and metal objects. One of Roentgen's first experiments late in 1895 was a film of the hand of his wife, Bertha. It is interesting that the first use of X-rays were for an industrial (not medical) application as Roentgen produced a radiograph of a set of weights in a box to show his colleagues (Donald Graham, 2000).

Roentgen's discovery was a scientific bombshell, and was received with extraordinary interest by both scientist and laymen. Scientists everywhere could duplicate his experiment because the cathode tube was very well known during this period. Many scientist dropped other lines of research to pursue the mysterious rays. Newspapers and magazines of the day provided the public with numerous stories, some true, others fanciful, about the properties of the newly discovered rays (Donald Graham, 2000).

Public fancy was caught by this invisible ray with the ability to pass through solid matter, and, in conjunction with a photographic plate, it provides a picture of bones and interior body parts. Scientific fancy was captured by demonstration of a wavelength shorter than light. This generated new possibilities in physics, and for investigating the structure of matter. Much enthusiasm was generated about potential applications of rays as an aid in medicine and surgery. Within a month after the announcement of the discovery, several medical radiographs had been made in Europe and the United States which were used by surgeons to guide them in their work. In June 1896, only 6 months after Roentgen announced his discovery, X-rays were being used by battlefield physicians to locate bullets in wounded soldiers (Donald Graham, 2000).

Prior to 1912, X-rays were used little outside the realms of medicine, and dentistry, though some X-ray pictures of metals were produced. The reason that X-rays were not used in industrial application before this date was because the X-ray tubes (the source of the X-rays) broke down under the voltages required to produce rays of satisfactory penetrating power for industrial purpose. However, that changed in 1913 when the high vacuum X-ray tubes designed by Coolidge became available. The high vacuum tubes were an intense and reliable X-ray sources, operating at energies up to 100,000 volts (Donald Graham, 2000).

In 1922, industrial radiography took another step forward with the advent of the 200,000-volt X-ray tube that allowed radiographs of thick steel parts to be produced in a reasonable amount of time. In 1931, General Electric Company developed 1,000,000 volt X-ray generators, providing an effective tool for industrial radiography. That same year, the American Society of Mechanical Engineers (ASME) permitted X-ray approval of fusion welded pressure vessels that further opened the door to industrial acceptance and use (Donald Graham, 2000).

Different Types Imaging (X-ray) Used For This Study:

Skull X-ray

Basically, there is three type of skull imaging that is defined as skull x-ray in this study. There are;

Skull-Anterior (P-A) View

This imaging demonstrates the anterior (P-A) view of the anterior wall of the cranium, the frontal sinuses, the ethmoid sinuses, and the crista galli. Where else the petrous ridge fill the lower two third of the eye orbits.

The procedure is done with patient in the prone position with the medial plane of the skull and body over the center line of the table. The hand is placed in a comfortable position at the sides of the head. The forehead and the nose is placed on the table so that both the midsagittal plane and the canthomeatal line are perpendicular to the tabletop. The top of the cassette is aligned to be 1½ inches above the vertex of the skull. Suspended expiration is employed and finally, the central ray is directed through the nasion to the film holder. The collimation is to the film holder.

Skull-Lateral View

The imaging demonstrates the lateral view visualizing the anterior and posterior clinoid processes, sella turnica, dorsum sellae, and superimposed parietal bones.

The procedure is done with the patient in prone position with the side of the skull being examined on the table. The opposite of the body is elevated; the knee and elbow is flexed for support. The midsagittal plane of the skull is placed parallel with the table top. The neck is also flexed so that the canthomeatal line will be perpendicular to the side of the table. The chin is supported with a sponge or patient's fist. On the canthomeatal line, a point ¾ inch anterior and ¾ inch superior to the external auditory meatus is centered over the center line of the table. The cassette is aligned to be 1½ inches above the vertex of the skull. Suspended expiration is employed and finally, the central ray is directed perpendicular through the selected point to the film holder. The collimation is to the film holder.

Skull-Occipital (Towne) View

Structures demonstrated through this imaging are posterior (A-P) view of the occipital region visualizing the bilateral petrous pyramids, foramen magnum, dorsum sellae, occipital squama, and the posterior portions of both the parietal bones.

The patient is placed in the supine position with the median plane of the skull and body over the center line of the table. The midsagittal plane is placed perpendicular to the table top. The chin is flexed so that the canthomeatal line is perpendicular to the table top. The top of the cassette is aligned with the vertex of the skull. Suspended expiration is employed and finally, central ray is directed 35° degrees caudad through a point in line with the external auditory meatus to the film holder. The collimation is to the film holder.

Temporomandibular Joints-Lateral (T.M.J.) View (Mouth open and mouth closed)

The structures demonstrated through this specific imaging are the lateral views of the condyle, its meniscus and it's in relationship to the mandibular fossa.

The procedure is divided in to two parts; the first part is with the mouth closed and the second part with the mouth open:

For the procedure with mouth closed, a mark is made with a wax pencil at ¾ inch anterior to the external auditory meatus on the aconthiomeatal line on each side of the head. The patient is placed in the prone position with the side of the head being examined placed on the table. The opposite side of the body is elevated and the knee and elbow is flexed for support. The lower pencil mark is placed over the center line of the table and the midsagittal plane is placed parallel with the tabletop. The acanthiomeatal line is placed perpendicular to the long axis of the table. The jaws is closed. Suspended expiration is employed and finally, the central ray is directed 15° degrees caudal through the lower pencil mark to the center of the film holder.

For the procedure with the mouth open, the mouth is opened and a sterile cork is inserted into the mouth. The acanthiomeatal line position is rechecked. Other technical parameters is the same as used for closed mouth procedure.

Paranasal Sinuses-Frontal Ethmoidal (Modified Caldwell) View

This imaging demonstrate the anterior (P-A) view of the frontal sinuses, anterior ethmiod cells, and superior optic fissures.

The procedure is done with the patient placed in the prone position and the median plane of the skull and body over the centre line of the table. The hands are placed at the sides of the head. The forehead and nose is placed on the center line of the table. Both the canthomeatal line and the midsaggital plane is placed perpendicular to the table top. Suspended expiration is employed and finally, the central ray is directed 15° degrees caudad through the nasion to the center of the film holder.

Mandible-Lateral View

This imaging demonstrates the mediolateral (lateral) view of the mandibular body. The symphysis and ramus may be also demonstrated with a slight variation in the head rotation.

This procedure is usually done with the patient placed in the erect position, either sitting or standing, with the side of the face being examined against the center of the erect film holder. A sandbag is placed in each hand of the patient and instructed him to extend each arm down the side of the body. The chin is extended upward and inward so that the long axis of the mandibular body being examined is parallel with both the erect film holder and the floor. The head is tilted at 25° degrees, and the parietal region is rested against the erect film holder. Suspended expiration is then employed and finally, a horizontal central ray is directed perpendicular through the center of the mandibular body to the center of the film holder. The collimation is to the film holder.

Figure 3: The photomicrograph of X-ray image of Skull AP-PA with an Impacted Wisdom Tooth (Mesioangulation).

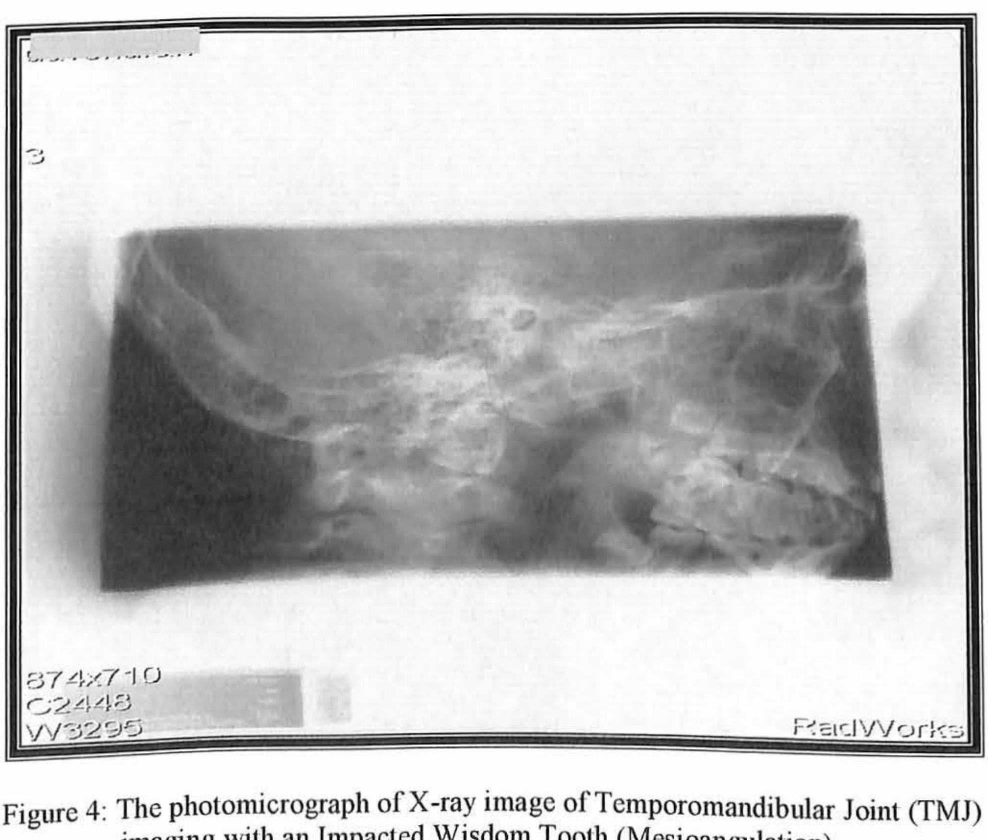

Figure 4: The photomicrograph of X-ray image of Temporomandibular Joint (TMJ) imaging with an Impacted Wisdom Tooth (Mesioangulation).

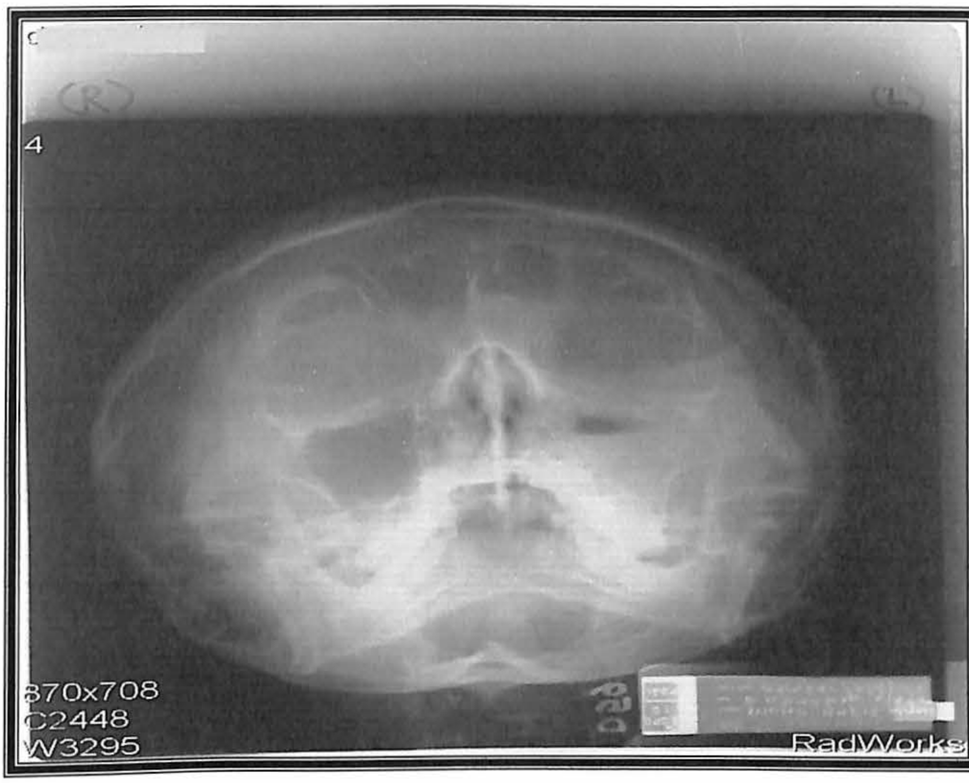

Figure 5: The photomicrograph X-ray image of Paranasal Sinuses PA showing an Impacted Wisdom Teeth (Mesioangulation).

Figure 6: The photomicrograph X-ray image of Mandible showing an Impacted Wisdom Tooth (Mesioangulation).

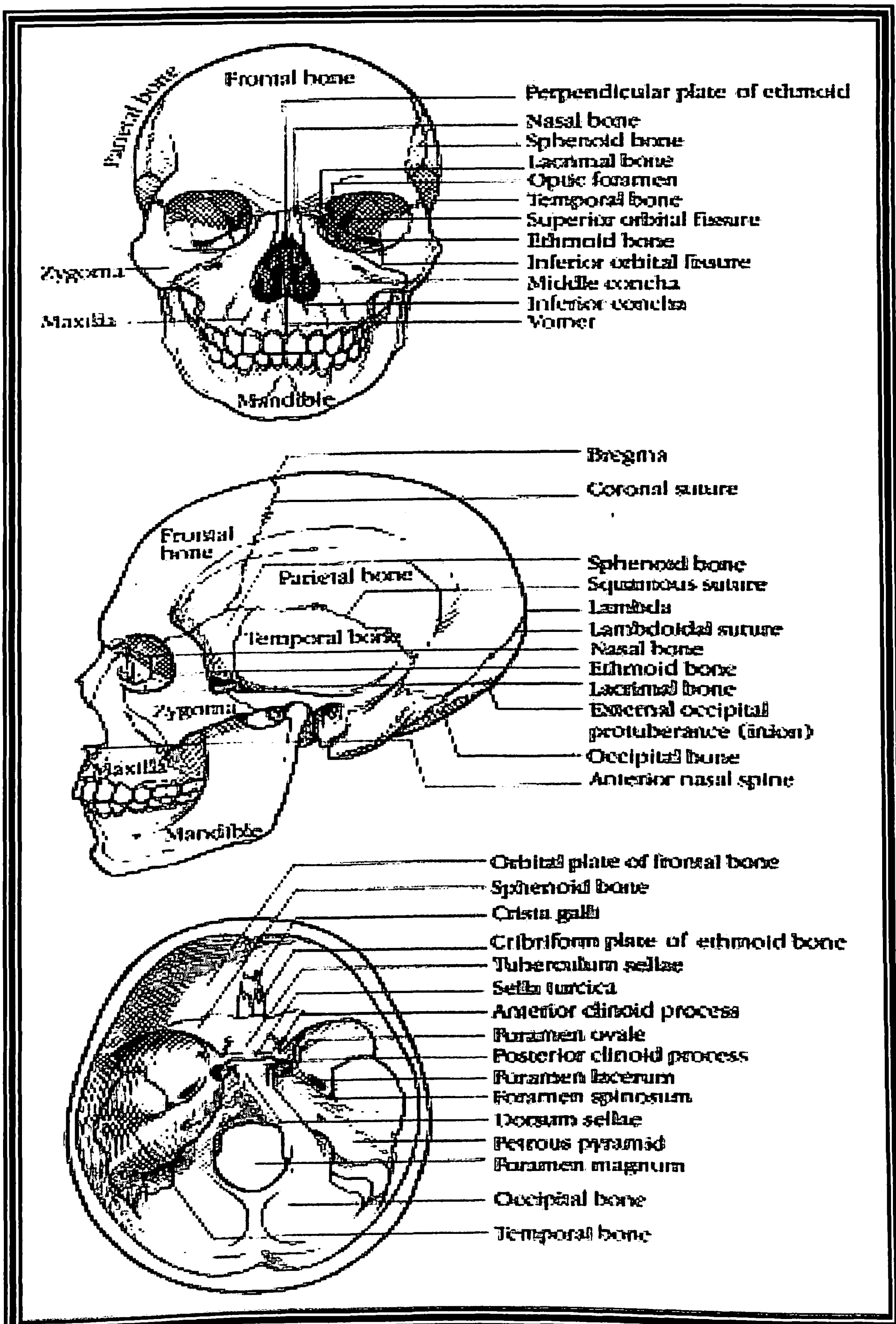

Figure 7: Artist illustration of varies different views of the skull with reference to its various anatomical sites.

REVIEW OF LITERATURE

The review here will be focused to close relationship of the wisdom tooth to radiography;

Freisfeld, Drescher, *et al.*, (1998), assessed the space for the lower wisdom teeth using the panoramic radiography in comparison with computed tomography and concluded that mesial rotation of the wisdom teeth as well as their different relation to the bony environment are hypothetically possibly important factors concerning with their eruption prognosis and that the three-dimensional CT-scan gives new possibilities for further investigations of third-molar problems.

Venta, Murtomaa, *et al.*, (1991) concluded that a panoramic tomogram taken at age 20 years of an individual will revealed various radiographic features on which an estimation of the likely future eruption of mandibular third molars could be based.

Pawelzik, Cohnen (2002), evaluated the geometric, topographic, and anatomic reliability of volumetric computed tomography (VCT) images by comparing conventional panoramic radiographs with reconstructed VCT panoramic and paraxial images before performing third molar surgery. They concluded and showed that the VCT paraxial images gave a significantly clearer perception of the mandibular nerve than conventional panoramic radiographs. However, conventional panoramic radiographs were shown to be better than the VCT reconstructed panoramic images and were therefore an invaluable tool in the "expert-derived" assessment and posed the potential for identifying the need for further VCT diagnostic procedures.