RADIOGRAPHIC PROFILE OF SYMPTOMATIC IMPACTED MANDIBULAR THIRD MOLARS IN THE WESTERN CAPE, SOUTH AFRICA

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A mini-thesis submitted in partial fulfillment of the requirement for the M.Sc (Dent) degree in Maxillofacial Radiology in the Department of Diagnostics and Radiology, Faculty of Dentistry, University of the Western Cape, South Africa.

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ABSTRACT

It is common practice to remove impacted mandibular third molars due to pathology associated with these impactions. Alternatively, impactions can be treated conservatively through a closely guarded follow-up regiment. However, many symptoms associated with impacted third molars may be prevented by elective removal of potentially problematic teeth.

To determine the risk of developing pathology associated with impacted mandibular third molars, a random sample of 200 pantomographs were analyzed displaying 324 impactions from patients who presented for treatment at the Maxillo-Facial and Oral Surgery Department, Faculty of Dentistry, University of the Western Cape.

The study consisted of an analysis of pantomographs and clinical records of these patients, with regards to the level and degree of impaction in relation to age and gender.

The results indicated that patients were mostly young with a mean age of 23 years at presentation. Females were twice more apt to develop symptomatic impactions. Pericoronitis was the most common reason for extraction, consisting of 50% of the cases. Caries was a more common finding in males (p-value 0.0017). Females older than 23 years most commonly presented with facial pain (p-value 0.0414)

Conclusion: This study concluded that females were more prone to develop symptomatic impactions at a younger age than males. Vertical impactions were most commonly associated with symptoms. This study recorded that level B impactions were more frequently encountered with symptoms than the other levels. Pericoronitis was the most frequent reason for removal of impacted mandibular molars.

DECLARATION

I declare that the “Radiographic Profile of Symptomatic Impacted Mandibular Third Molars in the Western Cape, South Africa”, is my own work that it has not been submitted for any degree or examination at this University or any other University, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Emad Qirreish September 2005

Signed:……

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DEDICATION

This thesis is dedicated to my parents and brothers

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1. CHAPTER ONE

INTRODUCTION

The removal of impacted mandibular third molars is one of the most common procedures in dental surgery (Hattab *et al;* 1999, Knutsson *et al;* 1996, Venta *et al;* 1993). There seems to be no controversy about the removal of symptomatic impacted mandibular third molars (Shira and Kneeland 1986, Lytle 1993, Koerner 1994, Erasmus 2002, Mercier and Precious 1992, Lysell and Rohlin 1988), but the prophylactic removal of asymptomatic impacted mandibular third molars may be regarded as a controversial procedure (Sasano *et al;* 2003).

Some studies support the prophylactic removal of impacted mandibular third molars (Shira and Kneeland 1986, Lytle 1993, Koerner 1994, Mercier and Precious 1992, Lysell and Rohlin 1988, Van Der Linden *et al;* 1993, Fuselier *et al;* 2002, Eidelman and Hasharon 1979), while other studies do not advocate the prophylactic removal of impacted mandibular third molars (National Institute of Health 1980, Song *et al;* 2000, Pasqualini *et al;* 2002). These studies were based on indications, contraindications or surgical complications as a guideline to decide whether prophylactic removal should be employed or not. Only a few studies used radiographs and clinical reports as guidelines for prophylactic removal of impacted mandibular third molars (Sasano *et al,* 2003).

There is a need to establish a well-defined profile for the common impacted mandibular third molars associated with symptoms.

The purpose of this study was to develop a radiographic profile of symptomatic impacted mandibular third molars on the basis of the level and angulation of the impaction as correlated to age and gender of the patients.

2. CHAPTER TWO

LITERATURE REVIEW

2.1 Definition:

Impacted teeth can be defined as those teeth that are prevented from eruption due to a physical barrier within the path of eruption (Farman, 2004).

The term impaction was defined by Peterson as one that fails to erupt into the dental arch within the expected time (Peterson, 1998).

Another definition states that an impacted tooth is one which, for various reasons does not erupt into the correct position in the dental arch at the appropriate time (Archer, 1966, Edelman and Hasharon, 1979).

Mead has defined an impacted tooth as a tooth that is prevented from erupting into position because of malposition, lack of space, or other impediments (Mead, 1954).

2.2 Eruption time:

Mandibular third molars may erupt as early as 14 years of age in Nigerians (Odusanya, and Abayomi, 1991), and up to the age of 26 years in Europeans (Kruger *et al;* 2001). The average age for the eruption of mandibular third

molars in male is approximately 3 to 6 months ahead of females (Hattab et al; 1999).

Mandibular third molars undergo continuous positional changes, and this may carry on at a reduced scale up to 38 years of age (Venta *et al;* 2004).

The wide age range found with third molar eruption, as well as positional changes after eruption, may be due to differences in race, (Alling *et al,* 1993, Richardson, 1975) nature of the diet, (Alling *et al,* 1993) the intensity of the use of the masticatory apparatus (Alling *et al* 1993) and possibly due to genetic background (Alling *et al,* 1993).

2.3 Etiology of impaction:

The main cause of impactions is a lack of space. The third molars are the last teeth to erupt and for this reason they are the teeth mostly affected (Richardson, 1975, 1977, Bjork *et al;* 1956).

Bjork *et al;* 1956 has examined the different factors which influence the lack of space in third molar eruption, and found that three factors are involved with space shortage, namely:

i. Reduced rate of growth in the length of the mandible, in which there is insufficient increase in the length of the mandible in proportion to the amount of tooth substance.

ii. Vertical direction of the condylar growth, which is associated with insufficient resorption at the anterior ramus border.

iii. Back-ward directed eruption of the dentition, which cause a decrease in space for third molars to erupt.

iv. Retarded maturation of dentition is a fourth factor contributing to incomplete eruption (Bjork *et al*; 1956).

Impaction of mandibular third molars can develop due to a decrease in the angulation of the mandible; an increase in the angulation of the mandibular plane; or third molars may remain in the same developmental angular position (Richardson, 1975).

Lack of attrition and occlusal forces on the dentition associated with processed foods lead to a decreased forward movement of the dentition, which may then prevent eruption of third molars. This theory was claimed by (Begg, 1954).

Richardson (1977) in his study found that patients with a skeletal class II occlusion were more prone to present with impacted mandibular third molars, that the mandible was smaller in patients with impacted teeth, that an acute gonial angle among patients with impacted third molars was present, and he also noted that the size of impacted third molars was larger than the erupted third molars.

The relation between the root angulation and impaction has also been studied and it was shown that angulated roots were more common in impacted

mandibular third molars as compared to erupted mandibular third molars. (Yamaoka *et al,* 1997)

Impacted mandibular third molars may be influenced genetically. Some studies showed that impacted canines and mandibular molars occur more commonly in familial settings (Oikarinen *et al;* 1990, Peck *et al*; 2002).

Archer (1966) subdivided the etiology of impactions into local and systemic causes:

Local causes: irregularities in the position of adjacent teeth; density of the surrounding bone; long periods of chronic inflammation of the overlying mucosa; long retention of primary teeth; premature loss of primary teeth and acquired diseases.

Systemic causes:

A. Prenatal causes

1. Hereditary
2. Miscegenation

B. Postnatal causes

1. Rickets
2. Anaemia
3. Congenital syphilis
4. Tuberculosis
5. Malnutriton

C. Rare conditions:

1. Cleidocranial dysplasia

2. Progeria
3. Achondroplasia
4. Cleft palate

2.4 Prevalence of impacted mandibular third molars:

Impaction of teeth has been studied by many authors and they found that third molars were the most frequently impacted teeth (Kim *et al*, 2003, Grover and Lorton, 1985).

It has been reported by Morris and Jerman (1971) that 65.5% of males between the ages of 17 and 24 years have at least one impacted tooth, whereas 22.3% of the subjects of both genders had all four third molars impacted. Aitasalo *et al;* (1972) found in their study that impactions occurred in 14.1% of patients in their study sample.

The prevalence of impacted mandibular third molars in the population varies in different studies from 18 to 32 % (Andreasen *et al;*, 1997).

Dachi and Howell (1961) found that maxillary impacted third molars occur more commonly than mandibular impactions with a ratio of 21.9% to 17.5%.

In contrast, Aitasalo *et al;* (1972) study showed no difference in the incidence between maxillary and mandibular impactions. The study of Quek *et al;* (2003)

showed that impacted mandibular third molars were three times more commonly encountered than impacted maxillary third molars.

Bjork and associates (1956) found that the occurrence rate of impacted mandibular third molars account for 17.3% of all impactions. They also stated that approximately 45% of the total population would develop impacted lower third molars.

Aitasalo and co-workers (1972) noted in their Finnish sample that 76.1% of all impactions were third molars and there was no difference between maxillary and mandibular third molars impactions.

2.5 Prediction of impacted mandibular third molars:

A factor that plays a major role in mandibular third molar eruption is the availability of enough mesiodistal space between the second molar and the mandibular ramus (Hattab *et al;* 1999).

The possibility of mandibular third molars to erupt is approximately 70% when the available mesiodistal space is larger than the mesiodistal width of third molars (Gnass *et al;* 1993).

The probability of the eruption of third molars after 20 years is higher when:

i. Root formation is complete.
ii. The crowns of third molars are vertically situated in soft tissue.

iii. Third molars are in the same occlusal plan as the neighbouring second molar.

iv. Mesiodistal space is sufficient (Venta et al; 1991).

There are various parameters for the prediction of eruption of mandibular third molars, such as “the third molar eruption predictor” (TME-predictor) of Venta. It has to do with the accuracy of predicting the eruption of mandibular third molars and it was shown that it may be applied on panoramic radiographs after some calibration has been done required before use (Venta *et al;* 2001).

Lucchese and Manuelli (2003) studied various predicting methods and found that none of these methods were accurate or reliable for the prediction of erupting mandibular third molars.

2.6 Classification of impaction:

Four main classification systems exist for the evaluation of impactions of third mandibular third molars:

2.6.A. Pell and Gregory

Pell and Gregory (Archer, 1966) classified impacted mandibular molars into three categories:

Type A: pertaining to the relation of tooth to ramus and second molar subtypes.

Class I: sufficient amount of space.

Class II: space is less than mesiodistal diameter of tooth.

Class III: all or most of tooth situated in the ramus.

Type B: pertaining to the relative depth of the third molar in bone.

Position A: tooth on same level with occlusal plane.

Position B: tooth between occlusal plane and cervical line of second molar.

Position C: tooth below the cervical line of the second molar.

Type C: pertaining to the position of long axis of the impacted tooth in relation to the second molar as taken from the Winter classification : Vertical, horizontal, inverted, mesio-angular, disto-angular, bucco-angular and linguo-angular.

2.6.B. AAOMS Classification

The system was proposed by the American Association of Oral and Maxillofacial Surgeons (AAOMS) and is referred to as the AAOMS Classification. The latter is based on the operation performed to remove an impacted tooth. This classification relates directly to the abnormal physical findings of the other classifications (Alling *et al;* 1993).

2.6.C. ADA Code on Procedures and Nomenclature

The American Dental Association (ADA) presented a special code that describes the amount of soft and hard tissues over the coronal surface of an impacted tooth. This code recognizes soft tissue impactions, partial bony

impactions, complete bony impactions, and complete bony impactions associated with unusual complications (Alling *et al;* 1993).

2.6.D. Combined ADA and AAOMS Classification

The AAOMS published the ADA codes along with explanations of the AAOMS procedural terminology, as follows:

07220 soft tissue impaction that needs incision to remove the impaction

07230 partially bony impaction that needs incisions of the soft tissue overlying above with flap opening.

07240 complete bony impaction that needs incision, flap opening, and bone removal.

07241 complete bony impaction with unusual surgical complications that needs incision, flap opening, and bone removal with unusual difficulties (Alling *et al;* 1993).

2.7 Gender and impaction:

Various studies have reported a relationship between mandibular third molar impactions and gender; however the results have not been consistent (Bjork *et al;* 1956, Pindborg 1970, Dachi and Howell 1961, Venta *et al;* 1991, and Hattab *et a;,* 1999).

Dachi and Howell (1961), Hattab *et al;* (1999), Venta *et al;* (1991), and Aitasalo et al; (1972) reported no difference in the prevalence rate of impacted third molars between males and females.

Some studies; Bjork *et al;* (1956), Quek *et al;* (2003), and Pindborg (1970) had shown that impacted mandibular third molars are more prevalent in females than males whereas Hellman (1936) found that impacted mandibular third molars are twice as common in females as compared to males.

In contrast, the study of Hugoson (1988) showed that males had a higher propensity than females to develop mandibular third molar impactions.

2.8 Race and impaction:

The prevalence of impacted mandibular third molars seems to vary between various countries (Kan *et al;* 2002).

Nanda and Chawla (1959) conducted a study on Indians and found a high incidence of 65% for the population, in which males contributed 32% and females 33% of impactions.

Dachi and Howell (1961) studied the prevalence rate of impacted mandibular third molars in the American population and found no statistical racial difference in the genders of which 35% of males and females presented with impacted mandibular third molars.

The study of Brown *et al;* (1982) showed that Whites had more impactions than Blacks.

Odusanya and Abayomi (1991) studied the impacted mandibular third molar prevalence in Nigerians, and found no difference between males (19%) and females (19%).

Murtomaa and colleagues (1985) studied the prevalence of mandibular third molar impactions in a Finnish cohort, 49% of the sample presented with impactions, and the authors found that males (28%) were more common to develop impactions than females (21%).

Rajusuo *et al;* (1993) also studied a Finnish cohort and found that 10% of the sample had impacted mandibular third molars.

Hugoson and Kugeleberg (1988) studied a Swedish sample, and found that 83% of the sample presented with mandibular third molar impactions, of which 51% were males and 32% were females.

Amaratunga and Chandrasekera (1988) studied a Sri-Lankan population, and found a low incidence of mandibular third molar impactions of 2%.

2.9 Angulation of impaction:

There are a number of studies on record which assessed certain morphological parameters such as the angulation of third molars.

The studies of Quek *et al;* (2003), Schroeder *et al;* (1989), Stanley *et al;* (1988), Schroeder *et al;* (1983), and Kramer and Williams (1970) showed that mesioangular impactions were the most common, followed by horizontal and vertical impactions.

Sasano *et al;* (2003) found vertical impactions to be the most common variant (46%), which was followed by horizontal impactions (34%).

Venta *et al;* (1993) did a study on impacted mandibular third molars noted that vertical impactions were the most common (60%), followed by mesioangular (29%), distoangular (65), and horizontal impactions (5%).

2.10 Level of impaction:

Leone and Edenfield (1987), and Hugoson and Kugelberg (1988) studied the level of impactions on recruits, and found that complete soft tissue impactions to be the most common impactions, followed by partial soft tissue impactions, the complete bone embedded impactions being the least countered.

In a prospective clinical study done on dental students, Sasano *et al* (2003) found that complete eruptions were the most common level of mandibular third molars (39.4%), followed by two-third partial impaction (34.3%), one third partial impaction (16.7%) and the least common impaction level was the complete encasement (9.6%).

Quek *et al;* (2003) studied the panoramic radiograph of Singapore patients who presented at the diagnostic imaging department, and found that impactions partially embedded in bone were the most common (85%), followed by the complete bony encasement type (9%), with the non-embedded impactions the least (6%).

2.11 Management of third molars:

The management of impacted teeth may vary from surgical removal to routine follow-up by means of periodical radiological and clinical assessment (Sasano *et al;* 2003).

It is advisable that the removal of impacted third molars should be carried out before the third decade, on condition that the patient is in good health, and without physiologic or pathologic conditions that may increase complications associated with surgery (Lytle, 1993).

According to the National Institution of Health (NIH, 1979), postoperative pain, swelling, infection and other possible consequences of surgery are less likely to

occur in younger patients. The best age for removal should be guided by the developmental stage of the impacted molar that is when the third molar roots are about two-thirds developed. An additional consideration is the evidence which suggests that early removal of the third molar seems to have a beneficial effect on the periodontal health of the second molar.

The early extraction of impacted mandibular third molars may be advantageous as early extraction may be easier to perform with fewer complications, and malocclusion may be prevented. Surgery in the younger patient is recommended in order to take advantage of the active defense mechanism, as recovery after extraction occurs more rapidly than that performed on the aged (Saglam and Tuzum, 2003).

2.12 Indications of removal impacted third molars:

The NIH concluded in the 1979 conference that both impacted and erupted mandibular third molars with evidence of follicular enlargement should be removed electively and that the associated soft tissue should be submitted for microscopic examination. Impacted teeth with pericoronitis should also be removed electively because of their known potential for repetitive infection and morbidity.

Although no consensus was reached on the subject of removal of asymptomatic impacted teeth without evidence of pathology, consensus was

reached that third molars with non-restorable carious lesions and third molars contributing to resorption of adjacent teeth should be removed (NIH, 1979).

Koerner (1994) highlighted that the indications for mandibular third molar removal namely: **existing pathology or pain** due to pericoronitis, periodontitis, periapical abscess, cysts or neoplasms, resorption of adjacent roots, and inflammation of the opposing soft tissue; **aberrant positions** in which the tooth is oriented buccally or lingually; **preceding dental work** with fixed or removable appliances; **arch length discrepancy** in cases when the impacted third molars are affecting the stability of orthodontic treatment.

Meisami *et al;* (2002) found that retention of an impacted mandibular third molar could significantly increase the risk of mandibular angle fractures.

Bishara and Andreason (1983), and van der Linden et al; (1993) have added other indications for elective removal of impacted mandibular third molars than the NIH (1979) namely: lack of space in the posterior tooth bearing area; pain of unknown origin; pre-irradiation therapy; and as a part of orthodontic treatment.

Lytle (1993) wrote that the indications for removal of impacted teeth include infection around the impaction; loss of bone around the impacted teeth; dental caries and damage of adjacent teeth; crowding of the dental arch; cysts and tumors associated with impacted teeth; pre-irradiation removal of impacted teeth; for prosthodontic reasons; and for chronic facial pain.

2.13 Contraindications for the removal of impacted third molars:

Tulloch *et al;* (1978) and Mercier and Precious (1992) listed the side effects and complications of surgical treatment of impacted mandibular third as follows:

A. Minor transient: pain, swelling, trismus, alveolar osteitis, secondary trauma, infection, nerve dysthesia for less than 6 months, and TM joint symptoms.
B. Minor permanent: nerve dyaesthesia more than 6 months, damage of adjacent teeth, and loss of periodontal membrane of adjacent teeth.
C. Major transient: mandibular fracture.

Erasmus (2002) said that the removal of impacted mandibular third molars is contraindicated if there may be a possibility of damage to adjacent structures, compromised patient health status, adequate space for eruption, orthodontic considerations, and when an unwilling patient is encountered.

2.14 Symptomatic third molars in relation to the level, the angulation of impaction and demographics:

2.14.1 Mean age of the patients with pathology associated with impacted mandibular third molars:

Leone and Edenfield (1987) reported that the mean age for symptomatic mandibular third molars was 20 years of age while the study by Lysell and Rohlin (1988) reported a mean age of 27 years.

Nordenram (1966) determined the mean age in patients with symptomatic impacted mandibular third molars to be 29 years, and this finding was supported by Knutsson *et al* (1996) who also noted a mean age of 29 years.

The Venta *et al;* (1993) survey found that the mean age of their study sample was 24.4 years.

2.14.2 Age and the relation with symptoms associated with impacted third molars:

In a prospective study performed on dental students extending over a period of 11 to 27 years, Sasano *et al* (2003) showed that patients between 20 and 30 years of age were more likely to develop symptoms along with impactions and this was followed by patients in their 30's.

Knutsson and associates (1996) reported that patients between 20 and 29 years of age were the most frequently affected with symptomatic impactions (61%), followed by the 30 to 39 year age group (24%).

Soft tissue pathology was more often encountered in patients above 21 years (Adelsperger *et al;* 2002).

2.14.3 Gender in relation to symptomatic impacted third molars:

The study of Knutsson (1996) reported that females were slightly more prone to develop pathological changes in association with impacted mandibular third molars.

The Venta *et al;* (1993) study showed that females more frequently required removal of symptomatic impacted mandibular third molars than males, with a ratio of 3:1 in favor of females.

2.14.4 Angle of impacted third molars in relation to pathology:

Kan *et al;* (2002) found in their study that 76% of impacted mandibular third molars presenting with some form of pathology were mesioangular inclined.

Knutsson *et al;* (1996) did a study on patients that presented for the removal of impacted mandibular third molars which were associated with pathology. Their results indicated that the mesio-angular inclination were the most commonly encountered (32%), followed by disto-angular (26%), vertical (24%), and horizontal (18%).

Venta *et al;* (1993) did a study on impacted mandibular third molars showing acute symptoms and their results concluded that the vertical inclination was the most common (62%), followed by the distoangular (20%) and mesioangular inclination (18%).

Bruce *et al;* (1980) studied the prevalence of various inclinations of impacted mandibular third molars in patients referred for the surgical removal of third molars, and found that the mesioangular inclination to be the most common type (38%), followed by vertical (30%), horizontal (20%) and distoangular inclination (12%).

Nordenram (1966) studied patients referred to an oral surgeon for removal of impacted mandibular third molars for various reasons. He found that there was no significant difference in the prevalence rates between the various angles of impactions. Vertical impactions were slightly ahead with (30%), followed by mesioangular (29%), horizontal (24%) and distoangular inclinations (17%).

The studies of Venta *et al;* (1993, 1999), Knutsson *et al;* (1996) and Sasano *et al;* (2003) reported that distoangular impactions showed the highest risk for developing a pathological condition associated with impacted mandibular third molars, and according to the authors, this might be due to the impaction of food particles.

2.14.5 Level of impaction in relation to the development of pathology:

The studies of Lysell and Rohlin (1988), Knutsson *et al;* (1996), and Venta *et al;* (1993) noted that impactions partially covered by soft tissue, were the most common variant associated with symptoms in more than two third of the cases, followed by complete soft tissue impactions, and complete bone embedded impactions.

Sasano *et al;* (2003) noted that the one-third partially impacted mandibular third molars had the highest propensity for developing a pathological condition (38.2%).

Venta and associates (1993) noted that partially impacted mandibular third molars have the highest risk for developing some pathology. This finding was supported by Knutsson *et al;* (1996), who reported that the risk for developing pathology along with partially impacted third molars seems to be 22 to 34% higher than molars completely embedded in bone.

2.15 The incidence of pathological conditions associated with impacted mandibular third molars:

2.15.1 Large follicles and cysts:

Bataineh *et al;* (2002) noted that cysts were associated with 1.6% of cases of impacted mandibular third molars. Knutsson *et al;* (1996) found the frequency of cysts to be 5%.

Shear and Singh (1978) also noted in his sample that males were more prone to develop cysts than females. Similar results obtained by Main (1989) who noted that cysts were more commonly encountered in males (70%).

Main (1989) found a peak age incidence in the fourth decade, and Knutsson *et al;* (1996) found that cysts were more common in patients aged 20 to 29 years. One third of the third molars that were removed in patients aged 50 to 59 years were associated with cysts.

Main (1989) noted that larger cysts seemed to be a feature seen mainly in horizontally impacted third molars.

Knutsson *et al* (1996) noted that the mesioangular inclination was the most common angulation found in association with cysts. Cysts were also more frequently encountered with impactions completely embedded in soft tissue.

2.15.2 Caries in association with impactions:

The study of Lysell and Rohlin (1988) showed that caries was associated with impacted third molars and second molars in 13% and 5% of cases respectively, and these findings corroborated with those of Punwutikorn *et al;* (1999).

Sasano *et al;* (2003) noted that 14.5% of symptomatic impactions were associated with dental caries.

Bataineh *et al;* (2002) noted an overall caries rate of 23% in impacted molars and this is the second most important factor that would necessitate the removal of impacted third molars. Only 0.5% of the second molars were associated with caries.

Knutsson *et al;* (1996) noted a high caries frequency of 31% with impactions. He also noted that caries were more common in patients between 20 and 29 years, followed by the 30 to 39 year group and also found that caries mostly occurred in association with mesioangular impactions. Partially exposed impactions were the most prone to develop caries.

2.15.3 Dental resorption in association with impactions:

Horizontal and mesioangular impacted mandibular third molars may impinge and resorb the root of second molars (Shafer *et al;* 1983, and Mercier and Precious, 1992).

Nitzan *et al;* (1981) observed that 2% of the impacted mandibular third molars were associated with root resorption, and there was no resorption in association with impacted teeth in the patients over the age of 30 years.

Nordenram (1987) noted resorption of adjacent second molars by impacted third molars in 4.7% of cases.

Stanley *et al;* (1988) and Sasano *et al* (2003) observed a similar resorption incidence of 3.05% and 5.5% respectively.

In contrast to the above findings, the prospective study of Von Wowern and Nielsen (1989) extending over a period of 4 four years, found no impactions

associated with resorption of second molars. These findings were supported by a similar study carried out by Sewerin and Von Wowern (1990).

According to Knutsson *et al;* (1996), resorption was a rare pathological finding and associated with impactions in only 1% of cases. They noted that resorption was mostly seen in patients between 20 to 29 years, and concluded that resorption occurred mainly in association with mesioangular and horizontal impactions. Resorption was usually encountered in impactions completely embedded in soft tissue.

2.15.4 Periodontitis in association with impactions:

The studies of Stanley and colleagues (1988), Lysell and Rohlin (1988) and Punwutikorn *et al;* (1999) registered that the incidence of periodontitis with impacted mandibular third molars were not that common. The incidences reported in these studies were 4.49%, 3%, and 3.5% respectively.

Knutsson *et al;* (1996) demonstrated that periodontitis occurred in 7% of symptomatic impactions. Similar results were obtained by Goldberg *et al;* (1985), where a 7.5% incidence of periodontitis with impactions was noted.

The Batianeh *et al;* (2002) study demonstrated a 13.6% incidence of periodontitis with impacted mandibular third molars while the Bruce *et al;* (1980) study showed that patients older than 35 years seemed to be more prone to develop periodontitis than younger patients.

Knutsson *et al;* (1996) demonstrated that periodontitis associated with impactions occurred mainly in patients between 20 and 29 years, followed by patients of 30 to 39 and least in the 40 to 49 year group. They also noted that periodontitis was mostly attributed to mesioangular and horizontal impactions. Their study also showed that periodontitis were mostly associated with teeth partially covered by soft tissue.

2.15.5 Pericoronitis in association with impactions:

The studies of Sasano *et al;* (2003), Knutsson *et al;* (1996) and Samsudin and Mason (1994), concluded that pericoronitis was the chief complaint presenting with symptomatic impacted mandibular third molars in 80%, 54%, and 60% of the cases respectively.

Lopes *et al;* (1995) showed that pericoronitis was responsible for 37% of symptomatic impactions in the sample they had studied.

The study of Lysell and Rohlin (1988) indicated that 30% of the symptomatic impactions were associated with pericoronitis.

Goldberg *et al;* (1985) noted that acute and chronic infections occurred in 21% of patients that presented for removal of impacted mandibular third molars.

Kay (1966) found the occurrence of pericoronitis associated with impacted mandibular third molars peaked in the 21 to 25 year age group.

Knutsson et al; (1996) found that pericoronitis was mostly seen in patients between 20 and 29 years, followed by patients 30 to 39 years and the 15 to 19 year group.

The Batanieh *et al;* (2002) study noted that pericoronitis was the single most common pathological condition calling for extraction of impacted mandibular third molars in 46% of cases. The study showed that pericoronitis was evident in 80% of partially erupted mandibular third molars.

Knutsson et al; (1996) also found that pericoronitis was mostly encountered in distoangular and mesioangular inclined teeth. They pointed out that partially impacted soft tissue impactions were more likely to be associated with pericoronitis (74%).

The studies of Halverson and Anderson (1992) and Leone and Edenfield (1987) demonstrated that the most important factor for developing pericoronitis in association with impacted mandibular third molars was due to the soft tissue opercula overlying the impacted teeth.

Punwutikorn *et al;* (1999) found that 36% of all symptomatic impactions were accompanied by pericoronitis, and that 94% of pericoronitis cases were due to partially erupted mandibular third molars.

2.15.6 Facial pain in association with impactions:

Facial pain seems to be a common complaint in young patients (Shepherd, 1994).

Lopes *et al;* (1995) noted that facial pain occurred in 23% of cases with impacted third molars.

Bataineh *et al;* (2002) reported that facial pain ascribed to impacted third molars occurred in 4.6% of their cases.

Goldberg *et al;* (1985) concluded that 30% of their patients that required extractions of impacted third molars were complaining of facial pain. None of these cases showed signs of infection.

2.15.7 Tumors in association with impactions:

A number of studies were done to determine the incidence of tumors that occurred along with impacted mandibular third molars, and these maintained that tumors were rarely associated with impacted mandibular third molars.

Sasano *et al;* (2003) found no tumors in association with impacted mandibular third molars in the sample which they studied.

The Goldberg *et al;* (1985) study did not differentiate between cysts and tumors, but they discovered that only 2% of patients referred for removal of impacted mandibular third molars presented with concomitant cysts or tumors. Regezi et al; (1978) reported that ameloblastomas were associated with impacted third molars in 0.14% in his cases. In a similar study Weir et al; (1987) found ameloblastomas in association with impacted third molars in 2% of his cases.

Shear and Singh (1978) mentioned that tumors developed in association with impacted mandibular third molars in only 0.0003% of cases.

Guven *et al;* (2000) concluded that impacted mandibular third molars co-existed with tumors in 0.79% of their cases. This figure was made up of 0.77% for benign tumors and 0.025% for malignant tumors. They also noted that tumors seemed to increase in number with advancing age.

2.16 Asymptomatic third molars:

There is an ongoing debate as to whether asymptomatic impacted third molars should be removed or whether treatment should be deferred until symptoms appear. Arguments favoring the latter may stem from the fact that complications of the procedure may be far worse than the initial complaint. These vary from dry socket, trismus, hemorrhage, displacement of teeth, swelling and dento-alveolar fractures (Mercier and Precious, 1992, Colgan *et al;* 2002 and Oginni *et al;* 2002), to complications of a permanent nature. The latter include

periodontal injury (Lysell and Rohlin, 1988, Bataieneh *et al;* 2002 and Rakprasitkul, 2001), temporomandibular joint injury (Mercier and Precious, 1992), and injury to adjacent teeth (Mercier and Precious, 1992 and Colgan *et al;* 2002). Serious complications, include neurologic damage (Lytle, 1993, Mercier and Precious, 1992, Saglam and Tuzum, 2003), massive postoperative infection and even a fracture of the mandible (Mercier and Precious, 1992, Libersa *et al;* 2002 and Oginni *et al;* 2002). However, elective removal of impacted mandibular third molars may prevent local periodontal breakdown in cases where partially impacted teeth is associated with food impaction (Mercier and Precious, 1992, Lysell and Rohlin, 1988, and van der Linden *et al;* 1993). It may also prevent the development of neurologic complaints, such as fatigue headaches, loss of balance, blurred vision and pain of unknown origin (Lytle, 1993, Lysell and Rohlin, 1988, van der Linden *et al;* 1993, Eidelman, 1979, Saglam and Tuzum, 2003).

Another advantage of the prophylactic removal of impacted third molars may counter the development of pathological conditions, such as caries, dentigerous- and paradental cysts and tumors (Shira and Kneeland, 1986, Koerner, 1994, Mercier and Precious, 1992 and van der Linden *et al;* 1993).

In some cases, a patient may benefit from the elective removal of impacted third molars, as the procedure may alleviate crowding within the dentition in the incisor region (Mercier and Precious, 1992, Bjork *et al;* 1956 and Quek *et al;* 2003).

Elective removal may also prevent resorption of second molars, especially when the third molar lies in a mesio-angular or horizontal relation to the second molar (Mercier and Precious, 1992, Lysell and Rohlin, 1988, Van der Linden *et al;* 1993 and Kostopoulou *et al;* 2000).

It has also been shown that elective removal may decrease the risk of mandibular fractures (Van der Linden *et al;* 1993 and Fuselier, 2002).

The arguments pertaining to the elective removal of asymptomatic impacted mandibular third molars mainly center on the surgical complications and the cost of the procedure (Kaminishi and Kaminishi, 2004).

The debate around the cost effectiveness is still there to judge whether prophylactic removal of impacted mandibular third molars is more cost effective or not (Song *et al;* 1997 and Edward *et al;* 1999).

Evidence-based studies have not supported the prophylactic removal of impacted mandibular third molars (NIH, 1979, Song *et al;* 2000 and Pasqualini et al; 2002), although others have shown that early removal of impacted mandibular third molars as a method of preventive treatment may eliminate the complications associated with surgical removal of impacted mandibular third molars (Kaminishi and Kaminishi, 2004).

3. CHAPTER THREE

AIMS AND OBJECTIVES

3.1 Aim of the study

The aim of this study is to develop a radiographic profile of symptomatic impacted mandibular third molars on patients above the age of 16 years.

3.2 Objectives of the study

The objectives of this study were to determine a possible correlation between the symptomatic impacted mandibular third molar and:

- the age of the patients.
- the gender of the patients.
- the level of impactions.
- the angulation of the impactions.
- and whether the above variables influence the symptomatology and pathology associated with impacted mandibular third molars.

4. CHAPTER FOUR

MATERIALS AND METHODS

4.1 Study design

This study is a retrospective record based study of patients with symptomatic impacted mandibular third molars that were treated at the Department of Maxillo-Facial and Oral Surgery, Tygerberg Hospital (University of Western Cape) during 2004 and up to May 2005. Panoramic radiographs and the patient's clinical record files were retrieved for evaluation.

4.2 The sample

Panoramic radiographs and clinical record files of 200 patients, who attended the Maxillo-Facial and Oral surgery Department for removal of impacted mandibular third molars from January 2004 to May 2005, were retrieved.

The patient's record files were reviewed in the archives of the University of the Western Cape, Tygerberg campus. The radiographs used were all taken at the initial examination prior to treatment.

Each of these patients had at least one symptomatic impacted mandibular third molar. Among these patients, 124 had bilateral symptomic impacted mandibular third molars.

4.3 Instrumentation:

4.3.1 The data capture sheet was assessed in two sections

(Appendix 1)

4.3.1.1 Section A: Record-based examination.

This section recorded clinical data of the patients.

- The patient's age.
- Patients were divided into five decades ranging from 16 to 65 years.
- The patients' gender was recorded to analyze the possible association between the gender and symptomatic impacted mandibular third molars.
- The incidence of any pathological anomalies with each impaction type was noted, along with relevant clinical data.
- Anomalies that were recorded in association with impacted mandibular third molars included:
  a. Pericoronitis (inflammation of overlying tissue of the impacted teeth) (Knutsson *et al;* 1996) that were noted in the initial examination of the patients.
  b. Caries and/or resorption of third molars and/or adjacent second molars. No attempt was made in differentiating between external resorption and caries, but cases were included showing obvious destruction of dental tissue in the root to crown areas of third molars or distal surfaces of second molars (Knutsson *et al;* 1996) (Appendix 2).
  c. Cysts/or enlarged follicles: where the follicle size was larger than 2.5 mm, it was considered hyperplastic follicle or early paradental cyst (Dachi and Howell, 1961). (Appendix 3).

d. Tumors, hamartomas, supernumery teeth. Lesion verified by histopathologic examination. (Appendix 4).
e. Chronic facial pain.
f. Periodontal breakdown: this was defined as vertical loss of alveolar bone support on the adjacent teeth, and cases were included showing a bone loss up to 3 mm lower than the cemento-enamel junction on the distal aspect of the second mandibular molar (Stanley *et al;* 1988) (Appendix 4).
g. Other reasons for removal included headache and an impacted third molar in the line of a fracture.

4.3.1.2 Section B: Radiographic examination.

A third molar was considered impacted when it was not fully erupted and the roots were formed after the age of 16 years. The teeth that were in the normal functional position in the occlusal plane were considered as impacted from the clinical notes of the surgeons who removed the teeth.

Angle of impaction:

The angle of an impacted mandibular third molar was determined by the angle formed between the intersected longitudinal axes of the second and third molars. The angle was recorded using an orthodontic protractor.

Impactions were classified according to the Modified Winter Classification System (Archer, 1966) as follows:

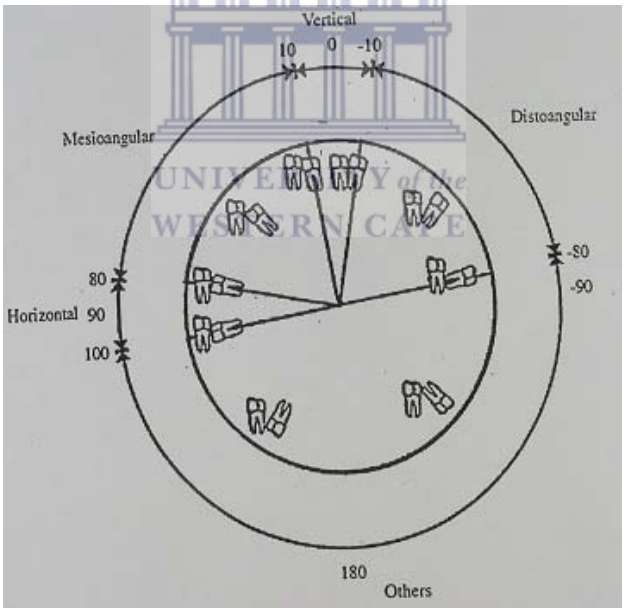
i. Vertical impaction ±10° (Appendix 2).

ii. Mesio-and disto-angular ± 11-70° (Appendix 2, 5 respectively).

iii. Horizontal >± 71°-100° (Appendix 4).

iv. Other types: which include buccolingual, mesioinverted, and distoinverted impactions (Appendix 3) (See Diagram 1).

Diagram 1: angular position of impacted third molars (Queck *et al*, 2003)



Level of eruption:

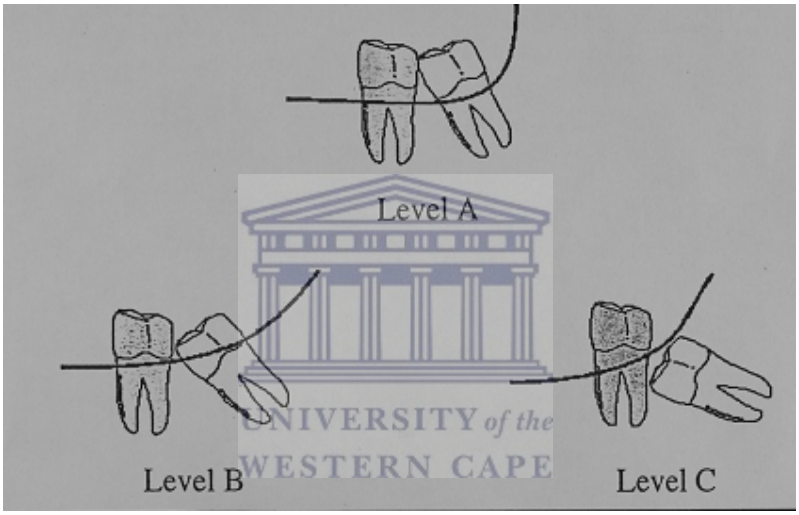
This was judged by the relation between the cemento-enamel junction of the impacted teeth and the alveolar bone: (See Diagram 2)

a. Level A: the crown is on the same level as the occlusal plane and the cemento-enamel junction lies above the alveolar bone. (Appendix 4)

b. Level B: the crown lies between the occlusal plane and the cemento-enamel junction of the second molar and the cemento-enamel junction of the third molar lies below the border of the alveolar bone (the crown not completely embedded in bone) (Appendix 6)

c. Level C: the tooth lies completely embedded in bone (Appendix 6).

Diagram 2: level of impacted third molars (Queck *et al*, 2003)



The radiographic machines which were used for taking panoramic radiographs were the Soredex Cranex Tome Ceph, Panelipse General Elective 3000, and Orthophos Siemens. Fuji film 15×30 and Fuji Film 12.7×30.5 were used.

The radiographs were taken by radiographers employed by the Dental Faculty and Dentistry students of the University of the Western Cape.

As there were more than one panoramic machine in use, and as there were more than one radiographer involved, measurement standardizations were difficult to obtain.

Because some impactions were buccally or lingualy inclined, and due to variable magnifications, standardization was not possible, no space measurements were employed in this study.

4.4 Inclusion and Exclusion criteria

4.4.1 Exclusion criteria

The following cases were not incorporated in the present study:

- Patients under 16 years of age.
- Patients with a congenital disorder.
- Patients who were asymptomatic and free from any pathology may be associated with impacted mandibular third molar.
- Incomplete information recorded in the patient files.

4.4.2 Inclusion criteria

The following impaction cases were considered for the present study:

- Patients 16 years and above.

- Those patients presenting with clinical symptoms associated with impacted mandibular third molars.
- Patients with pathology due to impacted mandibular third molars.

4.5 Procedures

The researcher has examined and recorded all selected radiographs as well as the corresponding patients' clinical records.

Radiographic interpretations were done by using a radiographic viewing box, a radiographic magnifying glass, and all assessments were carried out in a dark room.

The angle of impaction was measured by using an orthodontic protractor, and the follicular and pericoronal spaces were measured with an orthodontic ruler.

20 radiographs were examined on a daily basis to ensure that the researcher was not subjected to fatigue that could lead to errors in interpretation.

4.6 Statistics and Data Analysis

All results were tabulated in an excel computer program.

Pearson Chi- squared tests were performed and the p- values supplied.

Standardization calibration was approached in two ways:

Intra-examination of 173 of the radiographs was carried out 7 days after the first examination. The other 27 radiographs were taken by dental students on an out-patients basis and these were not re-examined. There was no significant difference in the results obtained between the first and second examinations.

For the inter-examination, a second examiner was involved in the radiographic assessment, and this examiner studied 36 of the radiographs as a measure to determine the rate of agreement. Total consensus was reached in 34 radiographs and in only 2 cases the inter-examiner differed with regards to the inclination of impaction.

Frequency distributions were reported on Cross-tabulations between the prevalence of symptomatic impacted mandibular third molars and demographic variables.

5. CHAPTER FIVE

ETHICAL CONSIDERATION

A letter was submitted to the Head of the Archives Department of the Faculty of Dentistry of the University of the Western Cape in order to request permission for the researcher to access the patient's files (Appendix 7).

All information gathered from this study was strictly confidential and no personal information was recorded.

No one had access to this information except the researcher and the second examiner. Neither the names nor surnames were used during this study.

All information collected was maintained and stored in such a way as to maintain confidentially.

6. CHAPTER SIX

RESULTS

Two hundred patients were included in the present study. Mean age ranged from 17 to 65 years, with a mean age of 24.6 years. The median age of the male patients was 25.5 years and for females 22 years, the standard deviation was 6.3 years.

Panoramic radiographs of 200 patients with symptomatic impacted mandibular third molars that attended the Maxillo-Facial and Oral Surgery Department for extraction of impacted mandibular third molars during the year 2004 up to May 2005 were assessed in conjunction with relevant clinical data.

Among the 200 patients, a total of 324 impacted mandibular third molars was recorded.

6.1 Gender prevalence

This study revealed that females more commonly presented with symptoms; there were 126 (63%) female patients and 74 (37%) male patients (See Table 1).

Table 1: Distribution of cases among the genders

Gender	Frequency	Percent	Cum Percent
Female	126	63.0%	63.0%
Male	74	37.0%	37.0%
Total	200	100.0%	100.0%

6.2 Impaction and age

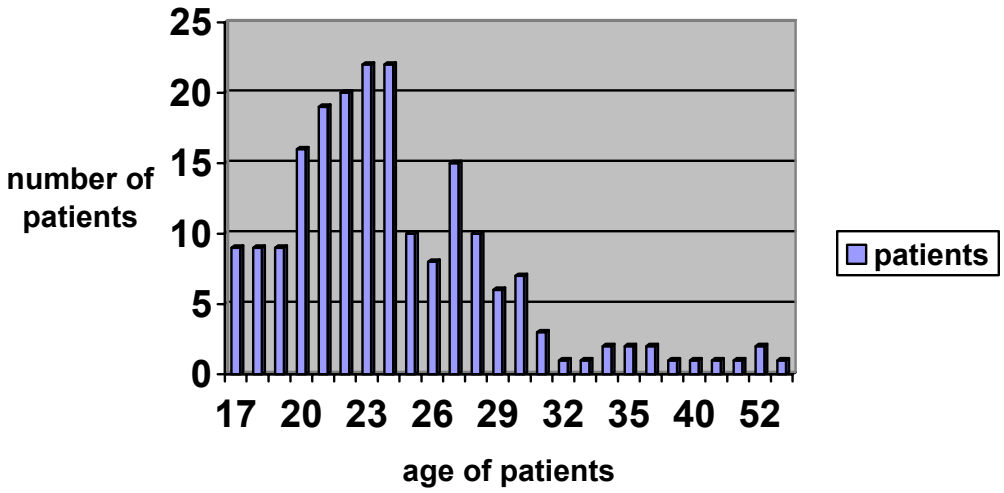
The patients were divided into five groups, ranging from 16 to 65 years; each group spanning over a 10 year period. It was found that patients between 16 to 25 years were the most likely to present with symptomatic impactions in this sample, out of a total of 135 cases (67.5%), followed by patients between 26 to 36 years of age in 56 cases (28%) (See Table 2).

Table 2: Distribution of the cases in the five age groups

Age group	Frequency	Percent	Cum Percent
16-25	135	67.5%	67.5%
26-35	56	28.0%	95.5%
36-45	5	2.5%	98.0%
46-55	3	1.5%	99.5%
56-65	1	0.5%	100.0%
Total	200	100.0%	100.0%

From the above, it is evident that symptoms related to impactions decrease with corresponding increase in the age of patients (See figure1).

figure 1: relation betweenthe age and number of patients



This histogram (fig 1) showed that symptomatic impactions tended to increase gradually between 17 and 24 years, and the symptomatic impactions were most commonly removed in patients between 23 and 24 years. The incidence decreases in frequency with increasing age, except in the 27 to 28 year age group, who showed an increase in symptomatic impactions above 25 to 26 years of age.

6.3 Age and Gender in relation to symptomatic impaction

This study showed that females between16 to 25 (98 patients, or 77% of all female patients) were more frequently involved with symptomatic impactions than males (37 patients or 50% of all male patients). Males between 26 to 35 years (31 patients or 41.9% of all male patients) were found to be more prone

to develop symptomatic impactions than females (25 patients or 19.8% of all females in this age group) (See Table 3).

Table 3: Distribution of the cases between gender and various age groups

	AGE GROUP					
Gender	**15-25**	**26-35**	**36-45**	**46-55**	**56-65**	**Total**
Female Row % Col %	98 77.8 72.6	25 19.8 44.6	1 0.8 20.0	2 1.6 66.7	0 0.0 0.0	126 100.0 63.0
Male Row % Col %	37 50.0 27.4	31 41.9 55.4	4 5.4 80.0	1 1.4 33.3	1 1.4 100.0	74 100.0 37.0
Total Row % Col %	135 67.5 100.0	56 28.0 100.0	5 2.5 100.0	3 1.5 100.0	1 0.5 100.0	200 100.0 100.0

The age groups were modified to empower the statistical analysis as follows:

Group A patients were those between 16 and 21 years, group B those between 22 and 34 years, and group C were those between 35 and 65 years.

The data for the males and females stem- and leave diagram were summarized in a contingency table (See tables 4 and 5).

Table 4: Relation between age and symptomatic impaction in females

Stem	Leaves
17	77777 77
18	88888 8888
19	99999 9
20	00000 00000 00000
21	11111 11111 11111
22	22222 22222 22222 2
23	33333 33333 333
24	44444 44444 4444
25	5555
26	6
27	77777 77
28	88888 8
29	99
30	0000
31	
32	2
33	3
34	
35	55
36	
Hi	44, 52, 52

Table 5: Relation between age and symptomatic impaction in males

Stem	Leaves
17	77
18	
19	999
20	0
21	1111
22	2222
23	33333 3333
24	44444 444
25	55555 5
26	66666 66
27	77777 777
28	8888
29	9999
30	000
31	111
32	22
33	
34	44
35	
36	66
37	
38	
39	9
40	0
41	
Hi	47, 65

6.4 Symptoms and the angle of impaction

The prevalence of symptoms related to the angle of impaction in this sample was recorded and it was found that the vertical position predominated (33.6 %), followed by the mesioangular inclination (32.4%), and the horizontal impaction (28.1%). The distoangular angular position was the least common type of impaction encountered (1.2%) (See Table 6).

Buccal and lingual inclination types of impactions were included in the category denoted under “other” in table 6, from which it can be seen that the prevalence of these inclinations make up 4.6% of all cases of impactions that presented with symptoms. (See Table 6)

Table 6: Distribution of various angles of impactions

Angulation	frequency	percent	Cum percent
Distal	2	1.2%	1.2%
Horizontal	91	28.1%	29.3%
Mesial	105	32.4%	61.7%
Others	15	4.6%	66.4%
Vertical	109	33.6%	33.6.0%
Total	322	100.0%	100.0%

6.5 Symptoms and the level of impaction

The prevalence of the various levels of symptomatic impacted mandibular third molars was then assessed and it became evident that level B impaction were the most common type in association with symptoms (63.3%),

followed by level A impactions (24.4%), and level C the least common type (12.3%) (See Table 7).

Table 7: The incidence of symptomatic impactions and the level of impactions

Level	Frequency	Percent	Cum Percent
A	79	24.4%	24.4%
B	205	63.3%	87.7%
C	40	12.3%	100.0%
Total	324	100.0%	100.0%

6.6 Impactions in relation to concomitant pathology

From the sample, it was recorded that pericoronitis was the most common etiology causing symptoms related to impacted mandibular third molars, as half of the cases (162 or 50%) presented with pericoronitis (See Table 8).

Table 8:Incidence of pericoronitis with impactions

Pericoronitis	Frequency	Percent	Cum Percent
Present	162	50.0%	50.0%
Absent	162	50.0%	100.0%
Total	324	100.0%	100.0%

Facial pain was the second most common cause of symptoms related to impactions, as 96 (29.6%) of the cases indicated that they were suffering from facial pain (See Table 9).

Table 9: Incidence of facial pain with impactions

Facial pain	Frequency	Percent	Cum Percent
Present	96	29.6%	29.6%
Absent	228	70.4%	100.0%
Total	324	100.0%	100.0%

This study also demonstrated that enlarged follicles were the third most common cause of symptomatic impactions, as 54 (16.7%) of cases presented with large follicles (See Table 10).

Table 10: Incidence of hyper-plastic follicle/cyst with impactions

Cyst	Frequency	Percent	Cum Percent
Present	54	16.7%	16.7%
Absent	270	83.3%	100.0%
Total	324	100.0%	100.0%

Caries or resorption of either the impacted third molar or the second molar developed in 53 (16.4%) cases (See Table 11).

Table 11: Incidence or caries of second /third molars

Caries	Frequency	Percent	Cum Percent
Present	53	16.4%	16.4%
Absent	271	83.6%	100.0%
Total	324	100.0%	100.0%

Impacted mandibular third molars in association with periodontal breakdown and bone loss in the vicinity of the impaction and/ or distal surface of the second molars were present in 18 (5.6%) of cases (See Table 12).

Table 12: Incidence of periodontitis

Periodontal breakdown	Frequency	Percent	Cum Percent
Present	18	5.6%	5.6%
Absent	306	94.4%	100.0%
Total	324	100.0%	100.0%

Tumors associated with an impaction were the least evident reason for removal of impacted molars. Only 2 cases in this series were associated with a tumor or

odontoma. On analysis one was an ameloblastoma and the other was a supernumerary tooth (See Table 13).

Table 13: Incidence of tumor

tumor	Frequency	Percent	Cum Percent
Present	2	0.6%	0.6%
Absent	322	99.4%	100.0%
Total	324	100.0%	100.0%

Other symptoms associated with mandibular third molar impactions were present in10 (3.1%) cases (See Table 14).

Table 14: Incidence of other symptoms

Others	Frequency	Percent	Cum Percent
Present	10	3.1%	3.1%
Absent	314	96.9%	100.0%
Total	324	100.0%	100.0%

Many of the impacted mandibular third molars presented with pain due to a single etiological factor, but some were associated with more than one etiological factor (See Table 15).

Pericoronitis developed in 111 (34.3%) cases, and pericoronitis combined with an additional pathological condition was noted in 51 cases. Pericoronitis associated with various pathological conditions was found in one case (See Table 15).

This study also showed that facial pain at the site of impaction occurred in 96 cases, and among these 77 cases presented with facial pain alone, 18 cases

showed facial pain in conjunction with another pathological condition, and one case had facial pain with two additional pathological lesions (See Table 15).

Cysts or enlarged follicles as a single pathological entity developed around impacted mandibular third molars in 22 (6.8%) of the cases, but these were combined with another pathological condition in 29 cases. In one case the impaction was associated two distinct pathological entities (See Table 15).

Caries or resorption of impacted third molars or second molars was evident in 27 (8.3%) of the cases, in combination with another pathology in 13 cases, and associated with two or more distinct pathological conditions in 2 cases (See Table 15).

Periodontal breakdown and/or bone loss around impacted third molars and/or the distal surface of second molars was found in 10 (3.1%) of the cases, combined with another pathology in 7 cases, and associated with two distinct pathological conditions in one case (See Table 15).

A tumor occurred with one (0.3%) impacted mandibular third molar, and a tumor in combination with another pathological condition was seen in another case (See Table 15).

Table 15: Frequency of pathological conditions association with an impaction

Pathology	Frequency	Percent	Cum Percent
Cyst	22	6.8%	6.8%
Facial pain	77	23.8%	30.6%
Facial pain/others	1	0.3%	30.9%
Facial pain/periodontal breakdown	1	0.3%	31.2%
Others	7	2.2%	33.3%
Periodontal breakdown/cyst	1	0.3%	33.6%
Pericoronitis	111	34.3%	67.9%
Pericoronitis/cyst	28	8.6%	76.5%
Pericoronitis/facial pain	7	2.2%	78.7%
Pericoronitis/others	1	0.3%	79.0%
Pericoronitis/periodontal breakdown	3	0.9%	79.9%
Pericoronitis/resorption	11	3.4%	83.3%
Pericoronitis/resorption/cyst	1	0.3%	83.6%
Periodontal breakdown	10	3.1%	86.7%
Resorption	27	8.3%	95.1%
Resorption/cyst	3	0.9%	96.0%
Resorption/facial pain	8	2.5%	98.5%
Resorption/facial pain/periodontal breakdown	1	0.3%	98.8%
Resorption/periodontal breakdown	2	0.6%	99.4%
tumor	1	0.3%	99.7%
tumor/facial pain	1	0.3%	100.0%
Total	324	100.0%	100.0%

6.7 Angle of impaction in relation to pathology

Assessment of the incidence of various pathological conditions in relation to the angle of impaction revealed that:

a. Pericoronitis was the single most common pathological condition associated with impacted mandibular third molars. Vertical impactions were more vulnerable to develop pericoronitis, as 46.9% of these impactions were removed due to pericoronitis, second in line was the mesial angulation with 29.6% of cases presenting with pericoronitis, followed by the horizontal type with 22.8%, and distal impactions with 25%. Other types of impactions than the above mentioned were not associated with pericoronitis (See Table 16).

Table 16: Relation between pericoronitis and the angle of impaction

	Angulation					
Pericoronitis	**Distal**	**Horizontal**	**Mesial**	**Others**	**Vertical**	**Total**
Present	1	37	48	0	76	162
Row %	0.6	22.8	29.6	0.0	46.9	100.0
Col %	25.0	40.7	45.7	0.0	69.7	50.0
Absent	3	54	57	15	33	162
Row %	1.9	33.3	35.2	9.3	20.4	100.0
Col %	75.0	59.3	54.3	100.0	30.3	50.0
Total	4	91	105	15	109	324
Row %	1.2	28.1	32.4	4.6	33.6	100.0
Col %	100.0	100.0	100.0	100.0	100.0	100.0

b. Facial pain was associated with impacted mandibular third molars in 96 cases of which 34 were mesially inclined, 29 cases horizontal, 20 cases vertical, and one case showing distal inclination (See table 17).

Facial pain was common among impactions other than the above mentioned with 80% (12 cases) in association with facial pain (See Table 17).

Table 17: Distribution of facial pain in various inclinations of impaction

	Angulation					
Facial pain	**Distal**	**Horizontal**	**Mesial**	**Others**	**Vertical**	**Total**
Present	1	29	34	12	20	96
Row %	1.0	30.2	35.4	12.5	20.8	100.0
Col %	25.0	31.9	32.4	80.0	18.3	29.6
Absent	3	62	71	3	89	228
Row %	1.3	27.2	31.1	1.3	39.0	100.0
Col %	75.0	68.1	67.6	20.0	81.7	70.4
Total	4	91	105	15	109	324
Row %	1.2	28.1	32.4	4.6	33.6	100.0
Col %	100.0	100.0	100.0	100.0	100.0	100.0

c. Resorption and/or caries of impacted or distal surface of second molars were noted in 53 cases. Among these, the horizontal angle was the most common type found to undergo caries, as 35 (66%) of cases were associated with resorption of the impacted teeth or second molars. This was followed by mesially angulated impactions with 20.8%, and the vertical impactions with 13.2%. Distal angulation and the other types of inclinations were not associated with detectable caries (See Table 18).

Table 18: Relation between caries and the angle of impaction

	Angulation					
Caries	**Distal**	**Horizontal**	**Mesial**	**Others**	**Vertical**	**Total**
Present	0	35	11	0	7	53
Row %	0.0	66.0	20.8	0.0	13.2	100.0
Col %	0.0	38.5	10.5	0.0	6.4	16.4
Absent	4	56	94	15	102	271
Row %	1.5	20.7	34.7	5.5	37.6	100.0
Col %	100.0	61.5	89.5	100.0	93.6	83.6
Total	4	91	105	15	109	324
Row %	1.2	28.1	32.4	4.6	33.6	100.0
Col %	100.0	100.0	100.0	100.0	100.0	100.0

d. Enlarged follicle around impacted mandibular third molars was subsequently studied in this sample. It was found that vertical impacted third

molars had the highest propensity for cystic changes, with 37 cases (68.5%), followed by mesially inclined impactions with 14 cases (25.9%), and distally angulated impactions with 2 cases (50%). The horizontally positioned impactions seemed to have a low propensity for cyst formation, as only one case (1.9%) developed a cyst (See Table 19).

Table 19: Relation between cyst and the angle of impaction

	ANGULATION					
Cyst	**distal**	**Horizontal**	**Mesial**	**Others**	**Vertical**	**Total**
Present	2	1	14	0	37	54
Row %	3.7	1.9	25.9	0.0	68.5	100.0
Col %	50.0	1.1	13.3	0.0	33.9	16.7
Absent	2	90	91	15	72	270
Row %	0.7	33.3	33.7	5.6	26.7	100.0
Col %	50.0	98.9	86.7	100.0	66.1	83.3
Total	4	91	105	15	109	324
Row %	1.2	28.1	32.4	4.6	33.6	100.0
Col %	100.0	100.0	100.0	100.0	100.0	100.0

e. Periodontal lesions and alveolar bone loss were associated with 18 impactions, and it was noted that the horizontally positioned impactions were the most frequently seen with periodontal lesions with 11 cases (61.1%), followed by mesial inclined impactions with 6 cases (33.3%). A single vertical positioned impaction developed periodontal symptoms, whereas the distal and other inclination types presented with no associated periodontal breakdown (See Table 20).

Table 20: Relation between angulation of impaction and periodontitis

	Angulation					
Periodontal break	**Distal**	**horizontal**	**mesial**	**others**	**vertical**	**TOTAL**
Present	0	11	6	0	1	18
Row %	0.0	61.1	33.3	0.0	5.6	100.0
Col %	0.0	12.1	5.7	0.0	0.9	5.6
Absent	4	80	99	15	108	306
Row %	1.3	26.1	32.4	4.9	35.3	100.0
Col %	100.0	87.9	94.3	100.0	99.1	94.4
TOTAL	4	91	105	15	109	324
Row %	1.2	28.1	32.4	4.6	33.6	100.0
Col %	100.0	100.0	100.0	100.0	100.0	100.0

f. Odontogenic tumors were a rare finding in this sample, as only two cases were encountered one with a distally inclined impaction, and the other with a vertical impaction (See Table 21).

Table 21: Relation between angulation of impaction and tumor

	Angulation					
Tumor	**Distal**	**Horizontal**	**Mesial**	**Others**	**Vertical**	**Total**
Present	1	0	0	0	1	2
Row %	50.0	0.0	0.0	0.0	50.0	100.0
Col %	25.0	0.0	0.0	0.0	0.9	0.6
Absent	3	91	105	15	108	322
Row %	0.9	28.3	32.6	4.7	33.5	100.0
Col %	75.0	100.0	100.0	100.0	99.1	99.4
Total	4	91	105	15	109	324
Row %	1.2	28.1	32.4	4.6	33.6	100.0
Col %	100.0	100.0	100.0	100.0	100.0	100.0

6.8 Impaction level and the prevalence of pathology

a. The study sample indicated that level B impactions were more prone to develop pericoronitis, with 115 cases (71%), followed by level A impactions with 27.8% of the cases, and level C with only 1.2% of the cases (See Table 22).

A notable fact was that 57% of level A impactions developed pericoronitis and that 56.1% of level B impactions had also presented with pericoronitis (See Table 22).

Table 22: Relation between level of impaction and pericoronitis

	LEVEL			
Pericoronitis	**A**	**B**	**C**	**Total**
Absent	45	115	2	162
Row %	27.8	71.0	1.2	100.0
Col %	57.0	56.1	5.0	50.0
Present	34	90	38	162
Row %	21.0	55.6	23.5	100.0
Col %	43.0	43.9	95.0	50.0
Total	79	205	40	324
Row %	24.4	63.3	12.3	100.0
Col %	100.0	100.0	100.0	100.0

b. Facial pain was the most common complaint in patients presenting with level C impactions as a 65% incidence of such cases were encountered (See Table 23).

Table 23: Relation between level of impaction and facial pain

	LEVEL			
Facial pain	**A**	**B**	**C**	**TOTAL**
PRESENT	14	56	26	96
Row %	14.6	58.3	27.1	100.0
Col %	17.7	27.3	65.0	29.6
ABSENT	65	149	14	228
Row %	28.5	65.4	6.1	100.0
Col %	82.3	72.7	35.0	70.4
TOTAL	79	205	40	324
Row %	24.4	63.3	12.3	100.0
Col %	100.0	100.0	100.0	100.0

c. Enlarged follicles developed more frequently with level B impactions (28 cases or 51.9%), followed by level A impactions (22 cases or 40.7%), and level C impactions with only 4 cases (7.4%) (See Table 24).

It was noted that level A impactions were more likely to develop a paradental cyst, as 27.8% of cases were involved with these cysts (See Table 24).

Table 24: Relation between level of impaction and cyst

Cyst	A	B	C	Total
Present	22	28	4	54
Row %	40.7	51.9	7.4	100.0
Col %	27.8	13.7	10.0	16.7
Absent	57	177	36	270
Row %	21.1	65.6	13.3	100.0
Col %	72.2	86.3	90.0	83.3
Total	79	205	40	324
Row %	24.4	63.3	12.3	100.0
Col %	100.0	100.0	100.0	100.0

d. Caries and resorption were more frequently seen in cases with level B impactions (34 cases, or 64.2%), followed by level A impactions (12 cases, or 22.6%) and level C impactions (7 cases, or 13.2%) (See Table 25).

It was noted that level C impactions showed the most frequent resorption rate with 17.5% of cases (See Table 25).

Table 25: Relation between level of impaction and caries

	Level			
Caries	**A**	**B**	**C**	**Total**
Present	12	34	7	53
Row %	22.6	64.2	13.2	100.0
Col %	15.2	16.6	17.5	16.4
Absent	67	171	33	271
Row %	24.7	63.1	12.2	100.0
Col %	84.8	83.4	82.5	83.6
Total	79	205	40	324
Row %	24.4	63.3	12.3	100.0
Col %	100.0	100.0	100.0	100.0

e. The occurrence of periodontal destruction accompanying the impaction of mandibular third molars was also studied in this sample, and it was found that level A impactions were more prone to develop periodontal symptoms as 11.4% of all cases of level A impactions were involved, followed by level B impactions with 4.4% of the cases. There were no level C impactions found in association with periodontal breakdown (See Table 26).

Table 26: Relation between level of impaction and periodontal breakdown

Periodontal Breakdown	**A**	**B**	**C**	**Total**
Present	9	9	0	18
Row %	50.0	50.0	0.0	100.0
Col %	11.4	4.4	0.0	5.6
Absent	70	196	40	306
Row %	22.9	64.1	13.1	100.0
Col %	88.6	95.6	100.0	94.4
Total	79	205	40	324
Row %	24.4	63.3	12.3	100.0
Col %	100.0	100.0	100.0	100.0

6.9 Impaction symptomatology in relation to gender and age

There were four main conditions associated with impacted mandibular third molars in this study. These were pericoronitis, facial pain, caries, and cyst development.

To empower the findings statistically the age groups were divided in to two age groups ≥ 24 years and ≤ 23 years.

6.9.a. Pericoronitis

The mean age of the patients presenting with pericoronitis was 24.94 years. The mean age for females was 24.97 years and the mean age for males was 26.55 years.

There was no significant difference between the two genders in the incidence of pericoronitis, as 57% and 56% of the males and females respectively had pericoronitis.

The main age group of the patients with pericoronitis was between 16 and 25 years with 67.9%, followed by patients between 26 and 35 years with 28.6%.

57% of the females at the age of 23 years or below were affected, while 53% above 23 years were affected. 52% of the males were affected at the age of 23 or less, and 59% of the males developed pericorontis above 23 years.

6.9.b. Facial pain

The mean age of the patients with facial pain was 25.92 years, the mean age of females being 24.26 years and for males 27.59 years.

More female patients (31%) presented with facial pain than males (23%).

The main age group of patients with facial pain was between 16 and 25 years of age (60.7%), followed by patients between 26 and 35 years of age (32.1%).

25% of females at the age of 23 years or below were affected while 42% of females were affected in the elder groups. Seventeen percent of males were affected at the age of 23 or less and 25% of the males developed facial pain after 23 years of age.

6.9.c. Caries and resorption

The mean age of patients presenting with caries was 25.22 years. The mean age of females with caries was 23.53 years, and for males it was 26.91 years. Males showed more caries than females. Thirty percent of the males and 12% of the female patients developed caries.

The main age group of patients with caries was between 16 and 25 years with 56.8 %, followed by the patients between 26 and 35 years with 32.4%.

10% of females 23 years or below had caries while 16% of females were affected in the elder group. 30% of the males were affected at the age of 23 or less, while 29% of the males above 23 years had caries.

6.9.d. Cysts and enlarged follicles

The mean age of patients who developed cysts radiographically was 23.13 years. The mean age of females with cysts was 22.09 years, and for males it was 24.17 years.

There was no significant gender difference in the patients that presented with cysts. 16% of males and 18% of females demonstrated cyst formation.

The main age group of patients with cysts was the 16 to 25 year group with 80 %, followed by patients between 26 to 35 years with 20%. No patient above the age of 35 years developed cysts.

20% of the females 23 years or below developed cysts, while 16% of females were affected in the elder groups. 26% of the males were affected at the age of 23 or less, while 12% of the males developed cysts after 23 years.

6.10 P- Value:

The significant p-values were seen with the following:

The relation between gender and caries: males were more prone to develop dental caries than females as proved by the p- value of 0.0017.

The relation between facial pain and gender at different age groups: females more than 23 years old were more prone to facial pain than younger age groups, as indicated by the p-value 0.0414.

7. CHAPTER SEVEN

DISCUSSION

The sample utilized for this study was taken from the dental records of patients presenting at the Dental Faculty, University of the Western Cape, South Africa.

A total number of 200 cases were selected and their files were retrieved from the archives. From each file, a panoramic radiograph and relevant clinical data, such as gender, age and main complaint were collected for assessment. The aim of the present study was to develop a radiographic profile of symptomatic impacted mandibular third molars.

7.1 Mean age:

The mean age of the cases that were studied was 24.5 years and this finding differs from a number of similar studies (Leone and Edenfield 1987, Lysell and Rohlin 1988) that were carried out on symptomatic impacted mandibular third molars. The mean age of the patients in the Leone and Edenfield (1987) study was 20 years, while the large sample of Lysell and Rohlin (1988) showed a mean age of 27 years. The Nordenram (1966) study came up with a mean age of 29 years, which was in agreement with the finding of Knutsson *et al* (1996).

The mean age of this study corroborated with the study of Venta *et al;* (1993) in which they measured a mean age of 24.4 years.

7.2 Age and symptoms related to impacted third molars:

The sample used in this study was divided in 5 age groups, ranging from 16 to 65 years. Each of these groups spanned a 10 year period. It was found that patients in the first group (between 16 and 25 years old) were the most likely to present with symptomatic impactions, with 135 (67.5%) cases, followed by patients between 26 and 36 years with 56 cases (28%). From this study, it is evident that symptoms related to impactions decrease with corresponding increase in the age of patients. These results were in agreement with the studies of Sasano *et al;* (2003), and Knutsson *et al;* (1996), who reported that patients with symptomatic impactions were mainly seen in the third decade.

7.3 Gender in correlation to symptomatic impacted third molars:

This study indicated that females were twice more common than males in presenting with symptomatic impacted mandibular third molars. This finding is in agreement with that of Venta *et al;* (1993), where it was noted that females were more commonly affected than males with symptomatic impactions in a 68:32% ratio.

This study showed a slightly higher female impaction incidence than the study of Knutsson *et al;* (1996), who found that females were more commonly affected by symptomatic impacted mandibular third molars.

This study also showed that females between 16 and 25 years were more frequently affected by symptomatic impactions than males. Males between 26 and 35 years were more prone to develop symptomatic impactions than females.

7.4 The inclination of impacted third molars in relation to the development of pathology:

This study showed that there was no significant difference in the prevalence between vertical, mesioangular and horizontal inclinations on the one hand, and the development of a pathological condition on the other hand. The vertical positioned impaction was the most common type seen with a 33.6% incidence, followed by mesioangular inclination with 32.4%, and horizontal impactions with 28.1%. The result of this study was in agreement with that of Nordenram (1966) who found no significant difference in the prevalence rates between the different angles of impaction.

This study contradicted the findings of Kan *et al;* (2002), Knutsson *et al;* (1996) and *Bruce et al;* (1980), who found that mesioangular impactions were predominantly associated with pathology. The latter was followed by vertical and horizontal impactions.

The Venta *et al;* (1993) study found that vertical impactions were the most common type encountered followed by distoangular and mesioangular inclined impactions.

This study did not corroborate with that of Venta *et al;* (1993) and Knutsson *et al;* (1996), in which the distoangular impactions were found to be the most likely to cause symptomatic impactions. The distoangular position was the least common type of impaction encountered (1.2%) in this study.

7.5 Level of impacted third molars in relation to the development of pathology:

The prevalence of symptomatic impactions in relation to the level of impaction was assessed in the present study and it turned out that type B was the most common impaction level in association with symptoms (63.3%), followed by type A level (24.4%), with type C the least common type (12.3%). This was in agreement with Lysell and Rohlin (1988), Knutsson *et al;* (1996) and Venta *et al;* (1993), who showed that soft tissue impactions were more apt to present symptoms with impaction than impactions completely embedded in bone.

7.6 The incidence of pathological conditions with impacted mandibular third molars:

7.6.a Large follicles and cysts associated with impacted third molars:

Enlarged follicles in the proximity of impacted mandibular third molars were frequently the cause for extraction, as 16.7% of the cases were associated with enlarged follicles. The frequency of cysts in the present study were higher than that determined in the studies of Bataineh *et al;* (2002), who noted that cysts

developed in 1.65% of the symptomatic impactions, and the study of Knutsson *et al;* (1996), who found that cysts were in association with impactions in 5% of cases.

This study showed that there was no significant gender difference in patients that presented with cysts. This finding differed from that of Shear and Singh (1978), and Main (1989), who found that males more commonly developed cysts around impacted mandibular third molars than females.

Analysis of the cases in the present study showed that the mean age of the patients that developed cysts was 22.80 years; the main age group of the patients with cysts was between 16 and 25 years, containing 80% of the cases, followed by patients between 26 and 35 years, containing 20% of the cases. These results are similar to those of Knutsson *et al;* (1996), and vary from the findings of Main (1989), who noted that cysts were more common in the fourth decade. Analysis of the sample in this study also brought to light that there were no patients above the age of 35 years who developed cysts. In contrast; Knutsson *et al;* (1996) noted that one third of the cyst cases occurred in patients between 50 and 59 years.

Further analysis of the cases in this study, revealed that vertical positioning of impacted third molars had the highest probability for cyst development, namely 68.5%, followed by mesially inclined impactions with 25.9%, and distally angulated impactions with 50%. The horizontally positioned impactions seem to have a low propensity for cyst formation as only 1.9% developed a cyst. This

finding differs from that of Main (1989), where horizontal impactions were the most common to develop cysts, and from that of Knutsson *et al;* (1996), where the mesioangular impacted molars predominated in developing cysts.

Cysts and enlarged follicles developed more frequently with level B impactions with 51.9% of cases, followed by level A impactions with 40.7%, and level C impactions with only 0.4%. Level A impactions were most likely to develop a cyst, as 27.8% of cases were involved with cysts. Similar findings to that of Knutsson *et al;* (1996) were obtained, who noted that cysts were more encountered with impactions that were completely covered by soft tissue.

7.6.b Dental resorption and caries in association with impactions:

There was no attempt to differentiate between external resorption and caries in this study.

The prevalence of caries and resorption of either impacted third molars or second molars were difficult to assess from the literature. This was due to the variations in the definition and the study type. This study relied on radiographic findings; as where other studies were mostly based on clinical reports of resorption and caries in association with impactions.

The prevalence of caries or resorption of either the impacted third molar or the second molar was studied in this sample and was seen in 16.4% of the cases. This was in agreement with the Sasano and associates (2003) study, which

found resorption in association with 5.5% of cases, and caries in association with 14.5% of symptomatic impacted mandibular third molars. The 16.4% figure in this study was less than that of Knutsson *et al;* (1996), who noted that caries was associated with 31% of cases and resorption was a rare pathological entity in the latter study and made up only 1% of the cases.

Caries is mentioned in the literature as one of the common pathological features associated with extracted mandibular third molars (Battaineh *et al;* 2002, Lysell and Rohlin, 1988 and Punwutikom *et al;* 1999). In contrast to caries, resorption is recorded in the literature as a rare condition associated with impactions (Nitzan *et al;* 1981, Nordenram *et al*; 1987 and Stanley *et al;* 1988). Some studies did not note an association between impaction and resorption (Von Wowern and Nielsen, 1989, and Sewerin and Von Wowern, 1990).

This study showed that the mean age of the patients with caries was 25.54 years. The main age group of patients with caries was between 16 and 25 years with 56.8 % of cases, followed by patients between 26 and 35 years with 32.4% of cases. The findings are in agreement with that of Knutsson *et al;* (1996).

Caries and resorption were encountered more in males than in females in this study; as 30% of males and 12% of females presented with caries.

This study also recorded that resorption and caries were more frequently seen in level B impactions, with an incidence of 64.2%, followed by level A impactions with 22.6%. Level C impactions had the highest risk for resorption, as 17.5% of the level C impactions underwent resorption.

Resorption and caries were commonly seen with horizontal impactions (66%), followed by mesioangular impactions with 20.8%. This corroborated with the findings of Knutsson *et al;* (1996), Shafer *et al;* (1984) and Mercier and Precious (1992).

7.6.c Facial pain in association with impactions:

This study brought to light that facial pain was second in line requiring symptomatic mandibular third molar removal, as it called for the extraction of 29.6% of the cases, this finding coincide with those of Lopes *et al;* (1995) and Goldberg *et al;* (1983), although the frequency of facial pain in this study was higher than that recorded by Bataineh *et al;* (2002) who found an incidence rate of 4.5%.

This study showed that facial pain was more common in level C impactions, as 65% of the cases with facial pain were seen with level C impactions. The inclination with the highest risk to develop facial pain was recorded in the "other" inclinations category (distal, mesial, horizontal, and vertical). This category included 80% of the cases.

Facial pain seemed to be the main complaint in young female patients with a mean age of 25 years. This finding is in agreement with that of Shepherd (1994).

7.6.d Periodontitis in association with impactions:

Periodontal breakdown was rarely associated with impacted mandibular third molars in the present study as only 5.6% of the cases presented as such, and this finding is in agreement with the study of Stanley et al; (1988), Kuntsson *et al;* (1996), Lysell and Rohlin (1988), Punwutikorn *et al;* (1999) and Goldberg *et al;* (1983). The incidence reported in this study is below that recorded by Batianeh *et al;* (2002), where a 13.6% incidence was noted.

Most patients in the study that presented with periodontal break down were between 16 and 25 years old. Sixty seven percent occurred in this age group and this finding differs from that of Bruce *et al;* (1980), who recorded that patients older than 35 years were found to be more prone to periodontitis. The incidence recorded here is however in agreement with that of Knutsson and colleagues (1996).

It was noted from the study sample that horizontal impactions were the most frequent impaction type involved in periodontal break down. A 61% incidence was recorded here and second in line were mesial impactions with 33% concurrence with periodontal breakdown. The findings corroborate that of Knutsson and colleagues (1996).

It was also noted that level A impactions were the most common level involved with periodontitis with an incidence of 11%. Similar findings were reported by Knutsson *et al;* (1996).

7.6.e Pericoronitis in association with impactions:

This study demonstrated that pericoronitis was the single most common cause for mandibular third molar removal, as 50% of the cases presented with pericoronitis. These findings are supported by the studies done by Knutsson *et al;* (1996), Bataineh *et al;* (2002) and Samsudin and Mason (1994). A lower incidence of pericoronitis was reported by Punwutikorn *et al;* (1999) as 36% of the cases presented with the latter condition. Lopes *et al;* (1995) reported a 37% incidence, Lysell and Rohlin (1988) 30% and Goldberg *et al;* (1983) 21%. Sasano *et al;* (2003) reported a higher incidence of 80% of pericoronitis that occurred along with impacted mandibular third molars.

The mean age of the patients that presented with pericoronitis was 25 years. Patients between 16 and 25 years were also most commonly affected by pericoronitis (67%), followed by patients between 26 and 35 years with 28%. This finding is in agreement with that of Knutsson *et al;* (1996) and Kay (1966).

Pericoronitis was encountered more frequently in level B impactions (71%), followed by level A impactions (28%). These findings support those of Knutsson

et al; (1996), Batanieh *et al;* (2002), Punwutikorn *et al;* (1999), Halverson and Anderson (1992) and Leone and Edenfield (1986).

Pericoronitis was commonly seen in cases with vertical impactions, followed by cases with mesial impactions. These results do not support the results obtained by Knutsson *et al;* (1996), who found that mesial and distal angulations to be more prone to develop pericoronitis.

7.6.f Tumors in association with impactions:

The prevalence of tumors in this study was low with only two cases (0.6%) of all pathological conditions were associated with impacted mandibular third molars. Similar results were found by Shear and Singh (1978), Goldberg *et al;* (1983), Guven *et al;* (1999) and Sasano *et al;* (2003).

Guven *et al;* (1999) noted that tumors seemed to increase with increasing age. This study was not able to substantiate this statement seeing that only the two tumor cases were present and in young patients.

Although the development of tumors may not be influenced by the angulation or level of impaction, it could be noted here that both tumors in this series were found with level C impactions, one distally inclined and the other vertically positioned.

8. CHAPTER EIGHT

CONCLUSIONS

This study demonstrated that females were twice more likely to present with symptomatic impactions than males. It was also clear that female patients were more prone to develop symptoms associated with impacted mandibular third molars at an earlier age than males, as the mean age of the genders were 22 and 26 years respectively.

This study noted that vertical impactions were the most common inclination associated with pathology and that level B impactions were the most frequent type to present with symptoms.

The study sample also showed that pericoronitis was the most common complaint that necessitated the removal of impacted teeth. This was followed by facial pain, which occurred more frequently in females, especially those older than 23 years. Pericoronitis and paradental cysts were more frequently seen with partially impacted third molars than completely impacted teeth. Males had a higher incidence of caries in impacted mandibular third molars than females.

According to the literature survey utilized in the present study, it was seen that the mean age of patients with symptomatic impactions was 27 years of age. Females also predominanted in most of the studies. According to the available literature, the most common type of impaction was the mesioangularly inclined,

partially impacted variant and pericoronitis was the single most common symptom associated with impacted mandibular third molars.

These findings differ from those in the present study in the following aspects: the mean age of the patients of this study was 24.5 years, and vertical positioning was the most common inclination associated with symptomatic impacted mandibular third molars.

The variation in the findings as reported here and in the literature indicates that there could be certain factors at play that may be related to demographical, and/or environmental conditions.

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APPENDIX 1

DATA RECORD SHEET

Section A: Record examination

Folder number:

Age:

Gender:

Pathology associated with the impaction:

Pathology	Presence
Pericoronitis	
Cariesr/resorption	
Cyst/follicle large	
Tumors	
periodontal	
Facial pain	
others	

Section B: Radiographic examination

Level of Impaction

Level of impaction	
Class A	
Class B	
Class C	

Angulation of impaction

Angulation of impaction	
Vertical	
Mesial	
Distal	
Horizontal	
Others	

APPENDIX 2

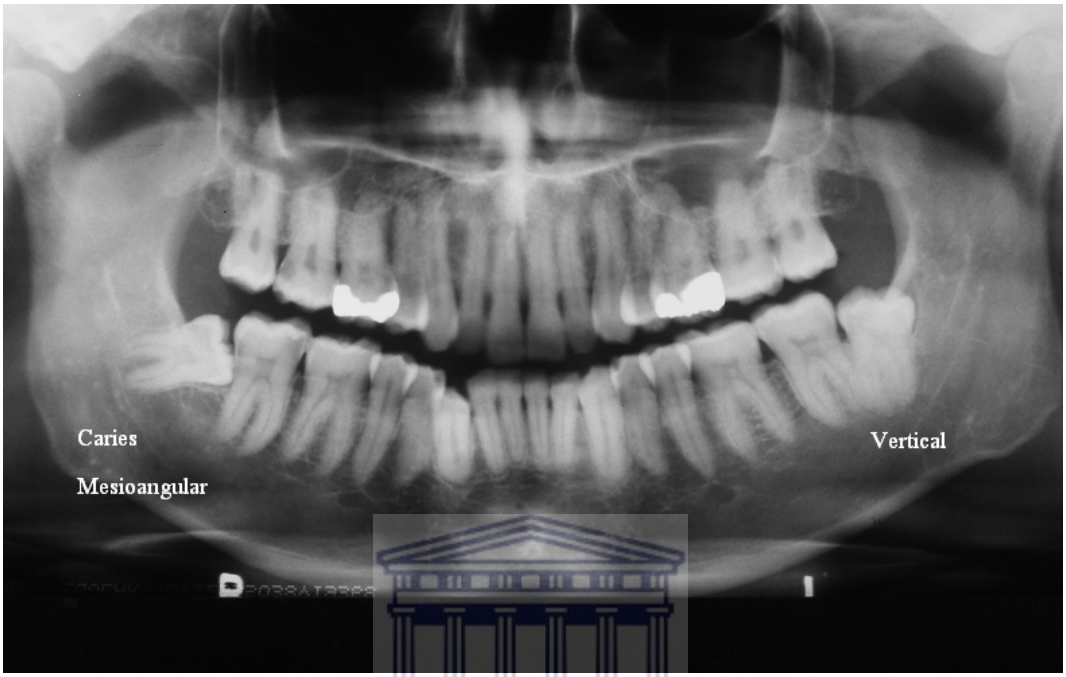

Figure showing different types of mandibular impactions and caries

APPENDIX 3

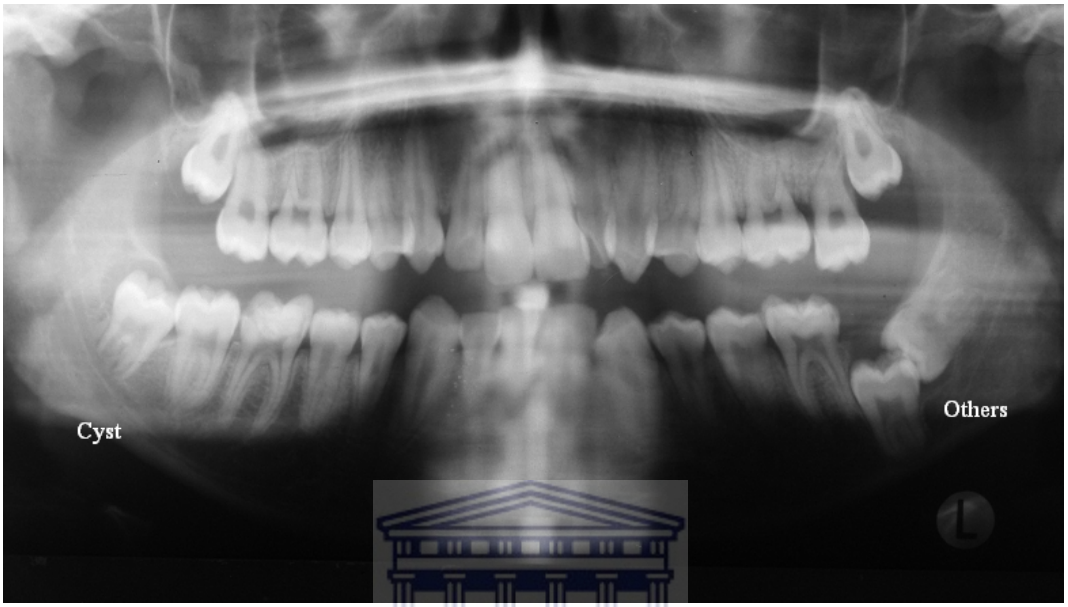

Figure showing different types of pathology associated with mandibular impactions

APPENDIX 4

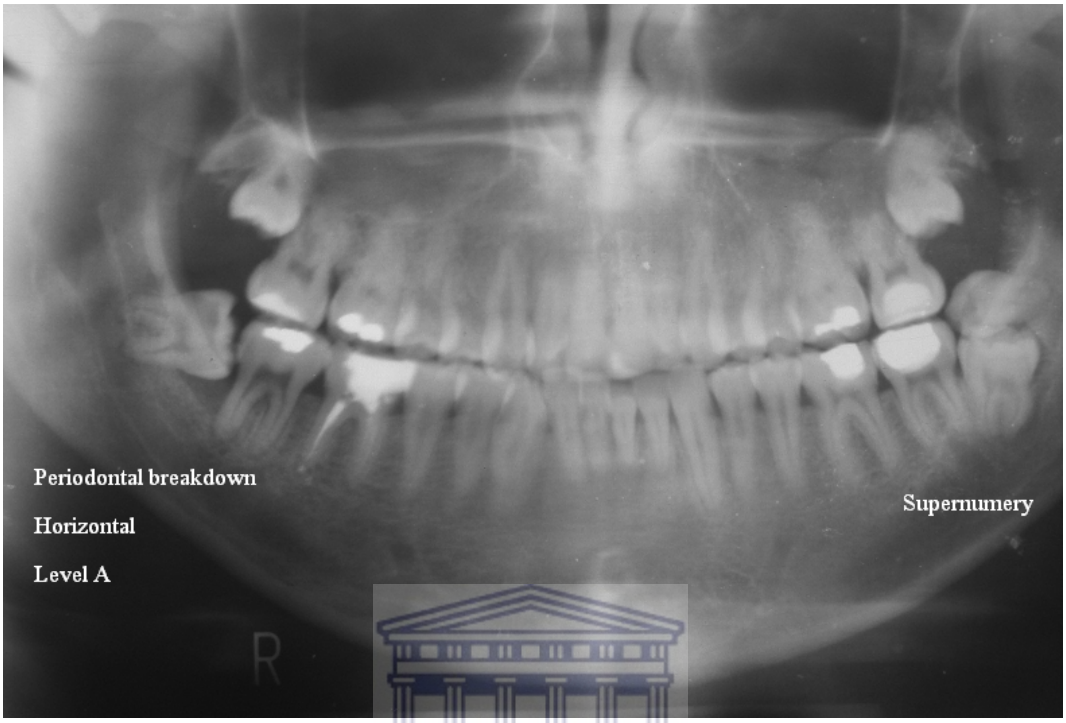

Figure showing different types of mandibular impactions and supernumerary tooth

APPENDIX 5

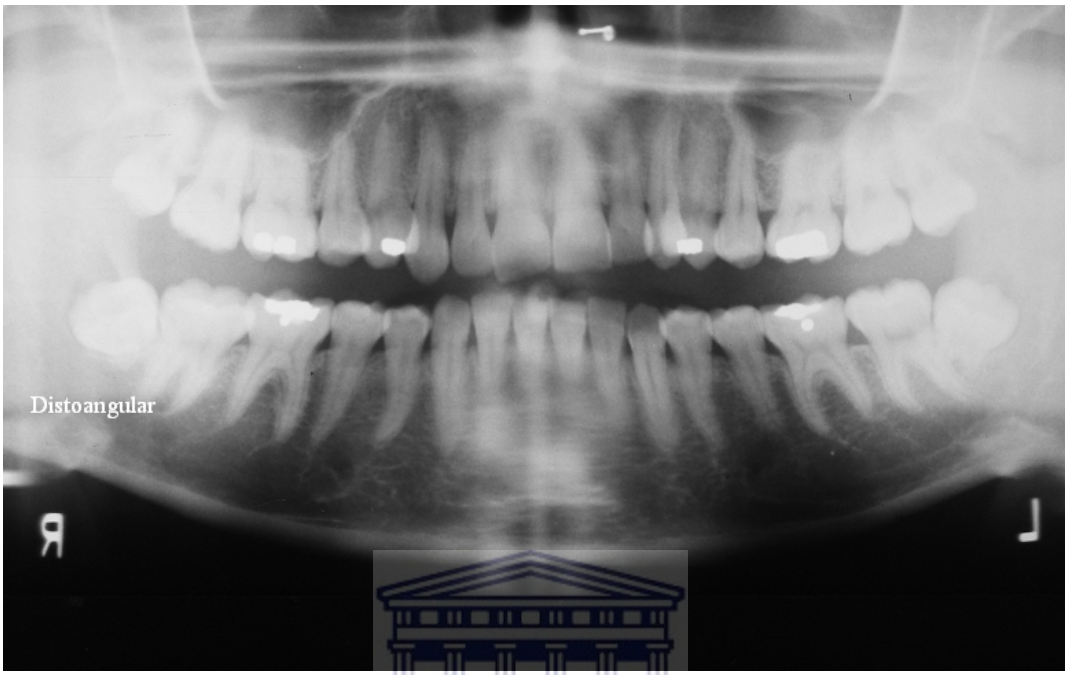

Figure showing distoangular mandibular impactions

APPENDIX 6

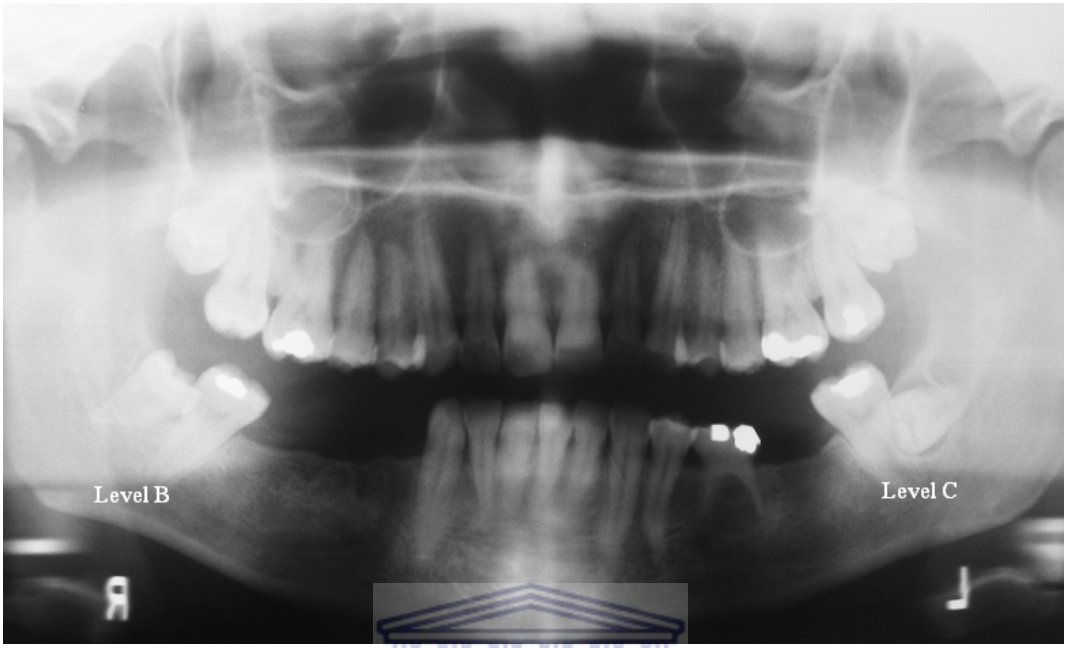

Figure showing different levels of mandibular impactions

APPENDIX 7

LETTER OF REQUEST FOR ACCESS TO THE PATIENTS FILES

10 May 2005

Dr H Carstens
C/o Dean / Manager
Faculty of Dentistry
UWC

Dear Dr. Carstens

Re: Access to patient records

I am currently doing an MSc Dent at the UWC. The title of the mini-thesis that I plan to do is "Radiographic Criteria for the prediction of symptomatic impacted mandibular third molars in the Western Cape, South Africa".

The planned research is a retrospective, record-based study. I have applied for the approval and registration of the protocol by the research committee of UWC.

I therefore kindly request your permission to access patient records at the institution. The patient's names will not be noted in the study. All clinical data will be used with discretion and confidentiality. No clinical files will leave the institution.

Thanks for your attention in the matter.

Yours sincerely

.....
DR EMAD EDDIN YACOB JUMA QIRREISH