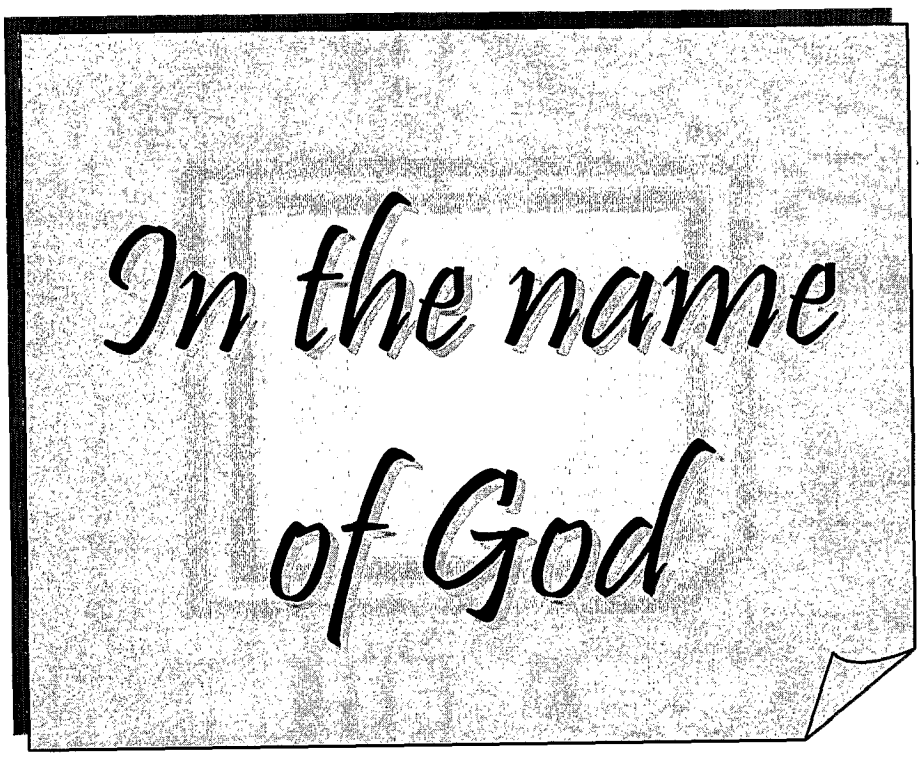

SHIRAZ UNIVERSITY OF MEDICAL SCIENCES
SCHOOL OF DENTISTRY

THESIS FOR THE PARTIAL FULFILMENT OF THE MASTER OF SCIENCE IN ORAL & MAXILLOFACIAL RADIOLOGY

ASSESSMENT OF RADIOGRAPHIC APPEARANCE OF MANDIBULAR INCISIVE CANAL IN PANORAMIC VIEW

INSTRUCTED BY:
Dr. SHOLEH SHAHIDI

CONSULTANT:
Dr. BARBAD ZAMIRI

BY:
Dr. SHAHRZAD ROOSTA

JUNE 2007

باسمه تعالی

دانشگاه علوم پزشکی شیراز
دانشکده دندانپزشکی

پایان نامه:

جهت دریافت درجه دکترای تخصصی دندانپزشکی

عنوان:

بررسی نمای پرتوشناختی کانال ثنایایی فک پایین در پرتونگاری پانورامیک

استاد راهنما:

سرکار خانم دکتر شعله شهیدی

استاد مشاور:

جناب آقای دکتر باربد ضمیری

نگارش:

دکتر شهرزاد روستا

خرداد ماه ۱۳۸۶

CONTENTS

Chapter 1

Introduction

Dentistry by its nature is a surgical branch of medicine. Performing anesthesia, tooth extraction and gingival curettage are some examples of invasive surgical procedures in this field.

So that, having trough knowledge of the anatomy of oral cavity and its associated structures is mandatory for all dentists.

Some parts of oral cavity are of more concern. Pterygomandibular fossa is an example.

One of the most critical anesthesia techniques (inferior alveolar nerve block) is performed in this area and many important anatomic structures are located in this area, such as inferior alveolar nerve and artery and medial pterygoid muscle.

By reviewing the literature and texts it is inferred conspicuously that many pathologic conditions occur in or near this part of the oral cavity, such as tumors, cysts and even dental caries and tooth impactions.

On the other hand, some areas of oral cavity are less appreciated, because of lower incidence of pathologic conditions in them. For example lower incisors have a lower rate of caries and in considering few exceptions such as CGCG and PCOD, most of the pathologic conditions are less common in the anterior mandible according to contemporary texts and literature.* This may result in inadequate appreciation to this area.

Although texts of oral cavity anatomy have explained the Mandibular Incisive Canal (MIC) as the continuation of inferior alveolar canal(1,2,3,4), many of dentists are unaware of its existence. (Fig.1)

A contributing factor may be inadequate ability of conventional radiographic views to display this anatomic structure.(5,6,7,8)

*According to the text: "Differential Diagnosis of ORAL and MAXILLOFACIAL LESIONS , wood & goaz" following pathologic conditions are usually located in the more posterior parts of the mandible: Ameloblastoma, OKC, Myxoma , COF,Pindborg tumor,metastatic lesions,...

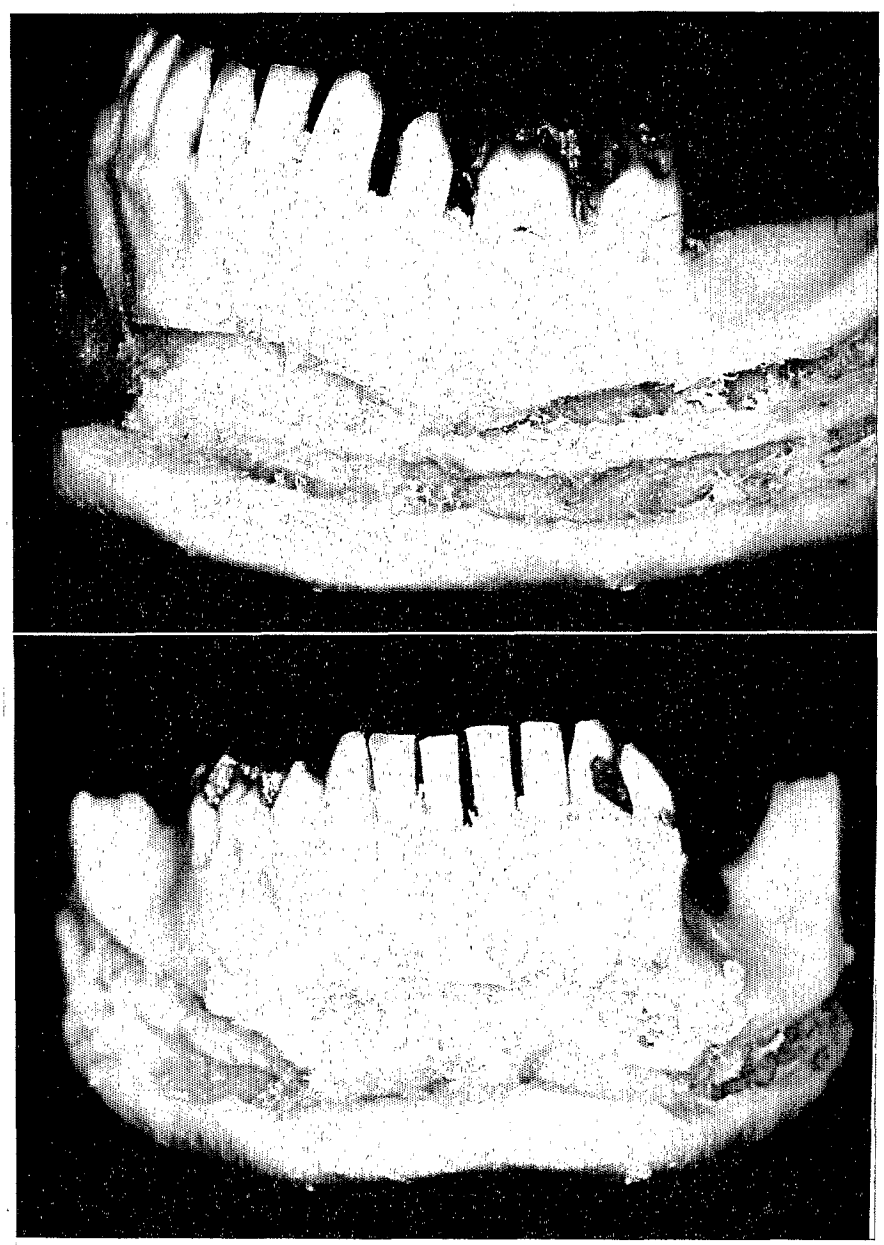

Fig.1 MIC, as continuation of IAC beyond mental foramen

Panoramic view is one of the most popular views in dentistry. Regrettably this view suffers from the superimposition of the cervical vertebrae on anterior mandible (1), which results in masking of the incisive canal.

Incisive canal is also hidden under the heavy bony tissues in periapical and occlusal views. Even mandibular inferior alveolar canal is not mentioned as a normal landmark of occlusal views.

All these, have resulted in an incorrect belief that anterior mandible is a safe area, far from vital, critical structures, by most of the dentists.(5,6)

Common surgical procedures performed in this region include bone harvesting from the chin, genioplasty in orthognatic surgery, screwing with or without plating after trauma of the anterior mandible and insertion of endosseous implants.(6)

Implantation and using new generations of implants, in increasing numbers, however changed many concepts and introduced new approaches in oral rehabilitation, which

involve mandibular anterior area much more commonly than ever.

Today symphyseal area is considered as an important site for implant placement. So that many operations are performed in this area routinely .In the light of the more recent development of placing full fixed prostheses supported by few implants , often located at the midline and just anterior to the mental foramen, anatomy should be revisited . For this particular concept , implying immediate loading , wider and longer implants (e.g. diameters of 4-5 mm) are most often required , enhancing the risks of involvement of the anatomic structures , especially those located in the cortical area. To avoid such complications , it is important to establish the presence , course , morphology , location and function of the incisive canal.(5)

Considering mandibular symphyseal area as a safe region has caused disastrous results in some operations.(5,6,9,10)

Unexpected severe hemorrhage, and sensory disturbances which have been observed as postsurgical complications, are not explainable with old believes.(5,9,10)

Another important complication resulted from interfering with MIC by implant fixture, is failure in osseointegration. Successful osseointegration requires the fixture to be covered by bone. If the fixture inserts into the canal , a gap will be created with the same width as the canal diameter around that part of the fixture .(6,7)

Confronting these complications, some authors started to review and reappreciate the anatomy of symphyseal area, in order to find an explanation.

In our study, we tried to determine the visibility of MIC in our population using panoramic view.

Panoramic view was chosen, because it is the most popular extraoral view, used by dentists.

Many dentists order this view as a preliminary screening view, because of its broad coverage, accessibility

and easiness of performance, acceptable patient dose and low cost. (1)

Some dentists rely on this view and deny other views even when other supplementary views are really needed.

Mandibular anterior area is superimposed by cervical vertebrae in panoramic views, especially in the cases of patients malpositioning (spine shadow ghost).(1)

On the other hand, the bone of mandible is thick and dense in the anterior area(1). These conditions hide the delicate MIC under a heavy radiopaque mask in panoramic views.

This means that there maybe an incisive canal in the area which can not be detected easily radiographically and we should become familiar with different manifestations of this canal and parameters that control its visibility to be able to detect this forgotten anatomic landmark.

Since 1997 , some researches have evaluated this area in various imaging techniques , such as panoramic , tomography and CT scanning , and different concepts have

been introduced about diagnostic value of panoramic technique.(5,6,7,8,11) Although CT scanning is the most exact imaging technique for detection of MIC(6) we tried to evaluate the good visibility of MIC in panoramic views, because panoramic views are the most widely used and familiar extraoral imaging modality in dental practice. If it is proved that panoramic view can serve in MIC detection , an easy accessible valuable source for MIC evaluation will be introduced.

Chapter 2

Review of the literature

The mandible

The mandible consists of horizontal, horseshoe-shape body and two vertical rami. The body of the mandible supports the mandibular teeth within the alveolar process. The rami of the mandible articulate with the temporal bones at the temporomandibular joints.(4)

The body of the mandible has important features on both the lateral and medial surfaces.

The lateral surface of the body of the mandible shows a ridge in the upper part of the midline, which represents the site of the mandibular symphysis. Close to the inferior margin of the body lies a distinct prominence, the mental protuberance.(4)

One each side of the protuberance are the mental tubercles. The mental protuberance and tubercles together comprise the chin. Above the mental protuberance lies a shallow depression called the incisive fossa. Posterior to this fossa, a canine eminence over lines the root of the

mandibular canine tooth. In the region of the premolar teeth is found the mental foramen. The mental branches of the inferior alveolar nerve and vessels pass on to the face through this foramen. Rarely, there may be multiple mental foramina. The alveolus forms the superior margin of the body of the mandible. The junction of the alveolus and ramus is demarcated by a ridge, the external oblique line. This ridge is continuous with the anterior border of the ramus and passes downwards and forwards across the body of the mandible to terminate below the mental foramen.(4)

The medial surface of the body of the mandible has two shallow depressions close to the midline on its inferior border. These are the digastric fossae, providing sites for the attachment of the anterior bellies of the digastric muscles. Above these fossa are the genial tubercles (mental spines). There are generally two inferior and two superior tubercles. They mark the sites of attachment of the geniohyoid and genioglossus muscles. Across the medial surface of the body of the mandible is a prominent ridge

called the mylohyoid line (internal oblique line). To this is attached the mylohyoid muscle. The ridge arises between the genial tubercles and the digastric fossa and increases in prominence as it passes backwards and upwards, to end on the anterior surface of the ramus. The surface of the mandible above and in front of the mylohyoid line presents a shallow depression in which lies the sublingual salivary gland. The depression is therefore called the sublingual fossa. The shallow concavity below the mylohyoid line is the submandibular fossa in which lies the superficial portion of the submandibular salivary gland. At the posterior end of the mylohyoid line is attached the pterygomandibular raphe.(4)

The alveolar process of the mandible continues upwards from the body. It consists of buccal and lingual alveolar plates joined by interdental and inter-radicular septa. Near the second and third molar teeth, the external

oblique line is superimposed upon the buccal alveolar plate.(4)

The ramus of the mandible meets the body of the mandible at an obtuse angle. The region where the inferior margin of the ramus meets the posterior margin is called the angle of the mandible. This area provides attachment for the masseter and medial pterygoid muscles and for the stylomandibular ligament. Superiorly are located the coronoid and condylar processes. These are separated by the mandibular notch. The lateral surface of the ramus is relatively featureless. It presents a surface for the attachment of the masseter muscle. In the centre of the medial surface of the ramus lies the mandibular foramen through which the inferior alveolar nerve and vessels pass into the mandibular canal. A bony process called the lingula extends from the anterosuperior surface of the foramen and gives attachment to the sphenomandibular ligament. A groove, the mylohyoid groove, runs down

from the postero-inferior surface of the mandibular foramen. Below and behind the mylohyoid groove, the medial surface of the ramus is roughened around the angle for the attachment of the medial pterygoid mescle. Running down from the tip of the coronoid process is a ridge called the temporal crest. This extends down to the bone just behind the third molar tooth. The triangular depression between the temporal crest and the anterior border of the ramus is called the retromolar fossa.(4)

The coronoid process lies anterior to the condylar process. It is a triangular plate of bone that gives attachment to the temporalis muscle.(4)

The condylar process varies considerably in terms of both shape and size. Its broad articular head joins the ramus through a thin bony projection called the neck of the condyle. The anterposterior dimension of the condylar head is approximately half the mediolateral dimension.(4)

The mandibular canal begins at the mandibular foramen and passes initially downwards and forwards in the ramus. It runs horizontally below the molar teeth in the body of the mandible. Near the premolar teeth, the canal bifurcates into incisive and mental canals. The narrow incisive canal continues forwards towards the midline beneath the incisor teeth. The mental canal runs upwards, outwards and backwards to open on to the face at the mental foramen.(4)

Ossification. The mandible ossifies in membrane from two centers that appear close to the site of the mental foramen during the sixth week of intra-uterine life. The two halves of the mandible are initially separated by a midline symphysis menti. With the disappearance of the symphysis at about two years of age, the mandible becomes a single bone.(4)

The mandible ossifies around the cartilages of the first branchial arches (Meckel's cartilages). Each cartilage