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EDITOR'S DESK

I am very happy to being a part of Desh Bhagat University Dental Journal "International Journal of Dental Sciences & Research" as editor-in-chief. I am fortunate to have team of well renowned, efficient, sincere national and international peer- reviewers, research scholars, editorial board members, and the office bearers to be the part of this journal. I am pleased to introduce the 2nd issue for 3rd volume of our journal under the guidance of Chancellor 'Dr Zora Singh', Pro Chancellor 'Dr Tajinder Kaur', Vice Chancellor 'Prof. (Dr.) Abhijit H Joshi, Principal 'Dr. Vikram Bali' Dean Academics 'Dr. Sunil Malhan.'

Our journal is a constructive platform to improve the quality and competitiveness of the manuscript, providing readers with most comprehensive and reliable information in advanced areas of dental sciences. The journal primarily caters to the needs of the dentistry through various multi-disciplinary publications. We publish original research investigations, review articles (systematic and narrative), short communications, editorials, case reports and letters to the editor on basic and clinical issues in dentistry.

I sincerely thank all the authors, reviewers, editorial board members, office bearers of the journal and readers for extending their continuous support and cooperation in bringing out this issue of the year 2023 successfully. Needless to say, any papers that you wish to submit, either individually or collaboratively, are much appreciated and will make a substantial contribution to the early development and success of the journal. I seek support of all interested faculty members, students, institutions and practitioners to give their inputs, comments and valuable suggestions that will improve our Journal's standards and reputation as a reliable source of high-quality information in the field of dentistry.

DR. VIKRAM BALI
Editor-in -chief

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HEMISECTION : A CASE REPORT

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Abstract
Advances in dentistry, as well as the increased desire of patients to maintain their dentition, have lead to treatment of teeth that once would have been removed. In order to carry out this present day mandate, periodontally diseased teeth with severe bone loss may well be retained by removal of one or more of their roots. This article describes a simple procedure for hemisection in mandibular molar and its subsequent restoration.
Keywords: Hemisection, periodontal diseases, endodontics.

Introduction

Modern advances in all phases of dentistry have provided the opportunity for patients to maintain a functional dentition for lifetime. Therapeutic measures performed to ensure retention of teeth vary in complexity. The treatment may involve combining restorative dentistry, endodontics, and periodontics so that the teeth are retained in whole or in part. Such teeth can be useful as independent units of mastication or as abutments in simple fixed bridges. Continued periodontal breakdown may lead to total loss of tooth unless these defects can be repaired or eliminated and health of the tissues restored. Thus tooth resection procedures are used to preserve as much tooth structure as possible rather than sacrificing the whole tooth[1]. The term tooth resection denotes the excision and removal of any segment of the tooth or a root with or without its accompanying crown portion. Various resection procedures described are : root amputation, hemisection, radisection and bisection. Root amputation refers to removal of one or more roots of multirooted tooth while other roots are retained.

Hemisection denotes removal or separation of root with its accompanying crown portion of mandibular molars. Radisection is a newer terminology for removal of roots of maxillary molars. Bisection / bicuspidization is the separation of mesial and distal roots of mandibular molars along with its crown portion, where both segments are then retained individually.[2]

Weine[2] has listed the following indications for tooth resection

Periodontal Indications:

1. Severe vertical bone loss involving only one root of multi-rooted teeth.
2. Through and through furcation destruction.
3. Unfavourable proximity of roots of adjacent teeth, preventing adequate hygiene maintenance in proximal areas.
4. Severe root exposure due to dehiscence.

Indications

1. Prosthetic failure of abutments within a splint: If a single or multirooted tooth is periodontally involved within a fixed bridge, instead of removing the entire bridge, if the remaining abutment support is sufficient, the root of the involved tooth is extracted.[3]
2. Endodontic failure: Hemisection is useful in cases in which there is perforation through the floor of the pulp chamber, or pulp canal of one of the roots of an endodontically involved tooth which cannot be instrumented.
3. Vertical fracture of one root: The prognosis of vertical fracture is hopeless. If vertical fracture traverses one root while the other roots are unaffected, the offending root may be amputed.
4. Severe destructive process: This may occur as a result of furcation or sub. gingival caries, traumatic injury, and large root perforation during endodontic therapy.

Contraindications;

1. Strong adjacent teeth available for bridge abutments as alternatives to hemisection.
2. Inoperable canals in root to be retained.
3. Root fusion-making separation impossible.

Case report;

A 32 years old man reported to the Department of Conservative Dentistry and Endodontics, Desh Bhagat Dental College and Hospital, Mandi Gobindgarh, Punjab with the chief complaint of pain and mobility of right mandibular first molar. On examination, the tooth was sensitive to percussion and revealed grade 2 mobility. On probing the area, there was a 9 mm deep periodontal pocket around the mesial root of the tooth.

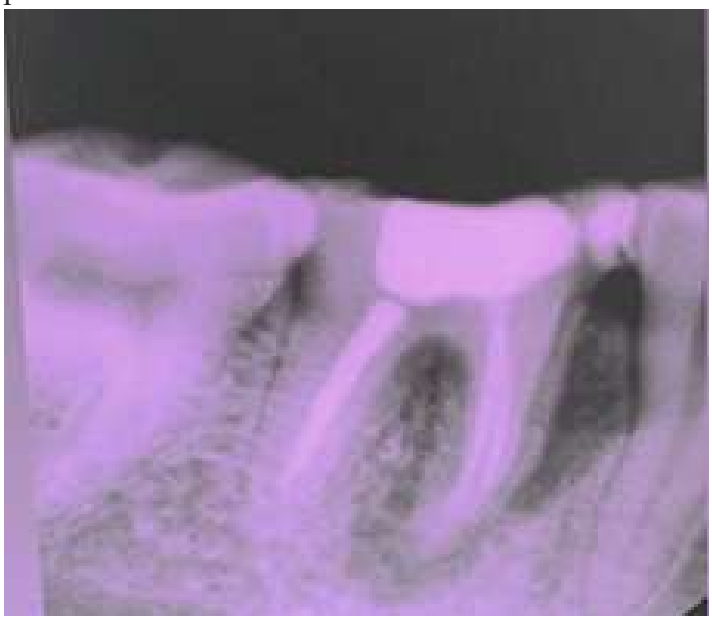

Figure No.1: Pre-operative X~-ray

On radiographic examination, severe vertical bone loss and a lesion was evident surrounding the mesial root and involving the furcation area. The bony support of distal root was completely intact. It was decided that the mesial root should be hemisected after completion of endodontic therapy of the tooth[4].

The working length was determined and the canals were biomechanically prepared using step back technique. The canals were obturated with lateral condensation method.

Under local anesthesia, full thickness flap was reflected after giving a crevicular incision from first premolar to second molar. Upon reflection of the flap, the bony defect along the mesial root became quite evident. All chronic inflammatory tissue was removed with curets to expose the bone. The vertical cut method was used to resect the crown. A long shank tapered fissure carbide bur was used to make vertical cut toward the bifurcation area.

Figure No.2: Hemisectioning

A fine probe was passed through the cut to ensure separation. The mesial root was extracted and the socket was irrigated adequately with sterile saline to remove bony chips.

The furcation area was trimmed to ensure that no spicules were present to cause further periodontal irritation.

Figure No.3: X – RAY of Sectioned tooth

The extraction site was irrigated and debrided and the flap was then repositioned and sutured with black silk sutures.

Figure No.4: Extracted mesial root

Figure No.5: Suturing

Discussion

Success of root resection procedures depend, to a large extent, on proper case selection. It is important to consider the following factors before deciding to undertake any of the resection procedures.

As with any surgical procedure, it can cause pain and anxiety. Root surfaces that are reshaped by grinding in the furcation or at the site of hemisection are more susceptible to caries. Often a favourable result may be negated by decay after treatment. Failure of endodontic therapy due to any reason will cause failure of the procedure[5].

It is important to consider the following factors before deciding to undertake any of the resection procedures.

1. Advanced bone loss around one root with acceptable level of bone around the remaining roots.
2. Angulation and position of the tooth in the arch. A molar that is buccally, lingually, mesially or distally titled, cannot be resected[6].
3. Divergence of the roots - teeth with divergent roots are easier to resect. Closely approximated or fused roots are poor candidates.
4. Length and curvature of roots - long and straight roots are more favourable for resection than short, conical roots[7].
5. Feasibility of endodontics and restorative dentistry in the root/roots to be retained[8].

In the case reported, various aspects of occlusal function such as location and size of contacts and the steepness of cuspal inclines may have played a significant role in causing mobility before treatment.

During treatment, occlusal contacts were reduced in size and repositioned more favorably. Lateral forces were reduced by making cuspal inclines less steep and eliminating balancing incline contacts.

Conclusion

The prognosis for hemisection is the same as for routine endodontic procedures provided that case selection has been correct, the endodontics has been performed adequately, and the restoration is of an acceptable design relative to the occlusal and periodontal needs of the patient.

Root amputation and hemisection should be considered as another weapon in the arsenal of the dental surgeon, determined to retain and not remove the natural teeth. With recent refinements in endodontics, periodontics and restorative dentistry, hemisection has received acceptance as a conservative and dependable dental treatment and teeth so treated have endured the demands of function.

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LASER SAFETY AND PRECAUTIONS: A REVIEW

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Abstract
Lasers have been suggested as an adjunctive or alternative to conventional techniques for various periodontal procedures and considered superior in respect to easy ablation, decontamination, and hemostasis along with less operative and post-operative pain. Introduction of lasers in implant therapy and newer laser technical modalities has revolutionised the periodontal treatment outcome with patient acceptance. Lasers emitting radiation in the visible and infrared regions produce effects that vary from a mild reddening to blisters and charring. These conditions are usually repairable or reversible however depigmentation, ulceration, and scarring of the skin and damage to underlying organs may occur from extremely high powered lasers. So to prevent this, we should be carefull and follow all patient safety measures to prevent sufferings to patient and operater as well.
Keywords : Laser, safety, treatment, hazards

Introduction

Non-surgical therapy by mechanical instrumentation is the primary recommended approach to control periodontal infection. Because conventional therapies result in wounding of the already inflamed periodontal tissues, the consequence of such therapeutic procedures depends largely on the cellular and molecular events associated with wound healing.[1] Although surgical and non-surgical approaches, such as scaling and root planing, are still regarded as important and useful modalities, but such instrumentation appears to demand considerable clinical skills, time, and may be limited by root anatomy and often precludes the achievement of the desired biologically compatible prognosis, it is essential to improve further possibilities.[2]

In the last decade, applying lasers as an adjunctive or alternative to current mechanical treatment had a great run in the treatment of periodontal diseases. The commonly used high power laser CO2 and Nd: YAG is capable of excellent soft tissue ablation and has adequate haemostatic effect.[3]

Patient Safety

The patient is anesthetized or sedated during the surgical procedure. Therefore, the ability of the patient to warn the surgeon of possible injury is impeded or removed. Hence, all efforts for the safety must be directed toward prevention of possible complications. This includes the use of noninflammable materials where possible. Laser resistant shielding materials are available for the surgical field and for protecting the anesthesia equipment. Certain adjustments in the anesthesia technique may also decrease the potential hazards.[4]

Personnel Safety

Personnel working in the laser environment can be at risk for injury. Similar patterns of injury from the laser occur in the workers as in the patients. However, because the operating room personnel are awake, they should be able to be aware of an injury situation that develops. Once aware, they should correct the problem and thereby prevent or minimize the injury.

Absolute rules for the safety of the personnel are as follows:

1. Post signs that lasers are being used. These signs should:
a. Describe the type of laser.
b. Indicate the risk class of the laser.
c. Indicate the required safety equipment for personnel.
d. State that if unprotected personnel enter the area, the laser is to be turned off.
2. Eye shields must be worn at all times by all personnel.
3. Safety shield must be used.
4. A bucket of sterile water should be immediately available in the operating room.
5. A laser safety officer must be stationed at the laser at all the times.
6. Safety orientation for laser use should be required of all surgeons, anesthesia personnel, and operating room staff.
7. Credentialing of surgeons for use of each type of laser and laser apparatus is needed.

Laser safety considerations in periodontology

Properly used by an experienced operator and in a re-

stricted area, the laser is a very safe instrument. The manufacturers have taken great measures to provide a wide margin of safety in the products recommended for dental use, with fail-safe default mechanisms to eliminate accidental exposure. However, certain safety measures must be strictly adhered to in the dental operatory. [5,6]

Fig.1. Types of Laser Safety Signs And Labels

When the laser is in use for any purpose, the access to the operatory should be restricted, a caution sign should be posted and all personnel involved in the treatment, including the patient, must have eye protection. For the CO2 laser operation, regular safety glasses with clear lenses are sufficient. The patient should wear safety glasses or have the eyes covered with moist gauze if sedated. The Nd:YAG laser operation requires special dark green lenses for the safety glasses that protect in the blue-green spectrum. Caution should also be taken near reflective surfaces, since the laser beam may be reflected off dental mirrors or instruments and hit other intraoral sites. The innovations in laser equipment laser modified for dental use have significantly reduced the need for a special aiming light with the C02 laser, since the flexible wave guide allows a focused beam at 2-4 mm from the target tissue (Luxar Corporation, Bothell, WA). The Nd:YAG laser using the flexible quartz optical fiber in a noncontact mode is also held within a few millimeters of the target tissue. Since the Nd:YAG laser beam is invisible, a coaxial red helium neon laser provides a visible light for the laser (American Dental Laser, Troy, MI). Additional safety standards for fire prevention become necessary when the laser is used in conjunction with general anesthesia and should be reviewed prior to use in the operating room.[5]

Fig.2. Protective Eyeglasses Used For Different Lasers Depending on the Wavelength of the Laser Beam

Laser vaporous byproducts (laser plume) are generated as smoke once the vaporization of the tissue surface occurs. The plume has been shown to contain particles with mean diameters of 0.1-0.3 pm, and within this plume of carbonized tissue, viable tumor cells and viral particles have been cultured. Animal studies have shown respiratory pathology from laser plume effects to both the CO2 and Nd:YAG lasers. Baggish et al. have also demonstrated in vitro that human immunodeficiency virus (HIV) pro-viral DNA was present in the laser smoke and collected in the evacuation tubing in their laboratory study. Wearing a surgical mask and using high-speed evacuation is essential for infection control, but the standard dental surgical mask does not filter out particles less than 0.5 pm. A new generation of laser surgical masks are now available that will filter to 0.1-pm particles. There are also evacuation systems with filtration for submicron particles that will increase the safety of laser use for biohazardous waste. The Ad Hoc Committee for the American Society for Laser Medicine and Surgery gives the following guidelines concerning hazards of laser plume: 1) all laser personnel should consider the laser plume to be potentially hazardous both in terms of the particulate matter and infectivity, 2) evacuator suction systems with high flow volume and frequent filter changes should be used at all times to collect the plume, the suction tip should be held within 2-5 cm of the laser impact and 3) eye protection, masks, gloves and gowns should be always

worn during laser use by all personnel, ensuring that the eyewear protects from splatter, the mask should have good effective filtration and the gloves should preferably be latex.[5]

Conclusion

Laser safety should also include the protection of tooth structure adjacent to the impact site. As mentioned previously in this review, the effects of laser irradiation on enamel or root surfaces can be detrimental when the focused mode is used for soft tissue ablation. Placing a periodontal retractor between the tooth and gingiva while attempting to hit the surface at a 90° angle will afford the best protection during soft tissue removal. It will also be essential to know the appropriate energies of each kind of laser. Application comfort, the silence, anesthesia reduction and other such advantages make lasers attractive for society and professionals. To use lasers safely in a clinic, the practitioner should have precise knowledge of the characteristics and effects of each laser system and their applications as well as a full understanding of the conventional treatment procedures.[6]

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COVID-19 INFECTION – AN OVERVIEW

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Abstract
Coronavirus disease is an infectious disease which is caused by the SARS- CoV-2 virus. It is highly contagious diseases producing severe acute respiratory syndrome and had a catastrophic impact on the world. It resulted in millions of deaths worldwide. First case was reported in Wuhan, Hubei Province, China in 19th December, 2019, after that it rapidly spread out worldwide. Due to its worldwide spread, WHO declared it a global pandemic on 11th March, 2020. With the emergence of a novel coronavirus in Asia, public concerns have awakened regarding emerging viral threats and the potential for the next pandemic. By taking precautions, its spread can be reduced and taking proper care, severity of diseases may be decreased. In this article we will discuss about pathogenesis, diagnosis and, treatment for COVID-19 infection.
Keywords: COVID-19, WHO, respiratory syndrome, American Dental Association.

Introduction

Coronavirus disease is an infectious disease which is caused by the SARS- CoV-2 virus. It is highly contagious diseases producing severe acute respiratory syndrome and had a catastrophic impact on the world. It resulted in millions of deaths worldwide. First case was reported in Wuhan, Hubei Province, China in 19th December, 2019, after that it rapidly spread out worldwide. Due to its worldwide spread, WHO declared it a global pandemic on 11th March, 2020.[1]

The COVID-19 comes under the family of single-stranded ribonucleic acid (RNA) viruses called Coronaviridae.[2] These viruses are believed to spread from animals to humans and it was reported that this novel coronavirus has a resemblance to coronavirus species found in bats, making it zoonotic in nature.[3] This virus belongs to same family which was linked to severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) which were discovered in 2002 and 2012, respectively.[4] The name severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was given by The International Committee on Taxonomy of Viruses.[5] The other popular name that is COVID-19 was given due to the similarity of its published genome sequence with that of b -corona viruses like SARS-CoV and MERS-CoV.[3]

SARS-CoV-2 virus adapted with genetic evolution and developing mutations similar to other RNA viruses results in various characteristics which are different than their ancestral strains. Several variants of SARS-CoV-2 have been reported during the course of this pandemic. On the basis of epidemiological update by the WHO, following are the five variants of concern:

1. Alpha (B.1.1.7): First variant of concern, which was described in the United Kingdom (UK) in December 2020.[6]
2. Beta (B.1.351): First found in South Africa in December 2020.[6]
3. Gamma (P.1): Firstly reported in Brazil in early January 2021.[6]
4. Delta (B.1.617.2): First reported in India in December 2020.[6]
5. Omicron (B.1.1.529): First reported in South Africa in November 2021.[7]

In humans, the SARS-CoV-2 can be found in salivary and nasopharyngeal secretions and can spread via direct contact or respiratory droplets. Dentists are at higher risk of catching this infection as most of dental procedures involve production of aerosols.[5] The common modes of transmission of infection in a dental clinic are[5]:

- Cross infection from aerosols
- Contact with blood and saliva.
- Injury from sharp instruments and needles
- Touching contaminated surfaces
- Inhalation of respiratory droplets
- Inappropriate use of personal protective equipment

However, the number of deaths reported in England and Wales between March and December 2020, was not significantly higher which led to the conclusion that there is low infection rate among dentists that might be due to the meticulous safety protocols followed in dental clin-

ics. The American Dental Association (ADA), as well as most European dental organizations, recommended prescreening of patients before visiting the dental clinic, suggested only one patient at a time in the waiting room of dental clinic, measuring staff and patients' temperatures, hand washing and sanitizing, make sanitizer easily available to patients, disinfection of all surfaces, to use personal protection equipment for the medical team, disposable shoe covers for patients, use of UV lamps and other air purifiers and high-efficiency aspiration during treatment procedures in the dental clinic.[8]

Pathophysiology

COVID- 19 infection transmission occurs through respiratory droplets. Faecal-oral transmission is also possible. Vertical transmission of infection has also been observed. It is confirmed that virus is present in sputum, pharyngeal swabs and faeces. Most of patients develop symptoms within 11.5 to 15.5 days after exposure. So, it is advised to quarantine the person for 14 days if he/she has been exposed to infection. The average incubation period of COVID-19 is 5.2 days.[9,10]

The actual mechanisms which are responsible for long-term complications of COVID-19 infection are not clear. There is complex of multiple pathophysiological mechanisms for progression of COVID-19 infection. Possible pathophysiological mechanisms may include direct viral tissue damage; the entry receptor for SARS-CoV-2, angiotensin-converting enzyme 2 (ACE2), is expressed in a variety of locations in the body allowing the virus to enter target cells through activation of its spike protein by transmembrane serine protease[2]. These receptors are expressed in various sites in body including epithelial cells, nasal goblet cells, gastrointestinal epithelial cells, pancreatic β cells, and renal podocytes suggesting that direct tissue damage may be a primary mechanism for complications resulted from SARS-CoV-2 infection. Studies early in the pandemic revealed that endothelial cells had high expression of ACE2 and that COVID-19 infection led to substantial alteration to the integrity of the vessel barrier and promotion of a procoagulative state. The long-term sequelae of these changes have been observed in follow-up studies of survivors of COVID-19, revealing pulmonary radiological abnormalities in 71% of patients and functional abnormalities in 25% of patients.

It was observed that there is complex of multiple pathophysiological mechanisms for progression of COVID-19 infection which are: direct cytopathic effects of SARS CoV 2, angiotensin converting enzyme 2 (ACE2) down regulation with subsequent renin–angiotensin–aldosterone system (RAAS) disbalance and a dysregulated immune response featuring a 'cytokine storm' coagulopathy associated with exocytosis of procoagulatory factors, thrombotic microangiopathy – probably caused by virus induced endothelial injury, complement activation, and cytokine effects and uncontrolled localised and/or systemic 'immunothrombosis' and autoimmunity.[11,12]

Symptoms

People who have COVID-19 infection can suffer from a variable symptoms and illness ranging from mild to severe intensity. Sometimes they may have no symptoms at all.

The most common symptoms occur in COVID-19 patients are:

- Fever or chills
- Sore throat, cough and shortness of breath.
- Fatigue, body aches and headache.
- Loss of taste or sense of smell.
- Congestion or runny nose.
- Gastrointestinal symptoms including nausea or vomiting and diarrhea.[12]

Children mostly have fever and cough after infection. However, children may have any of other symptoms similar to adults.[13]

Complication caused by COVID-19

Pulmonary complications

COVID-19 infection leads to various long-term pulmonary complications such as acute respiratory failure, pneumonia, chronic obstructive pulmonary disease (COPD), pulmonary embolism, dyspnea, ventilator dependence, pulmonary fibrosis, pulmonary hypertension,Cystic fibrosis, oxygen dependence, pulmonary function test (PFT) abnormalities, and fibrotic lung disease.[14]

In COVID -19 patients, the most common cause of death is acute respiratory failure, as in acute respiratory failure lungs are unable to pump sufficient oxygen into blood or also may not take enough carbon dioxide out. Severe pneumonia occurs in both lungs of infected person and it is serious illness and can be deadly. In pneumonia, air sacs in lungs become inflamed resulting in difficulty in breathing. In increased illness lungs get filled with fluid, pus and cell debris. These patients, are not able to transfer oxygen to the blood to keep their systems working properly.

Acute respiratory distress syndrome (ARDS) is most common complication of COVID-19. In patients with ARDS, the lungs are so severely damaged that fluid be-

gins to leak into them, due to that body has trouble in getting oxygen into the bloodstream. In such conditions patient may need mechanical help to breathe such as a ventilator till the recovery of lungs.[15]

Cardiovascular complications

COVID -19 infected patients hospitalized have suffered from heart problems. Xiong et al explained that myocyte injury resulted from increased metabolic demands induced by viral inflammation which become challenge for a weak heart. In pathological analysis it was reported that there is neither direct viral invasion of the virus to heart tissue nor lymphocytic infiltration. But autopsy analysis of patients reported myocyte necrosis suggesting invasion of SARS-CoV-2 into the pericytes and cause micro-circulation dysfunction.

Cardiomyopathy and cardiac arrhythmia also observed in COVID -19 patients. Higher sympathetic nervous system activity resulted from myocarditis and pro-inflammatory state, hypoxia, hypotension, ACE 2-receptors downregulation, drug toxicity/interaction, all these factors could lead to occurrence of cardiac arrhythmia or they aggravate arrhythmias.[16]

Diagnosis

RT PCR is a diagnostic test that uses nasal swab, tracheal aspirate or bronchoalveolar lavage (BAL) specimens. The primary, and preferred, method for diagnosis is the collection of upper respiratory samples via nasopharyngeal and oropharyngeal swabs. The use of bronchoscopy as a diagnostic method for COVID- 19 is not recommended as the aerosol that is generated, poses a substantial risk for both patients and healthcare staff. Bronchoscopy can be considered only for intubated patients when upper respiratory samples are negative and other diagnostic tools would significantly change the clinical management. However, bronchoscopy may be indicated when clinical and safety criteria are met and in the case of uncertain diagnosis.[17] Alternatively, tracheal aspiration and nonbronchoscopic BAL can be used to collect respiratory specimens in intubated patients.[18]

Zou et al. found that the levels of SARS CoV-2 RNA were higher in samples collected from the upper respiratory tract in the first 3 days after symptom onset, and high levels of SARS CoV-2 RNA were also found in samples collected from upper respiratory tract samples from an asymptomatic patient.[19]

Laboratory test

The most common laboratory abnormalities reported on admission amongst hospitalized patients with pneumonia included leucopenia (9–25%) or leukocytosis (24–30%), lymphopenia (63%) and elevated levels of alanine aminotransferase and aspartate aminotransferase (37%).[20,21] Increased inflammation indices, usually including reduced procalcitonin and increased C-reactive protein (CRP) levels, are associated with clinical severity. Young et al. observed an average CRP level of 1.1 mg/dL in patients with normal percentage oxygen saturation (SatO2) and of 6.6 mg/dL in hypoxemic patients.[21] Moreover, Ruan et al.[22] observed a correlation between CRP and mortality risk. Increased troponin was also reported in 7% of patients who subsequently died because of fulminant myocarditis.[23] Troponin appears to be a strong prognostic indicator of mortality. Finally, it was noticed that D-dimer and ferritin levels were usually high in hospitalized patients.

Radiological findings

Typical CT findings in individuals with COVID-19 were ground-glass opacities, particularly on the peripheral and lower lobes, and bilateral multiple lobular and sub segmental areas of consolidation, especially in ICU patients.[24] The number of lung segments involved was found to be related to disease severity. These opacities tended to flow together and thicken with progression of the disease. Non typical CT findings included pleural effusion (only about 5%), masses, cavitations and lymphadenopathies; therefore, these would suggest alternative diagnoses.[25]

Treatment

Many people with COVID-19 may have mild illness and can be treated with supportive care. Supportive treatment is aimed at relieving symptoms, these are:

- Pain relievers, such as ibuprofen or acetaminophen.
- Cough syrup or medicine.
- Rest.
- Fluid intake.

The FDA has approved the antiviral medicine remdesivir to treat COVID-19 in adults and children who are age 12 and older in the hospital. Remdesivir may be given to patients who are hospitalized with COVID-19 and need supplemental oxygen or have a higher risk of serious illness. It's given to patients through a needle in the vein.

Paxlovid is another medicine approved to treat COVID-19 in adults. It includes nirmatrelvir, a drug that blocks the activity of a specific enzyme needed for the virus that causes COVID-19 to replicate and an an-

tiviral drug called ritonavir that helps to slow the breakdown of nirmatrelvir. Paxlovid continues to be available under emergency use authorization to treat mild to moderate COVID-19 in people age 12 and older who are at higher risk of serious illness. Paxlovid tablets are taken by mouth.

The FDA also has approved the rheumatoid arthritis drugs such as baricitinib and tocilizumab to treat COVID-19 in some cases. Baricitinib is a tablet which seems to work against COVID-19 by reducing inflammation and having antiviral activity. Tocilizumab is an injection which works against COVID-19 by reducing inflammation. Both medicines may be used for patients in the hospital with COVID-19 who are on mechanical ventilators or need supplemental oxygen.

The FDA has authorized another drug called molnupiravir to treat mild to moderate COVID-19 in adults who are at higher risk of serious illness and who aren't able to take other treatment options. The medicine is taken by mouth as a pill.

The U.S. National Institutes of Health has recommended the corticosteroid dexamethasone for people hospitalized with severe COVID-19 who are on supplemental oxygen or need mechanical ventilation. Other corticosteroids, such as prednisone, methylprednisolone (Medrol) or hydrocortisone, may be used if dexamethasone isn't available.[26]

Precautions for prevention of COVID-19 infection

1. Washing hands frequently and carefully

Washing hands several times a day, especially after touching anything, including phone or laptop. It is recommended to use warm water and soap and rub hands for at least 20 seconds. Work the lather to wrists, between fingers, and under fingernails. Antibacterial and antiviral soap can be used. Use hand sanitizer when washing hands is not possible.

2. Avoid touching face

SARS-CoV-2 can live on some surfaces for up to 72 hours. So one can get the virus on his/her hands on touching a surface such as gas pump handle, cell phone, a doorknob etc. So avoid touching any part of face or head, including mouth, nose, and eyes after touching such things. Also avoid biting fingernails. This can give SARS-CoV-2 a chance to go from hands into body.

3. Stop shaking hands and hugging people

Similarly, avoid touching other people. Skin-to-skin contact can transmit SARS-CoV-2 from one person to another.

4. Don't share personal items

Do not share personal items like phones, makeup and combs etc. It's also important not to share eating utensils and straws.

5. Cover mouth and nose during coughing and sneeze

SARS-CoV-2 is found in high amounts in the nose and mouth. This means it can be carried by air droplets to other people when someone cough, sneeze, or talk. It can also land on hard surfaces and stay there for up to 3 days. So one should use a tissue or sneeze into elbow to keep hands as clean as possible.

6. Clean and disinfect surfaces

Use alcohol-based disinfectants to clean hard surfaces in home such as countertops, door handles, furniture, and toys. Also, one should clean phone, laptop, and anything else which is used regularly several times a day. Disinfect areas after bringing groceries or packages into home.

7. Take physical (social) distancing seriously

Physical (social) distancing, also means staying home and working remotely when possible.

If one has to go out for necessities, should keep a distance of 6 feet (2 m) from other people as infected person can transmit the virus by speaking to someone.

8. Wash fresh groceries

Wash all products under running water before eating or preparing. Be sure to wash hands before and after handling these items.

11. Wear a (homemade) mask

The Centers for Disease Control and Prevention (CDC) recommends that almost everyone wears a cloth face mask in public settings where physical distancing may be difficult, such as grocery stores. When used correctly, these masks can help to prevent people who are asymptomatic or undiagnosed from transmitting SARS-CoV-2 when they breathe, talk, sneeze, or cough. This, in turn, slows the transmission of the virus.

Some pointers to keep in mind:

- Wearing a mask alone will not prevent from getting a SARS-CoV-2 infection. Careful handwashing and physical distancing must also be followed.
- Cloth masks aren't as effective as other types of masks, such as surgical masks or N95 respirators.

However, these other masks should be reserved for healthcare workers and first responders.
- Wash hands before put on the mask.
- Wash mask after each use.
- One can also transfer the virus from the mask to his/her hands. So wash hands after touching the front of the mask.
- A mask shouldn't be worn by a child under 2 years old, a person who has trouble breathing, or a person who can't remove the mask on their own.

9. Self-quarantine if sick

One should call doctor if having any symptoms. Stay home until recovery and that person should avoid sitting, sleeping, or eating with loved ones even living in the same home.

Why are these measures so important?

Following the guidelines diligently is important because SARS-CoV-2 is different than other coronaviruses, including the one it's most similar to, SARS-CoV.

Ongoing medical studies show exactly why we must protect ourselves and others from getting a SARS-CoV-2 infection.

Here's how SARS-CoV-2 may cause more problems than other viruses:

Someone may not have symptoms

Sometimes person can carry or have a SARS-CoV-2 infection without any symptoms at all. This means he/she may unknowingly transmit it to more vulnerable people who may become very ill.

It has a longer incubation time

SARS-CoV-2 may have a longer incubation time. This means that the time between getting the infection and developing any symptoms is longer than other coronaviruses. According to the CDCT rusted Source, SARS-CoV-2 has an incubation period of 2 to 14 days. This means that someone who's carrying the virus may come into contact with many people before symptoms begin.

Patient may get sicker, faster

SARS-CoV-2 may make patient more unwell much earlier. Viral loads were highest 10 days after symptoms began for SARS CoV-1. In comparison, doctors in China who tested 82 people with COVID-19 found that the viral load peaked 5 to 6 days after symptoms began. This means that the SARS-CoV-2 virus may multiply and spread in someone who has COVID-19 disease almost twice as fast as other coronavirus infections.

Virus can stay alive in the air

Lab tests showed that both SARS-CoV-2 and SARS-CoV can stay alive in the air for up to 3 hours. Other hard surfaces like countertops, plastics, and stainless steel can harbor both viruses. The virus may stay on plastic for 72 hours and 48 hours on stainless steel. SARS-CoV-2 can live for 24 hours on cardboard and 4 hours on copper — a longer time than other coronaviruses.

Patient may be very contagious

Even if patient do not have symptoms, can have the same viral load (number of viruses) in the body as a person who has severe symptoms.

This means patient may be just as likely to be contagious as someone who has COVID-19. In comparison, other previous coronaviruses caused lower viral loads and only after symptoms were present.[27]

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CEPHALOMETRY IN ORTHODONTICS – AN OVERVIEW

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Abstract
Orthodontic records are an essential supplement to history and clinical diagnosis for the formulation of a comprehensive treatment plan. Cephalograms are one among these records. From cephalometric analysis one can check the position, size of jaws and their relation with each other. Also it these give information regarding proclination, retroclination of teeth and growth pattern of patient. Cephalograms are also used to evaluate treatment results by comparing pre and post treatment cephalometric values of patient. As malocclusion may be skeletal of dental in origin. For appropriate treatment one should aware about the actual problem of patient which may be related to discrepancy in jaws or dentition in both the arches. Cephalometric analyses help in diagnosing which part of face is at fault and need correction. Thus cephalograms are useful in orthodontics as providing information for diagnosis and treatment planning.
Keywords: Cephalograms, Steiner's analysis, Tweed's analysis, diagnosis, treatment plan.

Introduction

Orthodontic records are an essential supplement to history and clinical diagnosis for the formulation of a comprehensive treatment plan. Records in medicine, in general and orthodontics, in particular, are of greater significance since they are the only evidence of pre-treatment occlusion, which is irreversibly altered by the treatment.[1]

The records are essential to back reference and analyse treatment outcome, success and failures. They are the most reasonable evidence to patient–doctor and medico legal disputes. Records are most useful aid in education and research. The production, retention and archiving of precise and accurate patient records is an essential part of the orthodontists' professional responsibility. Records must be permanent, lasting, durable and should remain unaltered.[2] The vital information required to diagnose a malocclusion and develop an orthodontic treatment plan consists of a record of detailed history, clinical examination and other essential diagnostic investigation records.

These include the 3D imprint of the existing malocclusion/occlusion through study models or intraoral scans, the face in profile through photographs, craniofacial skeleton through cephalograms and status of dentition via X-ray (s). Additional investigations must be performed in cases of complex situations.

The essential or minimum diagnostic records:

The minimum set of orthodontic records includes study models, clinical photographs, panoramic and lateral cephalometric X-rays. Although in recent times concern views on the essentiality of X-rays are drifting to exclude those children whose malocclusion is such that X-rays will not add substantial information to clinical findings.

Additional records and investigations:

These may include additional X-rays such as occlusal views, PA cephalograms, tomograms of TMJ, 3D computed tomograms, biochemical studies related to bone metabolism and technetium scan.

The nature and severity of deformity and search for aetiology would decide the type of further investigations to be carried out.

For those involved in treating the malocclusions there is no excuse of being illiterate in the subject of cephalometrics. Cephalometrics can reveal important anatomical information relative to internal structures of the maxillofacial complex of a given case that is totally inaccessible by any of the other means available, either two-dimensional (radiological) or three dimensional (Model analysis).[3]

Cephalometrics has not been solely the exclusive instrument of orthodontics, but was initiated originally in the 18th century by the physical anthropologists that used it as a method of comparing the fossil remains of the skulls of early men1. Even though the science of Cephalometrics can be a useful diagnostic and evaluative tool for the periodontist, the prosthodontists, the oral surgeons and the general practitioners of dentistry,

it is seen that it has primarily remained within the province of the orthodontic profession.

The assessment of craniofacial dimensions is not a new skill in orthodontics. The earliest method was used to assess facial proportion from artistic point of view, with beauty and harmony as the guiding principles. By the sixteenth century the artist Durer and Da Vinci had sketched series of human faces with straight lines joining homologous anatomic structures; variations in the lines high lightened structural differences among the faces.[4]

Cephalometrics had its beginning in craniometry. For many years, anatomists and anthropologists were confined to measuring craniofacial dimensions using the skull of long-dead individuals. (Neanderthal and Collognon people whose skulls were found in European Caves in 18th and 19th centuries).[1] Applying these principles to craniometry to the living, however, was limited by the inaccuracies resulting from having to measure skulls through varying thickness of soft tissue. Much later, anthropologist invented an instrument, the craniostat, for orienting dry skull, which can be said to be the forerunner of cephalometry.[1]

Sir Wilhum Conrad Roentgen (1845-1925)[5] discovered X-ray on the night of November 8th 1845 which drastically changed the entire medical world. The concept of standardized radiographic head images was reported by **Pacini,[5]** who in **1922** demonstrated the basic procedure of cephalometrics whereby subjects were positioned to the cassette with gauze bandages at a distance of 2m from the X-ray tube. It was not until **1931** that **Hofrath[4]** in Germany and Broadbent[2] in the United States simultaneously and independently developed standardized method for the production of cephalometrics radiographs, using special holders known as cephalostats, to permit assessment of growth and of treatment response. At the same time Simons system of gnathostatics, a method for orienting orthodontic casts, was in use. These ideas from anthropometric and gnathostatics naturally evolved and fused into a new technology: radiographic cephalometrics.

Cephalometric analysis which is sensitive not only to the position of the teeth within a given bone, but which is sensitive to the relationship of the jaw elements and cranial base structures, one to other. In short, the analysis proposed is an effort to relate teeth to teeth, teeth to jaws, each jaw to the other, and jaws to the cranial base.

Cephalostat

Cephalometrics involves making the measurements from lateral and frontal head radiographs taken with the head held in a fixed position. The cephalostat helps to hold the head in predetermined fixed position.[6]

1. Cephalometric Equipment:

A cephalometric apparatus consists of cephalostat or a head holder, an X-ray source and a cassette holder.

Cephalostat are of two types.

A. The Broadbent – Bolton method[7] utilizes two sources and two film holders so that the subject need not be moved between the lateral and postero-anterior exposures. It makes more precise three-dimensional studies possible but precludes oblique projections. In Broadbent technique, a recording of the distances from the mid sagittal film and also the distance of the frontal films surface from the porionic axis. It allows for direct orientation of the frontal to the lateral, for transfer of right and left structures peripheral to the midline, the lateral x-ray film to the frontal film and reverse also. This orientation is of significance assistance not only in discerning right and left structures but also where correction might be necessary for a frontal radiograph in which the head is tilted down or up from the Frankfort plane relation.

B. The Highley method[5,6] used in most modern cephalostats use one X-ray source and film holder with a cephalostat capable of being rotated. The patient is repositioned in the course of the various projections. Highley places a lead diaphragm with a small aperture in the center directly in front of the x-ray tube so that the anterior edge of the opening is close to the path of the central X-ray.

2. Conventions in taking Cephalograms[5,6,8]:

A. The Lateral Projection – The midsagittal plane of the subject's head is conventionally placed at 60 inches (152.4 cm.) from the target of the x-ray tube with the left side (European convention is the right side) of the subject

towards the film. The central beam of the x-ray coincides with the transmeatal axis. i.e., with the ear rods of the cephalostat. Under most circumstances, the distance from the midsagittal plane to the film is held constant usually at 7 inches (18 cm). In the Broadbent Bolten Cephalometer, this distance varies according to the subject. The patient's head is placed with the Frankfort plane parallel to the floor and the subject's teeth together in their usual occlusal position.

B. The postero-anterior projection - The head is rotated by 90 degrees so that the central ray perpendicularly bisects the transmeatal axis. It is crucial that the

Frankfurt plane should be accurately horizontal, because when the head is tiled, all vertical displacements measured are altered.

The safety feature of the cephalometric technique includes the use of a 90 K.V. peak and the double emulsion film sandwiched within the intensifying screen. It has the advantage that these films have moderate speed as well as wide latitude so that the detailed record of the soft tissue is possible.[3]

Most contemporary cephalometers used in orthodontic offices incorporate the basic elements of roentgenographic cephalometry but utilize only one x-ray source with the associated ability to rotate the head holder 90 degrees to take a complimentary frontal view. Cephalometers that have provision for taking panoramic radiographs are also available for clinical use.[3]

Cephalometric roentgenograms require the following conditions[6]:

1. The sagittal plane of the patient's head for the profile view and the vertical plane for the postero-anterior view must be parallel with the film.
2. The central x- ray from the tube must pass through the axis of the ears (porion) and must strike the x-ray film at right angles when taking the profile views. When taking the posterior views the central X-ray should be on a level with the porion plane or the ear holders and at a right angle to the film.

Adjustments of cephalometer[6]

1. The patient is seated upright so that the right side faces the x-ray tube. The chair is elevated until the external acoustic meateus. The auditory canals are at the height of the ear rods.
2. The operator places a hand on the patient's head while the ear rods are drawn into the ear canals. The ear rods prevent horizontal rotations of the head. The head is then rotated vertically until the inferior margin of the left orbit is horizontal to the ear rods.
3. The holder in the anterior part of the cephalometer then is adjusted against the Nasion to keep the head in the position. The patient's head is thus oriented in the Frankfurt horizontal plane.

Classification of analyses

I. Methodological Classification[6]

The basic units of analysis are angles and distances in millimeters (Lines) Measurements (in degrees or millimeters) may be treated as absolute or relative, or they may be related to each other to express proportion and correlations.

Angular Analysis

The basic unit is angle or degrees.

Dimensional analysis considers the various angles in isolation, comparing them with average figures. Down's analysis is of this type.

Proportional analysis is based on comparison of the various angles to establish significant relations between the separate parts of the facial skeleton. **Koski's (1953)[4]** analysis belongs to this group and was developed further by **Koski and Vorolainon (1965)[4]**. The result obtained with this analysis gives the relation between the basic reference planes OP-N and OP-Pog in percent.

Analysis to determine position: Angular measurements may also be used to determine the position of parts of the facial skeleton. The SNA and SNB angles, for example, give the relations between the maxillary and mandibular bases and the cranial base.

Angular measurements on their own are not normally sufficient for cephalometry and linear measurements will be needed in addition.

Angular analyses have certain deficiencies[6]:

- The lines are drawn in relation to a primary reference plane, on the premise that this remains constant.
- If this plane shows deviations from the mean, the analysis is not reliable. Measurements are often related to particular norms or mean values.
- These norms are however subject to a number of factors, such as age, sex, hereditary and ethnic predisposition, etc.
- They are based on averages and in the individual case. It is the deviation from the mean that is characteristic.

Linear Analysis

For linear analysis, the facial skeleton is analysed by determining certain linear dimensions between anatomical points or constructed points. In almost all the analysis certain parameters utilize linear measurements.

II. Orthogonal analysis

In this analysis a reference plane is established with the various points projected on to it perpendicularly, after which the distances between the projections are measured. Orthogonal analysis may be partial or total. Total orthogonal analysis may be geometrical or arithmetical. The De Coster method is a total orthogonal geometrical analysis.

For the arithmetical method, the reference points are projected on to a horizontal and vertical reference plane

and the distances between the points on these planes are determined.

Partial orthogonal analysis involves orthogonal assessment of only part of the facial skull. **Wylie (1947)**[9] for instance used the Frankfurt horizontal plane as the reference plane. He projected a number of reference points perpendicularly on to this and measured the distances between the points thus obtained in the plane. The method differs from total orthogonal arithmetical analysis in that measurements are always made in one plane only.

The most widely known method is the Sassouni analysis (1955), with the reference points not projected perpendicularly, but by drawing arcs with the aid of compasses.

Dimensional, linear analyses are based on valuation of certain linear measurements, either direct or in projection.

The direct method gives certain linear measurements (e.g. the length of the mandibular base) as the distance between two reference points. The results are given in absolute terms, so that age also has to be taken into account for their interpretation.

Projected linear dimensional analysis determines the distances between certain reference points that have been projected onto a reference line.

Proportional linear analyses are based on relative rather than absolute values. The different measurements are compared to each other[4], without reference to norms.

III. Normative Classification:

Analysis may also be classified according to the concepts on which normal values have been based.

Mono-normative Analysis.

E.g. Tweeds and Margoli's Triangle

The arithmetical norms are average figures based on angular, linear or proportional measurements. Geometrical norms are average tracings on a transparent sheet. Assessment consists in comparing these with the case under analysis. These methods merely provide rapid orientation.

The disadvantage of mono-normative analysis is that individual parameters are considered in isolation. Nor do they necessarily represent a normal average as deviations in the individual dimensions of the jaws and face may compensate each other so that occlusion is normal. Just as normal measurements may cumulatively tend to one end of the range of normal variation, the sum total being malocclusion. Mono-normative analyses are suitable only for group studies, and not for diagnostic purposes.[5]

Multi-normative Analysis.

For these, a whole series of norms are used, with age and sex taken into account Example of this analysis Mc Namara analysis.

IV. Correlative Analysis.

These are used to assess individual variations of facial structure to establish their mutual relationships, Correlative analysis are the most suitable for diagnostic purpose, and are used as such by most authors. Examples are Coben's analysis, quadrilateral analysis by DiPolo.

V. Classification According to the Area of Analysis[4]:

The various analyses may involve limited areas or the whole of the facial skeleton.

Dentoskeletal Analysis.

These analyses involve the teeth and skeletal structures. They may be made from normalateralis, norma-frontalis, or three – dimensionally. A more recent development is three – dimensional stereometric analysis, but this is not yet fully developed for clinical use.

Soft tissue analysis

These may involve the whole profile in normal lateralis, or certain structures only. We usually do a partial lateral soft tissue analysis, for example Analysis of lips in a cephalometric radiograph.

Functional Analysis

Cephalometric radiographs may also be used to assess functional relations such as the occlusion to interocclusal space relationship in norma lateralis and norma-frontalis.

Uses of cephalogram

1. Cephalograms are useful to study of Craniofacial Growth – Serial cephalometric studies have helped in providing information regarding:[5,6]

- The various growth patterns
- To establish standard norms against which other cephalograms can be compared.
- Prediction of future growth
- Predicting the consequences of particular treatment plan.
-

2. Diagnosis of Craniofacial deformities – Cephalograms help in identifying, locating and quantifying the nature of the problem. The most important result being differentiation between skeletal and

dental mal-relationship.

3. Treatment planning- By helping in diagnosis and evaluation of craniofacial morphology, cephalometrics help in developing a clear treatment plan. Even prior to starting orthodontic treatment an orthodontist can predict the final position of each tooth within a given patient craniofacial skeleton.
4. Evaluation of treated cases- Detail cephalograms permit the orthodontists to evaluate and assess the progress of treatment and also help in guiding any desired change. Cephalometrics has also helped in revealing the much concerned the nature of orthodontic relapse and stability of treated malocclusions.
5. Application of cephalometrics - Finds its value in cine flourography where the movements of the tongue and soft palate can be studied.
6. Orthodontists have the chance to detect any asymptomatic cervical spine abnormalities in the lateral cephalogram. The lesions of the skull may also be detected in frontal and lateral cephalograms.
7. Cephalograms can be used as an adjunct for estimation of skeletal age.

Limitations of cephalometry

There are various shortcomings and inaccuracies related to cephalometric analyses. These are:

1. It gives a two dimensional view of a three dimensional object.[2] It only provides a sagittal view and therefore transverse discrepancies or asymmetries in the frontal view cannot be analysed (this requires a postero-anterior cephalogram or a CBCT three dimensional analysis).[10]
2. There can be error in identification of landmarks. Thus reliability of cephalometrics comes down.
3. Errors can be made during tracing procedure.
4. Assumptions – various things are "assumed" in cephalometrics.

a. Symmetry: The various analysis done on lateral projection are based on the assumption that the patient does not have any skeletal asymmetry. In case the patient has any skeletal asymmetry then the results of the analysis may not be accurate. This can be avoided by routine study of the P.A. projection.

b. A correct occlusal and postural position is important in the accuracy of the cephalogram.

5. Fallacy of False Precision: It is found that when a person takes a series of cephalograms of the head of the same person and does the tracings, locates land marks and calculates various angles, the angles measured show a standard error that is each time the measurement is differed slightly.
6. Fallacy of ignoring the patient: The cephalometric values should not be taken as fixed goals. Sometimes certain values of a given patient may vary from the mean value, but it may not be an indication for treatment. Thus, the patient should be analyzed individually before a treatment plan. Just because the values differ it does not mean that treatment is required. If function and esthetics are satisfied then any deviation from the normal cephalometric value can be ignored.
7. Traditional cephalometric analyses and norms were based on specific populations, mainly Caucasian populations from the early to mid 1900s. This is not applicable to other ethnic/racial populations nor does it reflect changes due to secular trends. There are now numerous studies providing cephalometric norms for various populations.[10]

Analysis used in Orthodontics

- Down's analysis
- Steiner's analysis
- Tweeds analysis
- Mc Namara's analysis
- Ricketts analysis
- Wits Appraisal
- Wylie analysis
- Cephalometrics for Orthognathic Surgery (COGS) for hard tissue and soft tissue
- Quadrilateral analysis
- Jarabak analysis
- Pancherz analysis
- Holdaway's analysis
- Bjork analysis
- Sassouni's analysis
- Analysis for anterioposterior cephalograms
- Rickets analysis
- Svanholt and Solow analysis
- Grummons analysis
- Hewitt analysis

Conclusion

Cephalometric analysis allows for the diagnosis and treatment of malocclusion, which requires an interprofessional team of dental health professionals, including but not limited to general dentists, orthodontists, and oral surgeons. Cephalometric analysis sheds light on the extent of skeletal and dental misalignments and possible causative factors. If a malocclusion is too severe to be treated by an orthodontist alone, a referral can be made for the patient to seek treatment by an oral sur-

geon, who can work with the orthodontist to correct the misaligned jaw utilizing orthognathic surgery, further emphasizing the need for an interprofessional approach to the diagnosis and management of complex orthodontic malocclusions. Meticulous planning and discussion with other professionals involved in managing orthodontic treatment are highly recommended to allow for successful patient outcomes.[11]

It is important to remember that meaningful data can be obtained from the headfilm and if the information is carefully applied, it can guide the clinician towards the correct treatment plan for the patient. The cephalometric morphological analysis has its limitations. Whereas it is very valuable in describing the face and permits the clinician to get an in depth understanding of where the problems are located in each individual case, it does not provide much information about future growth of the facial structures. Such information can best be provided by comparing a pre-treatment and an in treatment headfilm using a reliable superimpositioning technique.[12,13]

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EFFECTIVE STRATEGIES FOR MANAGING FLABBY RIDGES IN COMPLETE DENTURE PATIENTS

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Abstract
Making of a final impression of flabby tissue with minimal or no displacement of tissue and better stability of the denture. A fibrous or flabby ridge is a mobile or extremely resilient alveolar ridge that becomes displaceable due to fibrous tissue deposition. Inadequate support, stability, and retention of a complete denture are the problems encountered in these patients. This article represents a review of different impression techniques for the management of flabby ridge in complete dentures. These impression techniques helped in recording flabby tissue with minimal displacement and hence enhanced the stability, support, and retention of the denture.
Keywords: Flabby ridge, impression techniques, hobkirk's technique, massad's technique, lynch and allen's technique

Introduction

Edentulism is an important global public health issue due to its high prevalence which exceeds 10% in adults aged ≥ 50 years and the associated disability.[1,2]

A flabby ridge becomes displaceable due to fibrous tissue deposition. It is developed when hyperplastic soft tissue replaces the alveolar bone. It affects both maxillary and mandibular alveolar ridge but it is most commonly seen in the maxillary anterior ridge. Studies have shown that flabby ridge occurs in 24% of maxillary and in 5% of mandibular edentulous ridge When the edentulous maxillae are opposed by natural mandibular teeth in the anterior region, these teeth cause trauma to the maxillary anterior ridge as all occlusal forces are directed to this area, resulting in severe bone loss and fibrous hyperplastic tissue formation. E Kelly described this condition as "combination syndrome".[4] Flabby ridge is also a common finding in long-term denture wearers due to trauma from denture bases or the result of unplanned and uncontrolled dental extractions[2,5] Impression making of flabby ridge results in the displacement of fibrous tissue which later on recoils to its original position and dislodges the denture. Unless managed properly by special techniques, a flabby ridge adversely affects the support, retention, and stability of the denture. Various impression techniques have been described to overcome the problem of flabby tissue. This article describes three different impression techniques for recording flabby resorbed ridges, viz Hobkirk Technique, Massad's Technique, Lynch and Allen's technique.[6-8]

Classification of management of flabby ridges

Flabby ridge is managed by following method:

1. Surgical removal of fibrous tissue before conventional prosthodontics
2. Implant retained prosthesis
3. Conventional prosthodontics without surgical intervention.

Surgical removal of the fibrous tissue The outcome of this method is firm denture bearing area which enhances the stability of future As with any surgical treatment option, the health of the patient must be taken into consideration. Removal is contraindicated in circumstances where little or no alveolar bone remains.[9]

It can be argued however that the fibrous part of the ridge has a cushioning effect that reduces trauma to the underlying bone, which therefore should not be removed. The removed tissue often requires pros-thetic replacement by

denture base material; this can increase the bulk and weight of the prosthesis. Retention is also adversely affected by the significant loss of the sulcus depth which is important in aiding border seal[10,11] For conventional prosthodontics,
preservation of what is remain is more important. The flabby ridge may provide substandard retention for the denture base, it may be more desirable than no ridge at all[9,12] Implant retained prostheses
a) Fixed prosthesis
b) Implant retained overdenture.
Fixed and removable implant-retained prostheses have potential benefits compare to conventional prosthodontics. It enhanced the stability, retention, and oral function. An implant-retained overdenture, in comparison to a fixed prosthesis,is initially economic and the surgery is often more straightforward. However, the recurrent cost due to maintenance can be considerable. Implants in the maxilla, which has a higher prevalence of flabby ridge, are not as successful as in the mandible. The success rates for maxillary implants have been shown to be as low as 78.7%.[8] It is thought that this could be due to the placement of shorter implants into highly vascular, poor volume, low-density bone.[13] The diminished alveolar bone volume in this subject group may result in restrictions on suitable implant sites or the need for bone augmentation.10 In terms of both time and finance, the initial cost and long-term maintenance costs of these restorations can be high.[13,14]
Factors considered while going for implant retained prosthesis are fear of surgery,
discomfort, and inconvenience, general health of the patient, and risk of surgical complications or implant failure.
Conventional prosthetic management
Uncontrolled displacement of the mobile fibrous tissue from its resting position, forces exerted during conventional impression taking, results in a record of distorted denture bearing area. This problem can be managed by following impression technique:
Mucodisplacive impression technique is use to compress the loose flabby tissue to allow functional support from it by replicating the contour of the ridge during compression by occlusal forces. Where as Mucostatic impression technique is
achieve support from the other firm areas of the arch and maximizes retention. At present, the published evidence does not support the superiority of either of these techniques over the other. To over come this problems, the following
techniques are useful.
Choice of technique

One part impression technique
(Selective perforation tray)
It has been suggested that if the degree of mucosal displacement is minimal, then this modified conventional technique may be considered[15]

1. Preliminary impressions are taken in stock trays using low-viscosity alginate after appropriate border correction.
2. A spaced special tray is fabricated from the primary cast for use with a low viscosity impression material, such as impression plaster, low-viscosity silicone, or alginate.
3. Pressure on the unsupported, displace-able soft tissue can be minimized

Controlled lateral pressure technique
Controlled lateral pressure technique was advocated by many authors for use with a fibrous (unemployed) posterior mandibular ridge.[16,17]
In this technique tracing compound,(green stick) is used to record the denture bearing area using a correctly extended special tray. A heated instrument is then used to remove the greenstick related to the fibrous crestal tissues and the tray is perforated in this region. Light-bodied silicon impression material is then syringed onto the buccal and lingual aspects of the greenstick and the impression is gently inserted. The excess material is extruded through the perforations and theoretically, the fibrous ridge will assume a resting central position having been subjected to even lateral pressures.
Palatal splinting using a two-part tray system
For recording displaceable anterior ridge in maxiialry arches,

Osborne described an impression technique[18]
The main goal of this technique is to maintain the contour of the easily displaceable tissue while the rest of the denture bearing area is recorded with the help with previous denture a primary cast is fabricated. From this, a palatal tray is fabricated with wax being used to create space on the palatal aspect of the mobile
area and extending to the ridge crest around the arch. In this acrylic resin palatal tray, a low viscosity zinc oxide paste impression is taken of the palate. An upward force is maintained until it is apparent that the mobile ridge is just beginning to have pressure applied to it. Once this has been set, a second special tray impression is made completely encompassing the first tray. It should be inserted from infront, backward, and the presence

of the supporting zinc oxide should prevent backward displacement of the mobile ridge.

A neat modification of this approach was described by Devlin in 1985, in which a locating rod is positioned in the center of the palatal tray, but proclined to allow the second special tray impression to be guided in an oblique upward and backward direction to envelope the palatal tray[19] The palatal tray accurately locates the second part special tray using a stop, thereby allowing for a pre-planned even thickness of impression material

Selective composition flaming with impression compound material

In this method, first make a impression with alginate and pour a cast which reproduces a relatively undistortated ridge. In this cast now make an another impression with impression compound by using stock tray. After making an impression, The impression periphery is carefully softened and functionally trimmed. The fibrous part of the ridge can be outlined on the impression surface. The composition overlying the firm denture bearing areas is softened with a flame before the tray is seated under heavy pressure, attempting to replicate functional force. By performing the impression in this way, the original relatively undistorted

shape of the fibrous tissues is retained while the tissues more capable of functional denture support are recorded in a displaced state[20]

Two-part impression technique

Mucostatic and mucodisplacive combination

Most commonly used method for recording displaceable tissues. This technique was first described by Osborne in 1964 for mandible arches. This is a popular technique where many authors ensured that the pressure exerted by the tray does not cause distortion of the mobile tissues.[17,18,20,21] In this method, first make a primary impression and marked the displaceable tissue on impression which can be transferred on primary cast. Now a close-fitting special tray fabricated with cold-cured resin in which flabby ridge area is left uncovered. An alternative method described by Hobkirk, McCordand Grant, involves the removal of acrylic from a complete special tray creating a window over the displaceable Area.[16,21]

An appropriate border correction is done with green stick compound supported mucosa is recorded with zinc oxideeugenol or medium-bodied silicone.An impression of the displaceable mucosa is then recorded by applying or syringing a thin mix of impression plaster or light-bodied silicone.

Modification of the special tray after the more viscous impression material has been used to record the whole of the denture bearing area (including the displaceable area) previously described by McCord and Grant, could conceivably cause a degree of distortion in adjacent areas.[16]

The design of this modified special tray can vary from a completely uncovered section of the arch to a window overlying the unsupported mucosa. In the fibrous anterior maxilla, modification of the handle position is often required. A rim handle design has the benefit of aiding the prevention of unset impression material falling to the back of the mouth when the patient is supine. The advantage of a window design means that the appropriate border correction can be undertaken and checked around the entire sulcus before the second stage of the impression is completed.

Discussion

There are several literature concluded that surgical removal of the fibrous areas often results in a greater prosthodontic challenge. Where as Implant retained prostheses may offer a solution to the problems of stability and retention in fibrous

ridge cases. However, they are not without their disadvantages i.e surgery, treatment time, cost, etc. A conventional prosthodontic solution may avoid these

problems associated with surgery. Due to the obvious difficulties in the analysis of the success of prostheses constructed using the various impression techniques

described, the clinical choice has fallen mainly to personal preference, based on analysis of theoretical principles. Various techniques have been recommended and there is controversy as to whether the mucodisplacive technique which compresses the mobile tissue aims to achieve maximum support from it, or whether a mucostatic technique with the aim of achieving maximum retention should be employed. While recording the flabby ridge, we have to keep this in our mind first, why patient came, patient presenting complained for example,instability during mastication or lack of retention during rest, speech, etc. The amount and position of displaceable tissue should be considered. Where distortion is minimal, the use of perforations in the special tray overlying the fibrous region may be all that is required, we have to keep all this point in our mind whike recording the impression for flabby ridge. Using the palatal splinting technique it is conceivable that a degree of distortion, although minimal, may occur by anterior distortion during the first stage and compres-

sion of the ridge at the second impression stage. The two-stage technique is the closest of the described techniques to recording the fibrous ridge in its undisplaced position and would appear to have the highest number of advocates in the literature reviewed.[11,17-22] Indeed, the use of mucostatic impression techniques for the majority of normal cases were advised following a review of prosthodontic standards carried out in 1989.[22] The difficulty in researching this area is not surprising when the multifactorial complexity of denture satisfaction is considered.

Conclusion

The complete denture should fulfill its basic objectives of stability, retention, support, aesthetics, and preservation of tissues. Flabby ridge gets displaced during conventional impression-making procedures and results in instability of the
denture. Treatment options for management of flabby ridge include surgical excision, Implant retained prosthesis, or conventional complete denture. This article presents a review of different impression techniques for managing cases with flabby tissue which are cost-effective, easy, time-saving procedures. This led to better results and better patient compliance

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