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Assessment of Dental faculty members by only number of publications Leading cause of plagiarism in research.

The word plagiarism is derived from a Latin word Plagiare meaning to kidnap. Plagiarism is copying of texts, ideas, concepts from someone else's work and claiming it be one's own.[1] Since last couple of years there is publish or perish situation among teaching staff of dental colleges in India owing to the criteria set by the governing bodies for promotion. This has lead to increase in the incidence of scientific misconducts in research publications.[2] Dental council of India(DCI) the main governing body of all dental colleges in India has made it mandatory for faculty to have certain minimum number of publications and credit points for promotion or in present scenario in simple words it can said for survival in college. [3]

To achieve this and for career enhancement every faculty member wants his or her name in the author list in spite of their non involvement in the original research. All this has lead to race among teaching faculty to have more or more number of publications and according to most of the studies this has lead plagiarism, scientific misconducts and authorship conflicts in research work.[4]

Based on the data and review of many articles on this issue it is proved fact that this has lead to deterioration in the quality of research publications. publishing research work without anything new and just mere editing of previous studies on same research is no longer justified and it is considered unethical. but this has become a trend due to availability of flood of online journals .For success and running of journals articles are getting published without checking the plagiarism content by paying the so called publication charges as they cannot effort the cost of software checking the plagiarism which is making conditions from bad to worse.[5]

so lets wake up and if we want quality in the research work in future let us follow the protocol set by ICMJE (International committee of medical journal editors) which acts as a guide not only in deciding the type of research but also the sequence of authors based their contribution in that particular research.[6] Almost all of us have been witnessing these unpleasent issues. it is really sad and unfortunate that it is the number of publications not the quality of research which is getting importance in assessing the credibility of teaching faculty in dental colleges.

It is high time that the faculty evaluation system should change and include other parameters like quality of publication, ethical issues, and impact on social and patient care. The DCI and concerned State universities should include student feedback in a confidential way to evaluate the performance of a teachers started by MCI in some universities, otherwise with the present trend the priority will shift from teaching and clinical towards only publications only.[7,8]

As is said **"Authorship should not be bestowed up on it has to be deserved and earned".**

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Incidence and Pattern of Faciomaxillary Fractures in Adults: A 4 year Retrospective Study at Al-Ameen Dental College Bijapur, Karnataka.

Ahtesham Ahmad[1], Rafi. A Togoo[2], Nilofar N. Jamadar[3]
[1]Reader, [2]Professor, [3]Lecturer
[1,3]Department of Oral and Maxillofacial Surgery, MIDSR dental college, Latur, India.
[2]Department of Pedodontics and Public Health Dentistry, King Khalid university Saudi Arabia.

Abstract:
Face is the most prominent and ethically important structure of human body. Owing to increase in the population and number of vehicles the incidence of maxillofacial injuries has increased worldwide. Although so many studies have been done on the pattern and treatment planning of maxillofacial injuries worldwide, this is first of retrospective studies done in our region with emphasis given on etiology and pattern of fractures.

Key words: Fractures, Incidence, Etiology, Pattern.

Corresponding Author: Dr.Ahtesham Ahmad, Reader, Dept. of Oral and maxillofacial surgery, MIDSR Dental College, Latur. Email id.: drahtesham007@yahoo.co.in

INTRODUCTION

The face, being the most exposed part of body is vulnerable to trauma. The main cause facial bone fractures worldwide are Road Traffic Accidents, assaults, sports and fire arm injuries. Clearly etiology is expected to influence degree and injury sustained1. Maxillofacial region is injured the most common facial fractures includes mandible, nasal bone followed by Zygomatic, maxilla and alveolar processes2. Over the past 50 years significant developments has been made in the treatment of maxillofacial trauma patients. This study may provide valuable data for etiology, incidence, and type of maxillofacial injuries.

MATERIALS AND METHODS:-

Inclusion criteria:- All patients aged from 18 years to 65 years of age and either sex presenting with maxillofacial trauma to department were included in the study.

Exclusion criteria:-

1. Age < 18 years
2. Patient record with incomplete data.

In this study a total of 500 patients were evaluated from 2014 to 2018. .A number of parameters including age, gender, cause of injury, site of fracture, and type of injury were assessed. A detailed history of patients was taken from record books then specially required basic and specific investigations that were present in record books such as OPG, CT Scan, 3-D CT, PNS view were considered and recorded. The fractures were classified according to standard nomenclature and pattern of maxillofacial injuries were compiled according to age, sex, etiology, site, frequency, The data so collected was

subjected suitable statistical analysis test. Like chi square test, and t - test.

Results:-

There were 194 mandibular, 128 maxillary, 78 zygomatic complex , 72 mid face, 84 combined mandibular and maxillary , 8 nasal bone, 14 NOE fractures. **Table-I**

Table -I:- Fracture Distribution

TYPE OF FRACTURE	NO. OF CASES	PERCENTAGE
MANDIBULAR FRACTURE	194	38.7%
MAXILLARY FRACTURE	128	25.6%
ZYGOMATIC COMPLEX	78	15.7%
MANDIBULAR AND MAXILLARY FRACTURE	72	14.4%
NASAL BONE FRACTURE	10	2.%
NOE	18	3.7%

Regarding Pattern of mandibular fracture 25.7% body of the mandible ,24.3% seen in condylar region, 7.3% symphysis , parasymphysis-5.9% , 12.5% in ramus, 9.4% in angle region, 7.3% dentoalveolar and 1.3% in coronoid region. **Table-II**.

TABLE -II:- Distribution of Mandibular Fractures according to anatomic site.

	NO. OF CASES	PERCENTAGE
BODY	74	25.7%
CONDYLE	34	24.3%
ANGLE	14	9.4%
PARASYMPHYSIS	9	5.9%
DENTOALVEOLAR	19	13.2%
SYMPHYSIS	12	7.3%
RAMUS	10	12.5%
CORONOID	02	1.3%

The pattern of maxillary fractures was Lefort I – 53.1%, Lefort II – 25.1%, Lefort III -12.86%, maxillary alveolus – 9.2%. **Table-III**

Table No. III:- Distribution Of Maxillary Fractures

TYPE	NO. OF CASES	PERCENTAGE
LEFORT I	68	53.1%
LEFORT II	32	25.1.%
LEFORT III	16	12.06%
MAX. DENTOALVEOLAR	12	09.2%

The cause of injury included Four wheeler vehicles accidents – 187 (37.3%), motorcycle - 253 (50.3%), Assaults – `116 231.2%) , sports – 34 (06.8%). **Table-IV**

TABLE -IV:-ETIOLOGY OF INJURIES.

TYPE	NO .OF CASES	PERCENTAGE
FOUR WHEELER ACCIDENTS	187	37.3%
MOTOR CYCLE ACCIDENTS	253	5O.3%
ASSAULTS	116	23.2%
SPORTS	34	06.8%

special attention was given distribution of etiology of injuries among males and females which included out of 500 cases 455 cases males and 55 females **Table-V.**

Table-V:- Incidence of Injuries Among Males and Females.

TYPES	NO OF CASES	GENDER	PERCENTAGE
FOUR WHEELER ACCIDENT	`187	MALES - 160 FEMALES - 27	86.01% 13.09.%
MOTOR CYCLE ACCIDENTS	253	MALES – 193 FEMALES -60	76.28% 23.71%
ASSAULTS	116	MALES – 78 FEMALES -38	67.23% 32.71%
SPORTS	32	MALES – 24 FEMALES – 08	75% 25%

DISCUSSION:-

Continuous long term collection of data regarding the epidemiology of maxillofacial fractures is important because it provides valuable information regarding development and analysis of fracture patterns and its further prevention to implement measures such as usage of helmets and seat belts in legislation3, 4. The nature of retrospective study is important for original examination and documentation.it was found that, Mandible is the most common bone encountered followed by maxillary bone. Nasal bone fractures are least recorded in our study. Amongst mandibular fracture body of mandible is most injured least being the coronoid process. Lefort I is the most prevalent pattern of facial fracture in association with maxillary fracture followed by Lefort III pattern. Motorcycle accidents were predominant in this study least being sports injuries. Males encountered most of maxillofacial injuries from motorcycle accidents followed by assaults.

Several methods of prevention may serve to reduce the risk and to minimise complications resulting from automobile accidents which is one of the predominant cause of injury among the population. There are some proposals to reduce traffic accidents one of the more adequate protection for both driver and passenger like increased seat belt and air bags in cars usage of helmets and air bags jackets for two wheelers, lower speed limits, better highway designs, greater use of driver education programmes and more rigid requirements for license renewal including thorough eye and medical examinations5, 6. Violence prevention programmes focussing on both assault and self inflicted injury may help to decrease the maxillofacial trauma resulting from injuries.

CONCLUSION:

Assessment of incidence and pattern of maxillofacial injuries is very important as it helps in proper treatment planning. Record keeping of all data definitely is useful for any kind of research for future generations and also medico legal issues related to our speciality. . Further studies including fractures are always necessary because the trends in etiology of maxillofacial trauma are always changing and the aetiology of fractures may suggest new ways to prevent these injuries.

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Analysis of Pattern of Trauma in Maxillofacial Surgery: Retrospective Study.

Syed Ahmed[1], Dr. Gopal L Nagargoje[2] , Amol Dohipoide[3], Shraddha B Patil[4], Ashutosh P Dod[5]
[1]Professor & HOD, [2]Lecturer, [3]Reader, [4&5] P.G. Student
Department of Oral and Maxillofacial Surgery, MIDSR dental college, Latur, India.

Abstract:
Fractures of the facial skeleton are common following road traffic accidents, assault, falls, and sporting injuries. Aim of the present study is to analyze the incidence and pattern of maxillofacial trauma (fractures) based on etiology, age, sex and site.

This Study was conducted in MIDSR Dental college, Latur between January 2013 to December 2017. Total 546 patients were treated, out of which mandibular fractures (76.38%) were more common than mid face fractures (23.62%). In mandibular fracture parasymphysis (57.7%) fracture was most common followed by angle (18.3%) and body fractures (5.8%). Most injuries were caused by Road Traffic Accidents (77.5%) than assault and fall (22.5%). Most of the patients were in the age group 20-30 (40.65%) with Male to Female ratio 6:1

Key words: Maxillofacial trauma, Retrospective study, Road traffic accidents

Corresponding Author: Dr.Ahtesham Ahmad, Reader, Dept. of Oral and maxillofacial surgery, MIDSR Dental College, Latur. Email id.: drahtesham007@yahoo.co.in

INTRODUCTION

Face is an important structure in the body because of it's functional, aesthetic and social value, so trauma to the maxillofacial region require special attention.(1,2) Maxillofacial region involves the soft and hard tissues forming the face extending from frontal bone superiorly to the mandible inferiorly. Trauma to the facial region causes injuries to the skeletal components, dentition as well as soft tissues of the face.(3,4)

Fractures of the facial skeleton are common following road traffic accidents, assault, falls, and sporting injuries. The frequency of fractures of the mandible, zygomatic complex and maxilla has been reported in a ratio of 6:2:1. Surveys of facial injuries have shown that the etiology varies from one country to another and also within the same country depending on the socio-economic, cultural and environmental factors.(5,6)

In the more economically advanced countries, maxillofacial injuries are more often caused by interpersonal violence in the form of fights, assaults and gunshot injuries. Studies from most developing countries have shown that road crashes are the predominant cause of maxillofacial trauma.(7)

The purpose of this study was to evaluate the pattern, frequency and mechanism of maxillofacial injuries in a peripheral city of Maharashtra, India with a population of 5 lacs, over a period of 5 years.

MATERIAL AND METHODS

Over the period of 5 years, 546 patients with maxillofacial trauma reporting to Yashvantrao Chavan rural hospital, Latur were the part of the study. All the relevant data of the patients were retrieved from the case record section of MIMSR medical college and department of oral and

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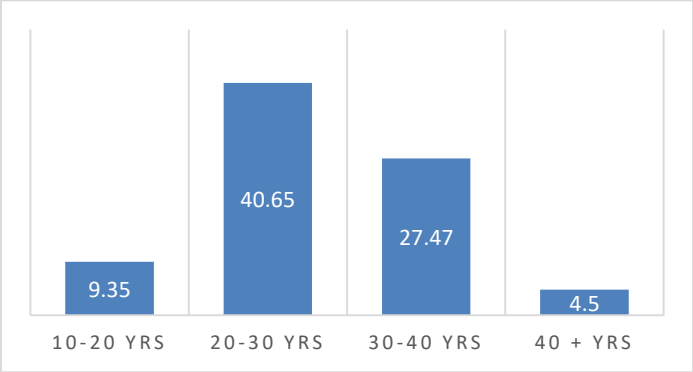
maxillofacial surgery, MIDSR dental college, Latur. The diagnosis of fracture is based on the clinical history, signs and symptoms, visual findings, manual examination and correct interpretation of radiographs.

All the patients were reviewed for age, gender, etiology, site and associated injuries of maxillofacial trauma. Age groups are divided into 10-20 year, 20-30 year, 30-40 year and age group more than 40 years. Etiology of maxillofacial fractures were divided into road traffic accident or RTA (two wheeler or four wheeler), assault and others (fall, sports injury). The site of maxillofacial trauma divided into midfacial fracture (zygomatic maxillary complex fracture, Naso-Orbito-Ethamoidal and Lefort I, II, III fracture) and mandibular fractures (Symphysis or parasymphysis, body, angle, coronoid, condyle, ramus and dentoalveolar fracture).

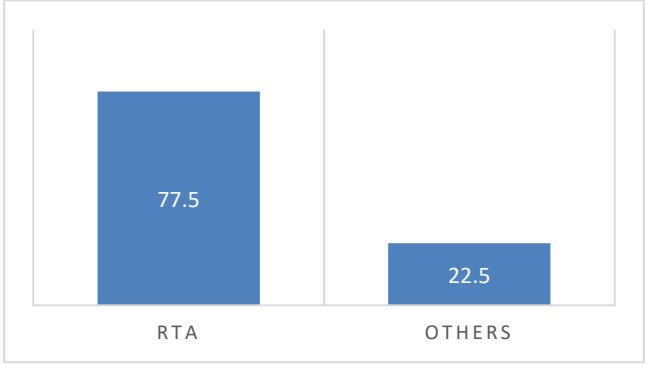
RESULT:

The data of the study was analysed on percentage basis. Most of the patients were in the age group of 20-30 years (40.65%) (Graph-1). There was predilection of Male patient's (87.36%) as compared to Female patient's (12.64%) in maxillofacial trauma and the male to female ratio (M:F) was 6.91:1 (Graph-2).

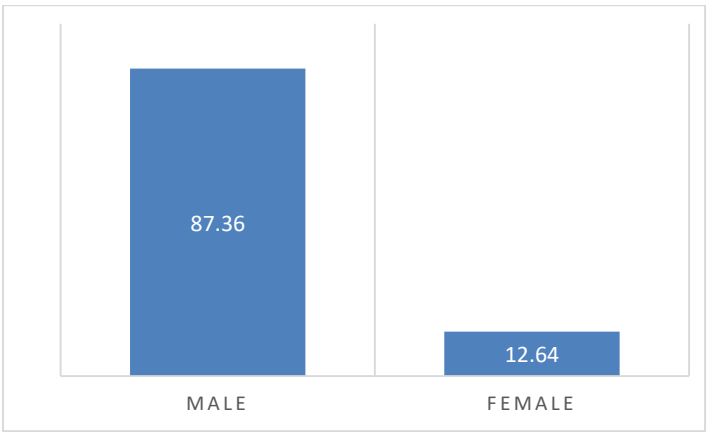
The most common etiological factor in our study was road traffic accident (RTA) (77.5%) (Graph-3). The frequency of mandibular fractures was high (76.38%) as compared to other bone fracture (Graph-4). In mandibular fractures, the most common site was symphysis and parasymphysis fractures (57.7%) followed by angle fracture (18.3%) (Graph-5). In midface fracture, the zygomatico-maxillary complex fracture was the common (64.8%) (Graph-6).



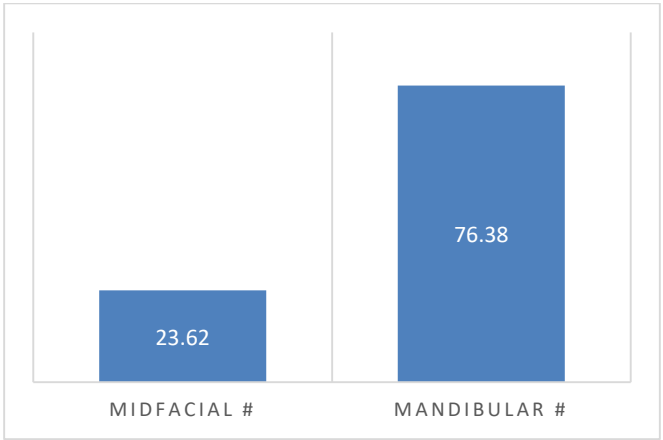
Graph-1 (Age groups distribution)



Graph-3 (Etiology)



Graph-2 (Gender distribution)



Graph-4 (Fracture site)

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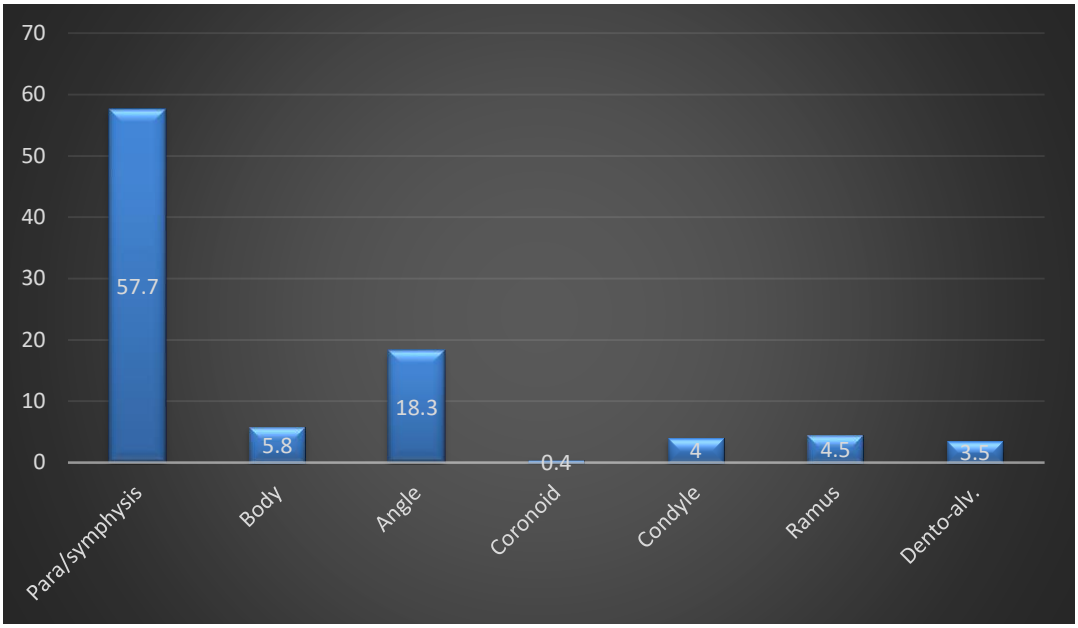
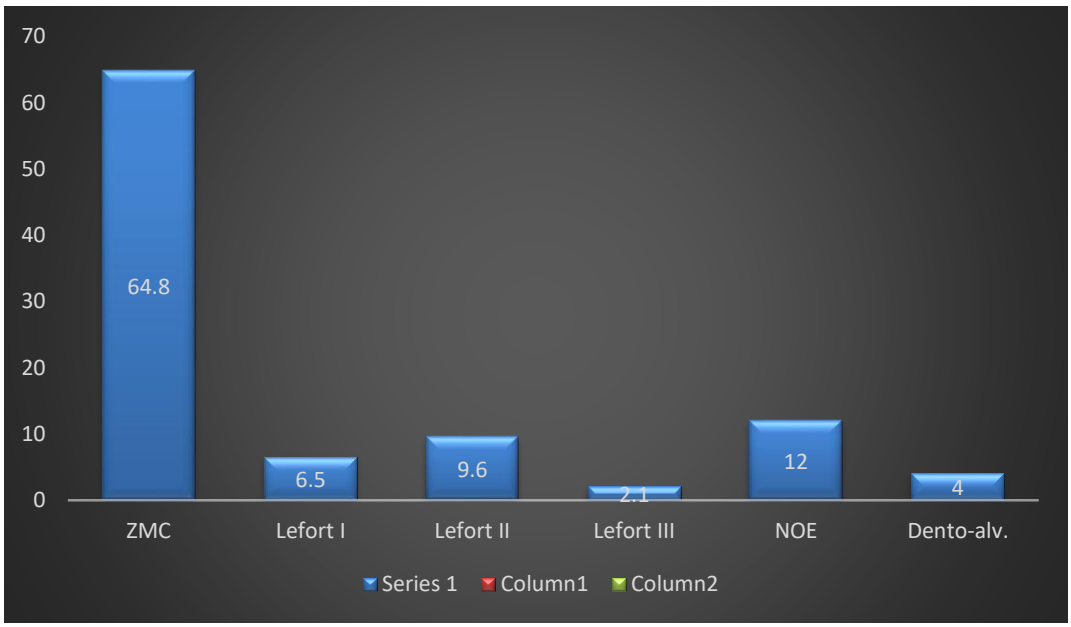


Graph-5 (Mandibular fracture sites)



Graph-6 (Midfacial fracture sites)

DISCUSSION

Most of the patient's in our study were in the age group of 20-30 years which is in agreement with most of the studies (3,8,9,10) but in contrast to some studies.(11,12) The reason behind maxillofacial injuries attributed more in the third decade, probably the peoples in this group are more active regarding sports, fights, violent activities.

The male predominance in our study agrees with what is reported in the literature.(2,11) Males are at high risk due to more participation in high risk activities which increases their exposure to risk factors such as driving, sports, alcohol consumption.

According to this study, The most common etiological factor for maxillofacial trauma was road traffic accident which is similar to other studies in developing countries.(3,11,13,14) but in contrast to some studies performed in developed countries which reported assault is the common cause for maxillofacial injuries.(15,16)

Mandibular fracture was the most common type of bone injury, similar finding was also reported by other studies.(13,14,17) As Mandible being the most prominent bone of face, so often fractured than strongly supported middle third of face.

In this study, among the mandibular fracture sites, symphysis/parasymphysis was the common site. The cause of injury reflects the direction of force applied to the mandible.

In midface fracture, the zygomatico-maxillary complex fracture was common, this was due to the prominent position of zygoma and nasal bone are more vulnerable to trauma.

CONCLUSION

Road traffic accidents were found to be the primary etiology for maxillofacial injuries including the fractures, with majority of the cases being observed with males. To avoid this, we recommend more stringent road traffic rules, awareness with civil behaviors like improved usage of seat belts and no drinking and driving and better conditions of roads.

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Sialolithiasis of Submandibular Gland: A Case Report.

Sheeraz Badal[1], Gopal L Nagargoje[2] , Ahtesham Ahmad[3], Priyanka Mahesh Samel [4,] Sanjeev Kailash Sharma [5]
[1,3]Reader, [2]Lecturer, [4,5] P.G. Student
Dept of Oral and Maxillofacial Surgery, MIDSR Dental College, Latur.

Abstract:
Sialoliths are calcified structures located in the parenchyma or ductal systems of the salivary glands. More than 80% of salivary sialoliths occur in the submandibular duct or gland, 6-15% occur in the parotid gland and around 2% are in the sublingual and minor salivary glands. Sialoliths are usually 5-10 mm in size and the stones more than 10 mm are termed sialoliths of unusual size or giant sialolith.
This case report describes one such "Giant sialolith" measuring approximately 25mm in length and 2.98gm in weight in right submandibular gland of 65 years old patient, operated by excision of sialolith along with removal of right submandibular gland under GA. This report also focus on the various treatment modalities in management of Giant sialolith
Key words: Giant sialolith, Submandibular gland.

Corresponding Author: Dr. Gopal L Nagargoje Lecturer Dept of Oral and maxillofacial surgery, MIDSR Dental College, Latur. Email id.: gopal.nagargoje@gmail.com

INTRODUCTION

Sialoliths are the calcified structures located in parenchyma or ductal system of the salivary glands.[1] It is one of the most common disease of the salivary glands and stands a major etiology in dysfunction of salivary glands. It has incidence of 0.12% of adult population and usually appears between the age group of 30-60 years with male predominance.[2] 80%-95% of sialoliths occur in the submandibular gland, 5% to 20% are seen in the parotid gland. 1%-2% are found in the sublingual gland and minor salivary glands.[3] Sialoliths are usually 5-10 mm in size and the one which are above 10 mm are termed as Giant Sialolith (sialoliths of unusual size) [4]

Factors that tend to favor formation of submandibular sialolith are: 1) Longer and wide diameter duct with slower flow rates; 2) Flow of saliva against gravity; 3) Submandibular gland saliva is more alkaline in nature with high mucin and calcium content of saliva.[5]

Systemic diseases such as gout, Sjogrens syndrome, medications such as anticholinergics, antisialogogues, trauma to the submandibular gland, head and neck radiotherapy, systemic renal impairment and old age can predispose patients to submandibular gland sialolith formation.[6]

Sialolith of submandibular gland consist of 82% inorganic and 18% organic contents.4 The inorganic contents of sialolith are mainly calcium phosphate and carbonate along with magnesium, potassium and ammonium in small amounts and organic matrix mainly composed of by the carbohydrates and amino acids.[1]

Many researcher explained the salivary gland sialolith formation by by different way like calcification around foreign bodies, desquamated epithelial cells and microorganisms in the duct.[7] Recently, Marchal et al. proposed a retrograde theory

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of sialolith formation, according to which a retrograde migration of foods, bacteria or foreign bodies from the oral cavity to the duct system may lead to sialolith formation.[1,6]

CASE REPORT

A 65 year old man reported to our department of oral & maxillofacial surgery with a complaints of pain and swelling in the right lower submandibular region of jaw since 15 days. There were episodes of pain in the same region for last 6 months but of moderate variety that the patient could tolerate. Presently, his pain was localised in nature, continuous in character, pricking type and sometimes radiating to the temporal region of same side. Pain use to aggravate during mastication, relieve by rest. Swelling was gradual in onset, progressing to the present size. There were occasions of mild swelling during meals for the last 3 months, which the patient had been ignoring.

On extraoral examination, the patient showed the diffuse swelling over the right submandibular region measuring approximately 2×3 cm with normal overlying skin (Fig.1).

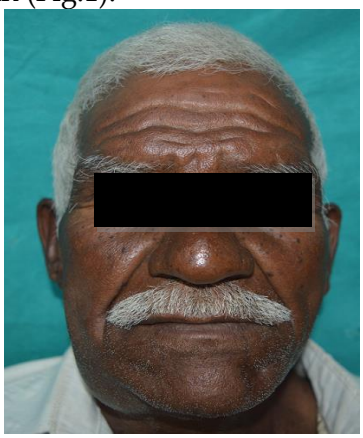

Fig.1 Preoperative front view showing swelling in right submandibular region

The swelling was warm and tender on palpation with firm in consistency. Intraoral examination revealed, inflammation of right floor of mouth with almost no salivary flow from right Wharton's duct orifice. The right submandibular gland was enlarged and tender on bimanual palpation. Orthopantogram revealed a solitary large oval calcified mass at right submandibular region measuring approximately 2×2cm in dimensions.(Fig.2) Computed tomography revealed the single radiodense mass measuring 2×2cm in diameter in right submandibular gland. (Fig.2)

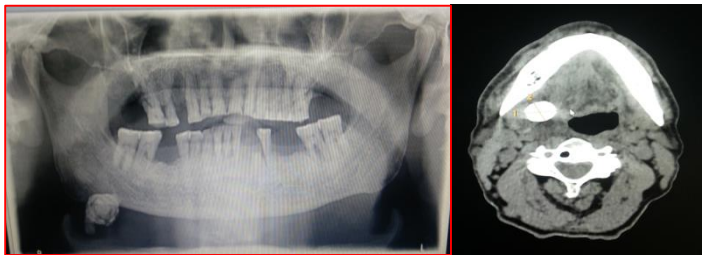

Fig.2 Preoperative radiographs showing sialolith on right submandibular gland

Ultrasonography of the right submandibular gland revealed the linear calcified density in the submandibular gland measuring approximately 2×2cm in diameter. All the other lab investigations were within normal limits.

Patient was taken under general anaesthesia by nasotracheal intubation. Incision was marked on lateral part of neck on right side. 2% lignocain with 1:80,000 adrenaline injected along the marked incision line. Following lateral extraoral transcervical approach skin incision was made &layer wise dissection was performed through subcutanous tissue, fascia platysma to expose deep cervical fascia(Fig3). Facial vessels were identified and clamped cut and ligated. Gland was separated from surrounding structures by preserving lingual and hypoglossal nerve. Wharton's duct was identified and cut close to floor of mouth. Entire gland duct along with sialolith was excised. Sialolith recovered measured approximately 25mm in length and 2.98gm in weight (Fig 4 and 5).

DISCUSSION

Sialoliths accounts for one third of all salivary gland disorders, which is mainly characterised by the obstruction of the salivary secretion.[1]

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Fig.3 Lateral transcervical approach skin incision

Fig.4 Right submandibular gland with sialolith

Fig.5 Sialolith measured 22mm in length and 2.98gm in weight

Zenk et al.[22] and Teymoortash A. et al.[23] found that, 80-90% sialolith occurs in submandibular gland duct and 10% occurs in gland itself. Lustmann et al.[7] found that, 50.3% sialoliths were located in the anterior portion of duct, 18.7% were in the posterior portion and 31% in the hilus and in the gland itself. Whereas in our case the sialolith was present within gland.

Levy DM et al.8 and McGurk M et al.[9] found that pain and swelling during mealtime which remains for few hours and followed by long episodes of remission up to weeks or months are the characteristic features of sialolithiasis. Ellies M. et al.16 59% patient were painful swelling, 29% were painless swelling and 12% were only pain. S. Kraaij et al.[10] found that 90% patients of salivary stone, infection of affected gland present and in 12-18% a purulent discharge is seen. Whereas our patient had a presentation of pain and swelling since a month, where size of the swelling had no relation with mealtime.

Sialolith measuring over the 10mm are termed as giant sialolith.[24] Manjunath Rai[5] reported a giant sialolith of 72mm and 45.8gm, whereas Cavina et al.[25] reported giant sialolith of 70mm and 18gm whereas K. V. Arunkumar4 reported sialolith of 20mm and 5.2gm.

Careful history and physical examination is the basis for the diagnosis of sialolithiasis.[1] Imaging modalities like Occlusal radiography, Orthopantogram(OPG), Computed tomography(CT), Ultrasonography, Sialography, Sialendoscopy or MRI scans can be used to confirm the diagnosis. Sialography is also important diagnostic modalities, it is considered as gold standard for the the diagnosis of sialolithiasis.[17] Sialography is contraindicated in acute infection or in patients who have allergy to contrast dye material.[10] Sialendoscopy is new non-invasive imaging modality

emerged which allows the almost complete exploration of the ductal system, including the main duct, secondary and tertiary branches.[17]

Differential diagnosis for sialolithiasis includes submandibular space infection, acute bacterial sialadenitis, warthin's tumour, pleomorphic adenoma, acinic cell carcinoma, Sjogren's syndrome, calcified cervical lymphadenopathy, hypothyroidism, sarcoidosis and haemangioma.[6]

Williams et al.[1] proposed that, If stone is small, the treatment of of choice should be conservative treatment, it includes local heat application, massage the gland as well as use sialogogues and patient should be well hydrated. Leung et al.[18] stated that, in cases of giant sialolith, if stone palpated intraorally, then remove the stone by intraoral approach.[18] Yoshimura Y. et al.[19] stated that, if there there is large sialolith within the gland which is not accessible intraorally then only excision of submandibular gland done for removal of sialolith, which was also done in our case.

Other treatment modalities includes extracorporeal shock wave lithotripsy and endoscopic intracorporeal shock wave lithotripsy, in these technique shockwaves are directed to the surface of sialolth without damaging surrounding structures and small fragments are produced of approximately 0.7mm to remove from duct. Nahlieli O. et al.[21] found that, endoscopiclly treated sialolithisis has success rate up to 83% .

Following transoral excision Lustman et al.[7] found 8.9% of recurrence rate in his study, Levy et al.[8] found 18% recurrence rate, Ellis M. et al.[12] found recurrence rate up to 2.7% in patients in which complete sialodenectomy of submandibular gland done for removal of sialolith. Cunning DM et al.20 reported xerostomia after submandibular gland excision in his 57% of patients. Ellies M et al.[16] reported that submandibular gland excision carries 0-8% risk of permanent marginal mandibular nerve palsy. Other postoperative complications includes the hematona, unacceptable scar and infection. Our patient was followed up for 2 years and did not report any complications.

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Periodontally Compromised Adult Patient Treating with Light Force in Fixed Mechanotherapy: A Case Report

Sayli Dusane[1], Pravinkumar Marure[2], Suresh Kangne[3], Anand Ambekar[4], Yatish Joshi[5], Chaitanya Khanapure[6]
[1]Post graduate student, [2,5]Reader, [3]Professor & HOD, [4]Professor, [6]Lecturer,
Dept of Orthodontics, MIDSR Dental College, Latur.

Abstract:
Periodontal disease and its sequelae often lead to an unesthetic appearance and functional problems which may be also associated withrestorative problems. Adult orthodontic therapy has a role in providing a complete rehabilitation in terms of both appearance and function with a satisfactory long-term prognosis, if the patient is reasonably motivated and responds well to the initial periodontal therapy.In this case report of patient who underwent orthodontic treatment because of right anterior spacing. The bone health of upper and lower anterior teeth was compromised. At the end of treatment, there was marked improvement in the bone level and profile of the patient.
Key words: Periodontium, light force, compromised bone.

Corresponding Author: Dr. Sayli R Dusane, Post graduate student, Dept of Orthodontics, MIDSR Dental College, Latur. Email id.: sayli.dusane10@gmail.com

INTRODUCTION

Dentistry has undergone significant evolution in the last two decades; there is tremendous focus on cosmetics today. The relationship between a person's physical appearance and his self-esteem is well documented.[1]

Orthodontic treatment has become one of the most commonly carried out treatment procedure in the present generation and more and more adult patients are in verge of accepting treatment because of improved and more developed diagnostic and treatment technique.1Periodontitis is an inflammatory disease associated with a bacterial infection.[6]

Ngom et al.[3] found significant correlations and suggested that malocclusions are risk markers for periodontal diseases.[4]

Multidisciplinary approach is often necessary to treat complex dental problems in our patients and there cannot be a better example than ortho-perio interaction.[5] Orthodontic treatment is based on the principle that if prolonged pressure is applied to a tooth, it will move as the surrounding bone remodels. Hence it is mandatory to see that good periodontal health should present before, during and after orthodontic treatment.[5]

The presence of microbial plaque, most important factor in the initiation, progression and recurrence of periodontal problems.

Many adult patients seek orthodontic treatment for aesthetic improvement due to the malalignment of the anterior teeth secondary to periodontal breakdown.[5]

The combination of orthodontic intrusion and periodontal treatment has been shown to improve periodontal conditions which leads to maintained oral hygiene.[8]

Therefore, the field of orthodontics should consider the combined regenerative and periodontal surgical treatments an invaluable addition to the

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armamentarium available for the orthodontic treatment of adult patients with severe loss of periodontal tissues. Similarly, the field of periodontics should recognize the importance of orthodontic intervention in achieving results unattainable with periodontal treatment alone.[5]

Case Report

A female patient at age of 21years old, complains of spacing in upper front region of teeth. On examination, the patient was in good health and had no history of medical problems. On clinical examination shows class I skeletal base with proclined maxillary and mandibular anterior teeth with spacing.

On periodontal examination, the left maxillary central incisors was extruded and right lateral incisor wasproclinedand found to have deep pockets mesially and distally [Figure 2]. A probing depth of 6 mm, 5 mm and 5 mm was found in relationwith left central, and right lateral incisor respectively.

Figure 1: Pretreatment extra-oral photographs

Figure 2:Pretreatment intraoral photographs

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There was no evident pus discharge, though bleeding on probing was present.Patient was advised for periodontal therapy.

Initial treatment consisted of scaling, root planning andsurgical curettage in relation to the maxillary anterior teeth, followed by adjunctive orthodontic therapy.

After inter departmental discussion on the treatment plan, it was decided to proceed with following steps in this case:

Phase I therapy comprising of scaling and root planning before orthodontic treatment.

Continuous monitoring of periodontal health with periodic scaling and root planning to improve the attachment was coordinated by the periodontist.

After the initial treatment, we started with the orthodontic treatment. Special attention was taken in using light forces to achieve leveling and aligning.Fixed mechanotherapy was started using preadjusted edgewise appliance, MBT prescription 0.022″ slot. In the maxillary and mandibular arch, alignment was started using 0.014″ NiTiarchwire and was followed by 0.016, and 0.018 NiTi followed by adequate leveling and aligning in both the arches, upper and lower 0.019″×0.025″ NiTiarchwires were given followed by 0.019″×0.025″ SS archwireswith loop distal to the lateral incisor. As soon as an 0.019″×0.025″ SS archwires was inserted, retraction of anterior teeth was performed using active tiebacks.

This helped us to intrude and retract the anterior segment as well as to convert the horizontal bone defect to a vertical defect.

Continuous periodontal follow-up comprising of scaling and root planningin the anterior region was performed with favourable results.

Figure 3: Mid treatment intra-oral photographs

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To achieving the short term orthodontic objectives such as alignment, good contacts, absence of rotations, class I occlusion with good cusp to fossa relation and good facial balance in periodontally compromised patients receiving orthodontic procedures in require extensive periodontal care/consideration to maintain the periodontium in a healthy condition during and after treatment.
Minor periodontal surgery may be required to prevent relapse after orthodontic treatment. In addition, it also required the lingual bonded retainers on a long-term basis.
Since there is a close relationship between orthodontic treatment and periodontal health and vice versa, an understanding of the ortho-perio relationship will help in bringing the best possible results in needy patients.

Result achieved

The case was finished with Class I incisor relationship with normal overjet and overbite. The right and the left buccal segment finished with a Class I molar and canine relationship. All rotations were corrected by the end of the treatment. No signs of root resorption in lower anterior teeth were noted and smile esthetics was significantly improved[Figure 4].

Comparison of pretreatment and posttreatment reveals good esthetic and functional result[Figure 5]

Figure 4: Post treatment intra-oral photographs

Figure 5: Post treatment extra-oralphotographs

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Discussion

The goal of orthodontic treatment is not only to improve facial esthetics and function but also to address the health of supporting structures and how teeth are placed in them. Elongated and spaced incisors are common problems inpatientssuffering from severe periodontal disease.

Lighter orthodontic force systems should be applied to periodontally compromised teeth as they can move easily, and greater orthodontic forces may negatively affect the periodontal membrane.It is essential that periodontal treatmentwith elimination of the plaque induced lesion be performedbefore the initiation of orthodontic treatment. Maintenance ofexcellent oral hygiene during the course of treatment is equallyimportant. Schwarz postulated that forces of about 25 gm/cm2 equal to blood pressure of PLD terminal capillaries should be optimal for tooth movement, while larger forces would block PDL blood flow, leading to tissue necrosis at compressed areas. Hence, necrosis caused is not due to the direct destructive effect of large orthodontic force but rather to stagnation of blood supply to the area. Due to the low force of 10 to 25 gm that was used in the patients there were no detrimental effects in the pulp.

Controlling plaque and eliminating inflammation are extremely important during the orthodontic treatment of patients with periodontal disease. Once orthodontic treatment is finished, the maintenance phase begins. The patient is required to be reviewed every 3–6 months to prevent reinfection and recurrence.[11,12]

Conclusion

Since there is a close relationship between orthodontic treatment and periodontal health and vice versa, an understanding of the ortho-perio relationship will help in bringing the best possible results in needy patients.

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Effect of Early Intervention in Improvement of Skeletal Class II Malocclusion and Profile Change by Use of Functional Appliance: A Case Report.

Radhika T Kalekar[1] ,Pravinkumar Marure[2,] Suresh Kangne[3]Anand Ambekar[4], Yatish Joshi[5], Chaitanya. Khanapure[6].
[1]Post graduate student, [2,5]Reader, [3]Professor & HOD, [4]Professor, [6]Lecturer
Dept of Orthodontics, MIDSR Dental College, Latur.

Abstract:
Functional appliances have been used for a long time for the treatment of Class II patients. The main objective of therapy with functional appliances is to stimulate increased growth at the condylar cartilage which induces supplementary lengthening of the mandible. The most commonly used functional appliances is Twinblock appliance. A case report of mandibular deficiency treatment with Twin Block headgear combination was used for skeletal correction in a female patient whose sexual maturation and cervical vertebral maturation stage indicated the growth peak period. At the end of the treatment, profile of the patient improved, Class I molar relationship with normal overjet and overbite was achieved.

Key words: Twinblock headgear therapy, Skeletal Class II correction, Vertical maxillary excess correction.

Corresponding Author: Dr. Radhika T Kalekar, Post graduate student, Dept of Orthodontics, MIDSR Dental College, Latur. Email id.: radhikakalekar143@gmail.com

INTRODUCTION

Functional appliances have been used for the treatment of Class II Division 1 malocclusion more than a hundred years[1] and over the past few years, there has been considerable debate on the merits of early orthodontic treatment for Class II Division 1 malocclusions.[2]

In orthodontic practice, Class II malocclusions are frequently observed. Droschl found it to be 37% among the children between 6 and 15 years of age. Mc Namara reported the most common characteristic of Class II malocclusion is mandibular retrusion.[3]

A wide range of functional/orthopedic appliances is available for the correction of Class II skeletal and occlusal disharmonies.[4]

A plethora of functional appliances such as the FR-2 of Fränkel,[5] bionator, the fixed and removable types of Herbst appliances[6] and the Jasper Jumper[7] have gained widespread popularity for Class II correction in the last few years.

Functional appliance system that has been successful during the last two decades is the twin-block appliance. Twin-block appliance originally developed by William J. Clark of Fife, Scotland,[8] for use in the correction of Class II malocclusions which is characterized in part by mandibular skeletal retrusion.[9] The main objective of therapy with functional appliances such as the Twin-block is to induce supplementary lengthening of the mandible by stimulating increased growth at the condylar cartilage.[10]

The popularity of twin block is mainly attributed to its high patient adaptability and ability to produce rapid treatment changes.[11] A major advantage of twin-block appliance is its relatively smaller size

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compared to other functional appliances. The appliance consists of maxillary and mandibular acrylic plates with bite blocks, which interlock at a 70° angle on closure while posturing the mandible forward.[12]

This case report demonstrates treatment of a patient with Class II Division I malocclusion using one-phase therapy. The treatment was accomplished with twin-block headgear combination.

CASE REPORT:

Pretreatment assessment

History and clinical examination

A 11-year-old growing female patient reported with a chief complaint of forwardly placed upper front teeth. There was no relevant medical or dental history. Extraoral examination revealed convex facial profile with posterior divergence, no gross facial asymmetry. Soft-tissue examinations revealed incompetent lips, nasolabial angle was acute, deep mentolabial sulcus [Figure 1].

Intraoral examination revealed a permanent dentition except the third molars in all the four quadrant. Maxillary and mandibular arch was U shaped and constricted. Oral hygiene was good with no underlying gingival or periodontal disease; however, mild stains were present without calculus. The incisor relationship was Class II with 9 mm overjet and 7 mm overbite.

Buccal segment relationship was Class II molar relationship on left and right side respectively. Lower dental midline is shifted towards right side by 2 mm [Figure 2].

Diagnosis:

Diagnosis revealed skeletal Class II jaw base relation, with vertical growth pattern, dentoalveolar Angle's Class II div 1 subdivision malocclusion with spacing in the upper teeth and crowding in the lower teeth, proclined upper and lower incisors, constricted maxillary and mandibular arch with linguoversion lateral incisors in third and fourth quadrant with convex facial profile and incompetent lips.

Problem List

1. Skeletal Class II jaw base relation.
2. Class II molar and canine relation.
3. Increased overjet and overbite.
4. Spacing in the upper arch.
5. Crowding in the lower arch.
6. Linguoversion of 32 and 42.
7. Proclination of upper and lower anteriors.
8. Narrow upper and lower arches.
9. Deep curve of spee.
10. Convex facial profile.
11. Incompetent lips.

Aims and Objectives of Treatment

1. Achieving skeletal class I jaw base relation.
2. Achieving Class I molar and canine relationship.
3. Achieving normal overjet and overbite.
4. Alleviation of crowding.
5. To expand upper and lower arches.
6. To correct proclination.
7. Levelling of curve of spee.
8. Achieving harmonious, soft tissue profile.

Treatment alternatives

1. The first alternative was an orthosurgical management after the patient's growth was completed. This option had the disadvantage of patient waiting for a few years.
2. The second alternative was the extraction of maxillary first premolars and a camouflage treatment for Class II, Division 1 malocclusion. However, this treatment option would not improve the patient's facial frontal and profile features. It would also not inhibit the vertical growth of maxilla. This treatment alternative, therefore, was avoided.
3. To improve patients profile by controlling the vertical maxillary excess and backward rotation of the mandible, twin block headgear combination was opted as a next treatment option.

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Figure 1: Pretreatment extra-oral photographs

Figure 2: Pretreatment intra-oral photographs

Treatment progress

To improve the profile and control the backward rotation of the mandible, twinblock-headgear combination was used. Construction bite for the twinblock was taken with 3 mm of vertical opening and 7 mm of horizontal advancement. After 1 week of twinblock wear the headgear was attached to the twinblock tubes in premolar - molar region of the acrylic blocks [Figure 3].

Treatment results

The patient's profile had significantly improved, although there was gingival show on smile. There was a significant reduction in the soft tissue facial convexity with downward and forward mandibular growth and a restraint of maxillary growth during. Class I dental occlusion was achieved bilaterally with optimal overjet and overbite [Figure 4]. The nasolabial angle was mildly acute at the end of treatment but showed a great improvement from its pretreatment value.

DISCUSSION:

The nature of a Class II malocclusion is related to many factors, such as maxillary and mandibular growth patterns, facial structure and dentoalveolar development. Correction of mandibular deficiency in a skeletal Class II patient with a vertical growth pattern poses a great challenge.

Figure 3: Twinblock- Headgear combination

Figure 4: Post treatment photographs

The control of vertical dimension becomes very important as the facial convexity is exaggerated by downward and backward rotation of mandible. It appears that the control of vertical dimension is imperative for an optimal forward displacement of the correction of a skeletal Class II malocclusion.

Twinblock appliance is one of the most widely used functional appliances for the sagittal advancement of the mandible with vertical control. This produces a more favorable muscle pattern and also a change in bony structures as muscles adapt to new functional stresses. The effects of functional appliances in a skeletal Class II malocclusion includes reduction of ANB angle, restriction of maxillary growth, advancement of mandible, increase in lower facial height, correction of overjet, improvement in overbite, uprighting of the maxillary incisors, protrusion of mandibular incisors, correction of dental Class II malocclusion, correction of facial convexity, and reduction of mentolabial fold.

Our patient had skeletal Class II pattern along with vertical growth pattern. As she was in growing stage, our objective was functional advancement of the mandible and inhibition of further maxillary growth. The best treatment plan for the patient would have been an orthosurgical management, but as the patient was not interested in surgery and moreover, her growth was yet to be completed, twinblock treatment option was presented to her. The patient wore the appliance regularly. The skeletal correction was achieved by mandibular base lengthening and restriction of increase in maxillary basal length. The profile of the patient was improved drastically as seen from the post myofunctional therapy photographs and the cephalometric readings. There was a great amount of improvement in the nasolabial angle. A consonant smile was obtained at the end of treatment. Class I dental occlusion was achieved bilaterally with optimal overjet and overbite.

CONCLUSION:

This case report elaborated on the use of twinblock-headgear combination for the correction of a severe skeletal Class II malocclusion. The result obtained was a marked improvement in the facial features and the correction of dental disharmony. Thus, by using twinblock- headgear combination, the results were obtained which helped the patient gain pleasing profile and better esthetic results.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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Interceptive Orthodontics- What? Why? When?

Vaibhav R. Ambashikar[1] , Suresh Kangne[2], Anand Ambekar[3], Pravinkumar Marure[4], Yatish Joshi[5], Chaitanya. Khanapure[6].
[1]Post graduate student, [2]Professor & HOD, [3]Professor, [4,5]Reader, [6]Lecturer
Dept of Orthodontics, MIDSR Dental College, Latur.

Abstract:
The major goal of modern orthodontics is to prevent or intercept developing malocclusion caused by aberrations in the developmental process. Thus, interceptive orthodontics plays an important role in reducing the development of future complex malocclusions. This article is an overview regarding the need for interceptive orthodontic techniques and the indications for the same.
Key words: Early malocclusion treatment, early orthodontic treatment, interceptive orthodontics, preventive orthodontics.

Corresponding Author: Dr. Vaibhav R. Ambashikar, Anand Sagar, Building no. 24, Flat no. 61, Bandra West, Bandra Reclamation, Mumbai-400050. Email id.: vaibhav16.xperia@gmail.com

INTRODUCTION

"An ounce of prevention is worth a pound of cure."
— Benjamin Franklin

Well-aligned teeth not only contribute to the health of the oral cavity and the stomatognathic system but also influence the personality of the person. The complex interplay between inherited and environmental influences make it difficult to evaluate the relative importance of each in the etiology of malocclusion. The long developmental period makes it possible for many external influences to affect the dentition.[1]

The development of dentition and occlusion plays an important part in the craniofacial growth and helps in assimilation of facts, prediction of teeth eruption and alignment and factors influencing them and implicate clinically for treatment. The guidance of development and eruption of the deciduous, mixed, and permanent dentitions is an essential component of comprehensive oral health care for all dental patients. This guidance should play a vital role to the development of a permanent dentition that is in a steady, functional, and aesthetically acceptable occlusion and normal subsequent dentofacial development.[2] Normal primary dentition and normal transition from primary to the permanent dentition are necessary to establish a normal adult occlusion. Hence one of the major goals of modern orthodontics is to understand this transition process well enough to prevent or intercept developing malocclusion caused by aberrations in the developmental process.[1] Early diagnosis and successful treatment of developing malocclusions will result in both, short-term and long-term benefits along with the goals of occlusal harmony and function and dentofacial aesthetic.[2]

Interceptive Orthodontics- What?

Richardson (1982) defined interceptive orthodontics as the prompt treatment of unfavourable features of a developing occlusion that may make the difference between achieving a satisfactory result by simple mechanics later, thus reducing overall treatment time and providing better stability and functional and aesthetic results.[3] Thus, in simpler terms, Interceptive Orthodontics can be stated as procedures that eliminates or reduces the severity of malocclusion in the developing dentition or as described by Proffit and Ackerman that they are the measures taken in order to eliminate the developing occlusion.[1]

Why Interceptive Orthodontics?

Dentists have the responsibility to recognize, diagnose, and manage or refer abnormalities in the developing dentition as dictated by the complexity of the problem and the individual clinician's training, knowledge, and experience.[2]

The long developmental period makes it possible for many external influences to affect the dentition.1 Interceptive and preventive orthodontic procedures are relatively simple and inexpensive treatment approaches that target developing malocclusions during the mixed dentition. Orthodontists perceive these as useful ways to reduce the severity of malocclusions,[2] improve a patient's self-image, eliminate destructive habits, facilitate normal tooth eruption, and improve some growth patterns.[3]

Early treatment is purportedly easier to perform, less time-consuming, and less expensive. However, early treatment should not be prescribed directly. One must ask why it is needed and when it should start, and the prognosis for early treatment should be thoroughly evaluated. Of course, the most important reasons to treat early are to avoid further disturbances during eruption and occlusal development and to prevent complications like resorption of adjacent teeth and loss of bone induction or development due to non-eruption.

In a retrospective cohort study conducted by King and Brudvik in 2010 studying the effectiveness of interceptive orthodontic treatment, it was found that the index of complexity, outcomes and need (ICON) decreased by 38% in the group intervened thus suggesting that interceptive orthodontics is effective in improving a malocclusion.[4]

When to start?

In a study, the patients at risk for future orthodontic problems were identified to be 28% of those examined, and most of the developing malocclusions were judged to be suitable for interceptive orthodontic treatment.[5] Another study of children screened in a community dental clinic at ages 9 and 11 years also found that one-third of the children would benefit from interceptive orthodontic treatment.6 Although interceptive orthodontic procedures often do not produce finished orthodontic results without a second phase of treatment in the permanent dentition, it has been suggested that systematically planned interceptive treatment in the mixed dentition might contribute to a significant reduction in treatment need between the ages of 8 and 12 years, often producing results so that further need of treatment can be categorized as elective.[4] Conceptually, the terms 'preventive' and 'interceptive' orthodontics refer to the possibility of treating young patients in ways which will obviate the need for later comprehensive treatment while operationally, they concern specific procedures or techniques in treatment of patients. Unlike preventive orthodontic procedures that are aimed at elimination of factors that may lead to malocclusion, interceptive orthodontics is undertaken at a time when the malocclusion has already developed or is developing. There are number of procedures that can be undertaken to intercept a malocclusion that is developing. Most patients who receive interceptive orthodontic treatment do not have all of their orthodontic problems addressed. However, limited interceptive treatment can reduce the need for comprehensive treatment and eliminate malocclusions considered to be medically compromising.[7]

Where to start?

"The early bird catches the worm."

-William Camden

Early detection and intervention of the developing malocclusion by the Dentist is of upmost priority to help the patient avoid the deleterious effects of it. The following are a few signs to intercept by the Dentist and to manage it:

Anterior crossbite

An old saying in orthodontics states "The best time to treat a cross bite is the first time it is seen".

Whether the malocclusion is skeletal or dentoalveolar, the treatment of developing crossbite is recommended in primary and early mixed dentition.8 There are many treatment options available for correction of crossbites according to the number and site of the teeth/tooth involved, the stage of the dentition and its etiology. Few of the choices available for crossbite corrections are

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Catalans appliance, tongue blade therapy, expansion appliance, cross elastics etc. Functional crossbites causing the abnormal shift of the mandible can be treated by reducing cuspal interference, particularly in the canine area. The main advantages of early treatment of anterior crossbite are to influence the process of growth in the upper jaw with simple and inexpensive appliance and also to avoid in many cases orthognathic surgery in future.[9]

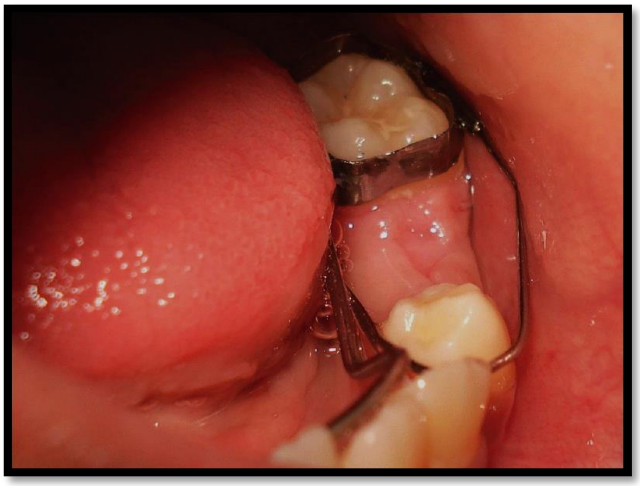
Proximal Slicing

Treatment in the early mixed dentition with the eruption guidance appliance is an effective method to restore normal occlusion and eliminate the need for further orthodontic treatment with long term stability.[10]

Its use has also been advocated for the improvement in the maxillo-mandibular relationship. Slicing of the first or second deciduous molars is occasionally required to allow the permanent succedaneous teeth to erupt into its normal position. The mesial surfaces of the deciduous first molars can be sliced to prevent the crowding of lower anteriors.[11] When space is required for the eruption of the maxillary canine, the mesial surface of the second deciduous molar can be sliced to allow the first premolar to be pushed distally to provide space for the erupting canine.[12]

Space regainer

Premature loss of primary teeth can be a potential threat towards the disturbance of the occlusion due to the space lost by migration of the adjacent teeth. Space regainer is the ultimate choice in such situation. Open coil space regainer, Gerber's space regainer, lip bumper, free end loop space regainer, split saddle space regainer, jack screw are a few of the examples. Lip bumper has been advocated to contribute to resolution of arch perimeter deficiency in mixed dentition.[13,14] During the transition from mixed to permanent dentition if the arch length is maintained with the use of passive lingual arch, it helps to release the leeway space for incisor alignment and also provides adequate space to resolve incisor crowding in most of the instances.[15]



Serial Extraction

Arch length mesial to first permanent molars tend to decrease rather than to increase on the interchange of teeth between the mixed to permanent dentition. Hence the initial objective in considering serial

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extraction is to intercept a developing arch length deficiency (crowding) problem to reduce or eliminate the need for extensive appliance therapy. However, it is essential to properly weigh the advantages and disadvantages of this treatment philosophy before undertaking the extraction procedure. The ideal patient for serial extraction can be described to be an 8 year old, with normal size, shape and number of teeth, class I canine and molar relationship with minimum overjet and overbite, orthognathic or slightly bimaxillary protrusive profile, relatively severe and symmetric arch length tooth size discrepancy in the middle mixed dentition, normal eruption sequence and dental development present radiographically, normal skeletal growth pattern and normal antero-posterior, vertical and transverse relationship. Several extraction sequences have been advocated with the most common ones being that of Dewel16 and Tweed. Another treatment philosophy, called "Timely extraction" which is similar to serial extraction is the sequential removal of primary teeth, but differs in that no permanent teeth are removed, has been described by Stemm.[17] It is indicated in cases with gingival recession due to labial positioning of incisors, coupled with an inadequacy of dental arch length.

INTERCEPTION OF HABITS:

Habits in the orthodontic sense refer to certain actions involving the teeth and other oral or perioral structures which are repeated often enough by some patients to have a profound and deleterious effect on the positions of teeth and occlusion. Some of the habits that can affect the oral structures are thumb sucking, tongue thrusting and mouth breathing.

Thumb sucking

Thumb sucking habit is the most frequently practiced by children and is capable of producing damaging effects on the dento-alveolar structures. The presence of this habit up to the age of 3 years is considered quite normal. Persistence of this habit beyond 3- 4 years of age can have a deleterious effect on the dento-alveolar structures and should hence be intercepted and intervened.18 In a study of thirty thumb-suckers, Lewis found that twenty-four had malocclusions, while the other six, who had broken the habit by the age of 5 years, had normal occlusions.[19] Thumb sucking is intercepted and can be resolved by use of habit breakers that could be of removable type or one that is fixed.

Tongue thrust

Tongue thrust can be stated as a condition in which the tongue makes contact with any teeth anterior to the molars during swallowing. The swallowing pattern needs to be evaluated as this deleterious habit that can clinically present with open bite and anterior proclination. The tongue thrust habit should be intercepted and managed by using habit breakers. The patient should be trained and educated on the correct technique of swallowing.[20]

Mouth breathing

Mouth breathing habit has a profound effect on the dento-facial region. It can be obstructive or habitual in nature. It was found that mouth breathing causes considerable backward and downward rotation of

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the mandible, increased overjet, increase in the mandible plane angle, a higher palatal plane, and narrowing of both upper and lower arches at the level of canines and first molars when compared to the nasal breathers. Interceptive procedures should involve identification and removal of the cause.[21] Persistence of habitual oral breathing is an indication to use a vestibular screen to intercept the habit.

Delay in tooth eruption

Eruption of deciduous teeth, their exfoliation followed by eruption of permanent dentition is an orderly sequential and age specific event. Whenever a permanent tooth fails to erupt at the appropriate time, an assessment of the local factors needs to be done to determine the cause of the delay in eruption. Mucosal barrier, over-retained primary teeth, ankylosed primary teeth and supernumerary teeth are other possible causes of non-eruption of succedaneous teeth, which should be ruled out. The management of depends on the etiology and the technique include surgical method to remove the obstruction, removal of the retained tooth, orthodontic traction, space creation and maintainance.[22]

Growth Modification

Interception of skeletal malocclusion has been widely accepted in order to reduce the severity of malocclusion and normalize the skeletal relationship with the help of functional appliances. Developing skeletal class II and class III malocclusions are one of the most challenging malocclusions to treat. Wide range of the functional appliances and the orthopaedic appliances have been used in treatment of these malocclusions. Thus, early recognition of such a problem and treating it using the remaining growth potential of the individual becomes an important aspect of interceptive orthodontics.

CONCLUSION:

General dental practitioners attend a larger number of patients compared to an orthodontist, thus an awareness regarding interception of developing malocclusion and treating it at the earliest becomes vital.

In children, though appliance therapy tends to be simpler than in adults because of growth and development and also due to transition from primary to mixed to permanent dentition, the treatment planning and monitoring are more complex. Early detection and appropriate referral of cases to an orthodontist is required whenever needed. Whenever treatment is done in children the totality of all the changes should be taken into account. Thus, interceptive orthodontics plays an important role in reducing the development of future complex malocclusions.

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Tongue Thrusting, Tongue Pressure & Tongue Pressure Measuring Devices- A Review!!!

Pavankumar Singh[1] , Anand Ambekar[2], Suresh Kangne[3], Pravinkumar Marure[4], Yatish Joshi[5], Chaitanya. Khanapure[6].
[1]Post graduate student, [2]Professor, [3]Professor & HOD, [4,5]Reader, [6]Lecturer
Dept of Orthodontics, MIDSR Dental College, Latur.

Abstract:
The tongue is a powerful muscular organ that exerts strong pressure at frequent intervals on the teeth during the daytime and nighttime. In tongue thrusting habits, the tongue is thrust between the upper and lower teeth in the jaw each time the patient swallows. It is clear that tongue function plays some role in the development of the dental arches. The distortions of the arches which accompany micro- or macroglossia, as well as the less dramatic but clinically significant effects as seen in oral habits such as tongue-thrusting, illustrate the possible effects. This article is to review various studies conducted on assessing tongue pressure using different pressure measuring devices in patients with or without tongue thrusting habit.

Key words: Early malocclusion treatment, early orthodontic treatment, interceptive orthodontics, preventive orthodontics.

Corresponding Author: Dr.Pavankumar R singh, Post graduate student, Dept of Orthodontics, MIDSR Dental College, Latur. Email id.: pavansingh6sept@gmail.com

INTRODUCTION

The tongue is a powerful muscular organ that exerts strong pressure at frequent intervals on the teeth during the daytime and nighttime. In tongue thrusting habits, the tongue is thrust between the upper and lower teeth in the jaw each time the patient swallows.[1]

It is clear that tongue function plays some role in the development of the dental arches. The distortions of the arches which accompany micro- or macroglossia, as well as the less dramatic but clinically significant effects as seen in oral habits such as tongue-thrusting, illustrate the possible effects.[2]

Most dental professionals accept the theory of Tomes (1873), who asserted that opposing forces or pressure from the lips or cheeks on one side and the tongue on the other, determine the position of the teeth in the arch.[3] The contribution of the forces of the lips, cheeks, and tongue are of particular interest to orthodontists in making correct treatment planning. The technical skills and protocol that the orthodontist uses to assess these forces of tongue and perioral muscles may determine the ultimate success of orthodontic treatment.[4,5]

Forces acting on the dentition are produced, principally, by perioral musculature and tongue. The forces play an important role in guiding teeth eruption and occlusion formation and maintaining dental arch shape and stability.[6,7]

The dentition is supposed to be in a state of balance between forces from the outside, the lips and cheeks, and forces from the inside, the tongue. During the past decades, a lot of devices have been used to study these forces and some conclusions were made that the position of the teeth was influenced by the forces developed by the soft tissues surrounding them and that there existed a dynamic equilibrium between forces from lips and cheeks and those from tongue.

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This dynamic balance would be different as oral functions change.[6,7]

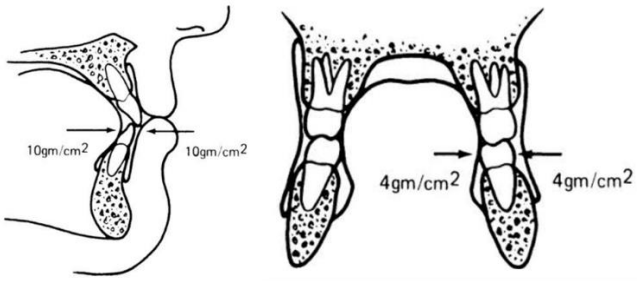

Figure 1: Equilibrium theory

Oral habits are repetitive behavior in the oral cavity which results result in loss of tooth structure and they include digit sucking, pacifier sucking, lip sucking and biting, nail-biting, bruxism, self-injurious habits, mouth breathing and tongue thrusting. These para functional habits are recognized as a major etiological factor for the development of dental malocclusion. Thumb sucking and tongue thrusting are the common ones. Abnormal tongue function, volume and posture have been long debated as a cause of malocclusion. Le foulon, in 1839 quoted "prevention is better than cure." Understanding the etiology, effects and it management at an early stage may be very helpful to prevent future severe skeletal malocclusion.[8]

Figure 2: Open-bite in Tongue thrusting habit

To the extent that the form of dental arches is influenced by the musculature, resting pressures and resting posture of the tongue and lip seems more important than pressure during swallowing or speech.[7]

It is very important for orthodontists to understand the effect of tongue function in the correction of malocclusion and stability after treatment. It has been reported that tongue thrust may be initiated during orthodontic treatment, especially when treatment creates temporary open spaces anteriorly or interferences with intercuspation or reduces tongue space. Cheng et al proposed that all tongue dysfunctions should be corrected if long-term stability of treatment results is desirable. Myofunctional therapy is can be indicated for correction of tongue thrust swallowing. It has been demonstrated that both myofunctional therapy and crib therapy in combination are successful in correction of tongue thrust swallowing.[9]

Figure 3: Different tongue thrusting habit breaking appliances

Equilibrium Theory, Muscle Pressures And Etiology:

The question of tongue lip pressure in the etiology of the malocclusion is basically a question of the validity of the "equilibrium theory" of the tooth position. Since the teeth remain in the stable position most of the time in most of people, and since tooth movement is observed when additional forces are

added to the system, it is apparent that there is an equilibrium which can be upset leading to proclination of teeth seen in tongue thrusting patients. However, it does not follow that teeth rest in the area of absolute balance between tongue and lip pressures. Therefore, it is more important to know the contributions of tongue and lips to the equilibrium. Direction, duration, magnitude of force are important variables which must be considered. According to findings of several investigators, even when the longer duration of lip pressures is taken into the account, the muscular activity of lips does not balance the functional activity of tongue. Time pressure integral come closer but do not balance.[6,7,10]

Several authors suggest that resting pressure rather than pressure during the functional activity might be more likely to influence the position of teeth. Brader hypothesized that the radius of curvature of dental arch influences the stresses on teeth, and this factor added to the resting pressure would reveal the equilibrium statement.[7]

All the above relates to the horizontal position of the teeth in the arches, however vertical position of the teeth may be influenced by the functional activity. As the amount of force accompanying tooth eruption is few grams, vertically directed intermittent forces accompanying swallowing and other activity might influence the eruption of teeth and resulting in open bite.[7]

Figure 4: Neutral pressure zone of the teeth in anterior and posterior region of the arches.

PRIMARY FACTORS IN EQUILIBRIUM POSITION OF TEETH[7]: -

1. Intrinsic forces by tongue and lips
2. Extrinsic forces: Habits (thumb sucking, etc.), orthodontic appliances
3. Forces from dental occlusion
4. Forces from periodontal membrane

COMPONENT	INTENSITY	DURATION
Forces Of Occlusion	Very High	Very Short
Lip Or Tongue Pressure		
-Swallow	High	Short
-Speech	Low	Short
-Rest	Low	Long
Forces Of Eruption	Very Low	Long

SECONDARY FACTORS IN EQUILIBRIUM POSITION OF TEETH[7]: -

1. Influences on postural relationship in the stomatognathic system
2. Secondary factors relating to eruption forces

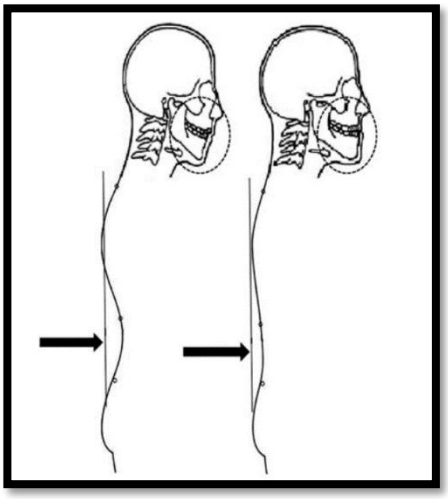

Figure 5: Patients with distal & vertical craniofacial patterns present higher than normal upper thoracic, lumbar lordotic and pelvic angle and vice versa.[35]

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VARIOUS METHODS EMPLOYED IN THE PAST STUDIES TO STUDY TONGUE ACTIVITY[10]: -

Electromyography-

Moyers investigated functional movements of the oro- facial musculature using the electromyograph. Since then, Tulley, Marx, and many others have contributed.

Measurement of intraoral pressures-

With the introduction of small transducers, intraoral pressures can be measured more accurately than with other methods previously described. Winders was probably the first in this field, and he has been followed by many other investigators who have confirmed that the tongue is probably more important than the surrounding musculature causing relapse of orthodontic treatment.

Cinefluoroscopy-

Ardran and Kemp, Cleall, Tulley, and others have shown that this technique has limitations in terms of speed and is only two dimensional. It does not lend itself to serial studies because, although the dosage is small using image intensifiers, it is difficult to persuade patients that it is clinically necessary.

Cephalometric head films.-

Peats and others have shown the possible differences between the relaxed and habitual postures of the tongue and this, in turn, has made some contribution to our knowledge. However, this technique is subject to variation.

Neurophysiologic experiments-

Bosma and his co-workers, Grossman, Berry, and Faweus, have carried out various neurologic tests on the behavior of the tongue. So far, the use of stereo gnostic tests has indicated very considerable individual differences in lingual sensorimotor factors.

Serial cinephotography-

This is difficult to analyze scientifically, but, it does highlight the individual variations. Although cinephotography cannot display the intraoral movements of the tongue, work by Whillis and other film studies carried out by the Veterans Organization have shown tongue movements through surgical defects in the fact. This longitudinal approach has proved to be of great value.

DIFFERENT TYPES OF DEVICES USED IN STUDIES TO MEASURE TONGUE PRESSURE: -

1. Mouthpiece containing strain gauges
2. Mouthpiece containing load cells
3. Mouthpiece containing force sensing resistors
4. Pressure sensors attached on teeth or on palatal plates
5. Dynamometers
6. Bulbs filled with some fluid and connected to a pressure sensor
7. Myometer 160
8. Flexible resistive sensors

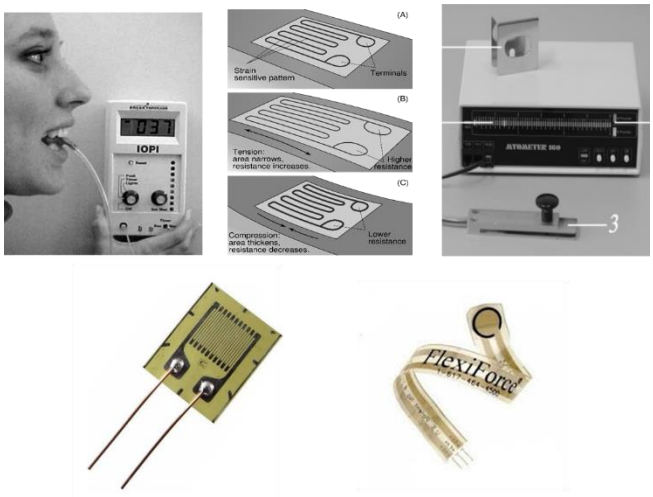

Figure 6: Different tongue pressure measuring devices

REVIEWS OF VARIOUS STUDIES CONDUCTED ON TONGUE PRESSURE:

Reference	Method	Sample	Results
Kydd (1956)[11]	Mouthpiece containing three strain gauges	One edentulous 30 years old man	Maximum force exerted anteriorly 23.13 N. Maximum force exerted laterally to the right: 11.56 N. Maximum force exerted laterally to the left: 10.23 N
Winders (1958)[4]	A-19 strain gauges	25 subjects with different malocclusion	Swallowing pressure ranged from 0.581 psi to 10.138 psi
Kydd et al. (1963)[12]	Mouthpiece containing two strain gauges	Subjects aged between 14 and 20 years old, with and without anterior open bite	Average pressure during swallowing was 27.95 kPa in subjects with anterior open bite and 12.06 kPa in normal subjects
Proffit et al. (1964)[13]	Mouthpiece containing two strain gauges	19 men aged between 22 and 32 years old	Average of maximum pressure during saliva deglutition was 4 kPa on anterior teeth and 4.20 kPa on lateral teeth
Posen (1972)[3]	Dynamometer	Subjects with normal occlusion	Maximum force: 6 N to 25 N.
McWilliams, Kent (1973)[14]	Dynamometer	Seven subjects with tongue thrust and open bite	Maximum force: 4.83 (Measurements were recorded on a zero to ten scale)
Dworkin (1980)[15]	Mouthpiece containing a strain gauge	67 men and 58 women aged between 20 and 72 years old	Maximum force exerted anteriorly: 32.9 N for men and 27.5 N for women. Maximum force exerted laterally to the right: 31.7 N for men and 28.7 N. Maximum force exerted laterally to the left: 29.3 N for men and 23.7 N for women

Frohlic et al. (1990)[16]	A cannula, to provide water scape, connected to a pressure measuring system.	25 young adults with normal dental occlusion	Average pressures in rest position were - 0.17 kPa, -0.001 kPa, -0.03 kPa and 0.48 kPa, during chewing were 5.08 kPa, 9.41 kPa, 9.34 kPa e 14.33 kPa and during swallowing were 19.65 kPa, 32.65 kPa, 30.45 kPa e 27.56 kPa at upper incisor, lower incisor, upper molar and lower molar respectively.
Robinovitch et al. (1991)[17]	Mouthpiece containing two strain gauges	One normal subject	Maximum force exerted laterally: 14.1 N Average force exerted laterally: 3.03 N
Scardella et al. (1993)[18]	Mouthpiece containing a strain gauge	Five normal male subjects aged between 21 and 36 years old	Maximum force ranged between 9.50 N and 16.33 N, average maximum force was 12.67 N±1.25 N
Mortimore et al. (1999)[19]	Mouthpiece containing load cell	86 women and 81 men aged between 42 and 62 years old	Maximum force for men: 26±8 N Maximum force for women: 20±7 N
Bu Sha et al. (2000)[20]	Bulbs filled with saline and connected to a pressure sensor	11 men between 19 and 41 years old	Maximum force: 28.0±2.0 N
Blumen et al. (2002)[21]	Mouthpiece containing a strain gauge	Eight healthy men aged between 25 and 60 years old.	Maximum force: 5.44±1.52 N
Hayashi et al. (2002)[22]	Bulbs filled with air and connected to a pressure sensor	41 subjects between 24 and 85 years old	Average pressure: 27 kPa
Clark et al. (2003)[23]	Bulbs filled with air and connected to a pressure sensor	63 subjects aged 19 to 95 years old	Maximum pressure: 40 kPa Average pressure: 35 kPa
McAuliffe et al. (2005)[24]	Bulbs filled with air and	15 subjects between 20 and 31	Average pressure: 36.92 ± 6.44 kPa

	connected to a pressure sensor	years old	
Hori et al. (2006)[25]	Seven pressure sensors attached on a palatal plate	10 healthy subjects (8 men and 2 women) between 24 and 30 years old	Pressure during swallowing ranged between 0.8 and 17.1 kPa
Ball et al. (2006)[26]	Three Bulbs filled with air and connected to a pressure sensor	21 subjects (average age of 63,6 years old)	Pressure during swallowing: between 7,76 kPa and 20,56 kPa
O'Connor et al. (2007)[27]	A mouthpiece containing a round button connected to the force sensor by a cylindrical steel beam	12 male subjects with average age of 23 years old	Maximum force: 24.3 ± 6.7 N
Kieser et al. (2008)[28]	Eight pressure sensors attached on palatal plate	five adult volunteers	Pressure during swallowing of 10 mL of water ranged from 13.05 to 289.75 kPa
Utanohara et al. (2008)[29]	Bulbs filled with air and connected to a pressure sensor	843 subjects between 20 and 79 years old	Maximum pressure was 41.7±9.7 kPa between 20 and 29 years old; 41.9±9.9 kPa (30 to 39); 40.4±9.8 kPa (40 to 49); 40.7±9.8 kPa (50 to 59); 37.6±8.8 kPa (60 to 69); and 31.9±8.9 kPa (70 to 79
Hori et al. (2009)[30]	Five pressure sensors attached to the palate	30 healthy subjects (20 men and 10 women) between 24 and 35 years old	Pressure during swallowing ranged between 1.0 and 14.5 kPa
Barroso et al. (2009)[31]	A piston-cylinder assembly attached hydraulically to a pressure	10 subject aged between 14 and 80 years old	Average force: between 3.55 N and 13.24 N Maximum force: between 4.97 N and 19.96 N

	sensor		
Lambrechts et al. (2010)[5]	The Myometer 160	107 subjects between 7 and 45 years old	Average pressure: 1.66 N
Tasalan et al. (2010)[1]	Diaphragm type transducer placed on palatal crib	13 tongue thrusting patients	Resting tongue pressure decreased from 21.09 ± 14.55 g/cm^2 to 12.8 ± 2.41 g/cm^2 and swallowing tongue pressure decreased from 216.43 ± 65.79 g/cm^2 to 142.95 ± 29.2 g/cm^2 at the end of 10th month
Valentim et al. (2014)[32]	Flexiforce resistive sensor placed on central incisor	28 subjects, aged 19–31 years	At rest- 0.00±0.00 N, During swallowing- 0.31±0.38 N
S Deshmukh et al. (2018)[33]	3 Flexiforce resistive sensor placed on palate	30 subjects with different growth pattern	Mean tongue pressure in average growth pattern cases was 49.48 Kpa, horizontal growth pattern was 51.47 Kpa, and vertical growth pattern was 35.36 Kpa.

OBSERVATIONS DEDUCED FROM THE ABOVE STUDIES:

Several researchers developed methods to quantify force/pressure exerted by the tongue, using different technologies. A trend of using strain gauges was observed in the first devices developed. Recently, the number of researches using bulbs and palatal plates with pressure sensors increased.

Some of the important results of the studies conducted on tongue pressure can be summarized as follow:

1. Maximum force exerted on the dentition by the tongue ranges from 37-240 g/cm^2 and 112 g/cm^2 on average.[4]
2. Tongue pressure during deglutition ranges from 41 to 709 g/cm^2.[4]
3. Mean tongue pressure was significantly more in the anteriomedial part of the hard palate than the posteromedial part.[34]
4. Mean tongue pressure in horizontal growth pattern cases was significantly higher than average growth pattern and vertical growth pattern has lesser tongue pressure when compared with average growth pattern.[33]
5. During the habitual position lip forces were greater than tongue forces. In function tongue exerts a much greater force on dentition than does the perioral musculature.[4]
6. Form of dental arches is more influenced by the musculature, resting posture and resting pressure of tongue and lips than pressure during swallowing or speech.[10]

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7. Equilibrium theory: -
   a. Forces exerted upon the crown of the tooth by the surrounding soft tissue may be sufficient to cause tooth movement in the same manner as that produced by orthodontic appliance.[6]
   b. Each element of the dentition may have more than one position of stable equilibrium within the system composed of the natural oral environment.[6]
   c. Differential forces, even when they are of small magnitude if applied over a considerable period of time can cause important changes in the tooth position.[6]
8. Forces from occlusion probably also play a role in the vertical position of teeth by affecting eruption.[7]
9. Respiratory needs influence head, jaw and tongue posture and thereby alter the equilibrium.[7]
10. Anterior open-bite subjects i.e. tongue thrusting patients exerts both tongue and lip pressures for a longer duration.[9]
11. Crib appliance wear results in a disturbance in intraoral pressure equilibrium.[1]
12. Males perioral and lingual forces is larger than females.[5]

The wide variation in maximum and average strength and pressure values found were related to the great diversity of devices. Methodological differences made it difficult to compare tongue force measured in different studies, as it depends on a number of factors such as the degree of protrusion, the direction of the movement, the distance between mandible and maxilla, the tongue region in contact with the sensor, the area in which the pressure is exerted. A lack of reproducibility in any of these parameters might lead to significant variation in the obtained results.

CONCLUSION:

This review will improve our knowledge about the tongue pressure and various instruments and methods employed to measure tongue pressure in patients with or without tongue thrusting habit.
It will also help in early detection of abnormal tongue pressure for treatment planning and retrain and reprogram the altered tongue pressure.

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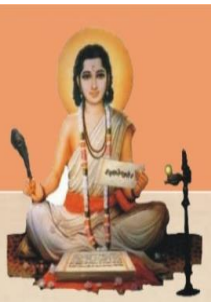

॥ पसायदान ॥

आतां विश्वात्मकें देवें । येणें वाग्यज्ञें तोषावें ।
तोषोनि मज द्यावें । पसायदान हें ॥१॥
जे खळांची व्यंकटी सांडो । तयां सत्कर्मीं रती वाढो ।
भूतां परस्परें पडो । मैत्र जीवाचें ॥२॥
दुरितांचें तिमिर जावो । विश्व स्वधर्मसूर्ये पाहो ।
जो जें वांछील तो तें लाहो । प्राणिजात ॥३॥
वर्षत सकळमंगळी । ईश्वरनिष्ठांची मांदियाळी ।
अनवरत भूमंडळी । भेटतु भूतां ॥४॥
चलां कल्पतरूंचे आरव । चेतना चिंतामणींचें गांव ।
बोलते जे अर्णव । पीयूषाचे ॥५॥
चंद्रमे जे अलांछन । मार्तंड जे तापहीन ।
ते सर्वांही सदा सज्जन । सोयरे होतु ॥६॥
किंबहुना सर्वसुखीं । पूर्ण होऊनि तिहीं लोकीं ।
भजिजो आदिपुरुखीं । अखंडित ॥७॥
आणि ग्रंथोपजीविये । विशेषीं लोकीं इये ।
दृष्टादृष्ट विजये । होआवें जी ॥८॥
तेथ म्हणे श्रीविश्वेश्वरावो । हा होईल दानपसावो ।
येणें वरें ज्ञानदेवो । सुखिया झाला ॥९॥

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