"CORRELATION OF BUCCAL CORRIDOR SPACE WITH OVERJET IN DENTULOUS PATIENT "

Dissertation

Submitted to

BABU BANARASI DAS UNIVERSITY,

LUCKNOW, UTTAR PRADESH

In the partial fulfillment of the requirements for the degree

of

MASTER OF DENTAL SURGERY

In

PROSTHODONTICS AND CROWN & BRIDGE

By

Dr. Pratibha Yadav

Under the guidance of

Dr. Garima Agarwal

Reader

PROSTHODONTICS, CROWN & BRIDGE

BABU BANARASI DAS COLLEGE OF DENTAL SCIENCES, LUCKNOW

(Faculty of Babu Banarasi Das University)

YEAR OF SUBMISSION: 2021 **BATCH: 2018-2021**

CERTIFICATE

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled **"CORRELATION OF BUCCAL CORRIDOR SPACE WITH OVERJET IN DENTULOUS PATIENT"** is a bonafide and genuine research work carried out by me under the guidance of ***Dr. Garima Agarwal*** , Reader, Department of Prosthodontics and Crown & Bridge, Babu Banarasi Das College of Dental Sciences, Babu Banarasi Das University, Lucknow, Uttar Pradesh.

Date: 29 - June - 2021

Place: Lucknow

Pratibha Yadav

Dr. Pratibha Yadav

CERTIFICATE BY THE GUIDE

This is to certify that the dissertation entitled **"CORRELATION OF BUCCAL CORRIDOR SPACE WITH OVERJET IN DENTULOUS PATIENT"** is a bonafide work done by **Dr. Pratibha Yadav**, under my direct supervision and guidance in partial fulfilment of the requirement for the degree of MDS in Department of Prosthodontics and Crown & Bridge.

Date: 29-June-2021

Dr. Garima Agarwal
Reader
Department of Prosthodontics and
Crown & Bridge.
BBDCODS, BBDU
Lucknow

ENDORSEMENT BY THE HOD / HEAD OF THE INSTITUTION

This is to certify that the dissertation entitled **"CORRELATION OF BUCCAL CORRIDOR SPACE WITH OVERJET IN DENTULOUS PATIENT"** is a bonafide work done by **Dr. Pratibha Yadav** under the supervision of **Dr. Amrit Tandan**, Professor & Head, Department of Department of Prosthodontics and Crown & Bridge, Babu Banarasi Das College Of Dental Sciences, Babu Banarasi Das University, Lucknow, Uttar Pradesh.

Dr. Amrit Tandan
Professor & Head
Department of Prosthodontics and
Crown & Bridge
BBDCODS, BBDU
Lucknow

Dr. B. Rajkumar
Principal
Professor & Head
Department of Conservative
Dentistry & Endodontics
BBDCODS, BBDU
Lucknow

COPYRIGHT

DECLARATION BY THE CANDIDATE

I hereby declare that the **Babu Banarasi Das University** shall have the rights to preserve, use and disseminate this dissertation in print or electronic format for academic / research purpose.

Date: 29-June-2021

Place: Lucknow

Pratibha Yadav

Dr. Pratibha Yadav

ACKNOWLEDGEMENT

"Acknowledging the good that you already have in your life is the foundation for all abundance."

The satisfaction and euphoria that accompany the successful completion of a task could be incomplete without the mention of the people who made it possible. I owe my immense respect to my parents and almighty who granted me countless blessings.

I humbly acknowledge my parents ***Mrs. Rita Yadav*** *and* ***Mr. Uma Kant Yadav*** *for their love, efforts and support throughout my life. I respect you for the selfless love, care, pain and sacrifices you did to shape my life. Without your blessings it would never have been possible. Thank you for giving me sincere encouragement and advise.*

It is my privilege and honour to express my most sincere and heartful thanks to my head, ***Dr.Amrit Tandan****, MDS, Professor & Head, Department of prosthodontics and crown & bridge, Babu Banarasi Das College of Dental Sciences, Lucknow, and consider myself fortunate enough for getting a privilege to work under his guidance and supervision. His unflinching courage and conviction will always inspire me, and I hope to continue to work with his noble thoughts. I can only say a proper thanks to his through my future work. It is to his, that I dedicate this work.*

I take this opportunity to express my deep sense of gratitude and heartful thanks to my guide ***Dr. Garima Agarwal,*** *MDS, Reader, Department of Prosthodontics and Crown & Bridge, Babu Banarasi Das College of Dental Sciences, Lucknow, for her guidance, personal attention and valuable insight in preparing the dissertation. I stand indebted to her for her motivation, support and encouragement that she have bestowed upon me.*

I am also thankful to ***Dr. Swati Gupta,*** *MDS, Professor,* ***Dr.Manoj Upadhyay,*** *MDS, Reader,* ***Dr. Virag Srivastava****, MDS, Senior Lecturer, Department of prosthodontics and crown & bridge, Babu Banarasi Das College of Dental Sciences, Lucknow, for their valuable suggestions, time to time guidance, encouragement and constant moral support during the period of my study. Without their support nothing*

ACKNOWLEDGEMENT

would have been possible for me. It was their understanding, valuable suggestions, unstinted help and personal attention that have provided good and smooth basis for this work.

I am thankful to ***Dr. Saundarya Priyadarshani****, MDS, Public Health Department and* ***Mr. Manoj Kumar Pandey*** *for providing valuable assistance in data analysis.*

I am really thankful to people who means a lot to me my brother ***Mr. Devesh Chandra*** *and my sister-in- law* ***Mrs. Parul Yadav*** *for always guiding me and giving me direction when I feel lost. Thank you for giving me sincere encouragement and advice.*

I would also like to thank my friends ***Dr. Ankit Mishra****, Dr****. Aishwarya Mehrotra*** *and* ***Dr. Georgee Sharun Philip*** *for being my true well-wisher. Thanks for being by my side and helping me in times of need.*

I would also like to extend my gratitude to my colleagues ***Dr. Aakanksha Pandey, Dr. Aishwarya Mehrotra Dr. Chetna Awasthi, Dr. Taruna Choudhary and Dr. Georgee Sharun Philip*** *for their help and encouragement throughout my work.*

I would also like to express my gratitude to all my juniors ***Dr. Aisha Mirza, Dr. Bhumika Singh Chauhan, Dr. Rehana Bano, Dr. Arushi Agarwal, Dr. Ashwin Matety, Dr. Akanksha, Dr. Charu Rukhaya, Dr. Krishna Priyadarshini, Dr. Rakhi Raveendran, Dr. Roopali Sharma and Dr. Rusa Sannigrahi*** *for their constant support and help in all my work and bringing the dissertation to completion.*

I also acknowledge the assistance rendered by the paradental staff in the department- ***Mr.Mauryaji , Mrs.Nirmla, Mr.Arvind and Mr.Ramsagar****. Besides this, several people have helped me knowingly and unknowingly in the successful completion of this project.*

Finally, I would like to thank all other unnamed who helped me in various ways. I would like to thank each and everyone…

DR. PRATIBHA YADAV

CONTENTS

LIST OF TABLE

LIST OF GRAPHS

LIST OF FIGURES

LIST OF ANNEXURES

LIST OF ABBREVIATIONS

List of Abbreviations	Stands For
NS	Negative Space
BCA	Buccal Corridor Area
BCAR	Buccal Corridor Area Ratio
FMA	Frankfort- mandibular plane
DSLR	Digital single lens reflector
JPEG	Joint Photographic Expert Group

ABSTRACT

BACKGROUND- The goal of esthetic treatment is to achieve an improved appearance that gives the patient a lively and realistic look. Buccal Corridor is one of the factors that should be assessed and considered while creating a smile. Proper overjet doesn't just affect your appearance but also plays an important role in stability of prosthesis.

AIM- The aim of this study is to correlate the amount of buccal corridor space during smiling with different overjet with Class I molar relationship.

METHODS-The study sample size was 45 individuals with class I molar relationship and were divided into three groups with overjet ranging from1-2mm(group A), 2-3mm(group B), and 3-4mm(group C) with 15 sample size in each group respectively. Measurement of buccal corridor space was carried by Videographic Analysis using digimizer software and adobe photoshop software and readings of overjet was measured clinically and both were compared.

RESULT- The ANOVA was applied on quantitative data, showed that there is no significant differences among groups mean of buccal corridor space from left side, right side and mean of left and right side.In case of group A there was a negative correlation between overjet and buccal corridor space. On increasing overjet as observed in case of group B and group C buccal corridor space also increases.

CONCLUSION- It was concluded that on increasing overjet as observed in case of group B (2-3mm) and group C (3-4mm) that buccal corridor space also increases.

KEYWORDS- Buccal corridor, overjet, esthetics, videographic analysis.

INTRODUCTION

Facial esthetics has been concern for an individual for a long time. It was probably in palolithic period when men developed his esthetics awareness and sensitivity. Greeks were the first to develop skills to appreciate the qualities of facial beauty through philosophy and sculpture. Term “aesthetics” was introduced as both the study of beauty and art by Greek philosopher, Plato and Aristole[1].

The face is the important element in assessing an individual’s esthetics. In the same context, one’s mouth and teeth are also essential features[2].

Smile has a significant role in facial attractiveness along with communicating a variety of emotions to those in surroundings which is unique to each an individual person[2]. The mouth and eyes of the speaker’s face can grab one’s attention. The upper and lower lips are framed in such a way as to display zone of the smile, the gingival scaffold, bordering the dentition and creating the space in oral cavity[`3,4].

A smile is characterized by spreading the lips, often to signal joy, as a change in one's facial expression in the following two groups, researchers have classified smiles: posed and unposed. The existing smile is portrayed as continuous, and the lip movements are relatively consistent..In comparison, an unwelcome smile is spontaneous and caused by joy or happiness[5].

An ideal soft tissue balances the face and confers charm. Beauty is the phenomenon of gratification by perception. There is a common norm for balance.

Beauty of the face regardless of race, gender, age and other variables called 'divine Proportion' which has also been used in various phenomenon, geometrical proposals and human architectural building. Divine proportion is a ratio that is a law of balance, which presents a relationship between mathematics and beauty in order to establish equilibrium, and also gives the illusion of perfection.

The social smile should be given utmost importance as it is the most appropriate for rehabilitation preparation and testing due to its reproducibility; however, Burstone stated in a published interview that it is very difficult for the smile to be reproducible and therefore it cannot be a precise guide for dental position. This difficulty highlights the importance of a dynamic video record, as it ensures that you capture the intended smile frame.

INTRODUCTION

Smiles is graded as state I smile (posed smile) and state II smile in different ways by Ackermann et al (spontaneous smile). In state I smile is close to a practised smile for clicking photographs. The Stage II Smile is a voluntary and natural expression of human emotion[5]. The primary goal of prosthodontics treatment is to produce a well-balanced smile that is an additional and most important treatment objective. There are many factors that need to be considered and evaluated in creating a smile that is aesthetically pleasing to both the doctor and the individual. This demand for a pleasant smile drives us to the field of dental esthetics, making the role of prosthodontist significant[6].

Esthetic dentistry is concerned with not only restoring symmetry and beauty of a face but also half in generating the appearance of elegance by the use of different dental materials and methods. The Buccal Corridor is one of the factors that should be assessed and considered while creating a smile. It serves as a black or dark region in between maxillary back teeth and the edge of the mouth while the person poses. It is well known in Prosthodontic literature that the absence of a buccal corridor is one of the features of an artificial or contrived smile called a "denture smile"[2]. According to the definition of the Frush and Fisher buccal corridor, whenever the individual smiles, there is space between the facial portion of the posterior teeth and the edges of the lips. When the buccal corridor is reproduced in an unnatural dentition, the illusion of a natural dentition is generated and an unrealistic presence is created when it is established[7]. Goldstein believed that the smile holds the second position to the eye as one of the most essential requirements influencing the beauty of the face [8].

Sarver and Ackerman recognize three basic criteria for the assessment of dental and facial aesthetics a dynamic and static 3-dimensional facial assessment, mainly focused on the clinical evaluation of the patient. Determining the relation of lip-tooth with anterior tooth in physiologic rest position while performing facial animation. It is also important to calculate the volume of dental and skeletal components of head and neck region and its effect on the soft tissue.

The importance of dental esthetics has been highlighted by the development of occlusal indexes that assess this aspect of malocclusion in order to justify the need for dental esthetics[9-10].

INTRODUCTION

For treatment from a professional point of view, good dental alignment is only one aspect of achieving good dental esthetics. Other anterior occlusal traits to be considered include overjet (OJ), overbite (OB) and dental midline relationships. It doesn't only influence your look to get an overjet. You might also have problems eating, drinking, and biting. It can also lead to pain in the mouth. The goal of esthetic treatment is to achieve an improved appearance that gives the patient a lively and realistic look[11].

Incisal guidance is the effect of the contacting surfaces of the maxillary and mandibular anterior teeth on the mandibular movements. The steepness of the incisal line is determined by the horizontal and vertical overlap of the anterior teeth. In normal occlusion, the lingual inclines (surfaces) of the six upper anterior teeth can be considered an incisal guiding factor[12].

As the overbite increases and the overjet decreases, the incisal guidance becomes steep leading to more off-axial forces on the teeth that are potentially dangerous[12]. The amount of overjet is more significant in affecting the health of the anterior teeth as it provides enough space for the mandible to move forward without damaging the periodontal support of the anterior teeth[13].

When all natural teeth have been lost, there is a hole inside the oral cavity that is a possible denture space. The neutral zone is the area in the possible denture space where the forces of the tongue pushing outward are neutralized by the forces of the cheeks and lips pressing inward[14-16]. As these forces evolve through muscle contraction during the various functions of chewing, speaking, and swallowing, they vary in magnitude and direction in different individuals[17,18].

Beauty expectations are simply a list and a comparison of anything we've seen or heard. Smile design varies from tooth design, one of which involves the contour, location and color of individual teeth, while the incorporation of these teeth into the face and facial features is of utmost importance in the design of the smile.

As a prosthodontist, we are rehabilitating oral function by replacing missing teeth with removable or fixed prosthesis. The overjet which is dependent on incisal guidance is

calculated and we always try to reproduce the same overjet in artificial prosthesis in order to achieve esthetics within the range of functionality.

Buccal corridor space also plays an important role in the esthetics and posterior teeth replacement effects of the above mentioned space as well as the esthetics. If we can establish a correlation between the overjet and the buccal corridor space and if can apply to the rehabilitation of the mouth, we can achieve better esthetics and function.

To our knowledge, there was no previous study that has assessed the correlation of buccal corridor space with overjet in dentulous patient. Therefore, the purpose of this study is to observe the correlation of width of buccal corridor space on smiling with overjet.

AIM

The aim of this study is to correlate the amount of buccal corridor spaces during smiling with different overjet with Class I molar relationship.

OBJETIVES

1. To evaluate buccal corridor space on smiling.
2. To evaluate overjet in dentulous patient.
3. To establish a correlation between buccal corridor space and overjet with Class I molar relationship.

Matthews TC (1978)[7] a muscle movement over the lips throughout the lower third of the face, along with a brightening of the eyes, was shown to be a symbol of a smile. A pleasing smile was unique way of non-verbal communication, and it communicates joy. The lips not only frame the grin and identify the minimum areas in need of aesthetic improvement, but they also provide guidance about where the teeth should be positioned. The dentist must ensure and construct a natural curvature of the jaw, sufficient visibility of the red area of the lips, an unhindered philtrum, and an unimpeded nasiolabial groove in order to achieve a cooperative smile. Smile morphology is made up of these entities that are maintained in accordance with exposed teeth.

Dunn J. William et all (1996)[18] stated the impact of dentofacial attractiveness to an individual's psychosocial well-being. Very little research is known about the interpretation of an appealing aesthetic portrait by dental patients. The aim of this research was to figure out what factors patients thought to differentiate attractive smiles from unattractive smiles.

Ackerman et al (1998)[3] mentioned that smiles can be posed or random. As a raised smile, marked stage I smile, and stage II as an unposed (spontaneous) smile. The most critical element in smile beauty has been found to be vertical lip thickness. The smile view segment is framed by the upper and lower lips.

Christopher Maulik (2005)[19] stated that the importance of a perfect smile cannot be overstated. As they smiled, many of the participants had a strong anterior smile height, a significant posterior smile height, a flat smile arc, teeth accessible to the maxillary second premolar, and an eleven percent buccal corridor. Females had higher anterior and posterior smile heights, a more complementary smile arc, and fewer buccal corridors than males. In comparison to the untreated group, the orthodontic participants scored more symmetric smile arcs.

Moore Theodore, Southard A. Karin, Casko S. John (2005)[20] evaluated the effect of buccal corridors on smile attractiveness as measured by general public. They believed that having narrow buccal corridors is indeed an appealing aesthetic feature for both men and women, and large buccal corridors should be addressed throughout orthodontic testing and therapy preparation.

Ritter Eneas Daltro et al (2006)[2] analysis was conducted to determine and verify the aesthetic impact of bilateral space between the edges of a maxillary teeth and lips. The study consisted of 60 photographs of smiles taken from 60 participants aged 18 to 25 years (30 males and 30 females).In that same research project, it was discovered that the negative space had no effect on orthodontists' and general practitioners' artistic assessments of smile pictures.

Parekh Manhar Sanjay (2006)[21] used to measure improvements in appearance by generating automated differences in smile arcs and buccal passages for male and female smile evaluated by orthodontists and laypeople. In a content management study orthodontists and laypeople used a tactile analogue scale to assess the beauty of 9 technology driven smile arc and buccal corridor male and female combinations. In an experimental web-based study, alterations were produced in a scientifically acceptable manner and dependent on standards developed by trained orthodontists. Both lay person and orthodontists enjoy gestures in which the smile arc follows the bottom lip and the buccal corridors are small according to the findings. Smiles with smooth grin arcs and overly buccal passages ranked slightly lower in attractiveness. The lowering of the smile arc exacerbates the detrimental effect of excessive buccal corridors on personality. Depending on the authors of this article, attention should be paid not to create an unnecessarily smooth smile arc during dental procedures.

Freire Medina Sheila et al (2007)[22] examined the presence of dental inconsistencies according to Bolton's criteria, obtained mean values for overbite, overjet, Spee curve and interincisal angle, and demonstrated some connection between these parameters. It was observed that the sample shows no dental discrepancy among the 12 teeth of opposite arches of normal occlusion and statistically significant correlation was found between overjet and overbite.

Martin J. Adam et al (2007)[23] evaluated the effect of the different sizes of the buccal corridors on the beauty of the smile. The 18 smiles produced were assessed by 82 orthodontists and 94 lay people. To measure discrepancies between the orthodontic and lay people paired tests were used and to compare the separate tests of the two classes were used. Just two out of eight asymmetrical smiles were found less desirable than orthodontists would have predicted for symmetrical smiles of similar arch widths, but no asymmetrical smiles

were deemed to be less attractive than expected. It was concluded that age and gender did not substantially affect the effect of BCs on the attractiveness of the smile.

Geld Vander Pieter et al (2007)[24] the role of the smile line and other factors of the attractiveness of the smile and its impact on individual personality were investigated, and the role of the smile line and other aspects were associated with the attractiveness of the smile and its effect on individual personality. The participants measured their smile appeal with a patient specific questionnaire. Smile line height was measured using the digital video system and personality was evaluated using the Dutch Personality Index. It was found that the size of the teeth, the visibility of the teeth, and the location of the upper lip were important factors in the self perception of the attractiveness of the smile. Color of teeth and gingival display were seen as important factors in the satisfaction of the appearance of the smile. Participants smiled with fully exposed teeth and some gingival showing, regarded their smile line as the most aesthetic. Participants smiling with fully exposed teeth and some gingival display saw their smile line as the most aesthetic, while smiles with disproportional gingival display were judged to be negative and correlated with the personality traits of neuroticism and self esteem.

Yang II Hyung, Nahmb S.D., Backc Hak-Seung (2008)[25] examined the sum of BCA during the smile displayed using hard and soft tissue variables. The research involved 92 adult patients who were treated with a set appliance only and had a canine and molar relationship of angle class I. The inclination of the occlusal plane and the linear ratio of the occlusal corridor showed no clear association with the BCAR. BCAR did not vary substantially between extraction and non-extraction groups. It was established that the vertical configuration of the face, the volume of upper incisor exposure, and the total of the tooth material should really be examined in order to stabilize the quantity of BCA in order to generate a more attractive expression.

Krishnan Vinod, Danie T. Sunish et al (2008)[26] specified Smile assessment and design are important; recent emphasis on soft tissues in orthodontic diagnosis and treatment preparation has been consistent with that on hard tissues. Smile detection is often ignored in clinical trials, and its relevance is yet to be properly addressed. They attempted a comprehensive evaluation of the characteristics of the smile with the objectives of measurement of vision differences and quantification of characteristics of the grin arc, estimation of the BC and revised index of

smile. There was no difference between the professionals and the laymen in the ultimate evaluation of the grin. Female had much more phonetic expressions than males, but there was a strong distinction between the left and the right buccal corridors among males and females. The MSI did not display a relationship to the facial index, although there was a negative relationship between the MSI and the mandibular gap of the facial height index. As a result, the Smile study should be an integral aspect of orthodontic care and recovery preparation.

Ioia Hideki et al (2009)[6] tested the theory that the expansion of the buccal corridor had no bearing on the smile assessment of Japanese orthodontists and dental students. Male and female reviewers for orthodontists and dental students don't really show a significant difference in the attractiveness of the smile in buccal corridors. There have been distinct changes in ordinary aesthetic ratings between orthodontists and dental students. Orthodontic and dental students preferred broader smiles to modest or small smiles, so the hypothesis was discarded.

Zia Umar Afeef (2012)[27] reported that the re-emergence of the soft tissue model in clinical orthodontics led to a smile study and the design of key elements in treatment planning. The purpose of this study was therefore to establish a correlation between one of the many variables affecting the smile; the interpremolar width with the buccal corridor area shows the patient through the smile. 147 dental and frontal images were collected and assessed for the area of the interpremolar width and the buccal passage. SPSS version 10 was used to measure mean and SD for age (in years), interpremolar width and inter commissar width of subjects. Frequencies and percentages were determined for gender. It was inferred from the analysis that there is a statistically significant association between the interpremolar width and the buccal corridor region shown during the smile.

TikkuTripti et al (2012)[28] evaluated the buccal corridor with an aesthetic grin and to be associated with the corresponding hard tissues. The result was that, if the number of buccal corridor views were raised, smiling pictures would be less appealing to the evaluators. The underlying strong skeletal structure mostly on buccal corridor was not affected but had a mild to moderate inverse relationship with intercanine and intermolar widths. The width of the buccal corridor was the least desirable type of smiles and yet the most attractive community of smiles.

Nascimento Cunha Diana et al (2012)[29] evaluated the effect of the buccal corridor breadth on the Caucasian and Afro-descendant smile aesthetics of male and female subjects by digitally edited photos, and contrasted the full-face and close-up view of the facial pictures. The facial portraits of four adults grinned and the photographs were digitally manipulated in three other smiles restoring the width of the buccal corridor, short, medium and broad. It was found that buccal corridor had influence on smile esthetics. Result of the study showed that medium width group was considered as the most attractive. It was concluded that no influence was exerted by the individuals' face, race or gender.

Meyer H. Anna et al (2014)[30] tested and compared pre-and post-operative arch widths and buccal corridor modifications following orthodontic treatment with or without premolar extraction. The relationship between the dimensions of the buccal corridor and the subsequent length of the arc and the inclinations of the buccal teeth was also developed based on the results. Significant change was noted post-treatment in the maxillary intercanine gap in the extraction group of subjects but not in the subjects within non-extraction group. No discernible difference was noticed in the widths of the buccal corridor or the areas measured between the subjects who had their teeth extracted and those who did not.

Dr. Sudhakar Narmadha, Dr. Vishwanath Aarthy (2014)[31] claimed that a structured systematic approach is needed to analyse, diagnose and predictably solve aesthetic problems. The ultimate goal is to achieve a pleasing composition of the smile by making an arrangement of different aesthetic elements. One of the most important tasks of aesthetic dentistry is to create harmonious proportions between the widths of the maxillary anterior teeth when restoring or removing the teeth. This review article also discusses the application of the Golden Proportion and the Red Proportion to dentistry as a smile template for complete edentulous and full bodied recovery. Also the potential reach of the smile concept.

Sierwald Ira, **John T. Mikeet al (2015)**[32] investigated whether esthetic impairments is related to overjet and overbite that can be assessed using an established oral health related quality of life instrument. Overbite ranged from −5 to 15 mm and overjet from −7 to 19 mm. Both an increase and a decrease in overjet resulted in more esthetic related and oral health - related quality of life impairment. Analysis with fractional polynomials, both an increase and

a decrease in overjet resulted in more esthetic impairments, characterized by a U shaped relationship. No association was verified for overbite.

Kakadiya Jignesh et al (2015)[33] conducted an experiment to test adult lip-tooth characteristics. Pre-treatment front-view images of dental patterns were recorded. In all the eligibility criteria, the final study consisted of 77 patients with an average age of 18 years. The results were analysed and there was a wide disparity between the malocclusion classes in the upper central incisor display ratio. There was no substantial gap between the malocclusion groups in the buccal corridor space during the smile, but only in the Class I category the difference was significant.

.

Cheng Hsin-Chung, Cheng Pei-Chin (2016)[8] evaluated the association between smile aesthetics and different forms of malocclusion, and established the cephalometric influences influencing the calculation of the smile. Both smile dimensions varied greatly between the three classes prior to orthodontic treatment, with the addition of the upper midline and buccal corridor ratios. The overjet was indeed the key factor that affected the smile sequence of all three forms of malocclusion.

Kaur Harneet et al (2016)[34] examined the influence of masseter muscle thickness on the buccal corridor space and even the associated craniofacial morphology. Forty-six young adults (23 males and 23 females) aged 18–23 years with intact dentistry and Class I molar relationships were included in the sample. Posed smile photos were taken to assess the buccal corridor space. The mean massage muscle thickness was 10.54 (±1.92) mm, 12.00 (±2.06) mm and 14.04 (±1.99) mm in relaxed, smiling and contracted states, respectively. Statistically important association was also observed between the massage muscle thickness, the contracted state and the buccal corridor width ratio. There was a strong correlation of massage muscle thickness in both vertical and transverse craniofacial morphologies. It was concluded that the thickness of masseter muscle was positively correlated with the width of the buccal corridor and affected both vertical and transverse facial measurements.

Dr. Patel Wasim et al (2016)[35] evaluated the average buccal corridor width for a sample of Indian adults with Class I normal occlusion. The sample consisted of 60 Indian adults aged between 18-25 years with Class I incisor, canine and molar relationship. Clinical examination

and digital frontal photograph with posed smile was performed for each individual and measurement of buccal corridor was done. Descriptive statistics and independent sample t-test were performed for the sample. Average buccal corridor space in Indian population with Class I occlusion was found to be 9.58% (medium broad smile). In males, it was found to be narrower (8.49%) than in females (10.67%).

Soheilifar Sanaz et al (2017)[36] analyzed and compared the arch and buccal corridor width variations and determine their association in orthodontic extraction and non-extraction procedure. The mean intermolar width increased 0.13 mm in the nonextraction group and decreased 0.83 mm in the extraction group. Healthy association was found mostly between the breadth of the buccal corridor in comparison to the canine and the width of the intercanine.

Dr. Srinivas Ajay et al (2017)[37] conducted a study to determine whether buccal corridor width influence on the smile esthetics which were judged by lay persons. Photographs obtained from 60 patients with age range of 17-30 years as a sample for study. The result was that the proportion of buccal corridor width with complete smile width did not influence substantially with a change in face shape in the average population but it was not a major factor impacting the aesthetics of the smile.

Nagarsekar Aradhana, Aras Meena (2017)[16] determined the key to long term occlusal stability i.e. the correct anterior guidance along with esthetics. Sometimes, little attention is given to prior guidance in prosthetic rehabilitation, which is equivalent to or exceeds condylar guidance in functional occlusion. Article concluded that a cautious approach to restoring aesthetics and function in a patient who has worn an anterior dentition with a bordertoedge relationship and a reverse smile line.

Bhat Rashmi, Subrahmanya M. Ravi (2018)[38] evaluated and compared the buccal corridor space in individuals having Class I and Class II Division 1 malocclusions .Known data showed that buccal corridor space is greater in individuals with Class II Division 1 malocclusion compared to individuals with Class I malocclusions. Conclusion was made that there is a significant difference in buccal corridor space between males and females. The correlation between certain dental and skeletal factors related to buccal corridor space and the

amount of buccal corridor space in individuals having skeletal Class II pattern was obtained by the study.

Kohli Shivani, Yee Ang (2019)[39] certainty of the treatment. Examination of facial and gingival features in relation to the teeth can be accomplished by assessing facial, dental and dental parameters, which are essential steps in the design of the smile. Following this, the diagnostic waxup, which is an important method, was performed on the maxillary anterior teeth to fulfil the smile design and to provide an anterior guideline. Diagnostic waxup helped the dentist to interact easily with the patient about the final aesthetic outcome with an enhanced smile line. Esthetic pre assessment provisionally prepared from a diagnosis waxup helps the dentist and the patient to determine the appearance of possible restorations during a smile and work. The purpose of this case report was to highlight the improvement of the smile with the aid of anatomical diagnostic waxup, in accordance with the principles of aesthetic smile design

Kedia Gunjan(2020)[40] the research investigated the similarity of the buccal corridor and the width of the smile with the aesthetic smile and the effect of the facial shape on it. Remarkable finding was that the width of the buccal corridor and the overall width of the smile did not change with the three forms of facial shape and the large faces tended to a larger buccal corridor and the narrow faces had a narrower buccal corridor.

MATERIALS AND METHOD

The present study was conducted to evaluate and find any correlation between buccal corridor of 45 subjects with their overjet on digital videographic image used for measuring buccal corridor space using digimizer software and adobe photoshop software and by taking readings of overjet with ruler and divider in the patient.

MATERIAL

A) SAMPLE

A total of 45 participants aged 18-25 years (mean age 21+-years) were chosen for this study using a randomised sampling process, individuals reporting to the common OPD, students at Babu Banarasi Das College of Dental Sciences, BBD University, Lucknow.
All the subjects were adults to ensue complete soft tissue growth so it does not affect soft tissue characteristics because of growth.

1. SAMPLE SIZE

Subjects will be divided into three groups:

GROUP	OVERJET	SAMPLE SIZE
GROUP A	1-2mm	15
GROUP B	2-3mm	15
GROUP C	3-4mm	15

2. SAMPLE SELECTION CRITERIA

The subjects were selected according to the following criteria-

Inclusion Criteria:

a. The age group is 18-25 years.
b. No prior orthodontic or maxillofacial surgery

c. Complete permanent dentition excluding wisdom tooth, no missing tooth or pathologic teeth or any other abnormality,

d. Can meet the Angle Class I Molar Relationship requirements.

e. Natural dental care and proper oral hygiene.

f. Recognize their voluntary interest in the study.

Exclusion Criteria:

a) Missing tooth
b) Prosthodontic work visible in smile
c) Any maxillofacial surgery.
d) Compromised periodontal status.
e) Gross facial asymmetry.
f) Excessive tooth attrition.
g) Abnormalities in the lip or history of lip surgery.

Digital Videographic image of all these subjects were taken and selected photographs from the video clip were used to measure buccal corridor space, as described in detail under the methodology.

3. ETHICAL ISSUES

The Babu Banarasi Das College of Dental Sciences, BBD University, Lucknow's ethical and research committee gave their approval.

4. CONSENT

A signed informed consent form as the guidelines of university was taken from the participants who agreed to participate in the study voluntarily.

B) CAMERA AND ACCESSORIES

1. Nikon D- 5200 (LENS 18-55) 14 Megapixel Digital Single Lens Reflex (DSLR) camera (24.1 megapixel DX- format sensor and 39 point AF system).
2. tripod stand
3. White Background
4. Ruler for calibration of photographs vertical and horizontal ruler on spectacle frame which were worn by the subject for calibration of the photographs.

Fig. 1- Tripod stand

Fig 2- digital camera

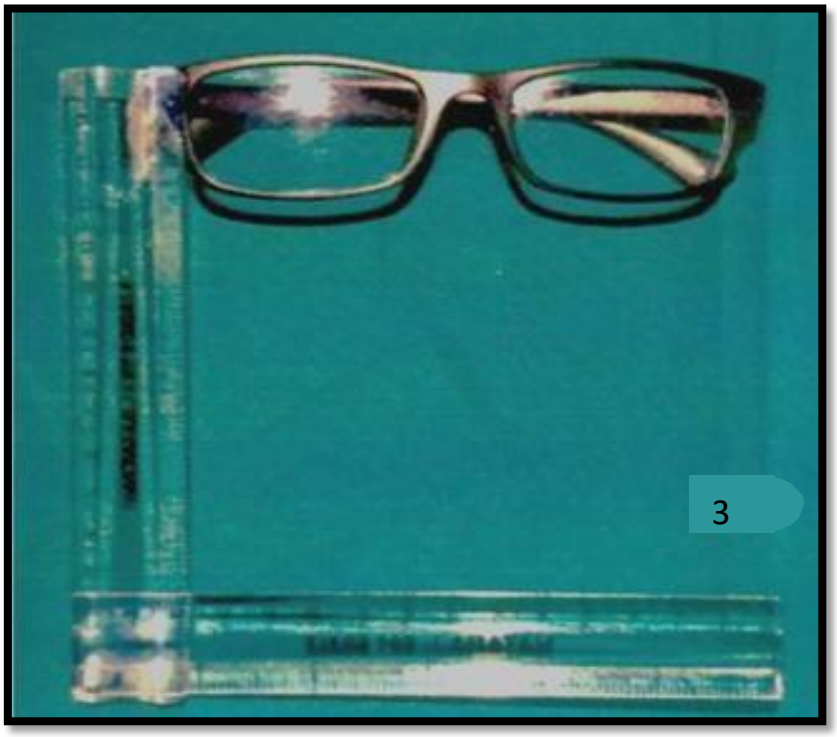


Fig 3- Horizontal and vertical calibrating scales on spectacle frame

C) COMPUTER AND SOFTWARES

Laptop with Window XP, Window 7, 1 GB RAM about 8 Mega byte free space on the hard disk with installed softwares-

a) Adobe Primiere and Adobe Photoshop

b) Digimizer Image Analysis software by MedCalc Software bvba (copyright 2005- 2014 MedCalc Software bvba)

Armamentarium used for measuring overjet

a) Ruler

b) Divider

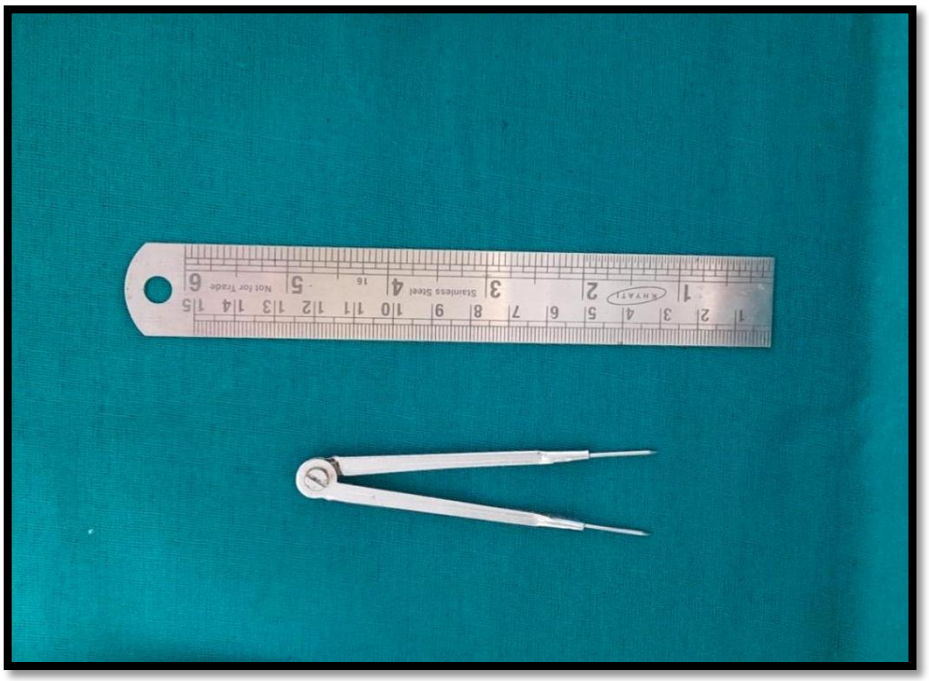


Fig 4- Ruler and Divider

D) METHODOLOGY

Methodology will be divided into:

1. Measurement of buccal corridor space by Videographic Analysis
2. Measurement of overjet clinically
3. Statistical Analysis

All the subjects were explained the full procedure of smile recording before taking the videograph.

i) POSITIONING OF THE SUBJECTS

The subjects were made to stand in an upright position against the white background and were asked to wear a spectacle frame with a horizontal and vertical ruler attached to the frame for calibration of the photograph. All the subjects were asked to look straight to attain natural head position where the interpupillary line and occlusal plane were parallel to the horizontal ruler placed on the spectacle frame. DSLR was placed on the tripod stand at a distance of approximately 4 feet from the subjects. The height of camera was adjusted for each subject.

ii) METHOD OF TAKING DIGITAL VIDEOGRAPH

The subjects were asked to lick the lip and then swallow, so as to obtain the relaxed lip position. Before recording videograph, each subject was asked to rehearse to say that "My name is----- and smile for 10 seconds."When confident, the subject was told to repeat the word and grin, to expose their teeth and smile for 10 seconds[41]..

Recording began approximately 1sec before each subject began speaking and then ended a second after they finished smiling[41].

Figure 5- Subjects were asked to look straight to attain natural head position

iii) VIDEO EDITING

The full video was then uploaded to a laptop (Dell) and imported to the cutting tool software, and the video editing programme recorded photos was converted to a JPEG format and renamed to Microsoft Windows 10 Professional with the required individual number and image width and height. Every file was transferred in the adobe photoshop software and was modified by using ruler in the frame to help standardise images in order to take direct measurements from frames. the resolution of each image was changed to 130 pixels per inch. The ruler was then selected on the adobe photoshop and adjusted to a millimetre. The cross configuration ruler was determined to be straight to the lens. To reduce the effect of facial attractiveness, the image was trimmed with vertical (nose tip and soft tissue pogonion) and transverse (perpendicularly taken from the zygomatic prominence) boundaries to eliminate most of the nose, cheeks, and chin.

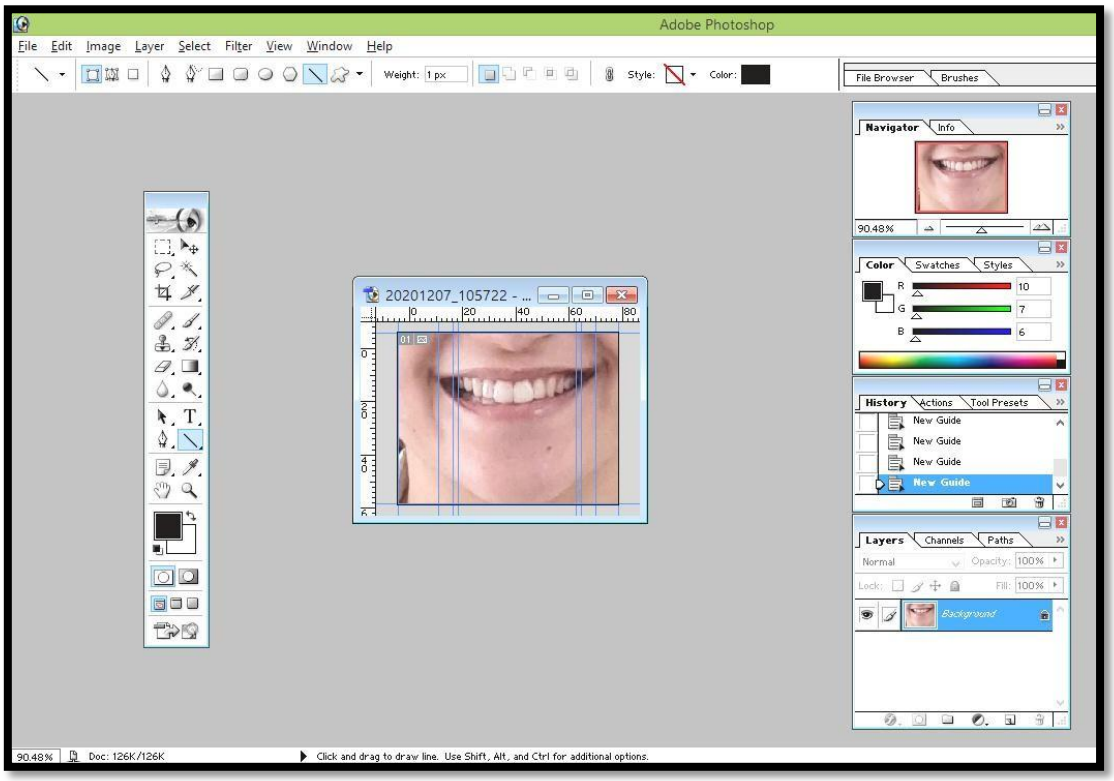


Figure 6- adobe photoshop for cropping of the photographs.

E) MEASUREMENT OF BUCCAL CORRIDOR SPACE

Method for measuring buccal corridor

Buccal corridor width = (outer commisure + most distal tooth visible) − (outer commisure + inner commisure)

This will be determined on each side and the average width of the buccal corridor will be taken for each subject. For this reason, vertical lines will be drawn going through the outer commisure, the inner commisure and the most distal tooth visible on either side[28].

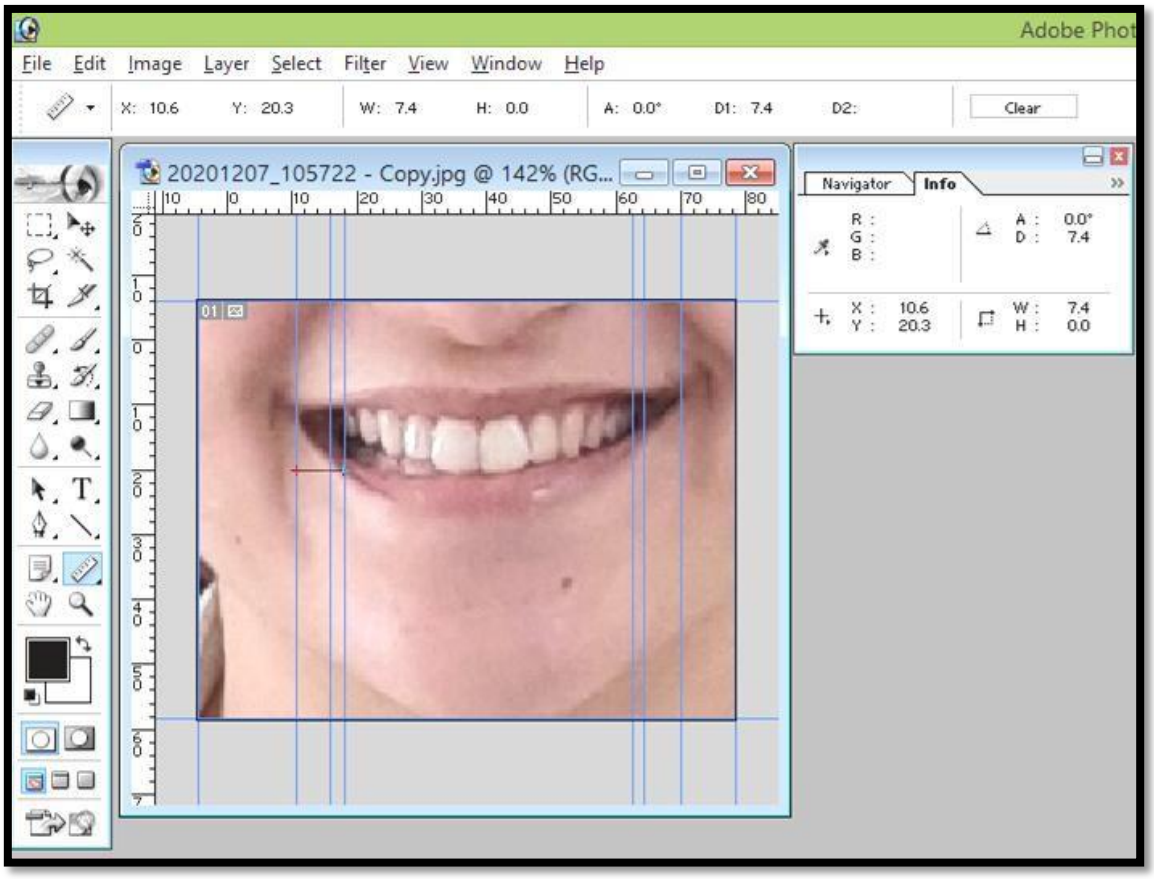


Figure 7- Adobe Photoshop for measuring buccal corridor width outer commisure + most distal tooth visible.

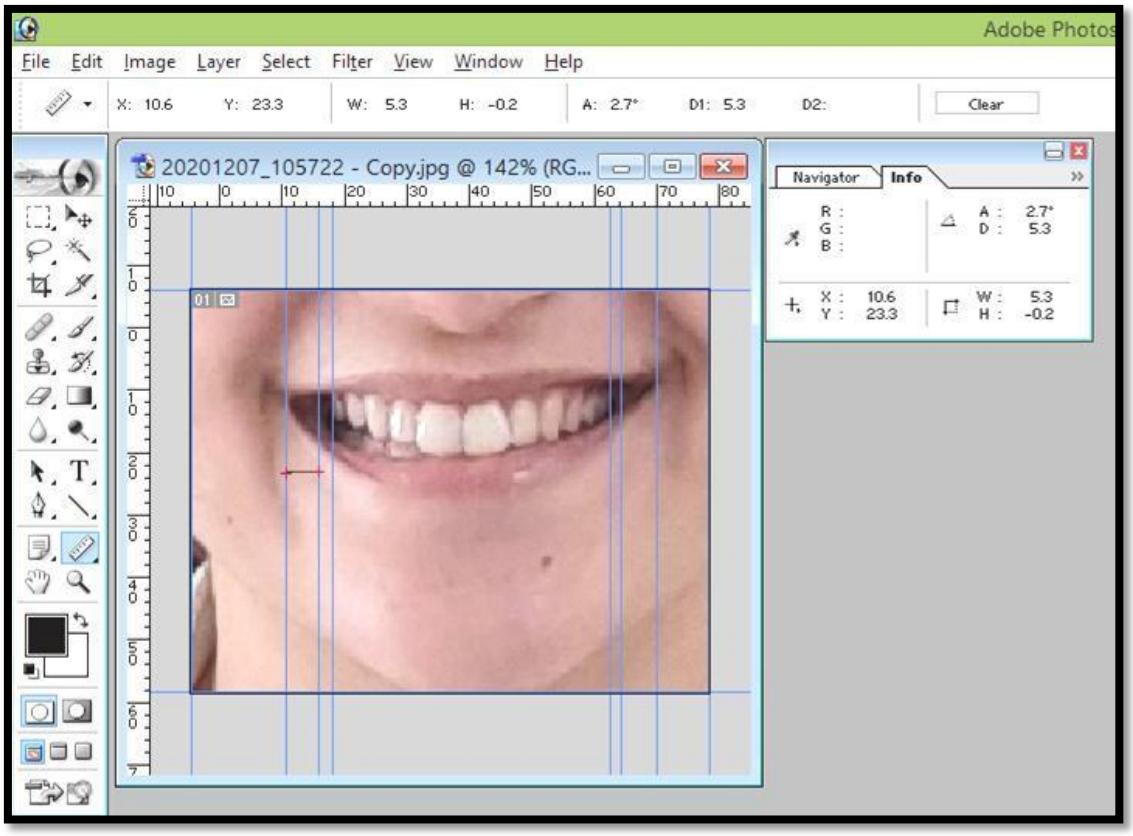


Figure 8- Adobe Photoshop for measuring buccal corridor width (outer commisure + inner commisure).

Figure 7 and Figure 8- Buccal corridor width = (outer commisure + most distal tooth visible) − (outer commisure + inner commisure)

F) MEASUREMENT OF OVERJET

Method of measurement

The patient was asked to sit in an erect position. Then the patient was trained to occlude in centric occlusion position and overjet was measured. The distance from the most prominent point on incisal edge of the maxillary central incisors to the labial surface of the mandibular central incisor was measured parallel to upper occlusal surface using divider and scale and the reading were noted[42] (Fig 9).

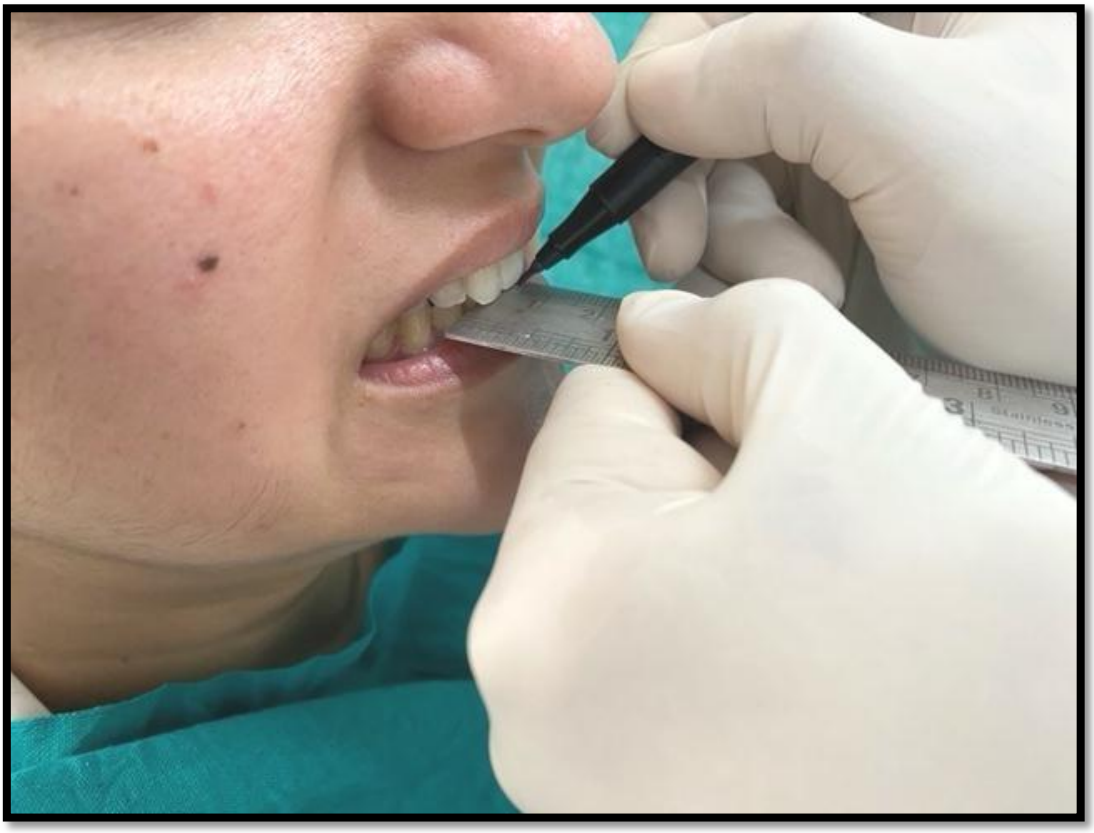


Figure 9- Measuring overjet clinically

G) STATISTICAL ANALYSIS

The collected data was subjected to statistical analysis for the final result.

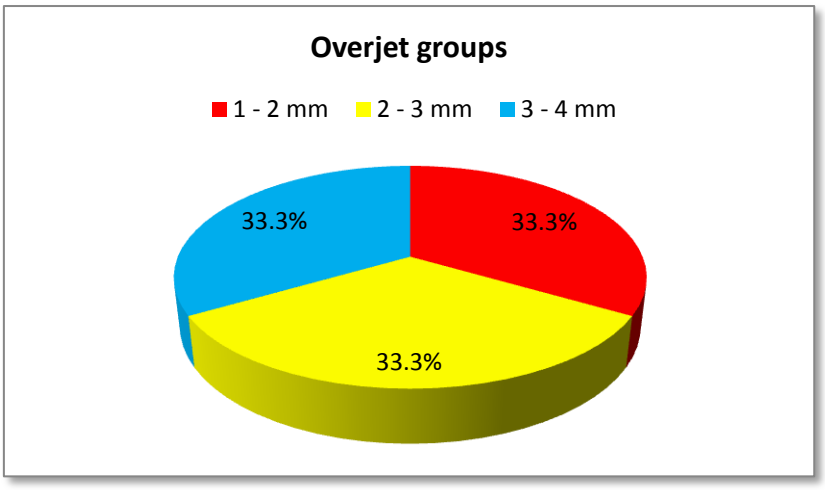
RESULTS AND OBSERVATIONS

The present cross sectional study was done in the department of Prosthodontics of Babu Banarasi Das College of Dental Science to evaluate the correlation of buccal corridor space with overjet in dentulous patient.

The characteristics distribution of the groups according to overjet at presentation (enrolment) is summarised in Table 1 and also depicted in graph 1 through a pie chart, respectively. An equal number of participants were included in the groups i.e. 45 (33.3%) per group.

Groups	N	Percent
1 - 2 mm	15	33.3
2 - 3 mm	15	33.3
3 - 4 mm	15	33.3
Total	45	100.0

Table 1: Distribution of subjects according to overjet



Graph 1: Pie chart showing distribution of the participants according to overjet

RESULTS AND OBSERVATIONS

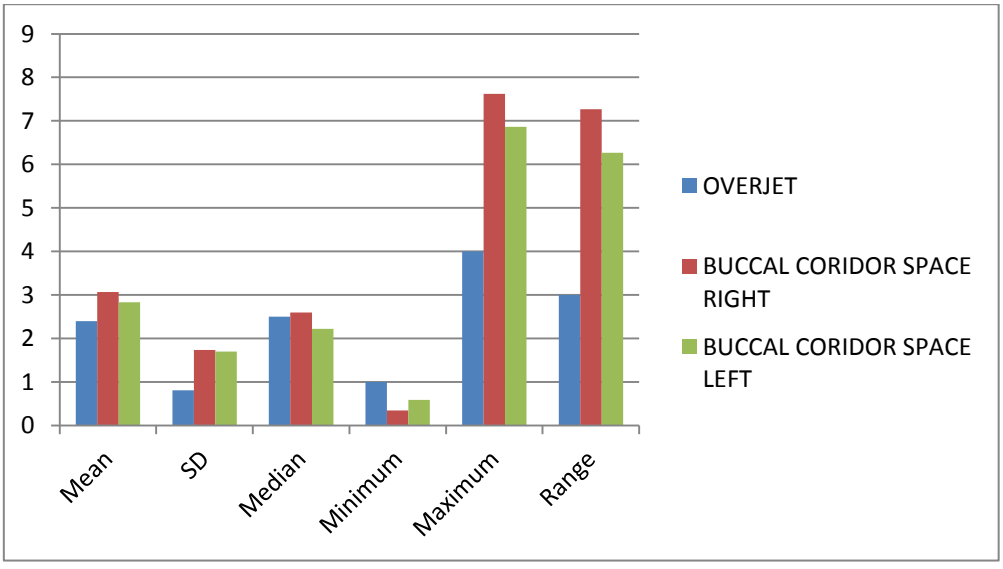
The overjet, buccal corridor space for left and right is shown in table 2 and graph 2 through bar graph. The overjet lied between 1 and 4 with the range being 3. The mean overjet was found to be 2.40+/-0.81 with the median of 2.5.

For buccal corridor space the mean was 3.07+/-1.07 which was higher compared to the left buccal corridor space. The range for the buccal corridor space was 7.27 and in between 0.35 to 7.62, with a median of 2.62.

The mean buccal corridor left space was 2.83+/-1.70. The left buccal corridor space was found between range of 0.59 and 6.86 with median of 2.22, which was less compared to mean right buccal corridor space.

	Mean	SD	Median	Minimum	Maximum	Range
OVERJET	2.40	.81	2.50	1.00	4.00	3.00
BUCCAL CORRIDOR SPACE RIGHT	3.07	1.74	2.60	.35	7.62	7.27
BUCCAL CORRIDOR SPACE LEFT	2.83	1.70	2.22	.59	6.86	6.27

Table 2: mean and range for overjet and buccal corridor space



Graph 2: bar graph showing mean and range for overjet and buccal corridor space

RESULTS AND OBSERVATIONS

Table3 and graph 3shows mean distribution of buccalcorridor space from left side, right side and mean of left and right side according to three over jet groups. A comparison was done and it was found that mean buccal corridor space for right was 3.32+/-1.51 which was higher compared to mean buccalcorridor space from both sides left and right and mean of left and right side as well.

The mean buccal corridor space right was high for 1-2mm when compared with 2-3mm (2.60+/-1.53) and 3-4 mm (3.28+/-2.13).

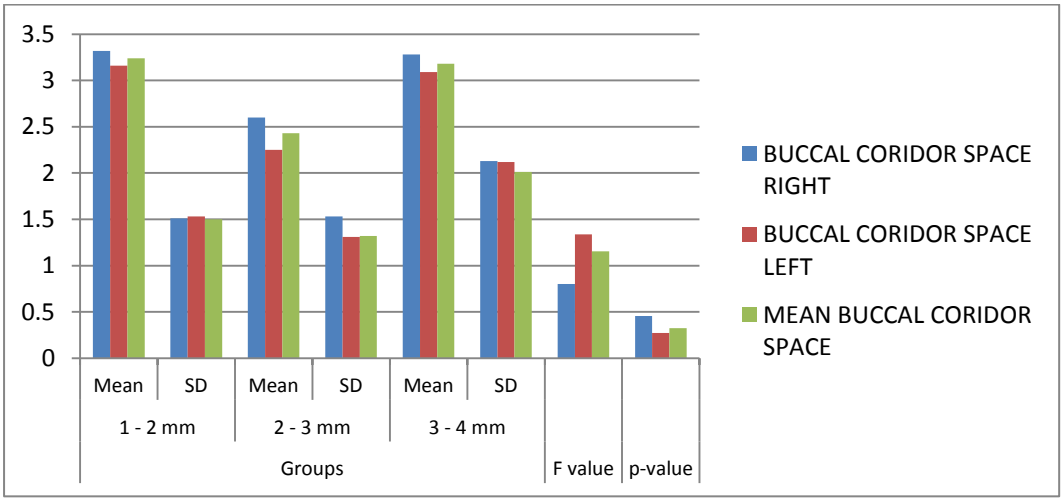
The mean buccal corridor space left for 1-2mm came to 3.16+/-1.53where as for 2-3mm (2.25+/-1.31) and 3-4 mm (3.09+/-2.12).

The mean buccal corridor space came to 3.24+/-1.50 for 1-2 mm whereas 2.43+/-1.32 for 2-3mm and 3.18+/-2.01 for 3-4 mm.

The one way analysis of variance was applied on quantitative data showed that there is no significant differences among groups mean of buccalcorridor space from left side, right side and mean of left and right side, which is evidence to discards the buccal corridor space effects on overjet groups.

	Groups						F value	p-value
	1 - 2 mm		2 - 3 mm		3 - 4 mm			
	Mean	SD	Mean	SD	Mean	SD		
BUCCAL CORRIDOR SPACE RIGHT	3.32	1.51	2.60	1.53	3.28	2.13	0.802	0.455
BUCCAL CORRIDOR SPACE LEFT	3.16	1.53	2.25	1.31	3.09	2.12	1.339	0.273
MEAN BUCCAL CORRIDOR SPACE	3.24	1.50	2.43	1.32	3.18	2.01	1.153	0.325

Applied one way ANOVA for significance **Table 3: mean distribution of buccalcorridor space from left side, right side and mean of left and right side according to three overjetgroups**

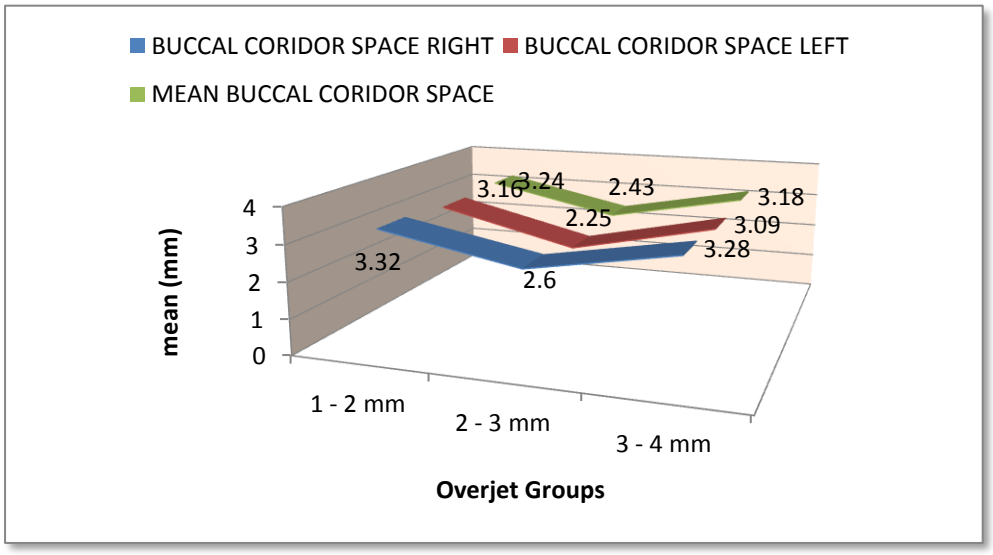


Graph 3: mean distribution of buccalcorridor space from left side, right side and mean of left and right side according to three overjetgroups

Figure 4 shows the mean buccal corridor space for left , right and overall mean difference. The mean difference for buccal corridor space right was found to be 3.32 at 1-2mm, 2.6 at 2-3mm and 3.28 for 3-4mm.

The mean buccal corridor space for left buccal corridor space left was found to be 3.16 at 1-2mm, 2.25 at 2-3mm and 3.09 for 3-4mm.

The mean difference for buccal corridor space right was found to be 3.24 at 1-2mm, 2.43 at 2-3mm and 3.18 for 3-4mm.



Graph 4 shows the mean buccal corridor space for left , right and overall mean difference.

Table 4 shows multiple in between group comparison using Turkeys test. The mean difference between the groups is summarized in the table. The mean difference between buccal corridor space of 1-2 mm and 2-3 mm was 0.71533 with a standard error of 0.63748 and was found to be non significant(p=0.506). The mean difference between 1-2 and 3-4 mm was 0.03333 and standard error of 0.63748 which was non significant (p=0.998). Which when compared to the difference between 1-2mm and 2-3mm was less. The mean difference between 2-3mm and 3-4 mm was assessed to be -0.68200 and was non significant (p=0.538). The mean difference was highest for 1-2 mm and 2-3mm and lowest for 1-2 mm and 3-4 mm.

The mean difference for buccal corridor space of left between 1-2 mm and 2-3mm was 0.90933 with standard error of 0.61600 and was found to be non significant (p=0.312). The mean difference between 1-2mm and 3-4mm was 0.07800 which was found to be non significant (p=0.991). The mean difference between 2-3mm and 3-4 mm was assessed to be -0.83133and was non significant (p=0.376). The mean difference was highest for 1-2 mm and 2-3mm and lowest for 1-2 mm and 3-4 mm.

The mean difference of buccal corridor space right and left was similar i.e. it was highest for 1-2 and 3-4mm for both sides and lowest for 2-3mm and 3-4mm.

The mean buccal corridor space for 1-2mm and 2-3mm was 0.81233 with standard error of 0.59765 and was found to be non significant (p=0.371). The mean difference between 2-3mm and 3-4mm was -0.75667 and was non significant (p=0.422). The mean difference between 1-2 mm and 2-3mm was assessed to be 0.05567 and was non significant (p=0.995). The mean difference was highest for 1-2 mm and 2-3mm and lowest for 1-2 mm and 3-4 mm.The mean difference of buccal corridor space right and left was similar i.e. it was highest for 1-2 and 3-4mm for both sides and lowest for 2-3mm and 3-4mm.

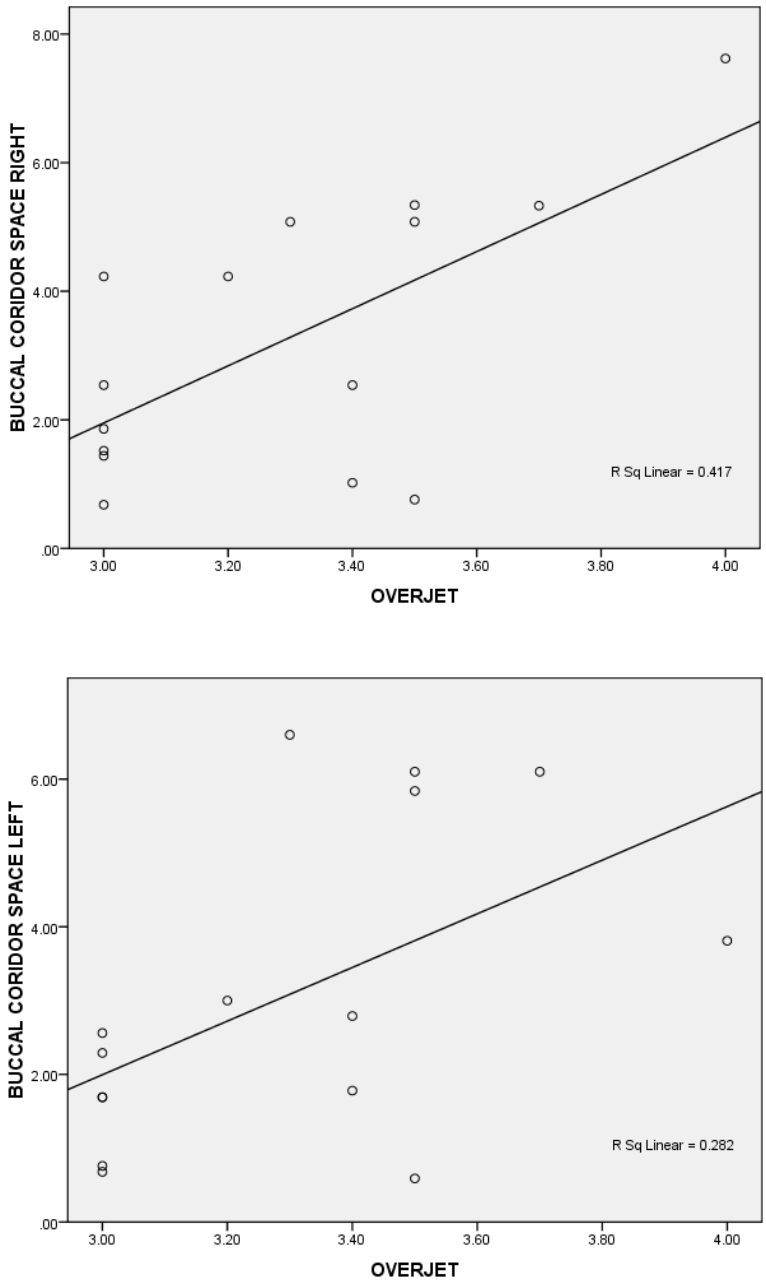
Table 4: showing Multiple Comparisons between different groups using Tukey HSD

Dependent Variable	(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	p-value	95% Confidence Interval	
						Lower Bound	Upper Bound
BUCCAL CORRIDOR SPACE RIGHT	1 - 2 mm	2 - 3 mm	.71533	.63748	.506	-.8334	2.2641
		3 - 4 mm	.03333	.63748	.998	-1.5154	1.5821
	2 - 3 mm	1 - 2 mm	-.71533	.63748	.506	-2.2641	.8334
		3 - 4 mm	-.68200	.63748	.538	-2.2307	.8667
	3 - 4 mm	1 - 2 mm	-.03333	.63748	.998	-1.5821	1.5154
		2 - 3 mm	.68200	.63748	.538	-.8667	2.2307
BUCCAL CORRIDOR SPACE LEFT	1 - 2 mm	2 - 3 mm	.90933	.61600	.312	-.5872	2.4059
		3 - 4 mm	.07800	.61600	.991	-1.4186	1.5746
	2 - 3 mm	1 - 2 mm	-.90933	.61600	.312	-2.4059	.5872
		3 - 4 mm	-.83133	.61600	.376	-2.3279	.6652
	3 - 4 mm	1 - 2 mm	-.07800	.61600	.991	-1.5746	1.4186
		2 - 3 mm	.83133	.61600	.376	-.6652	2.3279
MEAN BUCCAL CORRIDOR SPACE	1 - 2 mm	2 - 3 mm	.81233	.59765	.371	-.6396	2.2643
		3 - 4 mm	.05567	.59765	.995	-1.3963	1.5076
	2 - 3 mm	1 - 2 mm	-.81233	.59765	.371	-2.2643	.6396
		3 - 4 mm	-.75667	.59765	.422	-2.2086	.6953
	3 - 4 mm	1 - 2 mm	-.05567	.59765	.995	-1.5076	1.3963
		2 - 3 mm	.75667	.59765	.422	-.6953	2.2086

Above table shows the intra comparison of overjet groups, it's shows that there is no significant differences between groups mean of buccalcorridor space from left side, right side and mean of left and right side.

Graph 5 shows a scatter plot diagram representing a correlation between buccal corridor space left and overjet, r =2.82. The correlation was found to be positive.

Graph 6 shows a scatter plot diagram representing a correlation between buccal corridor space right and overjet, r =0.417. The correlation was found to be positive.



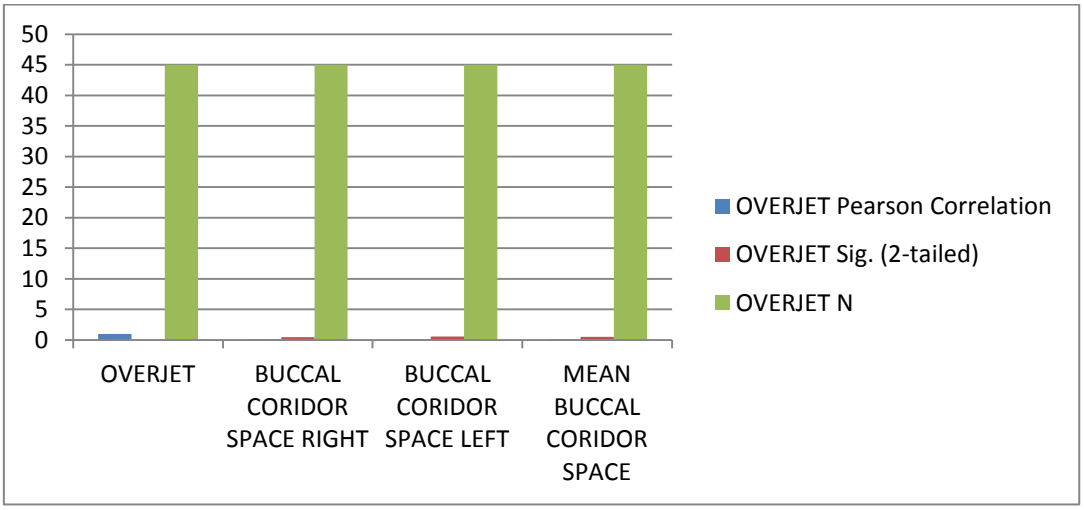
Graph 5 and 6: showing correlation between buccal corridor space (left and right) and overjet

Table 5 and Graph 7 show a correlation between overjet and buccal corridor space using Person's correlation. There was a positive correlation between overjet and buccal corridor space from left side, right side and mean of left and right side with correlation coefficient of 0.118, 0.084 and 0.106 respectively and it was statistically no significant with P value 0.439, 0.585 and 0.488.

Table 5: Correlations between overjet, buccal coridor space (left and right) and mean buccal corridor space

		OVERJET	BUCCAL CORRIDOR SPACE RIGHT	BUCCAL CORRIDOR SPACE LEFT	MEAN BUCCAL CORRIDOR SPACE
OVERJT	Pearson Correlation	1	.118	.084	.106
	Sig. (2-tailed)		.439	.585	.488
	N	45	45	45	45

**. Correlation is significant at the 0.01 level (2-tailed).



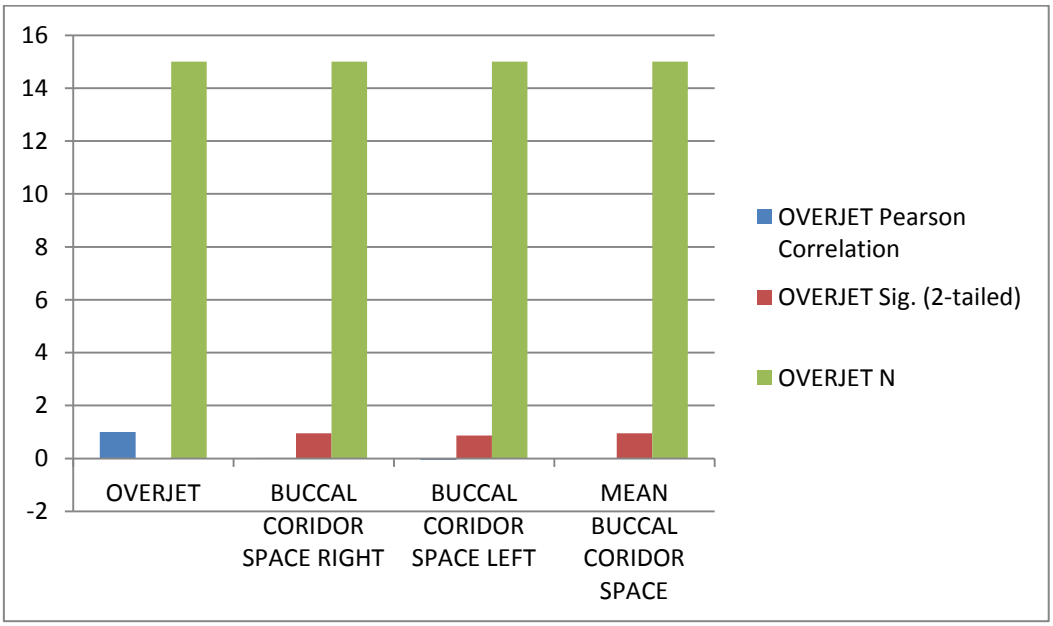
Graph 7: Correlations between overjet, mean buccal corridor space and buccal corridor space (left and right)

Table 6 and Graph8 shows Correlations between group A (1-2mm) overjet and buccal corridor spaceIn Group A; there was a positive correlation between overjet and buccal corridor space from right side with correlation coefficient of 0.118 which was not significant (p=0.439). There was a negative correlation between Overjet and buccal corridor space from left side with correlation coefficient of -0.084 which was not significant (p=0.585). There was also negative correlation between overjet and mean buccal corridor space with correlation coefficient of -0.106 which was significant (p=0.488).

Table 6: Correlations between group A and overjet and buccal corridor space

		OVERJET	BUCCAL CORRIDOR SPACE RIGHT	BUCCAL CORRIDOR SPACE LEFT	MEAN BUCCAL CORRIDOR SPACE
OVERJET	Pearson Correlation	1	.017	-.047	-.015
	Sig. (2-tailed)		.951	.868	.957
	N	15	15	15	15

**. Correlation is significant at the 0.01 level (2tailed).



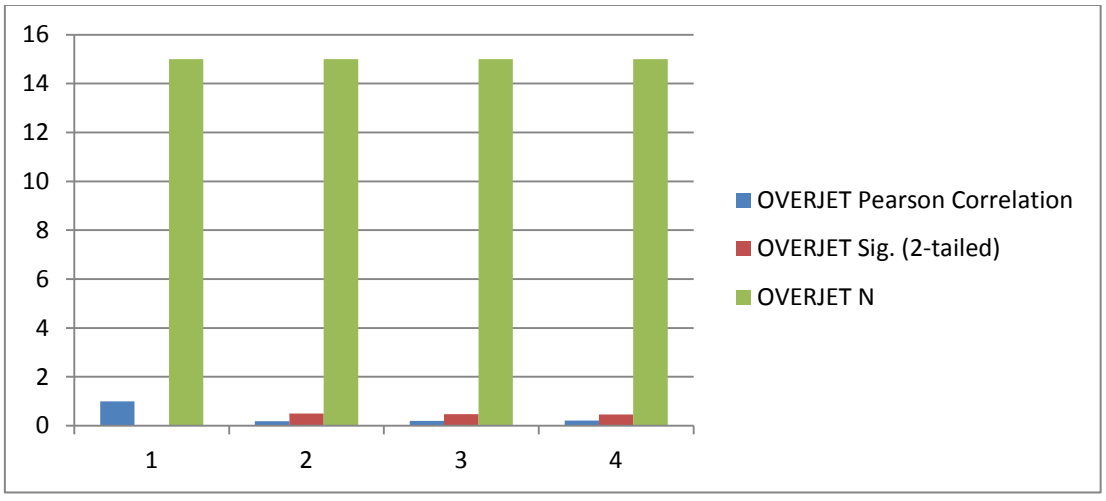
Graph 8: Correlations between group A and overjet and buccal corridor space

Table 7 and Graph 9 shows correlations between groupB(2-3mm) and overjet and buccal corridor space. In Group B; there was a moderate positive correlation between overjet and buccal corridor space from right side with correlation coefficient of 0.189 which was not significant (p=0.501). There was a positive correlation between overjet and buccal corridor space from left side with correlation coefficient of 0.204 which was not significant (p=0.467). There was also positive correlation between overjet and mean buccal corridor space with correlation coefficient of 0.209 which was significant (p=0.454). The buccal corridor space for right side was greater when compared to the rest where as the buccal corridor space for left was similar to mean buccal space.

Table7: Correlations between group B and overjet and buccal corridor space

		OVERJET	BUCCAL CORRIDOR SPACE RIGHT	BUCCAL CORRIDOR SPACE LEFT	MEAN BUCCAL CORRIDOR SPACE
OVERJET	Pearson Correlation	1	.189	.204	.209
	Sig. (2-tailed)		.501	.467	.454
	N	15	15	15	15

**. Correlation is significant at the 0.01 level (2-tailed).



Graph 9: Correlations between group B and overjet and buccal corridor space

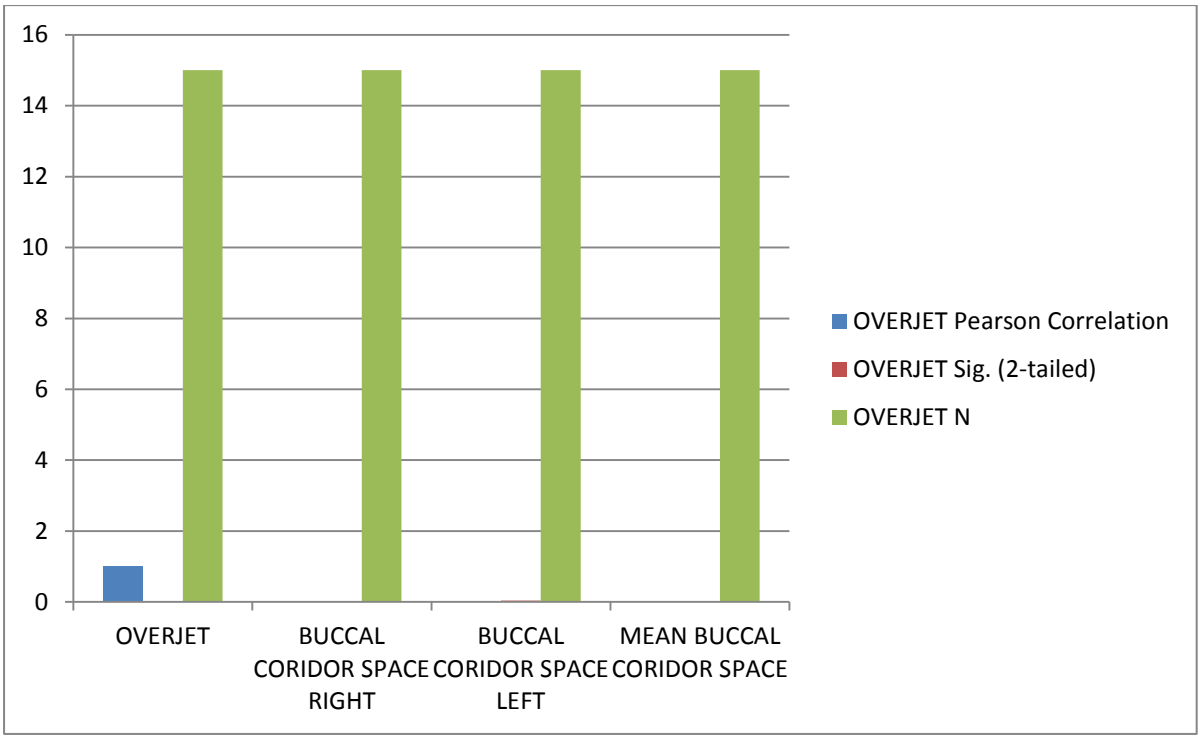
Table 8 and Graph 10 shows correlations between groupC(3-4mm) and overjet and buccal corridor space. In Group C; there was a moderate positive correlation between overjet and buccalcorridor space from right sidewith correlation coefficient of 0.646 which was significant (p=0.009). There was a moderate positive correlation between overjet and buccalcorridor space from right sidewith correlation coefficient of 0.531 which was significant (p=0.042). There was also moderate positive correlation between overjet and mean buccalcorridor space with correlation coefficient of 0.621 which was significant (p=0.014).

Table 8: Correlations between group C and overjet and buccal corridor space

		OVERJET	BUCCAL CORRIDOR SPACE RIGHT	BUCCAL CORRIDOR SPACE LEFT	MEAN BUCCAL CORRIDOR SPACE
OVERJET	Pearson Correlation	1	.646**	.531*	.621*
	Sig. (2-tailed)		.009	.042	.014
	N	15	15	15	15

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).



Graph 10: Correlations between groupC and overjet and buccal corridor space

DISCUSSION

According to the Merriam Webster dictionary, attractiveness can be explained as attribute of the specific individual that gives joy to the senses or to the mind when seen. Descriptive perfection is cherished from the inside; nevertheless, physical beauty can be created by the operator. In general, correct alignment, balance and proportions of the face are the default aesthetic criteria for determining the beauty of the face. As individuals continue to rely more about the physical characteristics of an artistic smile when providing treatment. Scholars had also began to redirect their study on scientific expertise that evaluate the smile and help the clinician to achieve optimum patient results. Actually, there has been a tendency to seek smile oriented, cosmetic outcomes when planning prosthodontics care. Clinicians consider the smile to be an important part of care preparation and a pillar of treatment goals[43].

"Smile" according to the dictionary is a noun and means a facial expression defined by an upward curvature of the corners of the mouth and a sign of enjoyment.

The smile is reflected by the shifting of muscle across the lips in the lower half of the face and beautification of the eyes. A pleasing smile is one of our unique ways of nonverbal communication, and it communicates joy. The location of the lip, the oral condition, the personality characteristics and the exercise of the smile influence the esthetics of the smile[44].

The presence of the buccal corridor results in the illusion of a natural dentition, while the artificial appearance is given when not provided. Goldstein believed that the smile ranked 2nd to the eye as the most basic characteristics influencing the beauty of the face. [24].

According to Ioi H et al (2009) the transversal dimension is one of the basic aspects of smile in relation to buccal corridors which can be assigned to one of six classifications[3,6].

1) Extra broad

2) Broad

3) Medium-Broad

4) Medium

5) Medium-Narrow

6) Narrow

Vander Geld P and al (2007) Smiling, the mesiodistal dimension of the mouth expands by more than as 30%, so that the excess of the transverse lips in the smile produces a longer buccal corridor.[24].

Other anterior occlusal traits to be considered include overjet (OJ), overbite (OB) and dental midline relationships. An overjet affects more than just your presence. You may also have trouble eating, drinking, or biting. It might also trigger jaw pain. The goal of esthetic treatment is to achieve an improved appearance that gives the patient a lively and realistic look. As the overbite increases and the overjet decreases, the incisal guidance becomes steep, leading to more potentially dangerous off axial forces on the teeth. The amount of overjet is more important in affecting the health of the anterior teeth as it provides enough room for the mandible to pass forward without compromising the periodontal protection of the anterior teeth[45].

The majority of studies have historically related the buccal passage to the corresponding hard tissue. Since the buccal corridor is evident in frontal images, its interaction with the lateral images hard tissue is a cause for concern. The present invitro study was conducted at Babu Banarasi Das College of Dental Sciences, Lucknow to find out any correlation of buccal corridor space with overjet in dentulous patient. Ethical clearance was given by institutional ethical committee of Babu Banarasi Das College of Dental Sciences.

The study sample size was 45 individuals with class I molar relationship and was divided into three groups with overjet ranging from 1-2mm, 2-3mm, and 3-4mm in each group respectively with 15 sample size in each group. The results obtained were compared with each other so as to evaluate any correlation of buccal corridor space with an overjet.

The explanation for this lack of significance between the buccal corridor and the overjet may be that, these dental and skeletal factors forms only single borderline of the buccal corridor space, the other confines of the buccal corridor space are influenced by the soft tissue drape, a

combination of mucosal lining, underlying fat of mucosa and ability of the attached muscles to relax and contract to reach its optimal length to function..[24,28].

Measurement of buccal corridor space was carried by Videographic Analysis. Geld Vander Pieter et al (2007) used a digital videographic measurement method to record a spontaneous smile of joy. By recording spontaneous smiles of joy, participants were able to assess their smiles, and approach the way their spontaneous smiles will be perceived by the social environment[7,24].

A digital camera was used to capture photographs of all subjects. Full procedure of smile recording was explained to all the subjects before making the videograph. Digital Nikon Coolpix A300 were placed on a tripod stand at a distance of approximately 4 feet from the subjects. The heights of camera were adjusted for each subject. Before taking the videograph, each subject were asked to rehearse the following phrase "My name is---------". Afterwards, 2 ¬3 shots were processed for every subject that was imported into the commercially accessible photo editing software. (Adobe Photoshop version7 and Digimizer 5.4.6)[46].

Dynamic records of speech also raise question of patient emotion during the record. For instance, the data which would be obtained from a patient visited the clinic in a happy frame of mind, and performed a dynamic record in a good mood, would be different from the one which we receive in patient with regular moods. In 2005, Lee and researchers examined the speech under various moods. They found that there was no discrepancy in expressiveness between the positive mood and the usual mood. They noted that the only moods that would alter speech articulation were the upset moods and the sad moods. For similar cause, unhappy or depressed patients were also omitted from the research[46,].

DISCUSSION

(a) a random smile; (b) a posed smile c-I) Distinct frames displaying the speech

Subjects who were included in study ranged from 16 to 26 years of age. All subjects selected were fulfilling the criteria of Angle's Class I molar relationship with no ortho treatment. Higher mean of buccal corridor space was found in group 12 mm overjet from both sides left and right and mean of left and right side also.

Measurement of overjet was carried by using divider and scale clinically from the most prominent point on incisal edge of the maxillary central incisors to the labial surface of the mandibular central incisor, measured parallel to upper occlusal surface

Tukey HSD test was used for intra comparison of overjet groups, it's shows that there is no significant differences between groups mean of buccal corridor space from left side, right side and mean of left and right side.

When buccal corridor space was compared to right and left side there was a positive correlation between overjet and buccal corridor space from left side, right side and mean of left and right side with correlation coefficient of 0.118, 0.084 and 0.106 respectively and it was statistically no significant with P value 0.439, 0.585 and 0.488.

DISCUSSION

In group A; there was a negative correlation between overjet and right side; overjet and mean of left and right side with correlation coefficient of 0.118, 0.084 and 0.106 respectively and it was statistically no significant with P value 0.439, 0.585 and 0.488.

According to Hyung Yang et al., a potential explanation why stomodium superius soft tissue menton displayed the strongest correlation was indeed the possible interaction with the actions of the lips (2008). The lower lip demonstrated more mobility than that of the upper lip during the smile. In context of this research, the long face could be said to have a preference for a less visible buccal corridor. It therefore tends to suggest that the less BCAR was positioned, the more anteriorly and downwardly the upper incisors were positioned, and the lower incisors were positioned earlier and upwardly. These incisor positions could be part of the dental compensation effect of a skeletal vertical pattern with a hyper divergent tendency.[25].

In Group B; there was a positive correlation between overjet and buccal corridor space from left side, right side and mean of left and right side with correlation coefficient of 0.189, 0.204 and 0.209 respectively and it was statistically no significant with P value 0.501, 0.467 and 0.454.

The reason as to why there is hardly any substantial variation between the buccal corridor and the overjet may be as stated one factor that might have affected the results, the difference in width, lighting used to capture the samples resulted in buccal and posterior corridors between the samples. The light is diminished when the teeth are located more posteriorly on buccal corridors, resulting in a gradual blackening and, as a result, a poor vision of the posterior teeth. The longer the buccal corridor is, the thinner the teeth are seen, minimizing the breadth of the arc while the width of the smile remains the same. According to this, we can infer negative space as an visual illusion rather than the actual space. This potential discrepancy in the centralization of light source between studies makes the comparisons difficult.[23,47,48].

In Group C; there was a moderate positive correlation between overjet and buccal corridor space from left side, right side and mean of left and right side with correlation coefficient of 0.646, 0.531 and 0.621 respectively and it was statistically significant with P value 0.009, 0.042 and 0.014.

DISCUSSION

According to article by Hideki Ioi et al that when width of the dental arch increases, the buccal corridor would decrease and it would result in broad smile. In contrast to the fact that the extraction procedure resulted in a discrepancy between the width of the arch and the soft tissues, Johnson found little difference between the proportion of intercanine width and the gap between the last apparent back teeth of the grin in orthodontic patients treated with or without the extraction of four premolars[6].

It was found in the study that buccal corridor (right and left) the one way analysis of variance showed that there is no significant differences among groups mean of buccal corridor space from left side, right side and mean of right side, which is evidence to discard the buccal corridor space effects on overjet groups. Intra comparison of overjet groups also showed that there is no significant differences between groups mean of buccal corridor space from left side, right side and mean of left and right side Analysis of variance showed that there is no significant differences among groups mean of buccal corridor space from left side, right side and mean of left and right side, which is evidence to discards the buccal corridor space effects on overjet groups.

Rigsbee et al used Hulsey's law to measure the buccal corridor, acknowledging the distance between the right and left maxillary canines as the distal end of the maxillary anterior arch. Although, this is not the buccal corridor, as Frush and Fisher have mentioned. For now, the posterior teeth should be included in the space assessment of the buccal passage[3,37].

The buccal corridor was described as a percentage of total smile width in Moore et al study. The authors had created and identified a set of buccal corridors and represented them by the resulting grin wholeness by trial and error.28 per cent of the buccal corridors were described as medium narrow, 15 per cent medium, 10 per cent medium wide, and 2 per cent broad smile fullness. Krishnan V et al narrower the interpremolar width was, the larger the buccal corridor area shows. This was in accordance with the results of the former studies. Ritter et al did an analysis and determined that the males displayed more buccal corridor than females, but the percentage discrepancy was not meaningful[20].

DISCUSSION

The upper incisors, which are more anteriorly and downwardly positioned, and the lower incisors, which are anteriorly and upwardly positioned, provide less buccal corridor space. All such incisor locations could be part of the hyper divergent dental compensation effect. propensity of the vertical skeletal pattern Spahl concluded that the elimination of the tooth in per segment of the arch results in a decrease in the radius of the dental arc curvature, a compression of the curve and a denture that is not sufficient to cover the oral cavity during the smile.[49].

The dogma was that the procedure with extraction resulted in a contraction of the dental arc and contributed to a rise in the buccal passage. However, some studies have shown that there is no difference in the width of the buccal corridor between the cases handled with and without the extraction of four premolars and the control group. This work has shown that there is also no difference in the width of the buccal and posterior corridors between individuals treated with extractions of one and four premolars, with the exception of potential criticism of the protocol of asymmetric extractions in Class II malocclusion, subdivision was the product of Lazare Marc et al in their study[26,47,49].

Study conducted by Harneet Kaur et al (2016) stated awareness of craniofacial muscle environment of each patient and how this musculature affects the etiology, treatment, and stability after treatment of malocclusions and jaw deformities. When a muscle is contracted, there is sliding of the muscle fibers and increase in fiber diameter that causes thickening. This change can be observed concomitant with the start of contraction and it shows a large value. Another cause of increase in muscle size while contracting for long periods would be an oedematous change of muscle. Thus, an increase in muscle thickness during smiling suggests some amount of masseter muscle activity during smiling Since masseter muscle has an effect on craniofacial morphology, which in turn has been shown to have some influence on buccal corridor space, there may be some association between the masseter muscle thickness and buccal corridor space. The present study shows a positive correlation between BCWR and masseter muscle thickness in contracted state. This corresponds to the earlier findings in the study where masseter muscle thickness increased during smiling state. However, the further scope of this investigation is to conduct a study on a larger sample preferably selected on the basis of skeletal features[34].

DISCUSSION

Limitations of the present study:-

The present study is correlational study to find any correlation between buccal corridor space with overjet in dentulous patient. It was concluded after the analysis that on increasing overjet in case of group B (2-3mm) and group C (3-4mm) that buccal corridor space also increases. There are various factors that can affect the buccal corridor space of an individual like arch form, muscles, photographic error and underlying skeletal structures.

The sample size of the study is small, hence the result cannot be generalized.

Future leads:-

The present study is an in-vitro study, although the complete and removable partial denture prosthesis are meant to function in the oral cavity. Clinical trials with the correlation found in the present study can be further investigated in the patient with different jaw relations to help the clinician to fabricate prosthesis with better functionality and esthetics.

CONCLUSION

The following conclusion may be drawn from the present study conducted to evaluate and to find out any correlation between buccal corridor space with overjet in subjects with pleasing smile using digital videographic image for measuring buccal corridor space using digimizer software and adobe photoshop software and readings of overjet by ruler and divider.

1. Quantitative data showed that there were no major variations between the mean buccal corridor space on the right and left side
2. An intra comparison of overjet groups, its shows that there are no significant differences between groups mean of buccal corridor space from left side, right side and mean of left and right side.
3. Correlations between the overjet group A (1-2mm) and the buccal corridor space in Group A; there was a negative correlation between the overjet and the buccal corridor space on the left and right side.
4. Correlations between the overjet group B (2-3mm) and the buccal corridor space. In Group B, there was a moderate positive correlation between Overjet and the buccal corridor space on the right and left side.
5. Correlations between group C (3-4mm) overjet and buccal corridor space. In Group C; there was a moderate positive correlation between Overjet and buccal corridor space from right side and left side.

It was concluded after the analysis that on increasing overjet as observed in case of group B (2-3mm) and group C (3-4mm) that buccal corridor space also increases.

BIBLIOGRAPHY

1. McNamara L, McNamara J.A., Ackermanc M.B. et al. hard and soft tissue contributions to the esthetics of the posed smile in growing patients seeking orthodontic treatment. *Am J Orthod and Dentofacial Orthop 2008;133,4:491-499*
2. Rittera D.E., Gandini L.G. et al .esthetic influence of negative space in the buccal corridor during smiling. *Angle Orthod 2006;76:198-203.*
3. Ackerman B. M., Ackerman L.J. smile analysis and design in the digital era. *Clin Orth Res 1, 1998; 2-11.*
4. Levin EI. Dental esthetics and the golden proportion. *J Prosthet Dent 1978;40:244-52.*
5. Burstone, C.J., Charles J. Burstone, DDS, MS. Part 1 Facial Esthetics. Interview by Ravindra Nanda. *J Clin Orthod, 2007. 41(2): p. 79-87.*
6. Ioi H., S. Nakata, Countsc L.A. Effect of buccal corridors on Smile Esthetics in Japnese. *Angle Orthodontist* 2009;79:628–633.
7. Matthews, T. G., Blatterfein, L., Morrow, R. M., & Payne, S. H. *The anatomy of a smile. The Journal of Prosthetic Dentistry 1978;39(2), 128–134.*
8. Cheng H-Chung, Cheng P-Chin. Factors affecting smile esthetics in adults with different types of anterior overjet malocclusion. *The Korean Association of Orthodontics* 2017;47(1):31-38.
9. Beresin WE, Schiesser FJ. The neutral zone in complete dentures. *J Prosth Dent 1976;36:356-67*
10. Jenny J, Cons NC. Comparing and contrasting two orthodontic indices, the index of orthodontic treatment need and the dental aesthetic index. *Am J Orthod Dentofacial Orthop 1996;110: 410-6.*
11. Soh Jen, Chew Tak Ming et al. Perceptions of dental esthetics of Asian orthodontists and laypersons. *Am J Orthod Dentofacial Orthop 2006;130:170-6.*
12. Freire M.S., Nishio C., et al. Relationship between dental size and normal occlusion in Brazilian patients. *Braz Dent J* 2007;18(3):253-257.
13. Beresin and Schiesser. The neutral zone in complete and partial dentures. *2nd ed. The C. V. Mosby Company. Saint Louis. 1978: 15 29.*
14. Demirel F, Oktemer F. The relations between alveolar ridge and teeth located in neutral zone. *Marmara Univ Dent Fac 1996; 2: 562 566.*
15. Mizrahi B. The Dahl principle: Creating space and improving the biomechanical prognosis of anterior crowns. *Quintessence Int 2006;37:245-251.*

BIBLIOGRAPHY

16. Nagarsekar Aradhana, Aras Meena. Role of anterior guidance in esthetic and functional rehabilitation. *The Journal of Indian Prosthodontic Society 2008;8,4:225-227.*
17. Demirel F, Oktemer F. The relations between alveolar ridge and teeth located in neutral zone. *Marmara Univ Dent Fac 1996; 2: 562 566.*
18. Dunn J. William et all. Esthetics: Patients' Perceptions of Dental Attractiveness. *J Prosthod 1996;5:166-171.*
19. Maulik Christopher, Nanda Ravindra. Dynamic smile analysis in young adults. *Am J Orthod Dentofacial Orthop 2005;132:307-15*
20. Moore Theodore, Southard A Karin et al. Buccal corridors and smile esthetics. *American Journal of Orthodontics and Dentofacial Orthopedics (2005);127(2):208-13*
21. Parekh, S.M., et al., Attractiveness of variations in the smile arc and buccal corridor space as judged by orthodontists and laymen. *Angle Orthod, 2006. 76(4): p. 557-63.*
22. Freire M.S., Nishio C., et al. Relationship between dental size and normal occlusion in Brazilian patients. *Braz Dent J* 2007;18(3):253-257.
23. Martin J. Adam, Buschang H. P., Boley C. J. et al. The impact of buccal corridors on smile attractiveness. *European Journal of Orthodontics 2007;29:530–537.*
24. Geld Vander Pieter et al. Age-related changes of the dental aesthetic zone at rest and during spontaneous smiling and speech. *European Journal of Orthodontics 30 (2008) 366–373.*
25. Yang Il-Hyung, Nahm Seok- Dong, Baek Hak- Seung. Which Hard and Soft Tissue Factors Relate with the Amount of Buccal Corridor Space during Smiling?. *Angle Orthodontist (2008);78(1):5-11.*
26. Krishnan V, Daniel T Sunish et al. Characterization of posed smile by using visual analog scale, smile arc, buccal corridor measures, and modified smile index. *Am J Orthod Dentofacial Orthop (2008);133(4):515-23.*
27. Zia Umar Afeef, Mahmood Amjad, Shahnawaz Adil. Effect of inter-premolar width on buccal corridor area show during posed smile. *POJ 2012:4(1) 4-9.*
28. Tikku T., Khanna R, Maurya RP, Ahmad N. Role of buccal corridor in smile esthetics and its correlation with underlying skeletal and dental structures. *Indian Journal of Dental Research* 2012;23(2):187-194.
29. Nascimento Cunha Diana et al. Influence of buccal corridor dimension on smile esthetics. *Dental Press J. Orthod 2012;17(5):1-5.*

BIBLIOGRAPHY

30. Meyer H. Anna et al. Maxillary arch width and buccal corridor changes with orthodontic treatment. Part 1: Differences between premolar extraction and nonextraction treatment outcomes. *Am J Orthod Dentofacial Orthop 2014;145:207-16*
31. Dr. Sudhakar Narmadha, Dr. Vishwanath Aarthy. Smile Esthetics – A Literature Review. *IOSR Journal of Dental and Medical Sciences 2014;13(1):32-36.*
32. Sierwald I, John T.M, Schierz O., Jost-Brinkmann P-G, Reissmann R. D. Association of overjet and overbite with esthetic impairments of oral health-related quality of life. *Journal of Orofaial Orthopedics* 2015;76:1-16.
33. Kakadiya Jignesh, Kambalyal Prabhuraj, Singla Mukesh, Jingar. Comparison of Incisor, Molar & Lower Anterior Facial Divergence in Hypodivergent, Hyperdivergent And Normodivergent Patient: A Study Modeland Cephalometric Study. *Dental Journal of Advance Studies 2016;4(2):104-112.*
34. Kaur Harneet, Tripathi Tulika, Rai Priyank, Kanase Anup. Influence of masseter muscle thickness on buccal corridor space and craniofacial morphology: A correlative study. *The Journal of Indian Orthodontic Society 2016;50:207-14.*
35. Dr. Patel Wasim, Dr. Desai Hina, Dr. Sharma Padmaja. Average Buccal Corridor Space in Indian Population with Class I Occlusion. *International Journal of Scientific Research 2016;3(11):420-421.*
36. Soheilifar S., Soheilfar S., Javanshir B., Noorani A., Akbarzadeh M., Malekshoar M. Comparison of buccal corridor and dental arch width changes in extraction and non-extraction orthodontics treatment. *Scholars Academic Journal Biosciences* 2017;5(1):21-28.
37. Dr. Srinivas Ajay, Dr. Shetty K. S., Dr. Kumar M., Y., Dr. Manjucharan. Correlation between facial form and buccal corridors and its influence on smile esthetics. *International Journal of Current Research 2017;9(08):56618-56622.*
38. Bhat Rashmi, Subrahmanya M. Ravi. Factors affecting buccal corridor space in Angle's Class II Division 1 malocclusion. *Journal of Orofacial Sciences 2014;6(1):31-36.*
39. Dr. Shivani Kohli Yee Ang. Smile enhancement with anatomic diagnostic wax-up and comprehensive esthetic smile designing. *J Int Oral Health 2019;11:221-7*
40. Kedia Gunjan, Kedia B. Neha, Chandra S.et al. Are buccal corridors and smile width relating to smile esthetics? *IP Indian Journal of Orthodontics and Dentofacial Research 2020;6(2):63–67*

BIBLIOGRAPHY

41. Sarver M. David, Ackerman B. M. Dynamic smile visualization and quantifification: Part 1. Evolution of the concept and dynamic records for smile capture. *Am J Orthod Dentofacial Orthop 2003;124:4-12*
42. Heikinheimo K, N. Marjatta, H. Toumas, Pirttiniemi M.P. Dental arch width, overbite, and overjet in a Finnish population with normal occlusion between the ages of 7 and 32 years. *The Europeon Journal of Orthodontics 2011Feb:1-9.*
43. Hoe Ming Tan et al. Variables and factors that may affect smile design: A mini review. *International Journal of Contemporary Dental and Medical Reviews (2015);1-4.*
44. Manjula S.W., Sukumar R.M. et al. Smile: A review. *J Pharm Bioallied Sci. 2015;7(1): S271–S275*
45. Soh Jen, Chew Tak Ming et al. Perceptions of dental esthetics of Asian orthodontists and laypersons. *Am J Orthod Dentofacial Orthop 2006;130:170-6.*
46. Jenny J, Cons NC. Comparing and contrasting two orthodontic indices, the index of orthodontic treatment need and the dental aesthetic index. *Am J Orthod Dentofacial Orthop 1996;110: 410-6.*
47. Branco C. C. Nuria, Janson Guilherme et al. Width of buccal and posterior corridors: Differences between cases treated with asymmetric and symmetric extractions. *J Orthod. 2012; 17(5):138-44.*
48. Lombardi RE. The principles of visual perception and their clinical application to denture esthetics. *J Prosthet Dent. 1973 Apr;29(4):358-82.*
49. Spahl TJ. Premolar extractions and smile esthetics. *Am J Orthod Dentofacial Orthop. 2003 Jul;124(1):16A-17A; author reply 17A.*

BABU BANARASI DAS COLLEGE OF DENTAL SCIENCES (FACULTY OF BBD UNIVERSITY), LUCKNOW

INSTITUTIONAL RESEARCH COMMITTEE APPROVAL

The project titled **"Correlation of Buccal Corridor Space With Overjet in Dentulous Patient."** submitted by **Dr Pratibha Yadav** Post graduate student from the **Department of Prosthodontics and Crown & Bridge** as part of MDS Curriculum for the academic year 2018-2021 with the accompanying proforma was reviewed by the Institutional Research Committee present on **26th November 2018** at BBDCODS.

The Committee has granted approval on the scientific content of the project. The proposal may now be reviewed by the Institutional Ethics Committee for granting ethical approval.

Prof. Vandana A Pant
Co-Chairperson

Prof. B. Rajkumar
Chairperson

Babu Banarasi Das University
Babu Banarasi Das College of Dental Sciences,
BBD City, Faizabad Road, Lucknow – 226028 (INDIA)

Dr. Lakshmi Bala
Professor and Head Biochemistry and
Member-Secretary, Institutional Ethics Committee

Communication of the Decision of the VIIth Institutional Ethics Sub-Committee

IEC Code: 06 **BBDCODS/01/2019**

Title of the Project: Correlation of Buccal Corridor Space With Overjet in Dentulous Patient.

Principal Investigator: Dr. Pratibha Yadav **Department:** Prosthodontics and Crown & Bridge

Name and Address of the Institution: BBD College of Dental Sciences Lucknow.

Type of Submission: New, MDS Project Protocol

Dear Dr. Pratibha Yadav,

The Institutional Ethics Sub-Committee meeting comprising following four members was held on 10th January 2019.

1.	Dr. Lakshmi Bala Member Secretary	Prof. and Head, Department of Biochemistry, BBDCODS, Lucknow
2.	Dr. Amrit Tandan Member	Prof. & Head, Department of Prosthodontics and Crown & Bridge, BBDCODS, Lucknow
3.	Dr. Rana Pratap Maurya Member	Reader, Department of Orthodontics & Dentofacial Orthopedics, BBDCODS, Lucknow
4.	Dr. Sumalatha M.N. Member	Reader, Department of Oral Medicine & Radiology, BBDCODS, Lucknow

The committee reviewed and discussed your submitted documents of the current MDS Project Protocol in the meeting.
The comments were communicated to PI thereafter it was revised.

Decisions: The committee approved the above protocol from ethics point of view.

Forwarded by:

Lakshmi Bala 21/01/19

(Dr. Lakshmi Bala)
Member-Secretary
IEC

Member-Secretary
Institutional Ethic Committee
BBD College of Dental Sciences
BBD University
Faizabad Road, Lucknow-226028

(Dr. B. Rajkumar)
Principal
BBDCODS

PRINCIPAL
Babu Banarasi Das College of Dental Sciences
(Babu Banarasi Das University)
BBD City, Faizabad Road, Lucknow-226028

Babu Banarasi Das College of Dental Sciences

(Babu Banarasi Das University)
BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

Consent Form (English)

Title of the Study ……..

Study Number……..
Subject's Full Name…….
Date of Birth/Age ……
Address of the Subject……..
Phone no. and e-mail address……
Qualification ……
Occupation: Student / Self Employed / Service /
Housewife/ Other (Please tick as appropriate)
Annual income of the Subject……
Name and of the nominees(s) and his relation to the subject…… (For the purpose of compensation in case of trial related death).

1. I confirm that I have read and understood the Participant Information Document dated ……..for the above study and have had the opportunity to ask questions. **OR** I have been explained the nature of the study by the Investigator and had the opportunity to ask questions.
2. I understand that my participation in the study is voluntary and given with free will without any duress and that I am free to withdraw at any time, without giving any reason and without my medical care or legal rights being affected.
3. I understand that the sponsor of the project, others working on the Sponsor's behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. However, I understand that my Identity will not be revealed in any information released to third parties or published.
4. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).
5. I permit the use of stored sample (tooth/tissue/blood) for future research. **Yes [ ]** **No [ ]**

6. I agree to participate in the above study. I have been explained about the complications and side effects, if any, and have fully understood them. I have also read and understood the participant/volunteer's Information document given to me.

Representative:……..
Signatory's Name……. Date …….
Signature of the Investigator…… Date……..
Study Investigator's Name..... Date……..
Signature of the witness…… Date……..
Name of the witness……
Received a signed copy of the PID and duly filled consent form
Signature/thumb impression of the subject or legally Date……..

Acceptable representative

Babu Banarasi Das College of Dental Sciences
(Babu Banarasi Das University)
BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

सहमति पत्र

अध्ययन शीर्षक.....
अध्ययन संख्या.....
प्रतिभागी के पूर्ण नाम.....
जन्म तिथि / आयु.....
प्रतिभागी का पता .....
फोन नं. और ई-मेल पता .....
योग्यता .....
व्यवसाय: छात्र / स्व कार्यरत / सेवा / ग्रहिणी .....
अन्य (उचित रुप मे टिक करें) .....
प्रतिभागी की वार्षिक आय .....
प्रत्याशीयो के नाम और प्रतिभागी से संबंध...(परीक्षण से संबंधित मौत के मामले मे मुआवजे के प्रयोजन के लिए)

1. मेरी पुष्टि है कि मैने अध्ययन हेतु सुचना पत्र दिनांक ..... को पढ व समझ लिया तथा मुझे प्रश्न पुछने या मुझे अध्ययन अन्वेषक ने सभी तथ्यों को समझा दिया है तथा मुझे प्रश्न पुछने के समान अवसर प्रदान किए गये।

2. मैंने यहॉ समझ लिया कि अध्ययन में मेरी भागीदारी पूर्णतः स्वैच्छिक है और किसी भी दबाव के बिना स्वतंत्र इच्छा के साथ दिया है किसी भी समय किसी भी कारण के बिना , मेरे इलाज या कानूनी अधिकारो को प्रभावित किए बिना , अध्ययन में भाग न लेने के लिए स्वतंत्र हुँ ।

3. मैंने यह समझ लिया है कि अध्ययन के प्रायोजक , प्रायोजक की तरफ से काम करने वाले लोग, आचार समिति और नियामक अधिकारियों को मेरे स्वास्थ्य रिकार्ड को वर्तमान अध्ययन या आगे के अध्ययन के सन्दर्भ देखने के लिए मेरी अनुमति की जरूरत नही है, चाहे मैने इस अध्ययन से नाम वापस ले लिया है। हॉलाकि मै यह समझता हुँ कि मेरी पहचान को किसी भी तीसरे पक्ष या प्रकाशित माध्यम में नही दी जायेगी।

4. मै इससे सहमत हूँ कि कोई भी डेटा या परिणाम जो इस अध्ययन से प्राप्त होता है उसका वैज्ञानिक उद्देश्य (ओं) के उपयोग के लिए मेरी तरफ से कोई प्रतिबंध नही है।
5. भविष्य के अनुसंधान के लिए भंडारित नमूना (ऊतक/रक्त) पर अध्ययन के लिए अपनी सहमति देता हुँ।

हॉ [ ] नही [ ] अनउपयुक्त [ ]

6. मै परीक्षण की अनुमति देता हुँ। मुझे इसके द्वारा यदि कोई परेशानी होती है, इसके बारे में जानकारी दे दी गई है। मैने रोगी जानकारी सूचना पत्र को पढ तथा समझ लिया है।

प्रतिभागी / कानूनी तौर पर स्वीकार्य प्रतिनिधि का हस्ताक्षर (या अंगूठे का निशान.....

हस्ताक्षरकर्ता का नाम..... दिनांक .....अन्वेषक के हस्ताक्षर ..... दिनांक .....

अध्ययन अन्वेषक का नाम .....

गवाह के हस्ताक्षर ..... दिनांक .....गवाह के नाम .....

मैनें पीआईडी और विधिवत भरे सहमति फार्म का एक हस्ताक्षर की नकल प्राप्त की.

प्रतिभागी कानूनी तौर पर प्रतिनिधि का हस्ताक्षर/ अंगूठे का निशान ..... दिनांक.....

Tools for statistical analysis:

Data was entered into Microsoft Excel spreadsheet and was checked for any discrepancies. Summarized data was presented using Tables and Graphs. The data was analysed by SPSS (21.0 version). Shapiro Wilk test was used to check which all variables were following normal distribution. Data was found to be normally distributed (p-value was more than 0.05). Therefore, bivariate analyses were performed using the parametric tests i.e. One way ANOVA (for comparing more than two groups) and Paired t test for comparing pre and post difference. Level of statistical significance was set at p-value less than 0.05

The following statistical formulas were used:

1. **The Arithmetic Mean:** The most widely used measure of central tendency is arithmetic mean, usually referred to simply as the mean. To obtain the mean, the individual observations were first added together and then divided by the number of observation. The operation of adding together or summation is denoted by the sign $\sum$.

   The individual observation is denote by the sign X, number of observation denoted by n, and the mean by $\bar{X}$

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

2. **The Standard Deviation:** The standard deviation (SD) is the positive square root of the variance, and calculated as

$$SD = \sqrt{\frac{\sum X_i^2 - \frac{(\sum X_i)^2}{n}}{n-1}}$$

where, n= no. of observations

and also denoted by subtracting minimum value from maximum value as below

3. **Analysis Of Variance:** Analysis of variance (ANOVA) is used when we compare more than two groups simultaneously. The purpose of one-way ANOVA is to find out whether data from several groups have a common mean. That is, to determine whether the groups are actually different in the measured characteristic. One way ANOVA is a simple special case of the linear model. For more than two independent groups, simple parametric ANOVA is used when variables under consideration follows Continuous exercise group distribution and groups variances are homogeneous otherwise non parametric alternative Kruskal-Wallis (H) ANOVA by ranks is used. The one way ANOVA form of the model is

$Y_{ij} = \alpha_{.j} + \varepsilon_{ij}$

where:

- Y_{ij} is a matrix of observations in which each column represents a different group.
- $\alpha_{.j}$ is a matrix whose columns are the group means (the "dot j" notation means that α applies to all rows of the j^{th} column i.e. the value α_{ij} is the same for all i).
- ε_{ij} is a matrix of random disturbances.

The model posits that the columns of Y are a constant plus a random disturbance. We want to know if the constants are all the same.

Assumptions are:

a) Response variable must be normally distributed (or approximately normally distributed).
b) Samples are independent.
c) Variances of populations are equal.
d) The sample is a simple random sample (SRS).

Two-way anovais used when we have one measurement variable and two nominal variables, and each value of one nominal variable is found in combination with each value of the other nominal variable. It tests three null hypotheses: that the means of the measurement variable are equal for different values of the first nominal variable; that the means are equal for different values of the second nominal variable; and that there is no interaction (the effects of one nominal variable don't depend on the value of the other nominal variable). When we have a quantitative continuous outcome and two categorical explanatory variables, we may consider two kinds of relationship between two categorical variables. In this relationship we can distinguish effect of one factor from that of the other factor. This type of model is called a **main effect model** or **no interaction** model.

4. **Post-Hoc Tests (Tukey-HSD):** After performing ANOVA, Tukey-HSD (honestly significant difference) post hoc test is generally used to calculate differences between group means as

where, $$q = \frac{X_1 - X_2}{SE}$$

$$SE = \sqrt{\frac{S^2}{2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$

S^2 is the error mean square from the analysis of variance and n_1 and n_2 are number of data in group 1 and 2 respectively.

5. **Level of significance:** "p" is level of significance signifies as below:

p> 0.05	Not significant (ns)
p <0.05	Just significant (*)
p <0.01	Moderate significant (**)
p <0.001	Highly significant (***)

Curiginal

Document Information

Analyzed document	Pratibha Plagiarism Report.docx (D98347284)
Submitted	3/15/2021 6:56:00 AM
Submitted by	Garima
Submitter email	amitlko@bbdu.ac.in
Similarity	4%
Analysis address	amitlko.bbduni@analysis.urkund.com

Sources included in the report

W	URL: https://www.researchgate.net/publication/7982791_Buccal_corridors_and_smile_esthetics Fetched: 4/11/2020 5:19:02 PM	1
SA	**Babu Banarsi Das University, Lucknow / akshita-plag.docx** Document akshita-plag.docx (D60065950) Submitted by: tandanamrit@bbdu.ac.in Receiver: tandanamrit.bbduni@analysis.urkund.com	5
W	URL: https://www.researchgate.net/publication/7238207_Esthetic_influence_of_negative_sp ... Fetched: 3/15/2021 6:56:00 AM	1
W	URL: https://www.researchgate.net/publication/6520969_The_acceptability_of_variations_i ... Fetched: 2/26/2021 7:29:15 AM	1
W	URL: https://www.researchgate.net/publication/257203947_Influence_on_smile_attractivene ... Fetched: 1/18/2020 6:05:03 AM	1
SA	**Library.docx** Document Library.docx (D94173381)	1
W	URL: http://52.172.27.147:8080/jspui/bitstream/123456789/32317/1/02_D018_63605.pdf Fetched: 2/26/2021 7:29:25 AM	1

Pratibha Yadav
29-June-2021

Garima