Analysis of Class III Skeletal Malocclusion that Require Orthognathic Surgery for Correction as Compared to Camouflage Treatment - A Retrospective Study

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Abstract

Class III malocclusion is a complex anomaly . Not all adult class III patients will need surgical correction. In the Indian population the incidence of a class III malocclusion is lesser than a class II. Orthodontic case records were reviewed and analysed. Class III adult malocclusions were evaluated to estimate the prevalence and the treatment protocol. From this evaluation of class III patients the span on close to a year report of 44 adult class III patients out of whom 10 patients required orthognathic surgery for correction . Surgery first done in 2 cases and other cases were single jaw or bi-jaw surgery done using conventional approach.In the camouflage treatment most of the cases were treated by non- extraction. Correct classification of adult Class III malocclusion patients succeeded to a high degree. Pearson's chi-square value is 1.867 and P value is 0.1 and the results of this study are not significant. The severity of the malocclusion should be used to determine the treatment protocol.Orthognathic surgery was successful in 92% patients . Most of the camouflage studies use mini-implants and non-extraction protocols. Surgical treatment done according to severity of class III and patient compliance.Among the assessed population 44 patients had skeletal class III malocclusion and in the adult patients 8 patients were treated with orthognathic surgery . The two main deciding factors to conclude as the treatment plan was based on the severity of the malocclusion and the patient compliance. Orthognathic surgery was successful in 92% patients

Keywords: *Skeletal Class III , orthognathic surgery , camouflage, Prognathic mandible*

Introduction

Class III malocclusion has varied etiological features that involves maxilla and mandible and sometimes involves the craniofacial region.[1,2] Class III malocclusion involves anomalies of skeletal and dentoalveolar components. [1] Their primary use is to provide a means of comparison of individual dentofacial characteristics with a population average in order to identify areas of specific deviation, as well as describe the spatial relationship between various parts of the craniofacial structures.[2] Orthodontic treatment involves the application of forces that are continuous in activity on as many areas of the dentition as possible and working in the direction in which the teeth are to move, with maximum comfort to the patient.[3] [4,5]Crown lengthening with osteotomy and gingivectomy may result in varied gingival heights between adjacent teeth compromising esthetics.[6]

The class III malocclusions has the highest frequency with prognathic mandible and sometimes with a combination of prognathic mandible and retrognathic mandible.[7]

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In the cephalometric findings class III patients have a shorter anterior cranial base, longer posterior cranial base, anterior bas, shorter retrusive maxilla, proclined maxillary incisors, retroclined mandibular incisors , increase in lower anterior facial height, gonial angle is obtuse [8,9] . The presence of risk factors such as age, gender and obesity . [10] This usually results in the application of a diagonal vector of force on the maxillary anterior teeth of both sides.[11]

The envelope of discrepancy shows the limit of corrections that can be done by orthodontic treatment. [12] The side effects of maxillary dentition as an anchorage unit for protraction could lead to labio version of maxillary incisors, extrusion of maxillary molars,[6] counter clockwise rotation of palatal plane and clockwise rotation of mandible[13] Direct bonding of orthodontic brackets since its inception into orthodontics has made tremendous advances and continuous efforts are on to find better bonding materials as bracket dislodgement continues to be a problem for orthodontists. [14]

In order to establish the cephalometric criteria in adult class III patients in order to allocate them to the treatment plan move objectively.[15] Pretreatment lateral cephalograms to decide either surgical orthodontic correction by univariate statistical methods. The difference between the ratios found in ANB (Point A , Point B and nasion as viewed on Lateral cephalogram) angle, mandibular plane angle, mandibular incisor angulation , Holdaways soft tissue relationship. Skeletal and dentoalveolar deviations need to be evaluated for individual variations to explain the malocclusion. [16] It is also better to understand the relationship between craniofacial structure and occlusion using multivariate approach.[17] The approach to be used after careful considerations of limitations are the cephalometric analysis and analysis landmark identification, selection and separation of groups, sample size. [18].

Not all patients are candidates for surgical correction, patient assessment and selection are essential diagnosis and treatment planning. The aim of this study was to analyse and distinguish between surgical and non- surgical subjects presenting skeletal class III malocclusions.

MATERIALS AND METHODS

This study design is of retrospective aspect conducted in an online setting in the centre of Saveetha Dental College using the online record keeping software DIAS. Due to the not wide prevalence of class III malocclusions in the Indian population, this method of search provided a large number of the same at a given point. The inclusion of skeletal class III malocclusion in the age group of 16 years and older . This study couldn't specify a particular population and race. The number of people in this study are the investigator and guide. The study was cleared by approval from the university review board. The sampling period was obtained between June 2019 to March 2020. Orthodontic case records were evaluated. Adult patients above the age of 16 with skeletal class III malocclusion. The sample requires a minimum of 40 patients with the skeletal malocclusion of class III after estimating using G power analysis by keeping power at 90. [19]After evaluating the case records to determine and isolate class III photographic data and cephalometric values were evaluated. The data was tabulated to excel sheet. The variables in this study taken into consideration are the severity of class III malocclusion based on reverse overjet , gonial angle, wits appraisal , ANB and overbite. The statistics was done using SPSS for performing analysis , chi-square test was done and cross tabulation to obtain graphical representation.

Results and Discussion

The time period for evaluation is from June 2019- March 2020 . The evaluation of 1128 cases revealed a total of 44 adult class III patients . 10 cases were chosen for surgical correction. Surgery first approach done in 2 cases . Depending on the correction needed and the jaw at anomalous relation and the soft tissue relationship of patients. One case required only mandibular setback, other case bijaw surgery. (Figure 1)

Conventional surgical approach was done in 8 cases. 87% cases were treated with camouflage, 85% cases were treated as non - extraction protocol.

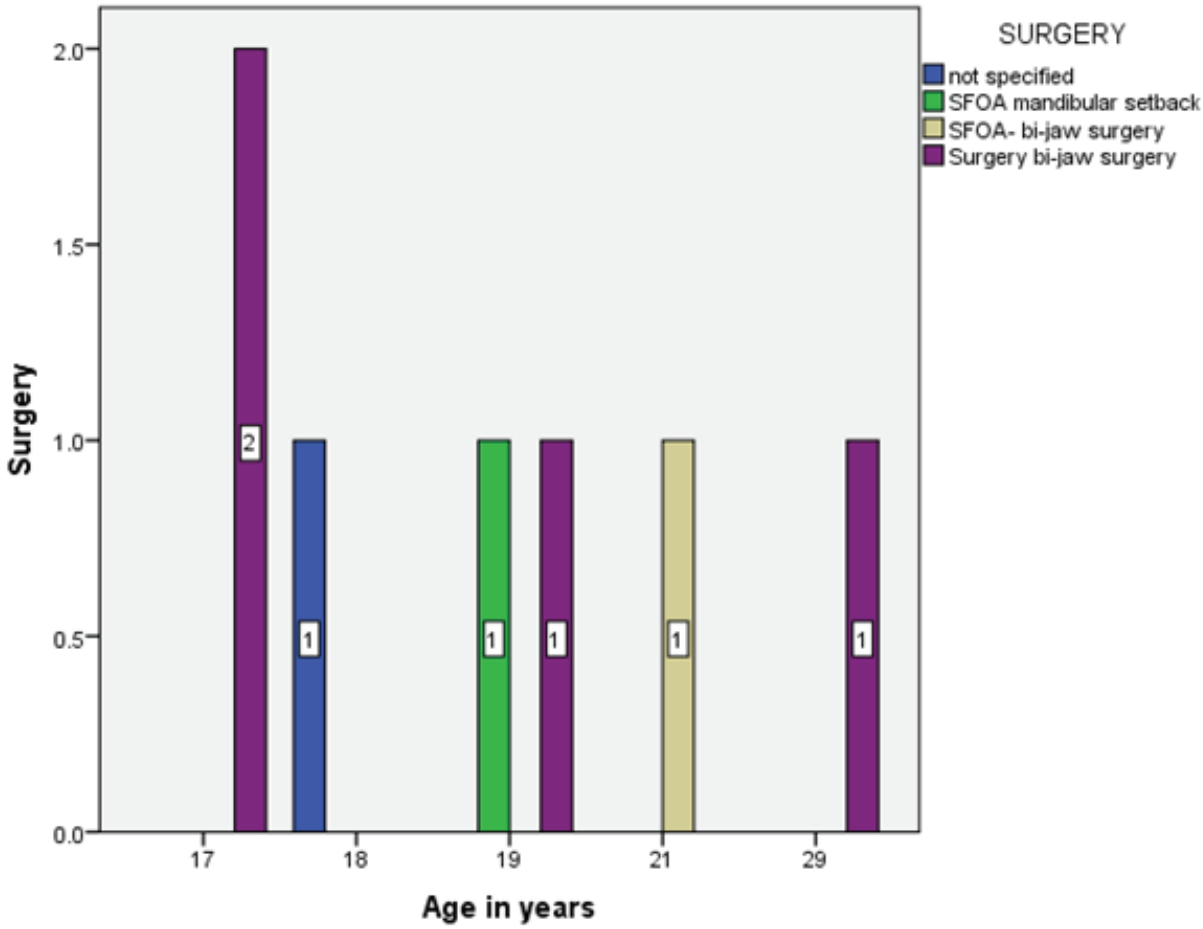

Figure 1 : Surgery done in adult class III patients

Bar graph represents the comparison between various age groups and the surgical plan options for class III orthognathic surgery. Green color represents surgery's first orthognathic approach with only a mandibular setback, blue color represents the surgical plan that isn't restricted to a particular nature, grey color represents surgery's first orthognathic approach and a bi-jaw surgery and purple color represents the conventional surgical approach.This bar graph shows that camouflage was most commonly done in all age groups and in adults above 17 years years of age surgery was done and in surgery , a bi-jaw approach was most common. However, there is no significant difference statistically. Pearson's chi-square value is 1.867 and P value is 0.1 (>0.05).

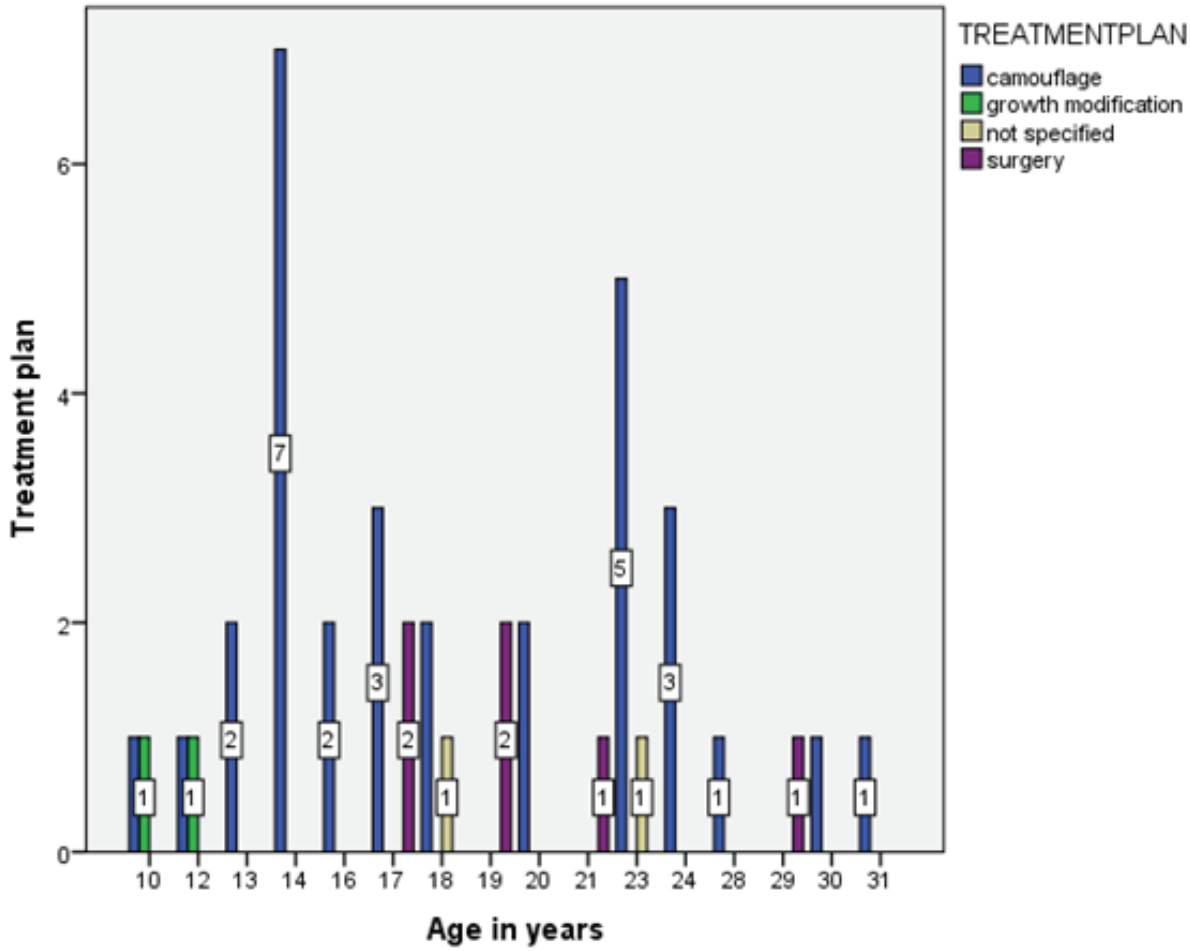

Figure 2 : Class III patient - Treatment plan . This bar graph represents comparison of all the various treatment plan options done in skeletal class III cases in comparison to various age groups of orthodontic participants. Blue color represents the camouflage as a treatment plan, grey represents an integrated treatment approach, green color the growth modification treatment plan and purple color represents the surgical plan. This bar chart shows that camouflage(blue) was most commonly done across all the age(years) groups of class III malocclusion and in adults above 17 years surgical treatment is done most commonly following camouflage. However, it is not significant statistically.

Pearson's chi-square value is 1.867 and P value is 0.1(>0.05) and the results of this study are not significant.

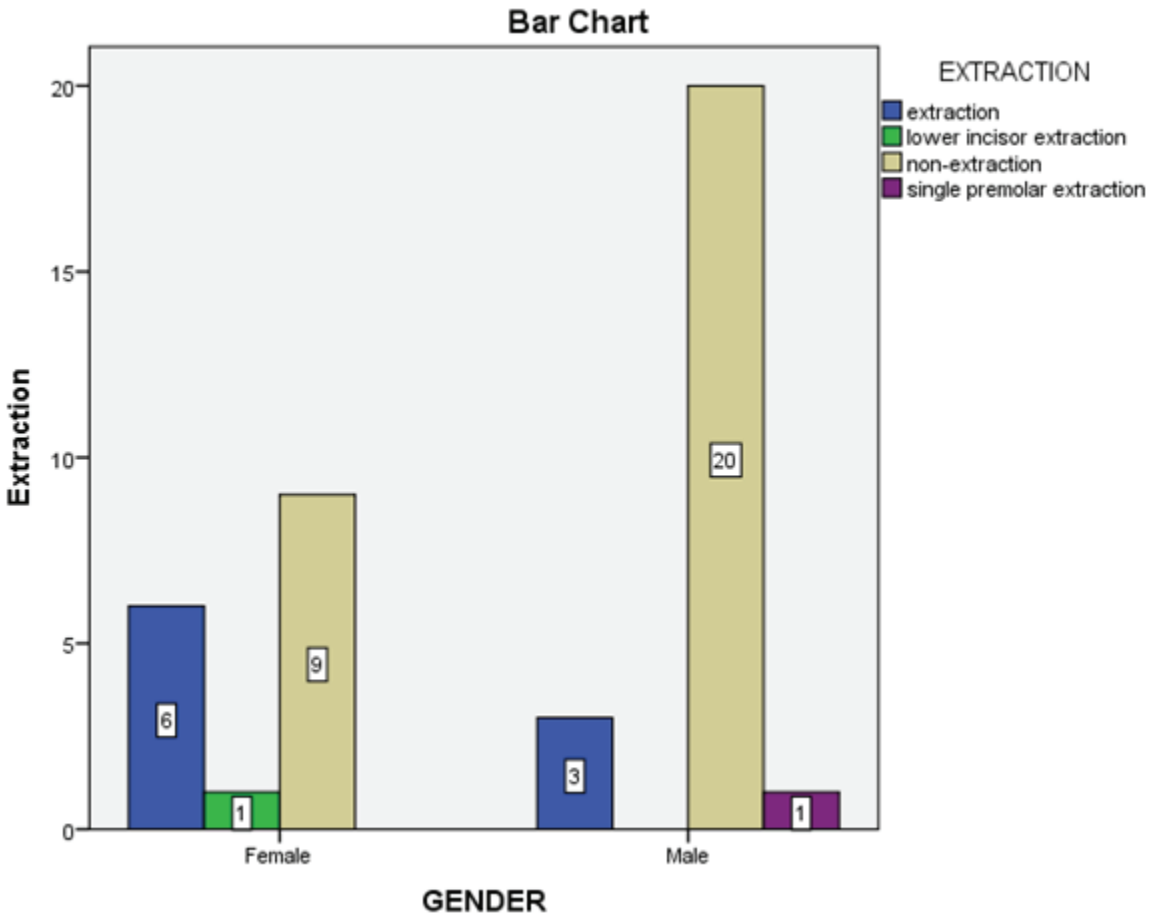

Figure 3 : The number of extraction done in Class III cases .This bar graph represents the extraction choice in skeletal class III cases in comparison to the gender (Males and Females). Green color represents lower incisor extraction, grey color represents non- extraction, purple color represents single premolar and blue color represents extraction. This bar graph shows that the majority of male patients needed extraction in skeletal class III cases of them in both the gender a non extraction approach is most commonly done. However it is not significant statistically.

Pearson's chi-square value is 1.867 and P value is 0.1(>0.05)

This study deals with the pretreatment separation of adult class III malocclusion patients into surgical and non-surgical cases. (Figure 1) Figure 2 represents the various treatment plan options for skeletal class III cases and figure 3 represents the extraction pattern chosen in class III patients. The decision as to which form of treatment was indicated to those who have degree of anteroposterior and vertical skeletal discrepancy, the inclination and the position of incisor and the dentofacial appearance. Lateral cephalometric examination to evaluate the growth pattern in Class III subjects the effect of treatment and outcome. [20] Pearson's chi-square value is 1.867 and P value is 0.1 and the results of this study are not significant. In younger individuals the camouflage or growth modification can be most commonly done whereas in adults above 19 years of age surgery and camouflage is attempted. In both the mechanics non-extraction was most commonly done as opposed to extraction pattern.

The envelope of discrepancy states that not all malocclusion can be corrected by orthodontic treatment alone , treatment with growth and surgical treatment .It is important to have clear criteria for determining patient option by established cephalometric yardsticks. While

providing absolute anchorage, these devices are used for specific periods of time and rely only on mechanical retention with the surrounding bone.[21] This initial period of treatment is also a time of acclimatization for patients because they experience restrictions concerning the food that can be masticated with abandoned appliance. [22] The fundamentals of orthodontics is that teeth move through the alveolar bone when adequate forces are delivered. Various local and systemic factors like age, nutrition, consumption of drugs, etc seem to affect orthodontic tooth movement.[23]

The results of this study indicates that the important factors that differentiate the surgery and non-surgical treatment options based on size of anteroposterior discrepancies, the inclination of mandibular incisors.[24] Discriminant model is relatively large sample so that new patient can categorize into surgical and non-surgical .[25] Miniscrews as effective temporary anchorage devices have occupied a central role in a typical orthodontic setup, since anchorage control and patient cooperation are very critical.[26]

Riedel has noted the ANB is the most commonly used cephalometric analysis to describe skeletal discrepancies between maxilla and mandible. The validity of a true indicator for anteroposterior jaw relationship is criticized due to the variations in the Nasion that is taken as a fixed point.[27].A patient judges the outcome of an orthodontic treatment by assessing the final improvement in facial esthetics. The gonial angle in patient is an important indicator for the type of growth pattern and has an influence on the treatment.[28]The binding relationship between orthodontic treatment and facial esthetics has made the facial outline as an important guideline for the treatment planning.[29] The sectioning was done to reduce the amount of time spent in optical sectioning of the tooth with the confocal microscope. The sliced disks were stored dry in amber-colored bottles until microscopic evaluation.[30] Incisor extraction can help minimize arch expansion, decrease the amount of tooth movement required, minimize facial change and reduce treatment time. When a lower incisor is extracted the canine will lie mesially beneath the upper lateral incisor and the canine tip will contact the distolingual marginal ridge of the lateral incisor rather than the mesial fossa of the canine. Magnitude of ANB angle is affected by rotations of the jaws relative to the cranial base. [31]. Because of its predictive power , discriminant analysis appears to be a particularly valuable tool for identifying class III patients in orthodontic treatment is sufficient for therapy.

Most of the camouflage studies use mini-implants and non-extraction protocols. Surgical treatment done according to severity of class III and patient compliance. Prevalence of class III patients in Indian population the class II and Class I cases . The type of surgery is not the same in all patients. Difference in choice between the surgery being done as a surgery first or conventional approach. Reason a surgical treatment is opted out for a patient also depends on patient compliance,cast and other systemic risk factors that can be better obtained from a prospective study design.Well planned randomised control trial, determine the treatment plan to give best results to compare the surgical versus the non-surgical treatment and comparison of surgery first and conventional surgery approach.

CONCLUSIONS

This study concluded that among the assessed population 44 patients(17%) had skeletal class III malocclusion and in the adult patients 8 patients(18%) were treated with orthognathic surgery . The two main deciding factors to conclude as the treatment plan was based on the severity of the malocclusion and the patient compliance. Orthognathic surgery was successful in 92% patients. In comparison, male patients needed extraction in skeletal class III cases and in both the gender a non extraction approach is most commonly done. Camouflage was most commonly done across all the age groups of class III malocclusion and in adults above 17 years surgical treatment is done most commonly following camouflage.

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