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COMPARATIVE EVALUATION OF EFFECTIVENESS OF FM AND TTBA IN IMPROVING THE FACIAL PROFILE FOR THE TREATMENT OF SKELETAL CLASS III MALOCCLUSION.

Dental Science

Dr. Priyadarshini Thakur* Postgraduate student, Department of pedodontics and preventive dentistry, Dr. D. Y. Patil Vidyapeeth, Pune *Corresponding Author

Dr. Ananth Kamath Reader and guide, Department of pedodontics and preventive dentistry, Dr. D. Y. Patil Vidyapeeth, Pune

Dr. Vishwas Patil Reader, Department of pedodontics and preventive dentistry, Dr. D. Y. Patil Vidyapeeth, Pune

Dr. Himali Solanki Postgraduate student, Department of pedodontics and preventive dentistry, Dr. D. Y. Patil Vidyapeeth, Pune

ABSTRACT

Background: - skeletal class III malocclusion in growing children are usually treated with the help of orthopaedic appliance like Facemask (FM), FM along with Rapid maxillary expansion (RME), chin-cup, mandibular headgear and Tandem traction bow appliance (TTBA)

Objective: To compare the effectiveness of FM and TTBA in improving the facial profile for the treatment of skeletal class III malocclusion.

Data Sources: An electronic literature research was performed within PubMed and Google databases from 21st May till 22nd Sept.2017.

Study eligibility criteria: Case report and case series in English language including FM and TTBA appliances treatment for class III malocclusion reporting clinical and cephalometric outcomes were included.

Participants: Studies that provided information for age group 4-13 years of age of either sex.

Intervention: TTBA appliance was compared with FM in the facial profile improvement in the treatment for skeletal class III malocclusion.

Conclusion: The traditional FM protrudes the maxilla with pure extra oral anchorage with minimal dentoalveolar changes. The TTBA is an intra oral tooth borne anchorage system that combines skeletal and dentoalveolar movement. Patients prefer the intraoral TTBA compared to the FM which frightens some patients due to its physical appearance and bulkiness which frequently causes skin irritation from the anchorage pads on the chin and forehead. FM has a better craniofacial adaptation after the treatment compared to TTBA

KEYWORDS

Skeletal Class III, Tandem traction bow appliance, Facemask.

BACKGROUND

Class III malocclusion can be defined as skeletofacial deformity characterised by a forward mandibular position with respect to the cranial base and maxilla. The facial dysphasia can be classified into mandibular prognathism, maxillary retrognathism or combination of both the anteroposterior jaw relation.

According to a systematic review and meta-analysis done by Daniel K. Hardy, Yltze P. Cubas, Maria F. Orellana in 2012 the populations from Southeast Asian countries showed the highest Angle class III malocclusion prevalence rate of 15.80%, based on 1874 individuals .Middle Eastern nations had a mean prevalence of 10.18% out of 4127 individuals. The European studies had an average prevalence rate 4.88% out of 1290 individuals. The African data produced a prevalence rate of 4.59% out of 7017 individuals. Indian populations had the lowest prevalence rate of 1.19% out of 1595 individuals.[1]

The treatment of Class III malocclusion presents one of the most concerning issues for the orthodontist, because of mandibular development. Studies done on facial development show that the maxillary development ends before that of the mandible . In this manner, Class III inconsistency compounds with age, and worsens as the age progresses. The early Class III treatment has numerous preferences: it encourages the eruption of canines and premolars in a normal relation, eliminates the traumatic occlusion of incisors, which may lead to gingival recession, gives a sufficient maxillary growth, and enhances the confidence of the young child.[2]

The facemask treatment produces at least one of the following impacts: rectification of the disparity between centric relation and centric occlusion, skeletal maxillary protraction from 1 to 2 mm, anterior movement of the upper teeth and tipping of the lower teeth to the lingual side. The impacts greatly affect more younger patients; be that as it may, they should be checked during their facial development, because of post treatment relapse.[3] The real issue, however, has been of patient compliance, because of both the physical appearance and bulkiness of the extraoral appliance. The TTBA was utilized effectively by Klempner for early treatment of Class III malocclusion. which is more patient compliant and less difficult than the prior one.[4]

The appliance has three components, two fixed and one removable. The upper fixed appliance consist of bands on deciduous second molars, transpalatal arch and palatal expansion arms. Soldered buccal arms are used for elastic traction. The lower appliance comprises bands on deciduous second molars, lingual holding arch, fixed bite plane for posterior occlusal coverage and buccal facebow tubes. A 0.045" headgear facebow with the outer bows was modified for elastic attachment is inserted into the lower tubes. Pin head clasps between the first deciduous molars and deciduous canines are used for mechanical retention, which augment the stability of lower appliance and prevent rocking of it in the upward direction at anterior segment during elastic traction.[2] In deciduous dentition, a lower midline expansion screw can be added, with instructions given to the parents to activate the screw one- quarter turn as needed between visits.[3]

PROCEDURE

SEARCH

Primary key words	Secondary Keywords
Facemask	Orthopaedic appliance, Reverse pull headgear, Interceptive orthodontics
Skeletal class III malocclusion	maxillary Retrognathism, mandibular prognatism, anterior crossbite
Tandem traction bow Appliance	TTBA, Orthopaedic appliance, Fixed appliance, interceptive orthodontics

STUDY SELECTION

The titles and abstracts of the identified studies were reviewed for relevance. No new articles were added to the collection after hand searching. Overall 122 articles were selected through PubMed and Google. 68 articles were excluded after removal of duplicates. Remaining 52 articles were screened for title and abstract. For

accuracy of this review finally 13 article were selected which consisted of Case reports and Case series . Individual studies of TTBA and FM appliance treatment for treating skeletal class III were used .Articles were screened by one reviewer (KB) and was crossed checked by second reviewer (RD).

DATA COLLECTION PROCESS

A standard pilot form in excel sheet was initially used and then all those headings not applicable for review were removed. Data extraction was done for one article and this form was reviewed by an expert (PK) and finalised. This was followed by data extraction for all the articles. Data were extracted from each study independently and entered into a computerised database. Differences were resolved by discussion amongst the reviewers to reach consensus.

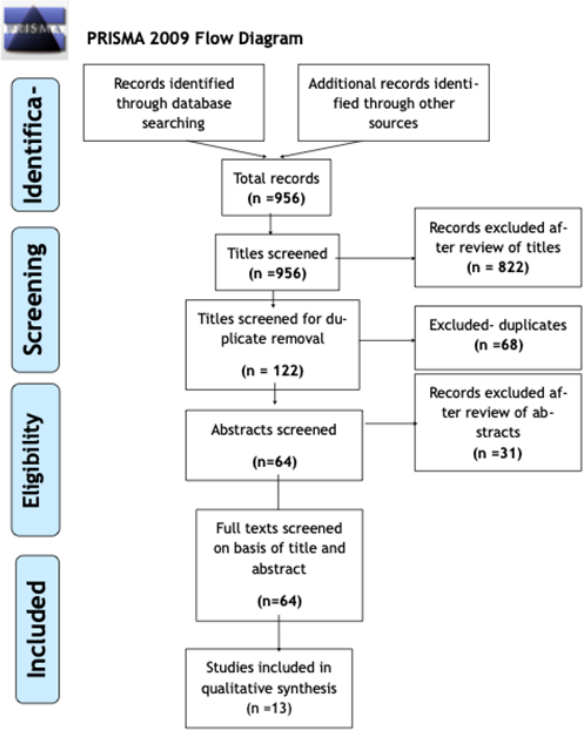
DATA ITEMS

The information extracted included the name of the:

- AUTHOR- Name of First Author.
- YEAR- Year in which study was carried out.
- LOCATION- Country in which study was carried out
- STUDY DESIGN- type of the study which was carried out
- SAMPLE SIZE- Total sample size considered for the study
- INTERVENTION- appliance which is used in the study
- SETTING – This determines where was the study carried out.
- POPULATION- the age group of the children included in the studies.
- OUTCOME- the group which had better results

Sr. No.	Author's Name	Location	Year of Publication	Study Design	Sample Size	Setting	Population	intervention	outcome	Author's remark
1	Sneha Basaveshwar Valgadde, Kishor Chougule	Kolhapur, Maharashtra, India	2016	Case Report	1	university	10 Yr boy	TTBA	TTBA is effective	In this case a 10 yr ld boy was treated by TTBA for 9 months. Active and passive phase is not mentioned seperated by the author and follow-up of the cases is not mentioned.
2	Ram Sukh, Gyan P Singh, Pradeep Tandon	Lucknow, Uttar Pradesh, India	2013	Case Report	1	university	8 yr old	TTBA	TTBA is effective	TTBA achived a skeletal correction in a 6 months period and the later 2 month the appliane was given in a passive form for retention purpose.
3	Adilson Luiz Ramos	Bazil	2014	Case Report	1	clinic setting	12 yr old	Facemask	Facemask is effecive	In this case report the entire traetment plan was divided into 3 phases. 1st phase- maxillary expansion was done by hyrax for 14 days. After that facemask was given for about 6 months for 12 hrs/day follwed by 4 months of facemask during night. 2nd phase- in this phase a fixed appliance was given along with intermaxillary elastics for abiut 16hrs/day followed by phase 3 where retainers were given for 6 months and 2 yrs at night.
4	Ansar J et al	Uttar Pradesh, India	2015	Case Report	1	university	10 yr old	TTBA	TTBA was effective	A 10 yr old boy's class III malocclusion was corrected with the help of TTBA for 5 months [alternate expansion and contraction]. Followed bt the the use of bionator as a retainer for 9 months. TTBA showed positive results. Follow up is not stated
5	Sharma A et al	Maharashtra, India	2014	Case Series	2	university	7 yr old	TTBA	TTBA was effective	case 1- TTBA was chosen over chin cup and twin block appliance dueto lower patient compliance.patient was 6 years 5 months. The active phaseof TTBA lasted for 7 months activated RME + 3 months pasive RME. 2 yrs foolow up, there is no mention of the orthodontic phase .case 2- in this a 7 yr old was given a TTBA for correction the class III, addition modiffvation of attaching a ball solder was done to prevent the sliping of the elastics.active phase of 6 months of activated RME + 3 months passive RME. follow up was done for 12 months showing no relaps.
6	Marure P K S et al	India	2014	Case Series	2	university	9-13 yr old	TTBA	TTBA was effective	In case no. 1 a 9 yr old girl was treated and in case no. 2 a 13 year old girl is treated, both the cases showed good results of TTBA in treating the skeletal class III. Exact acitive and passive phase was not mentioned by the author. Recall period is not stated.
7	Leon Klempner	USA	2011	Case Report	1	clinic setting	7 yr old	TTBA	TTBA was effective	Initial the patient was treated with a removable maxillary expansion in the TBBA appliance for about 5 months and 3 months of passive phase . Later this removable appliance was replaced by a quad helix fixed appliance for the maxillary component for about 5 months. the mandibular component was to be worn only at night during this time. after 2 1/2 yrs the entire TTBA was removed. patient was recaalled after 18 months and later after 4 yrs and 6 yrs. the treatment showed no replase. there was no orthodontic phase carried out in this patient.
8	Jeevarathan J et al	Tamilnadu, India	2013	Case Series	2	university	6-11 yr old	TTBA	TTBA was effective	In this case series a 6 yr old boy and a 11 yr old girl was treated with TTBA for their skeletal class III malocclusion. In case of the boy the appliance was removed after 4 months of active treatment and in case of the girl the appliance was removed after 9 monthsactive and 4 months passive. TTBA was proved effective in both the cases t improve the facil profile. In the boys case the exact active and passive treatment ime is not stated. and there is no follow-up report in both the cases.
9	Leon Klempner	USA	2003	Case Report	1	clinic setting	3.9 yr old	TTBA	TTBA was effective	In this case report a 3 yrs 9 months old girl was treated for skeletal class III with TTBA. TTBA consisted of a fixed maxillary component and a removable mandibular component. After 1 1/2 yr the TTBA appliance was removed, bbut the apilliance was also removed mid treatment when the child hd to undergo surgery for enlarged adenoids. the exact time is not stated betwwen the removal of appliance before surgery and placement after surgery. no retention plates were used. A follow-up of 1 1/2 yr showed no relaps of the treatment. there is no metion of fixed orthodontic phase.
10	Mansuri M and Singh VP	Nepal	2014	Case Report	1	university	9 yr old	Facemask	Facemask was effective	In this case report a 9 year old boy was treated with a combination of facemask and RME for Skeletal class III malocclusion. RME was done with the help hydrax followed by facemask in a combination for 3 months actve phase, pasive phase for 6 months and then fixed orthodontic phase for final alignment for 8 months. there was a definte improvement in the facial profile of the patient. after the treatment patient was given FR II as a retainer, retainer phase time period is not mentioned. follow-up of the case is not mentioned.
11	Kirthika Muthukumar, N. M Vijaykumar and M. C. Sainath	Tamilnadu, India	2016	Case Report	1	university	9 1/2 yr old	Facemask	facemask is effective	this case report states that there was an improvement in lip-nose-chin relation statingan improvemen n the facial profile. There was a positive change in the maxillo-mandibular realtion. Mandible had rotated downwards and backwards by the use of facemask appliance for 12 months and later a fixed orthodonticphase was carried out for 25 months
12	Maheshwari S. and Gupta N.D	Haryana, India	2001	Case Report	1	university	7 yr old	Facemask	facemask is effective	In this case report a 7 yr old boy was treated with facemask appliance for crossbite with skeletal class III malocclusion. There was a significant increase in the SNA, SNB and ANB angle suggesting an improvement of the facial profile. Facemask appliance was used for a period of 1 year. The use of a fixed appliace was not stated.
13	Muthukumar Karthi, Gobichettipalayam Jagatheeswaran Anbuselvan, Bhandri Pawan Kumar	Tamilnadu, India	2013	Case Report	1	university	10 yr old	Facemask		In this case report a 10 yr old boy of skeletal class III malocclusion was treated with a combination of RME and facemask in the 1st phase for 9 months then followed by fixed appliance treatment for another 12 months. Positive overjet was achived of 2mm in this case proving the efficacy of RME + facemask combination.

STUDY SELECTION



DISCUSSION

The preliminary goal of orthodontic treatment in skeletal class III is stimulating the downward and forward growth of the maxilla along with restricting the further growth of mandible thus leading to a positive overjet and class I molar relationship. Orthopaedic appliance are indicated in patients with a skeletal deficiency of the maxilla and who are in a growing age as the growth can be stimulated at this age and changes can be brought about. The objective is that there should be a positive value for ANB indicative that the maxilla is ahead of the mandible.

Above in the data extraction sheet total of 13 case reports and case series are considered for this systematic review with comprehended clinical study design, results, analysis and interpretation aiding readers to understand easily.

In a total of 13 case reports and case series. 5 case reports were discussed with the FM therapy. In the remaining 7 studies the treatment was done with the help of TTBA. Out of the 7 studies , 4 were case reports and 3 were of case series consisting of 2 cases each. All these studies compared the pre- treatment and post treatment records of the treated patients which consisted of cephalograph, profile photographs and diagnostic casts. And it showed a marked forward growth of maxilla and correction of the skeletal class III when treated in the growing age group below 13 years of age. Hence proving its importance in treating class III malocclusion in the growing phase.

CONCLUSION

Patients with Class III skeletal patterns generally continue to grow in that direction after active treatment. Because the relative growth velocity of the maxilla compared to the mandible remains constant, overcorrection is required to ensure long-term stability.

The traditional FM has the advantage of generating maxillary protraction with pure extraoral anchorage, creating a downward and forward vector of force against the maxilla with minimal compensatory dentoalveolar changes. In contrast, the Tandem Appliance provides a toothborne anchorage system that combines skeletal and dentoalveolar movement. Nevertheless, the increased level of patient cooperation with the Tandem Appliance, combined with the ability to control the vertical dimension, protract the maxilla, and benefit from the Class III elastic dentoalveolar effect, makes this appliance extremely valuable in nonsurgical Class III treatment. Further study of Class III treatment modalities, including bone anchors, is recommended.

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