CASE REPORT

Inter-disciplinary approach in management of a case with anterior Bolton's discrepancy: A Case Report from Tanzania

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ABSTRACT

Background: The assessment of intermaxillary teeth width relationship is often overlooked during diagnosis and treatment planning of orthodontic patients. This is particularly true for individuals with no obvious teeth size discrepancy. Inter maxillary teeth size assessment is important for early detection of teeth size disproportion between upper and lower jaw. This allows formulation of the definitive treatment planning which may involve both restorative and orthodontic specialists.

Clinical Findings: The current work is reporting a case of 16 years old female patient who complained of multiple spaces on the upper front teeth following braces treatment. The patient had been on fixed orthodontic treatment for 2 years and 8 months without any significant improvement. Past treatment history revealed an initial diagnosis of Angle's class I malocclusion with bimaxillary protrusion and lip incompetence, which was treated by fixed orthodontic treatment with extraction first pre molars on both jaws. Examination of the patient revealed multiple spaces on third sextant with reduced Bolton's anterior ratio.

Intervention: It was found that the spaces could not be closed by orthodontic tooth movement alone without altering the existed positive attributes. Therefore, controlled space closure was done using a continuous elastomeric chain on .019*.025 inches Stainless steel arch wire on .022 inches slot MBT bracket. The remaining spaces were then closed by crown build up. All positive attributes were maintained at the end of treatment.

Conclusion: A satisfactory occlusion was achieved in the present case through an interdisciplinary approach between orthodontics and restorative specialists.

INTRODUCTION

The goal of comprehensive orthodontic treatment is to achieve a satisfactory occlusion which aligns with the six keys of good occlusion.[1] This treatment requires clinical skills and experience to move teeth in various phases of treatment until the desired outcome is achieved. In some cases, the detailing phase is very challenging, and thus complex biomechanics are required.[2] The detailing phase becomes more complicated when there is a teeth width imbalance between the upper and lower jaws. In such cases, an ideal occlusion can only be achieved through reduction or additional of the teeth material on the anterior segment.[3] The reduction of teeth material may be achieved through teeth

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extraction or selective inter proximal striping of the appropriate teeth.[4] Additional of teeth materials is indicated in cases with the significant deficient of teeth material between upper and lower jaws. Direct or indirect crown build up may be done in teeth with teeth material deficient, and it requires an inter-disciplinary team work between Orthodontist and restorative specialist. Detailing complexity due to teeth size discrepancy can be avoided by early consideration of inter maxillary teeth size analysis during orthodontic diagnosis and treatment planning. Various methods of detecting inter maxillary teeth size discrepancy have been developed worldwide. Among these, the most popular and commonly used method is Bolton's analysis.[5,6] This analysis provides an ideal proportion between upper and lower teeth to achieve ideal occlusion.[5] The proportionality is provided by the sum of the mesiodistal width of the lower teeth in relation to that of upper teeth. For the perfect occlusion the ratio should be 77.2 ± 1.65% for the anterior six teeth and 91.3± 1.91% for the overall dentition.[3] The aim of this case report was to emphasize on the importance of early assessment of anterior inter maxillary teeth width relationship during diagnosis and treatment planning of orthodontic patients and the role of restorative specialist in achieving a satisfactory occlusion in orthodontic patients.

CASE PRESENTATION

A case of 16 years old female patient presented at Muhimbili University Dental clinic with a chief complaint of multiple spaces on the upper front teeth after starting orthodontic treatment. It was a self-referral case which had been on fixed orthodontic treatment for 2 years and 8 months.

The patient was a secondary school student, a first born in her family, lived with both parents, she had 2 siblings and the youngest sibling had protruded upper teeth. She had history of several dental visits for the similar complaint, and no history of abnormal oral habits reported. Medically, she had no history of chronic diseases such as Diabetes, heart diseases or blood disorders.

On examination, she had a mesoprosopic facial form, bilaterally symmetrical face, convex facial profile, lips incompetent, shallow mental labial sulcus and reduced nasolabial angle. Intra orally, she had a good oral hygiene with normal overlying soft tissues. Regarding dentition, tooth number 12 had a mid-dentinal caries on the mesial surface, one premolar was missing on each quadrant, there was a multiple interdental spaces on second sextant (3.5 mm between 11 &12, 1 mm between upper central incisors, and 2 mm between 33 & 34. Canines were in class I relationship on right side and class II on left side, while molars were in class I relationship on both sides. Over jet and overbite were 2mm each. Patient was on Fixed Orthodontic Treatment (FOA) with attachments in all teeth mesial to second molars except lower right first molar which had a missing molar tube.

Retrieval of patient's past treatment history relieved an initial diagnosis of Angles class I malocclusion with bimaxillary protrusion and lip incompetence, which was treated FOA with extraction first permanent pre molars on both jaws. Bolton's analysis was carried out and the patient was found to have reduced teeth materials on the upper jaw.

Figure1a- right view Figure1b- left view Figure1c- frontal view

Figure 1: Intra oral photos taken on the day of evaluation

Treatment objectives

The treatment objectives were to restore the carious tooth and to close all interdental spaces while maintain all the positive attributes i.e. normal midline, over jet, overbite and class I canine relationship on the right side.

Timeline

The treatment was planned in the following sequence; first- restorative consultation, second- distalization of the left canine to archive canine class 1 relationship third- Controlled space closure and crown build up preparations and fourth-Crown build up fifth- retention.

Restorative consultation

The case was discussed with the restorative specialist, where it was agreed that the crown build up to be done after orthodontic treatment and the carious tooth was restored before proceeding with orthodontic treatment.

Distalization of the left canine

Canine class I relationship on the left side was to be achieved through canine distalization using Temporary anchorage devices (TADs). However parent and patient did not approve the plan, alternatively, class II inter maxillary elastics 3/16, 0.4 oz was used instead.

Space closure and preparations for crown build up

The space between central incisors was closed with a power chain on 0.019* 0.025 inches stainless steel arch wire. Open coil spring was used to create 0.5mm space on both sides of the lateral incisors for crown build up. On the right side the spring was placed between canine and lateral incisor while on the left side it was placed between central and lateral incisors, and between lateral incisor and the canine. After six weeks, the midline space was closed and spaces were created as desired on the left side. However, open coil spring force was not well approximated on the right side which resulted into total space closure on the mesial side of lateral incisor (Figure 2b).

Figure 2a-right view

figure 2a-left view

Figure 2b-right view

Figure 2b-left view

Figure 2: Intra oral photos before space opening (2a) and after space opening (2b)

Crown build up

After crown build up preparations, patient was sent to the restorative department for additional of tooth materials on the upper lateral incisors. In this process, 0.5 mm of anterior composite resin was added on either sides of upper lateral incisors. The material used was A2 Fusion Universal Nano Hybrid Composite Prevest DenPro Limited, India.

Anterior laces back were released to allow complete access of the teeth during crown build up. However, they were not placed back after the procedure. This causes relapse of the midline diastema and midline shift (figure 3c). Moreover, one of the restoration appeared to have suboptimal aesthetics (figure 3a), therefore the patient was referred again for modification of the restorations (figure 4).

Figure 3a - right view

Figure 3b - left view

Figure 3c -frontal view

Figure 3a: Intra oral photos after initial crown build up using composite resin

Correction of the relapse

Upper left canine, premolar and first molar were tied with a passive lace back and power chain was placed between canine and the right central incisors to correct the midline diastema and midline shift using the same arch wire (figure 3). The resultant space mesial to the upper lateral incisor on the right side was then closed during crown re-build up (Figure 4).

Challenges;

The patient had been on treatment for too long, so they wanted to have the treatment done as early as possible. Also the previous treatment led to a substantial financial constraint to the parents.

For this reason, they demanded the cheapest possible alternatives in archiving the desired treatment outcomes. For instance, elastics were used instead of TADs, thus canine class I relationship was not fully appreciated on the left side. Likewise, composite resin build up was preferred over other better alternatives during the restorative care.

Follow-up and Outcomes: After orthodontic treatment and crown build up, the patient and parents were both satisfied with the final treatment outcomes. All attachments were removed and the patient was kept on a modified wrap around retainers on both jaws. The patient was informed to come for crown replacement when they are financially stable and she was scheduled to attend clinic after every 6 months.

DISCUSSION

Literature Context and Clinical Significance

The treatment objective of the case above was to close the anterior spaces. However, the existed positive attributes (overjet, overbite, mid line and class I canine relationship on the right side) make it difficult to achieve this objective while conserving an acceptable occlusion. Therefore thoroughly assessment of anterior inter maxillary teeth width relationship was carried out. In this assessment, sum of the mesiodistal width of six lower anterior teeth

Figure 4a - Right view

Figure 4b - Left view

Figure 4c - frontal view

Figure 4 : Intra oral photos showing final occlusion after orthodontic and restorative treatment

was divided to that of the upper anterior six teeth and multiplied by one hundred. This gave a value of 82.4%, which was higher than the standard Bolton's anterior ratio for the ideal occlusion (77.2 ± 1.65%).

Bolton's original study considered ± 1 SD as a standard range for achieving ideal an occlusion. However, recent studies have shown that inter maxillary teeth width ratio of up to ± 2 SD may still give an acceptable occlusion.[7, 8] Thus a discrepancy which causes challenge in achieving satisfactory occlusion is the one that goes beyond ± 2SD of Bolton's mean. The anterior inter maxillary teeth width ratio of the present case was above +2 SD and thus, it was clinically significance. The obtained ratio implied a deficient of teeth materials in the anterior segment of the upper jaw. Thus satisfactory occlusion could not have been achieved without additional of teeth materials on the upper anterior teeth.

Profit once suggested an easier alternative method of predicting teeth size discrepancy in a clinical setting.[9] According to this method, the mesiodistal width of upper lateral incisor must be greater than that of lateral lower incisor for an individual to have a normal occlusion. When this method was applied in the case above, these teeth showed equal width. Therefore crowns buildup was done on the upper lateral incisors.

Lessons Learned

Model analysis is often not considered during initial diagnosis and treatment planning. Overlooking of some of the essential diagnostic aids such Bolton's analysis has a negative impact on the outcomes of the treatment being provided. Fore stance, the initial attending doctor of the above case spent more than two and half years on space closure stage without achieving any satisfactory outcome. Thus orthodontic treatment was prolonged unnecessarily and the patient incurred extra cost in terms of money and time. Bolton's analysis involves teeth width measurement and mathematical calculations when if done manually, as it is in our setting, seems to be laborious and time consuming.[10] Therefore, it is not commonly used in the most of the clinical setup.[5] The Significance of Bolton's analysis is usually acknowledged later after facing challenges during space closure or settling of occlusion. Nonetheless, it should be remembered that, good occlusion cannot be achieved unless an ideal teeth width proportion exist between upper and lower jaw.[11] Therefore Bolton's analysis is recommended to be done in all orthodontic cases.[5]

CONCLUSION

The present case heighted the important of Bolton's analysis in orthodontic diagnosis and treatment planning. Early consideration of this analysis provides a clear and focused treatment plan of achieving a satisfactory occlusion. Additionally, it avoids unnecessary prolonging of orthodontic treatment which wastes patient's time and money. For those cases with inter-maxillary teeth width discrepancy a multi-disciplinary team work approach between orthodontist and restorative specialist is needed.

Ethical clearance: Parent and patient gave informed consent and assent respectively, to use the intra oral photos for learning and publication purposes.

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