



MODIFIED BONDED DISTAL SHOE APPLIANCE DESIGNED FOR A PATIENT HAVING INADEQUATE ABUTMENTS: A CASE REPORT

Dentistry

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ABSTRACT

Distal shoe appliance (DSA) is an important tool in paediatric dentistry for space maintenance, when there is a premature loss of primary second molar, for guiding the un-erupted permanent first molar. The purpose of our case report is to discuss the design and fabrication of a modified DSA. In this modified appliance, the primary mandibular incisors were bonded and the primary mandibular canines were banded which were used as abutments for eruption guidance of un-erupted permanent mandibular molars. This appliance was retained in the oral cavity for 8 months until the eruption of first permanent molars on either side of the arch. It is therefore, a noteworthy and a novel design which can be used for eruption guidance of permanent molars, if at all there be a clinical scenario where there are inadequate abutments due to early loss of all primary molars bilaterally.

KEYWORDS

Space maintenance, un-erupted tooth, distal shoe, mandibular molars, space maintainers, early loss

INTRODUCTION

It is an established fact that severe space loss occurs due to premature loss of primary second molars, especially when the first permanent molars have not erupted in the oral cavity. The choice of appliance in this scenario, is the distal shoe appliance (DSA) [1,2,3]. The fabrication and design of the distal shoe appliance conventionally uses the primary first molar as an abutment. Clinical picture can sometimes be extremely challenging, in which the clinician may encounter an unerupted first permanent molar with loss of both, first and second primary molars. Although Hicks [4] in 1973, has mentioned multiple loss of primary molars to be a contra-indication for DSA, literature is witness to case reports, in which paediatric dentists have successfully modified DSA to suit the clinical needs. [5,6]

Starkey had proposed the use of a removable appliance to address the problem of inadequate abutments [1]. However, this appliance completely depends upon patient compliance and strong motivation from parents. Moreover, there always remains a chance of the appliance being misplaced or broken, and patients with severe gag reflex will not be able to tolerate this appliance [5,6]. Therefore, a modified appliance that is adequately stable with a predictable clinical outcome was designed by few clinicians. A common trend in the design of these modified fixed DSA's; is the lingual component consisting of a stainless-steel wire following the arch which was soldered to banded canine/canines and the stainless-steel crown of a primary molar unilaterally. This soldered lingual assembly along with the intra-alveolar distal extension of the stainless-steel wire, helped in guiding the permanent first molar in the desired position of the arch [5,6,9]. Nevertheless, it must be realised that there could be a clinical situation wherein, it may not be feasible to use any of the primary molars as abutments for varied reasons.

This case report precisely describes a situation, in which the eruption guidance of the permanent mandibular first molar on the right side was successfully carried out with a modified DSA which used the primary mandibular incisors and canines as abutments.

Case Description

A four-and-a-half-year-old boy reported to the Department of Paediatric and Preventive Dentistry, Dr. D. Y. Patil Dental Hospital, Dr. D.Y.Patil Vidyapeeth, Pimpri Pune, India, with a chief complaint of pain in the mandibular left posterior region since a week. The clinical

examination revealed approximal carious lesions with the right and left primary mandibular molars. (Figure I)



Figure I – Pre-operative occlusal view showing carious molars bilaterally

Intraoral swelling was observed on the buccal aspect of first & second primary molars of right side and second primary molar of the left side. On clinical examination, pathologic mobility (Grade III) was observed with both the primary mandibular right molars and left second molar.

Radiographic examination of the first & second primary molars of right side and second primary molar of left side revealed pulpal involvement and varying degrees of periapical and furcal radiolucency with severe pathologic external root resorption.

A diagnosis of chronic dento-alveolar abscess was made and therefore it was decided to extract the first and second primary molars of the right side and second primary molar of the left side. The first primary molar of the left side was indicated for pulp therapy.

Conventional DSA was planned to guide the eruption of the first permanent molar of the left side using the first primary molar as an abutment. After pulpectomy, stainless steel crown adaptation was done with the first primary molar of the left side. An impression was made. A conventional DSA was fabricated on this working model.

Both the primary molars of the right side were to be extracted and the

first primary molar of the left side was already used as an abutment for the fixed DSA. Hence, it was not feasible to use any primary molar as an abutment for the eruption guidance of the first permanent molar of the right side. Therefore, the primary canines and incisors were used as abutments for the modified distal shoe appliance. The modified design included a lingual arch type S.S wire (0.9mm gauge) component beginning from the left canine and extending as the distal shoe on right side. (Figure II).



Figure II- Conventional and Modified DSA on the working model

The lingual arch wire was adapted just above the cingulum area of the primary mandibular incisors and canines. The length of the horizontal arm was measured radiographically, from the distal surface of the mandibular right canine to a line coinciding with the mesial surface of the unerupted permanent first molar. The vertical depth of the intra-alveolar extension was measured on the radiograph from the shadow of the soft tissue to approximately 1.5mm below the mesial marginal ridge of the unerupted molar. The 0.9mm gauge wire was bent in a V-shape inside the vertical cut of the working model, which then followed the buccal aspect of the ridge to end in the disto-buccal surface of the right canine. This wire component fabricated on the working model was then soldered to the bands adapted on the primary mandibular right and left canines, followed by finishing and polishing of the appliance.

The entire procedure was well explained to the patient and the parents. The necessary consent was obtained prior to the procedure. Extraction of primary molars was carried out and the appliances were seated. A procedural radiograph was obtained to make the final adjustments in the positioning of the intra-alveolar extension prior to cementation. The cementation of bands on the canines was done with type I glass ionomer luting cement (GC Gold Label, GC Corp. Tokyo, Japan). Light cured composite resin (FiltekTM Z250 XT, 3M ESPE, U.S.A.) was used to bond the S.S wire component on the primary mandibular incisors for additional retention (Figure III) followed by the cementation of conventional DSA.



Figure III- Intra oral photograph showing cemented conventional and Modified DSA

Appropriate instructions were given to the patient and parents regarding the appliance and oral hygiene maintenance. There was a meticulous follow-up at 2 month intervals to check the integrity of the

appliance, eruption status of the permanent molars and oral hygiene status (Figure IV).

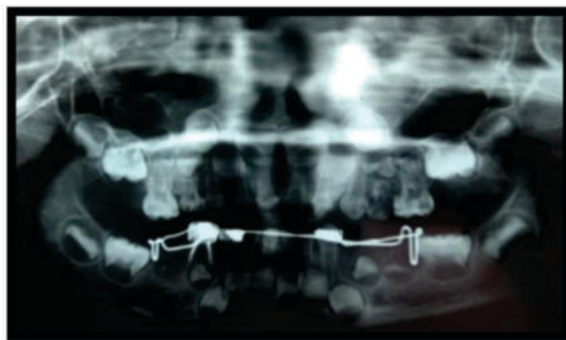


Figure IV- OPG showing the conventional & modified DSA post cementation

After a period of 8 months the first permanent molars completely erupted in the oral cavity and a removable functional space maintainer (Figure VI) was given to the patient. This was planned to aid the patient in mastication and also to prevent the supra-eruption of molars in the maxillary arch.



Fig VI- removable space maintainer given to maintain the space after removal of conventional & Modified DSA

DISCUSSION

This case report highlights the challenges posed due to the loss of multiple primary molars and the modifications in designing the appliances for eruption guidance of the unerupted first permanent molars. Since, the stainless-steel crown on first primary molar of the left side was already used as an abutment for the distal shoe appliance; it was not clinically possible to include this contralateral first molar as an abutment for the guidance of the unerupted first permanent molar of the right side. This situation thus rendered the primary incisors and the canines as the abutments that could have been used. Chronologically, we were aware that the first permanent molars would erupt before the mandibular incisors, but an OPG was made to confirm the same. The S.S wire component was soldered to the banded canines and bonded with composite resin to the primary incisors. This wire component provided sufficient strength, support, and stability for the successful eruption of the permanent molar.

Similar case reports [5,6,7] which have described modifications in fixed DSA's have successfully countered the problem of inadequate abutments. All these published reports have endorsed the use of at least one primary mandibular molar and a canine, or both the canines as abutments. These modified appliances had sufficient strength and could maintain its integrity for a period ranging from 2 months to 10 months [7,8,9,10].

The design planned in the present case, used only the primary canines and incisors for the eruption guidance of first permanent molar. This modified DSA is affordable and upon meticulous fabrication helped in maintaining the integrity of the arch

CONCLUSION

The appliance was a successful space maintainer and sustained in the oral cavity for a period of 8 months till the eruption of the first permanent molars. The patient acceptance, compliance and oral hygiene maintenance was also good in this case. However, this

appliance is not functional and the extensive lingual component demands meticulous oral hygiene maintenance. This modified fixed DSA did not involve any multi-rooted primary molar as an abutment and relied only on the primary mandibular anterior teeth for strength and stability.

Clinical Significance

The bonded modified DSA retained in the oral cavity until the eruption of the first permanent molar with minimal patient discomfort. Hence, it is a noteworthy and a novel design which can be used for eruption guidance of first permanent molars, if at all there be a clinical scenario which presents with loss of all primary mandibular molars.

REFERENCES

1. McDonald RE. Dentistry for the Child and Adolescent. 8th ed. Philadelphia, Pa: C.V. Mosby Co; 2004:636-8.
2. Graber TM. Preventive orthodontics. In: Graber TM, editor. Orthodontics principles and practice, 3rd ed. Philadelphia: WB Saunders Company; 2001. p. 627-67
3. Ak G, Sepet E, Pinar A, Aren G, Turan N. Reasons for early loss of primary molars. Oral health. Prev Dent 2005;3:113-7.
4. Hicks EP. Treatment planning for the distal shoe space maintainer. Dent Clin North Am 1973;17: 135-50.
5. Dhindsa A, Pandit IK. Modified Willet's appliance for bilateral loss of multiple deciduous molars: A case report. Journal of Indian Society of Pedodontics and Preventive Dentistry. 2008 Jul 1;26(3):132.
6. Gujjar KR, Indushekar KR, Amith HV, Sharma S. Modified Distal Shoe Appliance- Fabrication and Clinical Performance. J Dent Child 2012; 79(3): 185- 88.
7. Psaltis GL, Fischer TJ. An appliance for space maintenance and molar guidance. J Dent child 1982;5:357-8.
8. Barberia E, Lucavechi T, Cardenas D, Maroto M. Free end space maintainers: Design, utilization and advantages. J Paediatr Dent 2006; 31:5-8.
9. Bhat PK, Navin H.K., Idris M, Christopher P, Rai N. Modified Distal Shoe Appliance for Premature Loss of Multiple Deciduous Molars: A Case Report. Journal of Clinical and Diagnostic Research. 2014 Aug, Vol-8(8): ZD43-ZD4.
10. Somwanshi Y, Katre A, Jawdekar A Journal of Clinical and Diagnostic Research. 2016 Oct, Vol-10(10): ZJ03-ZJ04