

PRECISION IN ERUPTION, PROTECTION IN SPACE – ERUPTION GUIDANCE  
APPLIANCEDr. Tanvi Gupta<sup>1\*</sup>, Dr. Chaitra T. R.<sup>2</sup>, Dr. Seema Chaudhary<sup>3</sup>, Dr. Naveen Manuja<sup>4</sup> and Dr. Ashish Amit Sinha<sup>5</sup><sup>1</sup>Postgraduate Student (3rd year), Department of Pediatric and Preventive Dentistry, Kothiwal Dental College and Research Centre, Moradabad.<sup>2</sup>M.D.S, Professor, Department of Pediatric and Preventive Dentistry, Kothiwal Dental College and Research Centre, Moradabad.<sup>3</sup>Dr. Seema Chaudhary, M.D.S, Professor & Head, Department of Pediatric and Preventive Dentistry, Kothiwal Dental College and Research Centre, Moradabad.<sup>4</sup>Dr. Naveen Manuja, M.D.S, Professor, Department of Pediatric and Preventive Dentistry, Kothiwal Dental College and Research Centre, Moradabad.<sup>5</sup>M.D.S, Professor, Department of Pediatric and Preventive Dentistry, Kothiwal Dental College and Research Centre, Moradabad.**\*Corresponding Author: Dr. Tanvi Gupta**

Postgraduate Student (3rd year), Department of Pediatric and Preventive Dentistry, Kothiwal Dental College and Research Centre, Moradabad.

Article Received on 14/05/2025

Article Revised on 03/06/2025

Article Accepted on 23/06/2025

**ABSTRACT**

**Background:** Maintaining space in the developing dentition is essential and plays a key role in determining the future dental needs of pediatric patients. The early loss of primary second molars can lead to a notable discrepancy between available arch space and tooth size. When this primary molar is lost prematurely, the first permanent molar may shift and erupt too far forward. To prevent this, the distal shoe space maintainer is a widely accepted treatment option. **Case summary:** A 5-year-old male patient reported with grossly decayed tooth w.r.t 75. Diagnosis was made as chronic irreversible pulpitis w.r.t 75 and treatment was planned extraction of 75, followed by distal shoe space maintainer. **Conclusion:** A dentist has to constantly evaluate the dental space requirements during the transition from primary to permanent dentition in a growing child. The space loss can lead to problems such as crowding, ectopic eruption and impaction. The clinician can design an appropriate appliance for maintaining the space for premature loss of deciduous second molar. The ultimate goal is to develop a perfect and healthy occlusion in permanent dentition.

**KEYWORDS:** Case report, distal shoe, space maintainer.**INTRODUCTION**

Primary dentition is crucial for a child's overall growth and development. It supports essential functions such as chewing, appearance, and speech, while also guiding the proper eruption and alignment of permanent teeth.<sup>[1]</sup> In preventive and interceptive dentistry, maintaining the deciduous dentition until its natural exfoliation is essential. Premature loss of a primary tooth or multiple teeth can result in various complications. Teeth lost due to trauma, congenital absence, or extensive dental caries can later cause significant issues in a growing child. The primary second molar is particularly important for guiding the proper eruption and alignment of the permanent first molar. To prevent such complications, a space maintainer is often necessary. In such cases, the distal shoe space maintainer has proven to be highly beneficial.<sup>[5]</sup>

The distal shoe space maintainer, originally introduced by Willets, plays a crucial role in guiding the eruption of the permanent molar by providing a distal surface that acts as a guiding plane. When the primary second molar is lost prematurely, it can lead to a significant mismatch between the arch length and the size of the erupting tooth. Various treatment strategies have been suggested to address early tooth loss. One approach is to wait for the permanent molar to erupt and, if it erupts mesially, attempt space regaining. However, this may not be practical if the space loss is too extensive to be corrected using a simple removable appliance. Alternatives like a removable partial denture or a reverse band and loop have also been used, but these often fail to prevent the unerupted molar from drifting mesially and erupting beneath the appliance. In contrast, the distal shoe appliance effectively directs the eruption path of the permanent molar, preventing undesirable mesial drift. Thus, it is considered the preferred appliance for

preserving space and guiding proper eruption. Multiple designs of distal shoe space maintainers exist, and the pediatric dentist must select the most appropriate one based on the child's individual clinical and general conditions, as well as the dentist's own experience and familiarity with the available options.<sup>[7]</sup>

### CASE REPORT

A 5-year-old male patient reported to the department of Pediatric and Preventive Dentistry with a chief complaint of grossly decayed teeth in his mandibular left back teeth region since 6 months. Patient had no past dental history and medical history was non-contributory. On clinical examination deep occlusal caries were present w.r.t 75.

Radiographic examination revealed radiolucency involving enamel, dentin and pulp, and root resorption with periapical radiolucency involving both the roots and furcation area [Fig. 1].

Diagnosis was made as chronic irreversible pulpitis w.r.t 75 and treatment was planned as phase 1 - band construction w.r.t 74 and phase 2 –extraction of 75 followed by cementation of constructed distal shoe space maintainer. In the first appointment, the procedure was explained to the parent and the patient and informed consent was obtained.

Band fabrication was done w.r.t 74 with 0.005 \* 0.180 stainless steel band material [Fig. 2] and a mandibular impression was made. The band was removed and stabilized into the impression [Fig. 3] and the impression was poured [Fig. 4].

The gingival extension was calculated radiographically. Since the 36 has already pierced the bone, the loop was fabricated with 0.036 mm (19 gauges) wire spanning from the distal surface of the band to the mesial surface of the permanent first molar [Fig. 5]. Horizontal arm was measured 9 mm and vertical arm extended about 4 mm below the mesial marginal ridge of the 1<sup>st</sup> permanent mandibular molar. The loop was then soldered to the band and trimming and finishing was done [Fig. 6].

In the second appointment, after taking the brief history, inferior alveolar nerve block and long buccal nerve block was administered before extracting 75 [Fig. 7]. The bleeding was controlled and then the distal shoe appliance was seated on 74 with the gingival extension placed in the socket and the appropriate position confirmed with the radiograph and then was cemented with glass ionomer cement [Fig. 8] and patient was recalled after 4 months for follow up [Fig. 9-10]. During recall period reverse band and loop was advised in order to guide eruption of 35 in its place [Fig. 11-13]. Patient was recalled after 6 months for follow-up.

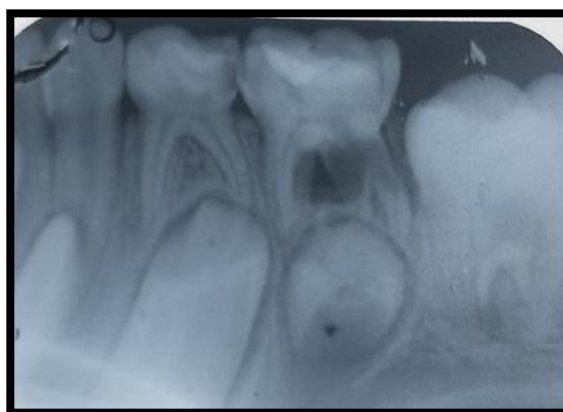


Figure 1: Radiographic Examination W.R.T 74, 75.



Figure 2: Shows Band Fabrication W.R.T 74.



**Figure 3: Shows The Band Placement And Stabilization Into The Impression.**



**Figure 4: Shows The Impression Was Poured With Dental Stone.**



**Figure 5: Shows Fabrication Of Distal Shoe Appliance On The Cast.**



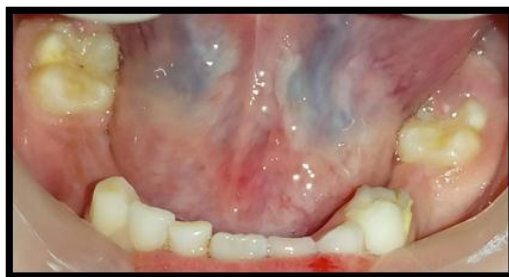
**Figure 6: Shows That The Loop Was Then Soldered To The Band And Trimming And Finishing Was Done.**



**Figure 7: Shows Intra Oral Photograph After Extraction W.R.T 75.**



**Figure 8: Shows Radiographic Image Of Distal Shoe Appliance W.R.T 36.**



**Figure 9: Shows Photograph After 4 Months Follow Up W.R.T 36.**



**Figure 10: Shows Radiograph After 4 Months Follow Up W.R.T 36**



**Figure 11: Shows Band Fabrication Done W.R.T 74.**





**Figure 12: Shows Photograph Of Reverse Band and Loop W.R.T 36.**



**Fig. 13: Shows Radiograph Of Reverse Band and Loop W.R.T 36.**

## DISCUSSION

Dental caries is the leading cause of premature loss of primary teeth. Additional contributing factors include trauma, abnormal tooth eruption, congenital anomalies, and early resorption caused by inadequate arch space. The choice of space maintainer depends on the specific tooth lost and the region of the mouth involved. Various types of space maintainers are utilized to support the restoration of normal oral function and to ensure the proper eruption of permanent teeth.<sup>[2]</sup>

An ideal space maintainer should have the following characteristics:

- Effectively preserve the mesiodistal space.
- Allow functional movement of individual teeth
- Be easy to maintain in terms of hygiene
- Offer good durability
- Be cost-effective

A developing malocclusion in the primary dentition is not a contraindication for using a distal shoe space maintainer. Even if orthodontic treatment is required later, placing a distal shoe can help prevent the mesial drift of the permanent first molar. Preserving the correct position of the molar provides valuable anchorage, which can facilitate and enhance the effectiveness of future orthodontic treatment.<sup>[3]</sup>

According to Baroni et al. and Qudeimat et al., the success of a distal shoe space maintainer lies in its ability to effectively guide the eruption of the permanent tooth into the dental arch without causing complications.

Additionally, it is important to establish a well-planned, long-term approach to space management in a growing child. This includes continuous monitoring of occlusion through the three key stages of dental development: primary dentition, mixed dentition, and permanent dentition.<sup>[4]</sup>

Hicks (1973) outlined the indications and contraindications for using the distal shoe appliance. Indications include failed pulp therapy, periapical bone damage, advanced root resorption, severe crown caries that cannot be restored, ankylosis, and ectopic eruption of the first permanent molar. On the other hand, the appliance is contraindicated in cases of poor patient or parental compliance, congenital absence of the first permanent molar, and multiple tooth losses resulting in insufficient abutments.<sup>[6]</sup>

Additional contraindications noted by other authors include patients with systemic conditions such as kidney disease, rheumatic fever, compromised immunity, juvenile diabetes, or certain blood disorders. It is also contraindicated for patients with congenital heart defects who require prophylactic antibiotics.<sup>[7]</sup>

The main advantage of this appliance is its effectiveness in guiding the first permanent molar to erupt in the correct position while also preventing the supraeruption of opposing teeth. It can be fabricated using either indirect or direct methods. However, there are several disadvantages, including the need for local anesthesia

and a surgical incision, the requirement for patient cooperation to maintain excellent oral hygiene, and the technical complexity of the procedure. Additionally, the patient must be closely monitored while the appliance is in place, precise measurement and fabrication are critical since there is no margin for error, and the appliance must be replaced after the first permanent molar erupts, continuing until the eruption is complete.<sup>[8-9]</sup>

The distal shoe has been designed in various forms based on its intended function and can be categorized as follows:

- Fixed or removable appliance
- Intra-alveolar or extra-alveolar type
- Pressure or non-pressure appliance
- Used with or without a lingual holding arch
- Unilateral or bilateral design
- Adjustable or rigid structure
- Functional or non-functional appliance
- Specially modified versions.<sup>[5]</sup>

The original designs by Willet and Roche were fixed, intra-alveolar, passive, non-functional, and unilateral appliances. These were intended to maintain the mesiodistal space required for the second premolar and to guide the eruption of the first permanent molar. While these conventional designs work well for unilateral loss of the deciduous second molar, they present challenges when used for bilateral loss of the mandibular second primary molars. To address this, Dhindsa and Pandit recommended modifying the appliance by adding a lingual holding arch. However, this modification may interfere with the eruption path of the permanent mandibular incisors, potentially necessitating a change in the appliance later on.<sup>[10]</sup>

Gegenheimer and Donly proposed a special modification where, in addition to the gingival extension, a distal loop was created and cemented in the patient's mouth. Once the permanent molar erupted, the gingival extension was removed, allowing the remaining appliance to function as a crown and loop until the premolar erupted, thus eliminating the need to fabricate a new appliance.<sup>[11]</sup>

Dhull et al. proposed a special modification featuring buccal and lingual arms instead of horizontal bars, with the buccolingual width matching that of the opposing supra-erupted molar. This design improved stability because the absence of a horizontal bar eliminated any interference during occlusion.<sup>[12]</sup>

## CONCLUSION

In Pediatric Dentistry, the foremost objective is to optimize the child's well-being by minimizing discomfort, enhancing cooperation, and efficiently managing chair time. In this case, a distal shoe appliance was fabricated and well tolerated by the patient. The appliance effectively facilitated the proper eruption and alignment of the permanent molar within the dental arch.

## REFERENCES

1. Tyagi M, Srivastava N, Kaushik N, Rana V. Effectiveness of Starkey's appliance as space maintainer; a 21 months clinical follow up. *Int J Med Dent Case Rep.*, 2021; 8: 1-3.
2. Shah R., Panda A., Virda M., Jani J., Shukla B., Savakiya A., Bhudharani U., Clinical Application of Distal Shoe: *Pediatr Case Stud Clin Dent*, 2024; 17.
3. Hicks EP. Treatment Planning for the Distal Shoe Space Maintainer. *Dent Clin North Am.*, 1973; 17(1): 135-50.
4. Brill WA. The distal shoe space maintainer chair side fabrication and clinical performance. *Pediatr Dent.*, 2002; 24: 561-5.
5. Patil VH, Trasad V, Hugar SM. Distal Shoe: A Review of Literature. *Int J Sci Res.*, 2013; 2(11).
6. Hicks EP. Treatment planning for the distal shoe space maintainer. *Dent Clin North Am*, 1973; 17(1): 135-50.
7. Barberia E, Lucavechi T, Cardenas D, Maroto M. Free end space maintainers: Design, utilization and advantages. *J Paediatr Dent*, 2006; 31: 5-8.
8. Laing E, Ashley P, Naini FB, Gill DS. Space maintenance. *Int J of Pediatr Dent*, 2009; 19: 155-62.
9. Space maintenance. Mathewson RJ, Primosch RE. *Fundamentals of pediatric dentistry*. 3rd ed. Carol Stream (IL): Quintessence Publishing Co Inc, pp - 333.
10. Dhindsa A, Pandit I K, Modified willet's appliance for bilateral loss of multiple deciduous molars. A case report. *J Indian Soc Pedod Prevent Dent*, 2008; 132-5.
11. Geneheimer R, Donly KJ. Distal shoe: a cost effective maintainer for primary molars. *Pediatr Dent*, 1992; 14(4): 268-9.
12. Dhull KS, Bhojraj N, Yadav S, Prabhakaran SD. Modified distal shoe appliance for the loss of a primary second molar: A case report. *Quintessence Int*, 2011; 42: 829-33.