

**A Conventional Approach Towards Regaining Space Using Fixed Open Coil Spring: A Case Report.**

<sup>1</sup>Dr.M.Manoharan- Senior Lecturer, <sup>2</sup>Dr.A.Kiruthiga Revathy-Post Graduate Student., <sup>3</sup>Dr.Patil Disha-SeniorLecturer, <sup>4</sup>Dr.V.Mahesh Mathian-Head of the department.

**Correspondence Author:** Dr. Kiruthiga Revathy A, Postgraduate student, Dept of Pedodontics, Vivekanandha dental college for women, Elayampalayam, Thiruchengode 637205, Namakkal dist, Tamil Nadu, India

**Conflicts of Interest:** Nil

**Abstract**

Space loss due to premature loss of deciduous teeth, especially second deciduous molar, can lead to mesial migration of the first permanent molar, disturb the integrity of arch resulting in space loss. Literature has shown that management of regaining space using interceptive measures like non-extraction methods and removable or fixed space regainers were satisfactory in such problem. This article describes a case of space loss in relation to mandibular second premolar with successful resolution of space discrepancy using appropriate space regainer.

**Keywords:** Open coil spring, Premature loss, Space regainer.

**Introduction:**

When a primary tooth is extracted or exfoliated prematurely, it results in disruption of arch integrity.<sup>[1]</sup> Teeth that are present mesial or distal to free space (extracted or exfoliated) tend to drift into the space consequently resulting in malocclusion.<sup>[2]</sup> The dentists should supervise the space for optimum development of occlusion.<sup>[1]</sup> In order to manage these, space maintainers can be used as a preventive measure. If space maintainers are not used at right time, the lost space is managed by interceptive orthodontics with space regainer. A well designed fixed space regainer is preferable than a removable regainer, because they are easy to maintain, cause less damage to tissue and are effective.<sup>[3]</sup> Thus the

present case report aims to exhibit a successfully regained space using fixed open coil spring regainer.

**Case report:**

An eleven-year-old girl reported to the department of pedodontics and preventive dentistry with a chief complaint of incompletely erupted permanent teeth in the lower right back region of the jaw for a year. Medical history was non contributory. Dental history revealed that patient had undergone an extraction of second deciduous molar due to dental caries, three years ago. On intra oral examination, the patient was in her mixed dentition, second premolar was locked due to migration of the adjacent tooth into the lost space. The study models were made and radiograph was taken (Figure1). Model analysis showed that there was 5mm space deficiency for the eruption of second premolar. Parents were informed about the space loss and its sequale and the importance of regaining space. According to William Profit, mandibular space cannot be regained easily by removable appliances.<sup>[4]</sup> Therefore, a fixed open coil space regainer (OCSR)<sup>[5]</sup> suitable for this case was designed.

**Construction of the appliance:**

The lower right permanent first molar was banded using band material of 0.180×0.006 inch thickness. After banding, 0.025 inch buccal and lingual tube is welded on the both sides of the band. The tubes were welded parallel to each other. Buccal and lingual tubes were blocked with

wax and alginate impressions of both the arches were made. The bands were stabilised using orthodontic wire and dental stone was poured. A stainless steel wire of 0.7mm thickness was bent into a 'U' shape and then inserted into the tubes, such that the horizontal part of the 'U' pressed against the distal surface of the first premolar at the contact area. Soldering of the wire was done at the junction of the horizontal and vertical parts of the 'U' shaped wire, which restricts the forward movement of the open coil spring. After that NiTi open coil springs (Rabbit force USA; 012" × 030") were inserted onto the wire (on the each side) such that each spring had a length that was twice that of the distance between the solder stops and anterior border of the tubes. The appliance was then cemented onto the first permanent molar by compressing the springs with 'U' shaped wire, so that the springs try to get back their original configuration, thereby creating a reciprocal force anteriorly towards the first premolar and posteriorly towards the first permanent molar (Figure 2). The patient was followed up every 15 days. Open coil spring was changed twice within the treatment duration. Desired space for the eruption of second premolar was achieved within two and a half months after the insertion of the appliance (Figure 3).

#### **Discussion:**

The primary dentition plays an important role in appearance, speech, chewing and also act as guidance of eruption of permanent dentition.<sup>[6]</sup> Most common causes for premature loss of primary dentition are dental caries, trauma and premature root resorption. The premature loss of deciduous tooth may decrease the arch length required for succeeding tooth which leads to crowding, rotation, drifting of adjacent tooth and impaction of the permanent teeth.<sup>[7]</sup> As pediatric dentists, early diagnosis and treatment of problems that lead to malocclusion could benefit the child.

There are various techniques like serial extractions, space regaining etc., to reduce or intercept malocclusion.<sup>[8]</sup> In present case, permanent molars and premolars had erupted in the mandibular arch, hence space regaining was planned. Space regainers can be broadly divided into removable and fixed type of regainer. Removable type of regainer have certain disadvantages like easy removal and worn at the whim of the patient, easily broken or lost. Hence fixed type of regainer was planned (open coil spring space regainer).

The OCSR consisted of NiTi coils that have a long range of the superelastic activity and excellent springback. Another advantage of open coil spring is that force can be controlled by operator because of its minimal load fluctuation in spite of large deflection.<sup>[9]</sup> The mean rate of space closure is 0.81 mm per month for NiTi spring.<sup>[10]</sup> However in this case 5mm of space was regained within two and a half months. This short treatment period could be due to the presence of minor amount of space mesial to first premolar, which was utilized for space closure. In addition space was regained by distalization of the first permanent molar as well. According to Gianelly et al distalization of the molar does not occur after the eruption of the second molar.<sup>[11]</sup> This is contrary to Flores-Mir C et al in which he stated that the effect of maxillary second and third molar eruption stage on molar distalization- both linear and angular distalization, appears to be minimal, which is true for the present case report.<sup>[12]</sup> Although fixed appliance was more comfortable to the patient it has disadvantage of affecting the gingival health and development of dental caries.<sup>[13]</sup>

#### **Conclusion:**

Several treatment techniques can be used for space maintenance. If there is not enough space for permanent tooth, space maintenance alone is inadequate. A thorough knowledge on potential alignment problems coupled with

timely intervention can prevent malocclusion and its progression in primary and mixed dentition. The current case has described the use of conventional open coil spring space regainer which is economic and requires less chairside time.

**References:**

[1]. Jeffry A. Managing the developing occlusion. In : McDonald RE, Avery DR, editors. Dentistry for the child and adolescent 7<sup>th</sup> ed. Philadelphia. Harcourt India Private Limited:2001 p.677-741

[2]. Seward F S Natural Closure Of Deciduous Molar Extraction Spaces, Medical Research Council Of Australia-1965:85-94

[3]. Laing E, Ashley P, Naini FB, Gill DS. Space maintenance. *Int J Paediatr Dent.* 2009 May;19(3):155-62.

[4]. Proffit W. Contemporary Orthodontics. 2nd Edition, Mosby Year Book: 380-383.

[5]. Costa GCD, Chalakkal P, Aras MA, Chitre V. Use of open coil space regainer for tooth movement prior to prosthetic treatment. *Journal of clinical and diagnostic research.*2015 Jun, 9(6): ZJ03-ZJ05.

[6]. Barberia E, Lucavechi T. Free end Space Maintainers: Design Utilisation and Advantages. *J Clin Pediatr Dent.* 2006; Fall; 31 (1) 5-8.

[7]. Cavalcanti AL, Alexander CRB, MeheriosPK, Garcia AFG- Prevalence of early loss of primary molar in school children in campinagrande, Brazil- *Pakistan oral & dental journal* 28;1:113-116.

[8]. Chandak P, Baliga S, Thosar N. Space regainers in pediatric dentistry. *International dental & Medical Journal Of Advantages Research* (2015), 1: 1-5.

[9]. Miura F, Mogi M, Ohura Y, Karibe M. The super-elastic Japanese NiTi alloy wire for use in orthodontics.

Part III studies on the Japanese NiTi alloy coil springs. *Am J Orthod Dentofacial Orthop* 1988;94:89-96.

[10]. Dixon V, Read MJ, O'Brien KD, Worthington HV, Mandall NA. A randomized clinical trial to compare three methods of orthodontic space closure. *J Orthod.* 2002;29:31-36.

[11]. Gianelly AA. Distal movement of the maxillary molars. *Am J Orthod Dentofacial Orthop* 1998;114:66-72.

[12]. Flores-CMA; Grath LRb; Heo Gc; Major Pd Efficiency of molar distalization associated with second and third molar eruption stage.A systematic review. *Angle Orthodontist*, 2013.33(4):735-742.

[13]. Negi KS. NiTi bonded space regainer/maintainer. *J Indian Soc Pedodod Prev Dent.* 2010;28:113-15.

**Figure legends:**

Figure 1: Preoperative photograph showing space loss in relation to 45.

- 1a: intra oral- Right lateral view in occlusion
- 1b: intraoral- mandibular occlusal view
- 1c: preoperative radiograph of 45

Figure 2: Intraoperative photograph showing insertion of appliance.

- 2a: intra oral- Right lateral view in occlusion
- 2b: intraoral- mandibular occlusal view

Figure 3: Postoperative intraoral photograph showing regained space.

- 3a: intra oral- Right lateral view in occlusion.
- 3b: intraoral- mandibular occlusal view.
- 3c: postoperative radiograph of 45

