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FABRICATION OF SIMPLE SPACE REGAINER FOR SPACE LOSS CASE

PEMBUATAN SPACE REGAINER SEDERHANA PADA KASUS KEKURANGAN RUANG

Case Study
Studi Kasus

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A B S T R A C T

Background: *Space loss is a condition where permanent tooth space is reduced due to premature tooth loss of the primary teeth. Premature tooth loss can be caused by trauma or tooth extraction due to caries. It can lead to the reduction of the arch length teeth drifting to the missing tooth area, impaired development and eruption of permanent teeth, crowding, rotation, and even changes in the anteroposterior relationship of the maxillary and mandibular first permanent molars. Space loss can be treated by using simple space regainer which can be modified, so that successful space regaining can be achieved.* ***Purpose:*** *To report the making of simple space regainer in space loss case.* ***Case analysis:*** *The dental laboratory received a dental cast of 11-year-old patient with space loss on tooth 25. To overcome this problem, a simple space regainer with special design was requested to make.* ***Result:*** *First, the suitable size of molar bands was selected, then the width and height were adjusted to suit the teeth,16 and 26. This space regainer was equipped with components consisting of loop incorporated with coil springs which were soldered to molar band.* ***Conclusion:*** *The fabrication of simple space regainer includes fitting the molar band to tooth 26, making loop with coil spring, soldering the loop to molar band, followed by finishing and polishing.*

A B S T R A K

Latar belakang: *Space loss* merupakan kondisi berkurangnya ruang gigi permanen akibat hilangnya gigi sulung secara prematur akibat trauma ataupun pencabutan gigi karena karies. Hal ini dapat mengakibatkan berkurangnya panjang lengkung rahang, pergeseran gigi ke daerah tanggal prematur, gangguan perkembangan dan erupsi gigi permanen, yang lebih lanjut menyebabkan berdesakan, rotasi gigi, dan bahkan perubahan relasi anteroposterior gigi molar pertama rahang atas dan bawah. Kehilangan ruang dapat dirawat dengan menggunakan *space regainer* sederhana yang dapat dimodifikasi agar upaya mendapatkan kembali ruangan untuk gigi permanennya dapat berhasil dengan baik. **Tujuan:** Melaporkan pembuatan *simple space regainer* dalam kasus *space loss*. **Analisis kasus:** Laboratorium gigi menerima model gips gigi pasien berusia 11 tahun dengan *space loss* pada gigi 25. Mengatasi masalah tersebut, teknisi diminta membuat *space regainer* sederhana. **Hasil:** Mula-mula dipilih molar band yang ukurannya paling mendekati dengan ukuran gigi molar kemudian disesuaikan lebar dan tingginya dengan gigi 16 dan 26. *Space regainer* ini dilengkapi dengan komponen terdiri dari *loop* yang menyatu dengan *coil spring* yang disolder ke molar band. **Kesimpulan:** Pembuatan *simple space regainer* meliputi pemasangan molar band pada gigi 26, pembuatan *loop* dengan *coil spring*, penyolderan *loop* pada molar band, dilanjutkan dengan *finishing* dan *polishing*.

A R T I C L E I N F O

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INTRODUCTION

Losing primary teeth before their due date is known as premature loss. Trauma, (Holan *and* Needleman, 2014) dental caries, premature root resorption are the most common causes of this condition (Jayachandar *et al*., 2019). Premature loss of primary teeth can lead to the reduction of the arch length (Law, 2013). The teeth drifting to the missing tooth area, the impaired development and the eruption of permanent teeth, crowding, rotation, and even changes in the anteroposterior relationship of the maxillary and mandibular first permanent molars (Herawati *et al*., 2015), in which permanent teeth may also be impacted, or they may grow buccally or lingually (Chandak *et al*., 2015). It is important to take an action to reduce the premature loss because of its disadvantages (Lopez-Gomez *et al*., 2016). When premature loss occurs, a space maintainer is highly recommended (Pawar, 2019; Souror *et al*., 2019).

When a primary molar is lost, there is a loss of space in the dental arch due to the neighboring teeth tilting slightly towards the edentulous area. The premolars will be impacted between the two teeth, leaning towards the diastema, or will seek to grow buccally or lingually and move away from the normal dental arch (Becker, 2012). The second premolars usually erupt lingually because the tooth seed is lingually positioned or even impacted. The permanent first molars need to be moved distally to regain space and allow sufficient space for the second premolars. The appliance used is called a space regaining appliance (Rahardjo, 2009).

A space regainer is a device used to regain the lost space due to adjacent teeth drifting to the edentulous area. The amount of space that can be restored in bilateral cases is about 2 mm/quadrant. In unilateral cases, it can be returned to 3 mm/quadrant (Premkumar, 2015). Space regainer can be divided into fixed and removable types. As an example, Negi K.S (2010) has developed Niti, bonded, simple, fixed space-regainer. A removable space regainer usually uses screws and springs to regain space (Disha *et al*., 2016).

In cases that require not only molar distalization but also premolar mesialization, and the space that must be restored is more than 3 mm, a modified space regainer can be used. Band on the molars that is combined with an additional loop of 0.9 mm wire touching the distal surface of the premolars can be applied, with two coils in buccal and lingual sides. The advantages of these appliances are that it is easy to produce, rigid, stable, quick to restore space, broader force range, and easy for patients to accept (Mala *et al*., 2019). The purpose of the present study is to discover the procedure for making a simple space regainer in the case of space loss for tooth 25.

CASE STUDY

The dental laboratory received a maxillary model from a dentist in a mixed dentition period. Existing teeth include 16, 55, 53, 52, 11, 21, 62, 63, 64 and 26. Tooth 55 had a large and deep caries. There was premature loss on tooth 54, but there has been no significant space reduction. The tooth 65 also had premature loss and the space between 64 and 16 had narrowed, so there would not be enough room for the left second premolar. The dentist had a request for making a space regainer with two coils on the buccal and lingual sides soldered to the molar band of tooth 26 (Figure 1).

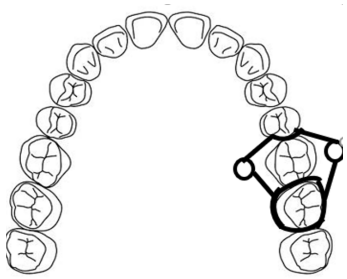

Figure 1. Appliance design

RESULT

The procedure for making this simple space regainer consisted of three main stages including adjusting the size of the molar band to tooth 26, making a coiled spring and finally soldering the coiled spring with the molar band (Figure 2-5).

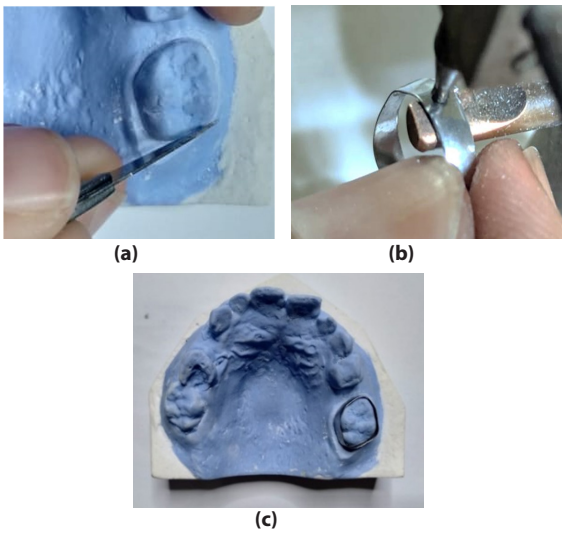

Figure 2. Model preparation: (a) Trimming the area around the abutment teeth; (b) Welding the adjusted band; (c) Fitting molar band to abutment teeth

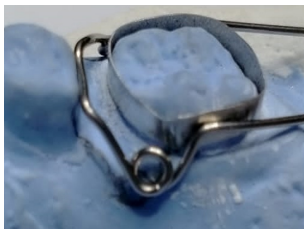

Figure 3. Buccal and lingual coils

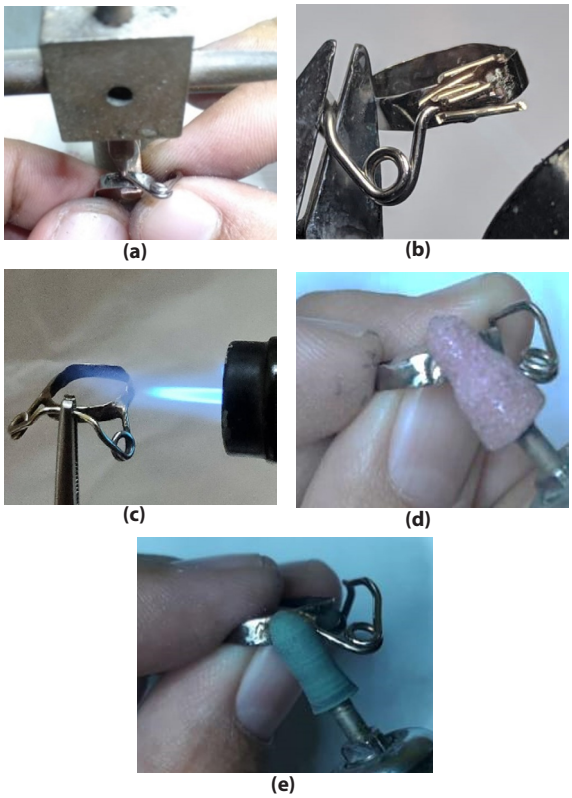

Figure 4. Soldering: (a) Welding the spring to molar band; (b) Putting dental flux and silver alloy in the soldering area; (c) Soldering; (d) Finishing; (e) Polishing

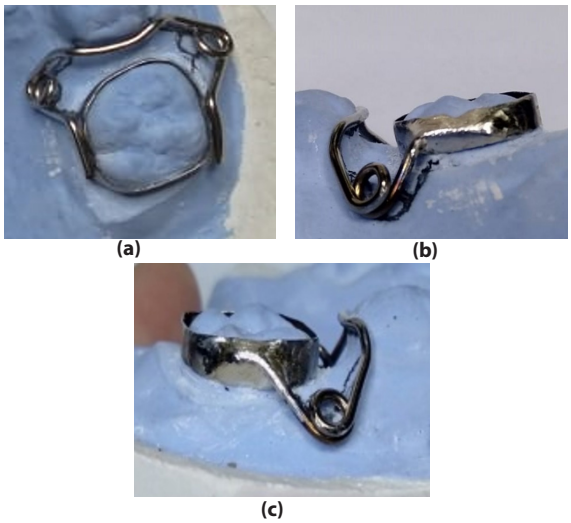

Figure 5. Result: (a) Occlusal aspect; (b) Lingual aspect; (c) Buccal aspect

The results of space regainer making can be seen in Figures 5 where the molar band was well attached to tooth 26 with buccal and palatal helix, and the wire was also well adapted to the distal contour of tooth 64.

DISCUSSION

Premature loss can be defined as the loss of primary teeth before their time to fall out and is usually caused by caries, trauma or abnormal root resorption (Pokorna *et al*., 2016). It can lead to tooth drifting (Xhemnica and Rroco, 2022), a reduction in the length of the dental arch (Chalakka *et al*., 2012) and the occurrence of the migration of antagonistic teeth, which causes rotation, crowding and impaction of permanent teeth (Farani and Dewi, 2018).

Premature loss of primary teeth can impair normal tooth development. Displacement of adjacent primary and permanent teeth into edentulous area can interfere the eruption of permanent teeth. Space regainer can get the dental arch length back and prevent malocclusion (Nonong, 2011).The space regainer can be in the form of removable or fixed appliances. Space regainer is an active device with an active component such as expansion screw (Rahardjo, 2009).The purpose of the space regainer is to restore the arch length reduction and provide a space for the eruption of the replacement tooth. It should be used until the permanent replacement tooth erupts completely or until the next orthodontic treatment plan is initiated.

Generally, space is restored more easily in the maxilla than in the mandible because it is supported by the palatal vault and it is possible to use extra oral force (headgear). Efforts to regain the space can also be done by slightly tilting the first permanent molars distally with fixed or removable appliances. Premature loss often causes permanent molars to tilt forward and mesially rotate, so the space that needs regaining is 2 to 3 mm distally, tipping and derotation (Proffit *et al*., 2013). Mala *et al*. (2019) introduced a modification of a simple fixed space-regainer with a loop design combined with two coiled springs on the buccal and lingual sides and attached to the molar band. This device can be used to restore space of >3 mm.

Before making this appliance, it is important to evaluate the dental model. Appliances that will be attached by cement, bonded or are functionally fixed appliances, require accurate dental impressions, i.e. the area to be made of the appliance should be obtained from good impression, without porous or nodules. If the vestibule is not printed properly, the model can still be used because the appliance will only be cemented on tooth 26 to the distal side of tooth 24. Bands are made of soft stainless steel and are available in various sizes to suit a wide variety of tooth types and sizes. The use of a band is preferred over bonding for cases on posterior teeth (Alam, 2012). In this case, band was put on tooth 26.

In orthodontic treatment, it is necessary to use an appliance that can provide optimal and constant strength in order to get the desired result. Coil springs are one of the efficient active components in providing the strength used to get the tooth movement (Kharbanda, 2020). Therefore, the loops on this device are combined with coiled springs. The modification with the coils increases the effective length of the spring and the deflection (Premkumar, 2015). Moreover, the addition of a coil on the loop increases the elasticity of the device, so that a greater force is applied to move the teeth (Mala *et al*., 2019). One posterior tooth can be moved up to 3 mm distally for three to four full months of appliance use. The spring is activated about 2 mm to produce 1 mm of movement every month (Proffit *et al*., 2018).

To make this appliance, welding and soldering processes are carried out to unite the loop and the coiled spring with the molar band. Welding is the joining of two similar metals or alloys without adding any other material. Welded joints become susceptible to corrosion mainly due to the deposition of chromium carbide and the loss of passivation that causes damage to the welded parts (Premkumar, 2015). Uniting the loop with the band is not enough only by welding, but also soldering. Soldering is a process in which two pieces of metal can be joined by adding a special alloy that has a lower melting point than the metal it is joined to (Bonsor and Pearson, n.d.). Before soldering, the metal surface is given flux first. Flux is a material whose composition consists of borax and fluoride and serves to remove the oxide layer and protect the metal surface from oxidation during the soldering process (Kenneth *et al*., 2012).

Conventional space regainer is considered no longer effective in dealing with the case of space loss in this case. Therefore, space regainer with a simpler design has been introduced. Simple space regainer that uses band is more stable and rigid, faster in regaining space and the range of force applied is greater because it uses coiled springs as reported by Mala *et al*. (2019).

CONCLUSION

Cases of space loss for tooth 25 due to teeth 24 and 26 drifting can be restored using a fixed simple space regainer. The making of a simple space regainer starts with adjusting the molar band with a tooth size of 26, making the loop which is combined with a coiled spring and attached to the molar band through welding and soldering processes, and finally finishing and polishing.

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REFERENCE

Alam, M.K., 2012. A-Z Orthodontics: Fixed Appliances, 1 st. ed. PPSP Publication, Kota Bharu, Kelatan, Malaysia.

Becker, A., 2012. Orthodontic Treatment of Impacted Teeth, 3 rd. ed. Wiley-Blackwell, New Jersey.

Bonsor, S.J., Pearson, G., n.d. A Clinical Guide to Applied Dental Materials, 1 st. ed. Churchill Livingstone, London.

Chalakka, P., Thomas, A.M., Akkara, F., Pavaskar, R., 2012. New Design Space Regainers: "Lingual Arch Crossbow" and "Double Bonded Space Regainer." J. Indian Soc. Pedod. Prev. Dent. Vol. 30(2), Pp. 161-165.

Chandak, P., Baliga, S., Thosar, N., 2015. Space Regainers in Pediatric Dentistry. Int. Dent. Med. J. Adv. Res. Vol. 1, Pp. 1-5.

Disha, P., P, B.K., P, P., Bali, P., 2016. Double Banded Space Regainer (DBSR) in Distalising Two Teeth-A Case Report. Int. J. Oral Heal. Med. Res. Vol. 3(1), Pp. 140-142.

Farani, W., Dewi, A., 2018. Prevalensi Premature Loss Gigi Desidui pada Anak Usia 9-10 Tahun Vol. 7(2), Pp. 43-47.

Herawati, H., Sukma, N., Utami, R.D., 2015. Relationships between Deciduous Teeth Premature Loss and Malocclusion Incidence in Elementary School in Cimahi. Med. Heal. Vol. 1(2), Pp. 156-169.

Holan, G., Needleman, H.L., 2014. Premature Loss of Primary Anterior Teeth Due to Trauma–Potential Short- and Long-Term Sequelae. Dent. Traumatol. Off. Publ. Int. Assoc. Dent. Traumatol. Vol. 30(2), Pp. 100-106.

Jayachandar, D., Gurunathan, D., Jeevanandan, G., 2019. Prevalence of Early Loss of Primary Molars among Children Aged 5-10 Years in Chennai: A Cross-Sectional Study. J. Indian Soc. Pedod. Prev. Dent. Vol. 37(2), Pp. 115-119.

Kenneth. J., A., Shen, C., R., R., 2012. Phillips Science of Dental Materials, 12 th. ed. Elsevier Science, St. Louis.

Kharbanda, O.P., 2020. Orthodontics: Diagnosis and Management of Malocclusion and Dentofacial Deformities, 3 rd. ed. Elseiver India, New Delhi.

Law, C.S., 2013. Management of Premature Primary Tooth Loss in The Child Patient. J. Calif. Dent. Assoc. Vol. 41(8), Pp. 612-618.

Lopez-Gomez, S.A., Villalobos-Rodelo, J.J., Avila-Burgos, L., Casanova-Rosado, J.F., Vallejos-Sánchez, A.A., Lucas-Rincon, S.E., Patino-Marin, N., Medina-Solis, C.E., 2016. Relationship between Premature Loss of Primary Teeth with Oral Hygiene, Consumption of Soft Drinks, Dental Care and Previous Caries Experience. Sci. Rep. Vol. 26(6), Pp. 1-7.

Mala, Devi., Gadicherla, P., Krishna, L.A., Chandra, P., 2019. A Simplified Space Regainer and Functional Space Maintainer-Case Report. Acta Sci. Dent. Sci. Vol. 3(4), Pp. 33-35.

Negi, K.S., 2010. NiTi Bonded Space Regainer/ Maintainer. J. Indian Soc. Pedod. Prev. Dent. Vol. 28(2), Pp. 113-116.

Nonong, Y.H., 2011. Removable Space Regainer (Laporan Kasus). In: Abidin, T., Pintauli, S., Primasari, A., Boel, T., Daliemunthe, S.H., Haraha, N., Syafiar, L., Hasbi, S.O., Syafrinani, S., Hasibuan, S., Octiara, E. (Eds.), Proceeding RDM&E-V 201. Fakultas Kedokteran Gigi Universitas Sumatera Utara, Medan, Pp. 294-306.

Pawar, B.A., 2019. Maintenance of Space by Innovative Three-Dimensional-Printed Band and Loop Space Maintainer. J. Indian Soc. Pedod. Prev. Dent. Vol. 37(2), Pp. 205-208.

Pokorna, H., Marek, I., Kucera, J., Hanzelka, T., 2016. Space Reduction After Premature Loss of A Deciduous Second Molar – Retrospective Study. IOSR J. Dent. Med. Sci. Vol. 15(11), Pp. 1-8.

Premkumar, S., 2015. Text Book of Orthodontic, 1 st. ed. Elsevier India, New Delhi.

Proffit, W., Fields, H., Larson, B., Sarver, D., 2018. Contemporary Orthodontics, 6 th. ed. Mosby Elsevier, Philadelphia.

Proffit, W.R., Fields, H.W., Sarver, D.M., 2013. Contemporary Orthodontics, 5 th. ed. Mosby Elsevier, St. Louis.

Rahardjo, P., 2009. Ortodonti Dasar, 2 nd. ed. Pusat Penerbitan dan Percetakan Unair (AUP), Surabaya.

Souror, Y.R., Khawandanah, M.S., Allam, S.E., Alaishan, R.A., 2019. Case Report: A Novel, Fixed Chairside Space Maintainer. Interantional J. Pedod. Rehabil. Vol. 4(2), Pp. 80-83.

Xhemnica, R., Rroco, M., 2022. Preventive and Interceptive Orthodontics Treatment. Eur. J. Med. Nat. Sci. Vol. 5(1), Pp. 26-31.