CASE REPORT

Modified Nance palatal arch appliance for anterior tooth replacement

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SUMMARY

The following case report presents a new and an innovative technique for the postextraction replacement of maxillary central incisors using the natural teeth as pontics. The novel appliance fabricated fully satisfied the demands of the adolescent patient for a fixed prosthetic, while fulfilling the aesthetic and functional requirements presented by the case.

BACKGROUND

Tooth avulsion is defined as the total displacement of a tooth out of its socket¹ and is unquestionably the most disturbing sequelae to any dental trauma for the child as well as the parent. The prevalence of avulsion is estimated to be 0.5–16% and it most commonly involves the maxillary anterior teeth. Postreplantation complications occur in 57–80% cases and most replanted teeth are lost within 5–7 years, despite root canal treatment.² In a growing child, the resultant compromise in mastication, speech and aesthetics, can have a deleterious effect on not just the physical, but also, more importantly, the psychological well-being of the patient. In such a scenario, the treatment options available for adults, such as implants, removable partial dentures and fixed partial dentures, are often inapplicable or inconvenient, thus compelling the clinician to explore alternative avenues.

CASE PRESENTATION

A girl, aged 11 years, presented to the Department of Pedodontics with a 4-month history of pain and mobility in her upper front anterior teeth with associated intermittent swelling. The patient had a history of trauma from 2 years ago, after a fall, which led to the avulsion of both the upper central incisors. The avulsed teeth were replaced in the socket after 5 h of dry extraoral time. Splinting of the teeth was done for a week but patient did not undergo any further dental treatment. The teeth were asymptomatic for a year, but since then the mobility and the pain had become progressively worse. Clinical findings confirmed the symptoms and also revealed a draining sinus on the buccal attached gingiva with respect to maxillary right central incisor. Other relevant findings were the presence of a class II division I malocclusion with an associated deep bite and incompetent lips (figure 1).

INVESTIGATIONS

Pulp testing confirmed that maxillary right lateral incisor and both the central incisors were non-vital. A periapical radiograph of the teeth revealed

external root resorption and periapical abscesses with respect to right and left maxillary central incisors, with only one-third of root remaining for the former (figure 2).

TREATMENT

In the present scenario, the central anteriors were deemed unsalvageable and it was decided to extract them while proceeding with root canal treatment for the right lateral incisor. Since, the pre-teen patient was deeply distressed with the imminent loss of her anterior teeth, immediate aesthetic treatment took precedence over orthodontic correction of her constricted maxillary arch. The pros and cons of the available tooth replacement options such as removable partial denture, fixed partial denture and implants were discussed with the patient and parents. Taking the patient's wishes into consideration, it was decided to use the patient's natural teeth as pontic, as part of a novel modified Nance palatal arch appliance.

Following extraction, an immediate denture was placed and the extracted teeth were stored in saline at 4°C. On the second appointment molar bands were adapted on both maxillary first molars and an alginate impression was made. After securing the molar bands in the impression a cast was poured using dental stone.

On completing the root resection of the extracted incisors, the pulp debridement was carried out and the pulp chamber was obturated with light cure composite resin. A modified ridge lap design was given and recess grooves were placed horizontally in the middle third of the palatal surface, immediately incisal to the cingulum.

A 0.9 mm round orthodontic wire was adapted on the cast, with its distal ends soldered to the

Figure 1 Preoperative photograph of patient.

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Figure 2 Preoperative IOPA of patient with respect to 11 and 21.

molar bands and anterior part approximating the slope of the palate, similar to a Nance palatal arch. The pontic teeth were stabilised in their final position on the cast and a second 0.9 mm wire was adapted into the recess grooves placed in the teeth. Owing to the deep bite it had to be ensured that the arms of this wire passed through the buccal embrasures of the lower teeth to prevent any interference with the occlusion. Finally the ends of this wire were soldered to the first wire. Care was taken to maintain a constant gap of 1 mm between the wires and the tissues and an acrylic button was incorporated at the junction of the two wires (figure 3).

Once a satisfactory try in was completed, the appliance was cemented with luting glass ionomer cement (figures 4 and 5). The patient was advised to use a floss to clean all the wire components and maintain adequate oral hygiene.

OUTCOME AND FOLLOW-UP

At 1 and 4 weeks recall appointment the patient was comfortable with the appliance and extremely pleased with the aesthetic

Figure 3 Modified Nance palatal arch appliance before cementation.

Figure 4 Intraoral view of appliance postcementation.

results. The patient was advised for a monthly follow-up appointment. She was further referred to the department of orthodontics for correction of class II division I malocclusion.

DISCUSSION

In general it has been determined that children with overjet of 5 mm are 1.37 times more prone to dental injuries, while those with inadequate lip coverage are 0.56 times more susceptible, as was the current case.³ In case of an avulsion injury replantation is the immediate and best avenue, but the prognosis of such a treatment depends on multiple factors, such as nature of trauma, storage medium used, length of extraoral time and the subsequent clinical treatment of the tooth in the long-term. The chances of periodontal healing after a dry storage period of 0–4, 5–20 and >21 min is 52%, 24% and 13%, respectively, with a general time limit of 75 min.⁴ A reimplanted tooth requires a minimum of 2-year follow-up as there is a possibility of ankylosis, infraocclusion, root resorption and discolouration presenting itself much later.⁵ The prevalence of inflammatory resorption in reimplanted tooth is about 30% and replacement resorption is about 61% and they were usually observed after 1 and 1–2 months, respectively.⁴ Often in such a scenario the only course of treatment left is extraction followed by tooth replacement.

The possible options on offer are removable partial denture, fixed partial denture and implants.

Figure 5 Postoperative photograph of patient.

Removable partial dentures are probably the cheapest and most easily fabricated but at the same time they often prove to be bulky, uncomfortable and requiring an adaptation period. The artificial acrylic pontics used are aesthetically unsatisfactory and are often rejected by patients.

The next alternative that can be explored is a fixed partial denture which requires significant tooth reduction and since the patient's growth is not yet completed, possible exposure of the crown margins due to natural apical migration of the epithelial attachment has to be taken into consideration.⁶

Undoubtedly, implants are the most suitable, aesthetic and conservative options for replacement of missing teeth; however, continued bone growth in adolescents may lead to infraocclusion of the implants relative to other teeth and in some cases periodontal problems may arise, with marginal bone loss around the implant and adjacent teeth.⁷ Implants are hence, inadvisable for adolescents till craniofacial growth completion is achieved.

The current case provided the wonderful opportunity of using the patient's natural teeth as pontic instead of acrylic or porcelain ones. Undeniably they provide the best possible aesthetics and psychological satisfaction to the patient with respect to size, shade, morphology and position. Furthermore, they provide the following advantages: ease of post cementation adjustments, reduction in complicated lab work and reduction in cost of treatment.⁸

Various authors have applied novel methods for chair side replacement of missing teeth using natural tooth pontics. Some have suggested the use of natural teeth as part of a cast metal resin-bonded frameworks for multiple tooth replacement.⁹ Recently though, a fibre reinforced composite, such as ribbond, has been used to provide interim fixed prosthesis for single tooth replacement.¹⁰ But these alternatives effectively splint the pontic to neighbouring sound teeth and hence raise the possibility of inhibiting the maxillary growth, particularly in the intercanine area.¹¹ Additionally, in the present case the patient's deep bite hampered the provision of sufficient clearance for utilising ribbond.

Another author has bonded the avulsed central incisor to orthodontic brackets attached to stainless steel wire, which in turn is soldered to maxillary molar bands.¹² But the addition of a Nance palatal arch button, carried out in the current case, presented the benefit of moving the fulcrum of the appliance posteriorly. This permitted some amount of microresilience which facilitates stimulation of the underlying tissue and thereby, prevents ridge resorption, which frequently occurs after extraction.¹¹ The appliance, owing to the simplicity of its design, also allowed effortless maintenance of hygiene through the use of floss.

Long-term follow-up of the patient is imperative to guarantee a successful treatment outcome. Also ensuring patient cooperation is indispensable. Hence, the fixed appliance presented here could provide the ideal answer to the aesthetic and functional dilemma faced by the dentist in such a case and offer a durable and satisfactory interim prosthesis for an adolescent.

Learning points

- ▶ The modified Nance palatal arch appliance is simple to construct, easy to maintain and a cost-effective intermediate tooth replacement option.
- ▶ The utilisation of extracted teeth as pontic created an outstanding match of colour and surface texture, an ideal contour and position and an excellent support of the soft tissue architecture.
- ▶ This fixed prosthesis is independent of patient compliance and hence cannot be lost or broken, as in the case of a removable partial denture.
- ▶ The current appliance is particularly applicable for a growing child, as it does not splint anterior teeth and permits the continued increase of inter canine arch width, unlike a fixed partial denture.
- ▶ Overall a positive psychological effect on the patient proves this novel appliance to be a viable transitional prosthesis in cases requiring extraction of teeth with intact clinical crowns.

Competing interests None.

Patient consent Obtained.

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