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Navigating the clinical ambiguity of implant placement in two young pubescent patients: an insight from two case reports

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Abstract

The horizon of implant dentistry has been ever-expanding owing to its long-term success in rehabilitating partially or completely edentulous cases. This perennial success and efficiency have encouraged clinicians to use osseo-integrated implants to replace teeth lost in children either due to trauma or congenital absence. Although a myriad of studies and publications suggest the placement of implants only after the attainment of skeletal maturity, as the growth-related changes such as remodelling, displacement, and mesial drift can put the future of implant and restoration in jeopardy, the use of implants in young pubescent or adolescent looks promising due to its evident psychological and social advantages over other contemporary alternatives such as a removable prosthesis or resin-bonded bridge. The first case report highlights a 16-year follow-up of a young girl treated at the age of 10 with an implant-supported prosthesis for the replacement of a missing maxillary left central incisor. The second case report centers around a 19-year-old teenage girl who underwent rehabilitation with a permanent fixed prosthesis, replacing her previous implant-supported temporary prosthesis. The implant was initially placed when she was 10 years old.

Keywords: Implants, Adolescents, Osseointegration.

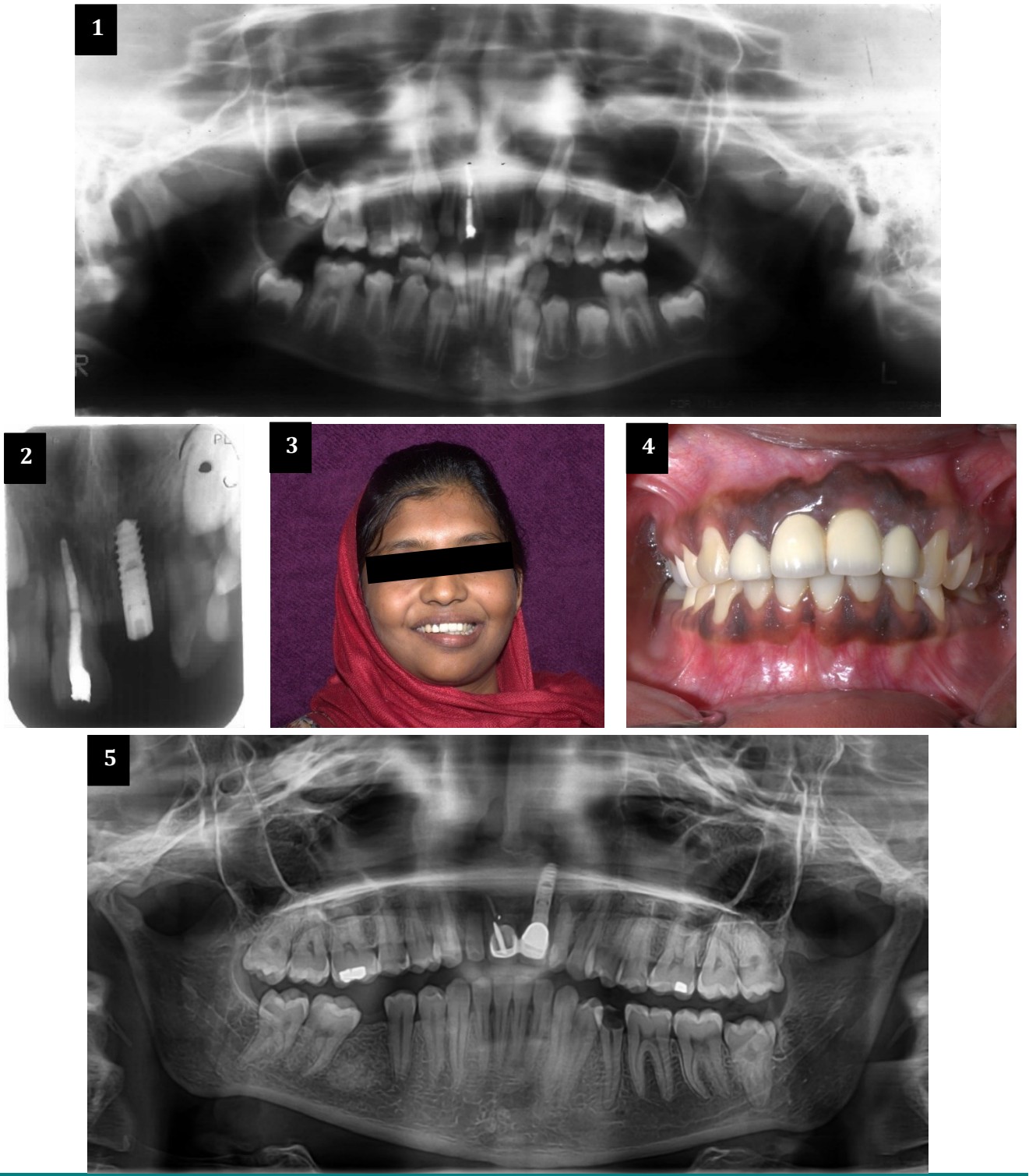
1. Introduction

Tooth loss in young pubescents due to either trauma or congenital absence can pose serious psychological and psychosocial impacts on them [1]. The available treatment choices for a partially edentulous arch include removable partial dentures, fixed partial dentures, and implants. Patients have a preference for a permanent and most conservative fixed treatment, with implants being the preferred option. They commonly decline alternative treatments like removable partial dentures or resin-bonded bridges. The reasons can be its removable character, reluctancy on the part of children to wear it resulting in space loss, poor retention of RPD due to exfoliation of deciduous teeth, hygiene challenges, the requirement of frequent refabrication and thinning of the labial bone plate due to loss of teeth and also due to pressure from labial flange making the future implant placement compromising, while the resin-bonded bridges are avoided due to frequent debonding and the hampering of the growth of adjacent teeth on which bonding has been done [2].

Osseointegrated dental implants over the years have proven to be a safe and successful method of tooth replacement [3]. It has emboldened clinicians to extend its usage to replace missing teeth in young pubescent and adolescent patients [4]. Although the pros and cons of dental implants in such cases remain debatable, implant-supported prostheses can have significant positive impact on the social and emotional lives of young individuals. The first case report outlines the utilization of an implant-supported prosthesis to replace a missing tooth in a young girl during her pubescent years. It further details the subsequent prosthetic phase and provides a comprehensive follow-up spanning 16 years. The second case report provides a comprehensive overview of the prosthetic rehabilitation undergone by a 19-year-old teenager. The initial implant placement occurred nine years prior. The primary concern expressed by the patient was the unsatisfactory aesthetic appearance of the temporary prosthesis.

2. Case Report 1

On August 5th, 1999, a 10-year-old female patient was brought by her mother, expressing concern about a missing front tooth resulting from a traumatic incident. During the preliminary examination, the patient appeared disengaged and introverted. Further discussion revealed that she was experiencing bullying and social embarrassment at school due to the absence of her tooth. Additionally, the patient faced difficulties in pronunciation and participation in school activities, which had a negative impact on her relationships with peers. Recognizing the distress of the parents, they requested a fixed and stable solution for dental rehabilitation. The patient's medical history was unremarkable, and no allergies to medications or local anesthesia were reported. Dental history revealed missing #21 and an endodontically treated #11. The face was brachycephalic in nature with a medium lip line. The preliminary clinical examination and radiographic evaluation revealed mixed dentition with a stable incisal relationship (Figure 1).



Figures 1-5: 1. Pre-operative OPG, 2. Immediate post-operative IOPA after implant placement, 3. Patient follow up after 9 years of implant placement, 4. Definitive prosthesis cemented, and 5. 16 years follow up OPG.

The parents showed their unwillingness to the discussed treatment alternatives such as a removable partial denture and a resin-bonded bridge and requested a long-term fixed rehabilitation. Considering factors such as the preservation of bone, psychological well-being, and long-term durability, the advantages of an implant-supported prosthesis were deemed more significant than any associated risks. Considering the patient's stable incisal relationship, facial structure with a shorter height, and emotional factors, the treatment plan was ultimately decided to involve a two-stage surgical process. This process aimed to position a root-form titanium implant, specifically the Pitt-East Bio-Oss variant, which measured 3.25 x 12 mm. The patient's informed consent was obtained prior to proceeding with the treatment.

Under aseptic protocol and antibiotic coverage, a full thickness mucoperiosteal flap was raised after the administration of local anaesthesia. The osteotomy was performed with sequential drilling as per the manufacturer's specifications. An endosseous implant was placed (3.25 x 12 mm) using a torque wrench and an

adequate primary stability of 30Ncm was achieved (Figure 2). Cover screws were placed, and the surgical site was sutured with 3-0 black braided silk. Post-operative instructions were given and mouth rinsing with 0.12% chlorhexidine twice daily was advised to the patient. The implant was uncovered following 4 months of osseointegration period. A cover screw was removed, and a short collar healing abutment was placed to engineer the tissue collar. After 3 weeks, an implant-level open tray impression was made, and a PFM crown was fabricated. The patient was reviewed after 2, 6 and 12 months of crown cementation and no untoward complication such as vertical discrepancy or gingival inflammation was found. Nine years later during the revisit, it was found that the crown on the implant abutment was approximately 4 mm shorter and more palatally placed when compared to the adjacent teeth. Hence, the abutment was substituted with a new one, and a PFM crown was fabricated to rectify the changes brought about by growth (Figures 3 and 4). The patient was reviewed for 16 years after implant placement on 7th May 2016. Upon clinical and radiographic examination, the implant was found to be healthy with no signs of peri-implantitis (Figure 5). The crown was sound aesthetically and functionally without any apparent discoloration, infraocclusion or vertical discrepancy in marginal gingival. The patient reported a positive psychosocial impact in her life after implant restoration.

3. Case Report 2

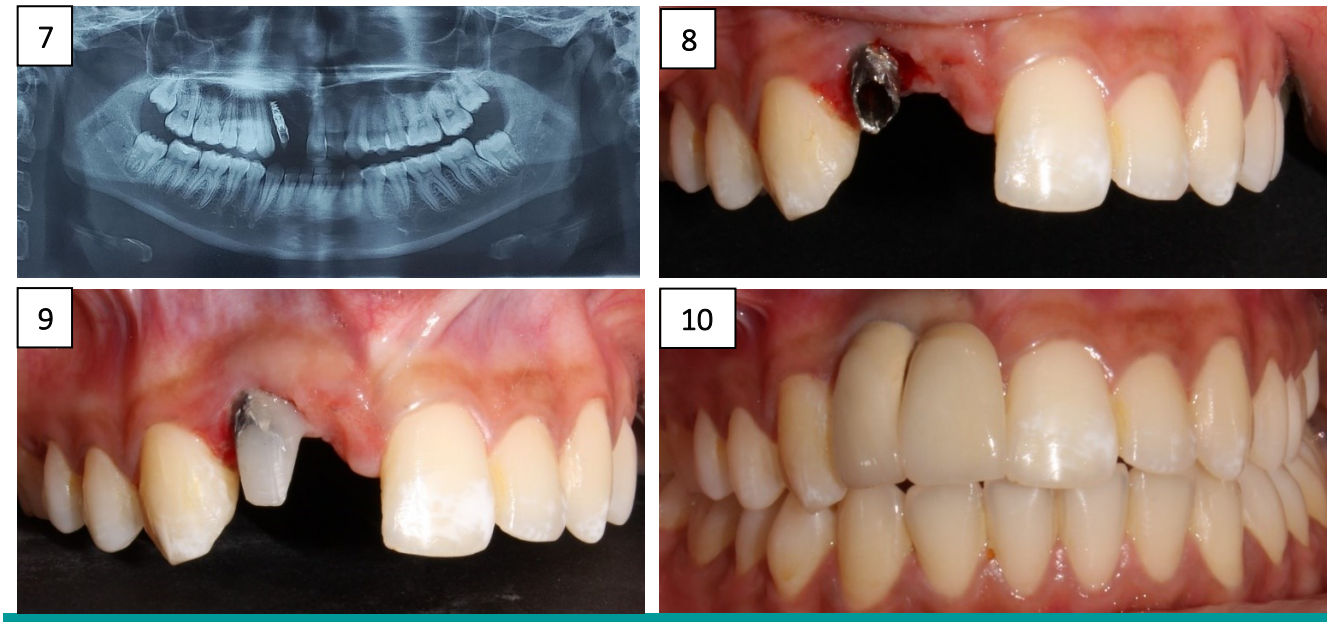
The second case report involves a 19-year-old teenage girl who presented to the department with a complaint regarding the unsatisfactory aesthetics of a maxillary anterior restoration that was performed 9 years ago (Figure 6). During the dental history assessment, it was revealed that an implant had been placed in a private clinic 9 years ago. Unfortunately, there were no available records indicating which implant system was used. Upon clinical examination, a provisional acrylic prosthesis in the region of the maxillary left central and lateral incisors was observed, exhibiting poor aesthetics and an anterior open bite. No signs of periimplantitis, screw loosening, or mobility were detected. Radiographic examination revealed the use of a two-stage implant in the #22 region, showing proper osseointegration (Figure 7). However, a vertical bone defect was noted, and over the past 9 years, the implant had drifted to a more apical position along with the abutment (Figure 8). The decided treatment plan involved the removal of the acrylic provisional prosthesis while conserving the existing abutment. Subsequently, the patient was to undergo rehabilitation with a permanent prosthesis. Upon removing the provisional crown, it was observed that the existing abutment height was insufficient to provide adequate retention. The vertical bone defect had resulted in a crown height space exceeding 15 mm. To address the insufficient abutment height, the decision was made to increase it using a core build-up technique utilizing dual-cure resin composite (Fusion Core DC Flow) known for its direct and accurate intraoral application (Figure 9). Subsequently, the abutment was prepared to accommodate a metal-ceramic cantilever fixed partial denture (FPD) utilizing the implant. A two-step putty light body impression was taken using polyvinyl siloxane impression material to capture the necessary details. Finally, the crown was cemented using resin-modified glass ionomer cement (Figures 10 and 11). Techniques like sandblasting and chemical etching have been utilized to create micro-roughness on metals that primarily rely on mechanical bonding [5].

Figure 6: Pre-operative extra oral view

4. Discussion

The decision to place implants in pubescent and adolescent patients remains controversial, as osseointegrated implants behave like ankylosed teeth where their movement in growing dentoalveolar complex remains uncertain [6]. Furthermore, the continuous eruption of teeth adjacent to dental implant might pose irreversible problems of infraocclusion, unstable contact, supra eruption of opposing teeth and vertical discrepancy in gingival marginal leading to aesthetic concerns [7]. Studies in porcine teeth have ascertained that osseointegrated implants do not follow the alveolar changes, and the loss of contact with vertical discrepancy is inevitable [8]. Thilander *et al.* studied 15 adolescents with 27 implants and observed a definitive infraocclusion and bucco-lingual discrepancy in all cases [9]. On the contrary, Wendy *et al*. and coworkers hypothesized that eruption and remodelling is a continuous process and postponing the implant placement does not necessarily prevent future complications instead definitive tooth replacement during the formative years can have a tremendous positive impact on the well-being of the patient [10]. Oesterle *et al.* and Cronin *et al.* proposed that chances for implants placed in posterior maxilla in children can get submerged due to resorptive process and implant placement should be delayed till skeletal maturity [11,12]. Ledermann and associates in their study of 42 implants in 34 patients aged between 9- to 18 years have documented favorable outcomes [13]. In a retrospective study, Bernard *et al.* and Jemt *et al.* showed that vertical movement can even happen in adults with residual growth potential, and hence, delaying implant placement need not be necessary [14,15].

Despite the reluctance, the implant utility seems ostensible as it preserves the alveolar bone in growing patients and has faster healing potential [16,17]. In a systematic review and meta-analysis by Elagib *et al.* [18] on dental implants in growing patients, it was concluded that the decision to use implants depends on factors like overall health, stage of jaw growth, number of teeth to be replaced, and anatomical features. Until the patient's growth is completed, a conservative treatment strategy is commonly recommended due to the potential changes in implant position caused by ongoing bodily changes in developing and growing jaws. In a systematic review on the adverse effects of implants in children and adolescents by Kamatham *et al.* [19], it was concluded that there is insufficient evidence to discourage the placement of dental implants in healthy growing children. The only reported adverse event is infraocclusion, which is discussed in terms of management. However, since the data is based on case reports, the findings should be interpreted with caution. Well-designed randomized controlled trials are necessary to fill this gap in the literature and provide more definitive conclusions. Hence, it can be extrapolated that postponing the implant treatment in young individuals need not necessarily prevent future complications while a successfully fixed implant restoration can satiate functional and aesthetic demands. The implant restoration feels more like a natural restoration to the patient and can enhance physical health, self –esteem and academic performance in pubescent and adolescent individuals. This paper presents one such case where a 9-year-old girl with a missing left central incisor is successfully treated with an implant-supported prosthesis, and a follow-up of 16 years revealed healthy and aesthetic restoration with no apparent discrepancies.



Figures 7-9: 7. Pre-operative OPG, 8. Implant and abutment appeared to have drifted apically, 9. Core build-up, and 10. Final cantilever FPD-post cementation.

Figure 11: Postoperative extra oral view

The second case report describes a specific case in which a 19-year-old teenage girl was successfully rehabilitated with an implant-supported cantilever prosthesis, significantly improving her aesthetics. Notably, the implant had been placed 9 years prior to the rehabilitation procedure. In cases of implant therapy, the prosthetic phase can be postponed until skeletal growth is fully completed. During this period, a temporary provisional prosthesis can be utilized to fulfill the functional requirements. This approach allows for proper monitoring of skeletal development and ensures that the final prosthetic restoration is planned and implemented at an optimal time when the patient's growth is stable.

5. Conclusion

The use of dental implants in young patients is an area that lacks extensive published reports, and long-term clinical studies are necessary to draw definitive conclusions. When considering implant treatment before skeletal maturation, it is crucial to inform the parents about the potential benefits and complications associated with its use. Due to current protocols, it is generally advisable to consider placing

implants after the individual reaches 18 years of age. However, in certain selected cases, implants may be placed with the consent of both the parents and the patient. Prosthesis planning should be given significant attention during the treatment process. Although some children may benefit from implant therapy, it is essential to carefully weigh the potential positive effects against the drawbacks of the procedure. Moreover, when employing techniques that are still being evaluated, clinicians and scientists have a greater responsibility to ensure proper follow-up and monitor the outcomes. To determine the most appropriate time for implant placement, factors such as skeletal growth status, degree of hypodontia, extent of psychological stress, existing dentition status, and dental compliance of the pediatric patient should all be considered.

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