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Case Report

Exceptional case of basal implant utilization in non-syndromic oligodontia: Innovations for a 20-year-old male

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ABSTRACT:

Non-syndromic oligodontia, characterized by the congenital absence of multiple teeth without systemic involvement, presents significant challenges in dental rehabilitation, particularly in younger patients. Traditional dental implants often struggle due to insufficient bone maturity. This report describes the treatment of a 20-year-old male with severe non-syndromic oligodontia using basal implants. The patient, with multiple missing teeth and underdeveloped alveolar bone, underwent clinical examination, radiographic imaging, and bone density assessments. A customized basal implant approach was selected to suit the patient's age and anatomical needs. Basal implants were tailored to the bone structure, ensuring optimal stability. Advanced surgical techniques minimized trauma and expedited recovery, while strategies to enhance immediate bone-to-implant contact bolstered stability and function. Four basal implants were placed in the mandibular arch, where conventional implants were unfeasible, and a fixed partial denture was installed in the upper arch. An interdisciplinary approach combined surgical and prosthetic techniques for optimal aesthetic and functional outcomes. At the 3-month follow-up, the patient reported high satisfaction with aesthetics, function, and phonation. This case demonstrates the effectiveness of basal implants for severe non-syndromic oligodontia in a young patient and highlights how a multidisciplinary approach can address complex dental challenges.

Keywords- Non-syndromic oligodontia, Basal implants, Interdisciplinary approach, Aesthetic outcomes, Functional outcomes, Bone-to-implant contact

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INTRODUCTION

Tooth number anomalies, including tooth agenesis or supernumerary teeth, arise from developmental disturbances during the initiation and proliferation stages of tooth formation. Congenital tooth agenesis is defined as a state in which one or more teeth, excluding the third molars, are missing.[1] Although various classification methods are available, tooth agenesis is usually classified according to the number of missing teeth; hypodontia, oligodontia, and anodontia refer to the states in which less than six teeth, more than six teeth, or all teeth, respectively, are missing. The underlying cause is partly attributed to the failure of tooth bud cell proliferation from the dental lamina.[2]Among these, oligodontia has a particularly low prevalence of 0.08% to 1.1% and has been reported as a symptom of systemic diseases such as ectodermal dysplasia, Down syndrome, Nance-Horan syndrome, Rieger syndrome, and cleft lip and palate.[3] Unlike syndromic oligodontia, mutations in PAX9, AXIN2, EDA, and MSX1 or environmental causes, such as drug-induced disturbances of the tooth germ and nutritional imbalances, are etiological factors in non-syndromic oligodontia.[4] In most oligodontia patients, congenitally delayed tooth genesis and prolonged retention of primary teeth are observed, and unstable occlusion, such as traumatic occlusion and hypo-occlusion, occurs as a result of

root resorption and ankylosis.[5] Teeth in such cases are narrow compared with normal tooth dimensions, leading to dental anomalies such as microdontia or conical teeth.[6] Excessive or insufficient restoration space can occur depending on the pattern and severity of tooth absence.[7] The absence of permanent tooth germs can lead to severe atrophy of the alveolar ridge, complicating prosthodontic treatments involving implants.[8] Patients with oligodontia often face psychosocial challenges during childhood and adolescence due to their appearance and difficulties with pronunciation resulting from congenital tooth agenesis. [9]Accurate evaluation of the number and position of missing and residual teeth, as well as the state of the alveolar ridge, is essential for effective treatment planning. [10] Prosthetic restoration options include resin adhesion, fixed or removable dental prostheses, and implants. However, treatment options can be restricted by the number and position of missing teeth and the condition of the residual teeth and alveolar ridge.[11] Given that conventional prosthetic treatments alone may not achieve optimal esthetic and functional rehabilitation, a multi-disciplinary approach involving oral and maxillofacial surgery, prosthodontics, periodontics and orthodontics is crucial.[12] Early diagnosis through clinical and radiographic examination is essential, with lifetime maintenance required.[13] Treatment goals should focus on restoring stable occlusion and improving both functionality and esthetics to support psychosocial adjustment.[14] Oligodontia, affecting between 1.6% and 9.6% of the population, can be particularly challenging when multiple or bilateral teeth are missing.[15] Familial predisposition is common, and the condition is often associated with hereditary syndromes such as ectodermal dysplasia, which can affect the alveolar ridges and basal bone, leading to malformed or cone-shaped teeth. [16] Management often involves prosthetic treatments, but inadequate bone support may limit options to removable dentures unless advanced surgical interventions are employed. Key factors influencing treatment include the number, distribution, and size of missing teeth, as well as the patient's age.[17] Oligodontia may be isolated or associated with genetic syndromes like ectodermal dysplasia, Van Der Woude syndrome, Down syndrome, and Rieger syndrome.[18] Non-syndromic or familial forms are more common. Clinical features often include cone-shaped teeth, microdontia, delayed eruption of permanent teeth, increased freeway spaces, and retention of deciduous teeth.[19] Conservative prosthetic treatments have limitations, potentially leading to unsatisfactory outcomes and dissatisfaction due to the short lifespan of removable partial dentures.[20] In contrast, dental implants are effective for addressing functional, aesthetic, and long-term rehabilitation needs.[21] Successful implant placement requires adequate alveolar bone and keratinized gingiva. The preservation of buccal bone by remaining deciduous teeth is crucial, as their early loss can result in alveolar bone atrophy. [22] Additionally, the surgical removal of ankylosed deciduous teeth may lead to local bone loss, often necessitating bone augmentation before implant placement.[23] Bone grafting remains a standard solution for managing alveolar bone atrophy.[24] Autografts from the iliac crest are considered the gold standard, but intraoral bone harvesting from the retromolar area, chin, or maxilla can also be effective.[25] Autografts offer essential properties for bone formation, including osteogenesis, osteoconduction, and osteoinduction.[26] Additionally, allografts, xenografts, or combinations of graft materials have shown success. The focus on implant survival alone does not fully address treatment success. [27]A comprehensive assessment should include functionality and patient satisfaction. Recent advancements in implant technology, including enhanced materials, geometries, and concepts, necessitate a reevaluation of traditional success criteria.[28] It is important to reassess implant success by considering not only survival rates but also patient-reported outcomes, which include both aesthetic and functional results.[29]In addressing severe atrophy, basal implantology, or bicortical implantology, provides a promising alternative.[30] By anchoring implants in the basal cortical bone, this approach effectively utilizes the high-quality cortical bone available in atrophic jaws.[31] Traditional solutions, such as bone grafts from the calvarial or iliac areas, sinus lifts, and nerve displacements, while effective, can be invasive and associated with variable patient outcomes.[32] The clinical case report highlights the successful use of basal implants in a severely atrophic jaw, demonstrating that modern implantology can offer effective solutions where traditional methods may fall short. This innovative approach addresses the limitations of conventional treatments, providing a viable pathway for patients with complex dental needs.[33]This case report concerns a patient with non-syndromic oligodontia without any specific systemic disease. The patient was rehabilitated by means of prosthetic restoration involving an implant, through multi-disciplinary treatments. In patients with oligodontia, lifetime maintenance care is essential for preservation of esthetics and function.[34]

CASE REPORT

A 20-year male patient reported to the Department of Oral and Maxillofacial Surgery at Maharana Pratap College of Dentistry and Research Centre, Gwalior with the chief complaint of unerupted teeth in his lower front jaw region. History of present illness revealed as multiple congenitally missing deciduous and permanent teeth in upper and lower jaw region.

Pre Operative Picture

His past medical history was non-contributory and family history revealed that he was born to non-consanguineous marriage with normal delivery and no one in his family have congenitally missing teeth. The patient had no history of trauma or extractions. Patient gave no history of any adverse habit. During physical examination, there was no abnormality in either hairs or nails, perspiration was normal and no congenital clefts of lip or palate was seen. Hence in this case, Oligodontia is not associated with any syndrome which is a rare finding. Extra oral examination revealed a face with normal facial profile and normal skeletal dental base relations. Intra Oral Examination revealed that maxillary central incisors presented with conical shaped, complete loss of mandibular incisors and canine and first and second molars are present in all four quardants. A provisional diagnosis of non-syndromic oligodontia was given with differential diagnosis of Ectodermal Dysplasia; Rieger syndrome and Van der Woude syndrome. Complete set of investigations were carried out which included serum calcium level, alkaline phosphate, TSH, T3, T4. The findings of these investigations were normal. During physical examination, hairs were not thin and sparse, nails were not brittle and no difficulty in perspiration was seen which ruled out ectodermaldysplasia; on occular examination, no signs of glaucoma was seen ruling out Rieger syndrome and lastly Van Der Woude syndrome was left out as there was cleft palate or any mucosal cysts in lower lip. Based on above findings non syndromic Oligodontia as final diagnosis was justified.

TREATMENT PLAN

Informed patient consent was obtained prior to treatment. All surgical operations were performed under local anesthesia. As the bone density was not sufficient to accommodate conventional implant, hence basal implant supported prosthesis was given in mandibular arch. Under strict aseptic conditions, 2% lignocaine with 1:80,000 adrenaline was administered to the patient. Once adequate anesthesia was achieved, the placement of Blue fix implant commenced using the Marathon implant system. The implant was inserted at a torque of 30 Ncm and a speed of 15,000 to 18,000 rpm. (**Figure 1**). Four basal implants two on either side of midline were placed in mandibular arch (**Figure 2**). The patient was recalled after 3 months for clinical and radiologic evaluation (**Figure 3 and 4**). The success criteria included: Immobility of the implant, absence of pain or suppuration, radiographically visible direct implant-to-bone contact, and less than 1.0 mm vertical bone resorption in the first year after prosthetic loading.

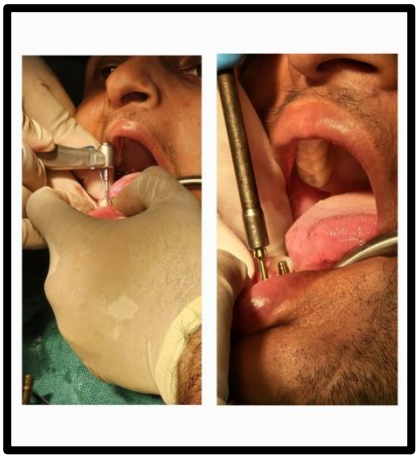

Figure 1: Intra operative site

Figure 2: Immediate Post – Operative site

There was no significant loss of blood during and after surgery. After procedure patient was kept under observation for 1 hour. The patient was referred to the Department of Prosthodontics and Crown & Bridge. Afterward, impressions were taken, and the procedure for the prosthesis was carried out, leading to the placement of a fixed partial denture in the maxillary arch.

Figure 3: Follow up after 3 months

Figure 4: Panaromic Radiograph of Follow up after 3 months

DISCUSSION

The selection of treatment is based on an evaluation of several factors, including occlusion, the patient's age, the alignment and shape of the remaining teeth, and the patient's preferences.[35] Dental implant therapy is well-regarded for effectively replacing missing teeth, with a success rate exceeding 94% over an average of 13 years.[36] However, factors such as smoking, poor diet, bruxism, dry mouth, osteoporosis, diabetes, and radiotherapy can negatively impact implant success, potentially leading to early failures, especially in individuals with congenital or acquired tooth loss.[37] In present case patient was non smoker and free of any systemic illness that contributed to success of implant insertion . A comprehensive review shows that the average implant survival rate for patients with oligodontia is 93.7%, with a range from 35.7% to 98.7% over 18 years.[38] This variation is mainly due to studies including children under 15, who typically have lower bone density and a higher risk of implant failure.[39]Conversely, studies suggest that individuals with hypodontia and oligodontia experience high satisfaction, effective chewing function, excellent speech performance, and a notable implant success rate based on Albrektsson's criteria.[40] In contrast, implants in patients with non-congenital tooth loss, such as from severe periodontitis, have higher survival rates, ranging from 97% to 100% in short-term follow-ups of 2 to 8 years.[41] Long-term studies indicate that implant survival rates range from 83% to 96% after 10 years, with success rates between 38.5% and 77.9% over 3 to 6 years.[42] These results suggest that implants for congenital tooth loss might be less favorable compared to those for non-congenital causes such as caries or trauma, although direct comparative studies are limited.[43]Basal implants can provide stable support for prosthetic devices, crucial in cases of non-syndromic oligodontia where there are multiple missing teeth.[44] These implants are anchored in the basal bone, which is denser and less prone to resorption compared to the alveolar bone.[45] This makes them an effective solution for anchoring dental prostheses in areas with limited bone volume.[46] In non-syndromic oligodontia, where traditional implant placement might be challenging due to insufficient bone quantity, basal implants can be advantageous. They utilize the basal bone, which is less affected by resorption and offers a stable foundation for the implants. [47] The placement of basal implants often requires less preparatory work compared to conventional implants. [48]This can be particularly beneficial for young patients, as it may reduce overall treatment time and avoid the need for extensive bone grafting procedures. [49] Innovations in basal implant technology, such as improved implant designs and materials, have enhanced their effectiveness in challenging cases.[50] For a young patient, this approach can lead to more durable and visually appealing outcomes with fewer complications. For a 20-year-old male, basal implants can notably enhance both function and appearance.[51] They can restore chewing function and enhance appearance, contributing to a more positive self-image and overall quality of life.[52] Effective management of oligodontia is crucial to address complications like irregular occlusion, altered facial appearance, and difficulties in mastication and speech.[53]An interdisciplinary approach is usually required, with early diagnosis involving thorough medical and radiographic evaluations to rule out associated syndromes.[54]In this case, significant bone resorption made conventional removable dentures impractical, and traditional implant systems would have required extensive, complex, and costly bone augmentation procedures. The chosen implant system improved the patient's chewing ability, speech, and overall confidence.[55] A definitive treatment plan should consider factors like residual ridge configuration and remaining bone amount. In this case, basal implant insertion followed by fixed prosthetic restoration. [56]The successful outcome highlights advancements in managing complex dental conditions in younger patients, though further research and long-term follow-up are needed to assess the sustainability and broader applicability of these techniques.[57]

CONCLUSION

Basal implants demonstrated successful integration with the surrounding bone, achieving both functional and aesthetic improvements. Post-treatment evaluations showed significant enhancement in mastication and speech, along with satisfactory radiographic outcomes indicating strong bone integration and implant stability. The use of basal implants in this case of non-syndromic oligodontia in a young patient represents a significant advancement in dental restoration techniques. This approach not only addresses the immediate functional and aesthetic needs but also highlights innovative strategies for managing complex dental conditions in younger populations. Further research and longer-term follow-up are necessary to assess the sustainability and broader applicability of these techniques.

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Conflicts of interest
There are no conflicts of interest

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