ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 05 | May - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

DENTOALVEOLAR COMPENSATION AND CLINICAL LONGEVITY: A 30-YEAR STUDY ON IMPLANT STABILITY IN OCCLUSAL DYNAMICS.

Dentistry

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KEYWORDS

INTRODUCTION

This case study follows the remarkable journey of a 27-year-old woman, a patient who played a pivotal role in advancing scientific research. In 1993, she bravely opted for an innovative endosseous titanium blade implant to replace her upper lateral left incisor. Over 30 years, her natural teeth and the interposed prosthetic tooth remained untouched, a testament to the stability of the dental implant and the success of prosthodontic rehabilitation with a crown. Her dental implant journey is not just a captivating story, but a shared experience that offers a rare glimpse into the long-term effects of such treatments.

This case report is an exemplary instance of how private practice can contribute significantly to scientific research. The patient received an endosseous titanium blade implant in 1993, and the permanent prosthetic crown was affixed six months later. The case was documented after a 5-year follow-up to describe treating agenesis with a wedge-form implant(1).

Luca Dal Carlo, the treating dentist and author, played a crucial role in the patient's journey. He monitored the patient during the initial planning phase and observed an increasing discrepancy over the years between the levels of the prosthetic tooth's incisal edges and those of the adjacent natural teeth. Notably, there were no alterations to the natural or prosthetic teeth over three decades, and the crown lengths measured from the gingival margin, biological width of the Implant crown tooth #2.2, remained unchanged.

Clinical Case

Three decades after treatment, Dr. Luca Dal Carlo revisited the patient's dental implant in the 2.2 zone. In 1993, at age 27, A.N. sought treatment for an absent lateral left incisor. Dr. Dal Carlo, operating out of Venice, Italy, was tasked with this case.

Upon evaluation, it was determined that limited bone width requires either extensive bone graft or utilizing an implant modality, which had certain advantages with thin or knife-edge ridges.

Figure 1 Digital Picture Taken 30 Years After Completion Of The Implant-prosthesis Therapy In 2.2 (apr. 24th, 2023).

A blade implant, wedge-form implant, or narrow ridge implant indicates the narrow ridge. The implantation occurred on April 19th, 1993, with the final crown placement on October 11th. A subsequent five-year review highlighted the health of the peri-implant tissues.

As time passed, the margins of the prosthetic crown and adjacent natural teeth diverged, yet no alterations were made to any of the crowns. This static approach to treatment underscores the crown's resilience and the implant's integration over an extended period.

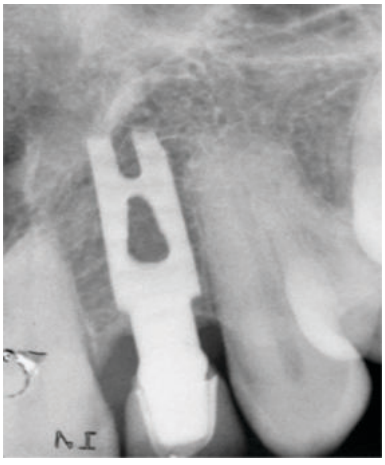

Figure 2 Analogic X-ray Taken 30 Years After Completion Of The Implant-prosthesis Therapy In 2.2 (apr. 24th, 2023).

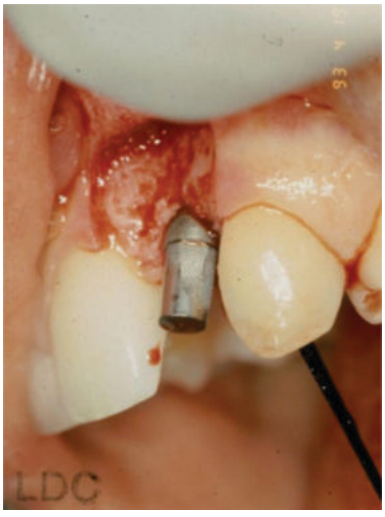

Figure 3 Analogic Picture Taken During The Intervention Of Blade Implant Insertion In 2.2 (apr. 19th, 1993). An Abutment Was Used To Carry The Implant In Position, And Then Immediately Removed And Replaced By Means Of The Healing Cap.

Figure 4 Analogic X-ray Taken At The End Of The Intervention (apr. 19th, 1993).

Figure 5 Analogic Picture Taken After Completion Of The Implant-prosthesis Therapy (oct. 11th, 1993)

Figure 6 The Length Difference Between The Prosthetic Crown In 2.2 And The Natural Crowns In 2.1 And In 2.3 Inexorably Grows During The Years.

DISCUSSION

The longitudinal study of dental implants reveals a complex interplay between prosthetic integration and bone dynamics. Initially, the dental community observed no contraindications to implant use; however, as clinical experience accumulated, more nuanced insights emerged regarding optimal insertion techniques and the potential limitations of implant use.

Since the 1950s, the bone response to successful dental implant insertion has been a subject of scrutiny, with early investigations utilizing vitallium implants to conclude that osseointegration occurred without interposing connective tissue—a process fundamentally divergent from the natural tooth-bone interface where a periodontal ligament is present (2,3). This ankylosis establishes a robust bone-implant connection distinctly different from the bone's relationship with natural teeth (4).

Dentists have frequently observed differences in positional stability between natural and prosthetic teeth in long-term follow-ups, particularly in younger patients. Such observations have prompted a reevaluation of the advisability of implant placement in individuals who have not achieved skeletal maturity, given the theoretical cessation of maxillary growth at the implant site (5-7).

The present clinical case suggests the possibility of ongoing maxillary growth throughout a patient's life, which may result in discrepancies between prosthetic crowns on natural and implanted roots. This finding raises a multitude of significant questions for the scientific community to consider:

- Is the observed stunted bone growth unique to oral implants, or is it also present in orthopedic implants, such as those in the hip or knee?
- Does the maxillae and mandible exhibit a similar growth pattern?
- Is it possible to predict and manage the discrepancies between implanted and non-implanted bone regions?
- What are the implications for dental bridges that utilize implants and natural teeth?
- What considerations should be made when treating the aesthetic zone?
- Do teeth promote the opposite effect, i.e., growth in contrast to the typical resorption observed in the upper jaw of the elderly?
- How should informed consent practices evolve in light of these findings?
- What are the potential legal implications for practitioners regarding patient outcomes?
- Can practitioners anticipate and plan for the eventual need to replace prostheses over time?
- Should implant prosthetic rehabilitation be included in insurance compensation following an accident?

The significance of this case is underscored by the rarity of consistent radiographic and photographic documentation spanning three decades. The presence of unchanged neighboring teeth provides stable reference points for tracking bone movement over time, thus isolating the impact of the implant.

Dentoalveolar compensation is an intricate adaptive process where the dental and supportive alveolar structures undergo modifications to maintain a functional bite despite underlying skeletal malocclusions. This adaptive capability is essential for balancing occlusal relationships and ensuring the efficiency of the masticatory system.

Understanding the nuances of dentoalveolar compensation is crucial for clinicians to develop effective treatment plans. It assists in predicting the potential for natural correction and designing orthodontic interventions that align with the patient's unique compensatory mechanisms. This understanding ensures a holistic approach to treatment, considering both the skeletal foundations and the dentoalveolar response to achieve functional and aesthetic outcomes.

The clinical case triggers a dialogue on the effect of dental implants on bone growth, initially presumed not to present implications. Historical research from the 1950s indicates that bone integrates with implants through ankylosis without connective tissue. However, dental practitioners have observed that implant sites in young patients might influence maxillary bone growth, prompting reconsideration of dental implants in patients before reaching full maturity (8-9). In this case, the documented growth of the maxilla raises intriguing questions about bone dynamics concerning implants, suggesting the potential for lifelong changes and their management (10-12).

CONCLUSION

The analysis of this case, alongside corroborative studies, strongly suggests that endosseous implants in the maxilla could significantly influence the relationship between implant-supported teeth and adjacent natural teeth. The implications extend to the continued growth of the upper jaw, which necessitates the consideration of potential prosthesis modifications over time. This evolving understanding not only prompts numerous inquiries and debates within the scientific community but also underscores the importance of our work in informing future dental practices.

This case underscores the dynamic nature of maxillary growth and its implications for implant-based dental rehabilitation. It challenges established beliefs and calls for a deeper understanding of the long-term evolution of treated and untreated bony areas with an integrated titanium implant. As this case elucidates, the aesthetic zone presents challenging and unique considerations, stimulating ongoing scientific discussion and analysis of dental implantology. It also highlights the

urgent need for further research and the crucial role each of us plays in advancing our understanding in this field.

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