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RESEARCH ARTICLE

A COMPREHENSIVE ANALYSIS OF THE BLADE (NARROW RIDGE) IMPLANT: ENHANCING CLINICAL VALIDITY AND FUNCTIONAL SUCCESS OVER FIVE DECADES

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ABSTRACT

Dental implants have revolutionized dentistry by providing an effective solution for patients with missing teeth. In recent decades, extensive research and advancements in implantology have led to the development of various designs and materials, all aimed at improving clinical validity and functional success. One such design, the blade, initially introduced by Leonard I. Linkow and further modified by Ugo Pasqualini and Marco Pasqualini, has gained significant attention for its unique features and obtained outcomes.

The purpose of this article is to present a comprehensive analysis of the clinical validity and functional success of the blade implant and as a clinical example we describe the rehabilitation of an edentulous central incisor of a young patient, observed over the course of five decades. By examining the blade's design, materials, modifications, and long-term outcomes, this study offers valuable insights into its effectiveness, stability, and patient satisfaction.

Keywords: Blade implant, Narrow ridge implant, Wedge implant, Time test

INTRODUCTION

The wedge form or narrow ridge implant (blade), has become a widely used and essential component of modern oral implantology. This modality continuously evolves, significantly inspiring technological advancements in developing surgical instruments.

In 1968, Leonard Linkow introduced the concept of blade and developed a comprehensive procedure protocol. His goal was to design a technique to simplify the insertion process and minimize complications for dentists.

Linkow's original design of the blade was a single stage surgical and prosthetic protocol.[1,2]

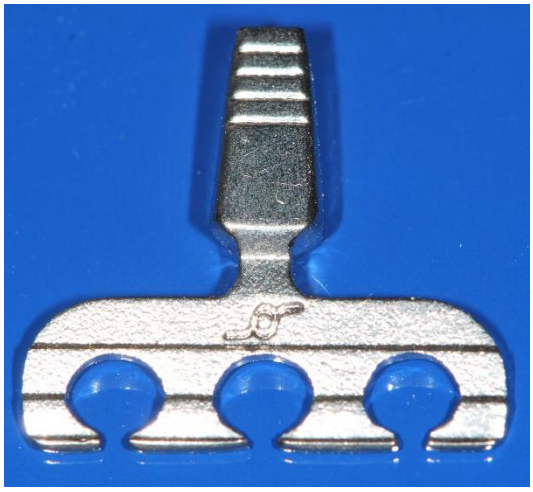

Fig.1 One of the Linkow blade.

In 1972, Ugo Pasqualini made significant modifications to the blade design, based on the theory of undisturbed healing. The redesigned implant now featured a body, shoulder with a neck and a screw on abutment. One notable addition was the incorporation of a tissue forming healing abutment or cap made of Teflon. The detachable abutment allowed for a protected healing process, providing guidance and support for the surrounding hard and soft tissues, thus preventing premature strain or injury. Additionally, the implementation of the healing cap facilitated a gradual and controlled load, promoting the natural formation of biological width and creating harmonious soft tissue contours. The two stage protocol has greatly improved the survivability of blade dental implants.[3]

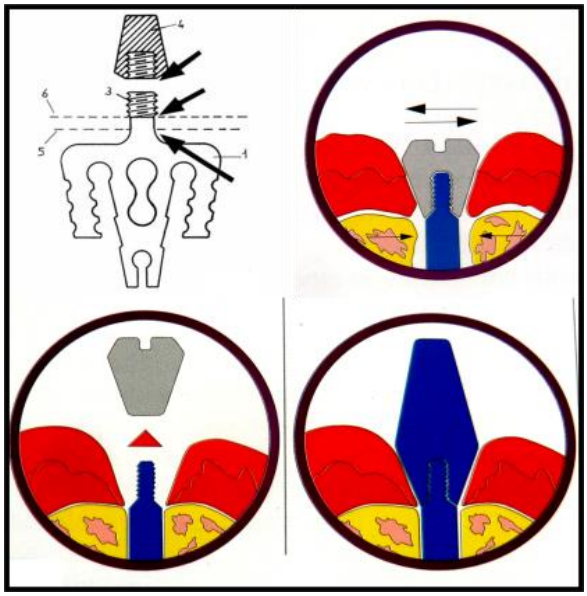

Fig.2 The screwable abutment blade, the temporary Teflon healing abutment models the mucosa according to the profile of the definitive abutment which replaces it once osteogenesis is complete (1972)

MATERIALS AND METHODS

The placement of blade implants involved a longitudinal incision and a mucoperiosteal full-thickness flap design. The osteotomy was then performed on the edentulous bone crest, with a long sagittal groove that is 1.5 times the length of the blade in order to accommodate the projected length of the implant. This groove could be outlined using a series of dots made with a fissure surgical bur, which were later connected to create the groove. The depth of the osteotomy was controlled using marks on the surgical drill and depth-

measuring instruments. Drilling was done with copious irrigation to minimize overheating of the bone.

Linkow recommended using conservative flaps during the procedure, to prevent air entrapment (air embolism) in the soft tissue. This suggestion was made to protect the patient from complications associated with using high-pressure air instruments.

Doctors place a blade by gently tapping it into the bone using the press-fit technique. The upper part of the blade, known as the shoulder, was positioned approximately 2 mm below the crest of the bone to ensure complete implant coverage by the surrounding bone. After implant placement for a two-stage protocol, Teflon coping was screwed into the neck portion, and the flap was repositioned and situated around the Teflon healing cap to promote proper healing.

Lately, new instruments have been introduced for preparing the bone and blade placement; Pneumatic and mechanical hammers and ultrasonic piezoelectric bone cutters are being used to improve the osteotomy process for implants, making the process more precise and less complicated[4,5].

When the one-stage implant was securely placed within the compact bone and emerged from the opening in the mucosa, it created a biological seal around the prosthetic abutment. However, the extended abutment, which is part of a one-piece blade, can pose a risk of premature loading due to habitual and mastication or forces applied by the tongue during swallowing. Close monitoring and appropriate precautions should be taken to avoid these complications. Pasqualini's modifications greatly improved the blade's survival and success rates. Adding a two-stage protocol by replacing the abutment with a healing cap emphasized undisturbed healing, enhanced and protected the implant's ability to integrate within the surrounding bone and soft tissues, and improved patient outcomes.

Histologically, the behavior of bone around the blade is similar to that observed with other endosseous implants. The adaptability of the blade body to narrow ridges makes it a suitable choice for specific cases, eliminating the need for long waits and more extensive and less predictable procedures like bone grafts, which are frequently required for root-form implants[6,7,8,9].

Clinical Validity and Functional Success:

The two-stage Pasqualini's polymorphic blade, has demonstrated remarkable clinical validity and functional success. Introducing the detachable abutment and the two-stage protocol has provided clinicians with enhanced control over the healing process, resulting in increased success rates. The extensive research in terms of the delayed load or staging load conducted by Pasqualini and his collaborators in university institutes includes animal experiments, and this was the first clinical evaluation. The staged protocol further validated the clinical efficacy of the blade.

Furthermore, this implant has consistently exhibited longevity and stability throughout the five decades of research. This integrated implant provides a strong foundation for prosthetic teeth, ensuring long-term stability and functionality. The presented documented case is evidence of the robustness and

consistency of this dental implants, showcasing sustained functionality and patient satisfaction[10,11,12].

RESULTS

Pasqualini's case report highlights the success and longevity of dental implants.

In 1972 encountered a patient with a missing left central incisor and a severely resorbed maxillary alveolar bone. This presented a challenge for implant selection and postoperative care. To address this, a modified blade implant was inserted and allowed to heal and integrate for three months.

Once the implant had fully integrated, the teflon healing cap was replaced with a customizable permanent abutment. The abutment was adjusted, and the standard crown/bridge impression technique was used to reproduce it on the laboratory model. A porcelain fused to a gold crown was then fabricated and inserted.

The success of this procedure was recognized at the national meeting of the Association of Italian Dentists in Milan in 1978 and subsequently published in national and international journals[13,14,15].

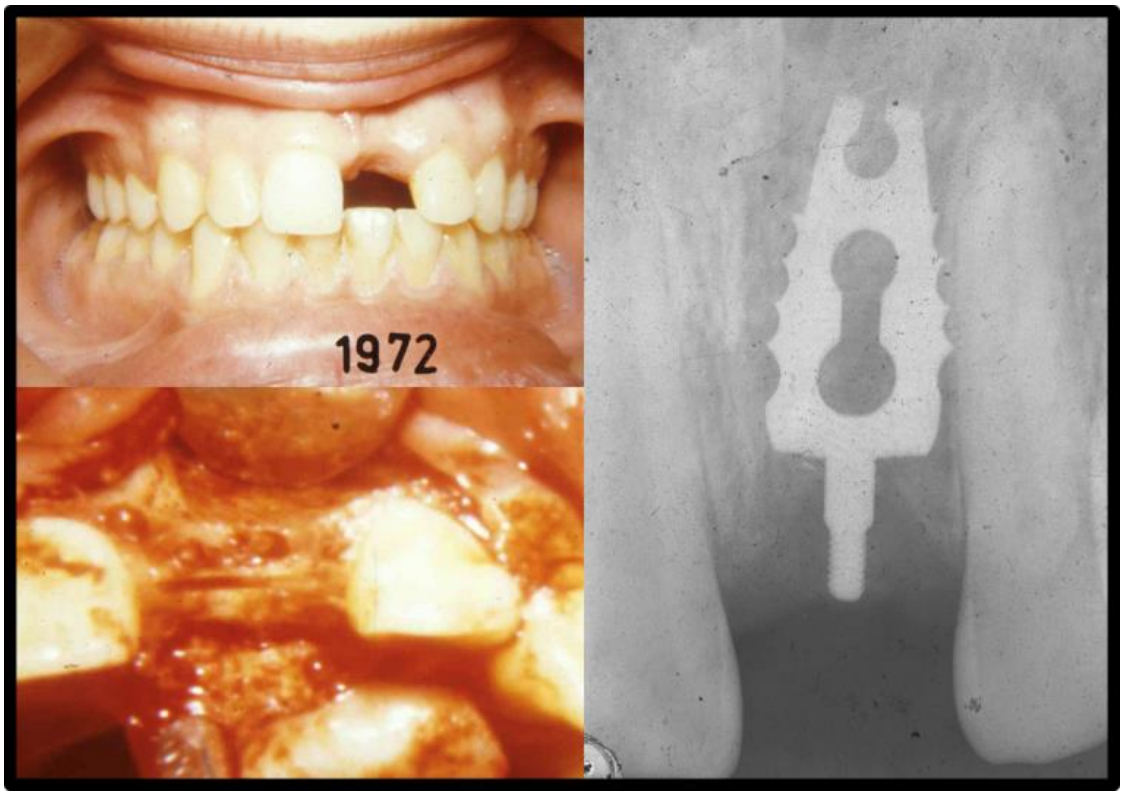

Fig.3 Loss of the upper left central incisor in a 16 year old boy (1972). X-ray of the inserted blade

Fig.4 Appearance of the healed mucosa after 3 months around the protective Teflon abutment, The newly inserted definitive prosthetic abutment, The single gold-porcelain crown: observe the boy's beardless chin (1972) and the x-ray of the completed case.

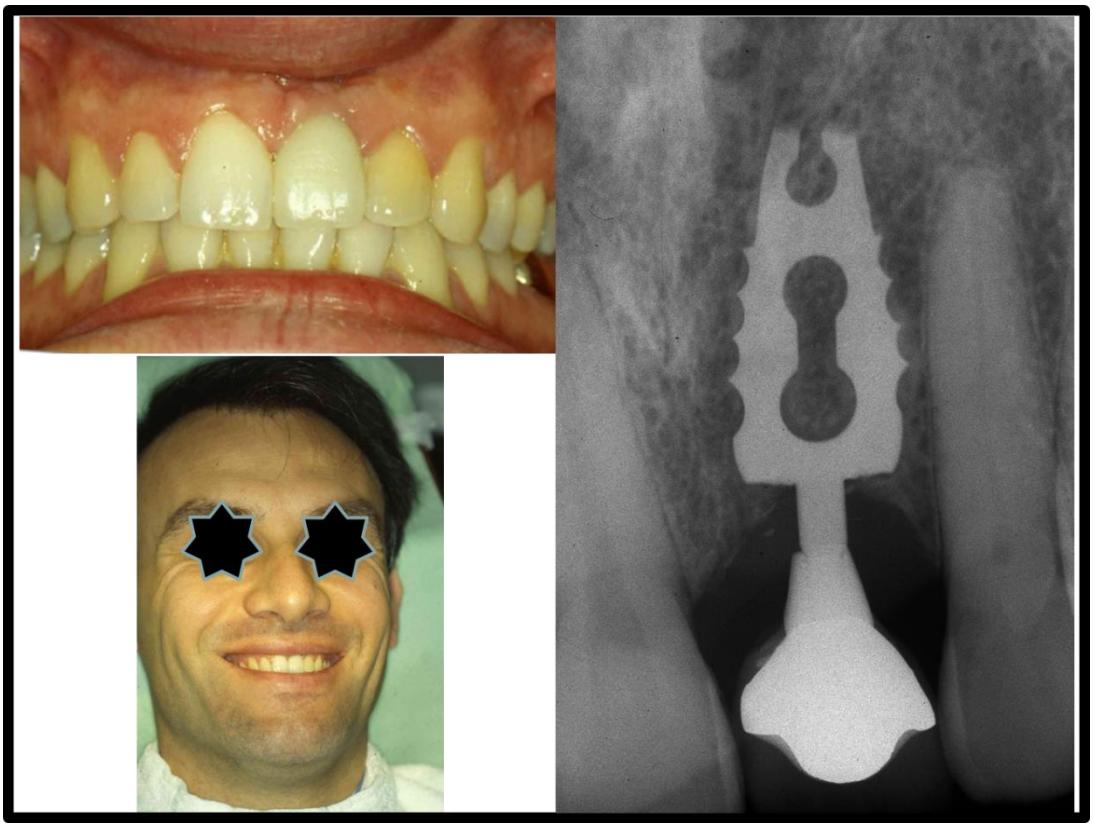

Fig.5 Follow-up at 27 years

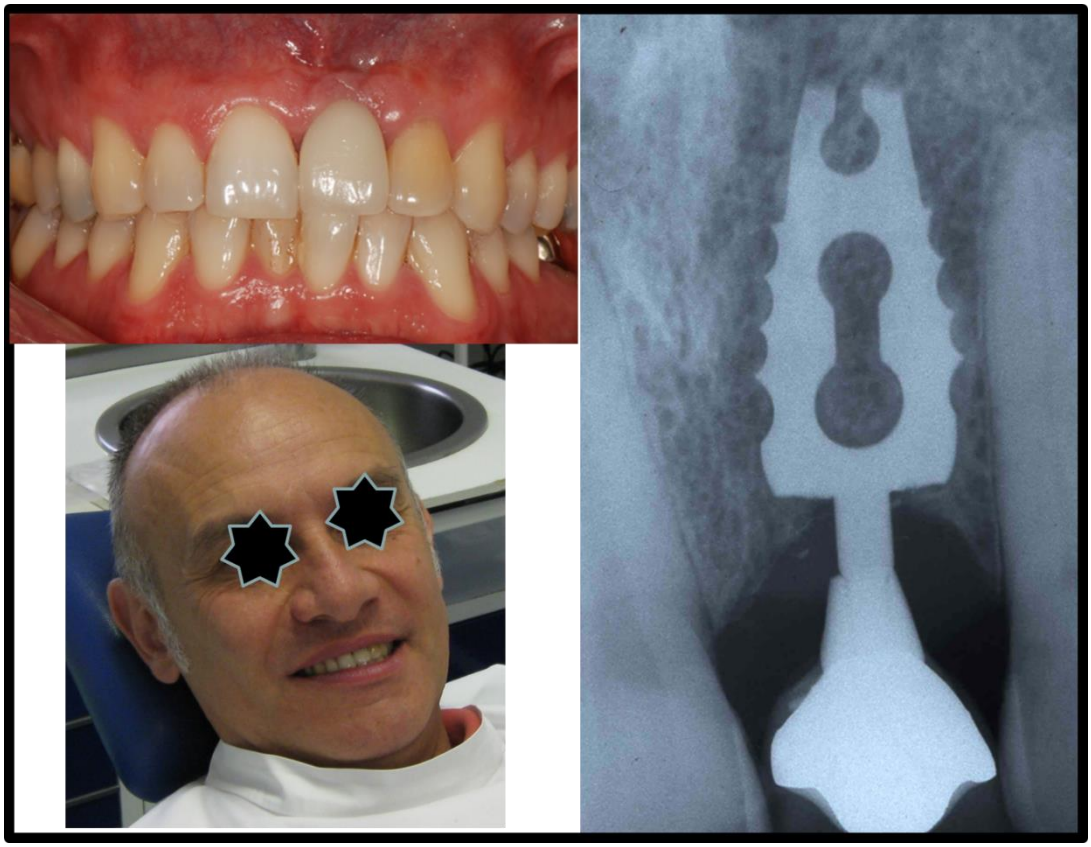

Fig.6The same case checked 38 years later: note the signs of age. Radiographic analysis demonstrates the absence of any recession of the enclosing tissues (2010).

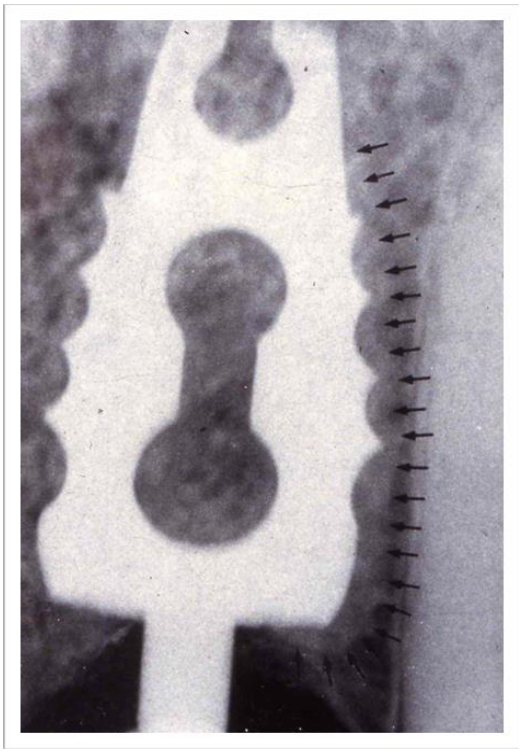

Fig.7A radiographic enlargement to highlight the formation of a "lamina dura" (arrows) around the implant.

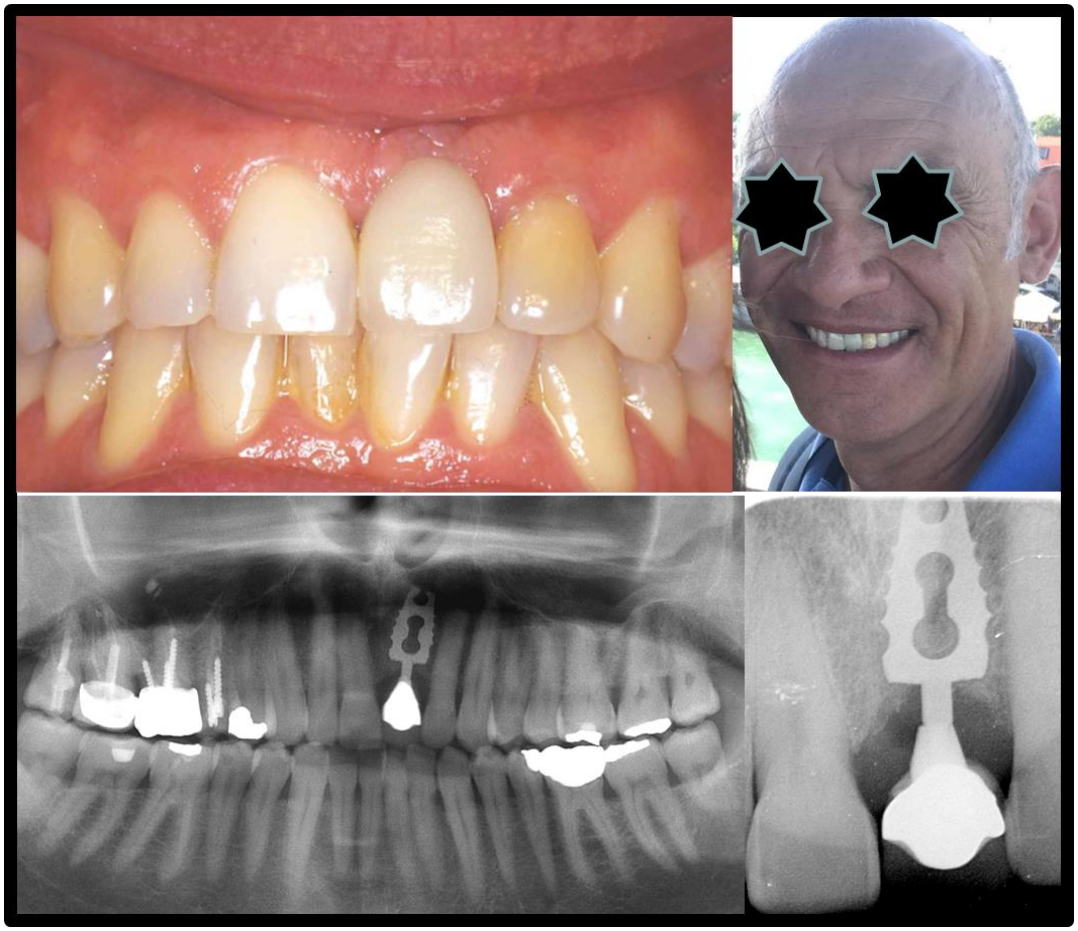

Fig.8 Check-up 50 years after implant prosthesis surgery (1972-2022)

DISCUSSION

In 1972, U. Pasqualini emphasized the importance of optimal surgical wound healing and implant integration. He highlighted that complete submergence of the implant, without any communication with the outside environment, creates favorable conditions for successful healing in certain clinical situations. The purpose of submerging the implant is not only to prevent microbial contamination but also to eliminate the harmful stress applied to exposed abutments.

During the oral-pharyngeal phase of swallowing, the tongue exerts significant pressure and can easily overload the abutment/implant. This creates tremendous stress, which can range from 20 to 200 kPa, depending on the size of the tongue. Such powerful torsion forces can jeopardize implant integration and compromise osteogenesis at the bone-implant interface.

This study emphasized that bone remodeling and resorption are influenced by the stress or forces applied to the implants. To study how stress influences implant integration, bone resorption, and opposition, laboratory tests were conducted[16,17].

The extensive animal experiments were conducted in collaboration with three prestigious national university institutes: the Institute of Dental Clinic of the University of Modena, the Institute of Pathology and Special Surgical Veterinary Clinic of the University of Milan,

and the Institute of Pathological Anatomy of the University of Modena. The monographic publication detailing these experiments, spanning over 100 pages, was awarded the prestigious "Campione d'Italia" prize in 1962.[18,19]

In conclusion, the blade implant, as modified represents a significant advancement in dental implantology. The modifications made to the original Linkow's design, including the introduction of a detachable abutment and the implementation of a two-stage protocol, have significantly enhanced the implant's success rates and long-term stability [20,21].

The longevity and reliability of oral implantology are evident in this case, and many others presented in peer-reviewed literature.

The implant inserted has been functioning successfully for over fifty years. The two-stage approach, progressive load, and single-stage tissue contouring cap utilized in this procedure demonstrate the advancements and achievements of the field[22,23].

CONCLUSION

Leonard Linkow and Ugo Pasqualini's implant and treatment protocol have proven to be durable and effective, showcasing the reliability of oral implantology. The extensive data collected from successfully documented cases using their implant have contributed greatly to the global knowledge on implant integration and clinical success rates. This wealth of information strengthens our understanding of oral implantology and solidifies it as a reliable and effective treatment option for patients.

Their pioneering work has paved the way for advancements in implant technology and protocols, further improving patient outcomes. In particular, the documented case of the blade serves as a valuable resource for dental professionals, providing evidence-based information to guide treatment planning and decision-making. As dental implantology continues to evolve, the contributions of the blade to the field will undoubtedly inspire further research and advancements. By combining scientific rigor with clinical expertise, dental professionals can continue to enhance the clinical validity and functional success of dental implants, ultimately benefiting patients worldwide.

The blade implant has United States Food and Drug Administration approval and continues to be a widely used and respected implant modality, with ongoing advancements and refinements in surgical techniques and instruments. Its contribution to the field of oral implantology cannot be understated.[24,25]

The blade becomes suitable for application in atrophic edentulous ridges that lack bone volume. It utilized anchorage from the adjacent lateral cortices, ensuring primary stability and enabling implant integration.

Conflict of Interest Statement:

The authors have no conflicts of interest to declare.

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Declaration Statement:

Please note that the owner of the proposed clinical case has given his written consent to the disclosure of the photos presented in this publication.

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References:

1. Linkow LI. The blade vent—a new dimension in oral implantology. *Dent Concepts*. 1968; 11:3-12.

2. Linkow LI. The endosteal blade-vent. *J Prosthet Dent*. 1973;30:611-612.

3. Pasqualini U. Endosseous implants. Protection of reparative osteogenesis with the "screw stump". *Dent Cadmos* 1972 Aug;40 (8):1185-94

4. Linkow LI. Implant dentistry today. A multidisciplinary approach. 1990; *V.1 Piccin* Padova: 35-58

5. Rossi F., Pasqualini M.E., Grivet Brancot L., Colombo D., Corradini M., Lorè B., Calabrese L. Minimally invasive piezosurgery for a safe placement of blade dental implants in jaws with severe bone loss. *J Osseointegr* 2014; 6(3): 56-60.

6. Ricciardi A. A two Year Report of a Human bone block. *Quintessence International Dental Dygest* 1977;1:9

7. Di Stefano D, Iezzi G, Scarano A, Perrotti V, Piattelli A. Immediately loaded blade implant retrieved from a after a 20-year loading period: a histologic and histomorphometric case report. *J Oral Implantol*. 2006;32(4):171-6.

8. Trisi P., Quaranta M., Emanuelli M., Piattelli A. A light microscopy, scanning electron microscopy and laser scanning microscopy analysis of retrieved blade implants after 7 to 20 years of clinical function. A report of 3 cases. *J Periodont* May 1993;64(5):374-378

9. Bianchi AE, Gallini G, Fassina R, et al. (1994) Sem analysis of bone-titanium interface of a blade-vent implant. *Il Dentista Moderno* 7: 1107–1113.

10. Buser D, Sennerby L, De Bruyn H. Modern implant dentistry based on osseointegration: 50 years of progress, current trends and open questions. *Periodontol 2000*. 2017 Feb;73(1): 7-21.

11. Misch CE. Osteintegration and the submerged blade-vent implant. *J Houston Dist Dent Soc* 1988:12-6.

12. Dal Carlo L, Pasqualini M.E, Nardone M, Linkow L. Blade implants in the treatment of thin ridges. *Implants the Intrnational C.E. Magazine of Oral Implantology North American Edition* 2013; 2: 15-18.

13. Pasqualini M.E. Prosthetic implants in monoedulism: retrospective case analysis after 27 years. *Dent Cadmos* 1999;10:61-64.

14. Pasqualini ME. Prosthetic implants in monoedulism: retrospective case analysis after 38 years. *Dent Cadmos* 2010; Dec; 10:65-70

15. Dal Carlo L, Pasqualini ME, Carinci F, Corradini M, Vannini F, Nardone M, Linkow LI. A brief history and guidelines of blade implant technique: a retrospective study on 522 implants. *Annals of Oral & Maxillofacial Surgery* 2013; Feb 01:1-3.

16. Dal Carlo L. Tongue's Influence on the Integration of Endosseous Implants. *Doctor OS* Mag. 2003;14(5): 479-484.

17. Szmukler-Moncler S., Salama H., Reingewirtz Y., Dubruille J.H. Timing of loading and effect of micromotion on bone-dental implant interface: review of experimental literature. *J Biomed Mater Res*. 1998 Summer; 43(2):192-203.

18. Pasqualini U, Pasqualini M.E. *Treatise of Implant Dentistry*. *Ariesdue* Carimate Como; 2009:28-82.

19. Dal Carlo L, Shulman M, Pasqualini ME: Advanced Implant Dentistry The Multi-modal Approach. *Lambert Ac. Pub*. Chisinau, 2022

20. Strecha J, Jurkovic R, Siebert T, Prachar P, Bartakova S. Fixed bicortical screw and blade implants as a non-standard solution to an edentulous (toothless) mandible. *Int J Oral Sci*. 2010 Jun;2(2):105-10.

21. Linkow LI, Winkler S, Shulman M, Dal Carlo L, Pasqualini ME, Rossi F, Nardone M. A New Look at the Blade Implant. *J Oral Implantol*. 2016 Aug;42(4):373-80.

22. Mangano F, Bazzoli M, Tettamanti L, Farronato D, Maineri M, Macchi A, Mangano C. Custom-made, selective laser sintering (SLS) blade implants as a non-conventional solution for the prosthetic rehabilitation of extremely atrophied posterior mandible. *Lasers Med Sci*. 2013 Sep;28(5):1241-7

23. Dal Carlo L, Pasqualini M, Shulman M, Rossi F, Comola G, Manenti P, Candotto V, Lauritano D, Zampetti P. Endosseous distal extension (EDE) blade implant technique useful to provide stable pillars in the ipotrophic lower posterior sector: 22years statistical survey. *Int J Immunopathol Pharmacol*. 2019 Jan-Dec;33: 1-5 20587384 19838092.

24. Hughes C: Letter to the editor. *J Oral Implantol* 2014; XL (Five) :523-524

25. Pasqualini ME, Rossi F, Dal Carlo L, Shulman M. The scientific documentation and the clinical History of the longest single implant published in the international literature: "50 years of function". *Doctor Os* 2023; Jan; XXXIV (01): 10-15