# Multi-Modal Oral Implantology. The Screw-Blade Single-Implant for the Replacement of the Upper Molar: A Case Report

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# ABSTRACT

Intense forces are naturally downloading on molar roots. Due to inflammation, the post-extraction sockets of the upper molars are often poor of bone on one side. A single implant supporting a prosthetic crown can easily go subject to displacing forces that reabsorbed and recently healed bone can hardly bear. By utilizing a couple of prosthetic roots, i.e.: one screw implant in the side in which bone is richer and one blade implant in the side in which the bony wall has gone subject to reabsorption, it is possible to build a better supported prosthetic crown. The clinical cases performed by the Authors confirm the validity of this implant architecture.

Aim of the work is to describe a post-extraction multi-modal implantological technique useful for replacing the roots of upper molars with poor bone support on one side.

*Materials and methods:* Combination of submerged screw implant and submerged blade implant or emergent screw implant and emergent blade implant welded intraorally.

*Discussion:* The combination of a palatal screw implant and a buccal blade implant, or vice versa, allowed to solve clinical cases and to make reliable prosthetic crowns.

*Conclusions:* The presence of variable residual anatomies in the molar area of the upper jaw recommends the use of morphologically different implant shapes, suitable for the construction of a biomechanically functional prosthetic abutment. Specifically in the presence of bone resorption, the combination of a screw implant and a blade implant allowed us to obtain a reliable abutment. Given the small number of cases performed, further research will confirm the positive results of this technique.

**Keywords:** Blade implant, post-extraction implant, wedge form implant.

## I. INTRODUCTION

The placement of a post-extraction implant to replace a compromised natural root is a therapy widely practiced by specialists, especially with screw implants. In the case of single-rooted teeth, the screw implant usually has a size compatible with the prosthetic crown, without any particular bending and displacement forces being generated. In the event that the tooth to be replaced is a molar, it is often necessary to provide the support of more than one implant, because a single large-caliber implant is not always compatible with the residual bone anatomy. In these cases, different solutions are described in the literature: two submerged screw implants [1], [2] two welded emergent screw implants [3], stabilized screw implants with welded thin cylindrical implants [4]. The different choices derive from the need or not for immediate loading or from that of protecting the implant from intraoral destabilizing forces, mostly related to the thrust of the tongue in swallowing [5]

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and to chewing trauma in the period necessary for osteointegration. In the upper molar, the outcome of periodontal pathologies to which the roots have been subjected can lead to asymmetrical resorption of residual bone, leading to the use of a palatal screw implant associated with a vestibular blade implant or vice versa [2]. The results, in the cases performed, were satisfactory. We therefore consider this option as an additional therapeutic choice, also in consideration of further verifications.

## II. DIAGNOSTIC AND THERAPEUTIC QUESTIONS

Frequently, the post-extraction site of a compromised upper molar is very critical for implantology. Before proceeding to place an implant, you need to ask yourself a few questions.

1) How deep is the remaining bone tissue?

2) What is the nature of the inflammatory or erosive

process that led to the extraction of the tooth?

3) Which degree of bone resorption has been caused by the periodontal desease?

4) What is the arrangement of the remaining alveoli after extraction?

5) What is the state of the residual soft tissues?

6) Is it advisable to insert an implant or more than one?

7) How far is the distance to the opposing teeth?

8) Do the opposing teeth follow the Spee and Wilson curves?

9) Will the prosthetic crown be at risk due to the stress of the dynamic movements of the inferior jaw?

10) What forces will the prosthetic crown be subjected to?

11) What material is the antagonist made of?

The requirements that the new dental-root prosthesis will have to comply with are numerous and absence of attention to one or more of them could lead to premature failure of the therapy. One of the aspects that help the treatment with implants of this anatomical site is constituted by the fact that the edentulous site does not present problems of aesthetic importance and therefore classical biphasic implantology techniques can be used, following the timeline protocols for the formation of a valid bone tissue.

### III. ANALYSIS OF THE QUESTIONS

The depth of the bone tissue above the apex of the roots of the upper molar (question no. 1) is often deficient due to the presence of the maxillary sinus. Very frequently the roots of the upper molars even protrude into it.

The permanence of the bone tissue that enveloped the dental roots is strongly conditioned by the pathological processes that the tooth has undergone over the years (questions 2 and 3). Normally, the upper molar has three well-separated roots. Following tooth extraction, it is usual to find a strong resorption of the bone surrounding the vestibular roots, while the palatine alveolus remains well preserved. On the contrary, a molar with fused roots easily leaves, as a residue, a well centered alveolus in the alveolar process, easily treatable with a wide-diameter screw implant (Fig. 1A and 1B).



 Fig. 1A. Wide-diameter submerged screw implant inserted after extraction of an upper molar with fused roots, which protrude into the maxillary sinus.
Fig. 1B. Intra-operative radiograph of a wide-diameter submerged screw implant inserted after extraction of an upper molar with fused roots.

Three diverging dental roots is the most frequent anatomical condition for superior 1<sup>st</sup> molars. If the bone tissue of the alveoli is well preserved and the surgical extraction maneuver has been careful, it is possible to treat the three alveoli with two / three screw implants, obtaining a well-stabilized abutment in the bone tissue [6]. However, this is an infrequent occurrence (Fig. 2).



Fig. 2. Two submerged screw implants inserted immediately after extraction in the palatine and vestibule-distal alveoli of an upper 1st molar and one submerged screw implant inserted immediately after extraction in the center of the alveolus of 2nd molar. The implants are enveloped in sufficient bone tissue. In the box upper right, situation after healing is displayed.

Very often, the bone tissue that surrounds the vestibular roots is strongly resorbed, counter-indicating the placement of vestibular screw implants, due to the lack of the external wall (questions 3-5).

The placement of a single implant in the palatal alveolus is often possible, but it involves the creation of a prosthetic crown in occlusal disharmony, therefore it could more easily deceive and/or produce stress on the implant-prosthetic component (peri-implantitis and / or fatigue fracture of the implant) [7]. In situations of occlusal inversion, this stress is further exacerbated (Fig. 3).



Fig. 3. If the prosthetic crown is supported by an implant positioned in the palatal alveolus of the extracted upper molar, the moment of force that is expressed in the functional movements tends to decree it, unscrew it or even break it. The presence of occlusal inversion aggravates the clinical situation, since the upper vestibular cusp is found to occlude with the center-fossa of the antagonist.

The non-axis positioning of the implant, for obvious biomechanical reasons, increases the risk of failure, especially in sites subject to intense load. In this regard, a simplified, easily applicable scheme was proposed by Fanali, with the Implant Prognostic Index (IPI). This index relates the horizontal distance between the implant axis and the antagonist, the vertical distance, and the inclination of the implant. From the three values, combined, we derive the index, which can indicate a low, medium, high, or very high risk. In the case of a misaligned implant inclined towards the palate, the risk index is high or very high [8].

It is therefore preferable to use two screw implants, as

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exemplified in Fig. 2. If the vestibular bone tissue underwent recession, the outermost screw implant would lack the space useful for the neoformation of bone tissue of adequate thickness, with the risk of dehiscence and consequent exposure of the coils (Fig. 4, left). The alternative is the insertion of a flat wedge-shaped implant, such as a Linkow-type blade (blade wedge-form implant) [9]-[13], in the residual bone tissue, which is more predictable than placing a screw implant without support of native bone tissue from the vestibular side. The blade implant, together with a screw positioned in the palatal alveolus, constitutes a balanced abutment from the bio-mechanical point of view, because the axial forces are transmitted to the cortical bone, thus eliminating bending momens of force (Fig 4, right).



Fig. 4. The use of two screw implants to replace the roots of a molar is indicated if the two implants are wrapped by at least two millimeters of bone thickness. Often this thickness is not present, and the use of a flat implant is recommended.



Fig. 5. CT 4 years after the mono-implant surgery consisting of a blade and a screw welded intraorally, inserted in area 1.6. The two implants are superimposed in the lateral view, while they are clearly distinguishable in the frontal and occlusal sections (TC sections 11-13). Also notice the single implant in zone 1.7-1.8 (2 screw implants 6 years after surgery) and the single implant in zone 1.5, replacing a single rooted tooth (screw implant 9 years after surgery).

In this way, a support area is created which collects the resultant of physiological, occlusal, and masticatory forces inside of it [2]. The flat shape of the blade withstands lateral forces (Fig. 5). This treatment strategy can also answer questions 4, 7 and 10.

## IV. CLINICAL CASE

Patient G.F., male, age 60, in good general health. The tooth element 2.6 was severely compromised (Fig. 6) and with the patient consent it was extracted (May 28, 2015). At

the same time, having ascertained the presence of a palatal alveolus still endowed with bone support in all its circumference, it was decided to immediately place, after an adequate surgical toilet, a submerged screw implant. On the contrary, the severely periodontopathic vestibular roots had determined the loss of most of the vestibular bone support, so it was decided to insert a submerged blade implant (AZ Implant, Bologna Italy), in order to obtain a vestibular pillar leaving adequate space for neoformation on to the residual bone tissue (Fig. 7-9).



Fig. 6. Pre-operative X-ray (Dec. 16, 2014).



Fig. 7. Wedge-form submerged blade implant with hexagonal connection.



Fig. 8. Positioning, immediately after extraction, of a submerged blade implant in the buccal alveolus and a submerged screw implant in the palatal one.

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Fig. 9. RX. Positioning, immediately after extraction, of a submerged blade implant in the buccal alveolus and a submerged screw implant in the palatal one.

Six months later, the healing screws were removed (Fig. 10), the definitive abutments were fixed (Fig. 11) and the necessary steps were then carried out for the realization of the definitive prosthetic crown, fixed to two implant roots.



Fig. 10. The two implants in zone 2.6, palatal screw and buccal blade, after freeing the overlying gingival layer and removing the cover screws.



Fig. 11. The two implants, blade and screw, at the time of the final impressions.



Fig. 12. Detail of the orthopantomography 5 years after the intervention (2020).

## V. DISCUSSION

The possibility of using different implant shapes allows to broaden the horizons of treatment of complex clinical cases, avoiding procedures for modifying the residual bone anatomy, which are unpredictable especially when tissue regeneration or grafting are carried out in anatomical sites that have been subjected to inflammation for a long time. The need to create a structure with bio-mechanical equilibrium leads to the search for alloplastic posts that are able to withstand, without lateral deflections, the axial forces applied to the prosthetic crown. In the upper molar site, the combination of screw implant and blade implant allows to obtain a good clinical result even when the vestibular bone tissue is particularly reabsorbed. Our experience using single crowns supported by different shapes of implants confirms previous histological and research conclusions about identity of bone response and capability of withstanding masticatory forces by screw-type and wedge-type implants [14]-[33].

#### VI. CONCLUSIONS

With this technique, the variety of single edentulous solutions is enriched by a method that, although used in a small number of cases, has so far given positive results. Further research will have to be carried out in order to include it in the suggested treatments of upper molar post-extraction alveoli with vestibular bone resorption.

### CONFLICTING INTERESTS

Authors declare that they do not have any conflict of interest.

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