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CASE REPORT

Extra short implants in jaws with extreme vertical resorption: Case series

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ABSTRACT

Introduction: The use of in vitro implants can repair severe resorption. This sometimes requires the use of prostheses in the most extreme cases, when the proportion of crown implants is not ideal, to reach 2:1 or 3:1. Materials and methods: Clinical analysis was carried out on implants with a residual of 5.5 mm or less and more than 6 months. Chi square test was used for categorical variables and student test was used for continuous variables. Then, a linear fitting regression model is established. **Results:** Six patients received in vitro implantation. 21.2% of the patients in the study were male and 78.8% were female, with an average age of 57 years. The average crown planting ratio was 3.19 (+/–0.24). The average bone loss of the implant was 0.86 mm (+/–0.33) in the near median position and 0.83 mm (+/–0.47) in the anterior position. There was no statistically significant difference in the functional proportion of proximal and distal bone loss (P = 0.224). **Conclusion:** According to the data provided in this study, even if the crown implant.

Keywords: dental implants; atrophy; bone resorption; oral rehabilitation

1. Introduction

The treatment of posterior alveolar ridge defects in patients with severe maxillary bone resorption is a challenge for every surgeon. In these cases, there are different bone regeneration techniques, such as transplantation with or without membrane and bone traction[1–5]. In many cases, the grafts are reabsorbed to varying degrees. Resorption usually occurs due to the presence of severely atrophic blood vessels and cell density differences in these areas. In addition, there is very thin soft tissue in these areas, which makes it difficult to obtain good gingival coverage and one-time closure without tension or suture dehiscence when placing a large number of grafts[6–8].

In vivo explants were created to address the need to simply repair these subsequent parts while avoiding the more complex assistive techniques described above. The main problem when using these implants is whether the survival rate is equivalent to that of other implants with larger length, and how to solve these problems to ensure that the whole implant performs well in biomechanics.

According to relevant published studies, the

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survival rate of short implants can be comparable to that of "traditional length" implants (following the cautious scheme formulated by the team of Anitua et al.), in which the atrophy is very serious and the implants are in vitro[9,10]. The data of these implants published by our research group showed that the survival rate was 98.2%[11] during an average follow up of two years.

The treatment plan developed for these implants includes the following steps: Biological milling (no watering at low speed) to form an implant bed, which relates to the repair of the implant. The implant bed contains an intermediate component (across telial multi IM), which produces the "overall" behavior of the system, produces better load transfer to the bone, and maintains tightness to ensure that there are no bacteria in the interface[12–18]. In this way, the length of the epithelium is combined with the length of the implant, which reduces the lever arm of the prosthesis and thus the ridge stress.

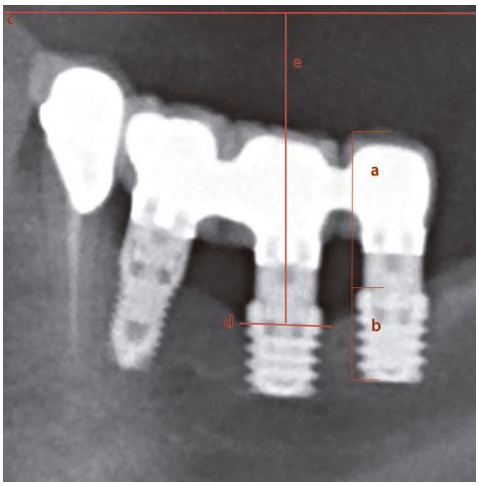
Based on a series of cases, this paper attempts to retrospectively evaluate the behavior of these implanted and repaired in vitro implants in the area of extreme bone resorption by analyzing the rate of marginal bone loss and the effect of prosthesis on joints.

2. Materials and methods

A retrospective study was conducted by selecting patients with ultra-long implants located in the posterior segment of the mandible. In these patients, due to the extreme resorption of bone, the implant needs to be inserted, and the minimum loading time is 6 months. In all patients, demographic variables, harmful habits (tobacco and alcohol), prosthesis data (crown implantation rate, prosthesis type related to the number of parts and manufacturing materials) and marginal bone loss (measured at the proximal and distal ends of the implant) were collected.

To determine the proportion of crown implants, we measured crown height gap (CHS) and bone loss using calibrated panoramic X-rays. All patients were positioned according to a strict protocol. Once the X-ray is obtained, the length of the X-ray is calibrated using specific software (sidexis, Sirona dental systems, Bensheim, Germany), which is the same as the length of the dental implant. Through the calibration measurement, the actual measurement of X-ray can be carried out (1:1 scale).

The crown implant ratio was determined by dividing the length of the implant by the length of the prosthesis placed on it. The crown height of the long axis of premolars and the middle crown area from the vestibular sulcus (interdental sulcus) of molars to the implant platform were measured. The measuring line must be completely perpendicular to the implant platform and at an angle of 90° to the implant platform (**Figure 1**).



Potential bone atrophy was observed in both maxillae when the removable prosthesis was removed

Figure 1. Measure the height of the crown (a) relative to the implant (b) and the height from the implant platform (d) to the eye plane (c).

In order to determine whether there are statistically significant differences between the two groups, Chi square test was used for categorical variables and student T-test was used for continuous variables. $P < 0.05$ was considered as the statistical significance of the statistical test used.

3. Results

We recruited six patients over the age of 18 who received in vivo implants. 21.2% of the subjects were male and 78.8% were female, with an average

age of 57 years. In any case, assisted surgical techniques were not used in implant surgery, and all implants were performed in two operations with a waiting time of up to three months.

The average crown implant ratio of implants was 3.19 (+/– 0.24 mm), ranging from 3 mm to 3.64 mm. All implants included in the study were ferulized, forming a bridge between two to four implants. 100% of cases were mainly screw fixation. All implants were repaired with a system consisting of percutaneous im (Tute, Spanish Institute of Biotechnology), which is connected to the prosthesis bolted to it.

The median bone loss of the studied implants was 0.86 mm (+/–0.33). The mean bone loss at the distal end of the implant was 0.83 mm (+/–0.4). When the proximal, middle and distal bone loss were analyzed according to the ratio of crown to implant, there was no statistically significant difference (P = 0.224). The mean follows up time was 19.2 months (+/– 4.6 months), ranging from 14 to 25 months. During follow up, no adverse events of prosthesis or implant were observed. **Figure 2–11** shows a clinical case in the study.

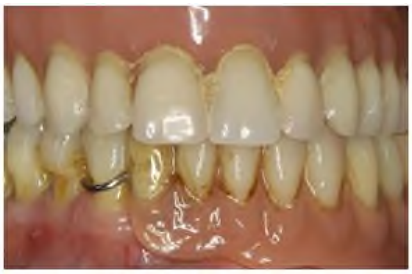


Figure 2. Patients with lower partial edentulous and upper complete edentulous (using removable dentures).

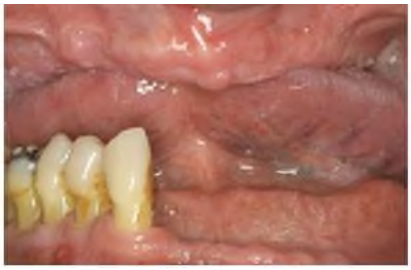


Figure 3. Bone atrophy in patients with upper and lower removable dentures.

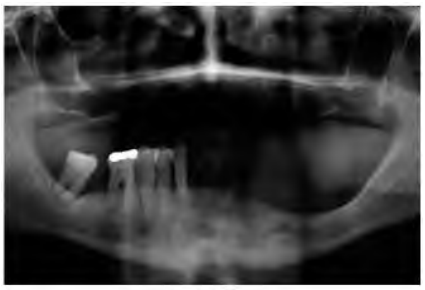
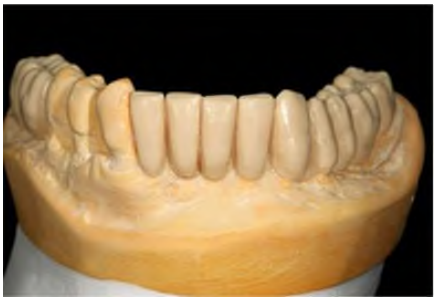
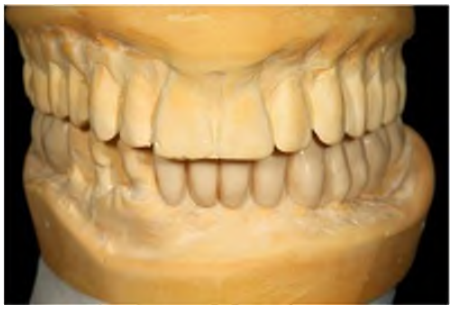


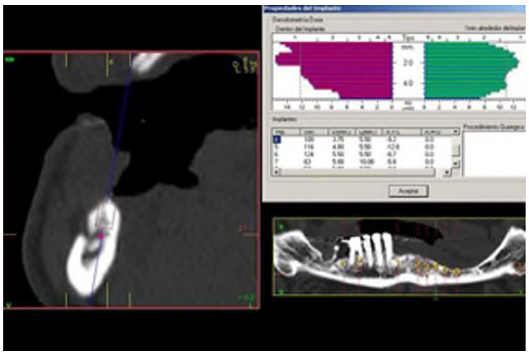
Figure 4. X-ray plain film of patients with lower edentulous and upper total edentulous.



Figures 5. Research on garment modeling.

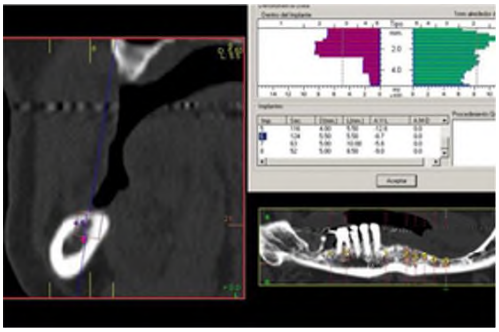


Figures 6. Research on garment modeling.



You can observe severe mandibular height atrophy at the back of the third quadrant, and then insert an ultrashort implant there

Figures 7. Planning dental CT with bti-scan III diagnostic software.



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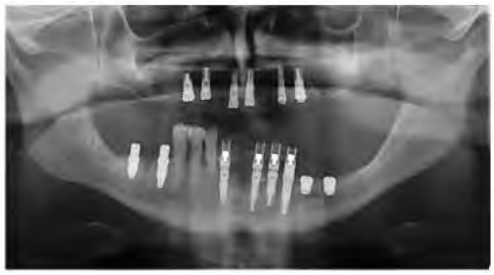
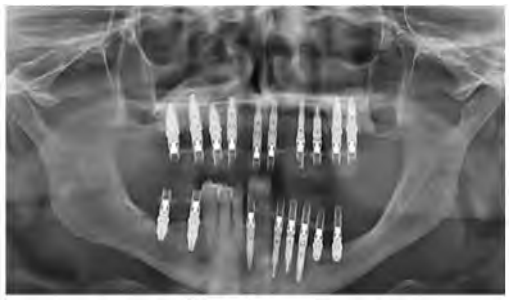
Figures 8. Planning dental CT with bti-scan III diagnostic software.



The postoperative X-ray after the implantation of the upper and lower implants further showed that the patient had performed maxillary sinus lifting in order to insert more implants in the rear of the maxilla in the future. It can be demonstrated that the in vitro implants in the third quadrant are submerged, while the remaining implants in this quadrant and the implants in the front of the fourth quadrant are placed in an immediately loaded prosthesis

Figure 9. X-ray examination after upper and lower implant implantation.



After three months, the remaining lower implants were wrapped in the prosthesis and loaded with body explants

Figure 10. X-ray after implant implantation.

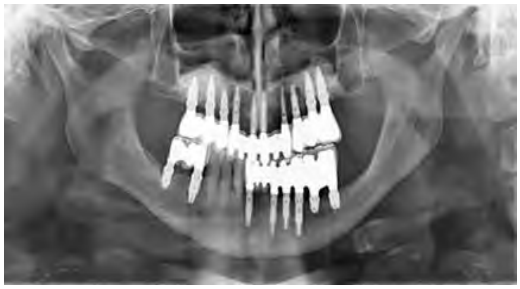


Figure 11. X-ray examination 5 years after implantation.

4. Discussion

Developing a protocol for this type of implant to accommodate this limitation (severe vertical shrinkage) is essential to achieve a success rate compared to “conventional length” implants. This prototype was used in all papers published by the team of Anitua et al., and the survival rate of in vitro implantation was 98.2%[11].

According to the data of traditional prosthesis, this unfavorable implant crown ratio (3:1) may have a serious impact on in vitro implants, but the data provided in this study can’t confirm this hypothesis. Other studies in this area have reached the same conclusion that there is no relationship between adverse proportion and ridge bone loss, although they do not assess extreme imbalance as in this study[19–22].

In this study, the implant was ferulate as part of the bridge. According to other studies in this area[23,24], this ferulization reduces the risk of bone loss and makes the biomechanical function of the joint better. Therefore, it can be suggested that prosthesis replacement in this way may be the key to the crown implantation of this implant than the unfavorable implant.

5. Conclusions

According to the data provided in this study, the use of in vitro implants with a crown implant ratio of 3 or more is not a risk factor for ridge bone loss or prosthesis or implant failure. Ferulization of explants improves biomechanical behavior under unfavorable crown implant ratio, which may be a suggestion worthy of consideration in this case.

Conflict of interest

The author declares no conflict of interest.

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