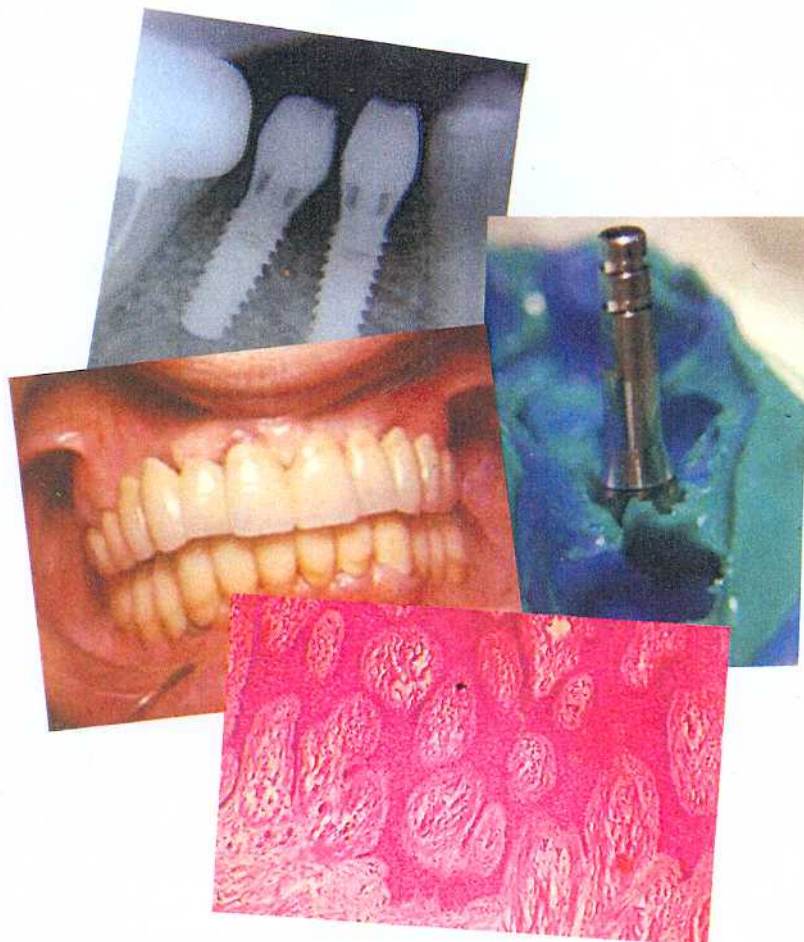


JISOI

DECEMBER 2005

THE OFFICIAL JOURNAL OF THE INDIAN SOCIETY OF ORAL IMPLANTOLOGISTS



Journal of the Indian Society of Oral Implantologists

VOL. 2 No.2, 2005

A REVIEW AND CRITICAL ANALYSIS OF A 32-YEAR OLD HISTOLOGICAL STUDY OF TISSUES AROUND THE NECKS OF TRAMONTE IMPLANTS

Silvano U. Tramonte, Antonio Camera & Marco E. Pasqualini

ABSTRACT

In 1972, Antonio Camera and Ugo Pasqualini with the help of Stefano Tramonte published a clinical case study which compared the tissue histology around the epithelial seal area of Tramonte implants and natural teeth in a patient. The authors of the present article, Antonio Camera (original author), Marco Pasqualini (nephew of Ugo) and Silvano Tramonte (son of Stefano) prepared a review and critical analysis of the original work, 32 years later (2004).

After an analysis of 2400 serial histological sections, they noted that the tissues in contact with the neck of Tramonte screw implants mimicked healthy periodontium and showed no inflammation.

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PREFACE

In 1972, A. Camera*, U. Pasqualini** and Stefano Tramonte*** published a distinctive study¹ comparing the histology of tissues that provide the epithelial seal in the emergence area of an implant and those of a natural tooth.

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***Ugo Pasqualini, then Professor of Maxillofacial Surgery and Prosthesis, Modena University*

****Stefano Tramonte, the inventor of the original Tramonte screw implant.*

The titanium Tramonte implant²⁻⁴ was fabricated in 1963 when the use of titanium in implants was being pioneered. This single-piece implant^{5,6} was decades ahead of its time with features like immediate loading^{7,8}, a flapless technique, the provision for biologic width⁹, good biomechanical design and a smaller emergence profile for better biological seal.¹⁰ The provisions in the Tramonte implant, for biologic width and immediate loading in a single, flapless procedure represent the latest findings in modern implantology.

INTRODUCTION

A seventy-two year old lady was referred to Ugo Pasqualini for placement of a Linkow blade implant¹¹⁻¹³ in the posterior right side of the mandible in 1970. Root form implants were not considered in the mandibular right region due to significant bone resorption (fig.1).



Fig.1 Initial Panoramic view

During this visit, a gold-acrylic bridge supported by three Tramonte implants, placed earlier (1967), was removed for follow up. On examination, the implants were found to be stable and surrounded by normal looking mucosa. Periodontal probing around the neck of each implant revealed depths of 2-3 mm.

The patient returned six months later (1971) as the prosthesis had loosened. However, the implants continued to be stable. During this visit, with the patients consent, a gingival flap was raised and biopsies were carried out around the Tramonte implants (fig.2) and also around a periodontally diseased mandibular tooth (fig.3) The favorable integration of the blade implant^{14, 15} could also be verified. After cementing the prosthesis, U.Pasqualini sent the biopsy samples to A. Camera for histological examination.

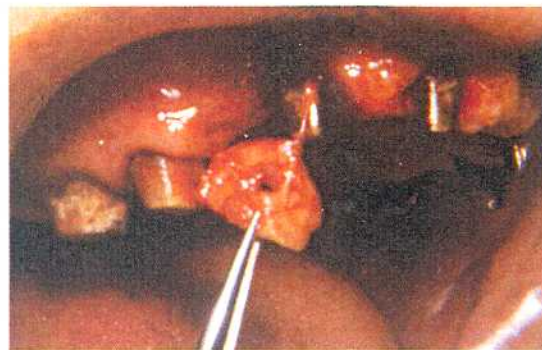


Fig.2. Tissue biopsy carried out around Tramonte implants



Fig.3. The periodontally inflamed area in the anterior area and the Linkow blade implant in the posterior region

Objectives of the research

The goal of the researchers, in 1971 was to study the "epithelial attachment"^{10, 16-19} around the emergence of the Tramonte implant. The mucosa around a non-submerged implant supporting a cemented bridge was analyzed. (fig.4)



Fig. 4. Intra-oral view at follow-up (1971)

MATERIALS AND METHODS

The samples were immersed in 5% Formalin, paraffin and stained with hematoxylin-eosin dye. 2,400 progressive serial sections of 4 mm each were made. The sections were made perpendicular and parallel to the emergence axis of both the tooth and the implants, at the "epithelial attachment", along the emergence surface in both structures.

The study evaluated (a) the epithelium at the emergence point of the implant and (b) the cell morphology at the "epithelial attachment" in the natural tooth and the three Tramonte implants.

Thus, the analyses of the sample would show a detailed picture of both the "external" and "internal" mucosa in contact with Tramonte screws and the natural tooth. (fig.5)

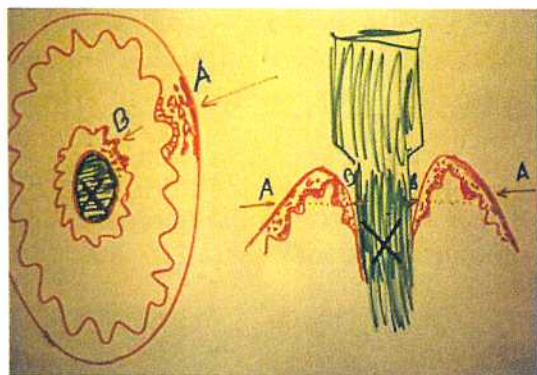


Fig.5. Original diagram depicting the macroscopic morphology of the implant & surrounding tissues (right side) and the scheme of progression of the perpendicular sections (left side).

RESULTS

All sections of the mucosa in tight contact with the neck of the implants were observed to be similar histologically. The *external* (oral) mucosa was keratinized and all successive epithelial layers (including the germinative cells at the basal layer) were visible and distributed along the epithelial pegs in the connective tissue underneath.

The *internal* (around the implant) mucosa was non-keratinized and exhibited a progressive loss of cellular layers till only a mono-stratification point of basal cells could be seen. Normal connective tissue was noted underneath.

A superficial section perpendicular to the implant axis shows the external mucosa (a) (fig.6) protected by a keratinized layer while the internal mucosa (b) shows a keratin-free layer.

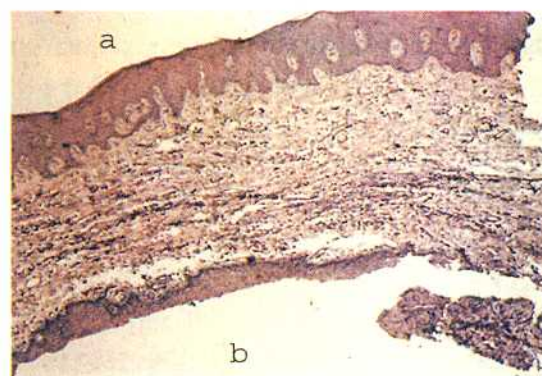


Fig. 6. H/E section showing superficial tissue

In a deeper section (fig.7), the external mucosa shows a decrease of the keratinized layer (a) and the presence of all the epithelial layers, while the internal mucosa (b) contacting the implant shows absence of the keratinized layer and the ovoid layer. Connective tissue pegs are

numerous at the base of the external mucosa but almost absent in the internal mucosa.

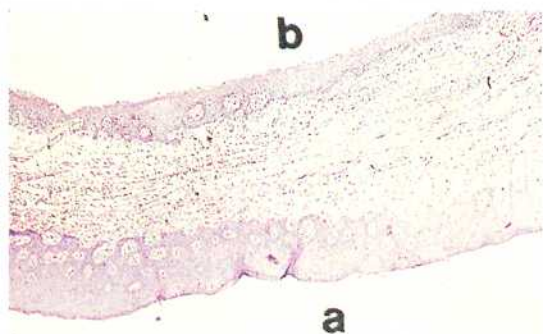


Fig. 7. H/E section showing deeper tissue

Fig.8 illustrates the difference between the external mucosa (a) with the keratinized layer and all the epithelial layers, including those of the numerous pegs at the basal layer and the rests of the internal mucosa (b) that start to recede, especially in the area marked with an arrow.

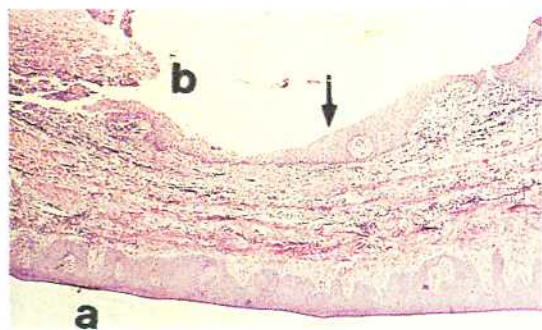


Fig. 8. H/E section showing difference between the external and internal mucosa

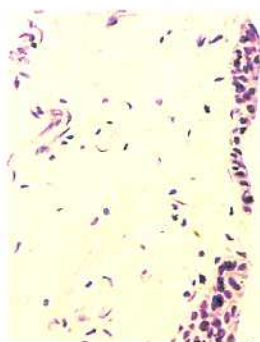


Fig. 9. H/E section showing a single layer of basal cells



Fig. 10. The regular reduction of the layers of the internal epithelium going from internal to external surface at the epithelial attachment (H/E stain, magnification 400X)

In fig.11, we can see the complete progression of the epithelial layers and the vivid activity taking place in the connective tissue underneath

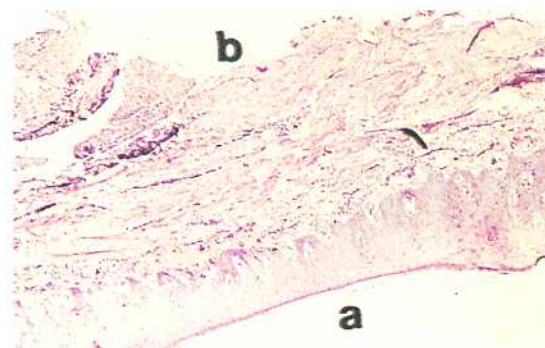


Fig. 11. Marked activity seen at the level of the connective tissue

The biopsy sample around the periodontally affected tooth shows marked mucosal hypertrophy and inflammation (fig.12).

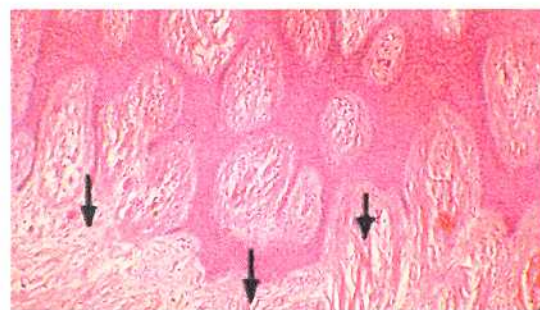


Fig. 12. H/E section of inflamed periodontal tissue

DISCUSSION

The overall consistency in the numerous (2400) sections permits a detailed analysis of the biological changes around the neck zone. The samples from the periodontally affected tooth in the same patient provide an excellent basis for comparison.

The cells in the neck zone of the periodontally affected lower right premolar show signs of chronic epithelial inflammation, recession and apical migration of the epithelial attachment. The section (fig.13) exhibits chronic inflammation of the epithelium and the connective tissue, with typical increase of the basal membrane pegs towards deeper layer with inflammatory cell (lymphocytes) infiltrate.



Fig. 13. Chronic inflammation in the tissues surrounding the lower premolar (H/E stain, magnification 180X)

The tissue histology around the three Tramonte implants is consistently normal.

Significant difference is noted between the external (oral) epithelium and the internal epithelium (adjacent to the implant surface). The external epithelium shows a protective keratin layer and papillary pegs in the connective tissue, which are reactive to physiologic masticatory stimulation.

The internal epithelium, at the depth of 1-2 mm, loses the keratinization as the sections go deeper (fig.10) denoting the progressive loss of the cellular layer till the connective tissue appears. The constant absence of the pegs in the internal epithelium is clear evidence of a reduced

cellular turnover due to absence of irritating stimuli.

The tissues around the abutments of the Tramonte implants, supporting a bridge type prosthesis are absolutely normal. This may allow us to predict that the actual seal will be maintained over the long term.

Histology confirmed that biological sealing area around these implants is identical to the epithelial adherence zone seen around necks of natural healthy teeth.

The results concur with studies related to the biological seal area²⁰⁻²⁶ even with the inability to demonstrate the pseudopodia of the basal cells over the implant surface in this study, as the implant was not retained in the bone. The hemidesmosomes adhere to titanium and create an authentic seal and isolate the internal cellular spaces. The conservation and consolidation of this seal testifies to the absolute biocompatibility of these implants which support a prosthesis.

Follow up of the case 13 years later.

In the follow-up, 13 years later, a panoramic radiograph (fig.14) and clinical photograph (fig.15) were taken.

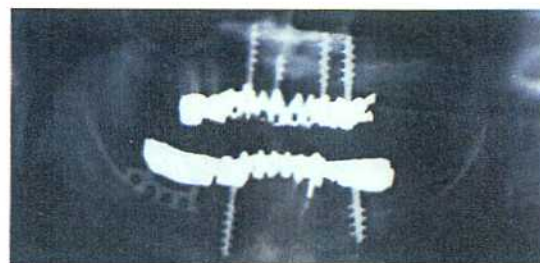


Fig. 14. Panoramic radiograph taken 13 yrs later.



Fig. 15. Clinical photograph taken at the same time of follow up.

Natural teeth showed more recession than the implants. The oral hygiene of the patient, a few months before her death, deteriorated due to her advanced age (81 yrs. old). In spite of that, the peri-implant mucosa appeared to be in good condition but the mandibular left lateral incisor shows inflamed mucosa with classic reddish appearance.

The root showed dental plaque attached to it, but the implant abutments were free from plaque. Furthermore, the gingival peri-implant recession involves only those implants that show a clear vestibular emergent point. The introduction and use of an abutment transfer technique after bending the emerging necks achieved better positioning of the abutments on the ridge. This problem has been resolved and did not invalidate the success of the implants.

The panoramic radiograph reveals the loss of the maxillary left molar and second premolar. These were substituted by another implant and the prosthesis was adjusted accordingly. (Fig.16)



Fig. 16. The original prosthesis has been re-adjusted to accommodate the new implant

The intraoral radiographs taken 13 years later (figs.17, 18) reveal bony integration of the four screws with compact bone around them. Fig. 18 shows the surface thread and abutment of the implant positioned for adequate biologic width, in order to decrease resorption.

We have to consider the advanced age of the patient and limited number of implants in

relation to the bone quality which deteriorated with time since the rehabilitation took place.



Fig. 17. The intra-oral radiograph affirms the bony integration of the implants



Fig. 18. The intra-oral radiograph shows the position of the screw threads

The tissues seen at the implant emergence points appear the healthiest (fig.19). With the consent of the patient, a biopsy sample was taken next to the maxillary right canine after reflecting a mucosal flap and observing the solid bone close to the implant (fig.20).

The superficial thread of the implant appears to be dehiscant due to resorption, but the bone



Fig. 19. Healthy tissue at the implant emergence area

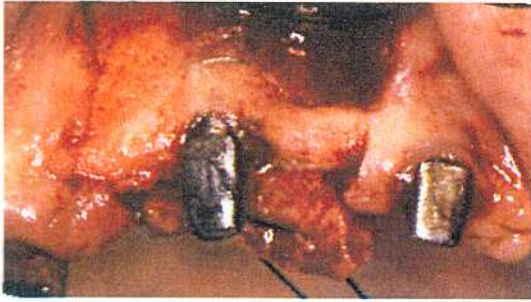


Fig. 20. A superficial implant thread exhibits slight dehiscence

appears to be normal and compact around it. The abutment has gone deep into the mucosa and its proximity to the bone crest has resulted in resorption which is not seen on the implant inserted in maxillary left second premolar.

CONCLUSION

This study documents the histopathology of the junctional epithelium around endosseous non-submerged implants under immediate loading in a 72 years old patient, with three Tramonte implants supporting a bridge for 4 years.

It allowed us to verify the following:

- a) The perfect healing and absence of bone resorption around the neck of three Tramonte implants, with immediate loading, after 4 years (1967-71) and 13 years (1967-80) of functional activity.
- b) The histological and clinical absence of inflammation on the tissues around the implant emergence zone.
- c) The identical morphologic behavior of tissues around the Tramonte implants emergence area and periodontal tissues around necks of healthy natural teeth, seen at the highest magnifications of light microscope.
- d) In the same patient, the periodontally affected tooth shows clinical and histological signs of inflammation together with recession of the epithelial attachment,

but the peri-implant area show very good clinical and histological state of health.

- e) The complete acceptance of an implant-supported cemented bridge without any problem after 13 years of use (1967-80), even after the consequent loss of tissue integrity due to decreased oral hygiene secondary to advanced age of the patient.

DISCLOSURE

Silvano U. Tramonte is the inventor of the new Tramonte screw implant which is marketed by Implamed Company.

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