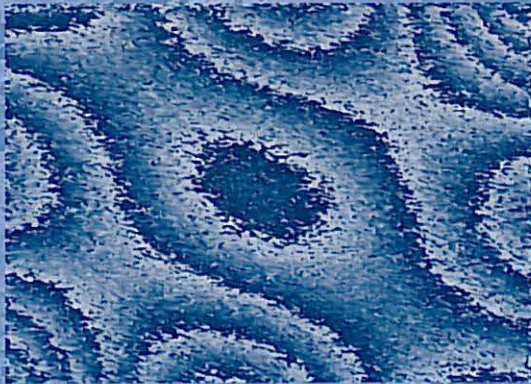


EXPERIMENTAL MECHANICS

New Trends and Perspectives

J.F. Silva Gomes, Mário A.P. Vaz
Editors



*Proceedings of the 15th International Conference on Experimental
Mechanics, Porto, Portugal, 22-27 July 2012*

Edições INEGI

ICEM15

EXPERIMENTAL MECHANICS
(NEW TRENDS AND PERSPECTIVES)

ICEM15

EXPERIMENTAL MECHANICS
(NEW TRENDS AND PERSPECTIVES)

Editors

J.F. Silva Gomes, Mário A.P. Vaz

Edições INEGI
(2012)

PAPER REF: 2790

MAXILLA BONE EVALUATION AND IMPLANT SURGICAL PLANNING IN A PERIODONTAL DISEASE PATIENT

Luis Queijo^{1,2(*)}, João Rocha^{1,2}, André Ramos³¹ESTiG - Instituto Politécnico de Bragança, Bragança, Portugal²CIber - Centro de Investigación en Biomecánica y Ergonomía, Universidad de Valladolid, Valladolid, Spain³Clinica Avenida - Medicina Dentária, Bragança, Portugal

(*)Email: lqueijo@ipb.pt

ABSTRACT

Knowing the value of biomodeling techniques - associating medical image segmentation with additive manufacturing, as a complimentary diagnose mean in the bone evaluation in complex and sensible anatomical areas (Queijo *et. al.*, 2010) it has been possible to support the diagnostic of a 50 years old female patient suffering from periodontitis who has lost an large amount of maxilla bone. At same time, by determining quantity and quality of maxilla bone in the affected area, the surgical planning have been made supported by complete and fractioned biomodels in order to correctly define implants placement.

INTRODUCTION

With bone loss possibly caused by several reasons as a major constriction for dental implant placement, it is absolutely imperative that dental surgeons perform a correct evaluation of bone quantity and quality in actuation areas. Even that some different material and techniques have been developed in the attempt to promote bone regeneration, in most cases that isn't a common practice, being preferable an accurate tool that allows correct bone evaluation. Actually dental surgeons have at their disposal different complementary diagnose means that allow them to quantify maxilla's bone improving, this way, accuracy in surgical planning for a correct implant placement. This is the case of biomodeling techniques.

Biomodeling technique, that associates image segmentation to additive manufacturing has revealed itself as a valuable clinical activity valuable tool. Starting with bi-dimensional medical images from computerized tomography (TC) or magnetic resonance (MRI) is possible to obtain digital tridimensional models with the ability of being produced as physical models. These present major benefits when compared with conventional techniques once personalized tridimensional anatomical models can be visualized, manipulated and shown to the patient to better understand the nature of surgical intervention as well as the possibility of manufacturing dedicated surgical guides (Queijo *et al.*, 2010).

In this study, patient is a 50 years old woman who suffered from chronicle periodontitis without knowing it until the symptoms have revealed it. When presented to the dental surgeon, 12th, 13th, and 14th teeth shifted so severely that almost had been lost when taking dental prints. They had to be removed in order to perform treatment and to allow posterior implant placement.

Periodontitis disease is the destruction of the supporting structures housing the tooth. If a sufficiently large amount of supporting bone and ligamentous attachment is lost, then the patient may present with a chief symptom of tooth migration or movement, loose teeth, and

even tooth loss (Zwetchkenbaum and Taichman, 2008). Chronic periodontitis is usually asymptomatic until the disease is so severe that teeth shift, loosen, or are lost. Individuals with advanced periodontitis may also have recurrent periodontal abscesses and halitosis ((Pihlstrom et al.).

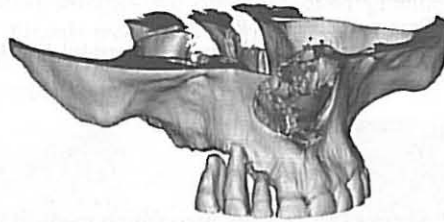


Fig. 1 - Evaluation digital model

During work, with TC exam images and using image segmentation have been possible to create several masks and render digital models to elucidate the severe maxilla bone loss and affected teeth conditions as is shown in figure 1.

After study area definition some sections had been digitally performed to better allow bone structures visualization and through additive manufacturing physical models had been constructed to allow a proper evaluation of the area to be treated and confirm if bone conditions allowed implants placement. With the complete maxilla model, implants positions and orientation were defined.

RESULTS AND CONCLUSIONS

With this work biomodeling prove itself as a valuable complementary diagnose tool in bone condition evaluation when applied in dental disease situations. In this case it has been fundamental to allow proper surgical planning and implant placement definition once maxilla bone near nasal sinus in the concerned area was in a sensible situation. The option for not performing any kind of bone regeneration treatment was based in the fact of available bone be sufficient and to do not extend patient's treatment.

REFERENCES

- [1]-Queijo, L.; Rocha, J.; Barreira, L.; Barbosa, T.; Ramos, A.; Juan, M.S. Maxilla bone pre-surgical evaluation aided by 3D models obtained by Rapid Prototyping. Boca Raton: Crc Press-Taylor & Francis Group; 2010. 139-144 p.
- [2]-Zwetchkenbaum, S.; Taichman, L.S. Chapter 14 - Oral Health. Clinical Men's Health. Philadelphia: W.B. Saunders; 2008. p. 243-262.
- [3]-Pihlstrom, B.L.; Michalowicz, B.S.; Johnson, N.W. Periodontal diseases. The Lancet.366(9499):1809-1820.