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# Raman spectroscopy, *In vivo* application for bone evaluation on dental surgery and periodontology. Possible alternative to histology

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Our days, there is a large number of surgical techniques involving the implantation of various types of bone graft and /or bone substitutes in order to achieve periodontal regeneration. Despite positive observations in animal models and successful outcomes reported for many of the available regenerative techniques and materials in patients, including histologic evidence, robust information on the degree to which reported clinical improvements reflect true periodontal regeneration remains just limited. It is requested a method adapted for a quik evaluation of the bone and precise in the mean time.

For the bone tissue, at micro level octacalcium phosphate (OCP, Ca8 (HPO4)2(PO4)4·5H2O,) is considered very important because it is regarded as an in vivo precursor of HA. Trying to find traces for phase transition of OCP to HA, the presence of HA nano rods and plate-like HA particles can be utilized as signs of bone good quality evidenced by SEM investigation (Fig. 1 b). The normalized peak intensity values, are related to each compounds concentration.

A group of ten patients was involved to our study. Investigation was performed by RAMAN technique, first in vivo and then in vitro for the harvested bone samples.

There were evaluated / compared the following peaks, for in vivo and then in vitro for the harvested bone samples (Fig 1 a):

- 430 – 450 cm-1 (v2, PO43-);
- 955 – 960 cm-1 (HPO4 2-, immature bone);
- 960 – 965 cm-1 (mineral bone, mature bone);
- 1023 cm-1 (P2 O7 4- ; PPi, inorganic pyrophosphate)

Raman method adapted for"in vivo" bone quality evaluation, is much less invasive then the well-known CT (computer tomography) or CBCT (con beam computer tomography) already used and more accurate. For this purpose, the Raman probe was modified with a "special cap" in order to assure regular sterilization for *in vivo* use.

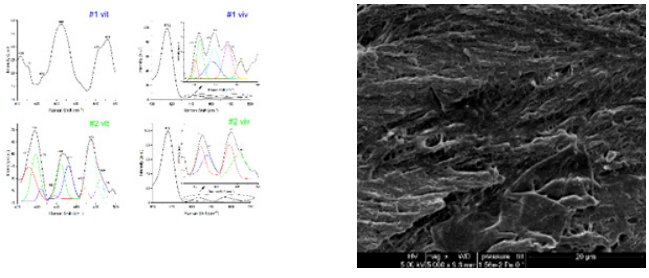

Fig.1. (a) Raman spectra for patients (#1, #2) in vitro and in vivo; (b) SEM micrograph patient #1.

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