Post-doctoral position in Bone quantitative Ultrasound and biomechanics

Location: Créteil, Paris Region.

**Development of ultrasonic characterization methods for the estimation of the biomechanical stability of an implant in bone tissue**

**Context**
The increases of population lifetime and of the accidents are the two main reasons explaining the growing interest of the scientific community in studying the osteoarticular system. Although implant and osteoarticular prostheses have been widely used in clinical routine since more than 30 year and have allowed considerable therapeutic and esthetic improvements, a lot of optimizations and developments of their performances remain to be done.

In particular, dental implants are widely used for maxillofacial rehabilitation purposes. Many cases of failure still happen due to a bad timing in the implant loading with the prosthesis. This is due to the fact that a reliable tool capable of verifying the quality of osseointegration is still missing. Such failures induce pain, degraded mastication conditions for patients and increased costs for dental surgeons. It still remains difficult to assess the stability of a dental implant and in particular the biomechanical properties of newly formed bone tissue around the implant.

The team 'Biomechanic' of the MSME laboratory (part of the Franch National center for scientific research) has developed a new method for the follow-up of implants, which is sensitive to the bone-implant interface quality, the only accurate criteria for the implant surgical success. The system uses quantitative ultrasound analysis, which is a non invasive, non radiating and relatively cheap approach. A proof of concept has been demonstrated *ex vivo*, which has allowed a PCT patent application. The first *in vivo* validations are currently in process.

**Subject**
The aim of the project is to improve the overall performances of the device already available in the laboratory. The work proposed herein has an experimental and a numerical component.

First, the candidate will work on the optimization of the experimental device already available in the laboratory. He/she will keep on working on *in vivo* validation experiments in rabbits and to start new ones in dogs, in conditions closer to the clinical situation.

Secondly, the candidate will continue the development of already existing numerical simulation tools, which will lead to the optimization of the signal processing methods used in the software of the device.

This work will be carried out in close collaboration with dental surgeons who are part of the project. The project is laureate of the national contest of start-up creation in innovative technology (Concours National de Création d’Entreprise de Technologie Innovante, catégorie Emergence).
**Candidate profile**
The candidate should have competences in the field of ultrasound imaging and characterization and/or bone biomechanics. Knowledge and interest in the biomedical domain would be appreciated.

Length of the contract: 12 months (possibly renewed for 6 more months).
Salary: to be debated.
Creteil is located in the near Paris suburb and is accessible via the Paris Metro network.

**Contact**
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