

## **Annex A Brief description of the training project**

*[to be replicated for each in the case of several training projects]*



### **Title of the Training Project:**

"Assessment comparative of two several systems biomechanical of distalization and finalization orthodontic supported by anchoring skeletal applied with dime surgical palatal"



### **Description of the scientific objective and**

**Training:** *(min 1,000 characters - max 5,000 characters)*

*[specify also the coherence with disciplinary and thematic areas consistent with the needs of the country, as well as of the regional territories covered by the program, in terms of high-skilled figures and oriented to meet the innovation needs of the companies referred to in the PNRR;]*

Since their introduction into clinical practice, orthodontic mini-screws, also called temporary anchoring devices (Temporary Anchorage Devices - TADs), have expanded the orthopedic possibilities of orthodontic appliances. The use of mini-screws in the palate, commonly called "palatal skeletal anchorage", offers the possibility of improving the effectiveness of numerous orthodontic and orthopedic devices. Distalization devices supported by TADs can be applied with different protocols. the most common configurations of mini-screws to support the maxillary distalization in the treatment of the second classes, provide two miniscrew palatal para-medians applied on the front portion of the palate and the use of hybrid anchoring systems with bars that connect the premolars to the palatal screws.

The vertical bone thicknesses of the roof of the palate decrease in the posterior para-median palatal areas at the sagittal level of the molars. This aspect makes difficult the positioning of the two rear para-median palatal mini-screws when their insertion is performed avoiding the invasion of the nasal cavities. To overcome these problems, several authors have proposed the insertion of mini-vines in the posterior palatal vault, by placing the body of the mini-screws in a specific region located laterally to the palatal process of the maxillary bone and apically with respect to the dental-alveolar process above the roots of the first maxillary molars. Scientific studies have shown that this area of the palate, defined as Palatal Posterior Supra-Alveolar Insertion Site (PPSAIS), offers adequate bone thickness for the insertion of mini-vines.

This area of the palate can therefore be used advantageously in different biomechanical configurations that, through fixed orthodontic devices, can allow the "disentangling" of the maxillary arch in class 2 malocclusions.

The first scientific objective of the research project is to compare the biomechanical system of distribution with orthodontic mini-screws positioned in the PPSAIS and fixed orthodontic equipment, with other conventional biomechanical systems that provide for the placement of mini-screws in the front portion of the palate and systems for maintaining the bar anchorage extended to the upper premolars.

Comparisons of biomechanical systems will be made with two parallel studies. A clinical trial conducted as a randomized and controlled clinical trial. The study will be conducted by first establishing the criteria for inclusion in the two groups of patients treated with distalisation and then a randomized sequence will be established that will allow the allocation of the enrolled patients to one of the two study groups. Prior authorization will be requested to conduct the study to the committee of the University Hospital.

The evaluation of clinical results will take place through the acquisition of multiple intra-oral scans acquired in the different phases of treatment and precisely: pre-treatment, post-distalisation, at the end of the space closure, after the finishing phase, after dismantling the fixed orthodontic equipment.

In parallel with the clinical study, an FEM study will be conducted to understand which could be the changes to be made to biomechanical systems to improve their effectiveness and their biomechanical efficiency.

The two studies, clinical and experimental, are perfectly consistent with the different

These are the disciplines of the PhD, namely medical and engineering.

The studies will be conducted with digital tools such as: intra-oral scanners for fingerprinting, CBCT (Cone Beam Computer Tomography), 3D printers, CAD software for the design of orthodontic devices and positioning of the orthodontic mini-screws.

The development of these digital technologies and their clinical application promotes digitization of diagnostic paths and the design, production of devices orthodontic. The employment of these technologies under of this path formative could contribute to the training of personnel who, in the future, could meet The need for innovation in our regional enterprises.



**Corporate Supervisor: Mr. Ottaviano Miceli**



**Methods of carrying out the activities**

**Training and research activities:**

The training activities will be carried out through lectures on research methodology; Seminars on modern digital technologies in the dental sector; and finally through discussion meetings of articles already present in literature (Journal Club).

The research activity will be directed in advance with the drafting of research protocols and then will be monitored weekly by scheduling organizational meetings to take stock of the progress of research.

Expected **impact** and results with particular emphasis on promoting economic development and the production system:

The doctorate will have the opportunity to train highly qualified figures in the field of digital applied to dental. Such figures could find new professional opportunities within the companies promoting the economic development of the country and the improvement of the dental production sector.

The company Micerium Spa will host at its headquarters the PhD student beneficiary of the grant funded from the resources of DM 352/2022 for a maximum of n. 6 months during the PhD.

The University will send abroad the PhD student beneficiary of the scholarship financed on the resources of the DM 352/2022 for a maximum period of n. 6 months at the following institution: The Dublin Dental University Hospital

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