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dental implants and prostheses before its surgical implantation enabling a re-design process. This paper is focused on the CAD/CAM subsystem developed in order to automatize the process of manufacturing surgical guides using several 3D models of the patient dental anatomy. A summarized version of the image processing step will be also presented. The CAD/CAM subsystem has been clinically validated achieving mean errors less than 5 degrees in the placement of the prosthetic crowns.

Paper 8 Special Session RAPID-Bio
14:00 - 15:30 Room ALBUFERA
Special Session on Rapid Prototyping for Improving the Development of Biodevices

## RAPID PROTOTYPING OF 3D ANATOMICAL MODELS TO HEMODYNAMIC STUDIES

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**Keywords**: Carotid, Rapid prototyping, FDM, TDP, PDMS, Hemodynamics.

**Abstract**: The purpose of this work is mainly to manufacture several anatomical models in a polymeric material – polydimensiloxane (PDMS) to study the blood flow through a carotid artery bifurcation. Over the last few decades, research has been shown that the geometry of the carotid artery is closely related to the development of serious cardiovascular diseases. Hence, there is a considerable interest in the development of in vitro experimental techniques able to obtain accurate measurements of the blood flow behavior through a realistic carotid artery. In this study we decide to apply rapid prototyping (RP) technologies combined with a PDMS casting technique in order to fabricate an anatomically realistic model of a human carotid to investigate, in a near future, the effect of the geometry on the local hemodynamics and consequently improve the understanding of the origin and development of these pathologies. Based on a human carotid computerized tomography (TC) it has been developed a 3D model through the application of two rapid prototyping techniques – Fused Deposition Modeling (FDM) and Tridimensional Printing (TDP). By combining the rapid prototyping techniques with a PDMS casting technique it was possible at the end to obtain an anatomically transparent model of a human carotid artery made by an elastomeric material, i.e. PDMS. Hence, we believe that this combination is a promising technique to perform in vitro blood studies through anatomically realistic models, such as a carotid artery.

Paper 3 Special Session RAPID-Bio
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## THE ROLE OF THREE-DIMENSIONAL SCAFFOLDS IN THE REGENERATION OF JOINT CARTILAGE

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**Keywords**: Three-dimensional scaffolds, Chondrocytes, Joint cartilage, Rabbit model.

**Abstract**: A variety of polymer scaffolds with pore architecture consisting of interconnected spherical pores with the same architecture but varying mechanical properties (in particular elastic modulus), water sorption capacity, pore surface characteristics (surface tension, presence of hydrophilic groups or electric charges) was prepared and implanted in a 3mm diameter full thickness defects in the knee joint cartilage of rabbits in order to show the influence of the scaffold properties on the histological characteristics of the regenerated tissue.