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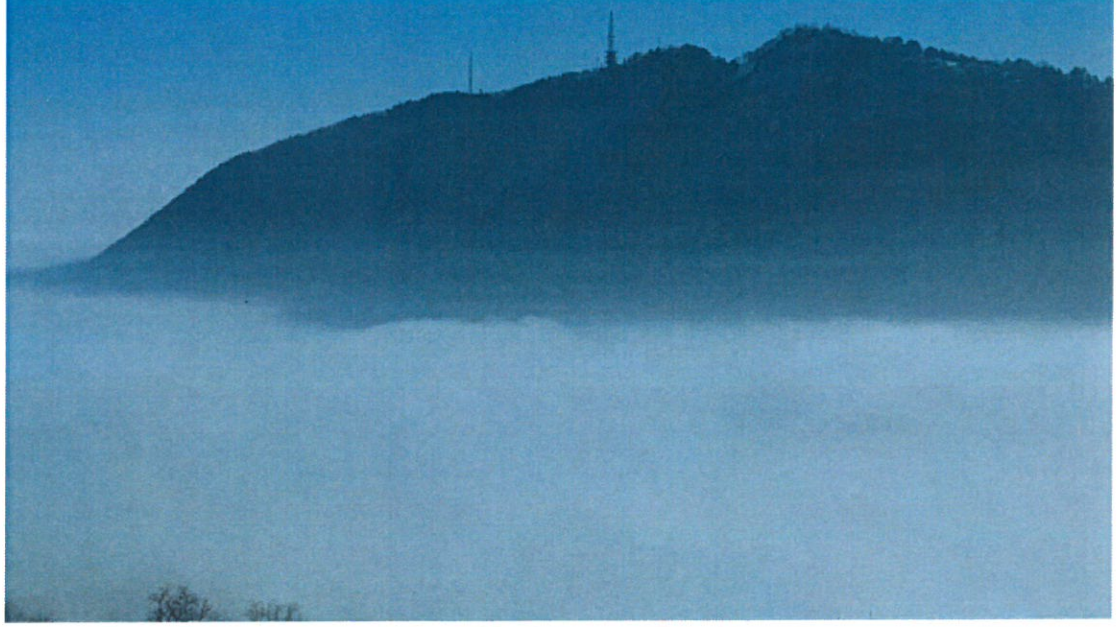

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POROUS TITANIUM IMPLANTS: A VERSATILE SOLUTION FOR ANY BONE DEFECT RECONSTRUCTION?

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Abstract: One of the most critical issues in orthopedic regenerative medicine is the design of bone implants and scaffolds that replicate the biomechanical properties of the original bones. Metals and their alloys have a long history of application in the human body because of their good mechanical

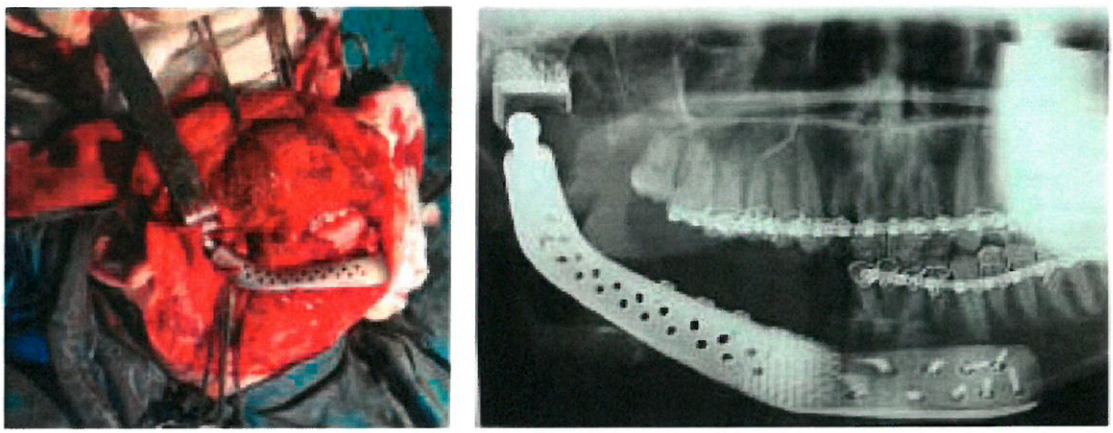

Fig. 1. Porous mandibular implant

strength, biocompatibility and corrosion resistance. But the devices made of metals and alloys are usually much stiffer than natural bone, leading to bone resorption and sometimes failure of the metallic devices. Most of the current implant metallic materials have higher elastic moduli than those of bones and the most effective method to reduce the elastic modulus is to modify the porosity of the devices. Traditional methods for obtaining open-cell porous metals include liquid state processing (direct foaming, spray foaming, etc), solid state processing (powder metallurgy, sintering, etc.), electro-deposition and vapour deposition. Selective laser melting (SLM) and electron beam melting (EBM) are computer-controlled fabrication processes based on layer-wise manufacturing principles. In Fig. 1 a mandibular prosthesis fabricated by EBM is presented. It is demonstrated that the porous implants not only mimic the human bones but also satisfy the multifunctional requirements for any bone defect reconstruction.