Preliminary Results of the Tomographic Assessment of Titanium and PCL (Polycaprolactone) Scaffolds in the Osteochondral Structure of an Experimental Sheep Model

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steochondral defects present a significant clinical challenge due to the distinct structural and functional properties of bone and cartilage. The development of biocompatible scaffolds that support both bone and cartilage integration is essential for effective tissue regeneration. This study presents the preliminary results of a tomographic assessment of titanium and polycaprolactone (PCL) scaffolds integrated into the osteochondral structures of an experimental sheep model. The aim of the study is to evaluate scaffold integration, tissue regeneration, and morphological changes using high-resolution computed tomography (CT) imaging by using Hounsfield unit of ROI values. The study implanted titanium and PCL scaffolds in lateral condyle of right femoral, and follow-up assessments were conducted at three different times (TO-directly after surgery, T3-3 months, and T9-9 months) to monitor bone ingrowth, scaffold stability, and osteochondral repair. CT imaging provided detailed threedimensional reconstructions, enabling quantitative analysis of bone density, scaffold degradation, and tissue integration at the bone-cartilage. The preliminary results indicate that the titanium-PCL scaffolds demonstrated good structural stability and facilitated bone tissue formation around the implant site, followed by titanium scaffolds and PCL scaffolds showed the low bone density as the control group. The porous architecture of the scaffolds promoted cellular infiltration and bone ingrowth, with evidence of progressive mineralization. Furthermore, tomographic imaging facilitated the identification of potential complications or abnormalities during the healing process. This imaging modality non-invasively evaluates tissue regeneration progress, enhancing our understanding of the effectiveness of different scaffold biomaterials and their potential clinical applications in orthopedics.

Keywords: Tomography, Scaffolds, Osteochondral Defect, ROI values, Hounsfield Scale