

Publication

The microstructure of mandibular bone grafts and three-dimensional cell clusters

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During the last decade, several tissues and biomaterials for medical applications in replacing bony tissues have been developed. Three-dimensional cell clusters and mandibular bone grafts are two distinct examples of these developments. The characterization of the complex three-dimensional structures, however, is still mainly restricted on the two-dimensional analysis of histological slices. The present paper examines the quantitative analysis of mandibular bone grafts and three-dimensional cell clusters on the basis of synchrotron radiation-based micro computed tomography measurements. An automated search of pre-defined microstructures through component labeling is applied to the real datasets in order to identify features that reside independently from other components. The examples demonstrate three levels of complexity: rather large pieces of bone augmentation material that touch each other, individual adipocytes difficult to automatically segment in a wet cluster and osmium-stained adipocyte exhibiting higher X-ray absorption than the surrounding tissue. Although the structures of interest such as the cells can be labeled, de-clustering of the components requires the incorporation of erosion and dilation algorithms.

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