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Classification of the Level of Mandibular Atrophy – a Computer-assisted Study Based on 500 CT Scans

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Abstract:

Objective: For the optimal treatment of patients with highly atrophic mandibles, it is required to assess and quantify the extent of atrophy. The classification schemes that are well established today are known to be limited with respect to objectivity and reproducibility. Thus, the aim of the study was to generate a computer-aided method of classification, investigate its applicability in comparison with the established methods, and apply it to a large set of data.

Materials and Methods: Mandibular geometries were segmented from 500 Multislice (MSCT) datasets of atrophic and non-atrophic mandibles and automatically processed to gain virtual images of the mandibular cross-sections. Three different human investigators classified these data according to Cawood and Howell's classification scheme. Additionally, a tailored computer algorithm was applied that could work automatically and thus be observer independent. Furthermore, geometrical properties of the mandibles were investigated, statistically analysed, and correlated to the protocolled dental status and to the human and computer-generated classifications.

Results: Whilst the atrophy classification scheme showed highly significant correlation to the local dimensions of the alveolar ridge, its reproducibility was limited. It was shown that the human classifiers could not objectively classify the mandibular atrophy according to the established methods, with only 60.9% of decisions being equivocal. The computer-aided method showed similar results to the human investigators.

Conclusion: It is feasible to develop computer-aided procedures for the objective and fully reproducible classification of the level of atrophy. With further research, the established classification scheme may be ameliorated with the aid of computational methods.

Keywords: mandibular morphology, biomechanical modelling, edentulous lower jaw, computer-aided medicine, classification of the level of atrophy

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