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BONE EVALUATION FOR CRANIOFACIAL IMPLANT PLACEMENT-MICRO CT ASSESSMENT OF MICROARCHITECTURAL PARAMETERS

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Introduction: The most important factor for successful implant therapy is good implant stability in the bone tissue. It is equally important for every type of implants, so EO (extra oral), craniofacial implants are not an exception. To achieve satisfactory implant stability bone tissue quality is one of the most important factors. Bone quality is determined by its microarchitectural parameters.

Aim: The aim of this study was to evaluate bone tissue microarchitectural parameters in targeted points for craniofacial implant placement.

Methodology: Micro CT method was used on cadaver model to determine optimal localisation for implant placement based on the bone density. Implant placement points were periorbital, perinasal and the auricular region. Each bone sample was scanned in dry state at a resolution of 10μm using micro computerized tomography (Sky Scan 1172 x-Ray Micro tomography, Sky Scan, Kontich, Belgium). Acquisitions were performed on 85kV voltages, 118μA pipe current, 1000ms time exposure, 0.5mm thick aluminium and copper filter, and 180 ° rotation. The obtained images were reconstructed using NRecon v.1.6.9.8 software with a beam hardening correction of 25%, a ring artefact with a correction of 18%, and a reduction of two. The images were then analyzed using CTAn 1.14.4.1 software. The parameters of the microarchitecture of the cortical bone that were measured included: cortical thickness (Ct.Th mm), cortical porosity (Ct.Po,%), pore diameter (Po.Dm mm), and pore separation (Po.Sp mm).

Results: According to Micro CT at the glabella region, the smallest porosity of the cortical bone was determined (Ct.Po 4,13mm), the largest pore separation (Po.Sp. 0,49mm), and the smallest pore diameter (Po.Dm.0,09mm), the cortical thickness also showed high values (1,49mm) and high implant stability values for disc implants. The highest (Ct.Th 2,72mm) was found at the Zygomatic region. Also, in the orbital region the thickness of the cortex was very high (Ct.Th.1, 89mm), although the porosity of the cortical bone was somewhat higher (Ct. Po. 6, 72). By examining the microarchitecture of the cortical bone at localizations: Orbital bone, glabella and peripheral region of the aperture piriformis, maxillary process of the zygomatic bone and the qualitative value of bone tissue in these localizations was optimal for insertion of the disc implants. The mastoid part of the temporal bone in the control group showed the smallest thickness of the cortical bone (Ct.Th.1, 25mm) and also a small porosity (Ct.Po. 4, 30mm) that justified the use of the screw implants.

Conclusion: Bone quality parameters were satisfactory on implant insertion localisations. Every implant type was adequate in shape and size for the intended localisation and its bone microarchitectural parameters.