

SUMMARY

Development and Fabrication of a Magnet-Retained Auricular Epithesis within an Interdisciplinary Project for a Patient with Grade III Microtia in Estonian Context

Facial defects caused by congenital anomalies, trauma or surgical interventions may significantly affect not only physical appearance but also social interaction, self-perception and identity. In contemporary visual culture, the face functions as an important communicative interface through which emotions, trust and social meanings are interpreted. Consequently, facial rehabilitation extends beyond medical restoration and includes psychological, social and cultural dimensions. Facial epitheses represent one possible rehabilitation method that enables patients to restore facial integrity while simultaneously reducing the visibility of anatomical differences in everyday communication.

This bachelor's thesis focuses on the development, fabrication and clinical implementation of a magnet-retained auricular epithesis for an 11-year-old patient diagnosed with Grade III microtia. The project was carried out within the context of Estonian clinical practice, where systematic facial epithesis services and established interdisciplinary workflows are currently absent. Therefore, the thesis also examines the organisational and methodological potential for developing facial epithesis rehabilitation practices in Estonia.

The work combines medical knowledge, digital technologies and sculptural practice within an interdisciplinary framework. Methodologically, the study is based on a qualitative case study approach integrating clinical diagnostics, digital modelling and artistic form-making. The project was conducted in collaboration with specialists in maxillofacial surgery and otorhinolaryngology, as well as international consultants specialising in anaplastology and implant-retained facial prostheses.

The theoretical part of the thesis examines the historical development of facial epitheses, the evolution of materials and fixation systems, and the role of interdisciplinary collaboration in contemporary craniofacial rehabilitation. Particular attention is given to the social and semiotic dimensions of facial appearance, including the relationship between visible facial differences, stigma and social participation. The thesis also analyses contemporary digital workflows, including 3D scanning, CAD/CAM technologies, Blender and implant-retained magnetic fixation systems.

The practical part of the research documents the complete rehabilitation process of the presented clinical case. Preoperative diagnostics included computed tomography (CT), magnetic resonance imaging (MRI) and 3D scanning of the patient's head. Digital modelling was carried out using Blender and Meshmixer software environments. The anatomical structure of the unaffected ear was digitally mirrored and adapted to the affected side in order to achieve symmetrical positioning and individual anatomical accuracy.

During the planning phase, adhesive-retained prosthetic solutions were initially considered in order to minimise invasive intervention. However, digital analysis, physical prototyping and clinical fitting demonstrated that the rudimentary auricular structures did not allow anatomically correct positioning or satisfactory aesthetic integration. Based on interdisciplinary evaluation, the treatment strategy was changed in favour of an implant-retained auricular epithesis using a magnetic fixation system.

Two craniofacial implants were surgically placed in the mastoid region. Following osseointegration, a custom silicone auricular epithesis was fabricated using a combination of 3D sculpting methods (digital sculptural modelling), 3D-printed prototypes and traditional anatomical sculptural refinement.

Particular attention was given to anatomical symmetry, pigmentation of the epithesis and its visual integration with the patient's facial structure. Special importance was also placed on the adaptation of the epithesis margins and the smooth transition between the material and the skin (feathering). In order to achieve the most natural visual effect possible, the edges of the silicone epithesis were reduced to a minimal thickness – practically to only a few microns. This was achieved through high-precision mould processing and the application of specialised silicone casting techniques that allowed the formation of an ultra-thin marginal transition.

The final epithesis was retained using a low-profile magnetic attachment system designed to ensure stable fixation, ease of use and hygienic maintenance.

The project demonstrates that the integration of digital technologies, clinical planning and sculptural form-making enables the creation of individually adapted facial prostheses with predictable aesthetic and functional outcomes. The interdisciplinary workflow used in the project also illustrates the potential for developing facial epithesis rehabilitation practices within the Estonian healthcare system.

In conclusion, the thesis highlights the importance of facial epitheses not only as medical prosthetic devices but also as socially and visually significant rehabilitation methods. The project represents one of the first documented interdisciplinary practical cases in Estonia

in which digital modelling, craniofacial implantology and sculptural practice were integrated into a unified auricular epithesis rehabilitation process.

Keywords: facial epithesis, medicine and art, microtia, silicone, auricular epithesis, craniofacial implants, magnetic fixation, digital modelling, sculptural practice, facial trauma, post-surgical defects, congenital malformations, identity, interdisciplinary approach, Estonian context, integration of sculpture and medicine, sculpture and medicine.