The reconstruction of 3D facial surface geometry from pre-injury 2D photographs has recently been established through large scale morphable face modeling.1 As well, in forensic sciences, models with variable soft-tissue depths2 are used to determine face shape from skull geometry. This study aims to ‘reverse-engineer’ a forensics’ tissue depth model to determine pre-injury CFS shape from reconstructed 3D facial geometry. It is hypothesized that 3D forensics data can be used to fill in missing gaps in CFS geometry with sufficient accuracy to guide pre-operative planning for CFS reconstruction.

METHODS: The forensics’ tissue depth model was applied to 3D facial geometries acquired through segmentation of head CT data. Age, sex and BMI were used as input parameters to guide the application of the forensics’ tissue depth model data to each face. The tissue depths between the face and CFS were determined by finding the Euclidean distance transform (nearest neighbor) employed by the original forensics study and via calculation using normal vectors generated from the face surface. Calculated tissue depth was evaluated against measured thickness on the head CT between the segmented CFS (bone) and the skin.

RESULTS: Tissue depth determined by nearest neighbor and normal vector measurements yielded accurate reconstructions of the frontal and zygoma bones (within 1mm, or +/- 2 voxels). However, only the normal vector technique succeeded in estimating tissue depth in bone regions where the face and skull have differing concavity (i.e. eye sockets, maxilla). Agreement was more limited in the lower facial skeleton where greater variation of soft tissue structures occur.

CONCLUSION: The reversed forensics tissue depth model was found to appropriately infer bony anatomy for the upper CFS from 3D face geometry. The 3D skull shaping provided by this work yields sufficient accuracy to warrant its inclusion into a translational pipeline of tools for pre-operative planning for CFS reconstruction.

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Microsurgery for Parotidectomy Defects: A Powerful and Versatile Tool for Aesthetic and Functional Reconstruction

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PURPOSE: Surgical management of parotid pathologies may lead to heterogeneous defects with variable involvement of skin, soft tissue, and bone along with possible sacrifice of the facial nerve. Local tissues are often inadequate to address these diverse reconstructive needs. We therefore aim to evaluate the role of microsurgery in reconstruction of parotidectomy defects.

METHODS: All microsurgical reconstructions for parotidectomy defects performed were identified and reviewed. Patient demographics, intra-operative variables including microsurgical flap characteristics, and reconstructive outcomes were analyzed.

RESULTS: A total of 11 microsurgical reconstructions in ten patients were performed. Average patient age and body-mass index were 38.5 years and 25.94kg/m². Six patients (60.0%) had a former smoking history while three (30.0%) had major medical co-morbidities. Six patients (60.0%) had prior surgical intervention with prior partial parotidectomy/enucleation (30.0%) being most common. Two patients each (20.0%) had undergone prior radiation and chemotherapy. Five (50.0%) and three (30.0%) patients underwent adjuvant radiation and chemotherapy, respectively. Average follow-up was 116.4 days.

The most common tumor pathologies were pleomorphic adenoma, acinic cell carcinoma, and squamous cell carcinoma (20.0%, each). Primary surgical procedures included total parotidectomy (30.0%), superficial parotidectomy (30.0%), radial parotidectomy (20.0%), and revision parotidectomy (20.0%). Four (40.0%) and two (20.0%) patients underwent concurrent neck dissection and bony resections. Three patients (30.0%) had facial nerve branch sacrifice reconstructed with nerve grafts in three cases (100.0%) and nerve transfers in two cases (66.7%).

Microsurgical free flaps utilized included medial sural artery perforator (MSAP) flaps in six patients (60.0%) and anterolateral thigh (ALT) flaps in five (50.0%) patients. Average flap and skin paddle sizes were 79.61 cm² and 5.33 cm², respectively. Two flaps (18.2%) were completely de-epithelialized and buried. Ten donor sites (90.9%) were
closed primarily while one MSAP donor site (9.1%) was closed with a full-thickness skin graft. Average total operative time was 10 hours, 54 minutes. Average patient length of stay was 4.6 days.

There was one overall complication (10.0%), representing a hematoma managed non-operatively. No patients experienced post-operative Frey syndrome. Three patients (30.0%) underwent secondary revision procedures, including flap debulking (30.0%), skin paddle excision (10.0%), and donor site revision (10.0%).

CONCLUSION: Microsurgery represents a safe and versatile tool for reconstruction of parotidectomy defects. Lower extremity flaps, notably ALT and MSAP flaps, are effective in restoring soft tissue bulk for adequate facial contour while also providing vascularized tissue to protect vital structures and mitigate aberrant nerve regeneration, assisting in prevention of Frey syndrome.

Craniofacial Dermoid Cysts: Experiences from the Royal Children’s Hospital in Melbourne, Australia

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PURPOSE: To ascertain the clinical spectrum of severity of dermoid cysts within the paediatric population, and to contribute to the understanding of which lesions are at higher risk of intracranial extension and warrant more thorough pre-operative work up.

METHODS: We conducted a single-centre, consecutive, non-randomized comparative case series, reviewing the case notes of all patients treated surgically for craniofacial dermoids at the Royal Children’s Hospital in Melbourne, Australia. The study period was between August 2013 and May 2017, and a total of 221 patients were identified using coding for “dermoid cyst” procedures. Of these, 147 were identified as having craniofacial dermoids and included in the study. Three surgical units were involved in care (Plastic and Reconstructive Surgery, Neurosurgery and Paediatric Surgery). The data collected included demographic information, pre-operative assessment, pre-operative imaging, date of surgery, age at surgery, surgical details, pathology reports and post-operative follow up.

RESULTS: 147 patients are presented within this series, with a total of 149 dermoid cysts removed. The age at surgery ranged from 2 months to 15 years, with an average age of 20 months. 88 (60%) children presented with lesions of the lateral brow. The next most common locations in descending order were midline nasal with 17 (11.5%), 11 occipital (7.5%), 9 temporal (6%), 6 midline frontal (4%), 5 medial brow/medial canthus (3.5%), 3 glabella (2%), 3 anterior fontanelle (2%), 3 posterior auricular (2%), and 2 parietal (1.5%).

53 of the 147 patients identified had preoperative imaging (36%). 21 patients underwent CT scan alone (40%), 18 underwent MRI alone (34%), 8 patients underwent combined CT and MRI scans (15%), 4 patients underwent ultrasound alone (7.5%), 1 patient had a plain radiograph (2%) and 1 patient underwent combined MRI and ultrasound (2%). In 4 cases (7.5%) the reported imaging was discordant with the operative findings. 3 of these cases failed to report attachment of the lesion to the underlying dura, and 1 failed to report a small breach of the inner table.

To classify the depth of the lesions, we modified the system used by Hartley et al1 to describe midline nasal lesions and applied it to lesions in all locations within the head and neck. We divided the lesions into superficial (type 1), bony remodelling/stalk to suture (type 2), intracranial extradural (type 3), intracranial intradural (type 4) and intracranial intradural (type 5). In this study, 96 lesions were classified as superficial, 31 showed a significant stalk to a suture or bony remodelling, 8 lesions were intracranial extradural, 10 lesions were intracranial intradural and 2 lesions were intracranial intradural. Average age at surgery was highest in group 2 and lowest in group 5.

CONCLUSION: Based on our data, we propose a system using specific classification of anatomical location to assist in the prompt identification of high risk lesions and facilitate sound pre-operative planning.

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