

## A Novel Approach to Surgical Markings Based on a Topographical Map and a Projected 3D Hologram

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**Purpose:** Surgical markings play a crucial role in planning plastic surgery procedures.[1, 2] Despite the importance of markings as a guide, these surgical markings are often imprecise. [3] Herein we describe a novel approach to liposculpture, guided by a computer-based roadmap. A digital 3D topographical surgical map is created using 3D photography and analytic software and then projected as an image onto the patient in the OR during surgery. This concept can be applied to most soft tissue procedures in plastic surgery.

**Methods:** Patients undergoing autologous fat grafting for facial asymmetry had pre-operative 3D photographs taken using the handheld VECTRA® H1 (Canfield© 2013). A hemi-composite model was created by bisecting the 3D photograph at the midline and reflecting the non-deficient hemiface. A color gradient represented the projection difference between the defect and the reference surface. (**Figure 1**) To create the topographic map, the color gradient was traced at 2mm projection intervals. The map was uploaded onto a iPhone 5s® and projected onto the patient using a hand-held *LED Pocket Projector* (axaa Technologies, USA). (**Figure 2**) Colored marking pens assigned to specific projection values were used to trace the map on the patient.

**Results:** Fat was injected according to the region and degree of deficiency as indicated on the topographic map, beginning centrally in the most deficient regions. The map was projected onto the patient intra-operatively for further guidance. By referencing markings generated by computer analysis and surgical simulation, the surgeon has access to a soft tissue surgical plan that precisely describes the relevant anatomy and may highlight areas not appreciated on physical exam.

**Conclusion:** This paper offers the first report of soft-tissue computer surgical planning using a projected 3D topographic map as a guide for surgical marking. Rather than relying surgeon assessment alone, we applied 3D surface scanning technology to perform an objective symmetry analysis on the computer, and then translated this virtual plan to the operating room using a projected hologram. Topographic maps are a simplified translation of the complex three-dimensional facial contour. They provide an easy-to-follow guide tailored to the patient's unique volume needs which are often not appreciated on standard 2D photographs. The value of this technology and its applications in other aspects of plastic surgery has yet to be explored, but offers great potential.

### Figure Legend:

**Figure 1.** Creating the hemi-composite from reflection of non-deficient hemiface.

**Figure 2.** Projection of topographic map and transfer to the patient for intra-operative guidance.

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