A Study on Semi-automatic Fibular Transfer Planning in Mandibular Reconstruction

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Abstract

In preoperative planning of mandibular reconstruction with fibular segments, it is necessary to determine the osteotomy lines and the proper placement of the segments. Interactive planning software [1, 2] is recently utilized in preoperative decision making, and surgeons are able to objectively analyze the surgical plan based on quantitative indicators. However, a time-consuming trial-and-error process is needed to obtain a better reconstruction pattern because manual 3D operation is required for adjustment of the fibular segments.

This study aims to develop a semi-automatic fibular transfer planning system based on both interactive operation and automatic placement of fibular segments. We formulate the placement process as an optimization problem that minimizes the shape error [2] between the surfaces of the patient's original mandible and of the fibular segments. The position of the connecting points of each segment is explored under the local shape constraint using a gradient-based search algorithm (Figure 1). In this presentation, we report some automatic placement results in 2-segment and 3-segment case and discuss applicability to practical preoperative planning.

Keywords: Surgical process modeling, automated planning, mandibular reconstruction

References


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