

Abstract

Objectives: The purpose of this study is to assess the impact of patient-specific 3D-printed surgical guides (3DSG) when utilized during post-traumatic orbital reconstructive surgery.

Methods: Retrospective analysis was conducted of 118 patients who underwent orbital fracture repair at a single institution between January 1, 2018, and July 31, 2024. Inclusion criteria were patients with a unilateral orbital fracture repaired, age over 15, and a postoperative CT scan available. Patients were divided into two groups: those repaired conventionally and those repaired with the use of a 3DSG. Computer-aided design modeling software was utilized to perform volumetric analysis of postoperative CT scans and characterize the volume of repaired and uninjured orbits. Post-reconstructive orbital symmetry was calculated and compared between the groups. The frequency of poor orbital volume restoration, defined as volume difference between sides of ≥ 2 mL, 8%, or both, was also compared.

Results: Of 118 patients, 87 were repaired conventionally and 31 were repaired with a 3DSG. Asymmetry between the repaired and unaffected orbital volume was greater in the conventional group (1.35 mL, SD \pm 0.95 mL) than in the 3DSG group (0.72 mL, SD \pm 0.48 mL), $p < 0.0001$. The incidence of poor postoperative volume restoration was less common when using a 3DSG (3.23% vs. 19.54%, $p = 0.039$) and NNT of 7.

Conclusions: In this retrospective analysis of a single-center experience, use of patient-specific 3D surgical guides during reconstruction of unilateral orbital fractures was associated with improved postoperative orbital symmetry and likely decreased risk of postoperative complications such as globe malposition.