

# Intraoperative CT: A Teaching Tool for the Management of Complex Facial Fracture Fixation in Surgical Training

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## INTRODUCTION

Adequate repair of complex facial fractures following poly-trauma can be challenging for a young surgeon in training. Accurate fracture reduction requires precise knowledge of facial anatomy, consistent anatomic dissection for identification of facial fractures, and most importantly, a global perspective of the facial skeleton for proper symmetrical alignment of the bony structures. Authors have noted that reconstructive surgeons may be at the forefront of individual facets of surgery however they lack considerably behind other surgical specialties when it comes to surgical education.<sup>1</sup>

Intraoperative computed tomography (CT) is a recent development that may serve to improve surgical education; the use of an intraoperative CT provides immediate postreduction or intraoperative scans that make the surgeon aware of the need for extra maneuvers for optimal fracture reduction and fixation in real-time. Indeed, this technique may be utilized as a training tool to assist surgical residents in the diagnosis and confirmation of accurate surgical reduction of complex facial fractures. Temple and Ross<sup>2</sup> noted that in current surgical training programs residents acquire and develop their surgical skills inherently with only sporadic periods of explicit teaching; as they progress in their training, they are given increased responsibility and eventually carry out procedures under supervision. This described method may not be ideal when approaching complex facial fracture cases because variability in trainees may prolong an already potentially difficult procedure to allow the young surgeons to better hone their skills.<sup>3</sup> Based purely on observation of basic surgical skill, the attending surgeon must then

instinctively rely on the sense that the young surgeon is ready with no objective data that they can master more complicated techniques.<sup>2</sup> Thus, there is a need to devise an algorithm of obtaining objective data while allowing the trainee to attain the appropriate surgical skills<sup>2</sup> for the management of complex facial fractures. The authors in this current study designed a method of improving facial fracture teaching in plastic surgical resident training while being able to document objective educational data.

## METHODS

This study was approved by the Institutional Review Board of the Beth Israel Deaconess Medical Center. The described method of teaching residents in surgical training of complex facial fractures utilizing intraoperative CT is outlined in Figure 1. In this study, Plastic Surgery residents were assessed in the operating room who ranged from postgraduate year (PGY) levels 4-8 (Figure 1). The attending surgeon was trained regarding the use of the intraoperative scanner before the initiation of the study to efficiently assess facial fracture reduction and fixation. In summary, the surgical resident under the supervision and guidance of the attending surgeon proceeds to expose, to align, and reduce the facial fractures. This outcomes assessment technique is suited well for the surgical mantra of “see one, do one, and teach one” because results of fracture reduction are immediate. Furthermore, after each procedure a “debriefing” session was performed with the resident in reviewing the operative sequence and intraoperative CT images. In addition, residents are able to archive intraoperative scans that may be printed from the CT scanning device. Next, the fractures are fixed using titanium plates and screws. A CT scan is then done using the intraoperative CT providing axial, coronal, sagittal, and 3D images. After a review of the intraoperative CT images is independently performed by both the surgical resident and the attending surgeon, management options are discussed and a decision is made as to whether to move forward with incision closure, or, in case of inadequate reduction, a revision is im-

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