



# The Role of Post-Operative Imaging after Orbital Floor Fracture Repair

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## Abstract

**Outcome Objectives:** Post-operative imaging is frequently obtained after surgery for craniomaxillofacial (CMF) trauma. A growing body of literature is questioning the value of this practice due to high costs and risk of radiation exposure. We aim to; 1) describe common reasons used for obtaining postoperative imaging in isolated orbital floor fractures, 2) evaluate its impact on management of patients, and, 3) assess overall utility of post-operative imaging in this patient population.

**Methods:** A retrospective review was performed of patients that underwent open reduction and internal fixation of isolated orbital floor fractures between July 1<sup>st</sup>, 2010 and June 30<sup>th</sup>, 2015. The preliminary cohort included 43 patients. Pre-, intra-, and post-operative imaging practices were analyzed with the primary outcome being operative and post-operative complications.

**Results:** Postoperative imaging was obtained for 12 of 64 subjects (19%): 6 for evaluation of plate placement without additional documented concerns (9.5%) and 6 for persistent symptoms including diplopia and blurred vision, diplopia and eye pain, and limited extraocular motility with eye pain (9.5%). Of those patients who had postoperative imaging, one patient (1.5%) had a deviation in standard postoperative management secondary to imaging findings. CT revealed an inferior rectus transection and optic nerve impingement and revision surgery was performed 26 hours after the original procedure. The single noted operative complication was an anterior skin flap buttonhole.

**Conclusions:** These data suggest that routine post-operative imaging is not warranted in the absence of persistent clinical symptoms following open reduction and internal fixation of isolated orbital floor fractures.

## Background

- Post-operative radiographs are routinely taken after surgery for craniomaxillofacial (CMF) trauma [1-3].
- Although a variety of justifications are provided to obtain imaging - including its utility in clinical decision making, teaching purposes, and for medico-legal reasons [1,4,5], a growing body of literature is questioning the value of this practice [1-4].
- Critics cite unnecessary radiation exposure, delayed discharge, and increased total cost to the patient with little to no demonstrated benefit over management based on clinical signs as reasons to discontinue the usage of postoperative imaging [6].
- Post-operative imaging patterns following orbital floor fracture repair have not been reported in literature.

## Methods

- Retrospective review involved analysis of data extracted from patients seen at Duke University Health System who underwent operative management of isolated orbital floor fractures from July 1<sup>st</sup> 2005 through June 30<sup>th</sup> 2015.
- 64 of 239 screened patients met the study criteria.
- To determine if post-operative radiographs were routine or not, the operative records were reviewed and the reason for requesting the imaging assessed.
- Imaging patterns were analyzed with respect to complication rates as well as across attending surgeons.
- Patients were then divided into 3 difference groups –
  - 1) Those with routine post-operative imaging study performed within 30 days of the operation,
  - 2) those who did not have routine post-operative imaging, and
  - 3) those who had selective post-operative imaging performed to address a specific indication or concern.
- Primary outcome variables included:
  - 1) whether routine post-operative radiographs impacted further management including need for revision surgery/additional treatment, and
  - 2) post-operative complications in patients with routine post-operative radiography versus those without.

## Results

**Table 1:** Cohort demographic data for all 64 subjects

Orbital Fractures n = 64		
Age	Mean	36.2
	SD	17.0
Gender	Male	41 (64%)
	Female	23 (36%)
Race	African American	29 (45%)
	White	27 (42%)
	Asian	6 (9%)
	Hispanic	2 (3%)
Mechanism of Injury	Assault	30 (47%)
	MVC	21 (33%)
	Fall	9 (14%)
	Sports-related injury	3 (5%)
	Other	1 (2%)
Number of Preoperative Imaging Studies	1	17 (27%)
	2	43 (67%)
	3	4 (6%)
Intraoperative CT Imaging	No	61 (95%)
	Yes	3 (5%)
Postoperative CT Imaging	No	52 (81%)
	Yes	12 (19%)
Intraoperative Complications	No	63 (98%)
	Yes	1 (2%)
Postoperative Complications	No	55 (86%)
	Yes	9 (14%)
Revision Surgery	No	63 (98%)
	Yes	1 (2%)

- Postoperative imaging was obtained for 12 (19%) patients: 6 per routine protocol and 6 per concerning clinical symptoms.
- Intraoperative imaging was performed for 3 (5%) patients.
- Revision surgery was required for one patient who experienced significant eye pain and reduced ocular motility following orbital floor reduction and fixation. A postoperative CT scan confirmed the clinical suspicion for optic nerve impingement.
- There were 10 cases of complications encountered in this study population. The single intraoperative complication involved a buttonhole of the anterior skin flap, which was closed in a layered fashion. Postoperative imaging was not ordered and the patient experienced an uneventful recovery.
- The other 9 complications involved postoperative symptoms, 5 of which warranted postoperative imaging.
- Revision surgery was required for a single patient, after postoperative CT scans demonstrated optic nerve impingement that was consistent with the observed postoperative eye pain and abnormal extraocular motility.
- Cases were also divided by surgical attending. Postoperative CT imaging rates ranged from 75% to 0% and postoperative complication rates ranged from 29% to 0%. Although 4 of the 6 surgeons ordered at least one postoperative CT scan per protocol, only a single surgeon ordered postoperative imaging in more than 20% of cases (75%).

**Table 2:** Cases with complications

Orbital Fracture Complications (n=10)				
Intra- or Postoperative?	Intraoperative Imaging	Postoperative CT Imaging	Complication	Revision Surgery
Intraoperative	None	No	buttonhole of the anterior skin flap closed in a layered fashion	No
Postoperative	None	No	blurry vision	No
Postoperative	None	No	persistent diplopia	No
Postoperative	None	No	post-operative conjunctivitis	No
Postoperative	None	No	persistent diplopia	No
Postoperative	None	Yes	persistent diplopia and blurred vision	No
Postoperative	None	Yes	persistent pain and diplopia	No
Postoperative	None	Yes	persistent diplopia	No
Postoperative	None	Yes	diplopia and swelling over the right brow with some minor corneal abrasions and hemorrhagic chemosis secondary to trauma and surgery	No
Postoperative	None	Yes	eye pain, abnormal extraocular motility	Yes

## Discussion

- Of the 64 cases of orbital floor fractures reviewed, postoperative imaging per protocol did not lead to any changes in postoperative management.
- Postoperative imaging was ordered per protocol in six patients, all of which had an uneventful recovery.
- In the single case where postoperative imaging affected clinical management, a CT scan was ordered due to concern over patient symptoms.
- These data support the case against postoperative imaging as routine standard of care for orbital floor fractures.
- The present body of literature suggests that the clinical, educational, and legal benefits of postoperative imaging following CMF trauma are marginal.
- Additional drawbacks to routine postoperative imaging must be considered. The cost of ordering postoperative imaging is significant for the patient.
- Additionally, facial CT imaging has been associated with thyroid, salivary gland, and brain cancer [7-10].

## Conclusion

- Postoperative imaging does not appear to influence clinical management decisions following orbital floor fracture repair.**
- These findings are consistent with reports of imaging patterns following other facial trauma cases, suggesting that the cited clinical, educational, and legal benefits of such imaging are marginal and do not exceed the drawbacks of associated patient cost and potential radiation exposure risks.**

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