Isolated Orbital Floor Fracture Management: A Survey and Comparison of American Oculofacial and Facial Plastic Surgeon Preferences

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Abstract

This article aimed to characterize, compare, and contrast the management of isolated orbital floor fractures among oculofacial and facial plastic surgeons in the United States. An anonymous 17-question multiple-choice web-based survey was distributed to all 590 members of the American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) and all 1,300 members of the American Academy of Facial Plastic and Reconstructive Surgery (AAFPRS) using each society's email database from November 2016 to January 2017. Two-hundred twenty-five oculofacial and 135 facial plastic surgeons completed the survey. The most important indications for surgery among both oculofacial and facial plastic surgeons were motility restriction, enophthalmos, and diplopia at 2 weeks. The most common preferred time to surgical intervention was 8 to 14 days; however, facial plastic surgeons were more likely to operate after 4 to 7 days ($p < 0.001$). The most common choices of orbital implant material were porous polyethylene and porous polyethylene plus titanium for both oculofacial and facial plastic surgeons, nylon for oculofacial surgeons, and titanium for facial plastic surgeons. The majority rarely/never used intraoperative computed tomography imaging or navigation. Facial plastic surgeons were more likely to perform postoperative imaging ($p < 0.001$). We report results of the first survey of isolated orbital floor fracture management among oculofacial and facial plastic surgeons in the United States. This survey characterizes practice patterns and areas of similarities/differences among oculofacial and facial plastic surgeons in the management of isolated orbital floor fractures, which may help define the current standard of care.

Keywords

- orbital floor fracture
- orbital implant
- survey

Orbital fractures are managed by many surgical specialties including ophthalmology, otolaryngology, plastic surgery, and oral and maxillofacial surgery (OMFS). Management practices vary, in part due to the diversity in surgical training among the specialties, specialty-specific trends, and the paucity of high-quality evidence-based studies defining the standards of care in orbital fracture management.^{1,2}

Therefore, surgeons are left to combine their personal experience with interpretation of the available data to shape their own practice patterns.

In recent years, there have been several studies published on surgeon preferences in the management of orbital fractures. These include surveys of oculofacial surgeons in the Asia-Pacific region; OMFS in the United States, United

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Kingdom, and Australia/New Zealand; and plastic surgeons in Canada.²⁻⁶ While there are perceived differences in practices of different specialties based on presumption or anecdotes, there has been no published survey study regarding orbital fracture management that includes both oculofacial surgeons and facial plastic surgeons. We surveyed oculofacial and facial plastic surgeons in the United States and compared and contrasted practice patterns between these two groups as well as with those from OMFS and plastic surgeons available in the literature.

Methods

This study was performed in accordance with the tenets of the Declaration of Helsinki and received institutional review board exemption. An anonymous 17-question multiple-choice web-based survey was conducted between November 2016 and January 2017. The survey was created using Google Forms (Google Inc., Mountain View, CA) and was distributed to all the members of the American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) and American Academy of Facial Plastic and Reconstructive Surgery (AAFPRS) using each society's email database as provided by the respective society offices. Two to 4 weeks after the initial distribution, survey invitations were redistributed a second time to increase response rate. Survey questions were designed to assess relevant factors for evaluation, decision for surgery, surgical techniques utilized, and follow-up for isolated orbital floor fractures (►Appendix A). These questions were similar to those used in other surveys regarding isolated orbital floor fracture management in the literature²⁻⁶ to allow comparison between previously published data and results from the current study.

Survey responses were collected in Microsoft Excel (Microsoft, Redmond, WA). Statistical analyses were performed using the R statistical computing package.⁷ *p*-Values were calculated to test for significant differences between oculofacial and facial plastic surgeon responses using a two-sided Fisher's exact test for count data. An overall *p*-value was calculated for each survey question (represented as a $n \times 2$ contingency table), and within each table a Fisher's exact *p*-value was calculated for each individual response option. Given that responses for 19 different survey items were compared, we used a Bonferroni-corrected significance threshold of $p < 0.0026$ to define statistical significance ($p = 0.05/19 = 0.0026$).

Results

Of 590 email requests sent to ASOPRS members, 225 surveys were completed and analyzed for a response rate of 38.1%. All 225 respondents were ophthalmology-trained and completed fellowship in oculofacial surgery. Of 1,300 email requests sent to AAFPRS members, 175 surveys were completed and analyzed for a response rate of 13.5%. These 175 respondents included 170 facial plastic surgeons, three plastic surgeons, and two OMFS. Given the small numbers of plastic surgeons and OMFS, the authors chose to analyze only the facial plastic

surgeon responses. Of the 170 facial plastic surgeons, 135 completed fellowship training in facial plastic surgery; this was the group of participants whose responses were analyzed to maintain consistency in formal fellowship training among oculofacial and facial plastic surgeons.

Demographics

Demographic information is included in ►Table 1. There was no significant difference in the number of years in practice between oculofacial and facial plastic surgeons. However, difference in type of practice was significant ($p = 0.002$) with facial plastic surgeons tending to be more likely to practice in an academic setting and oculofacial surgeons in a group practice. Number of isolated orbital floor fractures repaired per year also differed between the two groups ($p < 0.001$). While the most common response for both oculofacial and facial plastic surgeons was one to five fracture repairs per year (30.2 vs. 45.2%), 26.2% of oculofacial surgeons performed 11 to 20 fractures per year compared with 11.1% of facial plastic surgeons, which was significantly different ($p < 0.001$). There was no difference in the percentage of fractures that require operation. This question was intended to elicit the general frequency with which surgeons operate on orbital floor fractures they evaluate; therefore, the ranges of percentages are not equal but instead reflect responses that could be interpreted as rarely ($<30\%$), often (31–70%), or most of the time ($>70\%$). The majority indicated they operate on 11 to 30% or 31 to 70% of isolated orbital floor fractures.

Indications for Surgery

There were strong similarities in the indications for surgery among oculofacial and facial plastic surgeons (►Table 2). In both groups, the most important factors (strongly or very strongly) influencing the surgeon's decision to operate were motility restriction, enophthalmos, and diplopia at 2 weeks, as indicated by 95.9, 87.2, and 83.9% of oculofacial respondents and 96.9, 94.5, and 79.9% of facial plastics respondents, respectively. The only significant difference was for enophthalmos ($p = 0.002$), for which facial plastic surgeons were more likely to indicate this as a very strong factor ($p < 0.001$), versus oculofacial surgeons who tended to be more likely to indicate it as only a strongly or moderately influential factor.

Time to Operation

The most common preferred time from injury to surgical intervention was 8 to 14 days for both oculofacial and facial plastic surgeons (61.7 vs. 48.8%; ►Fig. 1). The difference in preferred time to operation between the two groups was significant overall ($p < 0.001$) and in particular at the time range of 4 to 7 days after injury (34.9% facial plastics vs. 18.0% oculofacial surgeons, $p < 0.001$).

Surgical Approach

The majority of both oculofacial and facial plastic surgeons preferred a transconjunctival approach in orbital floor fracture repair (94.1 vs. 85.5%; ►Table 3). This difference was not significant ($p = 0.004$).

Table 1 Demographic information for oculofacial and facial plastic surgeons

	Oculofacial number of respondents (%)	Facial plastic number of respondents (%)	p-Value
Number of years in practice			0.013
0–5	33 (14.7)	37 (27.4)	0.0058
6–10	34 (15.1)	25 (18.5)	0.46
11–20	60 (26.7)	32 (23.7)	0.53
> 20	98 (43.6)	43 (31.9)	0.026
Type of practice			0.0018 ^a
Academic	59 (26.2)	56 (41.5)	0.0034
Solo	59 (26.2)	27 (20.0)	0.20
Group	89 (39.6)	34 (25.2)	0.0059
Multispecialty	18 (8.0)	18 (13.3)	0.11
Number of orbital floor fracture repairs per year			0.000011 ^a
0	5 (2.2)	13 (9.6)	0.0044
1–5	68 (30.2)	61 (45.2)	0.0046
6–10	62 (27.6)	37 (27.4)	1.00
11–20	59 (26.2)	15 (11.1)	0.00068 ^a
> 20	31 (13.8)	9 (6.7)	0.039
Percentage of fractures that require operation			0.38
0–10% (rarely)	27 (12.1)	9 (7.1)	0.15
11–30% (sometimes)	82 (36.8)	47 (37.0)	1.00
31–70% (often)	98 (43.9)	56 (44.1)	1.00
71–90% (mostly)	14 (6.3)	13 (10.2)	0.21
91–100% (routinely)	2 (0.9)	2 (1.6)	0.62

^aResponses with statistically significant differences ($p < 0.0026$).

Orbital Implants

The most common choices of implants for orbital floor fracture repair were nylon (32.9%), porous polyethylene (27.9%), and porous polyethylene plus titanium (25.1%) for oculofacial surgeons and porous polyethylene plus titanium (39.4%), porous polyethylene (20.5%), and titanium (20.5%) for facial plastic surgeons (►Fig. 2). On the whole, this was significantly different ($p < 0.001$). Facial plastic surgeons were significantly more likely to prefer titanium ($p < 0.001$), whereas oculofacial surgeons were significantly more likely to prefer nylon ($p < 0.001$). For this survey question, there was an answer response of “Other” via which respondents could use free text to write in responses. The most common “Other” responses for oculofacial surgeons were “depends on fracture size and support,” “absorbable,” and “no preference,” and for facial plastic surgeons were “absorbable,” “dissolvable,” and “resorbable.”

More than half of surgeons (54.6% of oculofacial surgeons, 63.8% of facial plastic surgeons; $p = 0.11$) preferred to use a porous versus nonporous implant. The majority used more than one type of implant material (70.6% of oculofacial surgeons, 68.8% of facial plastic surgeons; $p = 0.72$).

Imaging

The vast majority of surgeons rarely or never used 3D intraoperative navigation (97.3% of oculofacial surgeons, 92.1% of facial plastic surgeons) or intraoperative computed tomography (CT) imaging (92.3% of oculofacial surgeons, 86.0% of facial plastic surgeons) for isolated orbital floor fracture repair (►Table 3). Facial plastic surgeons were more likely to perform routine postoperative imaging compared with oculofacial surgeons (24.8 vs. 5.5%, $p < 0.001$).

Follow-up

Follow-up time for uncomplicated isolated orbital floor fracture patients was similar between oculofacial and facial plastic surgeons, as the most common responses for both groups were 1 to 3 months (45.3% of oculofacial surgeons vs. 41.7% of facial plastic surgeons) and 4 to 6 months (31.8% of oculofacial surgeons vs. 26.0% of facial plastic surgeons; ►Table 3).

Discussion

To the authors' knowledge, this is the first survey regarding the management of isolated orbital floor fractures among oculofacial and facial plastic surgeons practicing in the

Table 2 Strength of factors in influencing decision of whether or not to operate for oculofacial and facial plastic surgeons

	Oculofacial number of respondents (%)	Facial plastic number of respondents (%)	p-Value
Fracture size			0.35
Very strong	81 (37.5)	58 (45.3)	0.17
Strong	72 (33.3)	43 (33.6)	1.00
Moderate	53 (24.5)	24 (18.8)	0.23
Weak	9 (4.2)	2 (1.6)	0.22
Very weak	1 (0.5)	1 (0.8)	1.00
Enophthalmos			0.0022 ^a
Very strong	120 (54.8)	93 (72.7)	0.00095 ^a
Strong	71 (32.4)	28 (21.9)	0.037
Moderate	23 (10.5)	5 (3.9)	0.039
Weak	4 (1.8)	0 (0.0)	0.30
Very weak	1 (0.5)	2 (1.6)	0.56
Motility restriction			0.28
Very strong	166 (75.5)	107 (83.6)	0.080
Strong	45 (20.5)	17 (13.3)	0.11
Moderate	7 (3.2)	4 (3.1)	1.00
Weak	2 (0.9)	0 (0.0)	0.53
Very weak	0 (0.0)	0 (0.0)	1.00
Early diplopia			0.13
Very strong	23 (10.9)	22 (17.3)	0.10
Strong	48 (22.8)	26 (20.5)	0.68
Moderate	62 (29.4)	43 (33.9)	0.40
Weak	57 (27.0)	31 (24.4)	0.61
Very weak	21 (10.0)	5 (3.9)	0.057
Persistent diplopia at 2 wk			0.46
Very strong	124 (56.9)	61 (47.3)	0.095
Strong	59 (27.1)	42 (32.6)	0.33
Moderate	29 (13.3)	22 (17.1)	0.35
Weak	4 (1.8)	2 (1.6)	1.00
Very weak	2 (0.9)	2 (1.6)	0.63
CN V2 paresthesia			0.38
Very strong	4 (1.9)	7 (5.5)	0.11
Strong	11 (5.2)	6 (4.7)	1.00
Moderate	34 (16.0)	24 (18.8)	0.55
Weak	58 (27.2)	29 (22.7)	0.37
Very weak	106 (49.8)	62 (48.4)	0.82

Abbreviation: CN, cranial nerve.

^aResponses with statistically significant differences ($p < 0.0026$).

United States. The authors compared the results of the current survey with similar surveys in the literature.²⁻⁶ There were several items on which there was consensus among members of the same specialty and between specialties, as well as items with considerable variability in responses.

Demographics

The response rates in the current survey of 38.1% for oculofacial and 13.5% for facial plastic surgeons were lower than those for similar surveys among oculofacial surgeons in Asia (58.3%),⁴ plastic surgeons in Canada (56%),² OMFS in the United Kingdom (73%),⁵ and OMFS in Australia/New Zealand (87%),⁶ but greater

Fig. 1 Preferred time from injury to surgical intervention for isolated orbital floor fractures for oculofacial and facial plastic surgeons.

*Responses with statistically significant differences ($p < 0.0026$).

than OMFS in the United States (8.1%).³ This could reflect geographic differences and/or the larger sample populations for the current study and American OMFS study.³ The surveys of Canadian plastic surgeons and Australian OMFS cited similar number of years in practice and number of fracture repairs per year to respondents in the current study.^{2,6}

The British and Australian OMFS operated on isolated orbital floor fractures with greater frequency than respondents in the current study, with 4% of British OMFS routinely exploring all floor fractures and 30% of Australian OMFS operating greater than 75% of the time.^{5,6} In contrast, 7.2 and 11.8% of U.S. oculofacial and facial plastic surgeons, respectively, operate on more than 70% of fractures, and less than 2% operate on more than 90% of fractures. This difference could reflect subspecialty differences, patient referral differences, health care system differences, or changes in practice patterns over time, as the British and Australian OMFS studies were conducted in 2000 and 2004, respectively.

Table 3 Preferred operative approach, use of intraoperative and post-operative imaging, and length of follow-up for isolated orbital floor fracture repair for oculofacial and facial plastic surgeons

	Oculofacial number of respondents (%)	Facial plastic number of respondents (%)	p-Value
Preferred operative approach			0.0041
Transconjunctival	207 (94.1)	112 (85.5)	0.012
Subciliary	7 (3.2)	15 (11.5)	0.0028
Subtarsal	3 (1.4)	1 (0.8)	1.00
Infraorbital	3 (1.4)	1 (0.8)	1.00
Endoscopic	0 (0.0)	2 (1.5)	0.14
3D intraoperative navigation (e.g., Brainlab, fusion)			0.080
Always	2 (0.9)	1 (0.8)	1.00
Sometimes	4 (1.8)	9 (7.1)	0.018
Rarely	33 (15.1)	15 (11.8)	0.42
Never	180 (82.2)	102 (80.3)	0.67
Intraoperative imaging (CT scan)			0.28
Always	9 (4.1)	8 (6.2)	0.44
Sometimes	8 (3.6)	10 (7.8)	0.13
Rarely	22 (10.0)	12 (9.3)	1.00
Never	181 (82.3)	99 (76.7)	0.21
Routine postoperative imaging			0.00000041 ^a
Yes	12 (5.5)	32 (24.8)	N/A
No	208 (94.5)	97 (75.2)	N/A
Length of follow-up			0.20
< 1 mo	12 (5.4)	13 (10.2)	0.13
1-3 mo	101 (45.3)	53 (41.7)	0.58
4-6 mo	71 (31.8)	33 (26.0)	0.27
7-12 mo	27 (12.1)	23 (18.1)	0.15
1-3 y	9 (4.0)	5 (3.9)	1.00
> 3 y	3 (1.4)	0 (0.0)	0.56

Abbreviation: CT, computed tomography.

^aResponses with statistically significant differences ($p < 0.0026$).

Indications for Surgery

The most important indications for surgery among both American oculofacial and facial plastic surgeons were motility restriction, enophthalmos, and diplopia at 2 weeks. American OMFS and Canadian plastic surgeons had similar responses, with 70 to 99% indicating very strong or strong influence of these factors.^{2,3} Similar to the current data, cranial nerve V2 paresthesia had only weak influence.^{2,3} Of note, trigeminal nerve hypesthesia or paresthesia is not an indication for surgery at our institution (Homer N, Yoon MK, unpublished data, presented at the ESOPRS Annual Meeting, Stockholm, Sweden, 2017). One indication where there was discrepancy was for early diplopia, as the majority (52.9%) of American OMFS indicated very strong or strong influence,³ whereas the majority of our oculofacial (56.4%) and facial plastic surgeons (58.3%) rated weak to moderate influence and Canadian plastic surgeons (66%) weak to no influence.² This is in agreement with recent reviews that early diplopia should not be used as an operative indication.^{8,9}

Data from the current survey and those in the literature are consistent with well-established recommendations regarding indications for surgery. Strong evidence has been reported for immediate surgical intervention in cases of diplopia with an oculocardiac reflex, white-eyed blow-out fracture, or other forms of entrapment.¹⁰ In addition, there is general agreement that patients with persistent diplopia and limitation of extraocular motility within 30 degrees of primary position, enophthalmos of more than 2 mm, large fractures involving greater than one-half of the orbital floor, or CT evidence of muscle entrapment require surgery within 1 to 2 weeks.^{11–16} Patients without any of these findings may generally be managed conservatively.¹⁷

Time to Operation

The most common response for preferred time from injury to surgical intervention was 8 to 14 days for both oculofacial and facial plastic surgeons, and the majority preferred to operate 4 to 14 days after injury. However, facial plastic surgeons were significantly more likely to operate 4 to 7 days after injury ($p < 0.001$). The current survey data are in agreement with Asian oculofacial surgeons, as 60.8% preferred to operate within 2 weeks.⁴ Similarly, most British (54%) and Australian (51%) OMFS prefer to operate within 6 to 10 days and 5 to 10 days, respectively.^{5,6} For U.S. OMFS and Canadian plastic surgeons, the majority operate between 4 days to 2 weeks.^{2,3} The decision to operate within 1 to 2 weeks of injury is in accordance with recommendations made in the studies referenced earlier.^{11–16} Although our survey inquired specifically about isolated orbital floor fractures, it is possible that some respondents considered cases with concurrent zygomaticomaxillary complex (ZMC) fractures, which may account for the shorter preferred time to operation for facial plastic surgeons. Each patient and fracture is unique; thus, surgery outside the above time frames may be necessary or preferred in some cases.

Surgical Approach

The vast majority of American oculofacial (94.1%) and facial plastic surgeons (85.5%) preferred a transconjunctival

approach, which is similar to Asian oculofacial surgeons (82.4%).⁴ A much smaller percentage of U.S. OMFS (58.2%) preferred a transconjunctival approach.³ These data are in contrast with the British and Australian OMFS studies in which the subciliary approach was the most common (41 and 43% of respondents, respectively), followed by infraorbital (37% in both studies), while the transconjunctival approach accounted for only 7 and 12%, respectively.^{5,6} The most common responses in the Canadian plastic surgeon survey were mid-lid/infraorbital (45%), then transconjunctival (31%) and subciliary (24%), yet their 10-year literature review demonstrated that plastic surgeons (86%) and OMFS (56%) favored subciliary incisions, whereas ophthalmologists (99%) and otolaryngologists (55%) preferred a transconjunctival approach.² These differences may result from comfort level operating in closer proximity to the globe that varies across specialties. The subciliary approach has been shown to have the highest rate of ectropion (14%)¹⁸ and can cause persistent scleral show and a visible scar,^{19,20} whereas in contrast, the transconjunctival approach is scarless and has the least incidence of complications.²¹

Orbital Implants

Porous polyethylene and porous polyethylene plus titanium were preferred among both American oculofacial and facial plastic surgeons, with oculofacial surgeons also commonly utilizing nylon and facial plastic surgeons utilizing titanium (►Fig. 2). It is important to note that most surgeons used other implants in addition to their preferred option, some indicating that their choice of implant depended on features of each specific fracture. Similar to these results, porous polyethylene was a popular option among Asian oculofacial surgeons (70.6%), American OMFS (43.7%), and Canadian plastic surgeons (45%),^{2–4} along with titanium for American OMFS (65.4%) and Canadian plastic surgeons (29%).^{2,3} In previous British/Australian OMFS studies, silicone (66%)⁵ and autologous bone (48%; 26% for defects <1 cm, 47% for defects >1 cm)⁶ were the most commonly preferred. The differences in materials between these two studies and all the rest are likely due to historical differences in preference and availability of materials 15 years ago compared with

Fig. 2 Preferred choice of implant material for orbital floor fracture repair for oculofacial and facial plastic surgeons. *Responses with statistically significant differences ($p < 0.0026$).

today. Porous polyethylene has steadily gained popularity due to favorable results and pliability, compared with autologous bone, which is rarely used due to donor-site morbidity and variable resorption.³ Titanium is recommended by some surgeons as well, and the data suggest that facial plastic surgeons, OMFS, and plastic surgeons use it frequently. Advantages include rigidity and permitting the egress of blood into the maxillary sinus, while disadvantages include the potential for orbital adherence syndrome.²²

Imaging

U.S. oculo-facial and facial plastic surgeons rarely or never use 3D intraoperative navigation or intraoperative CT imaging for isolated orbital floor fracture repair. Similarly, only 4.2% of Asian oculo-facial surgeons and 4.4% of American OMFS use intraoperative navigation.^{3,4} This is consistent with the finding that intraoperative CT imaging is most useful in cases of complex facial reconstruction.²³ Routine postoperative imaging was performed by 24.8% of facial plastic surgeons, which is similar to U.S. OMFS (35.9%)³ but significantly more than our cohort of oculo-facial surgeons (5.5%; $p < 0.001$). This difference could be in part due to differences in specialty training, number of fracture repairs performed, familiarity with orbital anatomy, or frequent use of postoperative imaging for other types of facial fractures (i.e., Le Fort, mandible, ZMC, frontal sinus) repaired by some specialties.

Follow-up

Follow-up time was similar among oculo-facial and facial plastic surgeons in the current study, with most following patients for 1 to 6 months postoperatively. The Asian oculo-facial study found that 47.2% follow patients for less than 6 months.⁴ Interestingly, 17.0% followed patients for 1 to 3 years and 7.5% indefinitely,⁴ compared with 4.0 and 1.4% of our oculo-facial respondents. These longer follow-up times could be a result of geographic, health care system, referral pattern, and health care resource differences.

Limitations

Limitations of the current study include the response rates of 38.1% for ASOPRS members and 13.5% for AAFPRS members. Despite these response rates, we were able to obtain 225 oculo-facial and 135 facial plastic surgeon responses. Another limitation is the potential biases in participants' survey responses that may not accurately reflect their actual practices. However, the anonymous nature of the study was meant to encourage unbiased responses. Although distributing our survey to OMFS and plastic surgeons would have aided in making more direct comparisons in practice patterns between all the specialties that manage isolated orbital floor fractures, there were limitations in doing this. A recent similar survey of American OMFS published in 2016³ made a repeat survey of the same group unnecessary, and the American Society of Plastic Surgeons had restrictions to survey their entire membership. Therefore, we surveyed oculo-facial and facial plastic surgeons using survey items similar to those already present in the literature to allow for comparison of responses.

Conclusions

In conclusion, we report results of the first survey of isolated orbital floor fracture management among oculo-facial and facial plastic surgeons in the United States as well as a comparison of the results with previous studies of other specialties. Among all the surgical specialties that manage orbital floor fractures, there is consensus regarding the indications for surgery. Similarly, most surgeons prefer to operate 4 to 14 days after injury, though in our study, facial plastic surgeons tended to operate earlier than oculo-facial surgeons. In general, most oculo-facial and facial plastic surgeons prefer to utilize a transconjunctival approach, whereas OMFS and plastic surgeons use subciliary or infraorbital approaches with greater frequency. Regarding orbital implant materials, there are some specialty-specific preferences with oculo-facial surgeons using nylon more frequently than any other specialty and titanium less frequently than any other specialty. Intraoperative imaging for isolated orbital floor fracture repair is rarely used across specialties, but postoperative imaging is most commonly used by facial plastic surgeons and OMFS while least commonly used by oculo-facial surgeons. Overall, there is similarity in follow-up time of 1 to 6 months. Although there are controversies regarding the management of isolated orbital floor fractures, the characterization of common practice patterns within each surgical specialty may serve to provide useful feedback, enabling surgeons to compare their current management practices with that of their surgical colleagues. In addition, defining common management practices as well as similarities and differences between specialties via surveys such as these may help define the current standard of care. Further studies analyzing outcomes could help determine if the impact of these differences in management is clinically significant.

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Appendix A Survey questionnaire regarding management of isolated orbital floor fractures distributed to oculofacial and facial plastic surgeons in the United States

Question	Answer choices
What is your surgical specialty?	Ophthalmology
	Otolaryngology
	Plastic surgery
	Oral maxillofacial surgery
Have you completed additional fellowship training?	Yes
	No
What fellowship training have you completed?	Plastic surgery
	Facial plastic surgery
	Oculofacial surgery
	Craniofacial surgery
	Other
How many years following training have you been in practice?	0–5
	6–10
	11–20
	>20
Which of the following best describes your type of practice?	Solo
	Group
	Multispecialty
	Academic
How many orbital floor fracture repairs do you perform in a year?	0
	1–5
	6–10
	11–20
	>20
Please indicate the strength of each of these factors in influencing your decision of whether or not to operate (on a scale of very weak, weak, moderate, strong, very strong)	Fracture size
	Enophthalmos
	Motility restriction
	Early diplopia
	Persistent diplopia (at 2 wk)
	Cranial nerve V2 paresthesia
What percentage of fracture patients that you see in the clinic/hospital requires surgery?	0–10%
	11–30%
	31–70%
	71–90%
	91–100%
If surgery is indicated, what is your preferred time from injury to surgical intervention?	<24 h
	1–3 d
	4–7 d
	8–14 d
	15–28 d
	>28 d

Appendix A (Continued)

Question	Answer choices
What is your preferred operative approach for orbital floor fracture repair?	Transconjunctival
	Subciliary
	Subtarsal
	Infraorbital
	Endoscopic
Do you prefer a porous or nonporous implant?	Porous
	Nonporous
Which is your preferred choice of implant for orbital floor fracture repair?	Autologous grafts (e.g., bone, cartilage)
	Allografts (e.g., dura mater, demineralized human bone)
	Nylon
	Porous polyethylene
	Porous polyethylene + titanium
	Titanium mesh
	Silicone
	Other
Do you use other materials in addition to your preferred option?	Yes
	No
How often do you use 3D intraoperative navigation (e.g., Brainlab, fusion) for isolated orbital fracture repair?	Always
	Sometimes
	Rarely
	Never
How often do you use intraoperative imaging (CT scan)?	Always
	Sometimes
	Rarely
	Never
Do you perform routine postoperative imaging on patients after fracture repair?	Yes
	No
How long do you routinely follow up uncomplicated orbital fracture patients?	<1 mo
	1–3 mo
	4–6 mo
	7–12 mo
	1–3 y
	> 3 y