Craniomaxillofacial Trauma Experience in Otolaryngology Residency: A National Survey of Program Directors

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Abstract

This article aimed to assess the depth and volume of craniomaxillofacial (CMF) trauma exposure and education in otolaryngology residency training in the United States. This is a cross-sectional survey. A 15-question web-based survey was distributed to program directors of 106 Accreditation Council for Graduate Medical Education (ACGME)-approved otolaryngology residency programs to inquire about program size and demographics, trauma coverage, case volume, and education. Responses were collected anonymously. A total of 77 responses were received, representing 73% of residency programs. Seventy-five programs (97%) reported that their residents rotated at a level 1 trauma center, and 72 (94%) covered CMF trauma. Sixty-one programs (79%) included pediatric CMF trauma. The majority of programs (76%) allocated less than 10% of residency-dedicated didactic lecture time to CMF trauma. Residents in all programs typically logged at least 11 to 20 cases before graduation with 24% of programs averaging more than 50 cases per resident. Ninety percent of respondents described the training as “somewhat” to “very adequate.” CMF coverage by the otolaryngology department, number of cases, and dedicated didactic lecture time to CMF trauma were significant factors on the perception of adequate training. The majority of program directors felt that the training in CMF trauma was adequate. Reasons for this may include that most residents rotate at level 1 trauma centers, have exposure to pediatric trauma, encounter an adequate volume of cases, and have dedicated didactic time to CMF education.

Keywords

- craniomaxillofacial surgery
- facial trauma repair
- otolaryngology residency
- resident education

Otolaryngologists are fundamental in the interdisciplinary evaluation and management of craniomaxillofacial (CMF) trauma, and residency education is critical to provide adequate training to manage CMF injuries. However, not a great deal is known about the state of U.S. residency education in CMF trauma. There are avenues to achieve greater education during residency training, including but not limited to simulation courses and CMF trauma courses offered by private and academic organizations such as the Arbeitsgemeinschaft für Osteosynthesefragen (AO) Foundation.^{1–3}

Currently, there are few opportunities for residents to seek greater training in CMF trauma after residency. There have been less than five otolaryngology residency graduates who have done a craniofacial fellowship between 2010 and 2016.⁴

The residents of U.S. otolaryngology—head and neck surgery programs are required by Accreditation Council for Graduate Medical Education (ACGME) to log at least 12 cases of mandible or midface fracture repairs as primary or teaching resident during their entire residency as key indicator cases.⁵ Additionally, trauma is part of the residency curriculum and

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the oral examination required for board certification as components of the other major sections of “head and neck” and “facial plastic and reconstructive surgery.”^{6,7}

In the past decades, the field of otolaryngology—head and neck surgery has evolved to include the addition of new techniques (e.g., endoscopic sinus/skull base surgery and robotics) as well as the development of new fields (e.g., sleep medicine). Because of this, traditional fields like CMF trauma “compete” for time and exposure during residency training with other subspecialties, running the risk of diluting the amount and quality of training. There have been no studies to date evaluating the education and training in CMF trauma during otolaryngology residency training in the United States.

This survey determined the depth and volume of exposure of residents in U.S. otolaryngology residency programs to CMF trauma. The survey was sent to otolaryngology residency program directors (PDs) in the United States to determine the level of education of CMF trauma that residents experience during their training.

Materials and Methods

This study was determined to be exempt by the Institutional Review Board at Emory University in May 2016. A web-based survey was distributed to PDs in ACGME-approved otolaryngology—head and neck surgery residency programs over a 12-week period between July and October 2016. Two subsequent e-mails were sent after the initial e-mail at 4 and 8 weeks. The survey was emailed to residency PDs and residency administrators as many residency PDs did not have a public e-mail address. The academic e-mail addresses were obtained from FREIDA Online, the AMA Residency and Fellowship Database. The authors designed a survey of 15 multiple-choice questions through *SurveyMonkey*. Participants were asked about the exposure to a level 1 trauma facility and pediatric craniofacial trauma, coverage of CMF trauma at their hospitals, average number of cases, didactic lecture time, and perception of adequacy of training. Questions about coverage were omitted for participants who selected that their program does not cover CMF trauma (► **Appendix A**). Responses were collected anonymously via *SurveyMonkey*. No identifying information was collected.

Descriptive statistics were calculated to describe relative frequencies of survey responses. The *z-test* was used to determine statistical significance between proportion data of categorical variables to determine which, if any, factors are associated with the perception of adequacy of training. The *Student's t-test* was used to determine if average number of residents was significantly associated with perception of adequacy of training. For statistical analysis, an “adequate” response was defined as a response of “very adequate” or “somewhat adequate.” An “inadequate” response was defined as “neutral,” “somewhat inadequate,” or “very inadequate.”

Results

A total of 77 (72.6%) of the 106 residency PDs responded to the survey. Of these responses, 72 (93.5%) were completed and 5 (6.5%) were partial responses. Respondents were from all regions of the United States. The South had the largest percentage of respondents (36.4%), and the West (13.0%) and U.S. territories (1.3%) had the smallest percentage of respondents. The Northeast and Midwest had 26.0% and 23.4% of respondents, respectively.

Most programs (97.4%) included rotations at a level 1 trauma center. Ninety-four percent (93.5%) of otolaryngology departments covered CMF trauma. A relatively smaller proportion, 79.2%, covered pediatric CMF trauma. For programs that did not cover CMF trauma, residents were able to get exposure to CMF trauma, particularly mandible and midface fractures, by rotations on a facial trauma service independent of the otolaryngology department, rotations with plastic surgery and oral and maxillofacial surgery (OMFS), rotations at a county hospital, or an “extra trauma chief year” at a nearby country hospital as described by one residency PD.

Every program except one shared coverage of CMF trauma with other specialties. Coverage was often divided among services by alternating days or weeks, and was rarely divided by alternating months. Coverage is described and shown in ► **Fig. 1**. Multiple surgeons were involved in staffing the cases including attending physicians on call, CMF surgeons, general otolaryngologists, and otolaryngologists trained in facial plastics, head and neck, and rhinology fellowships (► **Fig. 2**).

Fig. 1 Shared coverage and frequency of alternating coverage with other specialties. Most otolaryngology departments shared coverage of CMF trauma with the departments of plastic surgery and oral and maxillofacial surgery (OMFS). Alternating coverage is often divided by days or weeks.

Fig. 2 Otolaryngology faculty that staffed the majority of craniomaxillofacial (CMF) trauma cases. Most CMF trauma cases at institutions that cover CMF trauma are staffed by facial plastic fellowship-trained otolaryngologists and the attending physicians on call. For this question, more than one answer could be selected.

Residents at all programs were able to log at least 11 to 20 cases of CMF trauma on average before graduation. No programs reported 0 to 10 cases on average. Fourteen percent reported 11 to 20 cases on average, 19.4% reported 21 to 30 cases, 23.6% reported 31 to 40 cases, 19.4% reported 41 to 50 cases, and 23.6% reported 51+ cases. The average number of cases reported by each PD is shown in ►Fig. 3. The majority (76.4%) dedicated less than 10% of residency-dedicated didactic lecture time to CMF trauma, although 16 programs (22.2%) dedicated up to 25%, and one program (1.4%) dedicated greater than 25% of lecture time. Eighty-eight percent (87.5%) of programs had opportunities for their residents to attend CMF trauma courses. Thirty-two percent (31.9%) of PDs reported having no faculty members as an active participant of AO Foundation, and another 25.0% reported that they did not know if any member of their faculty was an active participant.

PDs were asked if they feel that CMF training and exposure in their program is adequate. Fifty percent felt it was very adequate, 40% felt it was somewhat adequate, and 10% felt the training was neutral, somewhat inadequate or very inadequate (►Fig. 4). The number of cases had a negative correlation with the percentage of “adequate” (somewhat to very adequate) responses, and reported caseloads of 41 or more were significantly associated with a greater number of “adequate” responses compared with caseloads of 20 or less ($p < 0.05$; ►Fig. 5).

An “adequate” response was also significantly associated with coverage of CMF trauma by the otolaryngology department ($p < 0.01$) and dedicated didactic time to CMF trauma of 11 to 25% ($p < 0.01$). The only PD who reported that the residents did not rotate at a level 1 trauma center reported that he or she felt the training was very inadequate. An “adequate” response was not significantly associated with

Fig. 3 Average number of cases residents logged during residency. Residents at all programs logged at least 11 to 20 cases on average, and two-thirds of programs logged at least 31 to 40 cases on average during residency.

Fig. 4 Program directors' responses on feeling of adequacy of craniomaxillofacial (CMF) training. Over 90% of programs felt that the CMF training in residency was adequate.

location by U.S. region, average number of residents per year, coverage of pediatric trauma ($p = 0.07$), how coverage is divided among specialties, and frequency of alternating coverage (by days, weeks, or months). CMF coverage, pediatric CMF coverage, and percentage of didactic time dedicated to CMF trauma are summarized in ►Fig. 6.

Discussion

The experience of CMF trauma in otolaryngology residency is regarded as adequate by most residency PDs. Although most programs have adequate training, there are still a few PDs who felt that the training at their program was inadequate. No programs reported that their residents logged less than 11 cases on average during residency. While this is only an average, this suggests that all programs are able to meet ACGME requirements of key indicator cases of mandible and midface fractures.

These data provide a benchmark for all programs to self-evaluate areas of improvement. We found that CMF coverage by their department of otolaryngology, dedicated didactic time, and higher caseloads were significant factors in the perception of adequate CMF training. Therefore, these could be potential areas that programs could target to improve their residency experience in CMF trauma.

Residents at most programs train with the facial plastic fellowship-trained otolaryngologists or the attending on call. Experiences with multiple surgeons of different training backgrounds provide a diverse residency experience but less than 20% of programs have residents who work with dedicated CMF surgeons. Less than half of PDs confirmed that their department has at least one faculty who is an active participant in the AO Foundation, which could heighten the didactic education as well. Residents at most programs also have the opportunity to supplement their education by attending CMF trauma courses (e.g., Principles of Operative

Fig. 5 Number of cases versus percentage of adequate responses. There was an association between increased percentage of "adequate" responses and increased number of cases in residency. Reported caseloads of 41 or more before graduation compared with 11 to 20 cases was significantly associated with an "adequate" response ($p < 0.05$).

Fig. 6 Percentage of “adequate” responses by associated factors. There was a significant association between programs whose otolaryngology department who do cover craniomaxillofacial (CMF) trauma and reported “adequate” training. Programs that had 11 to 25% didactic time dedicated to trauma were more likely to report “adequate” training. Coverage of pediatric CMF trauma was not a significant factor in “adequate” training.

Treatment of Craniomaxillofacial Trauma and Reconstruction offered by AOCMF).³

This survey is a fair representation of all the otolaryngology programs with a response rate of 77%. Most geographic regions were well represented. At least 70% from each region responded, except for the West region with a 45% response rate. Therefore, the data may be the least representative of the West region. The total number of programs per region was based on location by region as described in our survey (► **Appendix A**).

Previous studies have evaluated the residency experience of subspecialties within the field of otolaryngology.^{8–10} A survey of fellowship-trained otolaryngologists in 1994 cited that inadequate case volume is the most common reason for pursuing any fellowship.¹¹ However, as opposed to CMF trauma, standard otolaryngology subspecialties provide greater opportunities for further training in the form of fellowship. A fellowship that provides some training in trauma is the craniofacial fellowship. Most surgeons who pursue this fellowship are plastic surgery residency graduates. There have only been five craniofacial fellows (2.9%) who were otolaryngology or OMFS graduates in a 7-year period from 2010 to 2016.⁴ Furthermore, CMF trauma is only one component of the craniofacial fellowship, which varies largely from program to program, with CMF trauma making up approximately 15% of case volume in fellowships and approximately 25% of fellowship types.^{12,13} For these reasons, adequate CMF trauma education throughout residency is essential to become adept at diagnosing and managing these patients.

There were several limitations to our study. First, as a survey-based study, the responses are subjective and the opinion of the PD. Program directors are less likely to report negative findings, particularly about the adequacy of their program and whether or not the program meets ACGME requirements. Second, the survey was aimed toward residency PDs rather than residents in otolaryngology programs. The purpose of selecting PDs was to normalize the data

because each program can only be represented by one response, and the responses are demonstrative of the entire residency program, rather than a factor of the year of training of the respondent. This study therefore does not take into account whether residents themselves felt competent in CMF trauma at the completion of their training. This study also focuses on bony trauma versus soft-tissue cases like laceration repairs.

Training in residency is critical because pursuing a dedicated fellowship for CMF trauma is uncommon. Future directions should be aimed at determining competency in CMF trauma after graduation and how this correlates with the perception of training, and determining the value of supplementing residency education with other tools such as the AOCMF courses and simulation courses. Overall, our study suggests that otolaryngology residency PDs could improve their training in CMF trauma by increasing case numbers and didactic time or covering CMF trauma as a department.

Conclusion

The overall experience of training in CMF trauma seems adequate per most PDs across U.S. otolaryngology—head and neck surgery residency programs. Reasons that most PDs consider CMF training adequate could be that their residents rotate at a level 1 trauma center and are exposed to both adult and pediatric CMF trauma, encounter an adequate volume of cases, are in a department that covers CMF trauma, and have dedicated didactic time to CMF education.

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Conflict of Interest

None.

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Appendix A: Survey: craniomaxillofacial trauma experience in U.S. otolaryngology residency

1. In what region of the country is your otolaryngology residency program located?
 - A. Northeast (CT, MA, ME, NH, NJ, NY, PA, RI, VT).
 - B. South (AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV).
 - C. Midwest (IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI).
 - D. West (AK, AZ, CA, CO, HI, ID, MO, NM, OR, NV, UT, WA, WY).
 - E. United States territories (Puerto Rico, Guam, Samoan Islands).
 - F. Other.
2. Do your residents rotate at a level 1 trauma center?
 - A. Yes.
 - B. No.
3. How many residents does your program have per year?
 - A. 1.
 - B. 2.
 - C. 3.
 - D. 4.
 - E. 5.
 - F. 6.
 - G. 7.
 - H. Other.
4. Does your otolaryngology department cover craniomaxillofacial (CMF) trauma?
 - A. Yes.
 - B. No.
5. Does your program curriculum include pediatric CMF trauma?
 - A. Yes.
 - B. No.
6. If your answer was yes to Question 4, does your residency program share coverage of the CMF trauma cases with other specialties?
 - A. Yes.
 - B. No.
 - C. Answered “no” to Question 4.
7. If your answer was yes to Questions 4 and 6, with which other programs do you share coverage of the CMF trauma cases? More than one option may be selected. If not listed, please specify.
 - A. Plastic surgery.
 - B. Oral and maxillofacial surgery (OMFS).
 - C. Trauma surgery.
 - D. Answered “no” to Question 4.
 - E. Other.
8. If your answer was yes to Question 6, how is the coverage of the CMF trauma divided among the services? If not listed, please specify.
 - A. Alternating days (q day).
 - B. Alternating weeks (q week).
 - C. Alternating months (q month).
 - D. Answered “no” to Question 6.
 - E. Other.
9. If your otolaryngology program does not cover CMF trauma, how do the residents get exposure to CMF trauma, particularly mandible/midface fractures? If your answer is no, please specify.
 - A. My program does cover CMF trauma.
 - B. Other.

10. On average, how many cases of CMF trauma do residents log before graduation?
 - A. None.
 - B. 0–10 cases.
 - C. 11–20 cases.
 - D. 21–30 cases.
 - E. 31–40 cases.
 - F. 41–50 cases.
 - G. 51+ cases.
11. Regarding coverage of the CMF cases, who staffs the majority of the cases?
If the coverage is evenly shared, more than one option may be selected.
 - A. Attending on call.
 - B. CMF surgeon.
 - C. Head and neck fellowship-trained otolaryngologist.
 - D. General otolaryngologist.
 - E. Community otolaryngologist (adjunct clinical faculty).
 - F. Facial plastic fellowship-trained otolaryngologist.
 - G. Other.
12. Is any member of the faculty in your otolaryngology department an active participant of AO Foundation (AOCMF North America)?
 - A. Yes.
 - B. No.
 - C. Unknown.
 - D. Other.
13. What percentage of your residency-dedicated didactic lecture time is allocated to CMF trauma?
 - A. <10%.
 - B. 11–25%.
 - C. >25%.
 - D. Other.
14. Do your residents have the opportunity to attend CMF trauma courses (e.g., an Principles of Operative Treatment of Craniomaxillofacial Trauma and Reconstruction offered by AO CMF)?
 - A. Yes.
 - B. No.
15. Do you feel the CMF training and exposure of the residents in your program is adequate?
 - A. Very adequate.
 - B. Somewhat adequate.
 - C. Neutral.
 - D. Somewhat inadequate.
 - E. Very inadequate.