Cone-Beam Computed Tomography Education and Exposure in Oral and Maxillofacial Surgery Training Programs in the United States

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Purpose: The purpose of this study was to estimate the penetration of cone-beam computed tomography (CBCT) in oral and maxillofacial surgery (OMS) residency programs in the United States. In addition, this study was designed to assess the education and training, relevance, and image interpretation responsibility of CBCT as experienced by OMS residents.

Materials and Methods: The authors performed a cross-sectional study of all 102 US-based OMS program directors (PDs) from January 1, 2014 through April 30, 2014. Study variables included questions about 4 key factors in CBCT in OMS programs: access, education and training, relevance, and image interpretation responsibility. Data analysis was a product of the percentage of positive responses to each question.

Results: Fifty-four PDs participated in the study. The results showed that 87% of responding OMS programs have access to CBCT and that CBCT is used primarily for dental implant-related procedures.

Conclusion: OMS residents are actively involved in CBCT use in their residency. OMS residents' access to CBCT is increasing, and their education, training, and image interpretation responsibility is increasing.

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Since its commercial introduction into dentistry in 2001, cone-beam computed tomography (CBCT) has become an important tool for the oral and maxillofacial (OM) surgeon. CBCT provides the OM surgeon with 3-dimensional anatomic accuracy far beyond the capability of 2-dimensional radiography. This increased knowledge of patient anatomy can enhance the surgeon's appreciation of the patient and improve patient outcome by minimizing risk.[1-7]

CBCT has many applications in OM surgery (OMS). Such applications include, but are not limited to, dental implant treatment planning and placement, evaluation and surgical approach for difficult impacted teeth, localization of important anatomic structures in the surgical field, orthognathic treatment planning, diagnosis, interpositional device (splint) fabrication, evaluation of the pathology of maxillofacial structures, and evaluation and treatment planning for patients with cleft lip and palate, patients with temporomandibular joint problems, and patients with maxillofacial trauma or sleep apnea.[2-5,8-24]

The learning experience for an OM surgeon begins in earnest during the OM surgeon's residency. In residency, the nascent surgeon can learn carefully with proper supervision by faculty and more senior residents. Residencies also function to expose physicians to new and evolving technology and techniques to take with them into their post-residency professional career.

The purpose of this study was to evaluate the access, education and training, relevance, and image

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interpretation responsibility of OMS residents with CBCT. Although the number of OMS programs using CBCT in resident education is unknown at this time, the authors hypothesized that CBCT is part of many OMS training programs. The specific aims of the study were to determine how many programs incorporate CBCT into the resident curriculum, how CBCT is used and regarded in these programs, what type of training the resident receives in CBCT imaging, and who is responsible for CBCT image interpretation.

Materials and Methods

STUDY DESIGN AND SAMPLE

To address the research purpose, the authors designed a cross-sectional study of all 102 US-based OMS program directors (PDs) from January 1, 2014 through April 30, 2014. A 10-question multiple-choice survey using the online program surveymonkey.com was electronically mailed to each PD on 4 separate dates (Fig 1). Inclusion in the study required only completion of the survey.

STUDY VARIABLES AND DATA COLLECTION

An online link to the questionnaire was sent with an inquiry electronic mail 4 times to each PD with instructions on how to complete the questionnaire. Study variables in the following 4 categories were obtained: access, education and training, relevance, and image interpretation.

To determine access, PDs were asked whether their program had access to CBCT and when their program obtained access to CBCT. The former question was calculated as a binary variable (yes vs no). The latter question was calculated as a categorical variable with 5 choices: before 2006, from 2006 to 2009, from 2010 to 2013, plan for purchase, or no access. To assess the level of education and training of the OMS residents, 4 questions were asked. The first question was a binary variable question (yes vs no) asking whether the program actively trained residents to use CBCT in treating patients. The second question inquired how CBCT was used by residents in their OMS training program. This question was calculated as a categorical variable with 7 categories of response: dental implants, dental alveolar surgery, temporomandibular joint surgery, orthognathic surgery, orthodontics, periodontics, or all the above. The third question evaluated education and training by asking what type of training residents received in CBCT. This was calculated as a categorical variable with 4 categories of response: didactic, clinical and radiologic interpretation, technical use, or all the above. The fourth question addressing education and training inquired about the percentage of dental implant cases in which the residents used CBCT for diagnosis and treatment planning. This was calculated as a categorical variable with 5 levels of response: none, less than 25%, 26 to 50%, 50 to 75%, and greater than 75%.

Relevance of CBCT and OMS residency programs was addressed with 2 categorical variable questions. The first question asked how important PDs believed CBCT training was for OMS residents. Four levels of response were calculated: irrelevant, important but not necessary, necessary, or mandatory. The second relevance question addressed reasons behind the increasing use of CBCT by clinicians. Four levels of response were calculated: increased availability of CBCT technology, increasing acceptability of the technology by dental professionals, increased demand by patients, and a desire to have more sophisticated radiologic information in treatment planning cases.

Interpretation of CBCT analysis by OMS residents was addressed with 2 categorical variable questions. The first such question inquired about the responsibility of CBCT image interpretation. Three levels of response were calculated: ordering resident, supervising faculty, or radiologist. The second question regarding image interpretation queried the PD regarding further management of incidental findings at CBCT. Five levels of response were calculated: ordering resident, supervising faculty, radiologist, all the above, or unsure.

DATA ANALYSIS

All returned surveys were analyzed by the authors. Data analysis was a product of the percentage of positive responses to each question. Results were interpreted in relation to 4 themes: access, education and training, relevance, and image interpretation responsibilities in the residency program. Descriptive statistics were computed for each variable in the study.

Results

Fifty-four PDs (53%) responded to the survey. Not every PD responded to every question in the survey. Responses were received through an online-based Web site and results were interpreted accordingly. All responses were anonymous, so no distinction was made for PD affiliation with a hospital or dental school or medical school.

Questions 1 and 5 addressed access to CBCT. Evaluation of question 1 data showed that many OMS residents (87%) have access to CBCT (Table 1). In question 5 the data showed most (24 [44%]) OMS programs gained access to CBCT from 2010 to 2013. Sixteen PDs (30%) responded gaining access to CBCT from 2006 to 2009. Only 5 PDs (9%) claimed to have CBCT access before 2006. Five responding PDs (9%) currently have no access to CBCT technology. Four