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Research Article

Teaching of Oral Radiology in Brazilian Dental Schools

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Abstract

Aim

Much information is available in the literature on professionals' attitudes to oral radiology practices; however, there is no information available regarding the teaching of oral radiology. Therefore, our study set out to assess the education of oral radiology with regard to technique, processing and radiographic equipment in Brazilian dental schools.

Methods

A self-reporting questionnaire was sent to 171 universities, which could respond by mail or using a website. The answers were analyzed using descriptive statistics. The chi-squared test (significance level of 5%) was also used to identify differences between public and private institutions.

Results

The overall response rate was 38% (n = 65). Most academics practice intraoral techniques (periapical standard paralleling, 75.38%; periapical bisecting angle, 98.46%; occlusal, 95.38%; bite-wing, 100%); fewer practice extraoral techniques (27.69%). Film holders (95.38%), E/F speed film (83.08%), 70-kVp X-ray tubes (90%) and manual processing (96.92%)

according to the temperature-time method (72.31%) are mostly used. The chi-squared test did not show statistically significant differences between public and private institutions (p> 0.05).

Conclusion

The methods applied in Brazilian dental schools, whether public or private, seem appropriate for oral radiology education.

Keywords: Radiology; Dental Radiography; Education; Questionnaires

Introduction

Oral radiographs often add critical information to the clinical examination; thus, they have an important role in the detection and management of oral diseases. However, radiographs involve ionization radiation. Although radiation exposure in the dental setting is relatively low, a person may undergo many radiographic procedures. Furthermore, the cumulative nature of radiation exposure persists over a patient's lifetime [1].

The dose of radiation from oral radiology can be minimized in 3 ways: appropriate selection criteria, adequate technique, and optimization of development of the radiographs to avoid repeat radiographs [2]. Therefore, appropriate knowledge about the procedures in oral radiology is necessary. A professionals' knowledge of oral radiology may be affected by many factors, but education is certainly the most important. Consequently, the education of undergraduates during college should be as thorough as possible. Brazilian universities do not have a uniform curriculum in their oral radiology courses for demographic and socioeconomic reasons.

Although several studies have examined professionals' knowledge and attitudes in oral radiology practice [2-10], little information is available in the literature regarding the teaching of oral radiology. Thus, it is not known whether students are receiving a correct education to allow them to perform good practices in oral radiology. Because of this gap in the literature and the demographic and socioeconomic diversities in Brazil, the purpose of this study was to assess oral radiology education with regard to technique, processing, and radiographic equipment in Brazilian dental schools. In addition, we also aimed to identify differences between public and private universities.

Materials and Methods

This study was conducted after approval of the Ethics Committee of the Piracicaba Dental School/ State University of Campinas. A self-reporting questionnaire consisting of 8 questions about teaching oral radiology was designed. It included questions on technique, radiographic equipment, radiation protection, and processing. We mailed it to oral radiology professors at 171 Brazilian Universities (48 public institutions and 123 private institutions) in August 2011. A summary of the geographic distribution and the type of university is presented in Table 1.

Table 1. Geographic and public/private distribution of the universities that received the questionnaire.

Region	Private	Public	Total
Midwest	8	3	11
Northeast	13	14	27
North	9	4	13
Southeast	72	17	89
South	21	10	31
Total	123	48	171

The professors could return the completed questionnaire mail or they could answer the questions on a website developed exclusively for this purpose. To answer on the web site, a password for each university was sent with the questionnaire.

The responses were collected over 6 months both by mail and on the web site. They were inserted into a database using codes and the data were analyzed using the statistical software package SPSS Version 17.0 (SPSS Inc., Chicago, USA). Descriptive statistics were performed for each question on the questionnaire. Differences between public and private institutions were evaluated using the chi-squared test (significance level was set at 5%). The null hypothesis considered there were no differences between public and private universities.

Results

Sample results and characteristics

The overall response rate was 38% (n = 65). Of these, 44 universities (67.7%) returned the questionnaires by mail and 21 (32.3%) by the website. The geographic and public/private distribution of the universities that returned the questionnaire

is presented in Table 2.

Table 2. Geographic and public/private distribution of the universities that returned the questionnaire.

Region	Private (%)	Public (%)	Total
Midwest	3 (37.5)	1 (33.33)	4
Northeast	6 (46.15)	3 (21.43)	9
North	1 (11.11)	0 (0)	1
Southeast	33 (45.83)	8 (47.06)	41
South	6 (28.57)	4 (40)	10
Total	49 (39.84)	16(33.33)	65

Descriptive results

Table 3 shows the results obtained from all the institutions that returned the questionnaire.

Table 3. Questions included in the questionnaire with the answers given as a percentage of the sample*.

1. Which radiographic techniques do the students practice?				
Periapical (bisecting angle technique)	*Periapical (standard paralleling technique)*	*Bite-wing technique*	*Occlusal technique*	*Extraoral techniques*
98.46	75.38	100	95.38	27.69
2. Do the students use film holders?				
Yes	*No*			
95.38	4.62			
3. If the students use a film holder, which model do they use?				
Hanshin	*Rinn*	*Bite-wing*	*Other*	
91.94	12.9	75.81	12.9	
4. The students practice the radiographic techniques on whom?				
On each other	*On patients*	*Both*		
10.29	54.41	35.29		
5. Which film do the students use for training purposes?				
D	*E*	*E/F*	*It is up to the student*	
4.62	20	83.08	9.23	
6. What values of kVp and mA of the X-ray tubes are used in classes?				
60 kVp	*65 kVp*	*70 kVp*	*7 mA*	*10 mA*
6.8	3.4	89.8	88.6	11.4
7. Which radiographic processing method do the students use?				
Manual	*Automatic*			
96.92	21.54			
8. If the students use manual processing, which method do they use?				
Visual	*Temperature–time*			
27.69	72.31			

*Note that some answers account for more than 100% because some questions allowed more than one answer (e.g., some universities teach both the manual and automatic methods).

Most academics practice the periapical technique (standard paralleling, 75.38%, n = 49; the bisecting angle technique, 98.46%, n = 64), the occlusal technique (95.38%, n = 62) and the bite-wing technique (100%, n = 65); fewer use the extra-oral technique (27.69%, n = 18). Most universities use film holders (95.38%, n = 62); the Hanshin (91.94%, n = 57) and the bite-wing (75.81%, n = 47) models are the most commonly used. Radiographic techniques are practiced during clinical attendance (54.41%) and few institutions reported that the students train solely on each other (10.29%). E/F speedfilm (83.08%, n = 54) and 70-kVp X-ray tubes (90%) are used in most universities. In general, manual processing (96.92%, n = 63) is used according to the temperature-time method (72.31%, n = 47). The chi-squared test did not show statistically significant differences between public and private institutions ($p > 0.05$).

Discussion

Special attention to oral radiology practices is necessary because this uses ionizing radiation. Therefore, several studies have evaluated professional's attitudes regarding oral radiology [2-10]. However, before such evaluations, it is necessary to establish if the students are being taught adequately. This is especially important in a large country such as Brazil with demographic and socioeconomic diversities, which have implications for education in the universities. On the other hand, Brazil has the highest number of oral and maxillofacial radiologists of any country in the world [11], so the teaching of oral radiology is assumed to be well structured.

We aimed to assess the education of oral radiology in Brazilian universities using a self-reporting questionnaire, which is a widely used method in this field [12]. The questionnaire included questions pertaining to the techniques, processing and radiographic equipment used in the teaching of oral radiology. However, radioprotection concepts, such as the use of appropriate films and film holders, were also evaluated.

The use of digital systems is expanding quickly in many countries, where they are established in undergraduate and postgraduate environments. Although the use of digital technology in oral radiology is also increasing in Brazil, few universities currently have digital systems available for graduate teaching purposes. This can be explained by the complex bureaucratic government processes, particularly in public universities, but also by the high costs involved in importing digital systems. Therefore, because analogic film-based systems are mostly used in the teaching of oral radiology, the questionnaire used in this study had questions pertaining to radiographic films and processing methods.

In general, the universities assessed in our study were seen to

follow appropriate practices in the teaching of oral radiology. Intraoral techniques, which are the most commonly used in clinical practice, are taught to the students. Film holders and the temperature–time radiographic processing method are used, because they minimize the production of inadequate radiographs that need to be repeated. Sensible films (E/F) and X-ray tubes operating at a minimum of 60 kVp are used, exposing the patient to a low amount of radiation. Differences between public and private universities were also investigated in this study, but no statistically significant differences were noted. We expected that differences would be found, because the professors in public universities mostly work fulltime in a dedicated regime, which could result in a better learning environment. Fortunately, this was not observed and the private universities seemed to offer the same tools and equipment for teaching of oral radiology, maybe because they are subjected to less bureaucracy and receive more investments than public universities.

As already mentioned, incorrect practices in oral radiology are frequently being assessed by many investigators worldwide, so an interesting volume of data is available in the literature [2,3,5,6,9,10]. Some examples of incorrect practices are neglecting the use of lead aprons and thyroid shields, use of higher exposure time, inadequate processing of films, and improper disposal of processing solutions and lead foil. These practices are often associated with inadequate knowledge and training before graduation [10]. Although such incorrect practices have also been reported in Brazil [13], they may not be related to oral radiology education because our study demonstrates that this is adequate. However, our findings do not necessarily indicate that the students learned and applied in an acceptable degree the content that was taught to them.

On the other hand, although most of the universities declared that they teach the paralleling standard technique (75.38%), when questioned about the use of the Rinn film holder model, few answered affirmatively (12.9%). From our experience with colleagues, we have found that the paralleling standard technique has been performed with the Hanshin film holder, which is designed strictly for the bisecting angle technique. This observation was confirmed by the findings in this study (75.38% answered that they teach the paralleling standard technique, but only 12.9% have the proper film holder). Other inadequate practices detected were as follows: D speed film is still used (4.62%); undergraduates practice radiographic techniques solely on each other (10.29%); and a visual manual radiographic processing method is used (27.69%). These findings suggest that continuing education may be necessary in some institutions to reduce the incidence of such incorrect concepts and practices.

This study has some limitations, such as the use of a questionnaire, which allows the participant to respond according to his or her interest. Because we only assessed Brazilian universities, the findings refer only to the sample researched. The low response rate (38%) may reflect loss of information from many universities. On the other hand, the sample number (65) is larger than the total number of universities in many other countries.

In conclusion, most dental schools do not practice extraoral techniques, but all the intraoral techniques are taught. Sensitive films, film holders, X-ray tubes operating at least 60 kVp and the temperature-time radiographic processing method are used. No differences between public and private institutions were found.

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Conflict of interest

None declared.

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