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Use of dental radiography among Lithuanian general dentists

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SUMMARY

Objective. To gather information about the radiographic facilities and techniques used by Lithuanian general dentists.

Materials and Methods. Questionnaires were sent to all 2879 Lithuanian dental practitioners registered on the Lithuanian Dental Chamber licence registry data list. The questionnaire was made with multiple-choice answers. Respondents were invited to choose the only one category of answer that best fitted their clinical attitude. Questions included in the present survey concerned general and specific information regarding peculiarities of radiographic imaging. Only answers of respondents who are licensed as general dentists were included in this study.

Results. From the 2850 questionnaires mailed 1532 were returned. The response rate was 53.8%. Of the total responses 1431 questionnaires were received from licensed general dentists. Of total 956 dentists practiced in urban and 576 dentists in rural areas. 61.6% of respondents had access to an intra-oral radiographic unit in their practice and 91.5% of them used dental radiography always or often as the diagnostic tool. To support the film packet in the patient's mouth alternatively film holder or patient's finger was used by 48% of respondents, while film holder was used only by 19.3% of dentists.

Conclusion. Recently graduated dental practitioners more common used diagnostic radiography in endodontic pathology than dentists with a longer time from graduation. Film holder was not a popular device among general dental practitioners to perform periapical radioraphs. It is important to improve the existing dental curriculum to ensure the necessary competency when using dental radiography and film holders routinely in clinical practice.

Key words: general dentist, survey, radiography.

INTRODUCTION

Every general dentist is expected to be able to recognize and treat effectively pulpal and periapical injuries and diseases [1]. It is evident that routine use of radiography is very important prerequisite for the endodontic treatment quality. Due to the low numbers of highly qualified specialists in endodontics, general dental practitioners take the responsibility for the most of endodontic treatments. All these treatments rely upon one or more intraoral radiographs to allow root canal treatment to be undertaken. Obviously most radiographs are taken by themselves. Therefore basic knowledge and practical skills in dental radiography can ensure quality of diagnostic and treatment procedures.

The absolute accuracy from an intra-oral radiography is questionable due to the fact that it is two-dimensional shadow of 3-dimensional object. Modern three-dimensional imaging, especially cone-beam technology, is able to assess an area which is invisible in conventional radiography. Nevertheless conventional intra-oral radiography remains one of the most popular equipment in the daily dental practice.

Two techniques for taking periapical radiographs are teached in dental schools: paralleling and bisecting angle. Teaching of the paralleling technique in dental schools has superseded due to the better performance and reproducibility of radiographic images

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[2, 3, 4]. In endodontics, the paralleling technique has an advantage over the bisecting angle technique due to the less distortion of radiographic image. Surveys from different countries showed that not only undergraduate and postgraduate studies influence the choice of radiographic imaging technique but also it is influenced by dentist's age, attendance of continuous courses and working environment [5, 6, 7].

Studies showed that reproducibility and accuracy of radiographs can be improved by using lm holders [8, 9]. Film holders comprise a mechanism for holding the lm, a bite block and beam-aiming device and are available for the paralleling and bisecting technique for periapical radiography [10]. The use of lm holders with beam-aiming devices is recommended in general practice [11].

Standards of treatment in dentistry have experienced substantial changes during last twenty years in Lithuania. Alongside with changes in the undergraduate study programmes, the working environment of dentists, namely by the deficiency of both human and economical resources, have changed distinctly also. Uptill now use of radiography among Lithuanian general dentists was not analysed.

Therefore, the purpose of the present study was to gather information about the radiographic facilities and techniques in diagnosis of endodontic pathology used by Lithuanian general dental practitioners.

MATERIAL AND METHODS

Questionnaires were sent to all 2850 Lithuanian dentists. A list of dental practitioners was acquired from the Lithuanian Dental Chamber Licence registry data base. The structured questionnaire comprised 58 questions with multiple-choice answers. The questionnaire was sent with an explanatory cover letter and a stamped addressed, return envelope. Dentists were asked to choose only answers that best tted their clinical performance. Prior to the data collection, the questionnaire was tested in a pilot study and subsequently revised for the clarity and for the length of the questionnaire.

The questionnaire (summarized in Table 1) included inquiries about gender, duration of the professional activity, details about working environment and peculiarities of radiographic imaging in general dental practice.

Only responses from respondents who were licenced as general dental practitioners were assessed in the present study.

In order to make a more detailed comparison of the data, the sample was divided according to a few factors of interest; regarding the duration of the professional activity into the group A (up to 9 years), group B (10-19 years), group C (20-29 years) and group D (more than 30 years); according to the geographical localization of working place into rural and urban; according to the type of the working place into a full-time private dental practice, full-time community dental office or a combination of both.

All returned forms were coded by a single operator and the data were checked and entered twice in a personal computer. Blank or multiple answers were treated as missing values. Data was analysed with the statistical software SPSS 16. The Chi-square

Table 1. The operationalisation of the study variables and their scales of measurement

Study variables	Operationalisation&measurement scale
Work place	Geographical location of a dental clinic *(nominal)*
Gendre	Male (1), Female (2) (*nominal*)
Age	Age in full years (*interval*)
Date of university graduation	Year of graduation (*interval*)
Duration of the professional activity	Years of dental practise (*interval*)
Dental Education	General dental practitioner (1), Endodontist (2), Prostodontist (3), Periodontologist (4), Orthodontist (5), Pediatric dentist (6), Oral surgeon (7), General dental practitioner and a specialist (8) (*nominal*)
Type of Dental Practice	Full-time private practice (1), Full-time Community Dental Service (2), Community Dental Service and Private practice (3) (*nominal*)
Presence of radiographic unit in the working place	Yes (1), No (2) (*ordinal*)
Use of diagnostic dental radiography for endodontic pathology	Each measured as Never (1), Occasionally (2), Sometimes (3), Often (4), Always (5) (*ordinal*)
Performance of dental radiographs	Himself (1), Send to the department of radiology (2), Do not perform, because of an absence of the equipment (3), Do not perform, because of a lack of knowlegde (4) (*nominal*)
Source of knowledge in dental radiography	Substantivelly (himself/herself) (1), During undergraduate studies at the university (2), During continuous studies at the university (3) (*nominal*)
Method of performance of dental radiography in diagnosis of endodontic pathology	Use of periapical film holder (1), Use of periapical film holder or patient hold film with finger (2), Patient hold film with finger (3) (*nominal*)

test was used to compare proportions among groups and the significance threshold for all tests was set at P<0.05. The differences were evaluated as OR (Odds ratio) with their corresponding 95% CI (Confidence interval).

RESULTS

From the 2850 questionnaires mailed 1532 questionnaires were returned, which comprises the response rate of 53.8%. Of 1532 responses 1431 questionnaires were received from licensed general dental practitioners. The mean age of the respondents was 45 years (range 23-75 years). Years in practice among them were distributed as follows: the group A was composed of 316 dentists (22%), the group B of 372 (26%), the group C of 324 (23%) and the group D of 419 (29%) dental practitioners. A total of 956 dentists who practiced in urban and 576 dentists who practiced in rural areas responded to the present inquiry, while a total of 802 urban and 516 rural dentists did not respond. The non-response analysis (Chi square test) regarding the urbanization of dentists revealed no statistically significant differences (P=0.417) between respondents and non-respondents. This means that with some degree of caution, the present sample can be considered representative of Lithuanian dentists. The distribution of the geographical localization of working place of respondents and type of practice according to the duration of professional activity is shown in Table 2.

Of all 1431 respondents 61.6% had access to an intra-oral radiographic unit in their practice (Table 3). Only 33.7% of respondents from group D had an access to the radiographic imaging. Of all respondents 75.9% of respondents working in private clinics and 21.8% in public health services had an intra-oral radiographic unit in their working places.

General dental practitioners were asked to indicate how frequently they used this equipment in their daily practice with options of always, often, sometimes, occasionally and never (equipment available but not used). Of all respondents 91.5% used radiography always or often during the diagnostic procedures. Younger respondents more often used radiography as diagnostic tool than their older counterparts. It was evident that dentists with longer working load from C and D groups were not so confident in doing radiograms by themselves than respondents from A and B groups (Table 4).

General dental practitioners were asked to indicate where they have got basic knowledge and practical skills in performing radiographic examination. Most of respondents from A group with professional load up to 9 years got this knowledge during their undergraduate studies in the universities. Those who have graduated university more than ten years ago got this knowledge during continuous education programmes held in Vilnius and Kaunas Universities (Table 5).

Table 6 presents the use of film holders during radiographic imaging among general dentists. Results showed the most popular method used by dentists to support the film packet in the patients' mouth was the film holder or alternatively patient's finger.

Table 2. Geographical location and working environment of respondents according to the duration of their professional activity

Reply options	Group of respondents				Total
	A n=316	B n=372	C n=324	D n=419	n=1431
Geographical localization					
Urban area %	80.8	72.1	56.0	43.8	62.1
OR	5.4	3.3	1.6	1	
[95% CI]	[3.8-7.6]	[2.4-4.5]	[1.2-2.2]		
Missing (n)	3	3	1	3	10
			χ^2=126.8; df=3; p<0.001		
Type of practice					
Full-time private practice %	72.4	65.0	63.6	40.1	59.0
OR	3.9	2.8	2.6	1	
[95% CI]	[2.9-5.4]	[2.1-3.7]	[1.9-3.5]		
Full-time community dental service %	6.7	17.6	25.0	51.1	26.7
OR	0.1	0.2	0.3	1	
[95% CI]	[0.0-0.1]	[0.1-03]	[0.2-0.4]		
Combination of private practice and community dental service %	21.0	17.3	11.4	8.8	14.3
OR	2.7	2.2	1.3	1	
[95% CI]	[1.8-4.2]	[1.4-3.3]	[0.8-2.2]		
Missing (n)	1	3	0	0	4
			χ^2=213.5; df=6; p<0.001		

OR – Odds ratio; CI – Confidence interval.

DISCUSSION

The survey questionnaire is a common instrument used in evaluating healthcare systems. The major disadvantage of surveys is that often only low response rates are obtained. The implication of low response rates is that findings can not be generalized to populations of interest with any certainty. Response rate of the present study was 53.8%. The non-response analysis (Chi square test) regarding the urbanization of dentists revealed no statistically significant differences between respondents and non-respondents. This means that with some degree of caution, the present sample can be considered representative of Lithuanian dentists.

The use of radiographic images is an integral part of general dental practice and are referred to as the main diagnostic aid. Objectives of radiographic examination are to identify the presence or absence of disease, to provide information on the nature and extent of disease and enable the formation of a differential diagnosis and appropriate treatment planning. Successful interpretation of radiographs relies on clinicians understanding the radiographic image, being able to recognize the range of normal appearances as well as knowing features of relevant pathological conditions. It is difficult to imagine general dental practice without possibility to make radiographic images. This allows general practitioner to perform immediate diagnostic procedure and to ensure the control of treatment procedure. The results of the present study revealed the activities and choices made by Lithuanian general dental practitioners regarding radiographic imaging.

Results of this study showed that the lack of radiographic equipment in general dental practice exists. Only 61.6% of respondents have it in their working place. Much better were equipped private dental practices than community dental offices. Dentists having longer professional activity more seldom were working by themselves with radiographic equipment. It is evident that this could have an impact on the precision of diagnostic and treatment processes. Use of radiographic equipment on working site reduces the duration of endodontic treatment procedure, ensures the better infection control during root canal treatment procedures. Radiographic imaging is diagnostic tool which was always or often used by 84.8%-96.2% of Lithuanian general dentists. More often this tool was used by dental practitioners with working load up to 20 years. Responders from C and D groups were performing radiographic imaging by themselves more rarely than their counterparts from A and B groups. These results showed that those respondents who had graduated university where they got basic knowledge concerning radiography were more comfortable in using this tool by themselves.

Two techniques for periapical radiographs are used during radiographic examination of endodontic pathology in dental practice. The bisecting angle tech-

Table 3. Presence of radiographic unit in the working place according to the duration of the professional activity

Presence of radiographic unit in the working place	Group of respondents				
	A n=316	B n=372	C n=324	D n=419	Total n=1431
%	88.6	74.4	56.5	33.7	61.6
OR [95% CI]	15.3 [10.2-22.8]	5.7 [4.2-7.8]	2.5 fs[1.9-3.4]	1	
Missing (n)	0	1	0	1	2
	χ^2=263.892; df=3; p<0.001				

Table 4. Use of dental radiography in diagnosis of endodontic pathology according to the duration of the professional activity

Reply options	Group of respondents				
	A n=316	B n=372	C n=324	D n=419	Total n=1431
Use of dental radiography in iagnostics (always/often)					
%	95.3	96.2	91.0	84.8	91.5
OR [95% CI]	3.6 [2,0-6,5]	4.6 [2.5-8.3]	1.8 [1.1-2.9]	1	
Missing (n)	0	1	0	5	6
	χ^2=40.521; df=3; p<0.001				
Dental radiograms performs by himself	83.2	65.8	47.2	21.3	52.5
%	18.4 [12.6-26.8]	5.5 [3.8-8.0]	2.6 [1.8-3.7]	1	
OR [95% CI]					
Missing (n)	0	1	0	5	6
	χ^2=311.512; df=3; p<0.001				

nique is more old method for periapical radiography [10]. The bisecting angle technique can be performed either by using a film holder to support the film packet in the patients' mouth or by asking the patient to support the film packet gently using either an index finger or thumb. Using a film holder is the recommended technique to avoid irradiating the patient's fingers. However using patient's finger during radiographic diagnostic procedure is still widely used. Results of the present study showed that even 32.7% of respondents used patient's finger and 48.0% patient's finger alternatively with film holder during dental radiography depending on situation. The comparatively better performance of the paralleling technique resulted in this method being taught in dental schools [12, 13, 14]. Appropriate lm holders are essential to the paralleling technique. The literature reveals that the paralleling technique in endodontics is superior to the bisecting angle technique [15, 16]. Its routine use in endodontic practice ranges from 26.3% to 41.7% of dentists [17, 18]. Bohay et al. reported that 52% of Ontario dentists used the paralleling technique [6].

Moreover, the routine use of lm holders ranges from 21.6% to 26% [17, 18]. An American study reported use of lm holders by 65% of dentists in a Medical Centre staffed by general and specialist practitioners [19]. The majority of Australian general dental practitioners used lm holders with 25% using them routinely [20]. Ninety-two percent of Ontario dentists routinely used lm holders while they were used in only 27% of 62 Manchester practices [6, 21]. In the present study the use of lm holders during endodontic treatment procedure is not widespread among Lithuanian general dental practitioners. Only 19.3% of respondents dental radiographs perform using only film holders.

In this study dental practitioners were asked to choose whether they are using film holders, alternatively use film holders or patient's finger and finger only. It was evident that those who have finished

Table 5. Source of knowledge in dental radiography technique according to the duration of the professional activity

Reply options	Group of respondents				
	A n=316	B n=372	C n=324	D n=419	Total n=1431
Source of knowledge in dental radiography technique:					
Substantivelly (himself/herself)					
%	32.9	33.7	23.3	26.5	30.4
OR [95% CI]	1.4 [0.8-2.3]	1.4 [0.8-2.4]	0.8 [0.5-1.5]	1	
During undergraduate studies at the university					
%	46.9	8.4	3.1	2.0	19.9
OR [95% CI]	42.4 [10.3-175.6]	4.4 [1.0-19.2]	1.5 [0.3-8.0]	1	
During continuous studies at the universitety					
%	20.2	57.9	73.6	71.4	49.7
OR [95% CI]	0.1 [0.1-0.2]	0.5 [0.3-0.9]	1.1 [0.6-2.0]	1	
Missing (n)	39	111	161	321	632
	χ^2=242.585; df=6; p=0.001				

Table 6. Method used for dental radiography in diagnosis of endodontic pathology according to the duration of the professional activity

Reply options	Group of respondents				
	A n=316	B n=372	C n=324	D n=419	Total n=1431
Use periapical film holder					
%	24.5	20.5	10.1	17.2	19.3
OR [95% CI]	1.7 [0.8-2.9]	1.2 [0.7-2.3]	0.5 [0.3-1.1]	1	
Use periapical film holder or patient hold film with finger					
%	45.7	50.2	49.4	46.2	48.0
OR [95% CI]	0.8 [0.7-1.1]	1.0 [0.8-1.3]	1.0 [0.7-1.3]	1	
Patient hold film with finger					
%	29.8	29,3	40,5	36.6	32.7
OR [95% CI]	0.7 [0.4-1.2]	0.7 [0.4-1.2]	1.2 [0.7-2.0]	1	
Missing (n)	51	123	166	326	666
	χ^2=16.601; df=6; p<0.001				

undergraduate education less than 10 years ago are more often using film holders or combining these two methods than their older counterparts. Most of respondents from A group with professional load up to 9 years got this knowledge during their studies in university due to the changed study programmes where courses of dental radiography were implemented since 1996y. Those who have graduated more than ten years ago mainly were educated during continuous education programmes held in Vilnius and Kaunas Universities.

Several reasons may explain why the lm holders are used so rare. It could be the reason of unknowing how to position correctly them, also the lack of previous clinical experience by practitioner, limited information during undergraduate education.

Results of the present study emphasize the existing challenges in undergraduate and continuing education. Clearly, improvement in human as well as economic resources is necessary to obtain an improvement in use of radiography among Lithuanian general dentists.

CONCLUSIONS

It was concluded that the recently graduated dental practitioners more common used diagnostic radiography for endodontic pathology than dentists with a longer time from graduation. Film holder was not a popular device among general dental practitioners to perform periapical radioraphs.

It is important to improve the existing dental curriculum to ensure that both undergraduate and continuous students could get the necessary competency when using dental radiography and film holders routinely in clinical practice.

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