

Shielding in Dental Radiography: Is It Applied Properly?

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Abstract

Purpose: Lead shielding in the forms of thyroid straps and apron are known as protection devices in medical imaging. Recent data and guidelines do not recommend the routine use of lead shielding in dentistry imaging even for pregnant women. This study was conducted to investigate whether the application of these shielding is appropriate in our dental radiography.

Materials and Methods: The study was conducted in five dental radiography centers that performed panoramic and intra oral imaging. A questionnaire consisting of five items was developed and technicians were asked to fill it out for a period of one month.

Results: The results of this study showed that 72% of children and 70.3% of adults received protection by thyroid shielding. For 24% of children and 24.7% of adults no shielding was reported. In panoramic imaging of 55.5% children and 14.4% adult, thyroid shielding was used. Apron was applied for 33.3% of children and 54.4% of adults. No shielding was used for 11.1% of children and 30% of adults. Apron shielding in panoramic imaging for children was 33.3% and for adults 54.4%

Conclusion: The results of this survey showed, in general, a routine behavior exists in shielding application for dental radiography which has not been updated. Then, it seems that there is a need for updating knowledge regarding appropriate use of thyroid and apron shielding for this imaging modality.

1. Introduction

There is always a fear among the general public about the use of X-rays in medical imaging. Even, educated people and those who work directly with X-ray are concerned about its' side effects [1].

Dental radiography is one of the most common X-ray imaging, which is experienced by a wide range of community from childhood to elderly. Although it has significant diagnostic benefits, exposure of ionization radiation to a child, pregnant women and radiosensitive organs like thyroids are always great concerns [2]. Even in some cases, lack of knowledge about radiation and protection techniques may lead to its none or misuse.

Radiation protection in dental radiography can be reached by adjustment of image field-size, exposure parameters, and filtration and by the use of protective lead shields [3]. Lead shields in the form of apron and thyroid straps are protective devices and techniques that are known for technicians and also patients in preventing the harmful effects of ionization radiation. Application of shielding in dental radiography depends on imaging type (Intra Oral, Panoramic or CBCT, etc.), exposure condition and also patient. In intra oral imaging, for all children under the age of 20, thyroid shield should be mandatory [4], but in panoramic imaging if the thyroid is outside, the primary beam shielding is not recommended [5]. Except some occasional views like occlusal

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maxillary, which the primary beam is positioned towards the patient's trunk, fetal and gonadal dose in dentistry imaging is extremely low and there is no justification for the routine use of lead aprons [6]. In such cases, just reduction of patient anxiety and concern about the radiation can be considered as the benefits of apron.

Since recent data do not recommend the routine use of lead shielding in dentistry imaging even for pregnant women [7], in this study we are going to investigate if the application of thyroid shielding and apron is appropriate in dental radiography.

2. Materials and Methods

This was a cross sectional study for a period of one month. The study was conducted in five dental radiography centers that performed panoramic and intra oral imaging.

A questionnaire consisting of five items was developed with the following sections:

1. Age and gender of the patients,
2. Type of dental imaging (panoramic or intra oral) device,
3. Pregnancy,
4. Use of shield,
5. Type of applied shield (thyroid, apron).

A written questionnaire was distributed by visiting technicians in each imaging departments. The technicians were asked to fill this form for a period of one month. A second follow-up was carried out to collect the completed questionnaire.

3. Results

Total number of collected patient information was 279. Patients in this study were categorized in two groups of children and adults.

Since, radio-sensitivity of thyroid gland under 20 years old is relatively high [4], this group of patient was considered as children. With these inclusion criteria, 43 out of 275 patients were children. As it can be seen in

Table 1, 25 intra oral and 18 panoramic imaging were performed for this group of patients. In Intra oral imaging, thyroid shielding for 18 (72%) patients and apron for 1 (4%) patient were used and no shielding was applied for 6 (24%) individuals. For panoramic imaging, 10 (55.5%) thyroid shielding, 6 (33.3%) apron and 2 (11.1%) with no shielding were reported.

Table 1. Number of applied shielding (thyroid and apron) for children (under 20 years old) in dental imaging

Type of shielding	Thyroid	Apron	Nothing
Intra Oral Imaging	18	1	6
Panoramic Imaging	10	6	2

232 patients were adults (above 20 years old) with 166 panoramic and 81 intra oral imaging. As it is shown in Table 2, in panoramic imaging, 24 (14.4%) thyroid shielding, 91 (54.4%) apron and 51 (30%) with no shielding application was reported. For intra oral imaging of patients 57 (70.3%) thyroid shielding, 4 (4.9%) apron and for 20 (24.7%) cases no shielding was applied.

4 pregnant women were referred to dental imaging during the period of survey: apron and thyroid shielding were used for all of them.

Table 2. Number of applied shielding (thyroid and apron) for adult (above 20 years old) in dental imaging

Type of shielding	Thyroid	Apron	Nothing
Intra Oral Imaging	57	4	20
Panoramic Imaging	24	91	51

4. Discussion

In this study, the accordance of radiology technologist knowledge with updated data regarding the use of lead shielding in dental radiography was investigated.

Shielding of thyroid glands in intra oral imaging is very important. Different community and organization had declared different categories for use of this protection device. Recommendation of American Thyroid Association is thyroid collars for all dental radiographic examinations when they do not interfere with the examination [8]. According to European guidelines,

thyroid shielding should be mandatory for all patient under 30 years old, while, White *et al.* declared a smaller range which is dedicated to children under 20 years old. The results of this study showed that 72% of children and 70.3% of adults received protection by thyroid shielding which can be considered as an acceptable level. For 24% of children and 24.7% of adults no shielding was reported, that may be justified with views which could be interrupted by use of thyroid shielding. It seems that technicians apply thyroid shielding regardless of the age of patients. This method is in accordance with American Thyroid Association guidelines.

In panoramic imaging of 55.5% children and 14.4% adult, thyroid shielding was used. Apron was applied for 33.3% of children and 54.4% of adults. No shielding was used for 11.1% of children and 30% of adults. Comparing thyroid shielding application in panoramic imaging and intra oral shows about 16.5% reduction of use in children and about 55% in adults imaging. Since in panoramic dental imaging thyroid shield may interfere with primary beam and produces artefacts, the reduction of use, especially in adults imaging was expected [9]. Still high application of thyroid shielding in children panoramic imaging makes concern if it needs repeating because of shielding artefact [10].

Apron shielding in panoramic imaging of children was 33.3% and for adults 54.4%, while, based on international guidelines and reports apron dose reduction is negligible in dental radiography and its application is just recommended for removing anxiety [11].

The big amount of apron and thyroid shielding application in panoramic imaging may be due to lack of updating the knowledge regarding radiation protection in dentistry.

5. Conclusion

The results of this survey showed, in general, a routine behavior exists in shielding application for dental radiography which is not updated. Then, it seems that there is a need for updating knowledge regarding appropriate use of thyroid and apron shielding for this imaging modality.

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