

## Evaluation of X-ray Protection Methods Used in Dental Offices in Tabriz in 2005-2006

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### Abstract

**Background and aims.** The aim of this study was to evaluate x-ray protection methods in dental offices in Tabriz.

**Materials and methods.** In this study 142 dental offices were evaluated. A questionnaire-based method was used. The data was analyzed by descriptive methods.

**Results.** The least commonly used methods were leaded walls (4.9%) and film badges (16.9%) and the most commonly used methods were lead partitions (67.6%) and position-distance rule (68.3%). The most commonly used patient protection devices were E-speed films (84.5%) and long collimators (66.2%). The least commonly used methods, in this respect, were automatic processors (2.1%) and rectangular collimators (0%).

**Conclusion.** Regarding protection methods for the patient, results did not conform to international standards. Mostly, manual processing was used, resulting in extra radiation dose to patients. The methods which reduce the received dose of patients were disregarded in offices compared to educational centers, necessitating optimization of educational programs in these fields.

**Key words:** Dental office, film badge, lead partition, protection, x-ray.

### Introduction

Although the data obtained from radiography is useful for diagnosis, radiographic examination exposes the patient to ionizing radiation. This ionizing radiation results in the modification of biologic molecules, including metabolism, growth and multiplication of cells and genetic changes. Therefore, along with an increase in the diagnostic application of x-

ray, radiation protection protocols should be considered.<sup>1</sup>

One of the most effective methods is patient selection, based on the guidelines of American Dental Association. Dental practitioners should exercise professional judgment when ordering diagnostic radiographs for dental patients. Diagnostic radiography should be used only after clinical examination, consideration of the patient's history and both the dental and the general health needs of the patient.<sup>1</sup>

### Materials and Methods

In this study, 50 offices were randomly visited, from which only 29 offices were equipped with x-ray machines. Simple random sampling method was used in the present study. We used the random number series for randomization.

Based on the results obtained from the pilot study, approximately 60% of the offices in Tabriz were equipped with x-ray machines. In this study, out of 300 dental offices 142 ones (60%) were randomly evaluated.

The studied indices were: the use of lead partitions, leaded walls, position-distance rule, film badges and effects of collimator, film and processing.

### Results

The results demonstrated that 84.5% of dental practitioners use E-speed films and only 8.5% of them use a thyroid collar and 16.2% use a lead apron. Nearly 67.6% of the offices were equipped with a lead partition and 68.3% of dental practitioners use the position-distance rule. In general, approximately 38% of dental practitioners stand in an appropriate angle to the x-ray machine.

The least commonly used methods were leaded walls (4.9%) and film badges (16.9%) and the most commonly used methods were lead partitions (67.6%) and position-distance rule (68.3%) (Fig 1). The most commonly used patient protection devices were E-speed films (84.5%) and long collimators (66.2%). The least commonly used methods, in this respect, were automatic processors (2.1%) and rectangular collimators (0%) (Fig 2). In general, radioprotection principles for patients are disregarded in dental offices in Tabriz.

### Discussion

Guidelines specify which patient factors influence the number of required x-rays and which type of x-ray films should be ordered. The aim of intra-oral radiography is obtaining a high-quality image from oral structures with the least exposure of the patient.<sup>2</sup>

The size and shape of the x-ray collimator are two main factors in determining the received dose of the patient.<sup>3</sup> In the periapical radiographs, a rectangular collimator is recommended since it reduces exposed volume and the received dose. The results indicated that in dental offices in Tabriz, rectangular collimator is not used at all, which is consistent with the results of studies carried out by Ilguly, Jacobs and Aroua. All the above-mentioned studies have been carried out in dental offices.

To reduce patient exposure, high speed films must be used. For this purpose, E-speed film, which has the highest speed, is used. In the present study, the rates of E-speed, D-speed, and D/E-speed film use were 84.5%, 3.5%, and 12%, respectively.

In the present study, most of the dental practitioners were not aware of the speed of films and their effects. In the study carried out by Ilguly in 2005, 65.8% of dental practitioners were not aware of film speed.<sup>4,5</sup>

The results of the present study on the use of E-speed films concur with the results of studies carried out by Alcaraze in 2006 and Gaist in 2002.<sup>6,7</sup> Digital radiography needs half the exposure necessary for E-speed film and the images have a better contrast compared with E-speed films. In the present study, the rate of digital radiography use was 7%, which is consistent with the results reported by Ilguy and Aroua.<sup>2,3,5</sup> The reason for limited use of digital imaging may be its high initial cost. The advantage of automatic processing is the reduction of processing time. In this study, the rate of manual processing use was 97.9% and automatic processing was used in 2.1% of the cases. The rate of automatic processor use was concordant with Ilguy. The reason for limited use of automatic processor is its high cost and the need for its regular cleaning.<sup>2</sup>

To protect patients from x-ray, lead aprons and collars must be used. The main function of a lead apron is absorption of scattered radiation and reduction of the absorbed dose. In this study, lead aprons and collars were used in 16.2% and 8.5% of the cases, respectively.

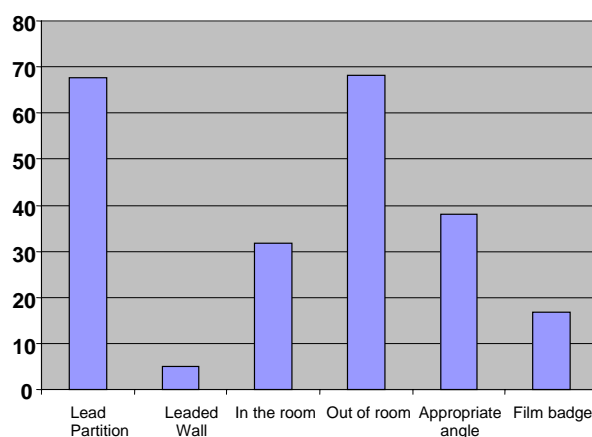
In the study carried out by Ilguy, 8.7% of dental practitioners used lead aprons and 3.7% of them used lead collars. The results of that study are consistent with the present study.<sup>2</sup>

In a study by Gaist, which was conducted in the universities of the United States and Canada, 95% of dental practitioners used lead aprons for extra-oral radiography and 85% of them used lead collars for intra-oral radiography. The differences observed between the results of the present study and other studies might be attributed to the samples evaluated, indicating that radioprotection methods are more common in universities compared to offices.<sup>7</sup>

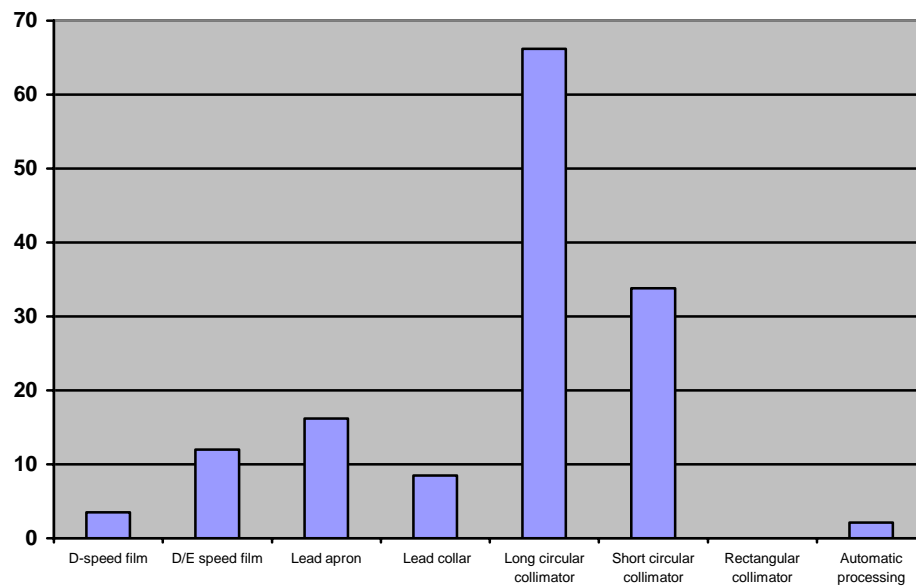
In the present study, leaded walls and lead partitions were used in 4.9% and 67.6% of the cases, respectively. In the study by Ilguly, 5% of dental practitioners used leaded walls and 11.2% used lead partitions. In general, the use of a lead partition in offices is more prevalent.<sup>8</sup>

### Conclusion

It can be concluded that radioprotection is considered important for dental practitioners than for patients. In 68.3% of the cases the position-distance rule is used indicating that this method is the most commonly used method. Concerning radioprotection for the patient, results were not acceptable and were not concordant with international standards. In 75.3% of the cases, dental practitioners used no protection for the patients. In general, the methods which reduce the received dose are considered less important in offices compared to educational centers. According to the results, radioprotection for patients has been disregarded, which necessitates more continuing education in this field.



**Figure 1.** Mean values of radioprotection methods used for dental practitioners.



**Figure 2.** Mean values of radioprotection methods used for patients.

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