Original Article

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Analysis of the Knowledge and Attitude of Turkish Urology Residents on the Use of Fluoroscopy Working in University Hospitals and Training and Research Hospitals: A National Survey-Based Comperative Study

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Abstract

Aim: Tendency, knowledge, awareness, and behavior patterns of urology residents in Turkey regarding the use of fluoroscopy may vary depending on the institutions. The study analyses and compares the awareness and tendencies of urology residents in university hospitals and training and research hospitals.

Methods: In this qualitative research, a 13-question survey prepared using "Google Forms" as of 01.03.2021 was shared for four weeks in the "WhatsApp" application group, which includes 279 urology residents studying at university hospitals and training and research hospitals in Turkey. One hundred and thirteen participants, who completed the questionnaire were included in the study. The data was analyzed by comparing two groups: university hospitals (group 1) and training and research hospitals (group 2).

Results: Of the 113 urology residents included in the study, 56 (49.6%) were in group 1 and 57 (50.4%) were in group 2. Sixty-seven point three percent (67.3%) of the residents stated that they never hesitated to participate in the operations in which fluoroscopy was used. Additionally, the residents stated that 43.4% of the auxiliary healthcare staff frequently refrain from being involved in these cases ($p<0.001$). While 21 (37.5%) of the residents in group 1 reported that they hesitated in these cases, this rate was found to be 16 (28.2%) in group 2 and a significant difference was observed between the two groups ($p<0.016$).

Conclusion: Although the residents who work in training in university hospitals are more scared of radiation exposure from fluoroscopy than their colleagues working in training and research hospitals, the lack of education is present and the use of dosimeters is very low in both groups.

Keywords: Fluoroscopy, radiation, survey

Introduction

With the advances in technology, open surgical interventions have decreased in modern urology practice and the use of endourological procedures has increased (1). Frequently used endourological procedures such as percutaneous nephrolithotomy (PNL), endoscopic ureter stone treatments, and retrograde intrarenal operations are mostly performed under fluoroscopy guidance. During these fluoroscopic-guided procedures, surgeons, patients, and operating room staff are exposed to a significant amount of ionizing radiation (2).

Stochastic (mutation and cancer) and deterministic effects may occur because of radiation exposure (RE). This effect is related to the duration, dose, and protection

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used (1). For this reason, the International Radiation Commission recommends that the radiation dose exposed should not exceed an average of 20 mSv (millisieverts)/year for five years (3).

To avoid these negative effects of radiation, personal protective equipment such as a lead apron, thyroid shield, radiation protection gloves, and goggles should be used, and basic principles should be observed (1). Additionally, it is necessary to use a dosimeter to determine the cumulative radiation dose exposed. However, studies on this subject have revealed that protective equipment and dosimeters are not used enough among urologists, and there is a lack of knowledge and awareness about this subject (2,4,5).

The urology residency is an important occupational group with a high risk of RE (6). In Turkey, urology residency training is applied in university hospitals or training and research hospitals. There are studies evaluating the awareness of RE among urology residents. However, according to our literature research, there is no study comparing the tendency to use fluoroscopy in different institutions. In this study, we evaluated the tendencies, knowledge, awareness, and behavior patterns of urology residents in Turkey regarding the use of fluoroscopy in different institutions.

Methods

Ethical Standards

This study protocol was reviewed and approved by the Ankara City Hospital Local Ethics Committee on May 18, 2021 (approval number: E2-21-502). Participants were informed that the data will be used for scientific purposes only.

Study Design

Physicians working as urology residents in university hospitals (group 1) and training and research hospitals (group 2) in Turkey were included in the study. The 13-question survey was prepared via "Google Forms" (Table 1). The questionnaire form was shared once every two days for four weeks as of January 3, 2021, via the "WhatsApp" application, which includes 279 urology residents and 113 urology residents completed the questionnaire. The answers given by the participants were kept confidential.

The survey included questions about the range of participants' ages, the year of urology residency, the institution (university hospital or training and research hospital), and the surgical techniques using fluoroscopy during their training. Additionally, the participants were also questioned about their own and the auxiliary healthcare staff's tendency to refrain from surgeries using fluoroscopy and to replace a surgery requiring fluoroscopy with a non-fluoroscopy method. It was evaluated whether they and their auxiliary healthcare staff received training on dosimeter usage, the radiation dose of fluoroscopy, and protection methods. Their opinions on the protective equipment and its adequacy and regular controls, and their knowledge of ionizing radiation protection methods were questioned too.

Statistical Analysis

Statistical data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 22.0 (SPSS Inc., Chicago, Ill., United States). Numerical data was expressed as the number of participants and the percentage [n (%)]. The chi-square and Fisher's exact tests were used to compare categorical data and a p-value of less than 0.05 was considered statistically significant.

Results

One hundred and thirteen participant urology residents completed the questionnaire. Of the residents, 56 (49.6%) were training in university hospitals (group 1) and 57 (50.4%) were in training and research hospitals (group 2). Eighty-one (71.7%) of the residents were between the ages of 25-30 and 60 (53.1%) were in 1-3 years of their education. One hundred and twelve (99.1%) of the participants reported that they preferred to use fluoroscopy in PNL, 75 (66.4%) of them preferred retrograde intrarenal surgery (RIRS), and 71 (62.8%) preferred nephrostomy/double J (DJ) insertion operations.

The hesitation rate to participate in a surgery requiring fluoroscopy was 67.3% and 43.4% for the residents and healthcare staff, respectively. This difference between the two healthcare worker groups was statistically significant ($p<0.001$). Furthermore, in groups 1 and 2, residents were hesitant to participate in a fluoroscopy-required surgery at a rate of 37.5% and 28.2%, respectively. This difference was also found to be statistically significant ($p=0.016$).

In group 1, 39 (69.6%) residents stated that they preferred methods (even if they required more sessions of operations) in which they would not use fluoroscopy at different frequencies, while in group 2 this number was 33 (57.9%), and the difference was found to be statistically significant ($p=0.042$).

In our study, 68.1% of the residents and auxiliary healthcare staff did not use dosimeters in any operation performed with fluoroscopy. Only six of the residents (5.3%) received training on the harmful radiation effects of fluoroscopy, radiation protection methods, etc. 107 of the participants (94.7%) reported that they used lead aprons in cases where fluoroscopy was used. One hundred-eleven (98.2%) of them used thyroid shields, while only two (1.8%) of them used radioprotective

Table 1. The distribution of the responses of urology residents training in Turkey to the questionnaire questions evaluating their tendencies and awareness regarding the use of fluoroscopy in operations, according to institution types				
	Total (n=113)	**Group 1 (n=56, 49.6%)**	**Group 2 (n=57, 50.4%)**	**p**
Q1. Age (years), n (%)				
<25	2 (1.8%)	0 (0)	2 (3.5)	
25-30	81 (71.7%)	35 (62.5)	46 (80.7)	**0.009***
>30	30 (26.5)	21 (37.5)	9 (15.8)	
Q2. Residency years, n (%)				
≤3	60 (53.1)	23 (41.1)	37 (64.9)	**0.011****
>3	53 (46.9)	33 (58.9)	20 (35.1)	
Q3. In which operations do you use fluoroscopy in your urology practice? n (%)				
PNL	112 (99.1)	56 (100)	56 (98.1)	>0.99*
RIRS	75 (66.4)	34 (60.7)	41 (71.9)	0.207**
Nephrostomy/DJ catheter insertion	71 (62.8)	34 (60.7)	37 (64.9)	0.064**
Q4. Do you hesitate to participate in operations that require fluoroscopy? n (%)				
Never	76 (67.3)	35 (62.5)	41 (71.8)	
Rarely	25 (22.1)	11 (19.6)	14 (24.6)	
Sometimes	11 (9.7)	10 (17.9)	1 (1.8)	**0.016***
Often	1 (0.9)	0 (0)	1 (1.8)	
Always	0 (0)	0 (0)	0 (0)	
Q5. Do auxiliary healthcare staff hesitate to participate in operations that require fluoroscopy? n (%)				
Never	7 (6.2)	5 (8.9)	2 (3.5)	
Rarely	13 (11.5)	5 (8.9)	8 (14)	
Sometimes	28 (24.8)	9 (16.1)	19 (33.3)	0.147**
Often	49 (43.4)	28 (50)	21 (36.8)	
Always	16 (14.1)	9 (16.1)	7 (12.4)	
Q6. Would you prefer to operate a case without using fluoroscopy in more sessions with different technique rather than in one session with using fluoroscopy? n (%)				
Never	41 (36.3)	17 (30.4)	24 (42.1)	
Rarely	41 (36.3)	18 (32.1)	23 (40.4)	
Sometimes	23 (20.4)	15 (26.8)	8 (14)	**0.042***
Often	5 (4.4)	5 (8.9)	0 (0)	
Always	3 (2.6)	1 (1.8)	2 (3.5)	
Q7. Do you and your auxiliary staff use a dosimeter in cases where fluoroscopy is used? n (%)				
Never	77 (68.1)	43 (76.8)	34 (59.6)	
Rarely	15 (13.3)	5 (8.9)	10 (17.6)	
Sometimes	13 (11.5)	5 (8.9)	8 (14)	0.378*
Often	6 (5.3)	2 (3.6)	4 (7)	
Always	2 (1.8)	1 (1.8)	1 (1.8)	
Q8. Have you been trained in the subjects on radiation effect caused by fluoroscopy, radiation protection method and etc.? n (%)				
Yes	6 (5.3%)	3 (5.4)	3 (5.3)	>0.99*
No	107 (94.7%)	53 (94.6)	54 (94.7)	

Table 1. Continued				
	Total (n=113)	Group 1 (n=56, 49.6%)	Group 2 (n=57, 50.4%)	p
Q9. Is there adequate ventilation in the operating room where fluoroscopy is used to reduce the effects of ionizing radiation? n (%)				
Yes	41 (36.3)	21 (37.5)	20 (35.1)	0.79**
No	72 (63.7)	35 (62.5)	37 (64.9)	
Q10. Do you believe that lead aprons worn during fluoroscopy surgeries are sufficiently protective? n (%)				
Yes	8 (7.1%)	2 (3.6)	6 (10.5)	
Partially	68 (60.2%)	39 (69.6)	29 (50.9)	0.118*
No	37 (32.7)	15 (26.8)	22 (38.6)	
Q11. Which of the following protective equipment do you use regularly in operations where fluoroscopy is used? n (%)				
Lead apron	107 (94.7%)	51 (91.1)	56 (98.2)	0.113*
Thyroid shield	111 (98.2%)	54 (96.4)	57 (100)	0.243*
Radiation protective glasses	2 (1.8)	1 (1.8)	1 (1.8)	>0.99*
Radiation protective gloves	0 (0)	0 (0)	0 (0)	
Q12. Do you think that protective equipment is regularly checked for effectiveness? n (%)				
Yes	7 (6.2)	1 (1.8)	6 (10.5)	0.113*
No	106 (93.8)	55 (98.2)	51 (89.5)	
Q13. Do you know/do you perform, what should be done to reduce the harmful radiation effect after fluoroscopy?"				
I do not know/I do not do	109 (96.5)	52 (92.9)	57 (100)	
I know/I do not do	3 (2.7)	3 (5.4)	0 (0)	0.057*
I know/I do	1 (0.8)	1 (1.8)	0 (0)	

Q: Question, PNL: Percutaneous nephrolithotomy, RIRS: Retrograde intrarenal surgery, DJ: Double J, *: Fisher's exact test, **: Chi-square test

glasses. It was learned that none of the residents were using the radioprotective gloves.

Finally, 106 of the residents (98.2%) answered "no" to the question "Do you think that protective equipment is regularly checked for effectiveness?" and 109 (96.5%) residents answered "I don't know/I don't do" the question "Do you know/do you perform, what should be done to reduce the harmful radiation effect after fluoroscopy?". The data about the answers given by the residents to the survey are shown in Table 1. The answers of all urology residents regarding the main questions are shown in Figure 1 and 2.

Discussion

In our study, even though all urology residents are at similar education levels on RE, the residents training in university hospitals had more anxiety about using fluoroscopy than their colleagues in training and research hospitals. Similarly, unlike their colleagues in training and research hospitals, the residents in university hospitals prefer to operate a case with a different method without using fluoroscopy in more sessions than in a single session using fluoroscopy. It may be because the residents working in the training and research hospitals care less about their safety due to the high workload. Additionally, auxiliary healthcare staff much more often avoid cases in which fluoroscopy is used than urology residents. This can be explained by the fact that residents with the concern of training in their occupation ignore ionizing RE. There are many studies in the literature about the awareness of RE of urology residents (1,4-7). However, this is the first study to evaluate the attitude and knowledge of urology residents concerning ionizing radiation according to their educational institutions.

Ionizing radiation is a serious health problem faced by practitioners when they apply it during medical diagnosis and treatment. While applying these procedures, the harmful effects of radiation must be taken into account. Especially recently, the increase in endourological interventions and the parallel increase in RE impose an important responsibility on urologists to protect themselves, auxiliary healthcare staff, and their patients

(8). For this purpose, the use of a lead apron, thyroid shield, radiation protective glasses, and gloves is recommended in cases where fluoroscopy is used, and it is known that this protective equipment prevents the harmful effects of ionizing radiation (1). However, many studies have shown that most urologists do not have sufficient knowledge about the harmful effects of radiation and do not take adequate precautions against radiation (1,9,10). In a recent study involving 309 urology residents from the United Kingdom, it was determined that 44.1% of the participants had not received any training on radiation protection methods (11). In a study that Harris et al. (4) evaluated 136 urology residents in the United States, it was shown that almost half of the residents did not receive formal radiation safety training. In the same study, it was reported that 99% of the residents used a thyroid shield, 97% of them regularly wore lead aprons, but only 9% of the residents used radiation protective glasses. Besides, it has been shown that none of the assistants wore radiation protective gloves. In another survey study conducted on urology residents in Canada, it was stated that although the rate of thyroid shield use was 96%, 24% of them used it irregularly. While the rate of use of radiation protective lead aprons is 13%, it has been

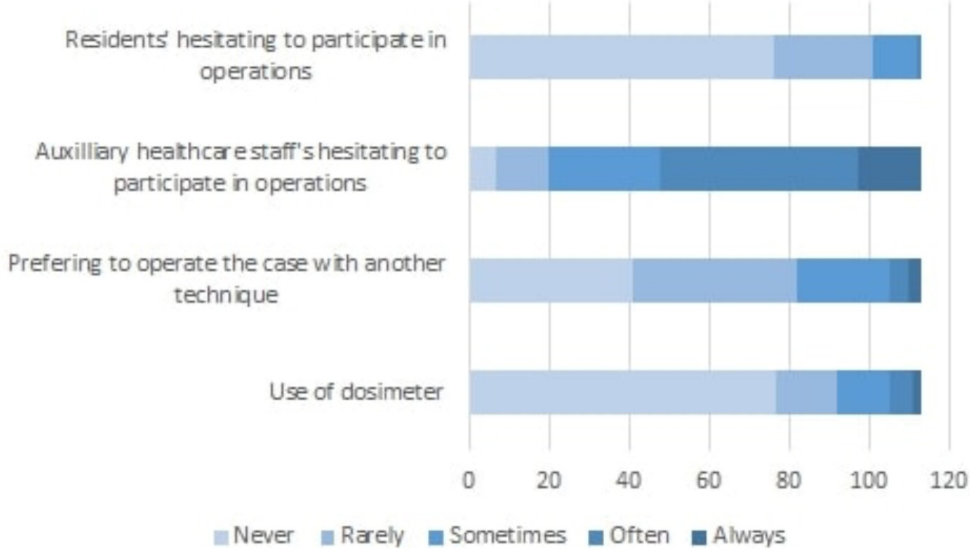

Figure 1. Distribution of urology residents' responses to Question 4, Question 5, Question 6 and Question 7

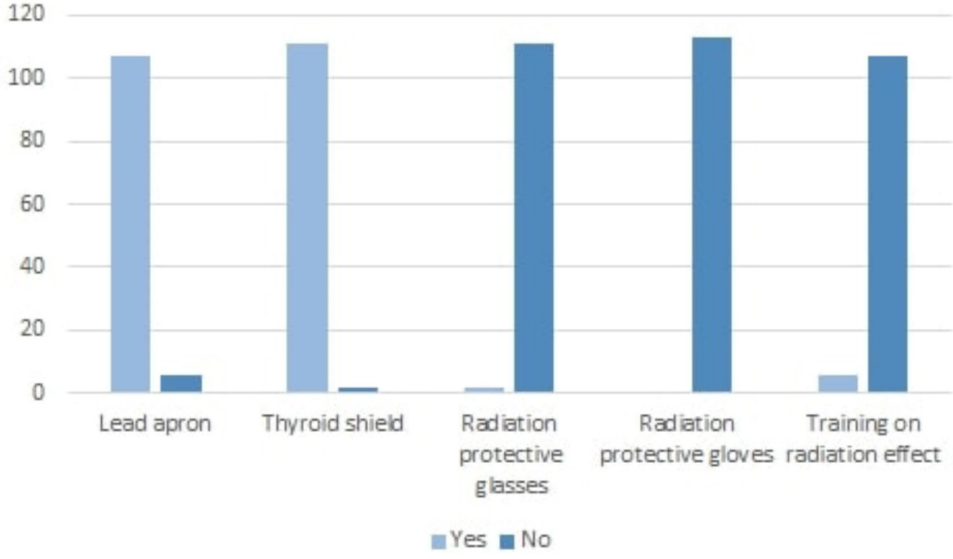

Figure 2. The urology residents' rate of use of the protective equipment and training on radiation effects

shown that almost no residents use radiation protective gloves. In this study, it was also emphasized that 70% of the residents did not use dosimetry (7). Similar results are also observed in studies conducted in Europe (5). In our study, it is seen that while the use of lead aprons and thyroid shields is quite high among urology residents in Turkey, almost none of the residents use radiation protective glasses and gloves. Additionally, 68.1% of the residents never used dosimetry and only 5.3% stated that they received training on radiation safety. Another striking result is that the vast majority of urology residents do not believe that protective equipment is regularly checked for effectiveness.

Fluoroscopy is used in many operations in urology. In the study by Altintas et al. (6), 53.9% of the participants answered the question "In which case do you need a fluoroscopy device the most" as PNL. In a recent study, it was reported that the duration of fluoroscopy used in ureteroscopy decreased with the experience of urology residents (12). In another study, it was shown that RE was not affected by the surgeon's experience (13). In our study, fluoroscopy was almost always used in PNL cases. In operations of RIRS and nephrostomy/DJ insertion, fluoroscopy was preferred in one of three patients. We think that this difference may have arisen due to studies showing the effectiveness and reliability of the non-fluoroscopic RIRS technique (14).

Study Limitations

There are some limitations of our study. First, this study is a survey-based study, and only those who preferred to participate in the survey via "WhatsApp®" were included in the study. Apart from this, the small number of participants is another handicap. Additionally, the status of the auxiliary healthcare staff to avoid cases using fluoroscopy was evaluated according to their responses to urology residents. Despite these limitations, the study's strength is that it is the first study to be conducted due to the tendencies of urology residents training in different institutions in Turkey about the use of fluoroscopy.

Conclusion

Although the use of a lead apron and thyroid shield is excellent in both groups, the rate of use of radiation protective glasses and gloves is almost zero. The residents who train in university hospitals are more scared of RE from fluoroscopy than their colleagues working in training and research hospitals. However, the lack of education is present and the use of dosimeters is very low in both groups. The tendency, awareness, and knowledge of urology residents about the effects of RE and methods of protection should be increased.

Ethics

Ethics Committee Approval: This study protocol was reviewed and approved by the Ankara City Hospital Local Ethics Committee on May 18, 2021 (approval number: E2-21-502).

Informed Consent: Participants were informed that the data will be used for scientific purposes only.

Peer-review:

Authorship Contributions

Concept: E.G., H.C.D., Design: F.S., S.Z.S., Data Collection or Processing: E.G., A.Y.O., Analysis or Interpretation: H.C.D., Literature Search: E.G., S.S., Writing: S.S.

Conflict of Interest: No conflict of interest was declared by the authors.

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