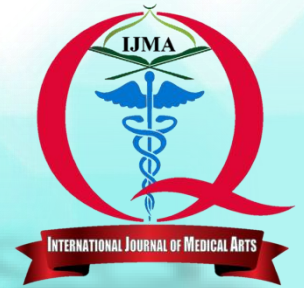


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## Original Article

# Gynecologists Basic Knowledge of Electrosurgery

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## Abstract

### Article information

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**Background:** Effective utilization of electrosurgical procedures needs knowledge about sources of energy and electrical circuits to obtain the standard tissue effects. Knowledge deficiency can negatively impact patients' outcomes and security.

**Aim of the study:** The current work aimed to assess the basic knowledge of electrosurgery among Egyptian gynecology residents.

**Patients and Methods:** The study included a convenient sample [120] from gynecology residents, Al-Azhar university hospitals [New Damietta, El-Hussein, El-Sayed Galal, El-Zahraa, and Assiut], Damietta generalized hospital and Damietta specialized hospital. It was across sectional study, where a survey has been completed to assess the grade of fundamental knowledge and attitudes concerning the use of electro-surgery between gynecology residents. The assessment of participants' knowledge was performed using 20 questions within the questionnaire. One point was assigned for each right answer. However, the wrong answer was assigned zero for this question. The total score was calculated by the total right answers [the minimum possible score was 0 and the maximum was 20]. The knowledge level was classified into low [for score < 10], moderate [fore scores 10-14] and high [for score  $\geq$  15].

**Results:** The mean knowledge score was  $12.18 \pm 3.53$ . The high knowledge score was attained by 30 residents [25%], the moderate score by 50 residents [41.6%] and the low score by 40 [33.3%].

**Conclusion:** Egyptian Gynecology residents had moderate fundamental knowledge concerning the consistent and effective usage of electrosurgery.

**Keywords:** Training; Electrosurgery; Gynecology; Questionnaire.



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## INTRODUCTION

Thermal cautery was the main modality used by the early surgeon's for a long time. The first known use was documented in the Edwin Smith papyrus, dated to about 3000 before Christianity [BC]. The history of electrosurgery, however, was connected to the development of electricity [1].

In 1920, Bovie established the current electrosurgery device. Cushing in 1926 was the first one to apply it in the surgical rooms in 1926. Its application was associated with a dramatic decrease in the perioperative morbidities and mortality [2].

The electrosurgery permits a coagulation or cutting in the human's body via the use of high-frequency alternating current. This unbelievable invention, that is presently utilized universally, is a vital and unique tool in the operating rooms [3,4].

All surgeons have helped from the positive impact of this tool regarding operative time, reduction of bleeding, and overall operative procedure [5]. However, the electrical current of the electrosurgery device can as well lead to unwanted effects on cases if improper use. Thus, effective and harmless usage of electrosurgery is important. Surgical specialist should be knowledgeable about its fundamental theoretical basis to accomplish the goal of proper use. The current research was made to assess the levels of fundamental knowledge and attitudes concerning electrosurgery usage between gynecology residents.

## THE AIM OF THE WORK

The aim of the work is to evaluate the basic knowledge of electrosurgery [electrical circuit, forms of current, and return electrode effects on tissue, surgical hazards and mode of its application] among a sample of Egyptian gynecology residents.

## PATIENTS AND METHODS

The study was conducted on a convenient sample [120] of gynecology residents at Al-Azhar university hospitals [Damietta, El-Hussein, El-Sayed Galal, El-Zahraa, and Assiut], Damietta general hospital and Damietta specialized hospital. It was a cross sectional study, which completed from the first of January 2021 to last of April 2021. Residents who were on the top of their work and accepted to share in the study were included.

**Ethical consideration:** The study protocol was submitted, revised, and approved by the local Research and Ethics Review Board [Faculty of Medicine, Al-Azhar University, Damietta]. An informed consent had been signed by each participant and an administration approval had been attained. Participant's rights were respected and the study was completed in accordance with codes of Helsinki declaration for research conduct and reporting.

**Methods:** A pre-formed questionnaire [20 queries] was completed by each participant to check his/her knowledge and attitudes against the use of electrosurgical devices. It was composed of two sections; the first section [queries 1 to 10] assessed the contributors' professional experiences if they have participated official training about electrosurgeries and their course of action regarding the usage and security precautions of the electro-surgery device [Table 1].

The second section [queries 11 to 20] [Table 2] was used to assess the knowledge levels of the contributors about the fundamentals of electrosurgery, including the electric circuits [queries 12, 18], forms of the electrical current [questions 15, 20], return electrode [question 13], impacts on tissues [questions 16, 17], operative hazard [questions 11, 19], and the application mode throughout the gynecology procedures [question 14]. The answers were collected from the participants by meeting them at the above mentioned hospitals.

The assessment of participants' knowledge was performed by calculating the total score of right answers [each query was assigned a one point for correct answer and assigned 0 for wrong answer]. The minimum possible score was 0, and the maximum was 20. Participant's knowledge scores were categorized into low, moderate, and high. Those who had scores lower than 10 points [<50.0% of total questions] were low, while those with scores 10-14 were moderate and those who had scores  $\geq 15$  were highly knowledgeable.

Table [1]: The first section of the questionnaire assesses the level of the fundamental knowledge of the gynecology residents regarding electrosurgery [professional experience, training about electro-surgery, and the practice with electrosurgery] [6].

n.	Query	Answer
1	Have you ever read any article or paper on electrosurgery?	
2	Have you ever participated in any training seminar on electrosurgery?	
3	Do you know the difference between electro cautery and electrosurgery?	
4	What is your professional title?	
5	Do you check the area of the return electrode [cautery plaque] placed preoperatively?	
6	Could you exactly define the variance among mono-polar and bi-polar surgeries?	
7	You observed a sub-cutaneous blood loss vein and held it using forceps. Which button would you press?	
8	Do you know what return electrode monitoring [REM] is?	
9	Do you know what desiccation means?	
10	Do you know the setup and characteristics of the electro-surgery device [generator] in the surgical room?	

Table [2]: The second section of the questionnaire to assess the levels of the fundamental knowledge of the Egyptian gynecologists concerning electrosurgery; these questions assessed their knowledge on the fundamentals of electrosurgery [6].

n.	Query	Answer
11	The electrode cable constantly tangles in your hand during surgery. What would you do?	
12	Return electrodes provide the earth for the electric current.	
13	Which is the most suitable location for return electrodes during gynecologic operations?	
14	When should the yellow button be pressed to obtain a cutting effect?	
15	Which wave form is used in bi-polar surgery?	
16	Which of the tissues is more resistant against the electric current?	
17	Desiccated tissue looks black	
18	Electrical current returns to the generator via the return electrode in bi-polar operation	
19	Which modality should be used in patients with a pacemaker?	
20	High-voltage interrupted waveform is used in fulguration	

**Data analysis:** The collected data were either categorical or continuous numerical. The first type of data was presented by the relative frequency and percentages. The second was presented by arithmetic means and standard deviations. Normal distribution of

continuous data was assessed by the Kolmogorov-Smirnov test.  $P$ -value  $<0.05$  was set as the margin of significance. The statistical package for social sciences [SPSS] version 18 [IBM@SPSS® Inc., Chicago, USA] was used to perform all statistical analyses. The independent samples student “ $t$ ” test was used to compare between two means, while one way analysis of variances [ANOVA] test was used to compare between more than two means, with least significant differences as the post hoc test.

## RESULTS

Table [3] presented the percentages of residents reported correct answer for each query. The highest percentages of residents check the area of the return electrode [cautery plaque] placed preoperatively [89.2%] [the strongest point], while the lowest percentage [8.3%] know what is the return electrode monitoring [REM] [The weakest

point]. Only 15.0% of residents participated in training seminars on electro-surgery, and the majority of them [51.7%] were juniors in their career. Seniors represent the minority [22.5%].

The mean crude knowledge and attitude score of studied participants was  $12.18 \pm 3.53$ . The high scorers were 30 residents [20.0%], the moderate scores were 50 [41.7%] and the lower scorers were 40 [33.3%] [Table 4].

Residents who read articles or papers on electro-surgery had a significantly higher percentage of knowledge score than those who do not [ $64.71 \pm 10.32$  vs  $49.85 \pm 15.03$  respectively]. Similarly, those who had training seminars are significantly more knowledgeable than those who did not [ $66.01 \pm 10.0$  vs  $52.83 \pm 15.26$ , respectively] [Table 5]. In addition, the advancement of career was associated with higher percentage of knowledge [Table 6].

**Table [3]:** Distribution of the studied gynecology residents regarding correct answers of questions

n.	Query	Correct Answer	
		n	%
1	Have you ever read any article or paper on electro-surgery?	40	33.3%
2	Have you ever participated in any training seminar on electro-surgery?	18	15.0%
3	What is your professional title?		
	Junior	62	51.7%
	Mid senior	31	25.8%
	Senior	27	22.5%
4	Do you know the difference between electro cautery and electro-surgery?	51	42.5%
5	Do you check the area of the return electrode [cautery plaque] placed preoperatively?	107	89.2%
6	Could you exactly define the variance among mono-polar and bi-polar surgeries?	53	44.2%
7	You observed a sub-cutaneous blood loss vein and held it using forceps. Which button would you press?	29	24.2%
8	Do you know what return electrode monitoring [REM] is?	10	8.3%
9	Do you know what desiccation means?	31	25.8%
10	Do you know the setup and characteristics of the electro-surgery device [generator] in the surgical room?	62	51.7%
11	The electrode cable constantly tangles in your hand during surgery. What would you do?	75	62.5%
12	Return electrodes provide the earth for the electric current.	92	76.7%
13	Which is the most suitable location for return electrodes during gynecologic operations?	81	67.5%
14	When should the yellow button be pressed to obtain a cutting effect?	64	53.3%
15	Which wave form is used in bi-polar surgery?	88	73.3%
16	Which of the tissues is more resistant against the electric current?	84	70.0%
17	Desiccated tissue looks black	56	46.7%
18	Electrical current returns to the generator via the return electrode in bi-polar operation	74	61.7%
19	Which modality should be used in patients with a pacemaker?	78	65.0%
20	High-voltage interrupted waveform is used in fulguration	83	69.2%



**Table [4]:** Scoring categorization among studied residents

Scoring grade	Statistics	
	n	%
High scorers [score 15 or more]	30	20.0%
Moderate scorers [score 10-14]	50	41.7%
Low scorers [score <10]	40	33.3%
The crude score [mean±SD]	12.18±3.53	

**Table [5]:** The association between reading and training from one side and percentage of knowledge scoring among studied residents

	Yes		No		P value
	Mean±SD	Min.-Max	Mean±SD	Min.-Max	
Reading [Q1]	64.71 ± 10.32	29.41 – 82.35	49.85 ± 15.03	17.65 – 94.12	<0.001*
Training [Q2]	66.01 ± 10.0	47.06 – 82.35	52.83 ± 15.26	17.65 – 94.12	<0.001*

**Table [6]:** The association between professional title and percentage of knowledge scoring among studied residents

	Percentage of knowledge score		p
	Min. – Max.	Mean ± SD.	
Junior	17.65 – 82.35	46.49 ± 13.08	<0.001*
Mid senior	35.29 – 94.12	62.05 ± 12.78	
Senior	35.29 – 82.35	65.58 ± 11.62	

## DISCUSSION

The current study revealed that, the mainstream of the gynecology residents had moderate knowledge regarding the main principles and secure use of electrosurgery. The mean crude score was 12.18±3.53 irrespective of known facts that, electrosurgery is the first technology presented to gynecologists in their early career years. Thus, we believe that, the electrosurgery did not had the significance it deserves in the resident training programs. This truth is evident in the current work, where only 15% of residents participated in training seminars. In addition, only one third of residents [33.3%] read articles about electrosurgery.

This could be explained by the prevalence of junior residents in the current work [51.7%], where the main training part is achieved by observation of senior [more qualified] residents or specialists. The insufficient knowledge of electrosurgery started with the terminology, as 57.5% of residents reported that, they did not differentiate between variations between electrocautery and electrosurgery.

The coagulation operations are frequently and non-correctly stated to as "cauterization" in Egypt. Cauterization is the operation in which something's are heated and then utilized to tissues while in electro cauterization, electrical currents heated the metals that is then utilized to the tissues. Although, in electrosurgery, an electrical current used to achieve the heating impact whereas travelling across the tissue. An active electrode can non-correctly be defined as a "cauterization pen" and the return electrode can be defined as a "cautery pad". In mono-polar electro-surgery, the electric current travels across the case as it finishes the circuit from the active to the return electrodes. The return electrode's main role is to un-load the current from the cases, securely [7]. Today's electro-surgical tools normally in operating rooms are 'isolated'. Thus, the circuit isn't done by the earth, but in the generator [8, 9]. About 23.3% of the contributor residents replied that electrical current can be earthed via the return electrodes that was non-correct.

Ayroza and Abdalla [10] reported that the most suitable location for locating the return electrode is the nearest flat area to the operative zone where the muscles mass is concentrated. The thigh is the nearest to the pelvic area and it has intense muscles and the region is flat. Thus, the return electrodes utilized to this area aren't subjected to fluids leak because of gravity effect. Consequently, the thigh is the favored area in gynecologic and obstetric surgery. About 89.2% of contributors reported that they preoperatively check the location of the return electrode and 67.5% responded properly regarding the most suitable location for return electrode's location in gynecologic surgery.

Return electrode monitoring [REM] systems were established to guard against pad site burns due to insufficient contacts of the return electrodes. These systems de-activate the generator by identifying variations in the return electrode amplitudes of the impedances [8]. Irrespective of the fact that, most of the today's electrosurgical devices include REM systems, only 8.3% of the contributors have knowledge about these technologies.

In bi-polar electrosurgical devices, the active and return electrodes are placed in the same device tip. Only the tissues grasped in the forceps are included in the electric circuit [11, 12]. For this reason, case return electrode isn't essential for bi-polar electrosurgery [13]. However, 38.3% of contributors incorrectly believed that the electrical current goes back to the generator via the return electrodes.

Participants thought that yellow switch was utilized for cut, while the blue switch used for coagulations, as it written as 'cut' on the yellow switch of the active electrode and 'coag' on blue switch. However, the yellow and blue switches only determine the forms of the electrical current. There is low-voltage direct current [DC] on the yellow switch, and high-voltage alternating current [AC] on the blue switch. Coagulations and cutting could be done with any button. The mainstream [75.8%] of contributors favored pressing the blue 'coag' switch thereafter holding of a blood loss vein with forceps.

As well, a similar technique may be done via low-voltage with the yellow switch [14], low-voltage usage is principally significant in minimal invasive surgeries.

Other studies revealed analogous findings concerning the knowledge of electrosurgeries between gynecologists and other surgeons [15-20].

The mean score of the participants who joined electro-surgery training and those who reads about electro-surgery were higher significantly. These findings show that official training is more serious issue to improve the base-line knowledge about electrosurgeries.

**Yildirim** [21] conducted a study to evaluate the knowledge and attitudes of 173 Turkish gynecology specialists and residents and their results are in line with current one regarding the effect of reading articles/papers about electrosurgery and training but was different regarding the association between seniority and basic knowledge. They did not detect significant differences between the mean scores of specialists and residents [i.e., juniors and seniors]. However, the mean score of those who had read papers on electrosurgery was significantly higher than uninformed participants [ $p=0.001$ ], and the mean score of those attended electrosurgery training seminars was significantly higher than those who had not [ $p=0.013$ ].

**Conclusion:** The knowledge levels of gynecologists in Egypt were assessed concerning electrosurgery fundamentals and the findings showed that they had moderate knowledge. However, there was a reduction in reading and training seminars about the electrosurgery. Thus, a training programs and seminars are recommended. In addition, future analytical studies for proper generalization of results are warranted. However, the small number of residents included in this study represents a limiting step against globalization of the study results. Futures studies are recommended.

**Conflict of interest:** None

**Financial disclosure:** None to be disclosed.

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