# SAFE ELECTROSURGERY USE: KNOWLEDGE, ATTITUDES AND PRACTICES OF SURGICAL TRAINEES

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## ABSTRACT

**Objective:** To determine the knowledge, attitudes and practices of general surgical trainees regarding safe use of diathermy.

**Methodology:** In this cross-sectional Survey, 47 surgical trainees of the Civil Hospital Karachi, comprising PGY 1 through 4, were interviewed by questionnaires made up of five close-ended and three open-ended items.

**Results:** Majority of the trainees belonged to the first two years of training. More than 80% had no formal training in diathermy use. Most of them were found lacking in core knowledge and evidence-based practice of electrosurgery.

**Conclusion:** There was a high level of ignorance regarding current and established principles of diathermy use among surgical trainees at the Civil Hospital Karachi.

**Key Words:** Diathermy, Electrosurgery, Surgical trainee

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## INTRODUCTION

Electrosurgical injuries are a fairly common post-operative morbidity, often leading to several medicolegal claims and lawsuits[1]. Various hazards of electrosurgery include burns, electrocution, inhalation of diathermy plume and hypoxic stress[2]. The electrosurgical generator is also responsible for most fire-related accidents in the operating room[3].

Diathermy is the most commonly employed electrosurgical gadget in the operating room[4]. Still, little or no attention is paid to learning and training of the basic and technical principles of electrosurgery[5]. Consequently, most studies undertaken to size up the operators' knowledge and competence in this regard have revealed shocking levels of ignorance and omission[5-7]. Needless to say that awareness and some working knowledge of electrosurgery is an essential part of surgical discipline, and competence in this regard will help curtail the complications and mishaps related to diathermy usage[8,9]. However, most of this knowledge is taken for granted, only to be acquired passively in the hands-on fashion[5]. This trial-and-error policy can lead to untoward incidents and mishaps.

This study was conducted at the Civil Hospital Karachi to assess the baseline knowledge and practicing attitudes of general surgical trainees as regards diathermy use.

## METHODOLOGY

This cross sectional survey was conducted at the Department of Surgery in Civil Hospital Karachi in March-April 2014. Surgical residents of the six general surgical units were given a questionnaire consisting of eight items. The items have been pre-validated in previous research conducted for the same objectives[6,7]. Of the eight items, five were close-ended questions i.e. answers to these were yes/no. These are given below:

- Have you received formal training in the use of diathermy?
- Do you think you have (currently) acquired sufficient training/expertise in the use of diathermy?
- Do you personally check for removal of metal from the patient's body?
- Do you place the grounding pad/electrode on the patient yourself?
- Do you check the diathermy equipment/generator before starting the procedure?

The remaining three items were open-ended type and included:

- What is the ideal site for placement of grounding pad/electrode? (Choices given were: Calf; close to

surgical site; others)

- What instrument/tool do you employ to make the skin incision? (Choices given were: Knife; diathermy; others)
- If a diathermy burn, or any other complication related to the use of diathermy, occurs, who is the person directly responsible for it? (Specify the member of operating team) (Choices given were: Surgeon; Scrub nurse; OT Supervisor; others)

In addition, the trainees were asked to provide their level/year of training (1 through 5). The only personal detail which was required on the proforma was the trainee's age.

The questionnaires were distributed in each surgical unit in the same sitting to avoid confounding the results (e.g. due to prior intimation or communication between trainees). Complete confidentiality of the trainees was maintained, and no identifying data was documented on the performas.

All data were transferred on the prototype constructed on SPSS version16.0, and results calculated there-of. Selective exclusion was performed for the items where a) answers were incomplete, and b) answers were illegible; these were considered 'missing' responses and excluded from the analysis of their respective items only. The final results were thus tabulated as: percentages, valid percentages and cumulative percentages.

## RESULTS

A total of 52 surgical trainees from six surgical units of the Hospital were approached. Five of them refused to get enrolled for various reasons. The final sample thus consisted of 47 subjects. Selective exclusion for 'missing' responses, described above, was required only for three items; these are further described in the respective results below.

The mean age of the surgical trainees was 29.76±4.84 yeas (range 26-52 years). More than half the trainees interviewed were in the first two years of training. Table 1 summarizes the level of training of the participants.

Close-ended items:

Of the 47 candidates, 38 had not received any formal training in diathermy use, while 32 believed they were not trained enough for the use of this gadget. Tables 2 summarize these responses.

Only 7 trainees practiced self-placement of the grounding electrode, while only 28 were into the habit of checking for metal removal before surgery. However, 32 trainees maintained that they did check the overall equipment prior to the operation (Table 3).

Open-ended Items:

Most trainees (80.9%) believed that calf muscle was the ideal site for placement of ground electrode. Only

**Table 1: Year of training (n=47)**

| Year Of Training | Frequency | Percentage |
|---|---|---|
| 1st Year | 15 | 31.9 |
| 2d Year | 13 | 27.7 |
| 3d Year | 6 | 12.8 |
| 4th Year | 8 | 17.0 |
| 5th Year | 3 | 6.4 |
| Total | 46 | 97.8 |

*All questions were not answered by all the responders.

**Table 2: Training in Diathermy Use (n=47)**

| | Response | Frequency | Valid Percent |
|---|---|---|---|
| Formal Training | No | 38 | 80.9 |
| | Yes | 9 | 19.1 |
| Sufficient Training | No | 32 | 68.1 |
| | Yes | 15 | 31.9 |
| | Total | 47 | 100 |

**Table 3: Responses on various questions (n=47).**

| | Response | Frequency | Percent |
|---|---|---|---|
| Self-placement of grounding electrode/ pad (n=47) | No | 40 | 85.1 |
| | Yes | 7 | 14.9 |
| Check for removal of metal (n=46)* | No | 18 | 38.3 |
| | Yes | 28 | 59.5 |
| Equipment-Check before surgery | No | 15 | 31.9 |
| | Yes | 32 | 68.1 |
| Ideal site for Placement of diathermy plate (n=44)* | At Calf | 38 | 80.85 |
| | According to surgery | 6 | 12.76 |
| Tool used for skin incision (n=45)* | Knife | 43 | 91.4 |
| | Diathermy | 2 | 4.25 |

*All questions were not answered by all the responders.

**Table 4: Person Responsible for Complications due to Electrosurgery (n=47)**

| Response | Frequency | Percentage |
|---|---|---|
| Surgeon (a) | 19 | 40.4 |
| Scrub Nurse (b) | 10 | 21.3 |
| OR Supervisor (c) | 13 | 27.7 |
| a+b | 1 | 2.1 |
| b+c | 2 | 4.3 |
| a+c | 2 | 4.3 |
| Total | 47 | 100 |

two were using diathermy for incision of skin (Table 3).

Less than half (40.4%) trainees believed that complications arising as a result of diathermy were the sole responsibility of the surgeon (Table 4).

## DISCUSSION

Electrophysics and its use in surgical practice is a discreet science, which gets only a passing attention during training and is mostly relegated to passive learning[5], although there is compelling evidence that some basic knowledge in this regard can mitigate the risk of related complications and mishaps[9, 10]. This has become even more relevant in the laparoscopic era, with the literature showing an overwhelming proof of a rising trend in the electrosurgical morbidity in minimally invasive operations over the past four decades[11, 12]. Not surprisingly, most studies conducted to evaluate the knowledge of surgical practitioners in this regard have revealed alarming levels of ignorance and lack of formal training[6, 7, 13, 14].

The current study was conducted to assess the level of knowledge and trends in practice among general surgical trainees at the Civil Hospital Karachi. Ours being one of the largest mainstream public sector Institutions in this country, we believe the results are a fair depiction of the prevailing pattern in this regard.

Majority of interviewees belonged to the first two years of training. This reflects the pyramidal nature of surgical training in our Institution: by default, and as per the training requirements of the College of Physicians and Surgeons Pakistan, all surgical residents are enrolled as general surgical trainees for the initial two years. Thereafter, most of them trail off to subspecialties; hence the smaller number interviewed in their senior years. We firmly believe that any training and teaching delivered vis-a-vis electrosurgery has to happen in the formative phase of surgical residency i.e. the first two years. Beyond that, most of the basic skills have already been internalized by the trainee. Therefore, we submit that the results of this survey reflect the status at such training levels where they are most relevant. The same probably applies to the average age of the sample, which is comparable to the expected age during the formative phase of training[15].

More than 80 per cent trainees declared that they had no formal training in the use of diathermy, while another 68 per cent believed the tutoring they had already acquired was insufficient. This figure surpasses

those reported internationally[5, 6, 7, 14]. In an email based survey of senior trainees, Assiotis et al found that 49.2 % had not received any formal training in diathermy use[6]. This emphasizes the need for dedicated and structured training modules in the use of surgical gadgets in general, and the diathermy in particular. To-date, the only program of this kind is being offered by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES). Supplemented by a robust and informative manual, it also takes the candidates through 22 hands-on stations[16].

Our results were in tandem with Assiotis' survey[6] in other variables as well. While 90% of the residents interviewed by them were not habituated to place the diathermy pads themselves, the figure in our study was only slightly less. However, majority of the trainees in the current study answered positively to removal of metals and checking the equipment before surgery. While these responses were encouraging, it is cold comfort when seen in the backdrop of the overall results. The practices of metal removal and equipment check possibly represent sketchily acquired reflexes, and not something reflective of a disciplined competency.

Most of the residents interviewed in the current study believed that the best site for placement of the grounding electrode was on the calf. Modern generators are programmed to automatically shut down if the grounding pads malfunction[17]. This has decreased the incidence of pad-site burns, but increased that of stray burns[18]. Nevertheless, the importance of ground-plate remains unarguable and the recommended ideal site for its placement is as close to the site of surgery as possible[19]. Once again, this response represents something learned only through observation of a common, but not necessarily a judicious, practice.

A lot of debate has surrounded use of diathermy to make skin incisions. The long-held dogma that diathermy causes necrosis of skin edges has now been challenged through evidence-based research[10, 20]; in fact, it has now been shown that incisions made with diathermy are associated with less pain and wound complications[20]. Very few of the trainees in our survey reported incising the skin with diathermy. We proffer that this represents a lack of knowledge vis-à-vis the current applications of electrosurgery.

Almost 90% of the residents believed that diathermy-related morbidity has to be the sole responsibility of individual members of the team (surgeon, scrub assistant or supervisor). While surgical complications may indicate a failure of a concerted team effort, we agree with Arenas et al[21] that any analysis of morbidity has to be patient-centered, not individual centered, in order that meaningful conclusions may be drawn there-of.

## CONCLUSION

Our study suggests that most of the current knowledge and practices of surgical trainees at the Civil Hospital Karachi, regarding diathermy use, are based on dogmatic and passively acquired information. This highlights the need for a didactic, evidence-based course on electrosurgery, which should be taught in the first two years of surgical training.

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## CONTRIBUTORS

MAK participated in planning of study, data analysis and manuscript writing. SSS helped in data management. MZ supervised the study. All authors contributed significantly to the final manuscript.