

## Diathermy awareness among surgeons—An analysis in Ireland<sup>☆</sup>



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### HIGHLIGHTS

- We evaluate, among surgeons, the awareness and attitude to the appropriate use of diathermy.
- Despite 89% of surgeons regarding diathermy as safe, 56% had inadequate understanding of principles of safe use.
- 49% could recall personal experience of diathermy complications but 58% did not want any diathermy training.
- There is a concerning dearth of awareness among surgical trainees and consultants alike regarding diathermy.
- The need for a shift in attitude among surgeons to more cautious and safe use is demonstrated.

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### ABSTRACT

**Introduction:** Diathermy is an integral part of many modern surgical procedures. While diathermy is generally accepted as 'safe', electrosurgery-induced injuries are among the more common causes for malpractice litigation. The purpose of this study was to evaluate the awareness among surgeons of the principles, risks, precautions and appropriate use of diathermy.

**Methods:** All surgeons employed from Senior House Officer (SHO) to Consultant grade in two teaching hospitals were surveyed. Sixty-three surgeons were asked to complete an anonymous questionnaire, which recorded level of training and addressed competence in principles, hazards, and precautions to be taken with diathermy.

**Results:** Eight Consultants, 5 Specialist Registrars, 19 Registrars and 13 SHO's responded (71% response). All but three subspecialties were represented. Eighty-two percent (37/45) had no formal diathermy training. Despite 89% (40/45) of surgeons regarding diathermy as a safe instrument, 56% felt they had inadequate understanding of the principles and failed to demonstrate an appropriate awareness of the potential risks. Fifty seven percent exhibited a dangerous lack of awareness in managing equipment not yielding the desired effect and 22% were unaware of any patient groups requiring special caution. Only 42% wanted formal training.

**Conclusion:** Our results show a dearth of awareness among surgeons regarding diathermy. Given our findings, we urge a shift in attitude towards diathermy, with surgeons adopting a more cautious and safe approach to diathermy use. We recommend that formal training be introduced as a hospital based initiative.

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## 1. Introduction

Basic diathermy principles are now used in many permutations to offer the current surgical world vital technology in routine surgical procedures and in developing advanced surgical techniques. It

allows cutting and coagulation of tissue with hemostasis. Most modern surgeons now use some form of diathermy and it is particularly invaluable in more intricate surgery, for example, in neurosurgery and ophthalmology. A varied spectrum of devices now exist in many permutations from an electrosurgical pencil or

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suction coagulators device to laparoscopic devices facilitating tissue dissection, grasping and clamping as well as vessel cutting and sealing. Procedures commonly involving the use of these instruments include breast wide local excisions, axillary dissections, Whipple procedure, colectomy, liver resections, nephrectomy, cholecystectomy and prostatectomy. While diathermy is generally accepted as 'safe', electrosurgery-induced injuries are among the more common causes for malpractice litigation [1].

It would appear that there are 2 main factors that result in unsafe or harmful use of diathermy. The first is technical error, for example bowel perforation or liver damage, which may be due to careless technique. The second is lack of awareness of the correct functioning of the equipment, for example incorrect positioning of the grounding pad causing a burn to the patient. Both of these factors appear more common in emergency surgery [1]. Modern surgery is heavily reliant on diathermy and it is incumbent on the surgeon to be fully cognizant of its safe and appropriate use. This study aims to evaluate the awareness among surgeons of the principles, risks, precautions and appropriate use of diathermy.

### 1.1. The general principles of diathermy

Diathermy originates from the Greek 'dia' for passing through and 'therma' meaning heat. It is defined as "the cutting and coagulation of body tissue with a high frequency current." [2]. It uses the basic principle that electrical current is converted to a high frequency alternating current in the range of 200 kHz–3 MHz, a frequency higher than that which causes neuromuscular stimulation. (Fig. 1). It is typically used surgically for 3 distinct purposes – cutting, fulguration (destructive coagulation with tissue charring) and coagulation. In surgical diathermy the patient forms part of the circuit, the alternating current passing through the tissue produces heat as it tries to overcome its tissue impedance. This is distinct from electrocautery which involves the direct application of heat.

In monopolar mode, the diathermy circuit is from the diathermy probe, through the patient to the grounding pad attached to the patient. Away from the active electrode the current disseminates through the body, with minimal current, therefore causing no tissue damage remote to the surgical site. In bipolar mode the current passes between the two prongs of the diathermy electrode thus with minimal flow through the patient, eliminating the need for a

grounding pad and minimising tissue damage at the surgical site [3] (Fig. 2).

## 2. Materials and methods

We conducted a survey of surgeons employed at two teaching hospitals. All surgical employees from Senior House Officer (SHO) to Consultant grade inclusive were issued with a questionnaire which was filled out by face-to-face interview between March and June 2014.

Questions posed included surgeon grade, years of surgical experience, sub-specialty and whether any formal diathermy training was ever received. Surgeons were also asked about their understanding of the principles of and differences between different diathermy modes and settings. Surgeon's clinical practice, i.e. whether they put on the diathermy pad or inspect the site at the end of a procedure was also investigated. Lastly, the surgeon's hazard awareness and experience of complications arising from electro-surgery was examined.

Initial interviewing revealed a flaw in the survey design in that it became apparent that participants were answering 'yes' to questions specific to diathermy principles (Questions-11,13,14,16,18,22,27). 6 questionnaires were completed with 'yes' answers that were not qualified with explanation. To rectify this and improve face validity the answers were defaulted to 'no' if examples were not provided and the original 6 questionnaires were discounted.

Construct validity was examined by means of an intervention study. Twenty medical students were surveyed and 13% were able to answer correctly the 'principles of diathermy' questions from the questionnaire. A tutorial was given by a surgical trainee on the principles of safe and appropriate diathermy use. Post tutorial increase in awareness was reflected in the re-survey with 96% of students providing correct answers for the same 'principles of diathermy' questions.

A copy of the questionnaire can be seen in [Appendix 1](#).

## 3. Results

Eight Consultants, 5 Specialist Registrars, 19 Registrars and 13 SHO's responded. The mean time of surgical experience acquired

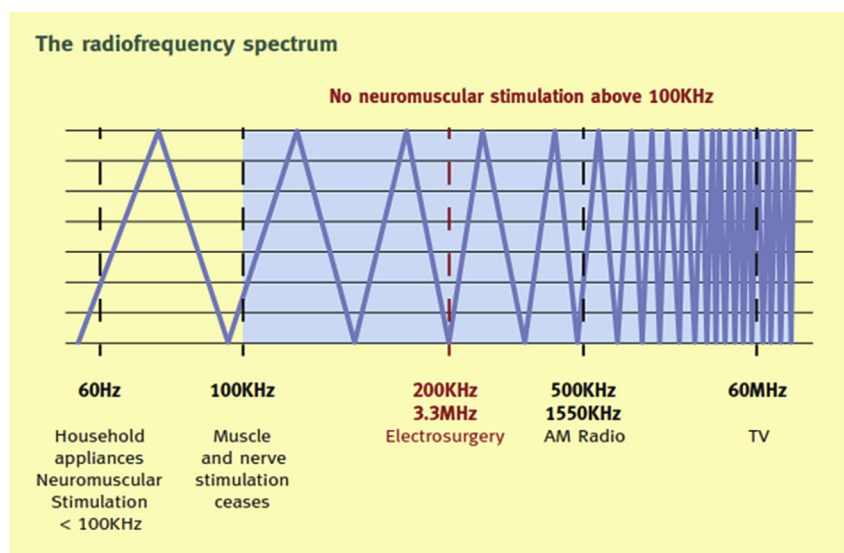


Fig. 1. Electrosurgery current on the radio frequency spectrum.

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