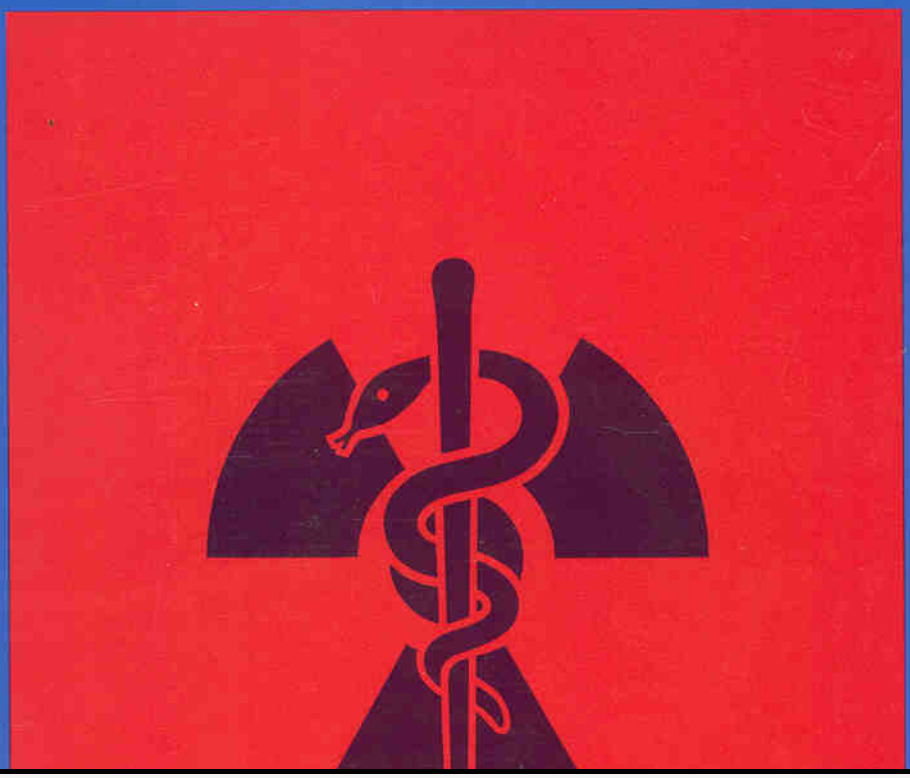
Code of Practice for the Safe Use of Microwave Diathermy Units (1985)



NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL

NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL

Code of Practice for the Safe Use of Microwave Diathermy Units (1985)

Reprinted from the Report of the 99th Session of the Council, June 1985

Australian Government Publishing Service
Canberra 1986

ISBN 0 644 04760 7

Printed by Watson Ferguson and Co., Brisbane

Appendix XXVI

CODE OF PRACTICE FOR THE SAFE USE OF MICROWAVE DIATHERMY UNITS (1985)

Introduction

The therapeutic use of heat produced by microwave radiation absorbed in the body is called microwave diathermy. The heat increases the flow of blood in the tissues through dilation of the blood vessels. This in turn increases capillary pressure, cellular membrane permeability, and metabolic rate, causing a more rapid transfer of nutrients from the blood across cell membranes. These actions may reduce pain and promote quicker healing.

A microwave diathermy unit is a device designed to generate microwave radiation and transfer it, via a coaxial cable and a radiating antenna, to the area to be treated. The antenna is incorporated in an applicator which has the function of directing the radiation towards the area to be treated.

These devices are capable of generating a sufficiently high level of radiation that there may be cause for concern for the safety of the eyes, the gonads and, in the case of pregnant patients, the foetus. It is claimed that radiation from microwave diathermy applicators has caused cataracts in patients being treated for sinus conditions. The eyes of patients being treated for a neck or shoulder injury could also be inadvertently subjected to stray radiation. Improper use of the machine may result in burns and/or scalds and tissue or organ damage. Care must also be taken to avoid subjecting the operator and/or the public to radiation levels exceeding those prescribed in the Australian standard AS 2772 ('Maximum exposure levels - Radio-frequency radiation - 300 KHz to 300 GHz'). It must be noted that the level of radiation present in the vicinity of a diathermy unit may be increased by reflections.

Care must be taken to ensure that the microwave radiation does not cause interference with other equipment.

This Code sets down appropriate rules and procedures to avoid excessive and/or unnecessary exposure to microwave radiation but should be read in conjunction with any State/Territory regulations covering their use.

Definitions

'Microwave diathermy unit' means a device using electromagnetic energy in the microwave frequency range (300 MHz to 300 GHz) for therapeutic purposes. The unit includes applicators, the microwave generator, and all associated electronics, controls and enclosures. In Australia the only approved frequency for microwave diathermy treatments is 2450 MHz.

'Treatment' means the use of a microwave diathermy unit on a human being to treat a symptom, disease or disability.

‘Applicator' means any device designed to conduct, transmit or transfer electromagnetic energy from a microwave diathermy unit to a patient undergoing treatment.

'Control' means any control used during operation of a microwave diathermy unit which affects the microwave radiation emitted by the applicator.

'Health professional' means a registered person who has satisfactorily completed an appropriate course of training approved by the relevant registration board and the State/Territory health authority.

'User' means the person having administrative responsibility for use of a particular microwave diathermy unit. This person shall be the owner or hirer of the unit or his agent or, if the unit is owned or hired by an institution or organisation, the agent of that body.

'Operator' means the health professional given the responsibility, by the user, to treat the patient using a microwave diathermy unit.

'Shall' indicates that the particular requirement is considered necessary to ensure protection from radiation.

'Should' indicates a procedure or precaution which is to be applied, whenever practicable, in the interests of minimising radiation hazards.

Hazards of High Level Exposure to Microwave Radiation

Burns

These may result as a consequence of excessive irradiances or may be due to preferential absorption of microwave radiation (as in the case of a wet dressing over a wound) or to reduced heat dissipation mechanisms (as in the case of the subcutaneous fat layer). In some cases deep tissue and organ damage may ensue.

Ocular effects

Lens opacities may be induced by microwave radiation. Single exposure to intense (>100 mW/cm^2) electromagnetic radiation at 2450 MHz for an hour or longer has resulted in cataract formation in experimental animals. The power density in the therapeutic beam is of a similar level, but the treatment time is generally somewhat shorter. However, repeated direct irradiation of the eye at such levels and for such treatment times does approach the power-time threshold required for cataract production. Goggles do not offer reliable protection.

Effects on the gonads

Exposure to microwave radiation may increase the temperature of the testes to the point where temporary sterility is induced. Very high specific absorption rates may cause permanent damage. The ovaries may also be at risk.

Teratogenic effects

Abnormalities in offspring have been reported in several animal species after exposure to intense microwave radiation. Intense fields resulting in significant temperature increase of the foetus could result in teratogenic effects in humans.

Examination and Interview

Microwave treatment shall not be administered unless prescribed by a health professional (as previously defined). At the examination and interview, when treatment is being prescribed, the health professional shall determine the suitability of the patient for treatment. This should not be prescribed if:

- the patient does not understand the potential risks,
- the patient is not able to cooperate with the operator in maintaining the proper position and in reporting the presence of a heating sensation which is the only indication of an adequate or excessive dose,
- the patient does not have normal sensation in the treatment area,
- the patient has metallic implants within the treatment area,
- the patient is pregnant,
- the patient wears a pacemaker,
- the patient has undergone ionising radiation therapy to the treatment area in the three months prior to the diathermy being administered, as skin sensation and blood circulation may be diminished,
- there is evidence or known history of vascular insufficiency,
- the patient has any evidence of cancer, unless the microwave treatment is carried out as part of a hyperthermia treatment regime. (The metastisis of a cancerous growth may be accelerated by a moderate increase in temperature, such as can be caused by a microwave treatment not specifically intended to treat a malignancy.)
- there are open wounds, haemorrhage, ischaemic tissue, tuberculous joints, or acute infections within the treatment area.

In the cases where the health professional, after due risk/benefit consideration, sees it necessary to prescribe microwave diathermy treatment outside the guidelines given above, adequate advice shall be given to the patient, to the user and to the operator of the microwave diathermy unit.

The head shall not be directly irradiated as there is a significant risk of irradiating the eyes. Most applicators are not sufficiently directional to restrict irradiation to the targeted area. Microwave irradiation of the head may only be carried out as part of a cancer therapy.

User Responsibilities

The user shall ensure, by administrative controls or otherwise, that:

- the microwave apparatus complies with all relevant Australian Standards and is maintained in accordance with the relevant State requirements,
- the unit is operated only by health professionals,
- the unit operator is not exposed to a radiation level exceeding the standard for occupational exposure specified by the appropriate authority,
- the general public (including waiting patients, receptionist etc.) is not exposed to a radiation level exceeding that recommended by the appropriate authority,
- a range of applicators suitable for treating different areas of the body is available (the use of modern applicators which reduce scattered radiation and concentrate the energy to the treatment area is encouraged),
- a visible and/or audible signal is installed, to indicate that the unit is operating, the unit is not the cause of electric interference with other equipment. (This may require the use of a screened cubicle and a mains filter.)
- non metallic chairs and/or beds are available to patients undergoing microwave diathermy treatments.

Treatment

Before administering the treatment the operator shall:

- ensure that the thermal sensitivity of the patient is not impaired by analgesics,
- ensure that the patient has removed all metallic objects (rings, watches, metal rimmed glasses, etc.) from the treatment area.
- ensure that the treatment area is not covered by a wet dressing or adhesive tape,
- remove towelling or clothing from the treatment area,
- ensure that the skin is dry,
- ensure that if the patient is wearing a hearing aid, it is removed,
- ask the patient to immediately report any symptoms experienced during the treatment except 'a mild, comfortable warmth',
- ensure that the testes are not directly irradiated and that care is taken to minimise indirect irradiation,
- ensure that the coaxial cable is correctly connected to both the machine and the applicator,
- not rest the applicator or cable over metal surfaces,
- align the applicator accurately to ensure an appropriate pattern of heating,
- direct the applicator away from the unit's controls,
- use care in handling the applicator (damage may result in an alteration of its directional properties),
- ensure that the chair or other patient support is not metallic.

After activating the unit the operator shall:

- remain outside the field of emission of microwaves and at least 2 metres from the patient,
- not leave the patient alone in the room during the treatment,
- ensure that the patient maintains the correct position and remains cooperative,
- interrupt the treatment if perspiration appears on the patient's skin,
- not allow the patient to touch the unit,
- ensure that no other person is in the vicinity of the unit or of the applicator during the treatment, in accordance with the administrative controls established by the user.