Operating Theatre Burn Injuries

Thesis submitted for fulfillment of Master Degree in General Surgery

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"وما أوتيتم من العلم إلا قليلا"

صدق ا   العظيم

ABSTRACT

The operating theatre must provide a safe, efficient, user-friendly environment. Operating room burns are a significant cause of morbidity and potential liability. Causes include warming of the patient, operative room fires and explosions, electrosurgical units, and less common causes, such as operating room lights, chemicals, lasers, and PTD. Management includes initial evaluation, information gathering, wound care, pain control, and finally follow-up. *Aim of the work:* increase awareness of intraoperative burns during standard procedures and provide recommendations for prevention and procedures to follow after their occurrence. *Patients and methods:* This study included ten patients with various forms of operating theatre burn injuries during the four years period from April 2002 to April 2006. *Conclusion:* Early E&G of operating theatre burn injuries has reduced burn morbidity and mortality more than any other intervention.

Keywords: Operating room, burn injuries, ESU, early, prevention, excision and grafting, liability, Medicolegal, ethical, fires and explosions, chemical.

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LIST OF ABBREVIATIONS

TBSA	TOTAL BODY SURFACE AREA
STSG	SPLIT THICKNESS SKIN GRAFT
E&G	EXCISION AND GRAFTING
FTSG	FULL THICKNESS SKIN GRAFT
PI	POVIDONE IODINE
ESU	ELECTROSURGICAL UNIT

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Introduction and Aim of Work

INTRODUCTION

Iatrogenic burn injuries represent a dramatic event that may affect a normal patient leading to significant sequelae either physically or psychologically. ***(Nahlieli et al.; 2001)***

The operating theatre burns are not that rare in adults in contrast to children. They included all aetiological burn types; chemical, thermal, electrical, and radiological burns. ***(Dorsh et al.; 1999)***

One of the most frequent form of operating theatre burns is the thermal one, especially that caused by improper use of the electrosurgical units (ESU). ***(Vidovato et al.; 2004)***

The extent of burn varies greatly from one aetiology to another; deep burns are the most encountered forms due to the high incidence of diathermy burns. ***(Vilos et al.; 2001)***

The hazards of operating theatre burns include infection that may lead to sepsis, scarring, contracture, and systemic complications that vary according to the extent of the burn injury, site and aetiology of the burn. Social and psychological complications should be respected. ***(Barker et al.; 2001)***

The assessment of operating room burn injuries is mandatory using clinical judgment, vascular flow assessment by laser and Doppler flowmetry. ***(Mertens et al.; 1997)***

The proper treatment of iatrogenic burn injuries should start immediately using different methods; excisions and reconstruction, excision and frequent dressings, or simply frequent dressings for small superficial burns. ***(Herndon et al; 2004)***

AIM OF THE WORK

The aim of this study is to review different aetiologies of operating theatre burns and to compare and classify the different protocols of management in order to increase awareness of intraoperative burns during standard procedures, to discuss their possible causes and warning signs, and to provide recommendations for prevention and procedures to follow after their occurrence.

Review of Literature

OPERATING THEATRES DESIGN AND SAFETY

A large proportion of our lives is spent within the environment of an operating theatre. There are physical, chemical, and infective hazards to the medical personnel, nurses and patients, thus making the operating department the most hazardous part of the hospital. It is essential to gain an understanding of this environment and the risks to both the staff and patients. In the operating theatre, the patient is totally helpless and under complete control of the theatre staff.

The operating theatre must provide a safe, efficient, user-friendly environment that is as free from bacterial contamination as possible. Operating suites should be sited near to each other for efficient flexibility of staff movement, preferably on the first floor, away from the main hospital traffic. They should be on the same level as, and close to, intensive care units and surgical wards. The suite should incorporate the theatre sterile supply unit.

The should be a minimum distance between operating rooms and the accident and emergency (A&E) unit and X-ray facilities, which will both be sited on the ground floor.

Each hospital should have a multidisciplinary user committee to optimize efficiency and safety, compromising surgeons, anaesthetists, operating theatre and anaesthetic nurses, microbiologists, a manager and a finance officer, in line with updated Department of Health recommendations.

Operating theatres now have an incident reporting system in place to audit adverse incidents in theatre. This is not designed to be punitive but educational. Joint audit sessions between anaesthetists and surgeons allow adverse incidents to be discussed in an open and constructive way.

An attempt was made by the Department of Health and Social Security in 1978 in Great Britain to introduce the nucleus concept, providing hospitals with theatre suits appropriate to the average district general hospital requirements. Orthopaedic, cardiac, neurosurgical, laser and other specialist requirements make it necessary to adjust the standard design. ***(Brigden; 1998)***

A. The Antiseptic Environment

Zones

- An outer or general access zone for patient reception area and general office.
- A clean or limited access zone between the reception bay and the theatre suite, and dispersal areas, corridors and staff rest room.

- Restricted access zone, for those properly clothed personnel engaged in operating theatre activities, including the anaesthetic room, utility and scrub up rooms.
- An aseptic or operating zone "the operating theatre".

Keep the number of people to a minimum, as the bacteriological count is related to number of persons and their movement. ***(Douglas; 1992)***

Air flow

Directional air flow (laminar air flow) may be vertical or horizontal. In addition to normal turbulent air flow through theatre, which is necessary to maintain humidity, temperature and air circulation, an increased rate of air change is necessary to reduce the number of contaminated particles over the patient, which is aerobic count of less than 35 microorganism-carrying particles per mm3. Air is pumped into the room through filters and passed out of vents in the walls of the operating room; it does not return into the operating suite. Most theatres have 20-40 or more air changes per hour. ***(Brigden; 1998)***

Operating suit and tent environment

In this system there is a high vertical laminar flow within a tent or designated area marked on the floor, and clean air from above the table is expelled down to floor level in a funnel-shape, thereby reducing contamination. The number of air changes may be increased to 400-600 per hour or more in the vertical laminar flow system of Charnley tent. Orthopaedic surgeons may wear airtight suits and helmets, and work in a high velocity vertical air flow environment, which has limited access to other personnel. By using suitable exhaust suits and such tents, infection in hip replacement may be kept as low as 0.5%. ***(Douglas; 1992)***

Skin preparation

Prefer a non-spirit-based skin preparation such as Betadine to minimize the risk of explosion. If you shave the patient, carry it out as late as possible. Skin drapes have limited benefit in preventing wound infection but help keep the skin towels in place. To prevent ingress of skin bacteria apply an iodine-impregnated adhesive skin sheet. ***(Brigden; 1998)***

Wearing of disposable, non-woven fabrics

Reusable, comfortable cotton operating gowns, sterilized by heat, have the disadvantage that when they are wet, bacteria can pass through onto the operative field. Disposable gowns of less permeable fabrics reduce dispersal of bacteria-laden particles that ay emanate from the operating or nursing staff. Optimally, everybody should wear these gowns, but they are costly. Wearing nylon or wool clothing is absolutely prohibited for fear of generating static electricity that may result in serious operative theatre explosions. ***(Brigden; 1998)***

Temperature

These should be controlled as part of an integral air-conditioning system to maintain a comfortable atmosphere, with a higher temperature for neonates, children, and elderly patients, and if the operation is prolonged. Temperature range is 20-22° C (68-71.6° F), with approximately 20-40 air changes per hour. Reduce heat loss by laying warming blankets on te sorbo-rubber table surface, wrap the patient in aluminum foil and infuse warmed intravenous fluids. Increasing humidity to 50% reduces cooling by evaporation. ***(Johnston et al.; 2004)***

Humidity

In past decades, static discharges were a feared source of ignition in an operating room filled with flammable anaesthetic vapors. Because increased humidity decreases the likelihood of static discharges, a relative humidity of at least 50% was recommended. Routine compliance with this requirement is no longer important in the modern era of non-flammable anaesthetic agents. However, static sparks can still damage sensitive electrical equipment or lead to microshock. ***(Douglas; 1992)***

Noise

Multiple studies have demonstrated that exposure to noise can have a detrimental effect on multiple human cognitive functions. Operating room noise has been measured 70-80 dB(A) with frequent sound peaks exceeding 80 dB, depending on which ventilation system (e.g., laminar flow) and surgical instruments (e.g., power drills and saws) were being used. One study demonstrated a reduction in mental efficiency and short-term memory in anaesthesia residents exposed to operating room noise. ***(Johnston et al.; 2004)***