Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/burns

Case report

Iatrogenic surgical microscope skin burns: A systematic review of the literature and case report

Joseph Lopez [a], Ashwin Soni [b], Daniel Calva [a], Srinivas M. Susarla [a], George I. Jallo [c], Richard Redett [a,*]

[a] Department of Plastic & Reconstructive Surgery, Johns Hopkins Hospital, 1800 Orleans Street, Baltimore, MD, United States

[b] Division of Plastic & Reconstructive Surgery, University of Washington Medical Center, 1959N.E. Pacific Street, Seattle, WA, United States

[c] Department of Neurosurgery, Johns Hopkins Hospital, 1800 Orleans Street, Baltimore, MD, United States

ARTICLE INFO

Article history:
Accepted 7 August 2015

Keywords:
Iatrogenic burn
Microscope burns
Thermal injury
Surgical burns
Microsurgery

ABSTRACT

Cutaneous burns associated with microscope-use are perceived to be uncommon adverse events in microsurgery. Currently, it is unknown what factors are associated with these iatrogenic events. In this report, we describe the case of a 1-year-old patient who suffered a full thickness skin burn from a surgical microscope after a L4-S1 laminectomy. Additionally, we present a systematic review of the literature that assessed the preoperative risk, outcome, and management of iatrogenic microscope skin burns. Lastly, a summary of the Food and Drug Administration's (FDA) Manufacturer and User Facility Device Experience (MAUDE) database of voluntary adverse events was reviewed and analyzed for clinical cases of microscope thermal injuries. The systematic literature review identified only seven articles related to microsurgery-related cutaneous burns. From these seven studies, 15 clinical cases of iatrogenic skin burns were extracted for analysis. The systematic review of the FDA MAUDE database revealed only 60 cases of cutaneous burns associated with surgical microscopes since 2004. Few cases of microscope burns have been described in the literature; this report is, to our knowledge, one of the first comprehensive reports of this iatrogenic event in the literature.

1. Introduction

Over the past 30 years, microsurgery has evolved significantly. Advances in surgical techniques have paralleled advances in technology, optimizing outcomes and efficiency in general microsurgical practice and enhancing the microsurgeon's ability to tackle increasingly complex cases. Among the technological advances has been the dramatic improvement in optics, magnification, and illumination of the standard operating microscope [1].

* Corresponding author at: Department of Plastic & Reconstructive Surgery, Johns Hopkins Hospital, 1800 Orleans St, Bloomberg 7314b, Baltimore, MD 21231, United States.
E-mail address: rredett@jhmi.edu (R. Redett).

http://dx.doi.org/10.1016/j.burns.2015.08.014
0305-4179/

Though improved technology has allowed for expansion of microsurgical techniques to previously untreatable problems, there are potentially adverse consequences associated with the use of such technology. Operating at increased levels of magnification requires the utilization of powerful heat-generating light sources. As the distance from the light source to the tissue decreases, the intensity of the radiant heat on the tissue increases. Recent case reports in the fields of hand surgery [2,3] and otolaryngology [4,5] have reported a few cases of microscope burns. However, these iatrogenic events are believed to be uncommon and few studies have assessed what factors play a role in causing them. In this article, we present a case report of a microscope burn in a young child after an L4/S1 laminectomy. Secondly, we also present a systematic review which aims to first, examine the clinical impact of these iatrogenic events, and second to generate several hypotheses on factors that might play a role in increasing the risk of microscope burns in microsurgery. Finally, based on the available evidence, we present "best practice" recommendations to assist the microsurgeon in preventing these deleterious events from occurring in the future.

2. Materials and methods

2.1. Systematic literature review

Using guidelines established by The PRIMA Group for systematic reviews and meta-analyses [6], an initial literature review was conducted on May 02, 2015 with the following broad search terms into the MEDLINE database: "microscope" OR "microsurgery" AND "burn." A total of 918 citations were identified. The abstract of all these citations were examined using strict inclusion/exclusion criteria for applicability. When there was doubt regarding the relevance of the study, the full-text article was retrieved. Studies which met the following inclusion criteria were included: (1) publication in a peer reviewed journal; (2) written in English; (3) published between the dates of September 01, 1990 and May 01, 2015; (5) basic science and clinical case series or reports that have assessed either the preoperative risk, management, or outcome of microscope thermal/burn skin injuries only; abstracts and conference reports were not included due to incomplete information. Reviews, meta-analysis, editorials, or correspondences were also excluded. References were also screened for further relevant articles; the same inclusion and exclusion selection criteria were applied. One article was retrieved from the screening of references to yield a total of seven articles that satisfied the aforementioned selection criteria, and they were all included in the final systematic review (Fig. 1).

2.2. Data extraction

The following data was extracted from each study: author, journal, year, study design, and conclusion. If the studies were clinical studies, the following was extracted: number of microsurgical burn cases, type of microscope used, microscope specifications using during the procedure, type of surgical procedure, details regarding location and severity of burn, and details regarding post-operative management. If the studies were basic science articles, a summary of the findings and experimental methods was recorded.

2.3. Review of the FDA database:

A systematic search of the FDA Manufacturer and User Facility Device Experience (MAUDE) database was performed. All adverse events reported over from 2004 to 2013 associated with microscope burns were reviewed. The MAUDE database search engine (http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfMAUDE/Search.cfm) was accessed on September 14, 2014, and the following search terms were queried together: "pentero," "movena," "vario," "opmi," "sensera," "pro magis," "pico," "cs-nc," "pentero" and "microscope burn." Search results were reviewed, and all episodes of soft tissue burns associated with the above surgical microscopes were recorded. Incident report case numbers, type of procedure, location, size, severity of burn, and other notable operative findings were summarized.

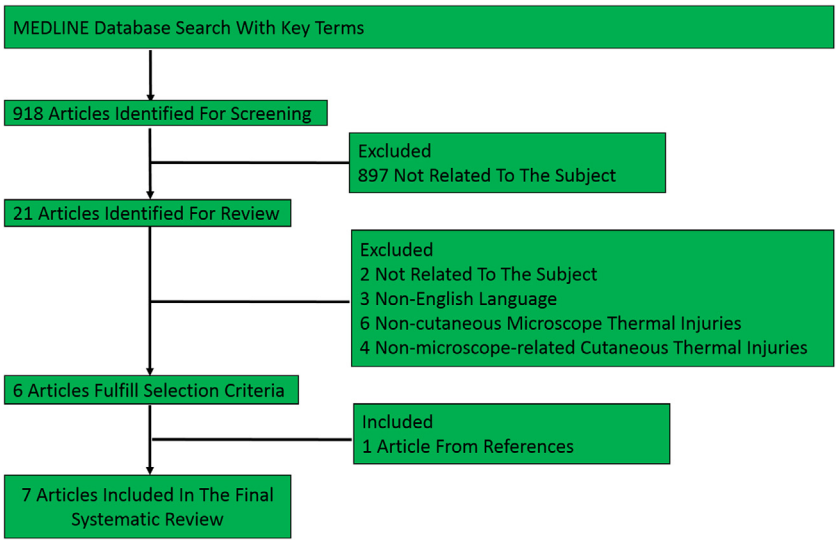

Fig. 1 – Attrition diagram of search strategy.