Intact Cells on the Laser Handpiece – a Non-contact Contamination

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Material adhering to the handpiece of the laser instrument was collected and analysed. Examination of semithin sections of the material by light microscopy revealed small clusters of clearly defined whole cells among the abundant debris. Electron microscopy of the cells revealed the presence of cell membranes, cytoplasm and organelles such as mitochondria. This could mean that infected cells or virus particles could adhere to the laser instrument or the hands of the operator as well. The medical implication of this finding requires serious consideration in regard to risks of infection from this procedure, to both patient and clinical personnel. ***Key words: CO_2 laser; Infection potential.***

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The carbon dioxide laser has gained wide acceptance in dermatologic surgery and generated a great deal of scientific interest and publicity. Its use has been advocated in the treatment of skin disorders such as verrucae, adnexal tumors, vascular lesions and tatoos (1–3).

Recently, physicians and patients have become increasingly aware of the potential risk of viral contamination entailed in surgical procedures including laser therapy (4). Since there is no contact between equipment and the skin in laser surgery, concern is related primarily to the danger of air-borne contamination (3–12). The risk of contamination from infected equipment has not been sufficiently considered.

In the course of routine work with the laser we noticed that debris and carbonized particles remain adhering to the handpiece of the instrument at the end of the workday. The purpose of the present study was to inspect this adherent matter regarding the presence of cells or perhaps intact viruses, bacteria, or spores.

MATERIALS AND METHODS

No specific study conditions regarding laser equipment or patients were established. The study was conducted under the conditions of our routine clinical work. A CO_2 laser was used either in a focused or defocused mode. Power settings were between 5 and 15 W, with continuous or pulsed emission, with a pulse duration of 0.1 to 0.2 s. Special care was taken to avoid any contact between the skin and the instrument, eliminating any possibility of contamination through direct contact.

Patients were not selected specifically for this study, but came from our general laser therapy population. Five to eight patients were treated per day, most of them suffering from viral warts of varying size and location.

All material which had adhered to the instrument's handpiece during a typical day of laser treatments was collected for microscopic study. The material was scraped off with a sterile surgical blade directly into the primary fixative, 2.5% glutaraldehyde in phosphate buffer, pH 7.4. Following postfixation in 1% osmium tetroxide and dehydration in a graded ethanol series and propylene oxide, samples were embedded in epoxy resin. Semithin (1 μm) sections were stained with toluidine blue and examined by light microscopy. For electron microscopy, ultrathin sections were stained with uranyl acetate and lead citrate.

RESULTS

Careful examination of the collected material by light microscopy showed occasional small clusters of clearly defined whole cells among the abundant debris (Fig. 1). The cells varied from apparently intact

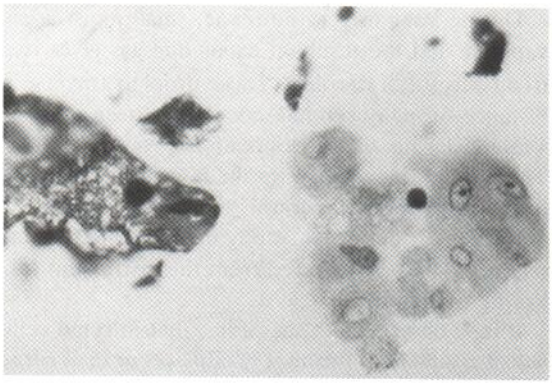

Fig. 1. Light microscopy of semithin section; small cluster of clearly defined whole cells. ×400.

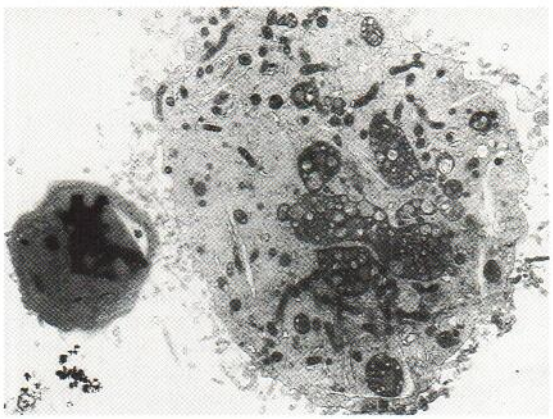

Fig. 2. Electron microscopy of the better preserved cells. ×11000.

to degenerated forms. Electron microscopy of the better preserved cells revealed the presence of cell membranes, nuclei, cytoplasm and organelles such as mitochondria (Fig. 2). Viral particles were not observed.

DISCUSSION

Renewed awareness and concern among physicians and patients regarding the possible transmission of infections during laser therapy has paralleled the increasing popularity and acceptance of this procedure. Concern for potential infection was heightened by reports demonstrating the presence of viruses, viable cells and spores in the smoke plume and aerosolized debris generated during laser surgery (3–12). In contrast to the considerable research effort that has been invested in the study of smoke and air pollution resulting from use of the laser, little has been done to examine contamination of the instrument itself.

During laser surgery on tissue, small moist areas vaporize and the resultant expanding gas gives rise to an aerosol of droplets. These droplets traverse a distance of many centimeters, as has been demonstrated during electrodesiccation procedures (9). The droplets may adhere to the laser instrument, or to the hands of the operator.

Results of the present study demonstrate that intact cells can be recovered from the instrument following routine use.

It may be expected, therefore, that infected cells will also adhere to the laser handpiece, or the operator's hands.

The medical implications of recovering cells from the instrument should be considered seriously with regard to the risk to both patients and clinical personnel.

We believe that dermatologists should be alerted to this possible route of infection, so they can monitor and avoid it until new techniques which prevent contamination of the instrument are developed.

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