

# The Use of a Contained Breathing Apparatus to Isolate the Operator and Assistant for Aerosolizing Procedures Including Dermabrasion and Laser Surgery

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Dermabrasion and carbon dioxide laser surgery aerosolize patient blood and tissue particles. The operating physician and assistants may therefore have intimate inhalational and mucous membrane contact with patients' body fluids. Herein is described the use of an isolated ventilation system to protect physicians and assistants from blood and tissue products aerosolized during the course of dermabrasion and carbon dioxide laser surgery.

Weber PJ, Wulc AE: The use of a contained breathing apparatus to isolate the operator and assistant for aerosolizing procedures including dermabrasion and laser surgery. *Ann Plast Surg* 1992;29:182-184

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The authors have absolutely no financial or other connection with Gast Corporation, manufacturer of the REGENAIR, or with any other company that makes any product remotely related to the scope of this paper.

Received Sep 6, 1991. Accepted for publication Sep 18, 1991.

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Traditionally performed, dermabrasion and carbon dioxide laser surgery unfortunately provide the operating physician and assistants with intimate inhalational and mucous membrane contact with patients' body fluids. Presently, there is much concern regarding human immunodeficiency virus (HIV) infection and body fluids safety. This concern is enhanced by an imperfect ability to detect HIV infection in some individuals. Herein is described the use of an isolated ventilation system to protect physicians and assistants from patients' blood and tissue products aerosolized during the course of dermabrasion and laser surgery.

## Material and Methods

The electrically operated air compressor (trade-marked as the REGENAIR, manufactured by Gast Corporation of Benton Harbor, MI) provides up to

3 kg/cm<sup>2</sup> of air pressure. The REGENAIR has a maximal air-flow rate of 0.25 m<sup>3</sup>/min. Because this breathing apparatus is especially made for deep underwater use, there is no chance of operating-room air leakage onto the face while the compressor is functioning. Two masks and 15 m of hose are included with the air-compression unit (Fig 1). The masks cover the entire face (including spectacles) with an airtight seal (Fig 2). A constant bath of fresh air is blown over the face and expelled through a one-way valve. The air provided to the surgeon and assistants is "fresh" if the compressor (air source) is placed in a room down a hall, the hoses pass 15 m down the hall, and the operating room door is closed (except for a 4 × 2-cm hole cut in the outer bottom corner for hose passage).

Ten full-face dermabrasions and nine carbon dioxide laser ablative procedures have been performed using this apparatus. The mask is surprisingly easy to apply and remove, and does not interfere with the dermabrasion or laser procedures in the least, with the exception of the need to talk loudly over the rush of air. Important points include the following: Schedule individual patients at the end of the day. When work on a patient is completed, leave the air flowing; do not remove the masks. If available, open the windows to the operating room, escort the patient into another room for dressings, close the operating room door, and then, once safely in a separate room, remove the masks.

## Discussion

Dermabrasion and carbon dioxide laser surgery are two surgical techniques that may result in aerosolized patient tissue and debris. Numerous adjuncts have been described to aid in the per-



Fig 1. The air compression unit, two masks, and two segments of 15 m (for each mask) of hose.

formance and to enhance the safety of dermabrasion [1, 2] and laser surgery. However, to our knowledge, no adjuncts have been described that eliminate the possibility of respiratory and mucous membrane exposure to patients' blood and tissue microdroplets. Herein is described the first use of an isolated ventilation system for the performance of dermabrasion and laser surgery.

Recently, studies have shown that portions of viruses or whole viruses may become airborne during laser surgery [3, 4]. Sawchuck and co-workers [4] were the first to detect viable bovine papilloma virus obtained from the air surrounding carbon dioxide laser ablation sites. A great concern in dermabrasion, a procedure in which microdroplets of blood and tissue are cast into the surrounding air, is the possible dissemination of HIV. The detection of antibodies to HIV is not as sensitive as the detection of HIV antigen, and antigen detection is not as sensitive as HIV culture [5]. Unfortunately, the most practical preoperative test may be the HIV-EI (enzyme immunoassay). Some surgeons require an HIV-EI before dermabrasion and carbon dioxide laser ablative procedures. However, there is a "window period," in which an HIV carrier may not be detected by the enzyme immunoassay test. This problem may be especially concerning because of the relatively long duration of the enzyme immu-



Fig 2. The mask in place with an occlusive seal. This assistant could also wear spectacles unhindered if desired.

noassay window period, which may range between several weeks and 6 months [6, 7]. This window period may explain cases of transfusion-associated HIV transmission that have occurred since the institution of HIV type 1 antibody testing in early 1985 [8]. Because approximately 1 million of 240 million persons residing in the United States are HIV positive, a surgeon who performs 100 dermabrasions or carbon dioxide laser procedures over 5 years may be at some risk for inhaling or encountering HIV. Therefore, HIV, traditionally a physical contact and a blood-borne disorder, may through dermabrasion become an airborne disorder.

Traditional dermabrasion and carbon dioxide laser ablative surgical wear includes glasses, surgical mask, Plexiglas welder's hood, surgical hair cap, full surgical gown, and gloves. Although the welder's hood stops the direct flight of particles, the operating room air may be laden with particulate patient tissue. Millions of these airborne particles surround and bathe the operating phy-

sician and assistants. These airborne particles can flow past or around the imperfect seals of the aforementioned traditional "barriers." Once past these traditional barriers, including the surgical masks, the particles may encounter the mucous membranes or respiratory systems. Therefore, danger exists. Some previously published experiments skirt this problem. For example, Sawchuck and co-workers [4] imply that surgical masks offer protection against airborne papilloma virus. A major qualification should be that the mask be perfectly sealed to the face at its periphery. The conditions of the referenced experiment regarding the mask filter reveal that a truly occlusive peripheral seal had been made by using a tight rubber band placed over a special collecting device. Unfortunately, virtually all surgical masks do not provide a perfect seal under real operating room conditions.

The entire REGENAIR unit retails for approximately \$1000. Herein is described the use of an isolated ventilation system to protect the physicians and assistants from blood and tissue prod-

ucts aerosolized during the course of dermabrasion and carbon dioxide laser surgery.

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