Decreased Splatter in Dermabrasion

Artemus J. Cox III, MD; Ted A. Cook, MD; Tom D. Wang, MD

Objective: To compare a new dermabrasion instrument equipped with a metal shield and hydration-suction apparatus with the standard instrument, with specific attention to the exposure of operating room personnel to potentially hazardous particles.

Design: A surgical trial with each of the instruments was performed with a skin model. The splatter caused by the 2 instruments was evaluated and compared statistically and graphically.

Subjects: Female hairless guinea pigs (450 g) were used as a skin model.

Interventions: Ten guinea pigs were treated with the standard dermabrading instrument, and 10 were treated with a shielded suction-irrigating dermabrader. The splatter was analyzed by counting the number of particles landing on strategically placed glass slides. Evaluations of histologic cross-sections of the dermabraded skin were compared in a blinded fashion.

Results: Statistical and graphic analysis showed the number of potentially hazardous particles generated by the suction dermabrader to be significantly less than that generated by the standard dermabrader. Histologic sections showed no difference between the 2 subsets.

Conclusion: The new shielded suction-irrigating dermabrader provides comparable surgical results while significantly decreasing exposure to potentially hazardous splatter particles.

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Dermabrasion is a common reconstructive and cosmetic surgical procedure that involves removal of the superficial layers of skin. It remains an important tool for the facial plastic surgeon despite the availability of comparable procedures, such as chemical peels and laser resurfacing. Dermabrasion is most useful in correcting uneven skin, as in acne scarring.1 However, the standard dermabrader unit (Figure 1) generates considerable airborne skin and blood debris, exposing operating room personnel to potentially hazardous material.

Barrier safety measures are generally quite effective in protecting operating room personnel from exposure, but there are always gaps in the barriers. In addition, aerosolized particles may remain suspended for some time, even after the procedure when the barrier protective measures have been removed. The idea of a shielded dermabrader is not new,2 but some authors note drawbacks in previous designs.3 More recently, a shielded dermabrasion instrument has been developed that attaches to a microdebrider handpiece (Figure 2). The rotating burr is slotted, providing suction access. The head is also attached to an irrigating port that provides a medium with which to suction the splatter particles and creates a gliding skin surface on which to dermabrade. The unit has been developed by Xomed Surgical Instruments Inc (Jacksonville, Fla) as an attachment to the Straight-Shot powered handpiece, and it is now commercially available.

This study analyzes and compares the splatter generated by these 2 dermabrasion instruments. These data were then used to evaluate the safety of the suction-irrigating dermabrader and determine the level of exposure to hazardous materials.

RESULTS

The hairless guinea pig was a good skin model, but the dorsum of the guinea pigs bleeds significantly less than human facial skin. As the model remained the same, our experimental comparison is valid, but
the overall results of splatter particles per 100 cm² appeared to be less than that experienced with human facial skin.

With the standard dermabrader, a preponderance of particles was splattered to the surgeon’s right. The greatest number of particles was found at 12 in to the surgeon’s right, with an average of 586 particles per 100 cm² and a range of 300 to 900 particles per 100 cm². The fewest particles were found at 24 in to the surgeon’s left, with a mean of 7 particles per 100 cm² and a range of 0 to 20 particles per 100 cm² (Figure 3).

Particle splatter with the suction-irrigating dermabrader was considerably less and more evenly distributed at each distance. Average particle splatter ranged from 1.5 to 2.5 particles per 100 cm² (Figure 3).

Dermabrasion was performed to the reticular dermis level as noted by the punctate bleeding. After each procedure, the guinea pigs were killed with an intracardiac injection of 1.0 mL of a combination of pentobarbital sodium and phenytoin sodium (Beuthanastia-D; Schering-Plough Animal Health Corp, Kenilworth, NJ). The slides were collected, and new slides were placed.

The slides were then analyzed by counting the number of splatter particles per slide over a grid system. A splatter particle was defined as any distinct contiguous grouping of skin and blood. Therefore, the particles varied considerably in size, but each was easily identifiable without magnification. Mean, range, and SD were determined, and the results were plotted on a graph and tabulated.

After the guinea pigs died, a biopsy was performed on each dermabraded area using a 4-mm punch. Five random samples from the standard dermabrader group and 5 from the suction-irrigating dermabrader group were chosen for histologic analysis. A staff dermatologist was blinded as to the groupings and asked to assess the cross-section samples.

Particle splatter with the suction-irrigating dermabrader was considerably less and more evenly distributed at each distance. Average particle splatter ranged from 1.5 to 2.5 particles per 100 cm² (Figure 3).

The suction-irrigating dermabrader’s handpiece is larger and heavier than that of the standard dermabrader, making it somewhat less maneuverable in tight spots. However, this difference was not felt to jeopardize function in any way, and the increased torque of the suction-irrigating dermabrader yielded a more consistent effect at the skin surface and quicker completion of the procedure.

Blinded histologic comparison of the postdermabradion punch biopsy specimens revealed no difference between the groups.

The number of people who are infected with the human immunodeficiency virus (HIV), the hepatitis B virus, and the hepatitis C virus continues to grow, as does the concern regarding transmission of infectious diseases in the hospital setting. Infected persons are often unaware...

Figure 1. The standard dermabrader instrument.

Figure 2. The shielded suction-irrigation dermabrader instrument (top) attached to a microdebrider handpiece (bottom).
of their status, and when they present for surgery, they unknowingly place operating room personnel at risk. A recent article by Garden et al \(^1\) that reported intact viral particles in the laser plume has raised even more concern about the transmission of infectious diseases. If one accepts the hypothesis that blood products and surgical debris can transmit infectious diseases, then one must accept that the generation of such debris is potentially hazardous. Most operating room personnel are immunized for hepatitis B, but no such protection exists for HIV or hepatitis C. Therefore, enlisting methods to decrease exposure is of paramount importance.

In dermabrasion, blood and tissue debris is splattered by the turning burr. All who have performed this procedure are familiar with the coating of blood spray on gloves, gowns, and protective face shields. Currently, barrier methods of protection have been very effective, but there can be gaps in the barrier and breakdowns in technique of barrier use that may decrease protection. Evidence exists that dermabrasion can generate aerosolized particles, which then may be transferred large distances by air currents. \(^2\) These aerosolized particles may still exist in operating room air currents after barrier protection garments have been removed.

Can these particles transmit infectious viruses? Concern for transmission of infectious disease in dermabrasion has been shared by many. \(^3,4\) The ability of a virus to cause infection in dermabrasion, however, relies on the infectious potential of the virus itself and the exposure load. Viral particles of HIV and hepatitis B have both been shown to retain their infectious potential for several days even after drying. \(^5,6\) Hepatitis B virus has been shown to be an extremely virulent infectious agent, requiring only tiny amounts of exposure to cause infection. \(^7\) It has much greater infectious potential than HIV, and possible transmission through airborne particles and conjunctival exposure has been documented. \(^1,10\)

In the dermabrasion setting, exposure load is determined by both the amount of contact surface area on operating room personnel that is open to exposure and the amount of debris that is generated by the dermabrader. As discussed, this can include aerosolized routes and contact with the conjunctiva. Overall, current safety precautions and protective measures have been effective in protecting health care workers from viral transmission when they are exposed to infected persons. \(^11\) However, in light of human error and limits of the protective equipment, the degree of risk is never zero.

This study showed conclusively that the suction-irrigating dermabrader generates fewer splatter particles than the standard dermabrader. The combined protection of a metal shield and suction almost eliminates splatter while still providing a technically adequate result. We have found the shield to be unobtrusive, and it does not limit viewing of the surgical area. The device works smoothly on the hydrated surface and is maneuverable in tight spots, although less so than the standard dermabrader. The greater torque of the suction-irrigating dermabrader allows for more consistency at the skin surface and enables the physician to complete the procedure in less time.

Our study did not address the number of aerosolized particles generated by the 2 dermabraders. This is still a potential route of infection. But, as the visible particle load was much less with the suction-irrigating dermabrader, we hypothesize that the aerosolized load will be less as well.

**CONCLUSION**

Concern regarding transmission of infectious diseases with dermabrasion is valid. As we are unable to change the infectious potential of viruses, the best method to decrease risk is to decrease exposure. The suction-irrigating dermabrader lowers the potential infectious load to which operating room personnel are exposed. In addition, it is a technically adequate and maneuverable device. The results of our study indicate that the suction-irrigating dermabrader will offer a safer method of dermabrasion for the aesthetic and reconstructive surgeon.

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Corresponding author: Artemus J. Cox III, MD, Division of Otolaryngology—Head and Neck Surgery, University of Alabama School of Medicine, HSA2, 619 19th St S, Birmingham, AL 35249-6889 (e-mail: artemus.cox@ccc.uab.edu).
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Wayne F. Larrabee, Jr, MD
Editor