and the scans have not normalized, then the pressure may be increased slightly to 1.75 atm abs. This cycle of 40 treatments (raising the pressure if necessary) and testing should be continued until no further improvements are obtained on scans and performance. Many patients will require up to 200 HBO exposures.

The authors’ fear of oxygen toxicity is unwarranted since the oxygen pressure-duration relationships used clinically are below the threshold for central nervous system toxicity even in the injured brain. Also, oxygen at these pressures may be acting as a scavenger of free radicals. Oxygen is, perhaps, the safest drug available when established guidelines (time and pressure) are followed. The nationwide incidence of convulsions is about one in every 5000 exposures. Convulsions are controlled by changing the gas from oxygen to air and by administering supplemental vitamins E and C to compliant patients. In managing dozens of brain-injured patients, we have never seen exacerbation of the pathological processes resulting from HBO treatment.

Based on our experience, we believe that the above intensive approach, when instituted in treating acute or long-standing brain injury, will markedly improve the number of favorable outcomes.

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References


RESPONSE: We appreciate the comments of Drs. Neubauer and Gottlieb regarding our clinical trial using hyperbaric oxygen (HBO) for treating acute severely brain-injured patients. In conducting a prospective clinical trial, one must carefully define the patient population to be treated as well as the treatment protocol to be administered. In our population of patients, in whom there is an expected mortality rate of 30% to 40%, it would be inappropriate to remove retrospectively the patients who died or those who were particularly severely injured in an attempt to make the results look improved. We agree that this study probably did not use the optimum dosing schedule for HBO treatment in severe head injury. We would disagree that more oxygen treatment is necessarily better for this group of patients. A careful review of the 99 patients treated by Holbach, et al., reveals that these patients received one to seven treatments of HBO.

At present, we are using a rat model of head injury to establish the optimum dosing schedule of HBO treatments. Our preliminary findings indicate that pre-oxidation (measured biochemically) is consistently higher in injured brains treated by HBO. We believe that oxygen toxicity in the acutely injured brain is a significant concern.

We have no experience in treating the chronically injured brain with HBO. The use of single-photon emission computerized tomography brain imaging with a tracer and HBO to define areas of reversible injury is intriguing. However, we would point out that brain-injured patients tend to improve over time, and it is essential to have controls to establish the efficacy of any treatment modality used. Since HBO therapy is labor-intensive and expensive, the approach discussed by Drs. Neubauer and Gottlieb should be more thoroughly investigated before it is accepted as standard treatment.

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Reference


Suction Control of Ultrasonic Aspirators

TO THE EDITOR: We have read with interest the recent technical note by Egemen (Egemen N: Suction control attachment for ultrasonic aspirators. Technical note. J Neurosurg 77:316–317, August, 1992). In this paper, Dr. Egemen lays claim to invention of a long slit “keyhole” attachment for an ultrasonic aspirator as a means of controlling suction pressure. We wish to point out that this is not a new idea, nor is it unique.

The very first pressure-adjustable suction tip was designed by Dr. Robert Spetzler for use in microvascular procedures. His design involved a simple symmetrical wide slot which, when uncovered, reduced suction to zero. However, it failed to provide a satisfactory gradation of suction power by variable occlusion of the slot. Inspired by this idea, Fukushima designed a keyhole suction tip, which has been available commercially since 1981.* Furthermore, we have incorpo-

* Suction tips manufactured by Fujita Instrument Corp., Ltd., Tokyo, Japan.
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Fig. 1. The Olympus Fukushima, Model UA-20, keyhole ultrasonic aspirator with suction control system, first made in 1989.

rated its characteristic teardrop shaped suction control system into a keyhole ultrasonic aspirator (Fig. 1). This ultrasonic aspirator has been available in Japan since 1989, and is currently awaiting approval from the Food and Drug Administration for use in the United States.

The application of pressure adjustment to the suction on ultrasonic aspirators was an idea that we did not consider publishing in the neurosurgical literature, and we were surprised to see it published in this journal, especially since this concept is already a reality and has been manufactured for the last 3 years. Additionally, Egemen's design, with its straight slot, was previously tested 10 years ago and found to have the disadvantage of poor control over the attenuation of suction power. The teardrop shape has been found to be superior in its ability to provide precise, gradual attenuation of suction power.

We wish Dr. Egemen to be aware of the existence of the Olympus ultrasonic aspirator and its initial year of production. Although he included a disclosure statement at the close of his report, his claim is obviously moot. We further express the hope that in the future the editors will be vigilant with respect to the true originality of new devices presented as technical notes in this publication.

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Response: I would like to thank Drs. Day and Fukushima for their letter, which gives me a chance to re-emphasize the importance of suction control in ultrasonic aspirators. The idea of suction control is not new. However, it was not possible from a review of the literature, to find the application of suction control to ultrasonic aspirator described. Drs. Day and Fukushima have mentioned a suction-controlled ultrasonic aspirator that has been available in Japan only since 1989 and has not been described in the neurosurgical literature. My literature survey revealed no documentation of this important contribution, which should have been published before.

It is my personal opinion and experience that, without suction control, ultrasonic aspirators should be considered dangerous. This opinion is shared by other neurosurgeons. Indeed, some of our colleagues refuse to operate with an ultrasonic aspirator, due to its poor suction control. Thus, the statement, "The application of pressure adjustment to the suction on ultrasonic aspirators was an idea that we did not consider publishing in the neurosurgical literature," is surprising. It is the responsibility of our colleagues to publish every new idea for the sake of neurosurgery and of our patients. I have been using a modified ultrasonic aspirator since the end of 1988 and, after having accumulated enough experience, I thought it appropriate to share my idea with all neurosurgeons for the sake of technical improvement.

I do not share the opinion of Drs. Day and Fukushima regarding the keyhole slot. According to my personal experience, the keyhole slot provides very good control over the attenuation of suction power. I do not understand why a teardrop slot should be superior to my design. The other technical difference between the systems is that the Egemen keyhole suction control is designed as part of a disposable suction tubing system. This characteristic is very important because it will not need to be cleaned after every operation. From the figure that Drs. Day and Fukushima have presented, it appears that there is potential dead space which should be meticulously cleaned.

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J. Neurosurg. / Volume 78 / April, 1993