TABLE 1. Patients Requiring Blood Patch

Blood Patch	Group 1 Perpendicular	Group 2 Parallel
YES	10	4
NO	10	17

Others may have different conclusions. The authors should be congratulated for developing such a large clinical series and adding to our knowledge of risk factors for dural puncture.

JOHN J. DOONER, M.D.
Director of Cardiovascular Anesthesia Services
St. Vincent Medical Center
Toledo, Ohio 43615

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In Reply:—Dr. Dooner questions the statistical analysis of our data concerning the frequency of blood patch following dural puncture with a large-gauge needle with the bevel oriented either parallel or perpendicular to the longitudinal dural fibers. In his analysis, he tests the two-sided hypothesis $P_1 \neq P_2$ and finds insufficient evidence to reject the null hypothesis. However, as the incidence of headache was significantly less with parallel needle bevel insertion, we felt the need only to determine if the headache incidence was also less, and chose to test the one-sided hypothesis $P_1 < P_2$.[1,2] With this approach, we obtain $P = 0.0385$ with Fisher's exact test,[1] and $P = 0.039$ using a corrected one-tailed chi-square test.[3]

The clinical importance of our findings may be more pertinently determined through further studies and clinical experience.

MARK C. NORRIS, M.D.
Associate Professor of Anesthesiology
Department of Anesthesiology
Thomas Jefferson University
Philadelphia, Pennsylvania 19107

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Routine Use of Transesophageal Echocardiography is Expensive and Time Consuming

To the Editor:—Martin and Bashein[1] once again demonstrate the excellent potential of Transesophageal Echocardiography (TEE) for intraoperative cardiac assessment. They are to be commended particularly for their candid appraisal that detailed analysis is "very time consuming" and "suitable only for research studies."

I believe that this labor intensiveness has proven to be the single most important impediment to adoption of TEE as a clinical tool in many locations. The private practice anesthesiologist views TEE not only as a capital expense, but as a continuing salary expense for the person who has to watch the TEE picture, since it is commonly felt that watching the TEE occupies too much time to allow the anesthesiologist to monitor the patient. This creates a dilemma: TEE appears desirable, but it is too expensive. I propose that there is a possible solution.

The computer used in Martin and Bashein's study, as in all other (to my knowledge) TEE studies, is a serial computer. That is, it performs one arithmetic operation at a time. This mimics the way that the human mind performs arithmetic. Unfortunately, even with the considerable speed of modern computers, the sheer mass of data involved in processing a TEE image makes it impossible to analyze a TEE image in real time.

Not all computers operate in the serial mode. Parallel computers take multiple computing elements (Central Processing Units, or CPU's) and operate them all simultaneously. While each CPU operates serially, the parallel organization of the CPU's allows a multiplication of the efficiency of the computer in performing such tasks as image analysis. This is quite similar to the way the human brain analyzes images. With proper programming, the enhanced capability can be orders of magnitude greater than the number of CPU's. By using parallel processing, it should be relatively simple to perform cardiac output, ejection fraction, and segmental wall motion analysis in real time. With electronically steered ultrasound, it should be possible to do it all in three dimensions in real time! Three dimensional real-time graphic displays could give information not yet imagined.

THEODORE A. NOEL II, M.D.
Staff Anesthesiologist
Florida Hospital Medical Center
601 East Rollins Ave
Orlando, Florida 32803

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In Reply:—Dr. Noel raises an important issue regarding our paper[1] and the future growth of TEE in anesthesiology.

We agree that labor intensiveness is the single greatest impediment to wider adoption of TEE as a clinical tool. Quantitative measurements on two-dimensional images take considerable time and may require additional personnel in order to derive results in a timely fashion. The bottleneck is the time required to outline the endocardial or epicardial borders manually using a joystick or other pointing device.

We briefly discuss progress in automatic border detection of transcutaneous images in our paper. However, a recent report by Bosch *et al.** is worth mentioning as they have developed a method that appears to perform reliably and accurately on transesophageal short axis images. Further, it executes within 30 s on a microcomputer that uses the Intel 80286 processor. How well it performs on a large data set is yet to be learned.

Dr. Noel correctly points out that image processing problems such as this lend themselves to use of parallel computers. These types of computing systems do have the potential for performing border detection on-line. As an example of how technology may progress in this area, we recall struggling in the early 1970s with the computers then available to perform simple ECG analyses. Today, commercial systems are being routinely used in Coronary Care Units to detect and analyze complex dysrhythmias in several patients simultaneously.

Our work in three-dimensional reconstruction has been undertaken in the belief that the border detection problem will be solved and come to fruition in the next several years. We therefore are investigating applications of three-dimensional cardiac reconstruction in animals and man, using tedious off-line processing while we look forward to the development of the necessary computer software and hardware to automate the process.

ROY W. MARTIN, PH.D.
Research Professor of Anesthesiology and Bioengineering

G. BASHEIN, M.D., PH.D.
Associate Professor of Anesthesiology
Adjunct Associate Professor of Bioengineering

Department of Anesthesiology, RN–10
University of Washington School of Medicine
Seattle, Washington 98195

* Bosch JG, Reiber JHC, van Burken G, Gerbrands JJ, Gussenhoven WJ, Bom N, Roelandt JRTC: Automated endocardial contour detection in short-axis 2-D echocardiograms; methodology and assessment of variability. Computers in Cardiology, IEEE 88CH2733–0, 1989 pp 137–140

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Acetylcholine Receptor Density and Acetylcholinesterase Enzyme Activity in Skeletal Muscle of Rats Following Thermal Injury

To the Editor:—The paper by Marathe *et al.*[1] tests the hypothesis that an increase in acetylcholine receptor (AChR) number explains the resistance to nondepolarizing muscle relaxants (NDMR) following thermal injury. The authors, however, find no increases in AChR number following thermal injury. Although these findings appear to contradict our previous reports[2,3] on AChR changes following burns, certain differences in the experimental preparation used need to be emphasized in order to avoid confusion among the readers.

Our model consisted of splenectomized rat with a total body surface area (TBSA) burn approximating 45–55%.[2] In this model, at 10, 14, and 21 days after burn, the burned animals lost weight compared to preburn weight, which was associated with significant increase in AChR number in the diaphragm. By 28 days, the size of the burn wound had decreased to approximately 19% TBSA, the body weight increased compared to preburn weight, and the AChR number had returned to control levels. In a more recent study,[3] using the same model of 45–55% TBSA burn, the gastrocnemius response to d-tubocurarine was evaluated and correlated to AChR changes. There was a 65–225% increase in AChR in the gastrocnemius at 10, 14, and 21 days after burn and the AChR number correlated significantly with increased effective dose for d-tubocurarine ($r^2 = 0.65$, $r = 0.81$). Another study in unsplenectomized mice examined the sensitivity of the gastrocnemius muscle to d-tubocurarine, at 21 days after a 20%, 30%, and 50% TBSA burn.[4] The effective dose of d-tubocurarine was unchanged in the