

vation reinforcing the slow kinetics of the windkessel, with the cardiac parasympathetic system unable to rapidly buffer these surges. Clonidine patients (fig. 3D in our article²) shows little lability in pressure³ linked to a reduced number or amplitude of bursts of sympathetic activity⁹ combined with a large sinus arrhythmia at resting pressures.

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(Accepted for publication November 23, 1999.)

Anesthesiology
 2000; 92:902-3
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Hemodilution: Fewer Keystrokes, Greater Accuracy

To the Editor:—I found the article by Monk *et al.*¹ a valuable contribution to the transfusion literature, especially because they included timely cost-effectiveness data. I am pleased to see the increasing interest in perioperative acute normovolemic hemodilution, evidenced by recent articles in *ANESTHESIOLOGY*¹ and elsewhere.^{2,3} Perioperative acute normovolemic hemodilution can spare many surgical patients exposure to allogeneic blood.⁴ Articles discussing hemodilution frequently refer to Gross's formula for estimating allowable blood loss⁵:

$$\text{Allowable blood loss} = (\text{Estimated blood volume}) \times [(\text{Hct}_{\text{start}} - \text{Hct}_{\text{final}}) / \text{Hct}_{\text{average}}]$$

This formula was an ingenious approximation to the original formula described in 1974.⁶ The original theoretical equation, which has been verified in several clinical studies,⁴⁻⁷ involved the solution of a differential equation that resulted in a formula requiring the computation of natural logarithms:

$$\text{Allowable blood loss} = (\text{Estimated blood volume}) \times [\ln(\text{Hct}_{\text{start}} / \text{Hct}_{\text{final}})]$$

In 1974, computing natural logs was inconvenient for the practicing clinician. However, now virtually everyone has access to inexpensive, solar-powered, lightweight, hand-held calculators that easily compute natural logs. Therefore, anyone can use the theoretical formula rather than an approximation. And it actually requires fewer keystrokes to compute a more accurate result.

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(Accepted for publication November 4, 1999.)

Anesthesiology
2000; 92:903
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Bispectral Index Increases and Decreases Are Not Always Signs of Inadequate Anesthesia

To the Editor:—We read with interest the report by Gallagher¹ on the influence of pacer artifact on the bispectral index (BIS). We wish to report another situation in which an item of operating room equipment resulted in alteration in the BIS signal.

The patient was a 58-yr-old woman who was anesthetized with isoflurane, sufentanil, and atracurium for a left partial hepatectomy. After induction, the BIS (model A1000 v3.12; Aspect Medical Systems, Natick, MA) was maintained at < 60 with electrodes impedances < 1,000 Ω . Forced-air warming therapy was performed using an upper-body blanket (Bair Hugger; Augustine Medical Inc., Eden Prairie, MN). Just before incision, the BIS was 56. After incision, cautery interrupted the electroencephalographic signal for a few minutes. When the signal returned, it showed a marked increase to > 80. However, hemody-

namics were unchanged, and there were no other changes in clinical signs. On investigation, we noted that the forced air blanket, which had been turned on simultaneously with the incision, lay directly on the skin with the warm air blowing on the forehead electrodes. Turning off the heating unit resulted in a decrease in BIS to \approx 60 (fig. 1). Each time forced-air warming resumed, the BIS increased. When the Bair Hugger unit was on but disconnected from the blanket, the BIS returned to values < 60 (fig. 1). This intervention eliminated any role for electrical interference caused by the device. We speculate that vibration of the head wires caused by the air circulation generated an artifact that was interpreted as a higher BIS value; however, this artifact was not visible on the raw electroencephalographic trace.

Bispectral index monitoring in the operating room is generally straightforward, but new medical devices may interfere with it. Knowledge of potential interference from forced-air warming systems must be taken into account when interpreting BIS.

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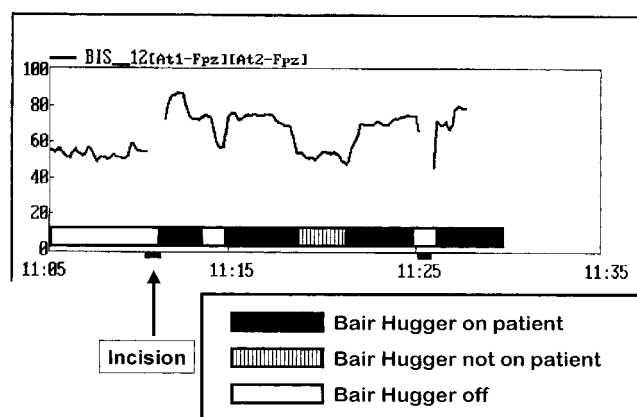


Fig. 1. Bispectral index trend display showing increases when cover of Bair Hugger is on patient.

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(Accepted for publication November 9, 1999.)