clinical practice, defined as the heart level). depending on the patient’s individual length and proportion. It would be better to standardize the measurement of head elevation, for example by the vertical distance between the skull base and the heart.

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References

TO THE EDITOR: We read with interest the article by Feldman, et al., on head position and cerebral perfusion pressure (CPP) (Feldman Z, Kanter MJ, Robertson CS, et al: Effect of head elevation on intracranial pressure, cerebral perfusion pressure, and cerebral blood flow in head-injured patients. J Neurosurg 76:207–211, February, 1992). We feel, however, that the failure to detect a difference in CPP with head position should be interpreted with caution.

If the study group as a whole is examined, more than 20% had an initial Glasgow Coma Scale score of 9 or greater (and thus may have not warranted intracranial pressure (ICP) monitoring), two patients had penetrating injuries (and thus were of questionable comparability to other injuries), and one-half had ICP’s less than 15 mm Hg with head elevation at 30° (which would not have warranted treatment under many “conventional” regimens).

In the authors’ Fig. 1, of the 12 patients whose CPP was 70 mm Hg or less at 30° head elevation, eight had a rise in CPP at 0°. It is in these patients, whose cerebrovascular reserve is most compromised, that efforts at improvement are critical. We are concerned that the failure to detect a difference in CPP with head position for the study group as a whole may represent a statistical artifact, due to an insufficient number of seriously injured patients and a misinterpretation of the data.

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RESPONSE: We appreciate the comments of Drs. Woischneck and Gaab and Drs. Ball and Benzel. Drs. Woischneck and Gaab report that they have found reductions in intracranial pressure (ICP) with 30° head elevation similar to the decreases that we report. They also found that the patients with higher cerebral perfusion pressure (CPP) tended to be those with reductions in CPP on head elevation. We found no statistically different changes in these measurements, perhaps because of the small number of patients studied.

Drs. Ball and Benzel emphasize an important point which was discussed in the Results section of our paper. While the data were analyzed for the entire group of patients, the individual patient’s data were shown in the graphs so that the readers could see the variability and subgroups of patients discussed. Five of the patients with a CPP of 70 mm Hg or less while lying flat had a modest decrease in CPP when their head was elevated to 30°. However, in only one of these patients was the cerebral blood flow (CBF) decrease clinically significant. In none of these patients did CBF reach ischemic levels. The four patients with the lowest CPP while lying flat had clinically significant increases in CPP when their head was elevated.

Drs. Ball and Benzel point out that the patients who were studied may not be the most critically ill group. It is true that these did not represent a consecutive series of patients; however, they were the only ones in whom the entire study protocol could be performed. Patients with the most severe intracranial hypertension had the greatest changes in ICP depending on the position of the head, and often required some other intervention such as mannitol administration before the CBF measurements could be completed. Although these patients were not reported in our study, in no case with more severe intracranial hypertension was CPP improved by placing the head flat. In fact, just the opposite occurred. The ICP increased and CPP decreased to such an extent that the study could not be completed.

Head position is only one aspect of the medical management of head-injured patients. We found that a reduction in ICP was the only consistent effect of 30° head elevation and that, in most patients, this reduction in ICP was not accompanied by a reduction in CPP or CBF. Certainly, this is a generalization, and we would not suggest that patients be kept with their head elevated regardless of the effect on ICP and CPP. For the individual patient, if CPP is lower at a 30° head elevation, then either that patient should be kept with his head horizontal or his blood pressure should be supported pharmacologically.

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Venous Drainage System and Risk of Hemorrhage from AVM’s

TO THE EDITOR: I read with interest the article by Miyasaka, et al., about the relationship between type of venous drainage and risk of hemorrhage in arteriovenous malformations (AVM’s) (Miyasaka Y, Yada K,