

# Surgical Risk as Related to Time of Intervention in the Repair of Intracranial Aneurysms

WILLIAM E. HUNT, M.D., AND ROBERT M. HESS, M.D.

*Department of Surgery, Division of Neurological Surgery, Ohio State University College of Medicine, Columbus, Ohio*

IT is generally agreed that the surgical risk in intracranial aneurysm is closely related to the patient's condition at the time of surgery, as well as to other factors such as age, associated disease, and the location of the aneurysm. Many criteria have been proposed<sup>1,2,5</sup> for the determination of surgical risk; some are based upon whether or not the patient is "conscious," others upon the number of days that have passed since the last hemorrhage, and still others upon the patient's age. We have felt that the intensity of the meningeal inflammatory reaction, the severity of neurological deficit, and the presence or absence of significant associated disease should provide the best clinical criteria for the estimate of surgical risk.

Our modification of Botterell's classification<sup>3</sup> has been applied to 275 consecutive cases of intracranial aneurysm treated by the faculty and resident staff of the Ohio State University and affiliated hospitals over a 12-year period (Table 1).

In this series, almost all cases were graded at admission and again just prior to operation. It is recognized that such classifications are arbitrary and that the margins between categories may be ill defined. We are, nevertheless, of the opinion that a fairly sharp differentiation is possible among patients who have few or no meningeal signs, patients who have well-defined meningeal signs but no neurological deficit, and patients who show neurological malfunction. Associated disease was sufficient to change the graded risk when it was unequivocally present and, in the judgment of the surgeon, severe enough to influence the patient's operative or postoperative course. We did not consider it necessary for the patient to have recovered completely from all symptoms and signs of the hemorrhage to be considered an optimal or Grade I risk.

Table 2 shows the relative distribution of

TABLE 1

*Classification of patients with intracranial aneurysms according to surgical risk*

Category*	Criteria
Grade I	Asymptomatic, or minimal headache and slight nuchal rigidity.
Grade II	Moderate to severe headache, nuchal rigidity, no neurological deficit other than cranial nerve palsy.
Grade III	Drowsiness, confusion, or mild focal deficit.
Grade IV	Stupor, moderate to severe hemiparesis, possibly early decerebrate rigidity and vegetative disturbances.
Grade V	Deep coma, decerebrate rigidity, moribund appearance.

\* Serious systemic disease such as hypertension, diabetes, severe arteriosclerosis, chronic pulmonary disease, and severe vasospasm seen on arteriography, result in placement of the patient in the next less favorable category.

cases upon admission, classified according to this method. The largest single group of patients were those classified as Grade II, and the second largest group were those classified as Grade III.

Assuming that neurological deficit indicates arterial spasm, ischemia, and brain edema and that under such conditions the intracranial contents are more vulnerable to manipulation, and then further assuming that patients without neurological deficit would be best able

TABLE 2

*Classification of aneurysm at time of admission*

Grade	Number	Deaths	Per Cent
I	61	7	11
II	88	23	26
III	79	29	37
IV	35	25	71
V	12	12	100
Total	275	96	35

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to tolerate surgery, we established the following policy with regard to operation.

First, patients graded I and II were taken to surgery as soon as a diagnosis could be made, preferably within 24 hours of admission. Second, with two exceptions, patients graded III or below were treated conservatively until they improved to Grade I or II.

The first exception was that patients who had multiple, repeated, bleeding episodes were operated upon at Grade III or lower; the second was that patients who appeared to have an intracranial hematoma threatening life were operated upon at once and the hematoma evacuated, with or without definitive repair of the aneurysm.

Obviously, with our criteria, serious systemic disease or marked vasospasm will delay operation. However, neither the patient's age nor the site of the aneurysm are used in determining the grade of risk. Furthermore,

the number of days elapsed since the last hemorrhage is not considered relevant. Figure 1 shows that the majority of good risk patients were operated upon within 3 weeks of their last hemorrhage, many in less than 1 week.

This paper represents a retrospective analysis of the results of the policies described above.

**Results of Early Intervention in Good Risk Patients**

In patients admitted to the hospital at Grade I or II (Table 3) the mortality was 20%, whereas in patients who reached the operating room for any procedure whatever at Grade I or II, it was 14%. The difference in mortality seems to be due to a number of instances of early fatal rebleeding. Fourteen of the 15 nonsurgical deaths occurring in patients who were admitted at Grade I or II were

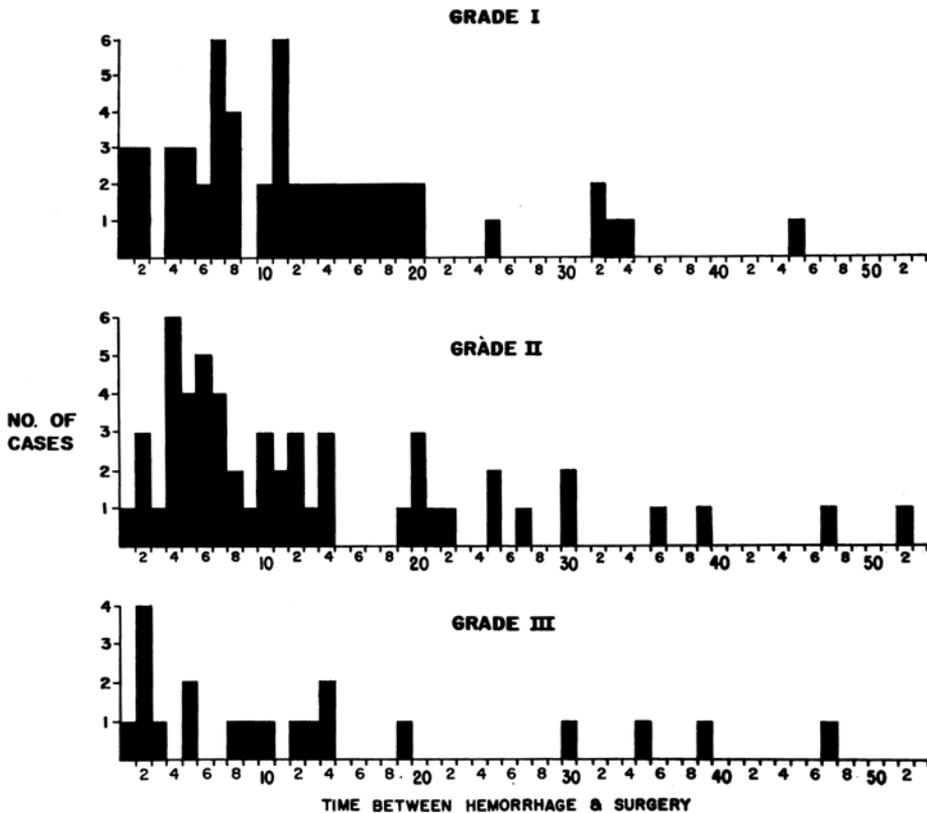


FIG. 1. Time between hemorrhage and surgery for Grade I, II, and III patients. The vertical bars represent the number of cases operated on each post-bleeding day (measured from the last known hemorrhage) for those cases that had bled. The grading was done at the time of operation. Note the number of cases operated within the first week, and within the first three weeks in each grade. Delay in surgery in Grades I and II beyond the first day or two was usually incurred prior to admission to our institutions.