Assessment of the Natural History of Anterior Communicating Aneurysms

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A considerable number of patients with ruptured aneurysms arising from the junction of the anterior communicating and anterior cerebral arteries will survive and not bleed again. There is some variation between series but generally a 50 per cent mortality has been found.3 The object of this study was to determine the factors that distinguish the patients that will rebleed from those that will not, so that operation entailing a considerable mortality can be restricted to the former group. A method is presented by which the prognosis of an individual patient can be determined with some degree of accuracy. Although the subject matter here is aneurysms of the anterior communicating artery, this method of analysis is potentially applicable to other aneurysms, other diseases and other treatments.

Materials and Methods

The case records and radiographs of 103 patients were studied to determine the influence of 14 possible prognostic factors. These patients were admitted to Atkinson Morley’s Hospital or The National Hospital for Neurological Diseases at Queen Square, London, under the care of Mr. Wylie McKissock, Mr. L. S. Walsh, or Mr. A. E. Richardson. All fulfilled 5 criteria:

1) They had had at least one subarachnoid haemorrhage.
2) A single aneurysm arising at the junction of the anterior cerebral and anterior communicating arteries was demonstrated by bilateral carotid angiography.
3) They were judged not to be in danger of succumbing to the rupture for which they had been admitted.
4) They were treated only by 6 weeks of rest in bed.
5) Their cases were followed for a period of at least 6 months.

Of the 14 factors that were considered, factors 1 through 5 are related to the condition of the patient, factors 6 through 13 relate to the morphology of the aneurysm or cerebral circulation, and the 14th relates to time.

Factor 1 was age and 2 was sex. Factor 3, conscious level, was arbitrarily divided into three categories: a) fully alert; b) alert with major signs such as hemiparesis, or drowsy with minor signs; and c) drowsy with major signs. Factors 4, diastolic blood pressure, and 5, systolic blood pressure, were based on the single recording made by the house officer on the fully reclining patient at least 24 hours after the original rupture.

Factor 6 was the direction of the aneurysm. The method of determining the direction is illustrated in Fig. 1, which shows an aneurysm judged to point up (U), with arrows designating forward and up (FU), forward (F), and down (D). Factor 7 was the length-breadth ratio of the aneurysm, in which the length was measured in the direction determined in factor 6 and the breadth was measured from that angiographic view that showed the largest dimension perpendicular to the length. Factor 8, the area-orifice ratio of the aneurysm, was approximated by dividing the product of the dimensions of length and breadth by the width of the aneurysmal neck, each measured from the same angiographic view that showed the largest breadth. Factor 9, absolute size, was determined by the largest diameter of the aneurysm in any view. Factors 10, locularity, and

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91~ England.
11, puncta, were counted from the angio-
grams, as was factor 12, the presence or ab-
sence of vascular spasm and factor 13, the
means of filling, as indicated by whether the
aneurysm filled with dye from one or both of
the carotid arteries.

The 14th factor was the time elapsed since
the original rupture, measured in days.

The 14 factors were correlated with the
incidence of rebleeding among the patients.
Those factors that proved to have a signifi-
cantly high correlation with recurrent rup-
ture were then analysed for interdependence
and only those that had an accurate and
relatively independent prognostic value were
retained.

Once the factors correlated with prognosis
were determined, a discriminative equation
relating the weighted factors to the proba-
ability of rebleeding was derived using the
method of discriminative functional analysis.
The resultant prognostic equation was then
tested on a second group of 46 patients. Mr.
Alistair Paterson of the Glasgow and West of
Scotland Neurosurgical Unit, Killearn Hos-
pital, kindly allowed the examination of the
records and radiographs of these additional
patients under his care as did Mr. J. Sloan
Robertson and Mr. Joseph Shorstein of the
same hospital. These patients satisfied the
same 5 criteria as the London group.

Results

Only 8 of the 14 factors proved to have
significance in predicting re-rupture in the
103 London cases. In this group, 51 patients
died or were disabled from recurrent haemor-
rhage, while another 8 rebled without neuro-
logical sequelae.

Because of limited computational facili-
ties, 6 of the factors, viz. volume-orifice ratio,
absolute size, locularity, puncta, vascular
spasm and means of filling, were excluded
from further consideration on the basis of an
empirical examination of the results. Six of
the 8 factors retained for further considera-
tion were individually associated with the
tendency to rebleed, to a significant degree.
In the case of age, the association was of
doubtful (Fig. 2) significance and in the case
of sex there was no association (Fig. 3). The
significant association between other factors
and the tendency to rebleed is clearly evident
from Figs. 4 to 7 and 13. Fig. 4 shows the
deterioration in prognosis that accompanies a
decline in conscious level. Figs. 5 and 6 show
the same deterioration associated with the

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**Fig. 1.** Determination of direction of the aneurysm. U=up, FU=forward and up, F=forward, and D =down.

**Fig. 2.** Relation of age to death or disablement.