A NEW ISOTOPE METHOD FOR DETECTING CONTINUED OR RECURRENT BLEEDING AFTER SUBARACHNOID HEMORRHAGE*

SANFORD F. ROTHENBERG, M.D.,† ERNEST J. PENKA, M.D.,‡ AND RICHARD W. GARRITY, M.D.§

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The diagnosis of subarachnoid hemorrhage usually presents no great difficulty. However, in the period immediately following the hemorrhage it is usually impossible to determine whether the bleeding is continuing or has ceased. Furthermore, for some time after the original episode, it is difficult to detect minor recurrences of bleeding. Conventional methods of clinical observation and examination of spinal fluid seem inadequate to determine accurately the course of subarachnoid bleeding.

In order to institute further diagnostic and therapeutic procedures at the optimal moment, it may be of considerable value to be able to determine whether bleeding has stopped or is continuing steadily or intermittently. Much of the difference of opinion that exists regarding the advisability of performing surgical diagnostic procedures, such as arteriography in cases of subarachnoid hemorrhage and the proper time for instituting such procedures, arises from a lack of precise information concerning the status of the bleeding. That opinions on these matters actually do vary widely will be evident from a few examples chosen from the literature on subarachnoid hemorrhage.

Walker, in an editorial on subarachnoid hemorrhage, stated: “A brief survey of the literature on the subject of subarachnoid hemorrhage and aneurysms will convince anyone that most of the data now available is so incomplete and biased that it only compounds the confusion of an already complex issue.” He also stated that “indications and contraindications for surgical diagnostic and therapeutic procedures to control a bleeding aneurysm and to prevent future hemorrhages have to date not been clearly defined.”

Silver advocated that all patients suffering intracranial bleeding be subjected to prompt cerebral angiography. He further advised that this examination be carried out as soon as possible after the episode of bleeding, and treatment for the lesion be instituted as soon as practicable. His conclusions were based on an analysis of 100 consecutive cases of intracranial bleeding.

Rowley, reporting on a mixed analysis of 157 cases of spontaneous sub-
arachnoid hemorrhage, regarded patients with spontaneous subarachnoid hemorrhage as surgical emergencies and recommended angiography be performed within 48 hours of the onset of the hemorrhage, to be followed by surgical therapeutic measures if the aneurysm is located. On the other hand, he advocated conservatism when a patient presents several weeks to months following a subarachnoid hemorrhage.

Magladery\(^1\) analyzed 235 patients with proven subarachnoid bleeding who were admitted to the Johns Hopkins Hospital during the years 1947–1954. He concluded by stating that his clinical material does not support the view that presently available surgical means of intervention offer any improvement over the current conservative approach. In speaking of angiography, Magladery made an analysis of the 90 patients, out of the whole 235, who had angiography. He stated that 53 per cent revealed no evidence of arterial aneurysm, arteriovenous malformation, or angioma. He further stated that the incidence of “positive” examinations was lowest when the procedure was performed during the first 7 days, adding that the chances of demonstration were found to be about 1 in 3 if done during that time; thereafter, he added, the odds were about equal. He stated that the mortality rate of the 235 patients was 46 per cent in those conservatively treated and 65 per cent in those operatively treated, surgical measures yielding an added mortality of 19 per cent. However, when he tabulated the mortality in a smaller group of 93 normotensive patients under 60 years of age, he found a 29 per cent mortality rate with conservative treatment and 65 per cent with surgical treatment, disclosing a disparity of 36 per cent.

The aforementioned sampling of the pertinent literature stresses the need for further fundamental information concerning patients with subarachnoid hemorrhage.

In an effort to provide a simple reliable method for more accurately following the course of subarachnoid hemorrhage, a new technique was developed. The procedure depends on the demonstration that intravenously injected red blood cells tagged with chromium 51 can be detected promptly in the spinal fluid when active subarachnoid bleeding is taking place.

**METHOD**

It is now a simple matter for any medical isotope laboratory to tag a patient’s red blood cells with chromium 51 within 1 hour. Some hospitals store group O blood, already tagged with chromium 51.

For control purposes, 15 normal individuals were studied. In each of these, 50 cc. of blood were withdrawn, tagged with chromium 51 and reinserted intravenously. Five cc. of spinal fluid were obtained 2 hours later and 24 hours later. The “specific activity” (radioactivity) of these samples of spinal fluid was immediately measured.

In 5 subjects to whose blood 100 microcuries of chromium 51 had been added, the specific activity of the spinal fluid was found to range between 4½ and 5 per cent above the background activity (Fig. 1).

In the other 10 individuals, to whose blood 200 microcuries of chromium