The Use of Tantalum Dust as an Adjunct in the Postoperative Management of Subdural Hematomas

ROGER G. VIETH, M.D., GEORGE T. TINDALL, M.D., AND GUY L. ODOM, M.D.

Department of Surgery, Division of Neurosurgery, Duke University Medical Center, and Durham Veterans Administration Hospital, Durham, North Carolina

Recurrence of a subdural hematoma following surgical drainage constitutes a major problem in the postoperative management of patients with this lesion. Munro and Tutor reported recurrent postoperative bleeding in 14 of 310 cases of surgically treated subdural hematoma. McLaurin and Tutore reported 90 patients with acute subdural hematomas who underwent surgery, 57 of whom died in the early postoperative period. Autopsy obtained in 34 of the 57 patients revealed a significant recurrence of the hematoma in 9 cases. Ingraham and Matson described recurrence requiring a 2nd craniotomy in 10 of 222 patients operated upon for subdural hematoma. Recurrence of hematomas following surgery was also mentioned in the reports of Kaplan, Svien and Gelety, and Parkinson and Chochinov.

Because of its frequency, a simple method is needed for detection of this complication in lieu of surgical re-exploration or carotid angiography. One technique proposed for the recognition of recurrent subdural hematomas, described by Parkinson and Chochinov, consists of applying one metallic clip to the pia-arachnoid in the operative area and a 2nd clip to the incised dura mater following drainage of the subdural hematoma. The distance between the 2 clips indicates the size of the subdural space as measured in anteroposterior skull roentgenograms taken in the postoperative period. They applied their method in 40 patients. The results indicated that this was a useful technique.

Since December, 1961, we have used a modification of Parkinson and Chochinov's technique for detecting recurrent subdural hematomas. Tantalum dust is placed on the pia-arachnoid in the area of exposure following drainage of the subdural hematoma. Tantalum clips are then applied to the incised edges of the dura mater. Thus, the distance between the tantalum dust and the clips as measured on postoperative anteroposterior skull films indicates the approximate size of the subdural space.

We are reporting the use of tantalum dust in 70 patients operated upon for subdural hematoma.

Clinical Material

This report is based upon 70 patients with surgically treated subdural hematoma, of whom 12 were females and 58 males, with ages ranging from 7 months to 98 years. Fifty patients were operated upon at Duke University Hospital and 20 at the Durham Veterans Administration Hospital.

For the purpose of this report, the patients were divided according to the type of subdural hematoma into three groups:

1) Acute: those patients operated upon within the first 48 hours following injury.
2) Subacute: those operated upon after 48 hours following injury but before the formation of an outer or inner membrane.
3) Chronic: those cases with an inner and/or outer membrane associated with the subdural hematoma.

Using this classification, 11 patients (15.7 per cent) had acute, 21 (30.0 per cent) had subacute, and 38 (54.3 per cent) had chronic subdural hematoma. Bilateral subdural hematomas occurred in 1 of 11 (9.0 per cent) of the acute group, in 1 of 21 (4.8 per cent) of the subacute group, and in 7 of 38 (18.4 per cent) of the chronic group.

Diagnostic Procedures. Preoperative carotid angiography was performed to establish the diagnosis in 8 of the 11 cases of acute subdural hematoma, while the remaining 3 cases were operated upon on the basis of clinical findings. In a total of 21 cases of subacute subdural hematoma, carotid angiography was done in 20 patients and pneumoencephalography in the remaining patient. In the 38 cases with chronic subdural hematoma, carotid angiography was performed in 32, pneumoencephalography in 2, and both procedures in

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1 case. In the remaining 3 cases of chronic subdural hematoma, surgery was carried out on the basis of clinical findings.

Surgical Procedures. The usual surgical procedure consisted of placing bilateral trephines in the temporal region of the skull. The trephine opening was enlarged into a craniectomy measuring approximately \( 4 \times 4 \) cm. If a subdural hematoma was found. In 9 patients, an osteoplastic craniotomy was performed. This was done in 1 patient with an acute subdural hematoma, in 2 with subacute subdural hematoma, and in 6 with chronic subdural hematoma. Following evacuation of the hematoma and partial excision of membranes (if present), a thin layer of finely powdered tantalum dust was placed over the pia-arachnoid of the exposed cerebral cortex. The tantalum was covered with a single layer of absorbable hemostatic agent (Surgicel) to hold it in position. Several tantalum clips were applied to the incised edges of the dura mater.

Postoperative Skull Roentgenograms. Stereoscopic anteroposterior and lateral skull roentgenograms were taken at varying intervals following surgery. X-rays were made whenever an adverse change occurred in a patient's condition or shortly following surgery in those patients who failed to improve. Otherwise, in those cases with continued postoperative improvement in clinical condition, x-rays were taken at the time of discharge from the hospital. In some cases, repeat skull x-rays were made at frequent intervals after discharge from the hospital over time periods ranging from 6 weeks to 2 years.

Results of Clinical Study

Ten of the 70 patients (14.3 per cent) died following surgery. These included 4 of the 11 patients (45.5 per cent) with acute subdural hematoma, 3 of the 21 patients (14.3 per cent) with subacute lesions, but only 3 of the 38 patients (7.3 per cent) in the group with chronic subdural hematoma. In 20 of the 70 patients (28.3 per cent), it was felt that the relative position of the tantalum dust and the dural clips aided postoperative management.

Group with Acute Subdural Hematoma. In 4 of the 11 patients with acute subdural hematoma, the position of the tantalum dust excluded the possibility that a recurrent subdural hematoma was causing the progressively deteriorating postoperative course. All 4 of these patients died. In 3 of the 4 cases, the patient's condition improved immediately after evacuation of the acute subdural hematoma. In each of the 3 cases, however, progressive deterioration in their condition began from 12 to 24 hours postoperatively. The diagnosis of a recurrent subdural hematoma was excluded by the roentgenographic findings which revealed that the tantalum dust and dural clips were approximated in each case. A brief clinical description of one of these cases follows:

Case 1. This 62-year-old man was admitted on November 11, 1963, with signs and symptoms of a cerebellar lesion. He had a history of carcinoma of the right lung diagnosed by thoracotomy in January, 1963. Ventriloculography, performed through posterior trephines, revealed a right cerebellar mass, and on November 26, 1963, a subtotal resection of a metastatic tumor and Torkildsen procedure was carried out. The patient's responses were dull. Two days postoperatively he developed a right hemiparesis, and a fixed and dilated right pupil. Bilateral temporal trephines were performed with evacuation of a left acute subdural hematoma. He failed to improve postoperatively although skull x-rays showed the clips and dust to be approximated. The wound was explored and no recurrent subdural hematoma was found. He continued to deteriorate and died on December 8, 1963. No autopsy was obtained.

Comment. Reoperation was performed 2 days following evacuation of an acute subdural hematoma on the basis of the clinical finding, in spite of the roentgenographic evidence that the subdural space was obliterated. The absence of a recurrent hematoma at the 2nd operation verified the preoperative x-ray finding.

Group with Subacute Subdural Hematoma. Of the 21 cases of subacute subdural hematoma, the tantalum dust aided postoperative management in 5. Each one of the 5 patients developed an adverse change in the clinical course after an initial improvement following evacuation of the hematoma. Reaccumulation of the hematoma as a cause for the adverse change was excluded by the approximation of the tantalum dust and the dural clips on postoperative skull x-rays. Three of these patients recovered and 2 died, in both cases death being the result of extensive cerebral contusion without a recurrent subdural hematoma and was confirmed at autopsy. An illustrative case follows:

Case 2. This 54-year-old man was admitted on October 27, 1963, with a 3-week history of confusion and disorientation. A right carotid arterio-