4. After three to four hours a further estimation of the patient's clotting-time is made. If this is not within an acceptable range, a suitable adjustment in dosage is made.

5. Further estimations of the patient's clotting-time should probably be made daily, to confirm that the anticoagulant effect is being maintained.

Summary

A method of continuous intravenous infusion of heparin with a syringe-pump is described. By this method very constant and easily controllable prolongation of the patient's whole-blood clotting-times were obtained.

Reliability, easy supervision, comfort for the patient, and a small volume of intravenous fluid are advantages of this technique. A suggested regimen for the control of heparin therapy is given.

I am indebted to Dr. P. A. Emerson for his help and encouragement with this paper; to Dr. C. J. Gavey for permission to study patients under his care; and to Dr. J. Russell Rees for much advice. My thanks are also due to Mr. John Fleetcroft, a medical student, who did many of the clotting-time estimations. The Department of Medical Photography, Westminster Medical School, kindly provided the photograph.

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Medical Memoranda

Use of the Quinton / Scribner Arteriovenous Shunt in Management of Aplastic Anaemias

Brit. med. J., 1967, **2**, 484–485

The original concept of a Teflon arteriovenous shunt for the treatment of acute renal failure by repeated haemodialysis was presented, with a description of a successful prosthesis, by Quinton, Dillard, and Scribner (1960). The further development of this to the Teflon/Silastic shunt described by the same authors (Quinton, Dillard, Cole, and Scribner, 1962) provided the fundamental requirement for chronic intermittent haemodialysis. The use of this shunt has since become almost universal in artificial kidney units, and a recent article has described the technique of its insertion to those with more general interests (Clark and Parsons, 1966).

It was for these reasons, and against a background of considerable experience in shunt management, that further uses for the arteriovenous fistula were sought; one of the first suggested was in the treatment of the aplastic anaemias.

In the management of these difficult cases one of the major problems is that of repeated blood transfusions. The veins become thrombosed and obliterated, and the development of deeper collateral vessels under a thickened siderofibrotic skin presents a serious technical problem to venepuncture. So the availability of such a satisfactory transfusion route was in itself attractive. Furthermore, even with a limited shunt life the sparing of other superficial veins and their dilatation by a small arterial inflow seemed to be additional fringe benefits.

At the time of writing (November 1966) only two patients have been treated. These were completely lacking in superficial veins and for this reason were rather unsuitable cases for this procedure. In addition both cases could only be classified as terminal, and no doubt more satisfactory results would be possible with earlier cases.

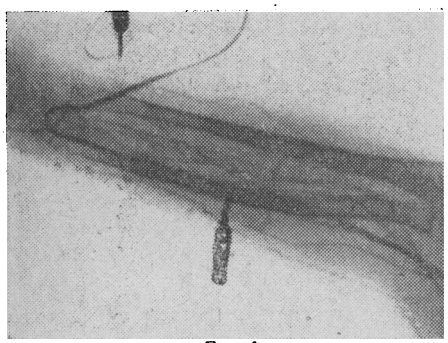

FIG. 1

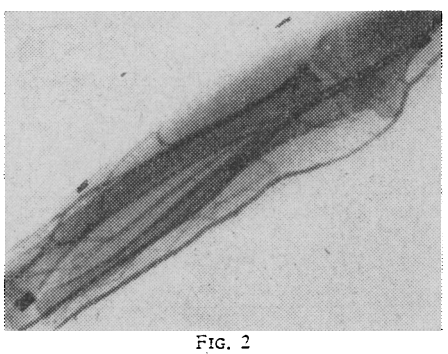

FIG. 2

CASE 1

This patient was first admitted to hospital five years previously, at the age of 12, with pallor and lassitude. He was diagnosed as having aplastic anaemia and started on regular blood transfusions. He was also treated with triamcinolone, methyl testosterone, ascorbic acid, folic acid, and phytohaemagglutinin, without response. His height was just under 5 ft. (1.6 m.) but he was not infantile and he had hitherto lived an active and almost normal life. Veins were very difficult to cannulate and he had become very frightened of venepuncture. An arteriovenous shunt was inserted on 27 July 1966, and recannulation was required on 14 August after venography. A clotting episode occurred on 22 October after packed cells had been given without heparin. Phenindione was given and the shunt flowed satisfactorily for three months until just before his death. In January 1967 he developed a pancytopenia and died on 30 January. He had required 57 units of blood up to the time of the shunt insertion and had 30 units with the shunt.

CASE 2

The patient was first admitted to hospital at the age of 11 weeks with anaemia. A sternal marrow showed decreased erythropoietic activity and from this time he required regular blood transfusions to maintain an adequate haemoglobin. By the age of 21 he had been given 400 units of blood or cells and had been transfused approximately 150 times. He was 4 ft. 8 in. (1.5 m.) tall and showed signs of infantilism; he had hepatospleno-

megaly, pigmentation, and cardiomegaly. He was, however, able to work as a diamond setter. An arteriovenous shunt was inserted in September 1966 to enable transfusions to be continued. The shunt clotted in the first few days and recannulation was performed and phenindione commenced. There were no further clotting episodes. He had four transfusions with 9 units of blood in the next two months. He died from heart failure and at necropsy the most significant feature was cardiomyopathy due to haemosiderosis.

METHODS

Infrared Photography.—This has been tried with the object of delineating the superficial venous system, but has not been found to be of value in our cases.

Arteriovenography.—In the first patient radiology of the arteriovenous anatomy was conducted as a secondary procedure when the inadequate venous cannula clotted. At this stage injection of Hypaque along the patent arterial cannula produced good outline of available veins in the venous phase (Fig. 1). This made the subsequent definitive venous cannulation much easier. In the second patient arteriovenography was performed as a first step by retrograde femoral aortography (Seldinger, 1953). Good vessels for cannulation were therefore selected from the outset (Fig. 2).

Surgical Technique.—The standard technique for insertion of these shunts was employed, but without crimp rings or external stabilizers (Quinton, Dillard, and Scribner, 1960). This was made difficult by the amount of bleeding which occurred from the numerous tiny collateral vessels lying in rather rigid fibrous tissue. In addition, the rigidity of the tissues and the thinness of the vein wall meant that wound closure after insertion of the cannula brought about compression of the vein around the vessel tip and rapid clotting. Careful site selection and extensive and careful undercutting of the skin flaps was found to solve this problem.

Healing.—No clinical diminution of healing rate was noted in our cases.

Transfusion Technique.—For transfusion a Y-shaped sterile connector (manufactured by Capon Heaton Ltd.) is attached to a standard drip set and its other two limbs are inserted between the shunt ends. The drip stand may have to be extended to provide a sufficient pressure head for the transfusion to proceed.

No diminution in blood flow through either cannula occurs and therefore there is no tendency towards clotting.

We would like to thank Dr. C. Hawkins and Dr. A. Paton for allowing us to treat their patients, and Dr. D. Officer and Dr. J. Taylor for their radiological and haematological help respectively; we are also grateful to Mr. T. Dee for the photographs shown here.

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Skeletal Metastases from Cerebellar Medulloblastoma

[WITH SPECIAL PLATE]

Brit. med. J., 1967, 2, 485–486

Wohlwill (1930) and Nelson (1936) first drew attention to possible systemic metastases from medulloblastoma of the cerebellum. The authenticity of their cases was contested at the time, but since then a small number of reports (Rubinstein, 1959; Paterson, 1961; Oberman *et al.*, 1963; Drachman *et al.*, 1963; Makeever and King, 1966; Schenk, 1966) have emerged in which there appears to have been unequivocal proof of distant metastases at postmortem examination. Other cases have been described where necropsy has not been performed, or where only radiological evidence is provided, and in these the data are often open to some doubt. To overcome such difficulties, Weiss (1955) formulated four criteria to aid the establishment of a definite relation between primary tumour and metastasis: (1) the proved presence of a single histologically characteristic tumour of the central nervous system; (2) a clinical history indicating that this accounted for the initial symptoms; (3) a complete necropsy to exclude the presence of another primary site; and (4) identical morphology of primary lesion and metastases, with due allowance for differences in degree of anaplasia.

The present case fulfils these criteria, and so joins a small group of fully authenticated medulloblastomas metastasizing outside the central nervous system.

CASE REPORT

A 20-year-old man was admitted to hospital in October 1961 with a month's history of nausea, occipital headache, and unsteadiness of gait. Examination showed papilloedema, left-sided cerebellar signs, and nystagmus, and a clinical diagnosis of posterior fossa tumour was made, which was supported by ancillary investigations.

At operation, tumour was found to occupy much of the left cerebellum, reaching the side of the brain stem and well into the vermis. It was removed macroscopically. Postoperatively he received radiotherapy to the posterior fossa, after which his symptoms and signs disappeared. Nine months later he complained of low back pain spreading down the right thigh posteriorly. Meningeal seedlings were suspected, and radiotherapy was given to the entire spinal-cord area.

He remained well for over a year, but in July 1964, while playing tennis, pain recurred abruptly in the same distribution. Bilateral limitation of straight-leg raising was the only abnormal physical sign. Plain *x*-ray films were normal, but myelography showed lumbar disc protrusion. He improved markedly with bed rest and skin traction, but some months later his legs weakened and sphincter disturbances developed. He became bed-ridden and was readmitted in September 1965 with the signs of a cauda equina lesion. A radiograph of the spine showed a sclerotic lesion in the posterior part of the seventh thoracic vertebra (Special Plate, Fig. 1), and further *x*-ray films showed a similar focus in the left acetabulum (Special Plate, Fig. 2). Lumbar puncture repeatedly failed, but myelography, performed by the cisternal route, showed a total block opposite the T 11–12 disc-space. A course of palliative radiotherapy was given, but he died in coma in November 1965.

PATHOLOGICAL FINDINGS

1961 Biopsy.—The cerebellar tumour consisted of closely packed small ovoid cells with scanty cytoplasm and irregular nuclei, arranged in interweaving bundles. They showed prominent nucleoli and numerous mitoses (Fig. I). Unipolar and bipolar cell forms, terminating in short fine fibrillary processes, were common. Rosette formation was not seen, but the appearances of the tumour are thought to be characteristic of medulloblastoma.

Postmortem Examination.—The relevant findings were limited to the central nervous system and skeleton. A thorough search failed to detect any tumour in lungs, adrenals, sympathetic chains,