DURAL SINUS VENOGRAPHY AS AN AID TO DIAGNOSIS IN INTRACRANIAL DISEASE*

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While the numerous adjuncts to diagnosis of intracranial tumors and other intracranial diseases have reached a high degree of accomplishment, investigative studies of the intracranial venous system, but for a few exceptions, have been lacking. Intracranial angiography by injection of contrast media into the carotid or vertebral arteries can usually be relied on to provide adequate evaluation of the arterial system of the head but often scanty information about the venous system.

The special methods of investigation of the intracranial venous system to be reported have thus far brought to light some interesting facts and proved of practical use. They may possibly introduce a new avenue of investigation that will prove valuable not only in intracranial tumors but in other conditions that alter the intracranial veins.

The methods employed include: (a) direct injection into the superior sagittal sinus of a contrast medium through a catheter introduced into the sinus; (b) retrograde injection of a contrast medium through a catheter introduced into the basilic vein of the arm passed upward into the internal jugular vein to the superior bulb; and (c) direct measurement of the venous pressure.

METHOD

Superior Sagittal Venogram. Local anesthesia is employed routinely. The head is slightly elevated to avoid possible air embolism and to minimize bleeding from the sinus. A 4 to 5 cm. longitudinal incision is made directly in the midline and centered at or slightly in front of the hairline. A burr hole is made, care being taken not to injure the underlying sinus. Additional bone is removed with the rongeurs if greater exposure seems necessary. A small incision is made in the superior wall of the sinus and a 8 ureteral catheter inserted and passed posteriorly for 3 or 4 cm. A steady stream of venous blood should be obtained when negative pressure is applied to a syringe attached to the catheter. If a good flow is not obtained, the catheter is not in the sinus and should be replaced.

Saline containing heparin (1 cc. in 500 cc. saline) is injected at intervals to prevent clotting. Cotton pledges are packed about the catheter and the wound is temporarily closed. The spinal fluid manometer containing a heparinized saline solution is attached to the catheter to measure the venous pressure in the sinus at rest and after compression of the jugular veins.

In the X-ray department, roentgenograms are made at \( \frac{1}{2} \) second exposure in the anteroposterior and lateral positions after rapid injection of 15 cc. of Diodrast (35 per cent). For best results the injection must be made as rapidly as possible. There are no symptoms attending the injections save the characteristic flushed sensation a few seconds later.

In the operating room the wound is reopened and the cotton pledgets and catheter are removed. Bleeding from the defect in the sinus is controlled with Gelfoam sponge and the wound closed. In some patients Gelfoam is packed in the burr hole about the catheter when the wound is initially closed and following the roentgenograms the catheter is removed without reopening the wound. If the venous pressure is high, however, it is safer to reopen the wound and be sure that bleeding from the sinus is controlled.

**Retrograde Jugular Venogram.** Local anesthesia is used. A catheter of the type employed in angiocardiography is inserted in a basilic vein in the arm and under fluoroscopic control passed upward through the subclavian vein and into the internal jugular vein to the superior bulb. Twenty-five cc. of 75 per cent Diodrast are injected rapidly and lateral roentgenograms secured at \( \frac{1}{2} \) second exposure. Pressure is made on both jugular veins during the injection. The patients complain of some headache during the injections and for 5 to 10 seconds afterwards. There are no other untoward symptoms.

Sometimes there is difficulty in getting the catheter to pass from the subclavian vein into the internal jugular vein and manipulation of the head and neck is required. Attempts to pass the catheter into the transverse sinuses have thus far been without success, probably due to the acute angle at which the sinus joins the superior bulb of the internal jugular vein. Venous pressure determinations may be made by attaching a manometer to the catheter.

**RESULTS**

In the normal (Fig. 1), there are certain constancies and variations of the venous pattern outlined by injection of contrast medium into the superior longitudinal sinus by the method described. The medium rapidly passes back through the longitudinal sinus, thence into the transverse sinuses and internal jugular veins. The other dural sinuses and the cerebral veins are not visualized though sometimes venous lacunae along the margin of the sinus and short segments of a few superior cerebral and diploic veins are seen. Also, if the catheter does not occlude the lumen of the sinus, occasionally the most anterior end of the sagittal sinus and short segments of the orbital and facial veins are visualized.

Compression of the jugular veins, one or both, for 15 seconds does not usually cause the contrast medium to pass into the cerebral veins nor alter the relative degree of filling of the transverse sinuses. It does, however, result in extensive filling of the occipital and vertebral system of veins.

The relative size and filling of the transverse sinuses in our first group of 12 normal patients were evaluated (Table 1). In 3 cases the transverse sinuses filled equally well and were the same approximate size. There was complete absence of filling of the left transverse sinus in 1 case and of the right in 1 case. In the remaining cases there appears to be a predominance