Conray ventriculography in the diagnosis of brain tumors and congenital malformations in children

Technical note

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In view of the technical complexity of gas ventriculography and the physiologic hazards of water insoluble contrast media, methylglucamine iothalamate 60% (Conray) was used in the diagnosis of brain tumor or congenital malformation in 15 children 1 mos to 10 yrs of age. The method proved simple, reliable, and radiographically satisfactory. General or local anesthesia was used. It was not necessary to change the position of the head during study. The medium left the ventricular system within 5 to 10 min and was excreted in the urine within 24 hrs. No complications occurred.

KEY WORDS • Conray ventriculography • children • brain tumor • congenital malformations

The use of air (or other gases) for radiographic delineation of the ventricular system, though long valued, is subject to limitations. To obtain information about some of the smaller intracranial structures, a type of tomography is required. Equipment for tomographic study is not universally available, and the precarious condition of certain patients, many of whom are under general anesthesia, makes these examinations unwarranted. When small amounts of gas are used, the position of the head must be changed many times for delineation of the entire ventricular system; this takes time, and occasionally induces complications such as impairment of ventilation, and partial obstruction of venous flow from the cranial cavity.

These considerations have led several observers to seek improved means of outlining the ventricular system.5,6,9,10 The first substances used in such studies were the water-insoluble organic icdine compounds, Lipiodol1 and Pantopaque. Although structures opacified by these substances can be visualized with less sophisticated radiographic equipment and technique than are required for studies with air, the head position must still be changed a number of times. In addition, the water-insoluble media may induce reactions in the ventricular system, the subarachnoid pathways, and the surrounding neural structures, and occasionally may cause systemic reactions.5-10 There are reports of obstruction and other types of malfunction of shunts placed after use of these media.5 Emulsification of Pantopaque, as described by Portera,6 reduces the amount of

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manipulation required; but this technique also is attended by complications such as fever, ependymitis, and arachnoiditis.

In 1966 Heimburger and his associates used a water-soluble organic iodine compound, methylglucamine iothalamate 60% (Conray)* ventricular contrast in stereotaxic procedures. Since April 1969, we have used Conray for all studies of the ventricular system requiring a positive contrast medium. This report is limited to consideration of our experience in infants and children.

Method

Under local or general anesthesia, the child is positioned supine. It is not necessary to reposition the head at any time during the examination. If the fontanel is not open, a 3/4-inch twist drill hole is placed in the right frontal bone. The anterior horn of the lateral ventricle is cannulated; 5 ml of cerebrospinal fluid is removed, and mixed thoroughly with an equal volume of Conray. The mixture is injected into the lateral ventricle. Six lateral films, at a rate of 2 per sec, are immediately made with the Sanchez-Perez serigraph; then two anteroposterior views are exposed manually. Since Conray injected into the cerebral subarachnoid space has been reported to cause convulsions, the ventricular needle must be flushed with 1 to 2 cc of normal saline solution before it is removed.

* Supplied by Mallinckrodt Chemical Works, St. Louis, Missouri.

Table 1

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>posterior fossa tumor:</td>
<td>(4)</td>
</tr>
<tr>
<td>medulloblastoma</td>
<td>2</td>
</tr>
<tr>
<td>astrocytoma of hemisphere</td>
<td>1</td>
</tr>
<tr>
<td>astrocytoma of vermis</td>
<td>1</td>
</tr>
<tr>
<td>aqueduct stenosis</td>
<td>3</td>
</tr>
<tr>
<td>Arnold-Chiari malformation</td>
<td>2</td>
</tr>
<tr>
<td>pinealoma</td>
<td>1</td>
</tr>
<tr>
<td>craniopharyngioma</td>
<td>1</td>
</tr>
<tr>
<td>hypothalamic glioma</td>
<td>1</td>
</tr>
<tr>
<td>posterior fossa arachnoid cyst</td>
<td>1</td>
</tr>
<tr>
<td>communicating hydrocephalus</td>
<td>1</td>
</tr>
<tr>
<td>normal</td>
<td>1</td>
</tr>
</tbody>
</table>

Results

We have used Conray in 15 children whose ages ranged from 1 mo to 10 yrs. The diagnoses are shown in Table 1; the seven tumors were in the third or fourth ventricle. Examples of films obtained are shown in Figs. 1 and 2.

Discussion

This water-soluble radiopaque substance has, in our experience, proved to be a reliable means of achieving satisfactory anatomic demonstration of the aqueduct and of the third and fourth ventricles of the brain. Its
technical advantages are considerable. Only basic radiographic equipment is needed, and the method does not entail manipulation of the anesthetized child during the examination. To obtain optimal visualization of the ventricular system, one must mix the medium thoroughly with the withdrawn ventricular fluid, and must expose films rapidly, immediately after instillation of the mixture. Conray disappears from the ventricular system within 5 to 10 min and is completely excreted in the urine by the end of 24 hrs.

At the April, 1969, meeting of the American Association of Neurological Surgeons, Dr. Salvador Gonzalez-Cornejo presented the results of Conray ventriculography in 26 patients (see previous article, pp. 405–407). During the discussion, Dr. Giovanni di Chiro, who had injected into the cisterna magna of dogs doses sufficiently large to be toxic, warned that this agent might have adverse effects. More recently, Jackson and his co-workers and Handa and Handa reported that it caused fever, nausea, vomiting, headache, and convulsions. That convulsions follow the inadvertent injection of Conray into the subarachnoid space had been noted previously. The medium has not been known to induce arachnoiditis or shunt malfunction.

In our series of 15 children, we encountered not a single complication attributable to the use of Conray. This remained true for several of the patients in whom more than one dose was injected during an examination, up to a total of 15 ml. There were no deaths in the series. In view of the simplicity of the method, and the excellence of the anatomic demonstrations obtained, we are continuing to use this rapidly excreted compound for ventriculography, while remaining aware of the possibility of adverse effects in a larger series.

References
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