Conray ventriculography in the diagnosis of infantile hydrocephalus

Technical note

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A method for visualizing the third ventricle, aqueduct of Sylvius, and fourth ventricle with methylglucamine iothalamate 60% (Conray) in infantile hydrocephalus is described. Only a small amount of contrast medium is necessary to visualize these structures. This procedure has been performed in 47 infants from 7 days to 3 years of age, and has been proved simple, safe, and valuable in the diagnosis of lesions around the third and fourth ventricles.

KEY WORDS • Conray ventriculography • infantile hydrocephalus • congenital malformation

ALTHOUGH methylglucamine iothalamate 60% (Conray) has been proved safe and useful in certain diagnostic situations,\(^7,9\) it has not been widely used in infantile hydrocephalus.\(^1,6,9\) In order to obtain acceptable films in cases of ventricular dilatation, large and potentially toxic amounts of Conray may be necessary.

We are reporting a technique for using small amounts of Conray in ventriculography of the third ventricle, aqueduct of Sylvius, and fourth ventricle in infantile hydrocephalus.

Technique

Under local or general anesthesia the patients are seated in an appropriate pneumoencephalography chair, with the neck and body flexed (Fig. 1). A No. 19 Teflon needle, 9 cm long, is introduced into the lateral ventricle through the lateral angle of the anterior fontanel, and advanced to the floor of the anterior horn of the lateral ventricle (Fig. 2 upper left). Occasionally in patients with a markedly dilated ventricle a longer needle (13 cm) may be necessary to reach the floor of the anterior horn. When the fontanel is closed the ventricular tap is performed through a twist drill hole in the frontal skull. Then 1.5 cc of undiluted Conray 60% are slowly introduced under fluoroscopic observation. The contrast medium stays in the bottom of the anterior horn of the lateral ventricle. The chair is then slowly somersaulted backward until the contrast medium flows into the anterior portion of the third ventricle, passing through the foramen of Monro (Fig. 2 upper right). The seat is then tilted further backward, so that the Conray will flow into the aqueduct and fourth ventricle. When there is an obstructive lesion in the aqueduct
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Therefore, after taking films for axial ventriculography, we usually inject a small amount of air (10 to 20 ml) to outline the lateral ventricles (Fig. 3 right).

Results

We have used this technique in 47 cases of infantile hydrocephalus (Table 1). The information from the films obtained with this method, even in the presence of a markedly dilated ventricular system, has been satisfactory, and good visualization of the axial ventricular system has been routinely obtained. The procedure has been well tolerated in all patients. We have not observed any convulsive episodes or any other side effects.

Discussion

To visualize the axial ventricular system in the presence of dilated lateral ventricles, direct catheterization of the third ventricle has been used.\textsuperscript{2,4,8} However, this technique requires burr holes, and sometimes the catheterization of the third ventricle is quite difficult, especially when the lateral ventricle is markedly dilated or the third ventricle is displaced. For these reasons Conray ventriculography has not been widely used in infantile hydrocephalus. Another recognized disadvantage of Conray ventriculography is the possible development of seizures.\textsuperscript{2,4} The incidence of seizures following Conray ventriculography is 0 to 3.9%.\textsuperscript{9} It has been reported that the development of seizures depends on the concentration of the contrast medium in the cisterna magna, and that the

![Fig. 1. Photograph of patient fixed in pneumoencephalography chair with neck and body flexed.](image)

or fourth ventricle, the Conray will remain in the upper ventricular system, as verified by films of the aqueduct and fourth ventricle obtained in the sitting or semi-sitting position. In cases of communicating hydrocephalus, Conray will flow along the anterior wall of the aqueduct and fourth ventricle; however, if it does not opacify the whole space of the aqueduct or fourth ventricle, it may be necessary to somersault the patient backward quickly to the supine position. Conray will then be seen in the posterior third ventricle, and if the head is now elevated slowly, the contrast medium will flow down into the aqueduct and fourth ventricle (Fig. 2 lower). With this method it is possible to demonstrate the aqueduct of Sylvius and fourth ventricle in communicating hydrocephalus (Fig. 3 left). Because of its high specific gravity, Conray 60% flows more easily without dilution.

One disadvantage of this technique is less reliable visualization of the lateral ventricle;

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>No. of Cases</th>
</tr>
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<tbody>
<tr>
<td>communicating hydrocephalus</td>
<td>14</td>
</tr>
<tr>
<td>Arnold-Chiari malformation</td>
<td>12</td>
</tr>
<tr>
<td>aqueduct stenosis</td>
<td>7</td>
</tr>
<tr>
<td>atresia of 4th ventricle</td>
<td>3</td>
</tr>
<tr>
<td>occlusion of foramen Monro</td>
<td>2</td>
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<tr>
<td>posterior fossa tumor</td>
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<tr>
<td>holoprosencephaly</td>
<td>2</td>
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<tr>
<td>hydrocephalodysplasia</td>
<td>2</td>
</tr>
<tr>
<td>vein of Galen aneurysm</td>
<td>1</td>
</tr>
<tr>
<td>Dandy-Walker malformation</td>
<td>1</td>
</tr>
</tbody>
</table>

TABLE 1

Clinical diagnosis of 47 hydrocephalic infants in whom Conray ventriculography was used

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total amount of Conray 60% should be small and not injected into the extraventricular tissue or space.\footnote{8}

We cannot draw conclusions from our small series regarding seizures or other side effects with this technique, but the amount of Conray 60% used is small; radiographically it can be seen to rapidly dilute with cerebrospinal fluid in the ventricular system before it reaches the cisterna magna. We have usually been able to demonstrate the aqueduct of Sylvius and the third and fourth ventricles with 1.5 ml of Conray 60%; however, if it becomes necessary to use more than 3 cc of contrast medium in this technique and a high concentration of contrast medium is visualized in the cervical subarachnoid space, it is advisable to

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**Fig. 2.** Skull films of a 3-week-old baby with communicating hydrocephalus. *Upper Left:* The lateral ventricle has been tapped and 1.5 ml of Conray 60% instilled on the floor of a lateral ventricle. *Upper Right:* The body is slowly somersaulted, and Conray flows through the foramen of Monro into the anterior third ventricle. *Lower:* The body is supine. The posterior third ventricle, aqueduct, fourth ventricle, and enlarged cisterna magna are seen.
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![Image](image.jpg)

**FIG. 3.** *Left:* Conray ventriculography in an 18-month-old infant shows aqueductal stenosis and hydrencephalus. *Right:* Conray and air ventriculography in a 2-week-old baby with myelomeningocele. There is evidence of hydrocephalus, elongation, and stenosis of aqueduct, and caudal displacement of the fourth ventricle.

perform a lumbar puncture with the patient in the sitting position and withdraw cerebrospinal fluid.

One concern might be the high concentration of contrast medium in contact with the ependyma of the third or fourth ventricle, but the toxicity of Conray in the intraventricular space is reported to be less than in the subarachnoid space, and we have not observed any cases that suggest a toxic effect on contiguous brain tissue.

**References**


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