cried, but did not respond to questioning. Blood chemistries now revealed serum chloride 93 meq/l, potassium 4.42 meq/l, sodium 122.5 meq/l, and calcium 9.4 mg%.

On the following day, two enemas of 5% NaCl were administered with fair return of liquid stool and flatus. By this time the patient was much more responsive and was taking a liquid diet by mouth. Serial determinations of plasma electrolytes over a 5 day period showed a steady rise in sodium and chloride until normal levels were reached. The data are shown in Table 1. An electroencephalogram taken during the hospital stay was reported as demonstrating cerebral irritability, probably on a metabolic basis. The patient was discharged on September 12, 1953, 7 days after admission. No further convulsions have occurred since her discharge.

TABLE I
BLOOD CHEMISTRY IN A CASE OF WATER INTOXICATION

<table>
<thead>
<tr>
<th>Date</th>
<th>Na</th>
<th>Cl</th>
<th>CO₃⁻</th>
<th>Ca</th>
<th>K</th>
<th>P</th>
<th>Creatinine</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-5</td>
<td>86</td>
<td>23.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-5 After</td>
<td>122.5</td>
<td>93</td>
<td>9.4</td>
<td>4.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infusion</td>
<td>9-6</td>
<td>134.1</td>
<td>97</td>
<td>2.4</td>
<td>3.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-9</td>
<td>132.5</td>
<td>105</td>
<td>23.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Concerning prophylaxis against water intoxication, the following measures are proposed:

1. It has been shown that isotonic and hypertonic saline is absorbed from the gut to a much lesser degree than tap water (6); therefore, when enemas are indicated in congenital megacolon, they should be saline enemas (1).

2. Diagnostic barium meals or enemas should be suspended in isotonic saline rather than water.

3. Potentially toxic substances such as magnesium sulfate or borax enemas are contraindicated in megacolon, because of possible excess absorption (7).

4. Substances such as prostigmine, which increase intraluminal pressure, should be used with care when administered concomitantly with enemas (1).

**THERAPY OF WATER INTOXICATION**

The intravenous administration of hypertonic (2%) saline or 2½% saline in glucose is indicated. Intravenous solutions lacking isotonic or hypertonic sodium and chloride are contraindicated. Since it has been demonstrated experimentally (6) that hypertonic enemas are rapidly diluted to isotonic concentrations by intestinal secretion of water, they may be of therapeutic value by removing excess extracellular water.

**SUMMARY AND CONCLUSIONS**

The literature on water intoxication following water enemas is reviewed, and a typical case is reported. Blood chemistries and therapy are reported in detail.

It is seen that the simple tap water or soapsud enema may be a not infrequent cause of serious water intoxication in congenital megacolon. The best therapy consists of the prevention of this complication by adherence to the principles discussed above.

**REFERENCES**


**TERIDAX, A NEW CHOLECYSTOGRAPHIC MEDIUM**

C. Rowell Hoffmann, M. D., Cincinnati, Ohio.

In the past decade a number of new radiographic media have been developed for visualization of the gallbladder. In 1940 Priodax® (iodoalphonic acid) was introduced in this country. This has proved to be a satisfactory medium (1-4). However, the occurrence of side effects, mainly diarrhea, in a small number of patients has stimulated further search for an improved cholecystographic agent.

Since 1950, at least three new cholecystopahques have been introduced. One of these, Teridax (5-7) (ethyltriodoalphonic acid) has been made available for clinical trial and evaluation.

**METHOD**

Over an eight month period, 96 patients with normal and abnormal gallbladders were studied with Teridax. In some instances, comparison examinations were made employing Priodax and Telepaque (iodopanoic acid) in the same patients.

Teridax was administered during this study in three different doses: 3.0 Gm.; 3.75 Gm., and 4.5 Gm. Patients received the drug at intervals varying from 8 to 16 hours prior to roentgenographic studies. In each case, Teridax administration was preceded by a noon dose.
meal high in fat content for the purpose of emptying
the gallbladder (8, 9). The subsequent evening meal
was devoid of fats. Following administration of Teri-
dax, nothing by mouth was permitted except water to
assist maximum dye concentration. In no cases were
laxatives, cleansing enemas, prostigmine, pituitary
extracts, or any other medications used.

Results

In 54 cases (56.3%) the gallbladder was well vis-
ualized. Twelve cases (12.5%) required a repetition
of the same dose of dye which resulted in gallbladder
visualization, due to the cumulative effect inherent in
cholecystographic media. In 30 cases (31.2%) there
was poor visualization or nonvisualization of the gall-
bladder even with repeated dosages. In all of these
30 cases, neither Priodax nor Telepaque adequately
visualized the gallbladders. Diagnoses of poorly or
nonfunctioning gallbladders were made. These pa-
tients, who subsequently had cholecystectomies, dem-
onstrated pathologic conditions which explained the
nonvisualization. In short, in this series, there was no
instance in which a normal gallbladder failed to vis-
ualize with the initial dose of Teridax.

The densities of the gallbladder shadows produced
with different media were measured photometrically
and compared. Teridax produced denser shadows than
did Priodax. However, the average density was not
so great as that found with Telepaque. This is con-
sidered to be advantageous, as excessive density may
mask the presence of stones (10). The density of
the gallbladder shadow produced by Teridax was suf-
ficient to visualize the gallbladder fluoroscopically in
every case. Teridax proved to be sufficiently radio-
lucent so that all stones of over 5 mm. in diameter
were visualized in the dye layer when the standard
prone posterior-anterior projection was used. As
stated, this is not always the case with a denser medium.

Biliary calculi under 5 mm. in diameter, unless con-
taining calcium, could not be uniformly visualized with
any of the three contrast media employed. The prone
posterior-anterior projection enhanced the depiction
of these small calcified stones which were more clearly
outlined with Teridax than with the other media
employed.

In some instances the presence of small, noncalcified
calculi was masked by overlying dye in the prone pos-
terior-anterior projection but could be demonstrated in
erect compression spot films. In all cases, better
radiographs were obtained by employing the 65 PKV
technic.

When patients taking Teridax were compared on a
weight and tissue-thickness basis, no significant dif-
f erences in density of gallbladder shadow were noted,
whether the patient received 3.0 Gm., 3.75 G., or the
4.5 Gm. dosage.

Five patients taking Teridax were studied at 2 hour
intervals for 18 hours. In all five patients the gall-
bladder was faintly discernible at 4 hours and visible at
6 hours. Sufficient dye remained in the gallbladder
to permit critical studies for a period of 8 to 18 hours.

Ten patients were maintained on a fat free regimen
for 48 hours after their cholecystographies. Satisfac-
tory, but reduced, concentrations of dye were still pres-
ent during the 24-48 hour period.

In some cases it was desirable to attempt visualiza-
tion of the extrahepatic ducts. The technic consisted
of giving the patient a concentrated fatty meal and
taking the x-rays within 20 to 30 minutes. The cystic
and common ducts, and occasionally the hepatic ducts,
were well visualized with Teridax when the fatty
meal was employed.

The use of Teridax was most noteworthy in the
freedom from side actions following its use. Other
investigators (7, 10) have previously reported this low
incidence of side actions.

In this series, cholecystography with Teridax was
performed on 26 patients with active peptic ulcer,
one with subtotal gastrectomy and four with hiatus
herniae. Presence of active gastrointestinal disease
would lead one to expect increased incidence of side
actions with halogenated compounds. However, Teri-
dax was not irritating to any of these patients—not
a single peptic ulcer patient complained of pain pre-
cipitated by the compound.

Unabsorbed radio-opaque material was not noted in
the large bowel in any patient receiving a single dose
of Teridax. In a few cases small amounts of unabsorbed
material were observed in the colon following repeat
doses. These appeared as a very faint haze of mul-
tiple, punctate opacities which did not obscure or con-
fuse the interpretation of the gallbladder shadow. This
phenomenon is quite different from the dense, large
particle opacities which fill the colon following use of
Telepaque.

Summary and Conclusions

Teridax was studied clinically in 96 patients. Sixty-
six patients had excellent cholecystograms showing
normally concentrating gallbladders. Thirty patients
had nonfunctioning gallbladders and were studied with
two other contrast media without visualization. All
of these 30 cases were found at surgery to have abnor-
malities which explained the nonvisualization.

The density of cholecystograms obtained with Teri-
dax was measured photometrically and found to be
between that observed with Priodax and that seen with
Telepaque. In 30 cases, neither Priodax nor Telepaque
adequately visualized the gallbladders. Diagnoses of
poorly concentrating gallbladders were made. These pa-
tients, who subsequently had cholecystectomies, dem-
onstrated pathologic conditions which explained the
nonvisualization.

It is concluded that:

1. Teridax rarely produces unabsorbed radio-opaque
material in the colon following administration of
recommended dosages of the dye. If present, the
colonic opacities appear as a faint, punctate haze
which in no way confuses cholecystographic inter-
pretation.

2. The densities of radiographs obtained with Teri-
dax are considered to be in an ideal range of
opaquification permitting better visualization of
gravel-type stones than the more dense medium,
which may at times completely mask them.

3. Teridax has resulted in a lower incidence of dis-
comforting side actions in our hands than has
any other cholecystographic medium employed to
date.