Intravenous Cholangiography

Some Observations on the Use of Cholografin

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• **Intravenous cholangiography with cholografin is a safe procedure, most useful for the study of patients who have had cholecystectomy and later have symptoms related to the biliary ducts.**

When jaundice or liver impairment is present, the examination is usually unsuccessful. However, these conditions are not absolute contraindications to the procedure. There may be failure to visualize the biliary ducts even in the presence of a normal liver.

Planigraphy is helpful in eliminating confusing superimposed structures and when there is only faint visualization of the common duct.

Intravenous cholecystography is only of questionable value as a supplementary examination to oral cholecystography. It may prove useful in certain instances when patients are unable to retain or absorb the oral media or where emergency operation is contemplated.

ATTEMPTS to visualize the biliary ducts other than by direct cholangiography were largely unsuccessful until the introduction of biligrafin in Germany in 1952. In the United States, this contrast medium has been named cholografin. It is the dinatrium salt of an adipine acid and has an iodine content of 64.3 per cent. The medium is prepared in 20 cc. vials of 20 per cent concentration for intravenous use. This concentration is almost isotonic. It is estimated that in the normal person 10 per cent of the dye is excreted by the kidneys and the remaining 90 per cent by the liver through the biliary duct system. There is practically no liberation of free iodine within the body. Once the contrast material reaches the intestines by way of the bile ducts, it is not reabsorbed.[5,6,7]

METHOD OF EXAMINATION

The patient is prepared by administering two ounces of castor oil the evening preceding the examination, with fasting after midnight, and administration of a cleansing tap water enema in the morning. One cubic centimeter of the contrast material is given intravenously as a test for sensitivity at least ten minutes before the procedure. A scout film of the right upper quadrant of the abdomen is made and technique adjusted accordingly. Although a 40 per cent concentration of the contrast material is now available, only the 20 per cent concentration was used by the authors. The drug should be injected very slowly over a 10-minute period and this has proved to be more difficult with the smaller volume. Slow injection is stressed by the manufacturer, since untoward reactions in general seem to be directly related to the rapidity of administration.

Films are taken at 20, 30, 40, 60, 90 and 120 minutes following the injection. The right posterior oblique projection is used at various degrees of obliquity as indicated after viewing the films during the course of the examination. In the experience of the authors, the common bile duct will almost always be visualized within the two-hour period or not at all (Figure 1). However, in one case an obstructed and greatly dilated common duct was observed on a 24-hour examination (Figure 2). Therefore a 24-hour film is taken whenever there is failure to visualize the biliary ducts at the end of two hours. Wise and O'Brien[8] also said they obtained a 24-hour film because of one instance in which a previously nonvisualized gallbladder was well demonstrated at 24 hours.

Planigraphy has been useful where confusing superimposed structures are present or when the duct is only faintly opacified.

The administration of morphine shortly before the beginning of the examination has been advocated as a means of producing contraction of the sphincter choledochus and hence increasing the concentration of the medium in the common duct.[4] The authors have not used this method up to the present, feeling that the facility with which the common duct emptied was of equal importance. Now, however, we are not certain but that better opacification is more desirable.

VISUALIZATION OF BILIARY TREE

The suggestion has been made that intravenous cholecystocholangiography might serve as a test of liver function. It is true that in the presence of liver

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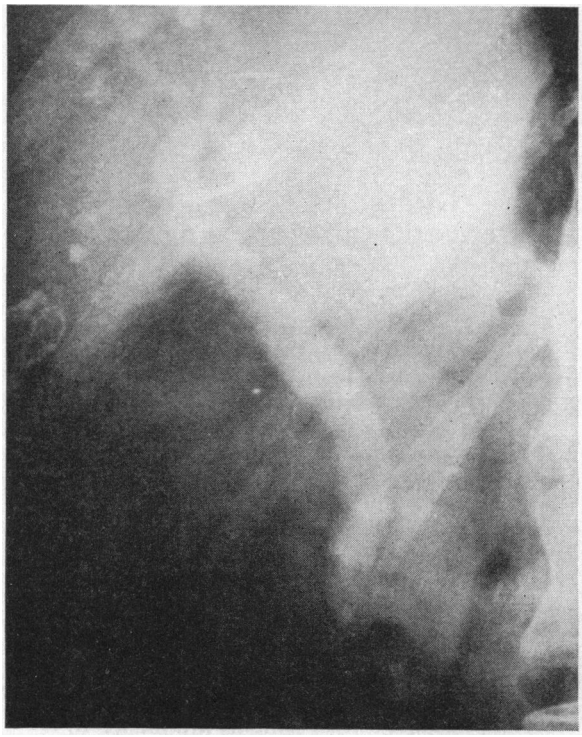

Figure 1.—Normal intravenous cholangiogram.

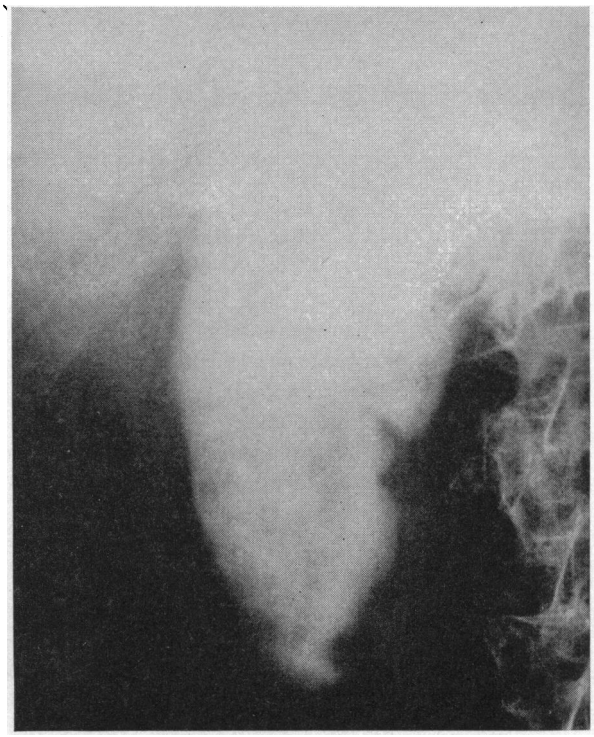

Figure 2.—Twenty-four-hour film. Decidedly dilated common bile duct. There was no opacification at the end of the standard initial 2-hour period of the examination. At operation, the duct measured 3 cm. in diameter and contained multiple calculi.

impairment or jaundice, failure to visualize the biliary structures can be expected; however, it cannot be anticipated with any degree of certainty. In 50 of the earlier cases in which the authors carried out the examination, the common bile duct was not demonstrated in 16 instances. In 12 of the 16 the patients were jaundiced or had laboratory evidence of impaired liver function at the time of the examination. In none of the remaining four patients was there a history of jaundice and in the two of these, in whom laboratory studies were done, liver function was normal. In a more recent case, the common bile duct was not visualized on a first examination in which there was no jaundice or evidence of liver impairment. A second examination was done one week later with excellent opacification of a normal appearing gallbladder and common bile duct. Wise and O'Brien noted some correlation of liver impairment and failure to visualize the biliary tract, but they also concluded that the range of abnormal liver function values covers a considerable spread within which visualization cannot be predicted with accuracy. They felt that there was little use in attempting the study if the sulfobromophthalein retention was above 40 per cent or the serum bilirubin over 4.0 mg. We now prefer not to examine patients who are jaundiced or have laboratory evidence of liver damage. If liver function studies are abnormal, we believe that the study should be delayed as long as possible.

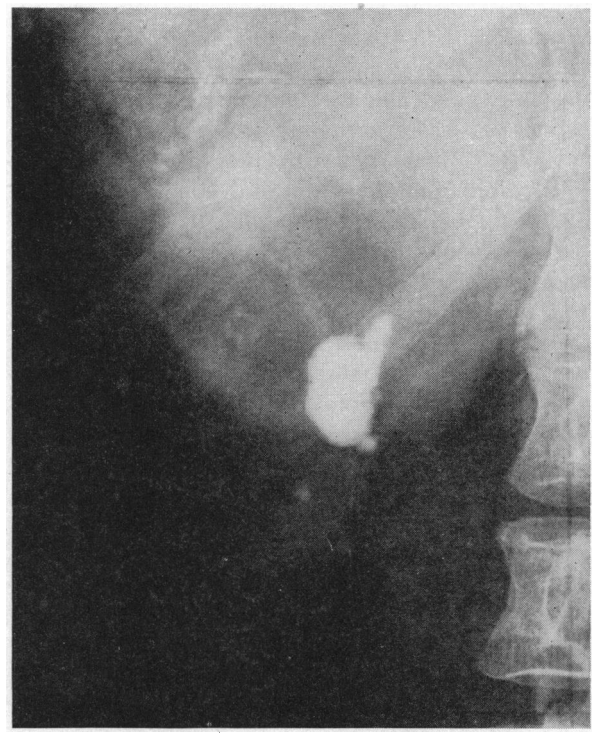

Figure 3.—Dilated common bile duct containing a large radiolucent stone with an opaque central nidus.

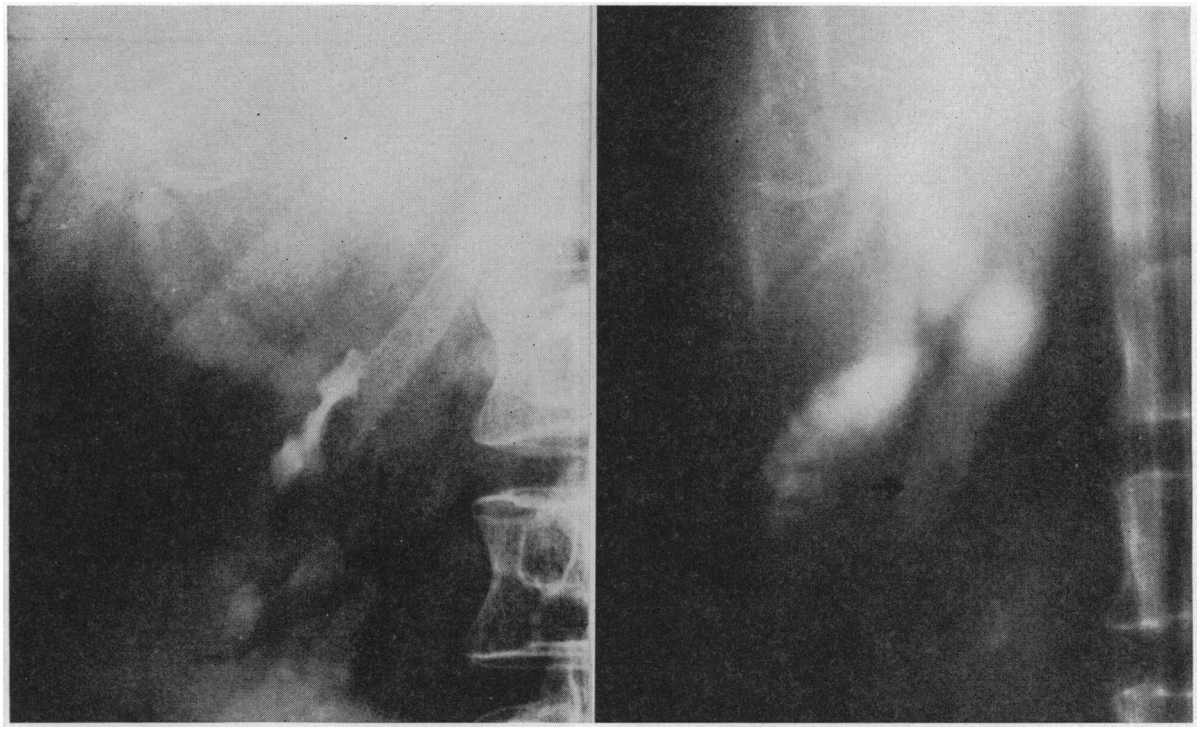

Figure 4.—*Left:* The distal common bile duct is obscured by opacified renal calyces. A calculus could not be demonstrated. *Right:* Planigram. A calculus (arrow) is clearly seen.

CHOLANGIOGRAPHY

What constitutes an abnormal common bile duct? The demonstration of a stone would seem to be an unequivocal pathological finding (Figure 3). The present method has not always proved successful in demonstrating stones; in one case a well visualized common bile duct that appeared normal contained many small stones at operation. Frequently the duct is so faintly visualized that stones cannot be excluded with certainty. Superimposed intestinal gas shadows can be misleading or confusing, but usually can be eliminated by positioning or by planigraphy. We now routinely make planigrams whenever the common duct is poorly visualized. Figure 4* is a case in which a stone in the duct was clearly demonstrated by this means, and the authors observed another similar case.

The diameter of the common bile duct would seem to serve as a useful indication of the presence or absence of obstructive phenomena. However, this presents certain problems. Don and Campbell[3] pointed out that following the relief of obstruction, the common duct may not return to normal size and, therefore, the demonstration of a dilated duct does not necessarily indicate obstruction at the time of the examination. In the series reviewed by Berk and co-workers,[2] the mean diameter of the ducts in patients before cholecystectomy was 6 mm. as compared with a mean diameter of 8 mm. after cholecystectomy, the patients in both groups being asymptomatic. They also compared two symptomatic groups. The mean diameter of the ducts was 6.4 mm. in the precholecystectomy group and 10.6 mm. in the symptomatic postcholecystectomy group. However, it must be noted that these are mean diameters and that there is such an overlap in the range of diameters in these various groups that little reliance can be placed on the size in any individual case. Wise and O'Brien said that in their series all ducts that were explored and that measured over 15 mm. were partially obstructed and all ducts measuring under 8 mm. that were explored were unobstructed. We have observed a number of cases in which ducts between 8 mm. and 12 mm. in diameter were found to be unobstructed at operation (Figure 5). We do not know what the upper limit of normal is but feel that a diameter greater than 15 mm. is probably of significance.

Wise and O'Brien felt that if the density of the common duct did not decrease significantly in the 120-minute film when compared with the 60-minute film, partial obstruction was present. Conversely, a decrease in density would be evidence against a significant obstruction. We feel that, in general, comparison of density in multiple films even during the same study is difficult; however, this observation may prove helpful.

*Courtesy of Dr. Denis C. Adler of Los Angeles.

Figure 5.—Common bile duct measuring 12 mm. in diameter. At operation, there was no evidence of obstruction and the duct was considered to be entirely normal.

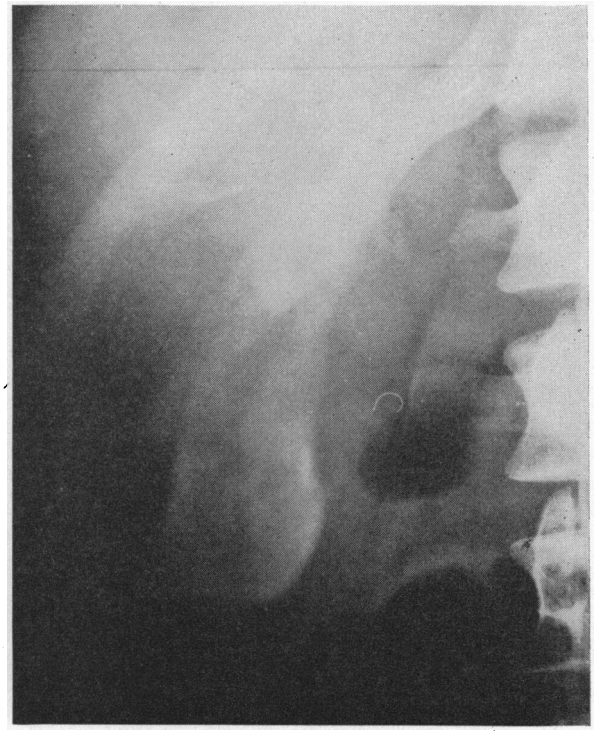

Figure 6.—Incomplete mixing of the contrast material and the gallbladder content.

The finding of cystic duct remnants, kinking and distortion of the duct and dilatation above a narrowed segment can be of significance, but must be correlated closely with the clinical findings. In one case in which there was a cystic duct remnant, a duodenal ulcer was present, which, it was felt, accounted for the symptoms. We have seen a number of other cases in which the clinical symptoms could not be attributed to the remaining portion of the cystic duct.

CHOLECYSTOGRAPHY

Intravenous cholecystography has been suggested as a supplementary examination to oral cholecystography when there is failure of visualization of the gallbladder. In view of the high index of accuracy of cholecystography with oral contrast media, we question the value and practicality of such a supplementary examination. Of 27 intravenous cholecystograms reviewed, there were 19 in which the gallbladder was not visualized. This group was among the earlier patients examined by this method, and the number of failures is undoubtedly high because of the increased incidence of jaundice and liver impairment at the time of study. In 12 of the 19 cases in which visualization failed, diseased gallbladders were observed at operation and in one case the organ was normal. In the remaining six of the 19 cases, operation was not done. There were eight cases in which the gallbladder was opacified. In two cases there were demonstrable stones but the patients were not operated upon. In one instance, gallstones were not visualized but stones were found at operation.

Failure to visualize the gallbladder is not felt to be necessarily indicative of obstructed cystic duct or diseased gallbladder. In two instances in the present series there was a normal oral cholecystogram and failure of visualization by the intravenous method. Also, the expense, inconvenience and added risk of injecting a contrast material must be considered. However, preoperative cholangiography in patients about to undergo cholecystectomy would seem to hold some promise in that unnecessary exploration of the common bile duct may be avoided. The authors feel that intravenous cholecystography in general should be reserved for patients who for some reason are felt to be incapable of absorbing or retaining the oral contrast media. Occasionally, it may be indicated in patients in whom emergency operation is contemplated and time is an important factor. A recent example of the latter was a young girl who had been involved in an automobile accident and who was suspected of having a ruptured gallbladder. An intravenous cholecystogram quickly demonstrated an intact gallbladder.

Other problems in interpretation of the cholecystogram can be expected. Reflux of the contrast material into the duodenal bulb[1] or antrum of the stomach may simulate a gallbladder remnant or even the gallbladder itself. Failure of adequate mixing of the contrast material with the gallbladder contents may simulate stones; or, if layering occurs, nonopaque stones may be overlooked. This may be avoided by continuing the examination until maximum concentration and mixing have occurred. Sometimes a zone of increased density adjacent to the gallbladder wall is noted during the course of the examination (Figure 6). This is probably due to incomplete mixing and the ability of the gallbladder to concentrate the material.

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A.M.E.F. Contributions

ON OCTOBER 1 of 1956 the American Medical Education Foundation had received donations of $587,285 since January 1. This does not include $130,000 from the California Medical Association which has been voted but will not be transferred until December. This total of $717,285 compares favorably to the $540,343 that was "on the books" on October 1, 1955 and assures that in 1956 the Foundation will again have a gratifying increase in income.

It is possible to make real achievement this fall, however. Many states are launching campaigns during the autumn period as they have in years past. These campaigns should result in the normal increase we have enjoyed throughout the year.

But—a dramatic goal is in sight: *One Million dollars for 1956* without the previous years' A.M.A. seed grants. If, across the country, every chairman and committeeman would urge that the contributors in his state add two dollars more to their donation; if every doctor who has given to his school or another charity sends just two dollars more to the Foundation, this *Million Dollar mark* will be reached.

—*American Medical Education Foundation Bulletin*