

# Experiences with the Use of Intracholedochal Heparinized Saline for the Treatment of Retained Common Duct Stones

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WE RECENTLY REPORTED a case of retained common duct stones treated with a continuous infusion of heparinized saline through a T-tube with disappearance of the stones on follow-up cholangiograms.<sup>2</sup> That patient was initially treated with saline alone for a period of 7 days at which time a cholangiogram demonstrated the continued presence of at least three stones. In a dose of 25,000 u every 8 hours heparin was added to the continuous saline infusion at that time and a cholangiogram repeated 5 days later was of poor quality but seemed to demonstrate disappearance of the stones. An additional week of heparinized saline infusions were given with follow-up cholangiographic evidence of stone disappearance. Since that report five additional patients have been successfully treated by this means and are the subject of this report.

## Case Report

**Case 1.** Patient V. T. underwent cholecystectomy and common duct exploration at Hitchcock Clinic in Hanover, N. H. Three postoperative cholangiograms demonstrated the retention of a large stone in the lower portion of the common bile duct. Figures 1 & 2 show evidence of the stone on cholangiography on 6-11-71 and 7-16-71. The patient was readmitted and treated with a heparinized saline irrigation drip continuously through the T-tube at a dose of 25,000 units of heparin per 250 cc. of saline every 6 hours. The patient had mild symptoms of cholangitis for the first 3 days of the choledochal drip which subsided spontaneously over the last 3 days of irrigation. A repeat cholangiogram (Fig. 3) on 7-28-71 demonstrated disappearance of the stone at which time the T-tube was clamped. This was well tolerated by the patient and the tube was removed 1 week later.

**Case 2.** A 69-year-old man was operated upon for obstructive jaundice and intestinal angina at Auburn, N. Y. Cholecystectomy and common duct exploration was performed with removal of common duct stones and a vein patch graft was applied to the

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superior mesenteric artery. Postoperative cholangiograms showed the presence of a retained stone on 7-16-71 (Fig. 4). The patient was a poor candidate for re-exploration and was followed as an out-patient. A repeat cholangiogram on 10-1-71 again demonstrated the presence of a large stone in the lower end of the common bile duct (Fig. 5). He was readmitted and given an infusion of 15,000 u of heparin in 250 cc. of saline every 6 hours through the T-tube. Approximately 20 hours after the start of the infusion the patient had a severe episode of colicky pain which lasted 20 minutes. Occasional intermittent episodes of pain lasting a minute or so recurred over the next 2 days and following that no further pain was noted. A T-tube cholangiogram was carried out which demonstrated a normal biliary tract. Figure 6 demonstrates a repeat cholangiogram taken 11-2-71 showing a reduction in size of the common bile duct and disappearance of the stones. The T-tube was subsequently removed and the patient has done well.

**Case 3.** M. K. was operated upon at the Kings County Hospital for jaundice and a sub-acute cholecystitis. A cholecystectomy and common duct exploration revealed common duct stones. He did well postoperatively but a T-tube cholangiogram performed on 7-19-71 (Fig. 7) demonstrated the presence of a stone in the lower portion of the common bile duct and failure of the dye to pass into the duodenum. The patient was treated with continued drainage of the T-tube and a repeat cholangiogram on 7-27-71 (Fig. 8) again demonstrated a retained common duct stone blocking exit of dye from the common bile duct into the duodenum. The patient was then started on 25,000 u of heparin in 250 cc. of saline as a continual drip every 8 hours through the T-tube. He experienced no episodes of cholangitis and tolerated the drip well. A repeat cholangiogram was made on 8-2-71 and demonstrated disappearance of the stone from the common bile duct and free entrance of the dye into the duodenum (Fig. 9). At this point the T-tube was removed and the patient's remaining post-operative course was uneventful.

**Case 4.** E. R. was operated upon at the Kings County Hospital undergoing cholecystectomy and common duct exploration for cholecystitis and jaundice. Her postoperative course was uneventful and on 12-30-71 a cholangiogram was performed. This demonstrated a failure of dye to enter the duodenum (Fig. 10) and was interpreted as a stone retained in the lower portion of the

Submitted for publication April 5, 1972.

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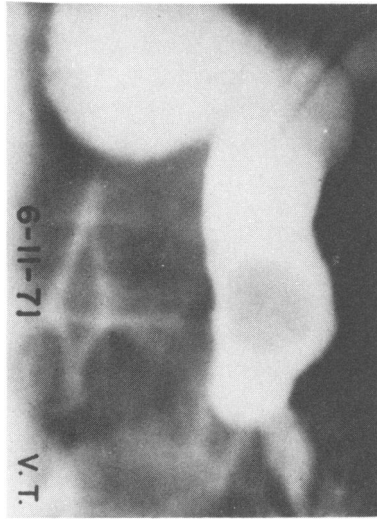


FIG. 1 and 2. Case 1—  
Large retained common  
duct stone.



FIG. 3. Case 1—After  
heparin treatment the  
stone is gone.

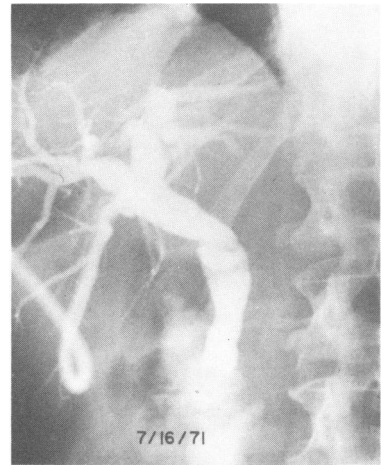


FIG. 4 and 5. Case 2.—  
Large retained stone at  
lower end of common bile  
duct.

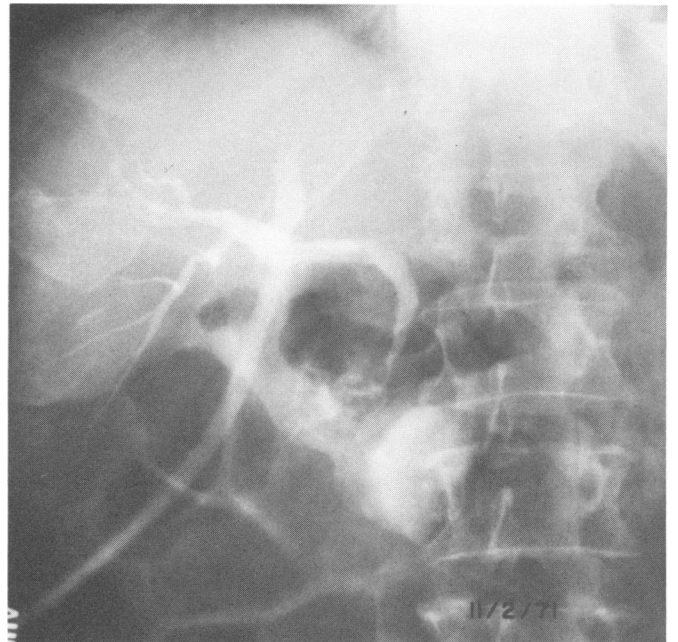


FIG. 6. Case 2—Demonstrating normal common duct without  
stones.

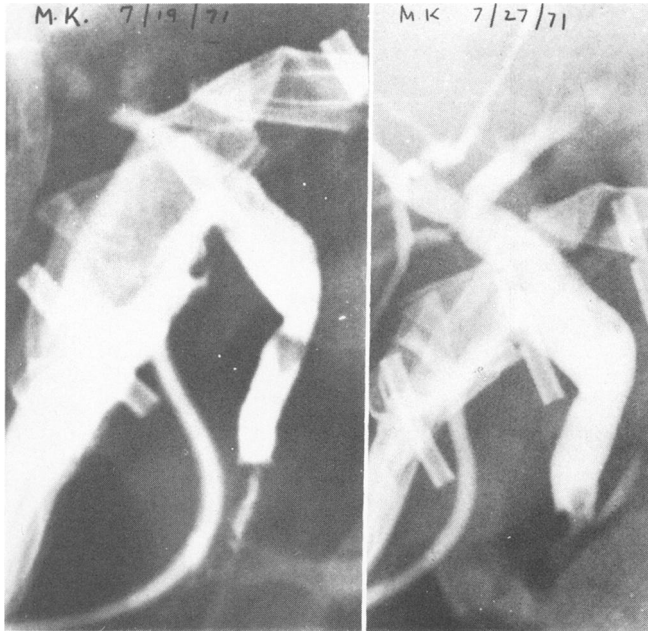


FIG. 7 and 8. Case 3—Retained common duct stone with failure of passage of dye into duodenum.

duct because of the configuration of the lower end of the bile duct with a sharp cut-off. The patient was started immediately on a heparinized saline drip using 25,000 u of heparin in 250 cc. of saline every 8 hours. The patient experienced no cholangitis or pain and tolerated the drip without difficulty. A repeat cholangiogram was performed on 1-6-72 (Fig. 11) and demonstrated free passage of dye into the duodenum without evidence of obstruction and no stone could be demonstrated. The T-tube was removed and the patient's remaining course was uneventful.

**Case 5.** An obese woman was operated upon at St. John's Hospital in Brooklyn for acute cholecystitis and jaundice on 12-17-71. Common duct stones were found and a T-tube was



FIG. 9. Case 3—Demonstrating free passage of dye into duodenum and no retained stones (8/2/71).

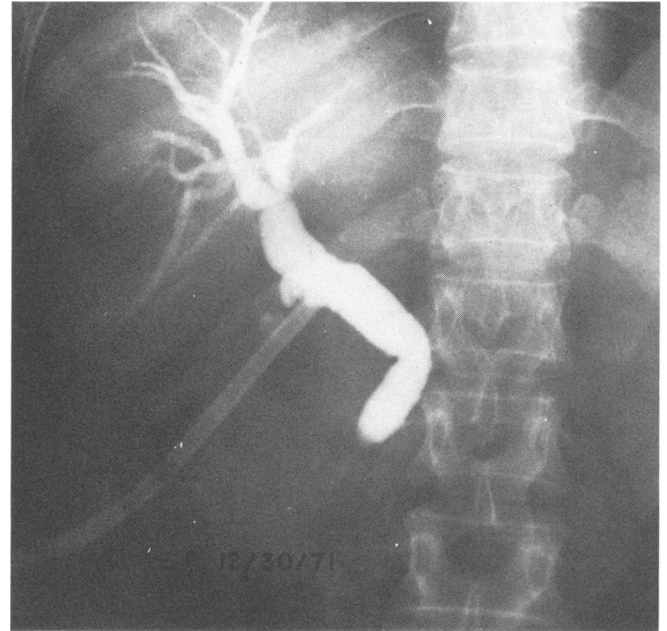


FIG. 10. Case 4—Obstruction of flow of dye into duodenum with configuration of stone in lower end of duct.

left in place postoperatively. A cholangiogram (Fig. 12) on 12-22-71 demonstrated retained common duct stones. On 12-25-71 the patient eviscerated and was reoperated upon as an emergency at which time a re-exploration of the common bile duct was performed revealing three additional stones. A T-tube was again left in place, the incision was closed and on 12-30-72 repeat cholangiogram demonstrated failure of passage of dye into the duodenum. The patient was treated with bile salts and magnesium sulfate by mouth and several irrigations of the T-tube with ether and nitrites. On 1-11-72 a repeat cholangiogram (Fig. 13) again demonstrated retained common duct stones. Because of the previous two operations it was felt unwise to re-explore the patient again at this time

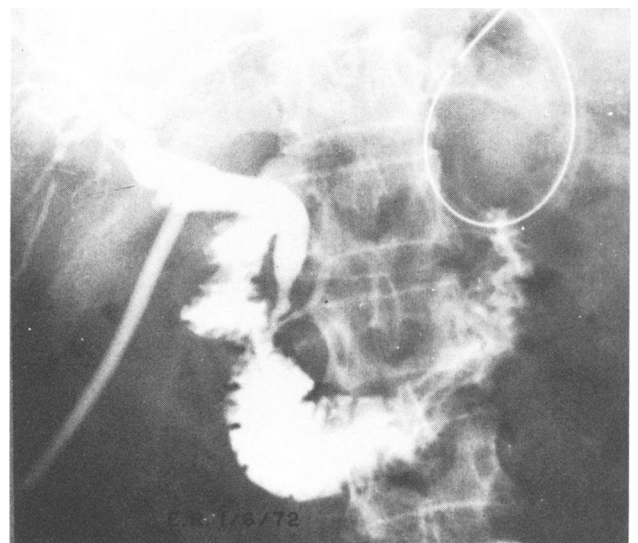


FIG. 11. Case 4—Normal common duct.



FIG. 12. Case 5—Demonstration of retained stones in common bile duct.

and heparinized saline irrigations were begun through the T-tube using 15,000-20,000 u of heparin in 250 cc. of saline every 8 hours as a continual slow drip. The patient experienced no discomfort or cholangitis from the treatment and on 1-19-72 a cholangiogram (Fig. 14) demonstrated complete patency of the biliary system, disappearance of the stone, and a rapid entrance of the dye into the duodenum. The T-tube was subsequently removed and the patient's course was then uneventful.

### Discussion

We hypothesize on the basis of our previous work<sup>2,3</sup> that heparinized saline would be a useful adjunct in the irrigation of the common bile duct in which precipitation of sediment was a problem. We were pleased to publish a successfully treated instance in which retained common duct stones disappeared by use of this treatment. At that time we encouraged other surgeons to attempt the treatment when indicated in order to test its efficacy and have thereby accumulated the subsequent five case reports.

The theory is based on increasing the suspension stability of bile by the addition of a highly negatively charged ion (heparin). We have demonstrated marked increases in negative zeta potential of a standard particle electrophoresed in bile containing heparin.<sup>3</sup> This indicated that the bile salt lecithin cholesterol micelles might be readily dispersed in solutions of this type. It is possible that the development of a gallstone with a calcified surface would tend to militate against dissolution merely on the basis of alteration of suspension stability of the solution in which the gallstone is placed. However, if the polar groups on the surface of the stone are positively charged and oriented toward the solution some dispersion may then occur in the presence of large quantities of negatively charged ions leading to softening or fragmentation of the stone. We do not feel that the

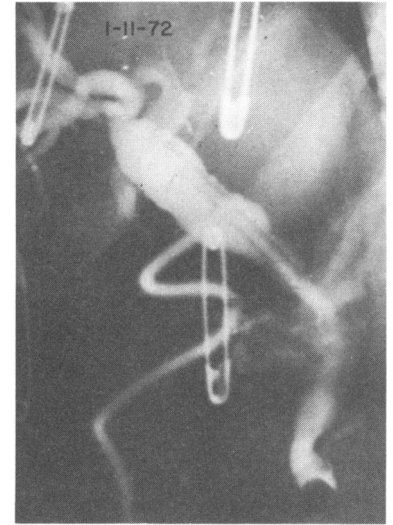


FIG. 13. Case 5—After treatment with ether irrigations and nitrites—retained stones are demonstrated.

irrigations alone are responsible for the success of the treatment since in the original case saline without heparin failed to remove the stones and in the last case reported in this paper—irrigations with ether and nitrites failed to alter the configuration of the retained stones. Unfortunately the other patients in the cases reported were not initially treated with a control solution in order to further test that hypothesis. In addition it is unlikely that the stones are passed in their original form since the large size of the stones as noted on the chol-



FIG. 14. Case 5—After heparinized saline irrigations—duct is normal.

giogram of the first two reported cases would heavily militate against spontaneous passage. It is more likely that fragmentation of the stone is occurring with the heparin drip and the smaller particles are then spontaneously passed. Another possibility may be a direct effect of heparin on the sphincter at the lower end of the common bile duct with either reduction in postoperative inflammation or sphincter relaxation being responsible in part for the stone passage. Once again, there would have to be some alterations in the size or configuration of the stones in order to explain the disappearance of the large stones noted in the first two cases.

The six cases so far reported represent an addition to the repertoire of treatment for retained common duct stones with a T-tube in place. Unfortunately destruction of heparin prevents its oral use and parenteral heparin produces alterations in blood clotting which would prohibit its use by that route for dissolution of gallstones. We have no evidence at the present time of excretion of heparin via the bile.

#### Summary

Five additional cases of retained common duct stones which disappeared after irrigation of a common duct with

heparinized saline are presented. Cholangiographic evidence is presented which indicates that this procedure represents an important addition to the treatment of retained common duct stones.

#### Addendum

At the present time we have accumulated 15 successful cases and four failures with this treatment for retained common duct stones.

#### Acknowledgment

We are indebted to Drs. Weismann, Buffington and Coppola for the use of cholangiograms reported in this paper.

#### References

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