

## Results of Subhepatic Fluid Collection after Cholecystectomy; A Serial Sonographic Study

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*A prospective serial ultrasonographic study was conducted to assess the incidence of subhepatic fluid collection in 130 elective cholecystectomy patients with and without surgical drains. Fluid collection was observed in 33(25.4%) of a total of 130 cases, comprising 16 of 60 cases (26.7%) in the drained group and 17 of 70 cases (24.3%) in the undrained group. This difference was not statistically significant ( $P>0.05$ ). At the time of the initial, second, and final serial scans, fluid collection was seen in 22.3% (29/130), 10% (13/130), and 1.5% (2/130) of the cases, respectively. There was no bile leakage among the patient receiving surgical drains, nor did fluid collection continue for more than 2 weeks that manifested clinical symptoms. These results indicate that drainage after uncomplicated elective cholecystectomy is unnecessary, and that the timing of ultrasonographic studies is one of the critical factors in determining the incidence of postcholecystectomy subhepatic fluid collections.*

**Key Words:** Postcholecystectomy, subhepatic fluid collection, ultrasonography

In the past, a large number of series studies have suggested that routine drainage after an uncomplicated cholecystectomy is unnecessary. Those studies, whether they were retrospective (Kambouris *et al.* 1975; Goldberg *et al.* 1975; Kassum *et al.* 1979) or prospective (Farha *et al.* 1981; Budd *et al.* 1982), were invariably designed to compare the incidence of complications, post-operative fever, hospital stays, etc., between patients who received a surgical drain, the drained group and those who did not, the undrained group. Because modern ultrasonographic technique can demonstrate the exact location, the amount, and the nature of peritoneal fluid collections (Goldberg 1976; Neff *et al.* 1983; Edell and Gefter 1979), this modality has provided additional objective evidence to resolve the debate related to drainage after cholecystectomy. (Mauil *et al.* 1981; Elboim *et al.* 1983).

We performed a prospective serial ultrasonographic study to assess the incidence and

resolution of subhepatic fluid collections with and without drainage after elective cholecystectomy. The incidence of fluid collection in relation to the length of surgery and the results of bile culture were also evaluated, along with the possible role of the drain as a conduit for microorganisms to enter the subhepatic space.

### MATERIALS AND METHODS

One hundred thirty patients who underwent elective cholecystectomy for gallstones at the Department of Surgery, Yonsei University college of Medicine from November, 1983 to October, 1985 were evaluated. Following a subcostal or paramedian incision, cholecystectomy was performed according to standard procedures. An operative cholangiography was performed usually via the cystic duct, and the gallbladder bed was closed mostly. The operations were performed by four surgeons. The decision to use or not to use a drain was left to the surgeon. A penrose drain was placed subhepatically in the area of the gallbladder and exited through a separate incision. Intraoperative bile culture from the gallbladder was routinely taken. Most drains were removed and cultured two days after surgery.

All patients underwent ultrasonographic studies pre- and post-operatively; those without a drain on

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the second and seventh days postoperatively, and those with a drain on the day after removal of the drain, the third postoperative day and five days later. Those patients who had an accumulation of fluid at the time of the second scan were subjected to a final scan on the fourteenth postoperative day. Sonographic examinations were performed utilizing a commercially available real time digital sector scan (SSD-280 LS) with a phased array 3.5 MHG transducer. Fluid collection was classified as small if it was less than 10 cc, moderate for 10-20 cc, and large for more than 20 cc. Statistical analysis of the two groups was carried out using the Chi square test with 2x2 contingency tables.

## RESULTS

In a study of 130 patients 70 patients, referred to as the undrained group, did not receive surgical drains, while 60 did (the drained group). The characteristics of the two groups were on the whole comparable in age, sex, body weight, type of incision, length of surgery, and operative cholangiogram (Table 1).

Table 1. Clinical data from study groups

Data	Undrained Group	Drained Group
Number of Patient	70	60
Male	20	25
Female	50	35
Age (yr)		
Mean	57	54
Range	(29-75)	(29-79)
Body Weight (Kg)		
Mean	62	61
Range	(47-83)	(38-87)
Incision		
Kocher	35	25
Paramedian	35	35
Length of Surgery (min.)	122	115
Operative Cholangiogram	66	52

### 1) Incidence of Fluid Collection and Resolution.

Thirty three of 130 patients (25.4%) demonstrated subhepatic fluid collections (Table 2). Of these 33 cases, 17 cases (24.3%) were from the undrained group whereas 16 (26.7%) were from the drained group. This difference was not statistically significant

( $P>0.05$ ). Among these 33 cases, 29 exhibited fluid collections at the time of the initial scan, and the remaining 4 cases of fluid collection were observed in the second scan which was performed five days later in both groups. Also, the second scan showed the complete disappearance of fluid collections in 20 cases (68.9%), while the other 9 cases disclosed moderate amounts of fluid being absorbed. At the time of the subsequent scan on the fourteenth postoperative day 2 of 13 cases still demonstrated small amounts of residual fluid, however, they did not present any clinical symptoms. The relationship between the amount of fluid collection and its resolution in both groups is depicted in Table 3. The overall incidence of fluid collection on the second-third, seventh-eighth, and fourteenth postoperative days were 22.3%, 10%, and 1.5% of cases, respectively. Following surgery there was no report of bile leakage in the drained group.

Table 2. Relationship between drainage and incidence of fluid collection

Fluid Collection	Undrained Group	Drained Group	Total
Yes	17 (24.3%)	16 (26.7%)	33 (25.4%)
No	53 (75.7%)	44 (73.3%)	97 (74.6%)

NS, Not Significant;  $X^2=0.06$ , ( $P>0.1$ )

Table 3. Amount and resolution of fluid collection

Fluid Amount	Undrained Group			Drained Group		
	Initial Scan	Second Scan	Final Scan	Initial Scan	Second Scan	Final Scan
Small	12	3	0	9	2+(3)	0
Moderate	2	1	1	3	1	0
Large	2	1+(1)	0	1	1	1
Total	16	5+(1)	1	13	4+(3)	1

Values in parentheses refer to number of patients exhibiting delayed fluid collection.

### 2) Duration of Surgery

Fluid collection was found in 28.6% (22 of 77) of the cases when the surgery was concluded in less than 2 hours, and in 20.8% (11 of 53) when the operation took more than 2 hours. This difference was not statistically significant ( $P>0.05$ ).

**Table 4. Relationship between bile culture and drainage to incidence of fluid collection**

Bile Culture	Undrained Group			Drained Group		Total	
	Total	Fluid Collection		Total	Fluid Collection	Total	Fluid Collection
Positive	14	3 (21.4%)	NS	16	5 (31.3%)	30	8 (26.7%)
Negative	47	14 (29.8%)	NS	37	11 (29.7%)	84	25 (29.8%)
Not done	9	0 ( 0.0%)		7	0 ( 0.0%)	16	0 ( 0.0%)
Total	70	17 (24.3%)		60	16 (26.7%)	130	33 (25.4%)

NS, Not Significant;  $P > 0.1$  $\chi^2 = 0.007, (P > 0.1)$ 

### 3) Bile Cultures

Of the bile cultures taken from 114 patients, 30 were positive for microorganisms. Of these 30 patients, 8 (26.7%) developed fluid collections whereas 25 (29.8%) of the 84 patients with sterile bile cultures accumulated fluid. Comparing the incidence of fluid collections between the groups when the culture was positive, we found no difference ( $P > 0.05$ ). Again, similar results were found when the bile culture was negative (Table 4).

### 4) Comparison of Bile and Drain Cultures

Bile cultures as well as drain cultures were performed simultaneously in 53 patients. Eight of the 53 patients with drains (15%) had positive cultures; of these 8 patients, 6 showed negative bile cultures. In these 6 cases, the organisms identified in the drain cultures were 2 cases of *Enterobacter*, 2 cases of alpha *Streptococci*, and 2 cases of *Staphylococcus coagulase* negative. Two of 14 positive bile culture patients also had positive drain cultures; one patient had the same organism in both the bile and drain cultures, and the other had different organisms (Table 5).

**Table 5. Relationship between bile and drain cultures**

Drain Culture	Bile Culture		Total
	Positive	Negative	
Positive	2	6	8
Negative	12	33	45
Total	14	39	53

## DISCUSSION

To our knowledge, there have been only two prospective ultrasonographic studies to assess the incidence and resolution of subhepatic fluid collection with and without drainage after cholecystectomy. The first randomized and prospective study was performed by Maull *et al.* (1981). Their report indicated that fluid collection was observed in 20% of the undrained group and in 5% of the drained group. The second prospective study with nonrandomized cases was performed by Elboim *et al.* (1983); in this study, 25 of 105 cases (24%) developed fluid collection. Surprisingly, all cases of fluid collection were in the drained group. The present study, also prospective and nonrandomized, demonstrates that the incidence of fluid collections between the two groups was not statistically significant; 24.3% in the undrained group and 26.7% in the drained group. The discrepancies between the results of the 3 studies remain inexplicable. However, they may be due to differences in the design of each study. The timing of the initial ultrasound scan was similar among the 3 studies. However, other important variables such as randomization of cases, timing of surgery (elective vs. emergency) and removal of the drain, and the extent of surgery, could not be exactly correlated. Despite this discrepancy, all have drawn the same conclusion that subhepatic fluid collections in asymptomatic patients is unlikely to cause clinical problems, and the drainage after an uncomplicated cholecystectomy is unnecessary.

A serial sonographic study by Neff *et al.* (1983) was done to document the frequency and evolution of fluid collection after abdominal surgery. Localized fluid collections were demonstrated on the fourth, eighth, and twelfth postoperative days in 19%, 5%, and 2.5% of the cases, respectively. The present study is not

exactly comparable to the previous one in some aspects because that patient population was heterogenous. Furthermore, the use of a drain was not mentioned in that study. However, some relevance exists between our data and their results in terms of natural history of asymptomatic fluid collections. This led us to conclude that asymptomatic subhepatic fluid collections disappeared rather rapidly with time, and therefore, the timing of ultrasonography could be one of the critical factors in determining the incidence of fluid collections.

Interestingly, delayed fluid collections were noted in 4 patients in a subsequent scan. To our knowledge, no similar situation was reported previously in the course of normal recovery, unless some pathological conditions were present. The delayed fluid collections may be due to one of the following conditions. First, regardless of the drainage, false negative findings on the initial scan are possible because the amount of fluid collection may be too scanty to be detectable prior to the second scan. Second, the drain worked so effectively that initial scan could not detect any fluid. However, with its subsequent removal on the second postoperative day, fluid began to accumulate and was detected on the scan five days later. Finally, on the second and third postoperative days, the patients may have experienced paralytic ileus which obscured the initial scan. Then, with the resumption of bowel movement, fluid collection became detectable.

A recent report (Gold *et al.* 1985) indicated that fluid collection within seven days postoperatively in asymptomatic patients would be of little clinical significance, while in another study (Neff *et al.* 1983) persistence of fluid collection beyond the twelfth postoperative day was considered abnormal. In the present study, there were two cases in which fluid collection persisted for more than fourteen days postoperatively. Although absorption was slow, the amount of fluid continuously decreased without clinical manifestation, and therefore, sonoguided aspiration was not necessary.

Elboim and his colleagues (1983) observed that a positive bile culture was associated with a slightly higher incidence of fluid collection. Our results are not consistent with these. In this particular subset of both studies, the number of cases with positive bile cultures was much fewer than those with negative bile cultures. Therefore, it is difficult to derive any meaningful relationship between the culture results and the incidence of fluid collections from these data. Finally, our subsidiary study of bile and drain cultures con-

firmed that the drain itself could be a route for the invasion of microorganisms into the subhepatic space.

## CONCLUSION

The results of this report suggest that the timing of ultrasonographic studies is one of the critical factors in determining the incidence and resolution of postcholecystectomy subhepatic fluid collections. They also indicate that drainage after an uncomplicated elective cholecystectomy is unnecessary.

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