Cholecystostomy in the High Risk Patient with Biliary Tract Disease

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The morbidity of complications and mortality following surgical operations for nonmalignant disease of the biliary tract is greatest among those 65 years and older. The reported overall mortality regardless of age ranges upward from 0.88%.[1] At The New York Hospital-Cornell Medical Center for a 43-year period (1932–1975) it was 1.77%. For those 65 and older it was 5.1%. For patients with acute cholecystitis it was 3.5% and of those in this category 65 and older it was 9.2%. This experience and that reported from other comparable clinics is the basis for advocating that the procedure selected be within the capacity of the patient to tolerate it. Specifically a cholecystostomy, a compromise procedure, may be lifesaving for the presenting situation deferring cholecystectomy until later. Admittedly the more effectual approach is undelayed definitive surgery when calculous disease is demonstrated.

THE INCREASING INCIDENCE of calculous biliary tract disease in our population and the late sequelae that develop in those living beyond 65 years of age renders cholecystostomy an indicated procedure more frequently than in decades past. It is a palliative procedure that imposes a minimal operative burden upon the patient and carries with it fewer iatrogenic penalties than the definitive procedure of cholecystectomy. Over a period of 43 years (1932–1975) 10,479 patients with benign biliary tract disease have been treated surgically at The New York Hospital-Cornell Medical Center (Table 1). Cholecystectomy alone was done in 8077 patients, 6638 for chronic cholecystitis and 1439 for acute cholecystitis. Cholecystostomy alone was done in 373 patients, in 82 for chronic disease and in 291 for acute cholecystitis. In addition to cholecystecomy or cholecystostomy, choledochotomy was done in 1500 patients.

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Acute Cholecystitis

In the surgical treatment of 2087 patients with acute cholecystitis, cholecystostomy was employed in 301 patients, 291 with cholecystostomy alone and 10 with cholecystostomy combined with choledochotomy. Cholecystectomy alone was done in 1489 patients and in an additional 297 patients it was combined with choledochotomy.

The indications for cholecystostomy fall into 2 categories: 1) difficulties which may interfere in the safe performance of a cholecystectomy and 2) a limited capacity of the patient to tolerate the operative burden of a cholecystectomy. The most serious situations are encountered in those patients 65 and older, the majority of whom have a long history of biliary tract disease.

There are 3 principal etiological factors that contribute to the pathological changes of acute cholecystitis. They are obstruction, infection and ischemia. Any one of these 3 may be the initiating cause but obstruction in calculous disease is by far the most frequent. The potential danger in acute cholecystitis is perforation of the gallbladder and the escape of bile into the peritoneal cavity. The rapidity with which this may occur seems greatest when obstruction due to calculi is present. Also related to the pathological changes in the gallbladder in acute cholecystitis are the previous effects of the disease and its duration (Fig. 1).

Among those 65 and older many have diminished function in other organs and systems that relate to protective mechanisms that may be required following

TABLE 1. *Surgical Treatment of Nonmalignant Biliary Tract Disease*

A. Cholecystectomy	8,077
B. Cholecystostomy	373
C. A or B plus Choledochotomy	1,500
D. Choledochotomy (secondary in search of stones)	311
E. Procedures for Strictures and Miscellaneous Conditions	218
Total Operations	10,479
Mortality	1.77%

operation upon the biliary tract. The older the patient and the longer the duration of biliary tract disease, the more common are the complications of acute cholecystitis if not treated by surgery. By and large, the older the patient the more difficult it is to estimate the exact nature of the pathology of the gallbladder by clinical examination and laboratory data. Indeed temperature and white blood count may be normal and the wall of the gallbladder gangrenous. During the 43-year period from 1932–1975 the proportion of patients 65 years of age or older treated surgically for acute cholecystitis increased steadily from 3.3% per annum to 38%; among men this reached 42%, a probable factor in the higher mortality and morbidity as compared to women.

The postoperative morbidity of complications and the mortality is highest among patients 65 and older with

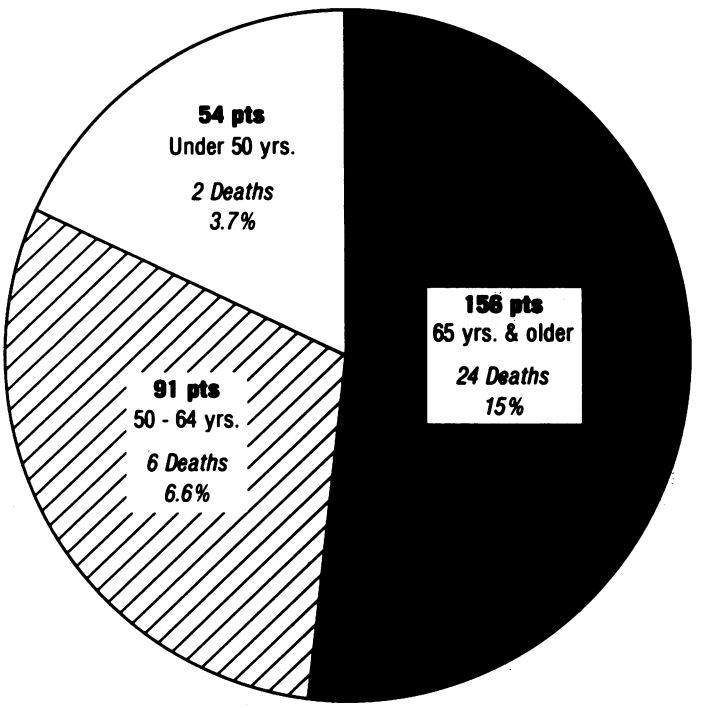

FIG. 1. Cholecystostomy for acute cholecystitis—301 patients. There were 32 deaths, resulting in a mortality rate of 10.6%.

acute cholecystitis (Table 2). In our experience at The New York Hospital-Cornell Medical Center from September 1, 1932 to September 1, 1975, 533 patients 65 years of age or older were treated surgically for acute cholecystitis. There were 49 deaths, a mortality of 9.2%. This proportion of our population is increasing. The incidence of calculous biliary tract disease is quite high among them. Cholecystostomy is being done more frequently because of contraindications for cholecystectomy with a reported mortality ranging from 7.1% to 28.5%. This is attributed largely to the advanced stages of pathological changes in the gallbladder and reduced functional capacity of organs and systems associated with age. Cholecystostomy is not the answer to this problem but rather earlier operation. The clinical course of acute cholecystitis in the young and robust is not associated with those hazards that are encountered among the elderly and debilitated.

Whether or not operation is justified for those patients who develop acute cholecystitis as a complication of the terminal phase of a systemic disease, such as hypertensive cardiovascular disease with marked arteritis and arteriolitis, depends chiefly on the probable expectancy of life at the time. Since this is extremely difficult to estimate and since catastrophic perforation of the gallbladder with resulting bile peritonitis can be averted by cholecystostomy performed under local anesthesia, it should be done. Finally there are those individuals who develop cholecystitis following operation for conditions unrelated to the biliary tract.[3,4] The problem is primarily one of diagnosis and the type of surgical treatment is dependent upon the local process and the patient's general condition (Table 3).

Primary Acute Cholecystitis

Primary, or ordinary, acute cholecystitis as a complication of cholelithiasis is associated with an impacted calculus that obstructs the outflow of the gallbladder either in the ampulla or the cystic duct. Calculi are present in approximately 95% of instances in our experience. Acalculous acute cholecystitis accounts for less than 5% and is associated with bacterial infection by way of the bile, blood stream or lymphatics. A chemical cholecystitis from bile with abnormal contents and reflux of pancreatic secretion probably occurs but is infrequent.

Acute Cholecystitis Following Unrelated Surgery

A group of 82 patients who developed acute cholecystitis following surgery unrelated to the biliary tract were treated by either cholecystectomy or cholecystostomy with 9 deaths, a mortality of 10.9%. There were 49 subjected to cholecystectomy with 4 deaths, a

TABLE 2. *Surgical Treatment for Acute Cholecystitis*

	No. Cases	Mortality
A. Cholecystectomy	1489	1.3%
B. Cholecystostomy	291	9.2%
C. A or B plus Choledochotomy	307	8.4%
Total Operations	2087	3.5%

mortality of 8.2%. The remainder of 33 were treated by cholecystostomy with 5 deaths, a mortality of 15%. The causes of death in the 9 patients in this group are listed in Table 4.

Acute cholecystitis following surgery unrelated to the biliary tract is not well tolerated. Delay in diagnosis and reluctance to subject the patient to another operation play a role in the high mortality rate.

Acute Cholecystitis Unexpectedly Encountered During Intra-abdominal Operations

A cholecystostomy for acute cholecystitis unexpectedly encountered was done in 15 patients. In each instance the gallbladder did not appear to be directly related to the condition that was being corrected surgically. There were 2 patients with liver abscesses with cholelithiasis but without calculi in the common duct and 2 had pancreatitis. Operation upon the large bowel was done in 4 instances, 3 for carcinoma and 1 for diverticulitis. Three small bowel resections were done, 2 for ileitis and 1 for benign tumor, 3 operations were performed for duodenal ulcer (2 resections and 1 gastroenterostomy) and 1 for umbilical hernia. There were 2 deaths. That acute cholecystitis so encountered is rare indeed is attested to by its occurring in only 15 patients among a total of 2087. The etiology is not evident. However all 15 had been ill for considerable time and had received medication for pain. Because the mean age for the 15 patients was 64, age may have played a role.

TABLE 3. *Acute Cholecystitis: Cholecystostomy*

	No. Patients	Mortality
Primary acute cholecystitis	243	8.2%
Acute cholecystitis following unrelated surgery	33	15.0%
Acute cholecystitis unexpectedly encountered during intra-abdominal operations	15	13.3%
Acute cholecystitis and common duct obstruction	10	50.0%

Acute Cholecystitis and Common Duct Obstruction

A common sequela of calculous biliary tract disease such as obstructive jaundice due to choledocholithiasis may occasionally quickly develop into an acute suppurative cholangitis. For 10 patients with this often lethal condition who had cholecystostomy plus common duct decompression, there were 5 deaths, a mortality rate of 50%.

Nonacute Cholecystitis

Indications for Cholecystostomy in 82 Patients with Nonacute Biliary Tract Disease

Cholecystostomy was done for nonacute cholecystitis in 82 patients; there were 7 deaths, a mortality of 8.5%. Fifty-five (55) of these were performed at the time that an operation unrelated to the biliary tract was being done and in most instances because the gallbladder contained many calculi. They were patients that the surgeon believed could well develop an acute cholecystitis in the postoperative period. However, 3 were done in patients with pancreatitis. Operations for peptic ulcer, carcinoma of the stomach or of the large bowel

TABLE 4. *Causes of Patient Deaths*

Patients	Sex, Age	Reason for Hospitalization	Cause of Death	Autopsy
		Cholecystectomy		
1. 100 50 15 E. F.	M, 65	Resection of esophagus, carcinoma	Pulmonary embolus	No
2. 77 97 45 M. W.	F, 74	Pinning fracture hip	Pulmonary embolus	No
3. 130 14 62 M. B.	M, 68	Resection, ca bladder	? septicemia	Yes
4. 109 01 59 D. P.	M, 63	Below knee amputation	Aspiration pneumonia	No
		Cholecystostomy		
1. 17 44 89 E. B.	F, 50	Resection sigmoid, carcinoma	Coronary occlusion	No
2. 113 70 01 S. Z.	F, 50	Mitral valve replacement	G-I bleeding	No
3. 128 24 19 M. S.	M, 71	Hip replacement	Gram neg septicemia	Yes
4. 108 67 45 A. A.	M, 76	Gastric resection, ulcer	? sepsis	No
5. 119 50 81 A. H.	F, 83	Amputation below knee Atherosclerotic gangrene	Cardiac failure	No

as well as inoperable and metastatic carcinoma were the conditions for which operation was embarked upon. Over half of these patients were 65 and older and many of these were debilitated.

In 27 patients cholecystostomy was planned after considerable deliberation by those in attendance and the patient. The most frequent indication was the recurrence of episodes of right upper quadrant pain brought on by ingesting even small amounts of food in the presence of direct or indirect evidence of cholelithiasis and chronic cholecystitis. The limited capacity of the patient to withstand a cholecystectomy were in order of incidence: 1) coronary heart disease and/or myocardial failure; 2) advanced general arteriosclerosis with previous cerebral accident residuals; 3) associated renal failure. Others include cirrhosis of the liver, blood dyscrasias and disabling systemic diseases such as myasthenia gravis and paralysis agitans.

Nonacute Cholecystitis and Common Duct Exploration

In addition to the 82 patients with nonacute biliary tract disease subjected to cholecystostomy, there were 10 patients who had common duct exploration as well (Table 5). The patients ranged in age from 33 to 78. There were 4 deaths, a mortality of 40%. The causes of death are listed in the following table. Three of these patients died in the early 1930's before vitamin K was used to reduce the bleeding tendency. The fourth patient died in 1945.

TABLE 5. *Causes of Death Following Cholecystostomy Plus Common Duct Exploration for Nonacute Cholecystitis*

Patient	Sex, Age	Cause of Death	Postmortem Examination
1. 6 02 59	M, 52	Common duct stones Jaundice Cirrhosis	No Autopsy
2. 8 04 67	M, 54	Common duct stones Hemorrhage Secondary to obstructive jaundice	Autopsy
3. 4 64 79	F, 33	Common duct stones Hemorrhage Secondary to jaundice	Autopsy
4. 3 66 04	F, 62	Common duct stones Coronary occlusion	No Autopsy

Cholecystostomy*

When a cholecystostomy is clearly indicated because the patient is too ill to tolerate more than a minimal procedure it may be readily done under local anesthesia (Fig. 2). (a) A vertical incision is made over the upper portion of the right rectus muscle, the usual position of the fundus of the acutely inflamed and distended gallbladder. The anterior rectus sheath is incised, the muscle fibers separated by sharp and blunt dissection. With retraction for exposure the posterior sheath and peritoneum are incised. (b) In the wall of the presenting fundus of the gallbladder a purse-string suture of silk is placed. (c) A small incision is made in the edematous serosa and a trocar is introduced and the fluid contents of the gallbladder evacuated. (d) With decompression, calculi are readily recognized. (e) These are removed. If they remain fixed in the ampulla of the gallbladder, forceps and/or a malleable pituitary spoon may be effectual in dislodging them. The gallbladder is then irrigated with normal saline solution to remove the debris within it. In the majority of patients bile will then appear in the gallbladder. (f) A four-wing Malecot catheter is introduced into the gallbladder a distance of approximately half its length and secured in place by a single suture and drawing up the purse-string suture. The catheter is then brought out through the wound in the abdominal wall. (g) The gallbladder is then secured to the abdominal wall by 4 sutures that pass through the peritoneum and posterior rectus fascia. (h) A Malecot catheter is secured to the abdominal wall and gallbladder. (i) A Penrose drain is placed alongside the gallbladder and brought out through either a separate incision or the operative wound.

For those situations in which the fundus of the gallbladder cannot be readily brought into contact with the peritoneum the following method has been employed. The objective is to provide drainage of the gallbladder extraperitoneally and avoid escape of bile into the peritoneal cavity. The incision is extended beyond that of the method just described, be it subcostal or mid-rectus. A flap of peritoneum and fascia 5 cm in width and in length sufficient to reach the fundus of the gallbladder from the abdominal wall near the costal margin is outlined. This is then dissected from the posterior aspect of the rectus muscle. A small incision is then made near the level of the base but a cm or 2 caudal to the costal margin and a Malecot catheter is passed from the gallbladder through the abdominal wall. The flap is fashioned into a tube to enclose it. The fascia-peritoneal tube is then anastomosed to the wall of the incised gallbladder.

If the fundus or distal portion of the gallbladder is gangrenous, the necrotic portion will not sustain sutures

* An early account of a planned cholecystostomy was published by J. Marion Sims[7] in 1878. A woman of 45, mother of a 19-year-old daughter, with acute cholecystitis and deeply jaundiced was operated upon by him at 10:00 A.M. on April 8, 1878, under ether anesthesia. There was incised an enlarged distended gallbladder, 8 inches in length with a thickened and edematous wall. Dark brown fluid and 60 gallstones were removed. The fundus of the gallbladder was amputated and the wall of the remaining transected portion sutured to the abdominal wall. Care was taken to pass each suture (8) through the whole thickness of the abdominal wall including the peritoneum. Death occurred 8 days later.

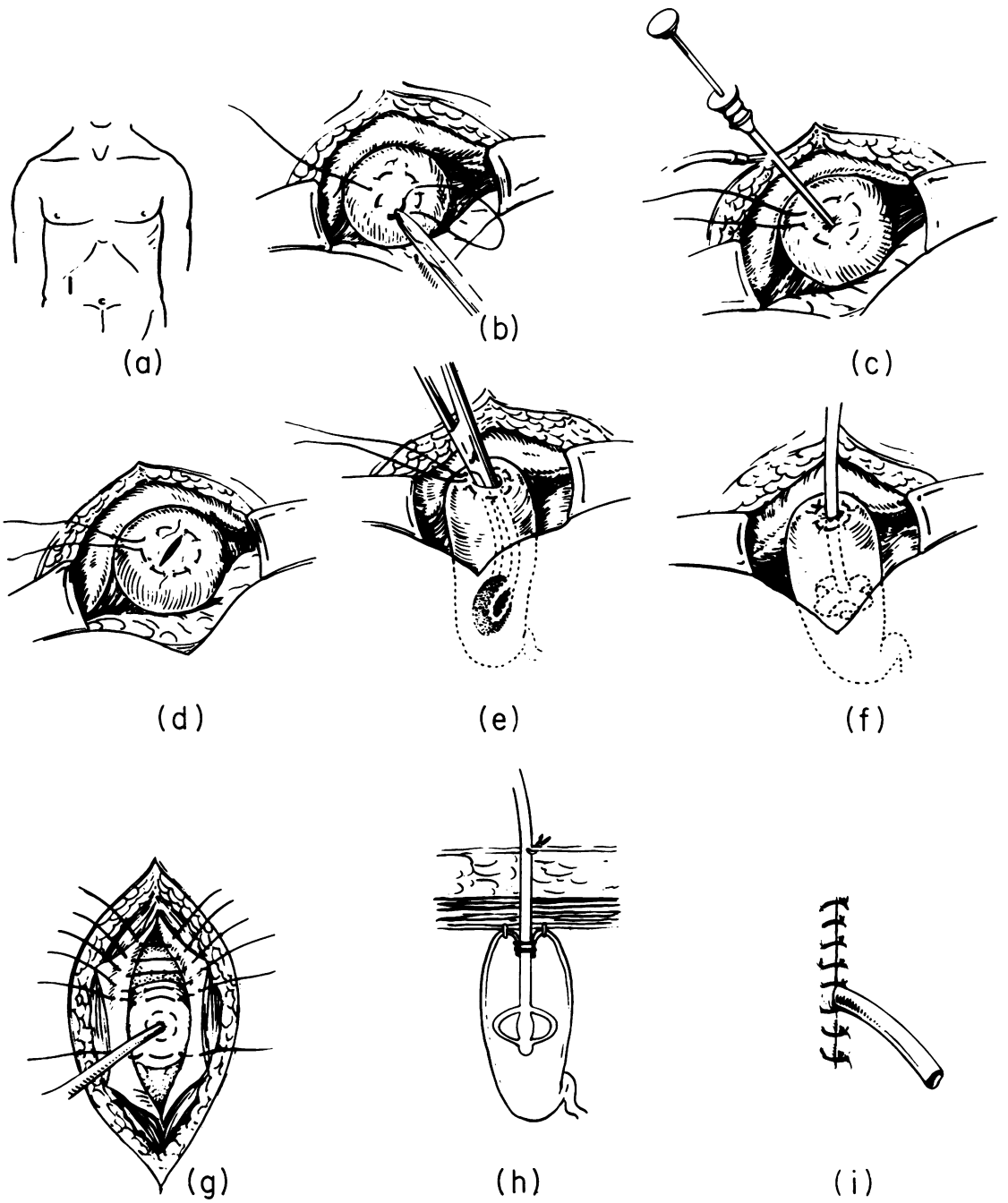

FIG. 2. Surgical procedure for cholecystostomy (see text).

to hold a drainage catheter or maintain approximation to the peritoneum of the abdominal wall. The necrotic portion is excised to whatever extent is required to provide viable gallbladder wall. Then the wall is inverted by one or more purse-string sutures of silk to secure a Malecot catheter in place. Such a remnant of the gallbladder can seldom be secured to the abdominal wall. Under these circumstances 2–3 Penrose drains are placed in the subhepatic area about the gallbladder and brought out through the abdominal wall, to establish and maintain adequate drainage to the exterior.

In nonacute cholecystitis with cholelithiasis the fundus of the gallbladder may rest several centimeters from the liver margin and the anterior abdominal wall. Using a flap of fascia and peritoneum a tube is fashioned about the Malecot catheter. By anastomosing the distal end of the tube to the gallbladder wall bile leakage into the peritoneal cavity is less likely.

Discussion

There has been much written about the subsidence of acute cholecystitis not treated surgically to the extent that cholecystectomy can be readily done. The disappearance of the acute inflammatory process has been reported to range from 2 weeks to a few months. We have found this

TABLE 6. *Mortality vs Age in the Surgical Treatment of Acute Cholecystitis*

	(A) Cholecystectomy			(B) Cholecystostomy			A or B Plus Common Duct Expl.		
	No. Patients	Deaths	Mort. Rate	No. Patients	Deaths	Mort. Rate	No. Patients	Deaths	Mort. Rate
≥65 years	260	13	5.0%	152	20	13.2%	121	16	13.2%
<65 years	1229	7	0.6%	139	7	5.0%	186	10	5.4%

difficult to determine. In the young and robust with a history of rapid symptomatic improvement from an attack, cholecystectomy is readily done. In those who are older and have had a long existent disease it may be difficult and indeed remains hazardous. Over the years patients in this latter category have been found to have a phlegmonous type of reaction that makes identification of structures almost impossible. It is suggested that time alone does not insure a reduction of the reaction in acute cholecystitis, particularly where biliary tract disease has been long existent. The situation may render cholecystostomy the procedure of choice. I have repaired injured common ducts that have been partially or completely interrupted by surgeons who have felt compelled to do a cholecystectomy following subsidence of clinical manifestations of acute cholecystitis without subsidence of the inflammatory process about the cholecysto-choledochal junction.

For those patients who had a cholecystostomy with evacuation of all the calculi in the gallbladder and without calculi in the common duct as demonstrated by cholangiography the drainage catheter may be removed within a period of 10–14 days. The sinus tract usually closes within a day or two. The patient is informed that calculi may develop in the gallbladder and that cholecystectomy is recommended. Unless there are contraindications it is suggested it be done within 3 months.

For patients with retained calculi in either the gallbladder or the ductal system, the cholecystostomy tube should not be removed. After conservative measures to rid the biliary system if they remain, cholecystectomy and choledochotomy are indicated with T tube decompression of the ductal system. The subsidence of inflammatory reaction of the gallbladder is usually sufficient at the end of 2 weeks to enable the procedure to be done. If there are any contraindications to operation it can be postponed leaving the cholecystostomy tube in place. There are many factors to be considered in those 65 and older that require critical evaluation relative to the postoperative course.

The surgical treatment for acute cholecystitis in 2087 patients included cholecystectomy (1489), cholecystostomy (291) and in addition in 307 patients choledochotomy. Cholecystectomy is the procedure of choice unless there are contraindications to this definitive procedure. With this procedure alone the mortality was 1.3%, and when combined with choledochotomy it was 7%. This is in contrast to the mortality of 15.3% for 301 patients for whom cholecystectomy was considered contraindicated. One hundred and fifty-six (156) of the 301 patients were 65 years or older, 152 undergoing cholecystostomy alone and 4, in addition to cholecystostomy, underwent decompression of the common duct. This further emphasizes that the older the patient with acute cholecystitis the more guarded is the prognosis regardless of the surgical procedure (Table 6). Advanced age with impaired physiological function of organs and systems and a high concentration of gram negative bacteria in the bile contributes to the gravity of the situation.

The experience with cholecystostomy at the Massachusetts General Hospital over a 9-year period (1962–1970) reported by Welch and Malt[9] is indicative of the seriousness of the situation for which the procedure is used. Of 154 patients undergoing cholecystostomy at this hospital between 1962 and 1970, one-half (group 1) had acute cholecystitis; the remainder had a different primary disease, and cholecystostomy formed a part of the operative procedure (group 2). Twenty-three per cent of the patients in group 1 and 18% in group 2 died in the early postoperative period.

From the Repatriation General Hospital in Sydney, Australia, Pheils and Duraiappah[6] reported that 25 cholecystostomies were done among 318 patients treated surgically for acute cholecystitis, an incidence of 7.8%. There were 2 deaths, a mortality rate of 8%.

Sixty-three cholecystostomies for acute cholecystitis performed on 72 patients were reported by Malmstrom and Olsson[5] from Lund, Sweden over a 10-year period (1957–1966) with a postoperative mortality of 20%, again emphasizing the seriousness of the situation for which cholecystostomy was performed.

Pikovsky and Grudinskaya[7] in 1967 reported on a total of 736 patients operated upon for acute cholecystitis. They emphasize that cholecystostomy for acute cholecystitis when cholecystectomy is contraindicated is associated with a high mortality rate. There were 140 cholecystostomies with 10 deaths, a mortality of 7.1%. Cafferata, Stallone and Mathewson,[2] reporting from the University of California (1969), reviewed their experience with 172 operations for acute cholecystitis, 49 of which

were cholecystostomies with a mortality rate of 28.5%. This suggests the graveness for which the operation is employed. We are inclined to the opinion that its use should be liberalized. Among an ever increasing elderly population with a high incidence of calculous biliary tract disease, cholecystostomy may be more frequently employed in the future.

An appreciation of these differences is to be kept in mind for elderly patients undergoing intra-abdominal surgery unrelated to the biliary tract, who have chronic cholecystitis and cholelithiasis. The indications for cholecystostomy as a prophylactic measure for acute obstructive cholecystitis merit critical consideration. The morbidity of complications and the mortality rate for acute cholecystitis that develops following operations unrelated to the biliary tract are considerable.

Conclusion

The prevalence of biliary tract disease and the excellent results of surgical treatment has placed operations upon the gallbladder and ductal system the most frequently performed operation within the abdomen. For the total, the morbidity of complications and the mortality is quite low. However there are 3 categories where the risk is relatively high. The first and most important includes patients 65 or older with disability who have acute cholecystitis. Second are those in the same age group with gallstones whose symptoms after eating are so severe they are debilitating and third are those who while undergoing an extensive surgical operation for a condition unrelated to the biliary tract are demonstrated to have a diseased gallbladder with calculi. An acute obstructive cholecystitis may develop in the postoperative period. To prevent this a cholecystostomy or cholecystectomy is done.

The patients with long standing biliary tract disease and/or the complication of acute cholecystitis who fall into these 3 categories and who have limited capacity to withstand surgical procedures account for most of the postoperative deaths. These may be reduced by employing cholecystostomy as a compromise and palliative procedure to meet the presenting situation. Definitive procedures may be anticipated later when circumstances are more favorable. These conclusions are based on the experience of over 10,000 patients treated surgically at The New York Hospital-Cornell Medical Center and the reports of several others.

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