

Concomitant Cholecystectomy and Coronary Artery Bypass

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Introduction and Methods: Cholelithiasis is a common disorder which may be present with coronary artery disease. Concomitant cholecystectomy and coronary artery bypass grafting (CABG) was performed in selected patients and retrospective study was performed to verify the safety of the concomitant surgery.

Results: A total of 55 patients (41 males and 14 females, mean age 64.6 ± 8.7 years) underwent concomitant cholecystectomy and CABG between 1992 and 2001 at the Shin-Tokyo Hospital Group. Exclusion from concomitant surgery was choledocholithiasis and/or acute cholecystitis. Cholecystectomy was performed via an upper abdominal incision extending the mid-sternal incision. In 48 patients (87.3%), the gastroepiploic artery (GEA) was used for coronary revascularization. The mean number of bypass grafts was 3.6 ± 1.2 . The mean operative time, intubation period, ICU stay, and postoperative hospital stay were 376 minutes, 15.6 hours, 3.9 days, and 23.0 days, respectively. Postoperative feeding was resumed 1 day after extubation. No intra-abdominal complications, delays in feeding, abdominal wound complications or postoperative bowel obstruction were observed.

Conclusions: Concomitant surgery of cholecystectomy and CABG did not increase the postoperative complications, and it is a feasible procedure of choice. (*Ann Thorac Cardiovasc Surg* 2002; 8: 358–62)

Key words: coronary artery bypass, cholecystectomy

Introduction

Cholelithiasis is a common disorder which may be present with coronary artery disease. Perioperative myocardial infarction is a major concern in patients with significant coronary artery disease and gallstones. The risk of myocardial infarction during major abdominal surgery can be reduced with appropriate coronary revascularization. Cholecystectomy can be performed either at the time of

coronary artery bypass grafting (CABG) or after CABG. In our institute, the gastroepiploic artery (GEA) is frequently used as a conduit of choice in CABG. It has been previously reported that concomitant surgery of CABG and cholecystectomy is feasible, however, these previous reports were all case reports,¹⁻³ and no large scale studies have been published. Thus, we report here a retrospective study of our experiences with 55 cases of concomitant surgery of cholecystectomy and CABG performed in our surgical group.

Methods

Between January 1992 and June 2001, a total of 2,416 consecutive patients underwent CABG in the Shin-Tokyo Hospital Group (Shin-Tokyo Hospital, Kobari General Hospital and Yokohama City Northern Hospital). Among them, 55 patients (2.3%) underwent concomitant cholecystectomy. The prerequisite of cholecystectomy is symptomatic gallstones without an evidence of choledo-

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cholithiasis, such as history of gallstone pancreatitis, history of jaundice, or dilated common bile duct. No patients with acute cholecystitis underwent concomitant surgery of CABG and cholecystectomy. Those with a history of previous upper abdominal surgery were not candidates for concomitant surgery. All patients gave informed consent prior to surgery.

Upper laparotomy was performed by extending the median sternotomy a few centimeters caudally. The internal mammary artery (IMA), radial artery and saphenous vein were prepared first. If the GEA was harvested, its quality was evaluated by finger palpation and then harvested in the usual manner.^{4,5} Briefly, dissection of the GEA was carried out proximally to the pylorus ring and distally to the mid-portion of the greater curvature of the stomach using an ultrasonic scalpel. After the entire length of the GEA was harvested, cholecystectomy was performed from the same incision. The liver was elevated and the gallbladder exposed. An incision was made into the serosa of the gallbladder and separation of the gallbladder from the liver bed was carried out. Care was taken to prevent the contents of the gallbladder being expelled into the abdominal cavity. The dissection was carried out from the fundus toward the ampulla. The gallbladder was retracted anteriorly to assist in identifying the cystic duct and cystic artery. The cystic artery was clipped and transected. The cystic duct was then ligated in close proximity to its junction with the common bile duct and transected. The gallbladder fossa was irrigated and meticulous hemostasis was achieved. After heparin was administered, the pedicles of the GEA and IMA were transected. The GEA was used as an in-situ bypass passing through the anterior surface of the liver via a small hole made in the diaphragm. CABG was performed under cardioplegic arrest with normothermia (36°C) supported by cardiopulmonary bypass or off-pump CABG under a beating heart (after 1996).⁶ The abdominal wound was closed shortly before chest closure. No drains were placed in the gallbladder fossa.

Postoperative care for the concomitant surgery was the same as for routine CABG. Antibiotics, the first generation of Cephem, were continued for 5 days. Oral feeding was started the day after extubation.

By retrospective chart review, the following parameters were collected: patient's age, gender, cardiac profiles, preoperative risk factors, graft material, surgical data, postoperative complications and mortalities. Outpatient follow-up was completed by the referring cardiologists or hospital outpatient clinic and compiled by December

31, 2001. Any cardiac events after discharge were reported, including myocardial infarction, angina, arrhythmia requiring hospitalization, congestive heart failure requiring hospitalization, native coronary artery or graft stenosis requiring any type of coronary intervention, and sudden death. Results were expressed as mean±standard deviation.

Results

Patient demographics

The patients consisted of 55 patients (41 males and 14 females, mean age 64.6±8.7 years). The preoperative data are described in Table 1. There was one emergent surgery and one redo CABG. All patients had gallstone documented by preoperative abdominal ultrasound.

Operative results

Operative data are shown in Table 2. The mean number of distal anastomoses was 3.6±1.2. All patients received a left internal mammary artery (LIMA) graft. The GEA was utilized in 48 patients (87.3%). The operation time was 376.1±102.0 minutes. Blood transfusion was required in 17 patients (30.9%). No intra-abdominal operative complications were noted.

The postoperative course is also displayed in Table 2. Patients remained intubated for 15.6±27.1 hours and resumed feeding the day after extubation. They stayed in the ICU for 3.9±3.8 days and were discharged from hospital after 23.0±22.8 days. Major complications were observed in 6 patients; however, no intra-abdominal complications such as delay in feeding, small bowel obstruction or abdominal incisional hernia occurred. One patient required a prolonged hospital stay (175 days) to treat pneumonia and respiratory failure. There were no hospital deaths in the studied group.

The recovery of patients who underwent concomitant surgery was compared to patients who underwent CABG during the same period of study, using the Student's t-tests for continuous variables or chi-square tests (Fisher's exact tests if n<5) for categorical variables. The control group consisted of 2,352 patients and received 3.3±1.1 distal anastomoses. The intubation time (15.6±27.1 hours in the concomitant group vs. 12.0±22.9 hours in the control group, p=0.32, NS), ICU stay (3.9±3.8 vs. 3.1±3.2 days, p=0.12, NS), postoperative hospital stay (23.0±22.8 vs. 17.6±11.4, p=0.08, NS), major complication rate (10.9% vs. 13.6%, p=0.56, NS) and mortality rate (0% vs. 1.7%, p=0.41, NS) were not significantly different.

Table 1. Preoperative patient demographics

	n=55	
Clinical characteristics		
Age	64.6±8.7	(28-82)
Age over 75	5	9.1%
Female sex	14	25.5%
Cardiac profile		
Previous myocardial infarction	37	67.3%
History of congestive heart failure	10	18.2%
Poor ejection function (<40%)	6	10.9%
Redo surgery	1	1.8%
Emergent surgery	1	1.8%
Angiographic profile		
Left main disease	8	14.5%
Number of diseased vessels	2.8±0.5	(1-3)
Three vessel disease	46	83.6%
Coronary risk factors		
Hypertension	28	50.9%
Diabetes	25	45.5%
Insulin user	9	16.4%
Hyperlipidemia	19	34.5%
Obesity	8	14.5%
Family history	14	25.5%
Comorbidity		
Peripheral vascular disease	3	5.5%
Cerebral vascular accident	9	16.4%
Chronic pulmonary obstructive disease	1	1.8%
Calcified ascending aorta	4	7.3%
Renal dysfunction (Serum Cr>1.5 mg/dl)	16	29.1%
Hemodialysis	2	3.6%

Remote results

Postoperative follow-up was completed in 53 patients (96.4%) with a mean follow-up period of 5.0±2.4 years (Table 3). During the follow-up period, there were 11 deaths (20.0%), including 1 cardiac death (1.8%), and 6 cardiac events (10.9%). No patients experienced cholelithiasis or small bowel obstruction after surgery.

Discussion

Acute cholecystitis developing in the early period of CABG is not common.⁷⁾ However, its prognosis is poor and the mortality rate is reported to be as high as 47% if it occurs during perioperative period.⁸⁾ Thus, symptomatic gallstones should be treated as soon as adequate coronary revascularization is completed.

Concomitant surgery of CABG and cholecystectomy was first reported in 1989³⁾ and concomitant surgery of GEA grafting and cholecystectomy in 1991.²⁾ A major advantage of concomitant surgery of CABG and chole-

cystectomy over a two stage operation is the graft preservation. Even a relatively simple abdominal operation, such as a cholecystectomy, may be a high risk and complicated procedure if the GEA graft has been utilized for coronary revascularization.¹⁾ Injury to the GEA graft will cause rapid hemodynamic deterioration, which requires rapid cannulation and cardiopulmonary bypass. Even if the GEA graft is not injured during an abdominal operation, traction to the pedicle may cause decreased graft flow and ischemia of the perfusion area of the heart.¹⁾

The GEA has been widely used for CABG since Suma reported its procedure in 1987.⁹⁾ The graft patency rate of in-situ GEA has known to be good, 91% at 3 years, which is superior to saphenous vein.^{9,10)} In our practice, in-situ GEA is used as the third conduit of choice following the left and right IMAs, and targeting revascularization of the right coronary system. To avoid inappropriate hemostasis of the conduits or graft kinking, we place the GEA to the anterior surface of the liver. The prevalence of abdominal complications after GEA grafting is relatively

Table 2. Operative results

	n=55	
Number of distal anastomosis	3.6±1.2	(1-6)
Aortic clamp time (minutes)	67.0±32.2	(12-209)
Pump time (minutes)	104.8±63.3	(35-428)
Off-pump CABG	3	5.5%
Operation time (minutes)	376.1±102.0	(160-725)
Blood transfusion	17	30.9%
Summary of grafts used		
Left internal mammary artery	55	100.0%
Right internal mammary artery	3	5.5%
Radial artery	14	25.5%
Gastroepiploic artery	48	87.3%
Inferior epigastric artery	1	1.8%
Saphenous vein	30	54.5%
Intubation (hours)	15.6±27.1	(3-164)
ICU stay (days)	3.9±3.8	(1-26)
Postoperative hospital stay (days)	23.0±22.8	(11-175)
Major complication (patients)		
Low output syndrome	0	0.0%
Postoperative myocardial infarction	0	0.0%
Respiratory failure	3	5.5%
Pneumonia	2	3.6%
Severe arrhythmia	0	0.0%
Cerebral vascular accident	1	1.8%
Re-exploration for bleeding	0	0.0%
Postoperative hemodialysis	0	0.0%
Mediastinitis	2	3.6%
Inhospital death	0	0.0%

low. However, laparotomy without knowledge of GEA grafting may cause graft injury.¹¹⁾ Thus, whenever a patient with GEA grafting undergoes abdominal surgery, the pathway of the GEA graft should be carefully evaluated by angiography.¹²⁾

On the other hand, a major disadvantage of concomitant surgery is infection due to bile spillage in the operative field. In our practice, acute cholecystitis is not suitable for concomitant surgery since the gallbladder is edematous and easy to rupture. In patients with acute cholecystitis, medical antibiotic treatment should be performed first. Due to technical reason, we do not perform an intraoperative cholangiogram. Patients with choledocholithiasis are not candidates for concomitant surgery either, since these patients require common bile duct drainage and its procedure is relatively complicated for cardiac surgeons. Choledocholithiasis should be treated by endoscopic retrograde cholangiopancreatography followed by endoscopic sphincterotomy prior to CABG. Another option for the treatment of choledocholithiasis is open common bile duct exploration after CABG, but it

Table 3. Remote results

Number of patients followed	53/55 (96.4%)
Follow-up period (years)	5.0±2.4
Patients with outpatient cardiac events	
Angina	4
Congestive heart failure	1
PTCA	1
Arrhythmia	0
Sudden death	0
Distant death	
Cardiac death	1 (1.8%)
Non-cardiac death	10 (18.2%)

should be performed by experienced general surgeons. Our series of cholecystectomy was performed by cardiac surgeons; thus, the procedure was limited to simple cholecystectomy.

Considering possible contamination of the chest wound by removal of the gallbladder, a subcostal incision for cholecystectomy was advocated by previous studies.³⁾

Even in those who reported cases of cholecystectomy performed by upper midline incision extending the midsternal incision, the abdominal cavity was closed prior to manipulation of the heart.²⁾ However, we have found that uncomplicated cholecystectomy does not increase the risk of wound infection. Furthermore, we have found that an upper midline incision provides an adequate operative field for cholecystectomy. Thus, we believe that a separate incision may not necessary for uncomplicated cholecystectomy if it is performed at the time of CABG. Our postoperative occurrence of mediastinitis was acceptable (3.6%). Even in the two patients who developed postoperative mediastinitis, the abdominal fascia remained intact and no subphrenic or intraabdominal abscesses were observed.

Patient's recovery was reasonable. The intubation period, ICU stay, and postoperative stay for the patients who underwent concomitant surgery of CABG and cholecystectomy was not significantly different from those with CABG alone. Concomitant surgery did not increase the operative mortality or morbidity rates. We concluded that concomitant CABG and cholecystectomy is a feasible procedure and which can be performed with the same risk as CABG alone.

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