Hepatectomy Without Abdominal Drainage

Results of a Prospective Study in 61 Patients

DOMINIQUE FRANCO, M.D.,*,† AZIZ KARAA, M.D.,* JONATHAN L. MEAKINS, M.D., F.A.C.S.,*,§
GIACOMO BORGONOVO, M.D.,*,‖ CLAUDE SMADJA, M.D.,‡ and DIDIER GRANGE, M.D.*

The increasingly simple postoperative course of major surgery has challenged the routine use of drainage after most abdominal surgical procedures. Therefore a prospective study was designed to determine if abdominal drainage could be safely avoided after liver resection and was evaluated in 61 consecutive patients. There was one postoperative death (1.7%) from variceal bleeding. Four other patients (6.7%) developed an abdominal complication: two right subphrenic hematomas requiring reoperation in one case and two incisional ascitic leaks requiring incisional repair in one patient. There was neither a subphrenic abscess nor bile peritonitis. Postoperative hospitalization was 11.5 ± 3 days in the entire group and 8.5 ± 1 days in patients without complications. These results suggest that liver resection can be performed safely without abdominal drainage and that the routine use of drains is unnecessary.

From the Groupe de Recherche sur la Chirurgie du Foie et de l'Hypertension Portale, Université Paris XI, Paris, Hôpital Louise Michel, Evry,* Hôpital Paul Brousse, Villejuif,† and Hôpital Bicêtre, Le Kremlin Bicêtre,‡ France

DURING THE LAST DECADE, progress in surgical technique and technology has made abdominal surgical procedures safer with a lower rate of postoperative complications and has simplified postoperative care. Abdominal drainage, which once was considered obligatory whenever the peritoneum had been opened, is now used, particularly as a routine, less and less when the surgical procedure has been satisfactory.[1] Drainage is not completely without its complications[2] such as ascending infection[3] and vascular[1] or intestinal ulceration.[4] The presence of a drain usually increases the nursing acuity[5] and prolongs the need for postoperative nursing care and hospitalization.[6] Finally it is uncomfortable and unpleasant for patients.[5] After cholecystectomy,[5,7-10] splenectomy,[11] or colectomy,[12] patients fare as well or even better without drains. However drainage is still regarded as indispensable after liver resection[13-15] based on the high risk of postoperative bleeding, bile leakage, and fluid accumulation in the space left empty by removal of liver parenchyma.

Because our postoperative local complication rate was low after liver surgery,[16] we started, in June 1985, a staged prospective study of the elimination of abdominal drainage after hepatectomy. This was first applied to patients undergoing a limited liver resection and following good results to two groups undergoing major liver surgery. The purpose of this work is to report the results of this policy of avoiding drainage in 61 consecutive liver resections.

Patients and Methods

From June 1985 to November 1988, 61 patients had liver resection without abdominal drainage. There were 34 men and 27 women averaging 54 years (range, 20 to 81 years). The indications for liver resection are given in Table 1. Hepatocellular carcinoma was the most common indication. Twenty-five patients had liver cirrhosis.

The type of resection was according to the liver anatomy of Couinaud[17] and is indicated in Table 2. There were 26 major resections, 18 segmentectomies, and 17 nonanatomic liver resections. Most of the latter were performed in patients with cirrhosis.

Resections were performed as previously described.[16] All operations were done through a long subcostal incision. Liver transection was done by kelly fracture. Hemostasis and bilistasis of any single radicle was done by resorbable clips (Ethicon[R], Neuilly Sur Seine, France). Ultrasonic or microwave dissectors were not used. Temporary clamping of the hepatic pedicle was used in 40 patients for a mean period of 25 minutes (range, 20 to 57 minutes) to avoid excess bleeding. Normovolemic he-

TABLE 1. *Indications for Liver Resection in 61 Patients*

Indication		n
Hepatocellular carcinoma		27
With a normal liver	2	
With a cirrhotic liver	25	
Liver metastases		16
From a colorectal cancer	10	
From another primary cancer	6	
Benign liver tumors		13
Cholangiocellular carcinoma		3
Intrahepatic cholelithiasis		2

TABLE 2. *Type of Liver Resection in 61 Patients*

Resection	Patients with a Normal Liver	Patients with a Cirrhotic Liver	Total Number
Major liver resections	21	5	26
Right hepatectomy	17*	3	20
Left hepatectomy	4†	2	6
Segmentectomies	8	10	18
One segment	2	8	10
Two segments	6	2	8
Nonanatomic liver resections	7	10	17

* Four patients had a right hepatectomy extended to segment IV.
† Two patients had a left hepatectomy extended to segment V.

modilution was used in 19 patients to decrease blood transfusions. All resections evolved without intraoperative complications. Mean operative duration was 240 ± 80 minutes, mean blood transfusion was 3 ± 2 units of packed red cells, and mean infusion of fresh frozen plasma was 4 ± 3 units.

A prospective study on the suppression of abdominal drainage was assessed in three successive groups of patients: 15 patients with a normal liver and limited (segmental or nonanatomic) resection, starting in June 1985; 20 patients with a cirrhotic liver and a limited resection, starting in May 1986; and 26 patients with a major hepatectomy and a normal or cirrhotic liver starting in January 1988. No patient had abdominal drainage once the protocol was begun in any of these three groups.

Before closing the abdomen, hemostasis and bilistasis of the transection plane were carefully checked and completed when necessary. No surgical glue was used. After left liver resection, the empty space was easily filled by the stomach, colon, and great omentum. After right hepatectomy the greater omentum was mobilized and, when necessary, the hepatic flexure was released to fill the right subphrenic space. The abdomen was closed in three layers by resorbable running sutures.

Cirrhotic patients received a short (one-day) perioperative course of cefotetan (1 g twice) and patients with a normal liver had no prophylactic antibiotherapy.

Results

One cirrhotic patient (1.7%) died four days after resection of segment IV from variceal hemorrhage. There were no abdominal complications at autopsy. The following results are given on the 60 survivors.

Fourteen complications (23.3%) occurred in 13 patients (21.7%). They are summarized in Table 3. There were four abdominal complications (6.7%). Two patients had a right subphrenic hematoma. The first occurred after segmentectomy V in a patient with a normal liver and a benign tumor. It was triggered by use of low-molecular-weight heparin on trial and was treated by percutaneous drainage. The second occurred after a right hepatectomy for hepatocellular carcinoma in a cirrhotic patient and required reoperation. No precise site of bleeding was found

and the recovery was uneventful. Two other patients had an ascitic leak through the wound. The first occurred after resection of segment VIII for a hepatocellular carcinoma in a cirrhotic patient with chronic respiratory failure. Strenuous coughing at extubation resulted in a small incisional dehiscence and leak of ascites that required repair. The last patient developed neoplastic ascites ten days after an extended right hepatectomy for a bulky cholangiocarcinoma, resulting in a self-limited ascitic leak through the incision.

All other complications were benign. Among seven patients with right pleural effusions, three had asymptomatic subphrenic fluid collection at ultrasonographic examination, all of which subsequently disappeared.

The rate of abdominal complications was similar after major hepatectomies (7.7%) and limited liver resections (5.9%). Abdominal and general complications were slightly higher but not significantly so in cirrhotic patients (8% and 28%, respectively) compared to patients with a normal liver (5.7% and 20%, respectively).

The mean postoperative hospital stay was 11.5 ± 3.6 days. It was 18 ± 9 days in the 13 patients with complications and 8.5 ± 1 days in the 47 patients with no complications.

Discussion

These results suggest that liver resection can be performed safely without abdominal drainage.

The imperative need for liver drainage was based on a high rate of postoperative abdominal complications in earlier series of liver resections, including postoperative

TABLE 3. *Complications After Liver Resection in 61 Patients*

Subphrenic hematoma	2*
Wound ascitic leak	2†
Right pleural effusion	7
Ascites requiring peritoneal tap	1
Incisional abcess	1
Pneumonia	1

* One patient required reoperation in the 12th postoperative hour.
† Incision was reclosed on the 6th postoperative day.

bleeding, biliary fistulas, and subphrenic abscesses.[13,14,18] Bleeding and bile leaks from the transection plane, together with remnants of devitalized liver tissue, were key factors in the origin of complications.[15] However progress in liver surgery technique has decreased the frequency of postoperative complications.[16,19] In a series of 100 consecutive liver resections for tumor, there were 1 subphrenic abscess, 1 biliary fistula resulting from accidental severance of a major bile duct, and 3 subphrenic hematomas.[16] Gentle transection of liver parenchyma along anatomical planes by kelly fracture and the use of surgical clips, which allowed careful closure of any small vascular and biliary radicles, determined this low incidence of postoperative complications.[16]

In the present series, only four (6.7%) postoperative abdominal complications occurred. Of these only the ascitic leaks might have been prevented or controlled by drainage. However they were minimal and easily managed in both patients. The diagnosis of right subphrenic hematoma was easily done, despite the absence of drainage, by ultrasonography. Fluid accumulation in an empty space after abdominal surgery is a natural event and it has been suggested that drains increase the amount of serous fluid.[20,21] In our patients asymptomatic fluid collections were eventually discovered by ultrasonographic examination in three patients with right pleural effusion. Interestingly none became infected and they vanished without treatment.

The risk of ascending infection along abdominal drains has already been emphasized[3] and it appears that after surgery for liver trauma infectious complications are less frequent when drainage was not used.[22–25] In 17 cirrhotic patients undergoing liver resection with closed abdominal drainage, postoperative infection of ascites occurred in four,[26] a complication that has not occurred since we stopped using drains.

None of the patients had bile peritonitis. Previous data suggest that after hepatectomy significant bile leaks result from injury to a major bile duct.[14] This is also the case in our experience.[16] Minor bile leakage from the transection plane is reabsorbed.

Elimination of abdominal drainage decreases postoperative patient discomfort,[6,10] simplifies the postoperative course, and shortens hospitalization.[5,6] In our early experience following hepatectomy in cirrhotic patients, a prolonged flow of fluid through abdominal drains was responsible for delayed postoperative hospitalization that averaged 17 days and significant infectious morbidity.[16,26] When elimination of drainage was found safe for limited resections, it was tried in cirrhotics and eliminated the infectious complications and reduced postoperative hospitalization by almost 50%.[26] In addition to the advantages for patients, this has markedly decreased the cost of liver surgery. When forgoing drainage was safe in cirrhotics, the concept seemed appropriate in all hepatic resections unless there was a compelling reason to drain.

These data support the concept that abdominal drainage need not be used routinely after liver resection. It is noteworthy that since January 1988, when all patients were entered into this study, drainage has not been used for any patient, regardless of the liver resection.

References

1. Smith SRG, Gilmore OJA. Surgical drainage. Br J Hosp Med 1985; 33:308–315.
2. Duthie HL. Drainage of the abdomen. N Engl J Med 1972; 287: 1081–1083.
3. Cerise EJ. Abdominal drains: their role as a source of infection following splenectomy. Ann Surg 1970; 171:764–769.
4. Benjamin PJ. Feculent peritonitis: a complication of vacuum drainage. Br J Surg 1980; 67:453–454.
5. Trowbridge PE. A randomized study of cholecystectomy with and without drainage. Surg Gynecol Obstet 1982; 155:171–176.
6. Hoffmann J, Lorentzen M. Drainage after cholecystectomy. Br J Surg 1985; 72:423–427.
7. Myers MB. Drain fever, a complication of drainage after cholecystectomy. Surgery 1962; 52:314–317.
8. Feingenberg Z, Wollock Y, Sokolovsky R, Dintsman M. Routine drainage in cholecystectomy. A bacteriological and clinical assessment. Am J Surg 1979; 137:313–316.
9. Budd DC, Cochran RC, Fouty WJ. Cholecystectomy with and without drainage. A randomized prospective study of 300 patients. Am J Surg 1982; 143:307–309.
10. Ronaghan JE, Miller SF, Finley RK, et al. A statistical analysis of drainage versus non drainage of elective cholecystectomy. Surg Gynecol Obstet 1986; 162:253–255.
11. Pachter HL, Hofstetter SR, Spencer FC. Evolving concepts in splenic surgery. Ann Surg 1981; 194:262–269.
12. Hoffmann J, Shokouh-Amiri MH, Damm P, Jensen R. A prospective, controlled study of prophylactic drainage after colonic anastomosis. Dis Colon Rectum 1987; 30:449–452.
13. Stone HH. Preoperative and postoperative care. Surg Clin N Amer 1977; 57:409–419.
14. Iwatsuki S, Geis WP. Specific complications in surgery of the liver. Surg Clin N Amer 1977; 57:1335–1356.
15. Thompson HH, Tompkins RV, Longmire WP. Major hepatic resection. A 25-year experience. Ann Surg 1983; 197:375–387.
16. Franco D, Smadja C, Meakins JL, et al. Improved early results of elective hepatic resection for liver tumors: one hundred consecutive hepatectomies in cirrhotic and non cirrhotic patients. Arch Surg 1989; 124:1033–1037.
17. Couinaud C. Le Foie: Études anatomiques et chirurgicales. New York: Masson Publishers, 1975.
18. Yanaga K, Kanematsu T, Sugimachi K, Takenaka K. Intraperitoneal septic complications after hepatectomy. Ann Surg 1986; 203: 148–152.
19. Iwatsuki S, Starzl TE. Personal experience with 411 hepatic resections. Ann Surg 1988; 208:421–434.
20. Elboim CM, Goldman L, Hann L, et al. Significance of post-cholecystectomy subhepatic fluid collections. Ann Surg 1983; 198: 137–141.
21. Monson JRT, MacFie J, Irving H, et al. Influence of intraperitoneal drains on subhepatic collections following cholecystectomy: a prospective clinical trial. Br J Surg 1986; 73:993–994.
22. Fischer RP, O'Farrell KA, Perry JF. The value of peritoneal drains in the treatment of liver injuries. J Trauma 1978; 18:393–397.
23. Moore EE. Critical decisions in the management of hepatic trauma. Am J Surg 1984; 148:712–716.
24. Gillmore D, McSwain NE, Browder IW. Hepatic trauma: to drain or not to drain. J Trauma 1987; 27:898–902.
25. Noyles LD, Doyle DJ, McSwain NE. Septic complications associated with the use of peritoneal drains in liver trauma. J Trauma 1988; 28:337–345.
26. Smadja C, Berthoux l, Meakins JL, Franco D. Patterns of improvement in resection of hepatocellular carcinoma in cirrhotic patients: Results of a non drainage policy. HPB Surgery 1989; 1:141–147.