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original article

Surgical drain after open or laparoscopic splenectomy: is it needed or contraindicated?

R. VECCHIO[1], E. INTAGLIATA[1], S. MARCHESE[1], S. BATTAGLIA[1], R.R. CACCIOLA[2], E. CACCIOLA[2]

SUMMARY: **Surgical drain after open or laparoscopic splenectomy: is it needed or contraindicated?**

R. VECCHIO, E. INTAGLIATA, S. MARCHESE, S. BATTAGLIA, R.R. CACCIOLA, E. CACCIOLA

Objective. *The Authors report their experience with the routine use of surgical drainage in a large series of splenectomies.*

Summary of background data. *Benefits and risks related to surgical drains have been always discussed, with some surgeons in favor of them and skeptic others considering not physiological their use. After splenectomy, their use is also largely debated, especially because of susceptibility of operated patients to infections.*

Patients and methods. *Two thousand nine cases have been reviewed. Indications for splenectomy, performed either by open or laparoscopic approach, included idiopathic thrombocytopenic purpura in 137 patients (65,4%), splenic lymphoma in 36 (17,2%), hereditary spherocytosis in 15 (7,4%), β-thalassemia in 8 (3,7%), other diseases in 13 (6,1%).*

Results. *"Active" or "passive" drains were placed in 80% and 20% of cases, respectively. Drains were removed 2-3 days after surgery in 90,2%, within 10 days in 4,3%, within 2 months in 0,4% of cases. In 2 cases a post-operative bleeding, detected through the drainage, required re-operation. One patient developed a subphrenic abscess, successfully treated by a percutaneous drainage. One case of pancreatic fistula was observed.*

Conclusions. *In Authors' experience, the use of drains after splenectomy does not affect the risk of subsequent infectious complications, independently on the type of the drainage system used. Early removal of drains in this series might have played an important role in the very low incidence of abdominal infections reported. The use of surgical drains after splenectomy might play an important role to early detect post-operative bleeding, as it happened in 2 cases of this series.*

KEY WORDS: Abdominal drainage - Laparoscopic surgery - Splenectomy.

Introduction

The use of surgical drain after abdominal surgery has always been a controversial issue.

Benefits and risks related to the operatively placed drains in the abdominal cavity have been discussed since a hundred years ago when some surgeons where in favor of the drainage, while skeptic others considered not physiological their use (1, 2).

In the common practice intra-abdominal drains have been used to help the surgeons in the post-operative phase to identify post-operative bleeding, to drain and monitor residual intraperitoneal pathologic liquids (such as bile, fecal material, pancreatic juice), and in order to prevent intra-abdominal septic collections (3).

So far, however, there is a lack of evidence proving significant benefits of surgical drains and, moreover, drains themselves have been imputed as responsible for related complications which may increase post-operative morbility (1, 4-12).

Similarly, placement of drains after splenectomy has been largely debated. Theoretically, the use of drain in splenectomised patients, whose susceptibility to infections and sepsis due to some microbial agents is well known, might predispose to an increased risk of subphrenic abscess formation and systemic infections (13, 14). This assertion, however, has been resized in other studies (15-17). The increased risk of loco-regional or systemic infections in drained patients following splenectomy, has been related to associated, not intra-operatively recognized, injuries to the pancreatic tail and/or to the bowel, or they have been ascribed to the drainage system itself (18).

In this study, we report our experience in a large series of open and laparoscopic splenectomies where the left sub-phrenic drainage has been routinely used. We attempt to answer if in our experience drainage could have

[1] Department of Surgery, University of Catania, Catania, Italy
[2] Department of Biomedical Sciences, Hematologic Unit, University of Catania, Catania, Italy

Corresponding Author: Eva Intagliata Eva, e-mail: evaintagliata@vodafone.it

altered morbility after splenectomy and what the benefits in the post-operative course had been.

Patients and methods

Clinical charts of patients who underwent open or laparoscopic splenectomy at the Department of General Surgery at the University of Catania in Italy, from February 1983 to June 2013, have been reviewed. The following data were analyzed: demographic data, indications for surgery, type of surgery (open or laparoscopic), associated surgical procedures, length of operations, type of surgical drainage, post-operative day of drain removal, post-operative complications.

Open splenectomy was performed in the traditional fashion. Laparoscopic splenectomy was performed (19) through a Hasson-trocar inserted in the left sub-hepatic region, two 5-millimeters trocars in the sub-xifoid and in the sub-costal anterior axillary line, and a 12 - millimeters laterally to the Hasson – trocar, in the left flank. With the patient lying in the right semilateral position (left flank elevated about 45° above the operating table), using a 30° scope, after dissection of the spleno-colic ligament, division of the gastrosplenic ligament with the short gastric vessels was accomplished using the ultrasonic dissector. The convex surface of the spleen was then accurately dissected from the lateral abdominal wall and from the diaphragm. At this point, the splenic hilum was approached from the anterior aspect and the splenic artery and veins were clipped and divided, using a laparoscopic stapler. Splenic hilum, tail of the pancreas, splenocolic and gastrosplenic ligaments, omentum and paraduodenal area were always checked for accessory spleens. The spleen was then inserted in a plastic bag which was pulled through the abdominal umbilical access. The spleen was finally crushed and removed.

Both in open and laparoscopic splenectomies a drainage was put in place in the left subdiaphragmatic region.

Results

In 209 cases all the above data were available and were reported in this study. Male to female ratio was 0,9 (133/144). Mean age of the patients was 43 years (range: 8-83 years). Indications for splenectomy were idiopathic thrombocytopenic purpura in 137 patients (65,4%), splenic lymphoma in 36 (17,2%), hereditary spherocytosis in 15 (7,4%), β-thalassemia in 8 (3,7%), 13 (6,1%) other diseases (myelofibrosis, splenic cyst, splenic mycosis, benign tumors), as shown in Table 1. Splenic longitudinal diameter, detected preoperatively through ultrasonography or CT scan, ranged from 10 to 14 cm in benign diseases, and from 18 to 24 cm in malignant diseases.

104 patients underwent open splenectomy, whereas in 105 patients laparoscopic splenectomy were performed. Associated procedure performed during splenectomy included 19 liver biopsies (11 in laparoscopic surgery, 8 in open surgery), 12 cholecystectomies (in laparoscopic surgery), 2 ovarian cyst resections (in laparoscopic surgery), and 3 abdominal lymphonodal biopsies (2 in laparoscopic surgery, 1 in open surgery) (Table 2).

Mean operative time was 65 minutes in both laparoscopic and open procedures, ranging from 40 minutes to 1 hour and a half. Intraoperative blood loss varied from 0 to 150 ml (median 80 ml in open procedure and 40 ml in laparoscopic splenectomy).

Twenty patients required blood transfusion after open splenectomy and 6 after laparoscopic splenectomy. Fourteen patients required conversion to open surgery (13%), 10 for tumoral invasion of the peri-splenic structures, 3 for intra-operative bleeding not well manageable through laparoscopy, and 1 because of lack of anatomical definition

TABLE 1 - INDICATIONS TO SPLENECTOMY.

PATHOLOGY	N. PTS (%)
- idiopathic thrombocytopenic purpura	137 (65,4%)
- splenic lymphoma	36 (17,2%)
- hereditary spherocytosis	15 (7,4%)
- β thalassemia	8 (3,7%)
- others (myelofibrosis, splenic cyst, splenic mycosis, benign tumors)	13 (6,1%)

TABLE 2 - DATA ON SURGICAL PROCEDURES.

TYPE OF SURGICAL PROCEDURES, n (%)	
- open splenectomy	104 (49%)
- laparoscopic splenectomy	105 (51%)
MEAN OPERATIVE TIME (range)	65 min (40 – 90 min)
ASSOCIATED PROCEDURES, (n)	
- liver biopsies	19 (11 laparoscopic, 8 open)
- cholecystectomies	12 (laparoscopic)
- ovarian cyst excision	2 (laparoscopic)
- abdominal lymphonodal biopsies	3 (2 laparoscopic, 1 open)
INTRAOPERATIVE BLOOD LOSS	
- open splenectomy (mean and range)	80 ml (range 0 – 150 ml)
- laparoscopic splenectomy (mean and range)	40 ml (range 0 – 150 ml)

of the Calot triangle's structures during combined laparoscopic splenectomy and cholecystectomy.

Accessory spleens, detected preoperatively by CT scan in 9 patients (6 operated on with open and 3 with laparoscopic splenectomy), were removed during the surgical procedure.

In the majority of the cases (167 patients, 80%) an active drainage was used, whereas a closed passive drainage was inserted in 42 cases (20%). Drainage was removed 48-72 hours after surgery in almost all the cases. Only in 10 cases drainage was left in place longer, because of a persistent draining. In these cases the drainage was removed within 10 days after surgery, except for one patient who developed a pancreatic fistula where the drainage was removed after 2 months (Table 3).

Mortality was reported in one case for cardiac arrest (0,3%) during surgery. Portal vein thrombosis was diagnosed in 4 patients (3 after laparoscopic and 1 after open splenectomies). In 2 patients post-operative bleeding, detected through the surgical drain, required reoperation. The patients were discharged from the hospital in day 5 (range 4-8 days). One case of sub-phrenic abscess was observed in a patient operated on for myelofibrosis two weeks after surgery, successfully treated by a CT scan guided percutaneous drainage (Table 4).

TABLE 3 - DATA ON SURGICAL DRAINS.

	N. PTS (%)
SURGICAL DRAIN	209 (100%)
- "active" drain	167 (80%)
- "passive" drain	42 (20%)
POST-OPERATIVE DAY OF REMOVAL	
- 2-3 days after surgery	199 (95,2%)
- within 10 days	9 (4,3%)
- after 2 months	1 (0,4%)

TABLE 4 - POST-OPERATIVE COMPLICATIONS.

COMPLICATIONS	N. PTS
- Post-operative bleeding	2 (1,8%)
- Portal vein thrombosis	4 (1 open, 3 laparoscopic)
- Subphrenic abscess	1 (open)
- Pancreatic fistula	1 (0,4%)
MORTALITY	1 patient (0,3%)

Discussion

Abdominal drainage has always been a subject of controversy and debate. Abdominal drainage has been the oldest procedure applied in surgery (2), but since its first use at the beginning of the '900 century not all the surgeons were in favor for its placement for prophylactic use after a surgical operation. Some surgeons (1) recommended its use, whereas others (1) were skeptics. After almost one century the debate is still open and so far no evidence exists whether or not to use abdominal drains after abdominal surgery. At the present time, little information exists in the Literature and the use of abdominal drainage after surgery is often dogmatic.

Abdominal surgical drains have been used for therapeutic or prophylactic reasons. For therapeutic reasons, drains have been placed in cases of intra-abdominal infections like in acute appendicitis with abscess, diffuse infectious peritonitis or to create a controlled external fistula in patients with leaking from intestinal suture line or pancreatic fistula (1).

Prophylactic use of the drain has been advocated to prevent abscess formation after surgical procedures at risk of peritoneal post-operative contamination (colon surgery, duodenal closure after perforation, hepatobiliary and pancreatic surgery at risk of bile and pancreatic leaks) (20). Furthermore, prophylactic drains have been placed as a warning sign to detect post-operative bleeding or anastomotic leakage (21).

However, some surgeons (22) found that their use was associated with increased septic complications, incisional hernias and intestinal obstruction.

Drains have been also implicated as a cause of local pain, and they have been associated with a risk of ascending infections (23-26). No data exists in the era of laparoscopic surgery (27). Complications of intraperitoneal drains also include drain tract bleeding, erosion of bowel and vessels, failure to remove or risk of lost drain in the abdominal cavity (1).

The type of surgical drain might influence complications related to it. Essentially, the drains may be classified as "active", when they are connected to a suction device, or "passive", when their function depends on gravity.

Passive drains are considered to be an open system, and they can be associated with contamination of the drain tract by retrograde spread of skin bacteria (5, 7). Some authors claim that passive drains are relatively inefficient in the upper abdomen because of the negative, inward sucking pressures generated during respiration (2), but others claim the opposite.

Active drains tend to become clogged by sucked tissue or clots, the higher the sucking pressure, the more prone to blockage the drain is. Sump suction drains (double-lumen systems) are more resistant to blockage, but they are usually of rigid construction and thus not considered safe for prolonged use in the peritoneal cavity (28).

Interestingly, a study of drainage after cholecystectomy showed that a single passive drain was twice as effective as a single active suction drain; also, the sump type drain was as effective as the passive one (28).

Some Authors affirm that closed-suction drain placement is not associated with a decreased risk of deep surgical site infection, also in case of isolated solid organ injury surgically treated (4).

Drainage of the splenic bed following splenectomy has similarly been hotly debated. Proponents of the use of drainage sustain that drainage is a safe, efficacious in removal of blood, serum, and pancreatic enzymes, and carries little, if any, risk of subsequent infectious morbidity (6).

In case of postoperative bleeding the volume of drained blood may facilitate a decision about further procedures and possible reoperation. However, in Piotr's series bleeding complications were diagnosed on the basis of clinical picture and ultrasonography, not on the volume of the drained fluid. That is why he thinks that routine drainage after splenectomy is not necessary (6).

Some Authors (29) have argued about the infectious complications connected with the inflammatory reaction induced by the drain and/or to ascending infections through the drain itself. In the Literature a "drain fever syndrome" has been described (29), consisting basically in fever without other symptoms of infection in patients with post-operative drainage. The clinical manifestation disappears after the drain's removal (29).

The reported high incidence of sub-phrenic abscess formation in splenectomized patients with surgical drain, has been advocated as the reason for abandoning routine or therapeutic drainage of the splenic fossa (5). In Piotr's series, infectious complications were observed in 10% of the patients who had drainage after splenectomy. The Authors reported a shorter hospital stay in patients without drainage (6), data which is confirmed also by other surgeons (29-32). Accordingly, Cohn (13) found a ten-fold increased risk of infectious complications in the splenic fossa, an increased risk which was observed also by Cherise et al. (14). Similarly, Olsen et al. (33) reported a 4,4% incidence of subphrenic abscess and Schwegman (34) a 9% incidence.

On the contrary, in a retrospective study of a large series of splenectomised patients who were drained, Ugochukwu (18) reported a low incidence of subphrenic abscess, which accounted for 0,17% of cases. An incidence of only 3,4% of subphrenic infections was also reported by Naylor (15) in more than 400 patients.

Only few studies have addressed the comparison of infectious complications rates between drained and not drained splenectomised patients. Daoud et al. (17) reported a comparable complication rate in splenectomised patients with 18,7% incidence of subphrenic abscess in the drained group and 12% in the undrained group. In a prospective randomized study, Pachter (35), comparing patients not drained after splenectomy and patients with passive or active drains, did not find significant differences in the incidence of infectious complications. In a recent study by Mohseni (4), in patients operated on for severe splenic injuries in a trauma setting, a deep vein thrombosis was observed respectively in 17% and 18% of drained and not drained patients, with no statistical difference (p=0.88) between the two groups.

The risk of subphrenic abscess formation after splenectomy has also been related to the type of drainage system, to the presence or absence of associated surgical iatrogenic pancreatic or gastrointestinal injuries and to the duration of drainage stay. In studies where a passive drainage had been used after splenectomy (33, 34), the incidence of post-operative infectious complications ranged from 4,4% to 9%. The risk of subphrenic abscess formation seemed to be much lower using the close active suction drainage, with an incidence that in the Literature ranges from 0,17% to 3,4% (15, 18). These data, however, was not confirmed in a recent study (4), where the use of intra-abdominal closed suction drains did not decrease the risk of post-surgical abdominal infections.

Subphrenic abscess formation after splenectomy in some studies seems to be related to the association of pancreatic or gastrointestinal injuries rather than to the use or the type of surgical drains. McGuire et al. (16) reported no infectious complications in splenectomised patients in the absence of associated enteric injury. Daoud (17) observed that the incidence of subphrenic abscess formation, was directly related to the occurrence of post-operative pancreatic fistula. Carmichael in 9 out of 221 patients with post-splenectomy subphrenic abscess found that in all the cases an iatrogenic injury of the gastrointestinal tract was demonstrated (5).

The early removal of drains after splenectomy could influence the occurrence of subphrenic infections. Patcher (35) in a series of 105 patients whose drains were removed within 4 days after surgery, referred a very low incidence of subphrenic abscess. Unfortunately, in other studies the time of drainage removal has not been reported (36, 37).

Conclusion

The data presented in our study represents, at our knowledge, one of the largest retrospective series that analyses the role and the complications related to the use of surgical drain in splenectomised patients. In our experience, the use of drains in the left subphrenic fossa after splenectomy does not affect the risk of subsequent infectious complications. These assertions seem to be true independently on the type, passive or active, of the drainage system used. Early removal of the drains in our series might play an important role in the very low incidence of abdominal infections reported in our study, as well as the absence of concomitant pancreatic or enteric injuries.

The use of surgical drains after splenectomy is in our experience important to detect post-operative bleeding in an early phase, which allows a prompt and efficacious treatment.

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