

# Urgent Redo-Laparotomies: Patterns and Outcome—A Single Centre Experience

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**Abstract** A proportion of the operations performed in a surgical gastroenterology department are unplanned repeat laparotomies for complications of the original procedure. We examined why, in our department, these ‘redo’ laparotomies were performed and what was their outcome. We retrospectively analyzed 6530 patients operated between September 1996 - December 2010, of these 257 redo laparotomies were performed in 193 (2.5 %) patients. There were 138 males and 55 females who had a mean age of 42 years (range 7–68 years). Eighty one (42 %) of the index surgeries were elective and 112 (58 %) performed in the emergency situation. Pancreas was the commonest organ for the index operation {50 (25.9 %)}, followed by the colon and rectum {45 (23.3 %)} and the small bowel {36 (18.7 %)}. Postoperative bleeding was the most common cause for re-exploration 66 (34.2 %) followed by an abscess or fluid collection that required surgical drainage 57 (29.6 %). The mortality rate after redo laparotomies was 33.2 % with sepsis and multi-organ failure being the commonest cause of death. Urgent redo-laparotomies that are performed following complicated abdominal operations have a high mortality rate. Postoperative bleeding, intrabdominal abscess and peritonitis are the commonest cause for redo-laparotomy. Multiple redolaparotomies and associated comorbid conditions are significant predictors of mortality.

**Keywords** Redo-laparotomy · Outcome

## Introduction

A large number of operative procedures are performed in a tertiary referral surgical gastrointestinal unit and abdominal re-exploration forms a significant proportion of these. Abdominal operations that have to be redone following the index surgery in an emergency situation are called urgent redo-laparotomies. These redo-laparotomies are usually because of complications of the index operation like biliary peritonitis, fecal fistula, burst abdomen or anastomotic leaks. Because of increased morbidity and mortality associated with these, they are often called the final choice operations [1–3]. Urgent redo-laparotomies can be subdivided into ‘on-demand surgery’ where the patient’s condition necessitates re-exploration and ‘planned’ wherein a relaparotomy is performed every 36 to 48 h for inspection, drainage and peritoneal lavage of the abdominal cavity until findings are negative for ongoing peritonitis [4]. In our department, we follow a policy of on-demand laparotomy.

Because there were few reports on the indications and results of such reoperations we retrospectively analyzed our prospectively maintained database to determine the incidence and indications for urgent redo-laparotomies and evaluate the factors affecting morbidity and mortality in such cases.

## Patients and Methods

Between 1996 and 2011 we performed abdominal operations in 6530 patients, of whom 193 (2.93 %) patients required a further urgent, unplanned re-exploration, i.e. ‘redo-laparotomy’. We excluded those patients from our

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analysis in whom a combined abdominothoracic operation was performed and those whose index surgery was performed at other hospital before being referred to our centre for further management.

The characteristics analyzed included the age, gender, primary diagnosis, index procedure performed and post-operative complications requiring redo-laparotomies. The interval between the laparotomies, mortality and cause of death were also recorded. The clinical condition, laboratory parameters and radiological investigations formed the basis for our decision to perform a redo-laparotomy. All the index surgeries and the subsequent redo-laparotomies were performed or supervised by an experienced gastrointestinal surgeon. Postoperatively patients received the third generation cephalosporins and anaerobic coverage. Further the antibiotic policy was based on microbiology reports and the patient's clinical condition. ICU stay, inotropic requirements and other supportive measures were instituted in patients on a need basis.

#### Statistical Analysis

A chi square test and the Fisher exact test were done using SPSS 11.5 software. A *p* value of <0.05 was considered to be significant.

#### Results

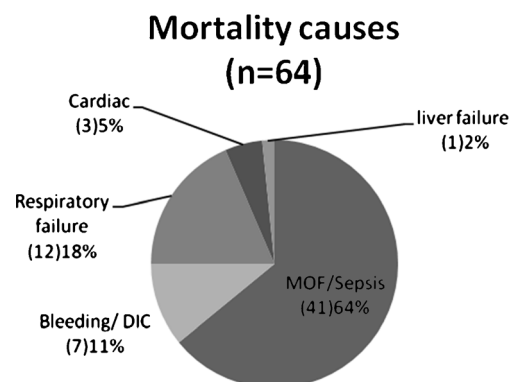
Overall a total of 6530 patients who underwent surgery during the period were included for analysis. Of those, 4928 were males and 1602 were females with mean age of 48.2 years and the mortality of the entire group was 4.54 % (Table 1). A total of 257 urgent redo-laparotomies were conducted on 193 (2.95 %) patients fulfilling the inclusion criteria, with 49 patients requiring more than one re-exploration. There were 138 males and 55 females whose mean age was 42.7 years (range: 7 to 68 years). In 81 (42 %) of these, the index surgeries were elective and in 112 (58 %) they were performed as emergencies. In 101 patients (52.3 %), infection was present during the index surgery and 49 (25.4 %) patients underwent the primary operation for malignancy. The presence of infection during index surgery and malignancy were not associated with a significant rise in mortality. Preoperative intervention in the form of radiologically guided aspiration, percutaneous drain placement or endoscopic interventional procedure was performed in 28 (14.5 %) patients, and 59 (30.6 %) patients had intervention postoperatively. These interventions had no significant impact on mortality (*p*=0.85).

**Table 1** Patient characteristics

Patient characteristics	Total no of patients (n=193)
M:F	3:1
Age( mean in yrs)	42.7
Emergency surgeries	58 %
Mortality	33 %
Mean number of reexplorations per patient	1.33
Mean interval to relaparotomies (days)	9.36 (1–29)
Average hospital stay(days)	24
Presence of malignancy	25.4 %
Presence of infection during index surgeries	51.8 %
Other interventional procedures performed	39.6 %

The pancreas was the most common site of index surgery 50 (25.9 %), followed by the colon and rectum 45 (23.3 %) and small bowel 36 (18.7 %) (Fig. 1). Postoperative hemorrhage was the commonest cause for re-exploration in 66 (34.2 %) patients followed by abscess and collection that required surgical drainage 57 (29.6 %) (Table 2). The mortality in patients undergoing urgent redo-laparotomy was 33.2 % (64/193) compared with an overall mortality of 4.54 % in the patients who did not undergo redo procedures. Redo procedures for bowel gangrene and pancreatic disease were associated with a higher mortality rate than those for abdominal dehiscence, intestinal obstruction and fecal fistulae, but these did not reach statistical significance (Table 2).

Sepsis with multiorgan failure was the cause of mortality in most patients, accounting for 41/64 (64 %) deaths followed by respiratory failure seen in 12 patients (18.7 %). Uncontrolled bleeding, disseminated intravascular coagulation and cardiac causes were responsible for the deaths of 7 (10.9 %) and 3 (4.7 %) patients, respectively. Liver failure with hepatic encephalopathy was the cause of death in a patient with chronic liver disease who underwent major hepatic resection for hepatocellular cancer (Fig. 2).



**Fig. 1** Causes of death

**Table 2** Indications for Redo-laparotomy and mortality

Indications	Total no (%)	Mortality % (n)
Fecal fistula without evidence of anastomotic failure	27 (14 %)	18.5 % (5)
Anastomotic failure	13(6.7 %)	30.8 % (4)
Abscess/collection	57 (29.6 %)	28.0 % (16)
Hemorrhage	66 (34.2 %)	42.4 % (28)
Biliary fistula	6 (3.1 %)	33.3 % (2)
Intestinal obstruction	13(6.7 %)	23 % (3)
Abdominal dehiscence	4 (2.1 %)	25 % (1)
Bowel Gangrene	7(3.6 %)	71.4 % (5)

## Discussion

The incidence of urgent redo-laparotomies performed is dependent upon the disease process and the type of surgery performed [5]. Studies have reported the incidence of urgent redo-laparotomies to range from 1 % to 4.4 % – ours was 2.95 %. Operations on the pancreas had a high incidence of re-exploration at 5.11 %. This could be due to the relatively complex case mix in our department – out of the 977 pancreatic operations performed during the period, 400 were pancreaticoduodenectomies and 191 necrosectomies.

Complications requiring redo-laparotomy have been broadly divided into five groups: (i) luminal or abdominal cavity hemorrhage, (ii) abdominal collection or peritonitis with or without the presence of perforation, (iii) postoperative obstruction (mechanical or paralytic), (iv) wound dehiscence and (v) other miscellaneous causes [3, 6, 7].

In our study, complications requiring urgent redo-laparotomies included these groups; however, we have further subdivided the second group of patients into fecal fistulae and postoperative bile leaks in the absence of anastomotic failure and intra-abdominal abscess/collection without evidence of leak. This was done to see if we could predict which group of patients would do better.

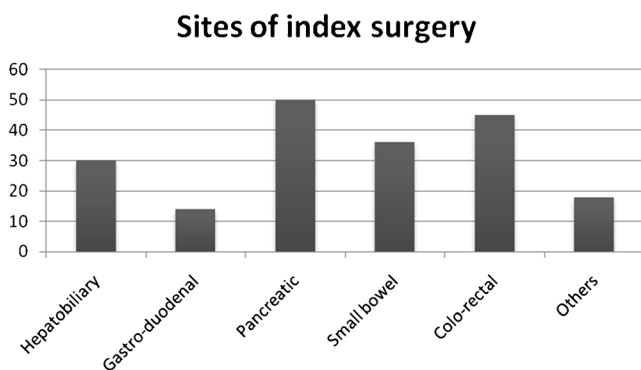
Other reports have suggested that urgent redo-laparotomies were most commonly performed following diffuse/localized

peritonitis in 32–52 %, obstruction in 25–63 %, wound dehiscence/ evisceration in 7–22 %, hemorrhage in 3 % and other causes in 2–3 % of patients [3, 8, 9]. One study had shown anastomotic leaks and intestinal perforation as the cause for redo-laparotomies in 52 % patients (42/81) [3]. As compared to this, in our study, collections, perforation and enteric fistulae accounted for more than half of the cases of re-exploration. However, the incidence of anastomotic failure was comparatively low at 6.7 % (13/193), but hemorrhage constituted a larger proportion at 33.7 % (65/193). This could be attributed to the more complex surgeries performed in the form of hepatic and pancreatic surgeries where the incidence of bleeding is generally higher. The proportion of hepatobiliary, and colorectal surgeries in our series was higher as compared to others. (Table 3) [2, 3, 7, 10].

Urgent redo-laparotomies, irrespective of the initial indication, have life-threatening consequences, so early diagnosis and immediate surgery to rectify the cause might save lives [2]. Despite the advances in imaging, surgical techniques and critical care still carry a high mortality rate, ranging from 15.5 % to 61.5 % [3, 5, 7, 8]. We observed a mortality rate of 33 %, which is less than that reported by Haluk et al. (53 %) in patients undergoing major GI surgical procedures.

The cause of re-exploration has been found to be an important factor in influencing mortality rates in urgent redo-laparotomies. Mortality rates for re-exploration following wound dehiscence and obstruction have been low in other studies, while mortality following enteric fistulas or anastomotic leaks was high [2, 3]. The site of index surgery could be an important factor affecting mortality. Some authors have shown higher mortality rates following re-exploration for gastrointestinal surgeries [2–4]. Mortality from gastroduodenal re-explorations and colorectal surgeries were lower, and we got similar results for our gastroduodenal and colorectal re-explorations. However, when we analyzed our data there was no significant difference in mortality rates for re-explorations based on the site of the index surgery ( $p=0.167$ ) or based on the indication and finding at re-exploration ( $p=0.101$ ). Re-exploration for pancreatic surgery and presence of bowel gangrene during re-exploration were associated with increased mortality rates of 48 % (24/50) and 71 % (5/7), respectively, though they did not reach statistical significance possibly because of the small numbers of patients affected (Tables 3).

Inflammatory and septic complications account for most re-explorations [4, 9, 11, 12]. However, it was not always easy to determine the site of sepsis. Hutchins et al. reported rates as low as 17 % in preoperative determination of site of a septic focus [13]. Early surgical intervention in these has been shown to reduce mortality [2, 8, 11, 12], but this may not always be successful with residual abscesses existing in

**Fig. 2** Sites of index surgery

**Table 3** Site of index surgery and mortality

Site of index surgery	Total number of surgeries performed (%)	Total number of patients who underwent urgent redo-laparotomy (%)	Mortality after redo-laparotomy (%) $P=0.167$
Hepatobiliary	1594 (24.41 %)	1.88 % (30)	33 % (10/30)
Pancreatic	977 (14.96 %)	5.11 % (50)	48 % (24/50)
Gastroduodenal	603 (9.24 %)	2.32 % (14)	14.3 % (2/14)
Smallbowel	1239 (18.97 %)	2.90 % (36)	38.9 % (14/36)
Colorectal	1306 (20.00 %)	3.44 % (45)	26.7 % (12/45)
Others	811 (12.42 %)	2.22 % (18)	11.1 % (2/18)
Total	6530 (100 %)	2.95 % (193)	33.13 %

as many as 41 % of patients with fecal peritonitis despite urgent surgical intervention [9]. The use of minimally invasive techniques like radiologically guided percutaneous drainage are often inadequate to deal with this type of sepsis. In our series, 37.8 % (73/193) patients underwent preoperative or postoperative intervention, but there was no significant impact on mortality ( $p=0.857$ ).

Surgery in resistant sepsis improves survival. Holzheimer and Gathof showed a reduced mortality from 67 % to 37.5 % in patients who underwent re-exploration for sepsis resistant to treatment versus those who didn't undergo re-exploration [14].

The timing of surgery may also have an impact on mortality. Mortality rates decreased from 46 % to 26.5 % and from 21.4 % to 15.3 % in patients who underwent urgent re-explorations in the studies by Desiaterik et al. and Zavernyi et al [15, 16]. Early diagnosis and early redo-laparotomy reduce chances of multiorgan failure by up to 60 % and also has an impact on mortality [13]. However, there is no consensus on the indication and timing of urgent redo-laparotomies and the surgeon's experience may play a role. Invasive modalities failed to show any impact on mortality in our study, suggesting that a more aggressive approach in such patients may have been more advantageous. Inadequacy of the first re-exploration has grave consequences as multiple re-explorations are associated with significantly higher mortality rates in many studies. Rygachev and colleagues reported mortality of 66.5 % for multiple laparotomies versus 30.6 % for a single laparotomy [2, 8, 9]. We found this held true in our study as well where the mortality was 23.6 % (34/144) in patients who had undergone single re-exploration as compared to 61.2 % (30/49) in patients with multiple re-explorations ( $p<0.001$ ). This emphasizes the importance of thoroughness at the first laparotomy.

Postoperative hemorrhage is an important cause for redo-laparotomy. Depending on whether it is luminal or intraperitoneal, it will manifest as upper and lower gastrointestinal hemorrhage or via the drains/incision site. While minor hemorrhage can be addressed by judicious fluid resuscitation, blood products and watchful waiting, major hemorrhage requires prompt intervention. The incidence of

postoperative hemorrhage requiring redo-laparotomy is about 0.1–0.34 % [3]. We had a redo-laparotomy rate of 1 % (65/6530) for bleeding. Mortality following postoperative hemorrhage varies from 18.4 % to 33 % [2–4, 9, 17]. In our study, we had a mortality of 42.4 %, which was slightly higher compared to earlier studies published in the literature. This higher rate of redo-laparotomy for hemorrhage could be attributed to higher proportion of liver and pancreatic surgeries in our patients.

Intestinal obstruction requiring laparotomy is seen in up to 25–60 % of all redo-laparotomies, as reported in various studies. In a study by Unalp et al. 5 % (4/81) underwent redo-laparotomy for obstruction with the mean interval to intervention being 4 days [3, 8, 9, 18]. Our series had a rate of 6.7 % (13/193), which is consistent with the previous reports. However, obstruction manifested later in our series, so the time to intervention in our series was higher with a mean of 12.7 (6–24) days. Postoperative ileus is often expected after difficult procedures and most patients improve on conservative management. This could be the reason for longer time to intervention and to a relatively lower incidence of obstruction as an indication for undergoing redo-laparotomy in our series.

Sepsis and multiorgan failure were the most common causes of death, accounting for 64 % (41/64) and this is consistent with the previous reports [3, 4, 10]. However, in 18 % of our patients the cause of death from infection was pneumonia and respiratory failure (Fig. 2), potentially preventable complications in our patients who were relatively young.

## Conclusion

Urgent redo-laparotomies are associated with mortality rates, which are six times higher than after the index procedures. While urgent re-explorations are usually unavoidable, the adequacy of the first redo surgery is important as multiple redo-laparotomies are associated with a significantly higher mortality.

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