

Relaparotomies Following Major Abdominal Operations

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Özet: MAJOR ABDOMINAL OPERASYONU İZLEYEN RELAPAROTİMİLER

Hastanemizde, 6 yıl süresince yapılmış 2326 majör abdominal operasyonun retrospektif incelenmesiyle; 72 (%3.10) hastaya postoperatif erken dönem komplikasyonları nedeniyle, hastaneden çıkarılmadan önce relaparotomi yapıldığı saptandı. Bunların 18(%25)'i öldü. Ençok mide ve biliyer operasyonlardan sonra relaparotomi gerekti. Enfeksiyonlar ve evissereasyonlar ençok karşılaşılan komplikasyonlardı. Primer operasyonun acil koşullarda yapılmış olması, 60 yaşın üstündeki hastalarda postoperatif intestinal obstrüksiyon gelişmesi, herhangi bir yaştaki hastada kaçak veya iskemi komplikasyonlarının gelişmesi, sistemik yandaş hastalık olması ve ikiden çok operasyon yapılması bu seride mortaliteyi yükselten faktörler olarak belirlendi. 18(%25) olguda teknik hata saptandı. Relaparotomi intervali, ortalama 16.32 gün olarak bulundu.

Anahtar Kelimeler: Majör abdominal operasyon relaparotomi, postoperatif erken dönem komplikasyonları, mortalite.

Summary: Review of 2326 major abdominal operations performed in our hospital during a 6-year period revealed retrospectively that 72 patients (3.10%) required relaparotomy because of post operative early complications during the same hospitalization. Of these, 19 patients (25%) died. The most common primary operations necessitating relaparotomy were stomach and biliary operations. Infections and eviscerations were the most common complications. In this series, high-mortality factors were identified, including emergency primary laparotomy, postoperative intestinal obstruction in patients over 60 years of age, leaks and ischaemia at any age, concomitant systemic disease and more than two operations. In 18 patients (25%) having relaparotomies, a technical error at the primary operation was identified. The mean interval of relaparotomy was 16.32 days.

Key Words: Major abdominal operations, relaparotomy, postoperative early complications, mortality.

Primary operation does not always provide a permanent recovery and relaparotomy is required either because of the nature of the illness or postoperative early complications. Unwanted but unavoidable operations, relaparotomies were and continue to be important problems. Desired levels of incidence and mortality have not as yet been reached.

There is not only few publications on this subject but also the ones available lack detailed analysis. In this study, we attempt to study the general characteristics of relaparotomies and the detailed specifications of complication groups within themselves, and to determine the factors that influence mortality.

PATIENTS and METHOD

In this research, 2326 major abdominal operations performed in the 1st and 6th Surgical Clinics of Ankara Numune Hospital between January 1987 and January 1993 were studied retrospectively. These operations which were performed through incisions enabling a complete abdomen explorations were defined major abdominal operations. Such operations as those performed by using Mc Burney incisions, inguinal hernia incisions and umbilical hernia incisions (appendectomies, hernioraphies, colostomy closures, abscess drainages, etc.) were not included.

The case when patients were reoperated due to a complication prior to discharge, within the period following their primary laparotomy recovery

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Table I: General characteristics of primary laparotomy cases.

No. of patient	2326
Sex	
female	1219 (52.41%)
male	1107 (47.59%)
Mean age	54.62 (14-82)
Emergency operation	168 (7.22%)
Mortality	92 (3.96%)

phase, were defined as relaparotomy. While operations performed for complications due to wound dehiscences and wound infections were not taken into consideration, second operations where a partial or complete abdomen exploration were possible were regarded as being relaparotomies. Similarly, also included were evisceration repairs since they enabled partial abdomen explorations.

During relaparotomy, when more than one complications were clearly observed in one patient, each case was evaluated separately.

Since there is a separate surgical clinic where cases of emergency are treated in our hospital, a great majority of operations in this series were performed under elective conditions. As both clinics where our series had been formed have little interest in vascular surgery, the number of vascular operations is low. Cysthydic operations were classified as a separate group because these cases are frequent in our country.

Complications which result in relaparotomy were studied under 7 separate groups leaks (anastomosis leaks, duodenum and biliary fistulas, etc.), bleedings (intraabdominal and intravisceral bleedings), obstructions (such intestinal obstructions as postoperative adhesions, volvulus and invagination), infections (generalized peritonitis, intraabdominal abscess), ischaemia (insufficiency of visceral blood supply), eviscerations (complete layer wound dehiscence) and others.

RESULTS

Of 2326 patients who had major abdominal operation, 1219 patients (52.41%) were women and 1107 (47.59%) were men. The average age in these cases was 54.62 (the youngest, 14; the oldest, 82). Number of emergency operations done

Table II: Primary laparotomy groups.

		No. of patients	%
I. group	Stomach op.	466	20.03
II. group	Biliary system op.	1164	50.04
III. group	Small intestine op.	45	1.93
IV. group	Large intestine op.	121	5.20
V. group	Cysthydic op.	197	8.47
VI. group	Miscellaneous op.	333	14.31

because of acute abdomen is 168. 92 patients (3.96%) out of 2326 patients died. General characteristics of primary laparotomy cases are presented in Table 1.

The grouping of primary laparotomies according to the related organ is in Table 2. Biliary system operations are half of the series. Most of them are cholecystectomies performed for chronic calculous cholecystitis cases. Miscellaneous operation groups are pancreas operations, splenectomies, operations of retroperitoneal tumors, and a few number of hysterectomy and vascular operations. Of 2326 major abdominal operation, 72(3.10%) was performed relaparotomy because of early postoperative complications.

Of the relaparotomy cases, 42 patients (58.33%) were women and 30(41.67%) were men. The average age was found to be 48.25(the youngest, 14; the oldest, 77). Primary operations of 17 (23.61%) were performed under emergency conditions. 16 patients (22.22%) had malign primary disease. 18(25%) of 72 relaparotomy patients died. Table 3 presents general characteristics about these patients.

Out of 10 patients who were operated for three times, 3 patients (30%) died. 2 patients were operated for four times and both patients (100%) died.

Primary operation groups of relaparotomy cases are presented in Figure 1. Relaparotomy was required mostly following the stomach and biliary operations. In terms of relative frequency (relaparotomy/primary laparotomy), however, large intestine and small intestine operations were among the operations that cause relaparotomy most (Figure 1).

Early complications in 72 relaparotomy cases

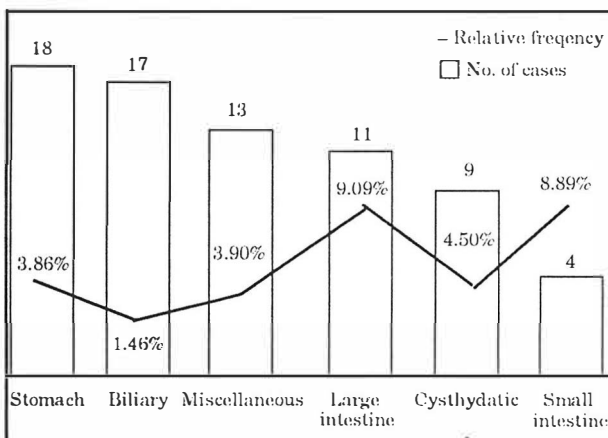
Table III: General characteristics of relaparotomy cases

No. of patient	72
Sex	
female	42 (58.33%)
male	30 (41.67%)
Mean age	48 (14-77)
Primary emergency case	17 (23.61%)
Primary malign case	16 (22.22%)
Mortality	18 (25%)

are presented in Table 4 (a total of 89 complications were evaluated because 10 patients were operated for 3 times, 2 patients for 4 times, and 2 different simultaneous complications were observed at 3 patients). Most frequent were infection and evisceration complications. One of the two cases in the others group was reoperated because of failure in endoscopic extraction of retained stones in choledoch. In the other patient, although postoperative abdominal pains and distention complaints were evaluated clinically as being relaparotomy indications, no pathology was found at operation.

As it can be seen in Figure 2, the number of mortal cases are highest in infections and leaks group. Yet, in terms of relative frequency, leaks group where 6(75%) of 8 patients died, and ischaemia group where 2(66.66%) of 3 patients died, were outstanding with high levels of mortality.

Primary operation groups of mortal relaparotomy

**Figure 1:** No. of relaparotomy in primary operation groups and relative frequency of relaparotomy cases.**Table IV:** Complications which result in relaparotomy.

	No. of complication	%
Infections	31	34.83
Eviscerations	22	24.72
Obstructions	13	14.61
Leaks	9	10.11
Bleedings	8	8.99
Ischaemia	4	4.49
Others	2	2.25

*10 patients were operated for 3 times, 2 patients for 4 times and 2 different simultaneous complications were observed at 3 patients.

my cases are in Figure 3. The highest number of mortal cases was observed in stomach operations group and miscellaneous operations group. No mortality occurred in cysthydic operations group. In terms of relative frequency, highest levels of mortality were observed in small intestine (2 of 4 died) and miscellaneous (5 of 13 died) operations groups, whereas incysthydic (no mortality in 9 cases) and biliary (3 of 17 died) operations the lowest levels were found (Figure 3).

Of 18 relaparotomy cases who died, 10 had their primary operations under emergency conditions. 17(10.12%) of them required relaparotomy and 10(58.82%) died.

Technical Error

In cases when complications leading to relaparotomy were thought to have been iatrogenically caused by the operation team, such complications were regarded as technical errors. In our

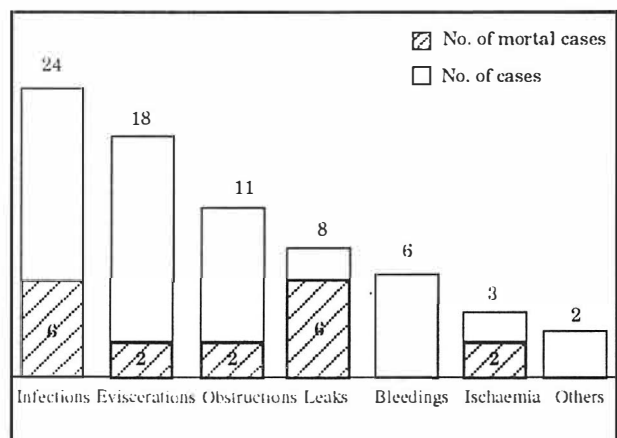
**Figure 2:** No. of cases and mortality in complications groups.

Table V: Concomitant diseases in relaparotomy cases.

	Survived	Died	Total
Diabetes mellitus	4	6	10
Chronic obstructive lung disease	2	4	6
Chronic coronary artery disease	2	2	4
Congestive heart failure	2	1	3
Hypertension	1	1	2
Others	3	1	4

*In 6 patients more than one concomitant diseases were observed.

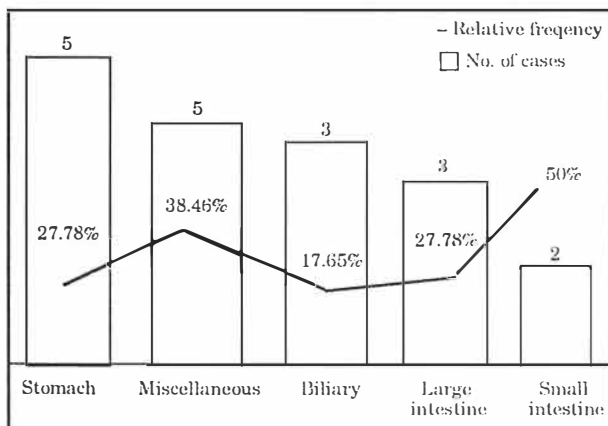
series, technical errors were observed in 18(25%) relaparotomy cases. 11 were definite and 7 were possible errors.

Relaparotomy Interval

The mean period between primary operation and relaparotomy was found to be 16.32 days (the shortest, 2 hours; the longest, 60 days). Mean interval was the shortest (2 days) in the bleeding group, and the longest (23.04 days) in the infection group.

Diagnostic Studies

In all cases, clinical evaluation formed basis for relaparotomy indication. Apart from the traditional diagnostic studies; the most commonly used method was ultrasonography. It was implemented on 65 (90.28%) of 72 relaparotomy cases. While ultrasonography failed on 4 patients (6.15%), it enabled definite diagnosis on 47 (72.31%) patients, and was helpful on 14 (21.54%) patients. Computed tomography was implemented on 10 patients, endoscopic retro-

**Figure 3:** Primary operation groups of mortal relaparotomy cases and their relative frequencies.**Table VI:** Cause of mortality in relaparotomy cases.

	No. of patients	%
Multiple organ failure	12	66.67
Myocardial infarction	1	5.56
Acute renal failure	1	5.56
Hepatorenal syndrom	1	5.56
Pulmonary failure	3	16.67

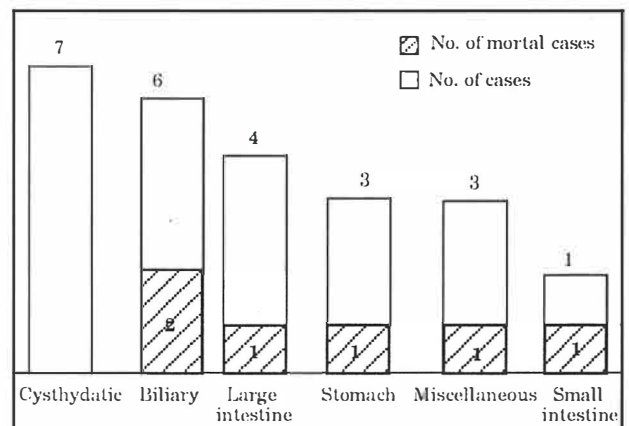
grade cholangiopancreatography on 4 patients, and percutaneous transhepatic cholangiography on 1 patient. Angiography or magnetic resonance imaging were not used.

Concomitant Diseases

Of 72 relaparotomy cases, 23(31.94%) had concomitant diseases. In 6 patients, more than one concomitant diseases were observed. 13(24.07%) of 54 surviving patients, and 10 (55.56%) of 18 patients who died had concomitant diseases. These figures are presented in Table 5. In others group, chronic hepatic disease, rheumatoid arthritis, ankylosing spondylitis and in one trauma case, subarachnoid hemorrhage were observed.

Causes of Mortality

Since on autopsy was carried out in this series, causes of mortality were compiled by using clinic observation records and death reports. As it can be seen in Table 6, in most cases the cause of mortality is multiple organ failure.

**Figure 4:** Primary operation groups in infection group and mortality.

Infections

The mean age in this group was 43.96 (the youngest, 18; the oldest, 70) and the mean age of the patients who died in this group was 46.5 (the youngest, 35; the oldest, 60). Age did not play a precipitant role in mortality.

Of 24 infection cases in this group, 17(70.83%) had intraabdominal abscess, 5 (20.83%) had generalized peritonitis, 1 (4.17%) had necrotizing fasciitis and in 1(4.17%) who had ileal pouch-anal anastomosis pouchitis had been observed.

6(25%) of 24cases died. Figure 4 presents primary operations and mortal cases. Infection complications were most frequent after cysthydatidic operations and no patient in this group died. Although biliary operations appeared to be the group with highest number of mortal cases, in terms of relative frequency small intestine operations cause highest levels of mortality. Technical errors were found in 3 (12.5%) cases (2 definite, 1 probable). Primary disease of 4 patients (16.67%) was malign. Primary laparotomy of 6 patients (25%) was performed in emergency conditions and 5 of them died. Emergency operations appeared to be precipitant factors of mortality in infection group. Mean relaparotomy interval was found to be 23.04 (the shortest, 1 day; the longest 60 days) days.

Eviscerations

The mean age in this group was 52.89 (the youngest, 35; the oldest, 75) and the mean age of

the patients who died in this group was 54 (the youngest, 44; the oldest, 64). Age did not play a precipitant role in mortality.

Of 18 evisceration cases, 2 (11.11%) died. Figure 5 presents primary operations and mortal cases. In terms of relative frequency, the highest levels of mortality was in large intestine operations group. Technical errors were spotted in 3 (16.67%) (1 definite, 2 probable) cases. 6 cases (33.33%) had malign primary diseases. Primary operations of 5 patients (27.78%) were performed under emergency conditions and 2 of them died. Mean relaparotomy interval was found to be 9.5 days (the shortest, 2 days; the longest, 30 days). Of 18 cases, 11 (61.11%) had median, 6(33.33%) paramedian, and 1 (5.56%) subcostal incisions. 9 cases (50%) had postoperative wound infection 3 patients (16.67%) had chronic obstructive lung disease and 3 patients (16.67%) had chronic obstructive lung disease and 3 patients (16.67%) had hypoproteinemia.

Obstructions

The mean age in this group was 48.45 (the youngest, 14; the oldest, 70) and the mean age of the patients who died in this group was 65 (the youngest, 60; the oldest, 70). Age was a precipitant factor in mortality.

Of 11 obstruction cases, in 10 (90.90%) occlusion of the intestine by adhesions from previous operations was observed. In 1 patient who was performed interposition of a jejunal segment

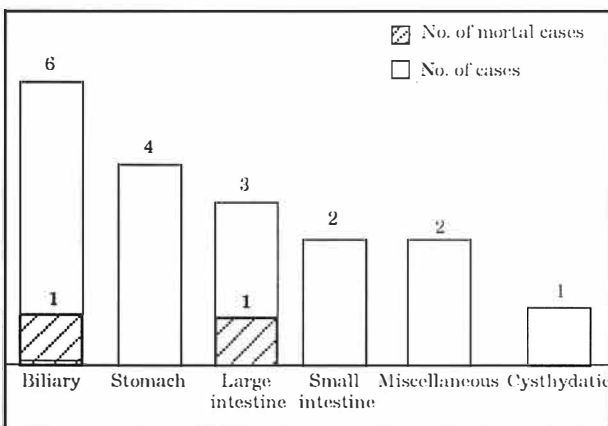


Figure 5: Primary operation groups in evisceration group and mortality.

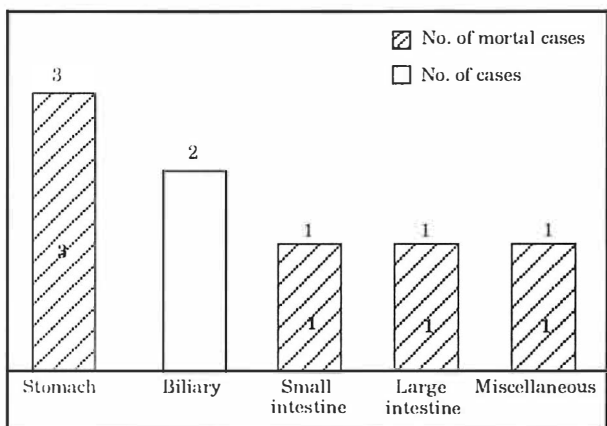


Figure 6 : Primary operation groups in leak group and mortality.

Table VII: Comparison of our results with other series.

Author	Year	No. of primary operations	Mortality of primary op. (%)	Relaparotomy rates (%)	Mortality of relaparotomy	Technical error rates(%)	Relaparotomy interval (mean, day)
Zer (3)	1980	3680	??	2.6	38	?	?
Harbrecht (2)	1983	1633	?	6.9	48	0.4	?
Kirk (1)	1988	3000	9.6	4.7	42.5	2	12.4
Our series	1993	2326	3.96	3.10	25	0.8	16.3

*not reported

due to dumping syndrome, jejunal invagination developed.

Of 11 cases, 2(18.18%) died. In terms of primary laparotomy, 4 cases were in stomach operations group (1 died), 3 cases were in miscellaneous operations group (1 patient who was performed pancreas resection because of chronic pancreatitis died), 2 cases were in the biliary operations group, and the remaining two cases were in the large intestine operations group (no mortality occurred in the last two groups). No technical errors were found. In 1 case (9.09%), the primary disease was malign. 1 patient (9.09%) was performed primary operation under emergency conditions and this patient survived. mean relaparotomy interval was found to be 21 days (the shortest, 4 days; the longest, 60 days).

Leaks

The mean age in this group was 54.37 (the youngest, 29; the oldest, 70) and the mean age of the patients who died in this group was 53.66 (the youngest, 29; the oldest, 66). Age was not a precipitant factor in mortality.

Of 8 leak cases, 3 (37.5%) had enteroenterostomy, 1(12.5%) had esophagojejunostomy, 1 (12.5%) had gastroenterostomy, 1 (12.5%) had leakage from the duodenal stump, 1 (12.5%) had pancreaticojejunostomy leak, and 1 (12.5%) patient developed biliary fistula because of iatrogenic choledoch injury.

Of 8 cases, 6 (75%) died. Figure 6 presents primary operations and mortal cases. All patients in stomach, small intestine, large intestine, and miscellaneous operations groups died. Technical errors were found in 4 (50%) cases (2 definite, 2 probable). 4 (50%) cases had malign primary diseases. In 4 (50%) cases hypoproteinemia was

found. 2 patients (25%) were performed primary operation under emergency conditions and they died. In this group, emergency operations were outstanding as precipitant factor in mortality. Mean relaparotomy interval was found to be 15.6 days (the shortest, 6 days; the longest, 40 days).

Bleedings

The mean age in this group was 42.50 (the youngest, 35; the oldest, 75). There was no mortal cases.

Of 6 bleeding cases, 5 (83.33%) were intraabdominal and 1 (16.67%) was intravisceral bleedings. In terms of primary laparotomy, 3 cases (50%) were stomach operations, 2 (33.33%) were miscellaneous operations (operations on iliaca communis artery injury and traumatic liver rupture), and 1 case (16.67%) was cysthydic operation groups.

In all 6 cases (100%), definite technical errors were found. No patient had malign primary disease. 2 patients (33.33%) were performed primary operation under emergency conditions and they survived. Mean relaparotomy interval was found to be 2 days (the shortest, 2 hours; the longest, 5 days). In two patients, operations were performed at postoperative 2nd and 6th hours. In a patient operated for pylor stenosis, melena developed and continued in spite of blood transfusion. Reoperation was decided in postoperative fifth day. Bleeding was found to be on the gastroenterostomy anastomosis region. This was the latest relaparotomy case.

Ischaemia

The mean age in this group was 50.66 (the youngest, 34; the oldest, 74) and the mean age

of the patients who died in this group was 39 (the youngest, 34; the oldest, 44). Age was not a precipitant factor in mortality.

Of 3 cases, 2 (66.67%) died. In terms of primary laparotomy, 1 patient was performed splenectomy due to congestive splenomegaly. Postoperative portal vein and superior mesenteric artery thrombosis developed. This patient was operated for 4 times and died. The second patient who suffered from atherosclerotic heart disease had atrial fibrillation, and was operated of small intestine necrosis, and died. The third patient was performed abdominoperineal resection because of rectum cancer. This patient was reoperated due to postoperative colostomy necrosis, and survived.

Technical errors were found in 2 (66.67%) cases (2probable). In 1 (33.33%) case, the primary disease was malign. 1 patient (33.33%) was performed primary operation under emergency conditions and this patient died. Mean relaparotomy interval was found to be 21.3 days (the shortest, 2 days; the longest, 54 days). In the patient who developed portal vein thrombosis following splenectomy, the longest interval of the group-54 days-was observed.

DISCUSSION

When we review the literature, we observe that publications on the subject are of a limited number. As primary laparotomy groups in these articles exhibit variant characteristics, direct comparisons are likely to be misleading.

Kirk presents both abdominothoracic and abdominal operations in his series (1). Whereas in Harbrecht's series there are few non-complicated cholecystectomies, in our series there are plenty (2). Authors' views on the definition of relaparotomy differ as well. While Harbrecht defines relaparotomy as operations needed within the 2 months following the primary operation, Kirk analyzes cases without inducing a time limit (1,2). In our series, we include the operations performed for complications developed within recovery period following the primary operation. Despite all these differences, we compare our results with those of other authors in Table 7.

Although striking technical developments have occurred in diagnosis and treatment of postoperative complications, as Table 7 shows, it is not possible to argue that there is a major decrease in the number of relaparotomy incidences. By means of widespread use of ultrasonography in clinics, non-invasive computed tomography, magnetic resonance imaging and arteriography (an invasive method), it is possible today to diagnose complications earlier and accurately and obtain detailed information. It is also possible to treat patients who have complications by using interventional radiology and endoscopic procedures which do not require reoperations, and which bear decreased levels of morbidity. Successful percutaneous intraabdominal abscess drainages carried out with the guide of ultrasonography and computed tomography, extraction of retained stones in choledoch through biliary endoscope can be given as examples of such applications.

Percutaneous abscess drainages have been gaining popularity and they are reported to present 78.5% success, 10.4% complications, and 2.6% recurrence (7,8,9). When a suitable and safe location is present and when intraabdominal necrosis which requires surgical debridement is absent, percutaneous abscess drainage can be primary choice. Yet, the response to this application should be closely monitored and, in case the application has failed, surgical operation should not be postponed.

Owing to novelties in the field of antibiotic, medical approaches have been gaining importance, with infectious complications decreasing and somatostatin analogues being successfully applied in gastrointestinal fistulas. Despite of these extraordinary developments, there still exist some cases in which the diagnosis of postoperative early complications through the evaluation of clinical signs and symptoms and treatment through relaparotomies are inevitable.

In literature, the rate of mortality was reported to be below 10% after major operations (1). In Polack's personal series, laparotomy mortality is 10% (4). Our mortality level presents a low rate, 3.96%. This is due to the fact that in our series

the number of non-complicated cholecystectomies is large and the number of urgent primary laparotomy is low (7.22%).

In the articles, relaparotomy mortality was given as 20-71% (1,2,3,5,6). Our relaparotomy mortality is 25%. As primary operations of 24% of our relaparotomy cases were performed under emergency conditions and 22% had malign primary disease, this figure is acceptable. That while the level of mortality in those patients operated for 3 times is 33.3%, the level of mortality in those operated for 4 times is 100%, proves the high level of risk reoperations pose for patients. In making decisions about relaparotomy, the balance of benefits-disbenefits should be carefully evaluated. Especially with aged patients, and patients whose disease has not cured at the first operation or who have concomitant diseases, in making decisions about relaparotomy diagnostic studies should be used for definite diagnosis. The presence of peritoneal irritation, hypotension or bacteremia is associated with an 80% to 95% likelihood of a positive exploration. In these patients 50-90% mortality was reported. Patients who underwent exploratory surgery only on the basis of organ failure had an 81% mortality. Exploration directed by physical examination, computed tomography, or ultrasonography before the onset organ dysfunction produced the best outcome a 51% mortality (7,8,9). In our series ultrasonography was successful on the diagnosis of 61 (94%) patients.

Although in Kirk's series there are 8 patients without pathology in relaparotomy, in our series there is 1 patient who has. Even though technical advancements have not reduced relaparotomy rates in time, we can easily claim that negative relaparotomy rates have decreased.

The fact that 59% mortal cases of relaparotomies had primary operations under emergency conditions supports the idea that emergency operations result in higher rate of mortality.

In our series, precipitant factors in mortality were; performing the primary operation under emergency conditions (especially leaks, infections and ischaemia groups), postoperative intestinal obstructions in patients over age of 60, development of leaks or ischaemia complications in

patients of any age, relaparotomy following small intestine operations, systemic concomitant diseases, and more than two operations. In making decisions about relaparotomy on patients with one or more of these factors, therapeutic and non-invasive applications should also be taken into consideration.

Despite widespread use of new antibiotics and proflactic antibiotics with large spectrum, both in our series and in other series, infection is the most frequent complication to cause relaparotomy (2,3). Intraabdominal infections mostly after cysthydic operations is a case peculiar to our country. In our series, in cysthydic operations the frequent use of external drainage method (52%) and the fact that drains remain in abdomen a long time (mean 7.3 days) resulted in high rates of infectious complications.

In our series, the lowest level of mortality occurred in evisceration and obstruction groups. A review of evisceration groups revealed such etiological factors as the primary disease being malign, application of primary operations under cases of emergency, median incisions, concomitant chronic obstructive lung diseases, and hypoproteinemia. These support the general considerations on eviscerations. Our findings in obstruction group are in accordance with Frykberg's large series where intestinal obstruction complications are analyzed (14). In that article, it was reported that 5-29% intestinal obstructions were observed following primary laparotomy (15% in our series), that cases are generally in middle age group (mean age is 48.5 in our series), that relaparotomy interval is generally 1 month (21 days in our series), and that obstructions are mostly caused by postoperative adhesions with a rate of 80% (90% in our series).

There is no doubt that every surgeon wants to do the best for his patient to reach the best performance. Yet, it is difficult to attain perfection in surgery and iatrogenic complications are unavoidable despite all efforts. In our series, of 2326 laparotomy cases, the rate of relaparotomy due to technical errors was 0.8%. Leaving probable technical errors aside, this rate drops to 0.5%. Considering the fact that our hospital is a training center, this rate is acceptable. Yet, it is

noticable that the rate of technical errors in bleeding group is 100%.

It is natural for relaparotomy interval to be different in different indications. In patients whose relaparotomy has been definitely diagnosed, it is a general tendency not to waste time. However,

in Zer's series, in cases when conservative treatment was prolonged before operation, mortality was low (3).

As a result, in postoperative early complications where diagnosis and treatment is rather sophisticated, attaining low levels of mortality remains to be a major problem of surgeons today.

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