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FACTORS AFFECTING MORBIDITY AND MORTALITY IN PERFORATED DUODENAL ULCER

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Abstract

Duodenal ulcer is a particular type of peptic ulcer disease that afflicts the lining of the duodenum. The indications for surgery in duodenal ulcers are; bleeding, perforation, obstruction and intractability or non-healing. Today, most patients undergoing operation for duodenal ulcer disease have simple over-sewing of bleeding ulcer or simple patch of perforated ulcer. Simultaneous performance of vagotomy either truncal or highly selective is increasingly uncommon because of reliance on postoperative proton-pump inhibitor to decrease acid secretion and eradication therapy for helicobacter pylori infection. Despite of the widespread use of gastric anti-secretary agents and eradication therapy, the incidence of perforated duodenal ulcer has changed little.

This study aimed to assess the factors that lead to increase the rate of morbidity and mortality in patients with perforated duodenal ulcer in different age groups and to know the effect of time lapsed between onset of symptoms and surgery.

This is a prospective study that included 100 patients who underwent emergency laparotomy for perforated duodenal ulcer during a period from May 2008 to January 2011. The operations were done in Al-Sader Teaching Hospital and Al-Basrah General Hospital. The clinical finding, general risk factors, co-morbid medical diseases, operative finding and post–operative complications were all taken in consideration. Follow-up period ranged from 2 weeks to 18 months.

Of the hundred cases who included in this study, 96% were males and 4% were females with mean age of 43.13 years (range from 10 to more than 70 years). The disease was more common in rural areas (58%) than in urban areas (42%). Fifty five percent of patients gave previous history of duodenal ulcer and 45% had no previous history of duodenal ulcer. The most common risk factors are smoking (32%) and NSIADs (25%). In this study most of elderly patients presented with medical diseases such as hypertension, diabetes mellitus, ischemic heart disease and chronic obstructive pulmonary disease. Most patients admitted to hospital between 19–24 hours (21%), (8%) admitted during 6 hours and (2%) admitted after 120 hours. Regarding the complications occurs in this study, wound infections, chest infections and paralytic ileus were the most common complications. Mortality rate was 2%.

In conclusion, the most common factor that leading to development of postoperative complications is delayed in hospital admission, so to improve the results of treatment of perforated duodenal ulcer, the diagnosis and treatment should not be delayed and the associated medical illness should be treated.

Introduction

Helicobacter pylori infection is the most common cause of peptic ulcer disease and it is uniquely equipped for survival in the hostile environment of the stomach.

The organism possesses the enzyme urease which converts the urea into ammonia and bicarbonate thus creating an environment around the bacteria that buffers the acid secretion by the stomach. The effect of ammonia (strong alkali) on the antral G cells is to cause the release of gastrin via negative feedback loop. The end result is hypergastrinemia and acid

hypersecretion and this result in antral epithelial metaplasia in the postpyloric duodenum (duodenal metaplasia). This duodenal metaplasia allows Helicobacter pylori to colonize the duodenal mucosa and, in these patients, the risk of developing duodenal ulcer increases 50-fold. When Helicobacter pylori colonizes the duodenum, there is a significant decrease in acid-stimulated duodenal bicarbonate release. When Helicobacter pylori infection is successfully treated, acid secretory physiology tends to normalize. Up to 90% of patients with duodenal ulcers and 70–90% of patients with gastric ulcers, have Helicobacter pylori infection[1].

The Perforation is the second most common complication of peptic ulcer. Most perforated peptic ulcers are located in the first part of the duodenum (35-65%), with 25-45% located in the pylorus and 5–25% located in the stomach[1].

In selected population, non-operative management of perforated ulcer is a reasonable option. The onset of symptoms of less than 24 hours, hemodynamic stability and an absence of systemic signs of sepsis in a patient under the age of 70 years are all indications for a trial of non-operative management[2,3].

Patients with hemodynamic instability, onset of symptoms is longer than 24 hours in duration, those with peritonitis on physical examination and those with systemic signs of sepsis should be surgically explored. Additionally, patients who are age 70 or greater are less likely to respond to non-operative management, and should be considered for early operative intervention[4].

Definitive ulcer surgery like patch closure with highly selective vagotomy, patch closure with truncal vagotomy and pyloroplasty or distal gastrectomy (billroth I, billroth II, Roux-en-Y) with or without vagotomy is no longer required in majority of patients as recurrence rates have dropped dramatically with post operative medical therapy including histamine 2 receptor blockers and proton pump inhibitors[5,6].

This study aimed to assess the factors that lead to increase the rate of morbidity and mortality in patients with perforated duodenal ulcer in different age groups, and to know the effect of time lapsed between onset of symptoms and surgery on development of post-operative complications.

Patients and Methods

A descriptive prospective study was based on the patients admitted in Al-Sader Teaching Hospital and Al-Basrah General Hospital from May 2008 to January 2011. In this study, 100 patients were diagnosed in casualty as duodenal ulcer perforation. The diagnosis based on history, clinical examination and plain X-ray of the chest (P-A view) in erect posture as well as abdominal ultrasound if available. All cases had pneumo-peritoneum (air under diaphragm) on plain X-rays. Other investigations like blood for Hb%, white blood cell, serum blood sugar, serum amylase, blood urea and blood grouping were done in some cases.

The age of patients in this study ranges from 10 to more than 70 years, mean age was (43.13) year. Ninety six patients were males and 4 patients were females.

Regarding the place of residence, 58 patients live in the rural areas, while 42 patients live in urban areas.

In our study, 55 patients gave a previous history of duodenal ulcer disease (this is proved by esophagoduodenoscopy which done previously) and 45 patients without a previous history of duodenal ulcer disease.

The risk factors associated with perforated duodenal ulcer mentioned in this study includes; smoking, nonsteroidal anti-inflammatory drugs, steroids, fasting, stress, family history and alcoholism. Also the associated medical diseases include; hypertension, diabetes mellitus,

ischemic heart disease and chronic obstructive pulmonary diseases. The preadmission time varied from 6 to 120 hours and most patients were admitted between 19-24 hours (about 21 patients).

All patients were admitted to emergency unit and kept on nil by mouth, intravenous fluid infusion, nasogastric tube with monitoring of vital signs. Broad spectrum antibiotics were given intravenously in form of third generation cephalosporin (dose is 1gram three times daily) and metronidazole (dose is 500 mg three times daily), with gastric antisecretary agents (like H2-recepter antagonist & proton pump inhibitors) and appropriate analgesia.

All patients were not delayed in casualty and shifted immediately to the operating theatre after resuscitation period (i.e. no post admission delay).

Laparotomy was done through upper midline incision and found that moderate to large amount of free fluid collections in the peritoneal cavity in form of sero-sanguineous, bilious & purulent fluid; and 26% of cases had gross peritoneal soiling. Forty percent of perforations were adherent by omentum at time of surgery.

The perforations were located at the anterior wall of first part of the duodenum and the size of perforations were varies from less than (5 mm) in 60% of cases, (5-10 mm) in 30% of cases and in 10% of cases the perforation size were more than (10 mm).

During surgery the site of perforation was identified and the perforation was closed transversely with interrupted suture of 1/0 or 2/0 atraumatic Vicryl With omental patch. Thorough peritoneal toilet and suctioning was done and insertion one or two tube drain (near the site of closure and in pelvic cavity) laparotomy wound was closed in layers with meticulous haemostasis.

Adequate postoperative care was done in all cases during hospitalization and all patients were continued on intravenous fluid, antibiotics, gastric anti-secretary agents, analgesia and nasogastric tube for several days. In uncomplicated patients the nasogastric tube removed after third or fourth postoperative days, oral fluid started and the patients were discharged from hospital after (6-8) days.

In our study, 24 patients developed several complications in form of wound infections, respiratory infections, paralytic ileus, burst abdomen, septicemia, pelvic collections, renal failure, urinary tract infections, intestinal obstruction, incisional hernia and others.

Regarding the mortality rate, only two patients died out of hundred cases due to multiple organ failure and septicemia.

Follow up done in all patients after discharging from the hospital. Follow up done after 2 weeks, 1 month, 2 months, 6 months, 12 months and 18 months.

Results

Hundred cases were studied, 35 patients (35%) were between 30 and 40 years of age group. Age ranged from 10 years to 70 years, mean age was 43.13 years and standard deviation was 14.10 years. Ninety six patients (96%) were males while 4 patients (4%) were females.

Age group (years)	Number of males	Percentage	Number of females	Percentage	Total	Percentage
10-20	1	1%	0	0%	1	1%
21-30	17	17%	0	0%	17	17%
31-40	35	35%	0	0%	35	35%

41-50	19	19%	0	0%	19	19%
51-60	14	14%	1	1%	15	15%
61-70	7	7%	2	2%	9	9%
>70	3	3%	1	1%	4	4%
Total	96%	96%	4	4%	100	100%

Table I: Age and sex distribution in patients with perforated duodenal ulcer.

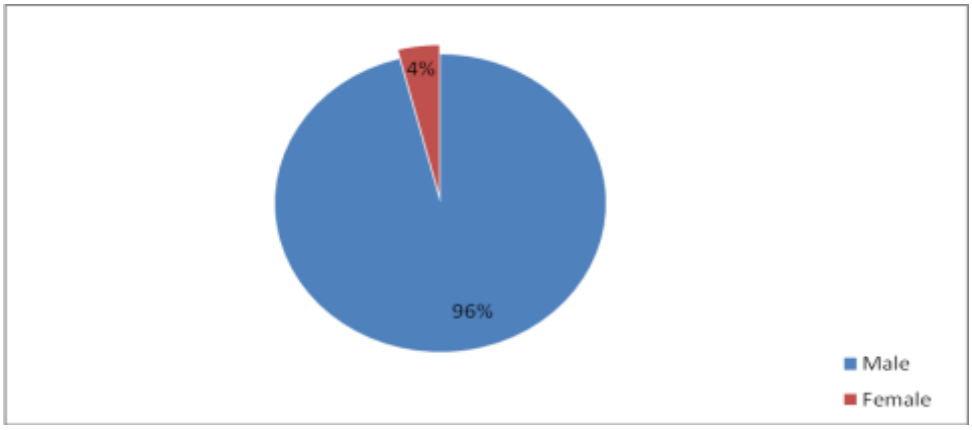

Figure 1: Male to female ratio

Fifty eight patients (58%) were from rural areas, while 42 patients (42%) were from urban areas.

Table II: Place of residence

Status	Number	Percentage
Rural	58	58%
Urban	42	42%
Total	100	100%

In this study, 55 patients (55%) gave a previous history of duodenal ulcer and 45 patients (45%) without previous history of ulcer .

Table III: History of duodenal ulcer disease

History of duodenal ulcer	Number	Percentage
duodenal ulcer	55	55%

No history of duodenal ulcer	45	45%
Total	100	100%

Thirty two patients with perforated duodenal ulcer were active smokers, 25 patients gave history of intake of NSAIDs, 11 patients were on steroid therapy, while 10 patients were fasting in Ramadan holey month, 9 patients were suffering from stressful conditions, 9 patients have had family history of duodenal ulcer and 4 patients were alcoholics. Eleven patients had multiple risk factors.

Table IV): Risk factors of perforated duodenal ulcer

Associated risk factor	Number	Percentage
Smoking	32	32%
NSAIDs	25	25%
Steroids	11	11%
Fasting	10	10%
Stress	9	9%
Family history	9	9%
Alcoholism	4	4%
Multiple factors	11	11%

Fourteen patients with perforated duodenal ulcer have had hypertension, 11 patients were suffering from diabetes mellitus, 7 patients gave history of ischemic heart disease and 2 patients were with chronic obstructive pulmonary disease (COPD).

Table V: Associated medical diseases

Medical disease	Number of patients	Percentage
Hypertension	14	14%
Diabetes mellitus	11	11%
Ischemic heart disease	7	7%
COPD	2	2%
Total	34	34%

The time between onset of symptoms and admission varied from 6 hours to 120 hours. Nine patients came to the hospital within 6 hours of the onset of symptoms, 21 patients came between(19 -24 hours and 2 patients came after 120 hours.

Table VI: Time between onset of symptoms and admission.

Duration (hours)	Number	Percentage
6	9	9%

7-12	14	14%
13-18	16	16%
19-24	21	21%
25-36	12	12%
37-48	7	7%
49-72	13	13%
≥72	8	8%
Total	100	100%

All patients presented with severe abdominal pain began in upper abdomen. Most of the patients (65%) have abdominal distention and (13%) of patients presented with manifestations of shock.

Table VII: Major symptoms at admission

Symptoms	Number	Percentage
Severe abdominal pain	100	100%
Abdominal distention	65	65%
manifestations of shock	13	13%

Table VIII: Major signs at admission

Signs	Number of patients	Percentage
Manifestations of shock	13	13%
Tachycardia	100	100%
Anemia	30	30%
Fever	30	30%
Dehydration	50	50%
Abdominal distention	65	65%
Abdominal tenderness	100	100%
Abdominal rigidity	100	100%
Absence of bowel sound	75	75%

Twenty four patients in this study developed complications. The commonest complications were wound infections (20.83%), respiratory complications (segmental collapse of the lung) (20.83%), paralytic ileus (16.66%), while septicemia, burst abdomen, and pelvic collection occur in (8.33%) for each. Intestinal obstruction, incisional hernia, urinary tract infection and renal failure occur in (4.16%) for each one.

Two patients developed two complications and another patient who came 120 hours after the onset of symptoms developed three complications like renal failure, respiratory infection and burst abdomen.

Table IX: Postoperative complications

Complications	Number of patients	Percentage
Wound infections	5	20.83
Respiratory complication	5	20.83
Paralytic ileus	4	16.66
Burst abdomen	2	8.33
Septicemia	2	8.33
Pelvic collection	2	8.33
Intestinal obstruction	1	4.16
Incisional hernia	1	4.16
Urinary tract infection	1	4.16
Renal failure	1	4.16
Total	24	100 %

Most complications developed between 4^{th} and 5^{th} postoperative day and these were wound infections, chest infections and ileus. Partial intestinal obstruction developed after 3 months, while incisional hernia developed after 6 months.
Mortality: Two patients 2% died on the second postoperative day due to septicemic shock with multiple organ failure.
The complicated patients had prolonged hospital stay as much as 28 days.
The complicated patient:
Age distribution: Most of the patients were in middle age group. Average age of the complicated patients were 46 years. Duration before admission in complicated patients: An average 50.7 hours were lapsed outside hospital before admission (range between 6 hours to 120 hours). Ninety six hours before admission were lapsed in patients who developed burst abdomen and paralytic ileus. Renal failure developed in a patient who lapsed (120) hours before admission. Hospital stay of complicated patient: The average hospital stay of complicated patients was 13 days (range from 7 to 28 days). Most prolonged stay period was found in burst abdomen (28) and patient with pelvic collection and respiratory complications had hospital stay for 13 days and 11 days respectively .
In uncomplicated patient: An average hospital stay was 7 days (range from 6 to 8 days), and 19 hours were lapsed outside hospital before admission.

Discussion

Duodenal ulceration still is a common disease and the most common complications of duodenal ulcer disease in decreasing order of frequency are; bleeding, perforation, and obstruction due to modern diagnostic and effective treatment facilities of duodenal ulcer. The incidence of patients with chronic duodenal ulcer and pyloric stenosis has reduced markedly. In contrast, incidence of perforated duodenal ulcer has not reduced at all to that extent and it is still common in surgical practice[1].
The age of the patients in this study is ranging from 10 to more than 70 years, mean age was 43.13 years. This was similar to that of other studies, like the results of ABMA

Hannan(2005)[7], Barman (1990)[8] and Paul. H. Jordan (1995)[9], the peak incidence of duodenal ulcer perforation was in the 4th decade, 31 to 40 years.

There were 4 cases of females presented with perforated duodenal ulcer in our study while in ABMA Hannan and Rayhana Awwal[10] studies no female affected. So in this present study the affected female may be due to increasing use of NSAIDs, steroids, and smoking.

Other studies also found a male predominance like Paul. H. Jordan study showed male-female ratio 26:1 and Barman study reported (78 %) affected male patients. The very low incidence of female patients with duodenal ulcer perforation in comparison to male incidence may be due to great difference in habits, social, economical and cultural activities[11].

Table X: Comparison of socioeconomic state of our study with two different studies

Zangana & Garota study	Kais & Zakaria study	Our study	Status
61%	42%	42%	Urban
39%	58%	58%	Rural

In table X: 58 patients with perforated duodenal ulcer live in the rural areas while 42 patients live in urban areas and this difference may be explained due to alterations in occupations, educational status, and alterations in life style, and these results were similar to that reported by Kais and Zakaria study (2005)[12], while Zangana & Garota study (2004)[13], were found patients residing in the rural areas had a lower incidence of perforations (39%) than that living in the urban areas (61%).

About 55 patients gave previous history of duodenal ulcer (this depending on esophagoduodenoscopy which done previously) and 45 patients without history of duodenal ulcer. This is similar to other studies such as ABMA Hannan in which 60 patients have history of duodenal ulcer, and Paul. H. Jordan reported 67 patients had previous history of duodenal ulcer .

Table XI: Comparison of risk factors between our study and other three studies

Zangana&Garota	Kocer et al	Kais&Zakaria	Our study	Risk factor
65%	73.2%	69.4%	32%	Smoking
……..	8.9%	32.2%	36%	NSAIDs and steroids
53.2%	.....	53.2%	10%	Fasting
18%	…….	75.8%	9%	Stress
…….	…….	33.9%	9%	Family history
……	12.3%	27.4%	4%	Alcohol

In table XI, regarding the risk factors associated with perforated duodenal ulcer, in our study it was found that 32% were smokers (most of them taking about 40 cigarette or more per day), 36% were on NSAIDs and steroid, fasting patients were constituting about 10% of the total number, both stress and family history had 9%, while alcoholic patients had incidence about 4%.

In a study done by Kais and Zakaria on 62 patients with perforated duodenal ulcer found that the smokers constitute about 69.4% , those on NSAIDs 32.2%, fasting patients about 53.2%, those with stress about 75.8%, those with family history constitute 33.9% and alcoholic patients about 27.4%. In Zangana and Garota study on 124 patients, the incidence of three risk factors : smoking 65% , fasting 53.2% , stress 18% .

In Kocer et al study(2004)[14] on 269 patients, they reported that the incidence about 73.2% for smokers, NSAIDs and steroid was 8.9% patients, and alcoholic patients with 12.3% patients.

Fasting play an important role in duodenal ulcer perforation (10% in our study). This may be explained in that missing one of the important three daily meals, during fasting, with prolonged unneutrilization of gastric acidity especially in smokers during the nights of Ramadan, can be increasing gastric acidity and decreasing the defensive mechanisms of gastric mucosa causing ulcer and then perforation[15,16].

It seems that stress is a significant risk factor. This might reflect the effect of the war situation in our country, 45% of our patients were have no history of duodenal ulcer disease during the period preceding the perforation, and this explained that the stress is important factor in ulcer perforation especially those who were fasting Ramadan[12].

A positive family history of first degree relatives with duodenal ulcer increases the risk to develop ulcer disease and it's complications. This familial aggregations of ulcer is multifactorial; sharing psychological stress, food habits, in addition to the same genetic factors[17].

In this study we found some patients with perforated duodenal ulcer were associated with one or more of medical diseases like hypertension, diabetes mellitus, ischemic heart disease and chronic obstructive pulmonary disease which influence the rate of morbidity and mortality and this is supported by other studies like Kocer et al study[14].

The duration between onset of symptoms and the admission to the hospital has a great influence on post operative complications. It range from 6 to 120 hours; and most of patients (21%) were admitted to the hospital between 18-24 hours. Nine patients were admitted during the first 6 hours, and 2 patients were admitted after 120 hours.

In ABMA Hannan study[19] found that 19% admitted between 19-24 hours, 13% admitted during the first 6 hours, and 2% admitted after 120 hours.

In this study the complicated patients lapsed 50.7 hours before admission whereas the uncomplicated patients lapsed only 19 hours. This suggests that the prolonged period before admission to hospital increases the rate of postoperative complications. This is supported by Deus Fombellida[18] and ABMA Hannan studies.

All patients in this study presented with abdominal pain, tenderness, guarding and rigidity but the severity varied from patient to patient. Thirteen patients presented with shock during admission who were less than that of ABMA Hannan (19%) and Rayhana Awwal (30%) studies[9].

In our study, 65% of patients presented with abdominal distention, while in ABMA Hannan study, 67% of patients presented with abdominal distention and in Rayhana Awwal study the abdominal distention found in all patients.

All patients in this present study had free gas shadow in plain X-ray of the chest in erect posture, although it is generally accepted that only 70% of duodenal perforation have X-ray features of pneumoperitoneum .

Table XII: Comparison of perforation size between our study and two different studies

Site of perforation	ABMA Hannan study	Kocer et al study	Our study	Size of perforation

All in the anterior wall of the first part of duodenum	64%	71%	60%	Less than 0.5 cm
	27%	21.9%	30%	0.5 – 1 cm
	9%	7.1%	10%	More than 1 cm

In table XII: laparotomy findings in this study were more or less; similar to that of other studies. Found that 60% of perforations were less than 5mm in size , 30% were between 5-10mm in size and 10% of perforations were more than 10mm in size, also found that 26% of cases had gross peritoneal soiling.

In comparison with ABMA Hannan study, about 64% of perforations were less than 5mm in size, 27% of perforations were between 5-10mm and 9% were more than 10mm in size, and 23% of cases had gross peritoneal soiling.

Kocer et al study reported that 71%, 21.9%, and 7.1% for perforation sizes <0.5, 0.5-1, and >1 cm respectively.

In our study there is no clear effect of size of perforation on the rate of morbidity and mortality, because we had not huge perforation size.

Patient who lapsed a longer time before operation had purulent peritoneal fluid in 25% of cases; in contrast to 22% of cases had purulent fluid in ABMA Hannan study.

In table XIII, the complications in this study occur in 24 patients. In ABMA Hannan study, found that 21% of patients developed complications, while in Rayhana Awwal study 40%, and in Bonati study (30%)[19], while in Kocer et al study, were 24.2% of patients developed complications. The mortality rate in our study was 2%, which is similar to that reported by ABMA Hannan study, and lower than rate of both Kocer and Boey et al study[20] (8.6% and 7.8% respectively).

Table XIII: Morbidity and mortality for different studies

Bonati study	Rayhana Awwal study	Boey et al study	ABMA Hannan study	Kocer et al study	Present study	Complications
30%	40%	……..	21%	24.2%	24%	Morbidity
……..	…….	7.8%	2%	8.6%	2%	Mortality

In table XIV, we found that in our study, wound infections, respiratory complications, and paralytic ileus were the most common complications (20.83%, 20.83%, and 16.66%, respectively) as well as complications in ABMA Hannan study, but with different rates (14.3%, 19%, and 14.3%, respectively). In case of Kocer et al study, respiratory complications (37.04%) were the most common complications than in our study and in ABMA Hannan study. The rate of wound infections in Kocer et al study was (18.52) which is more than the rate in ABMA Hannan study and less than that present in our study.

Table XIV: Comparison of percent complication of perforated duodenal ulcer between our study and two different studies.

Kocer et al study	ABMA Hannan	Our Study	

		Study				
%	No.	%	No.	%	No.	Complications
18.52	20	14.3	3	20.83	5	Wound infections
37.04	40	19	4	20.83	5	Respiratory complication
9.25	10	14.3	3	16.66	4	Paralytic ileus
0	0	9.5	2	8.33	2	Burst abdomen
8.34	9	9.5	2	8.33	2	Septicemia
1.86	2	19	4	8.33	2	Pelvic collection
0	0	0	0	4.16	1	Intestinal obstruction
0	0	0	0	4.16	1	Incisional hernia
0	0	4.8	1	4.16	1	Urinary tract infection
9.25	10	4.8	1	4.16	1	Renal failure
0	0	4.8	1	0	0	Duodenal fistula
84.26 □	91	100	21	100	24	Total
□ In Kocer et al study (cardiac failure 7.41%, anastomotic dehiscence 5.55%, cerebral vascular disease 1.86%, gastrointestinal bleeding 0.92%).						

Most postoperative complications occurred in the 4th and 5th postoperative day. One patient developed partial intestinal obstruction and treated conservatively in hospital for three days, while another one who developed incisional hernia treated surgically with hernial mesh repair.

The average age of the complicated patients was 46 years. The complicated patients also lapsed more time (average 50.7 hours) before admission. Average hospital stay of complicated patients was 13 days. This result was relatively similar to ABMA Hannan study, but less than that of Mesbah study[21] (the average hospital stay of complicated patients was 17.8 days). This short hospital stay in our study was due to lower incidence of complications. Uncomplicated patients were discharged from hospital 6-8 days after operation and average hospital stay was 7 days.

Conclusion: The most common factor that leading to development of postoperative complications is delayed hospital admission, so to improve the results of treatment of perforated duodenal ulcer; the diagnosis and treatment should not be delayed and the associated medical illness should be treated.

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