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Evaluation postoperative complication of laparoscopic cholecystectomy in diabetic patients

Seyed Vahid Seyed Hosseini*

General Surgeon, Surgery ward of Shahid Mahallati Hospital, Tabriz, Iran

*Corresponding author

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A B S T R A C T

The high prevalence of gallstone and acute acalculous cholecystitis in diabetic patients proves the involvement of the biliary system in these patients. The intraoperative and post-operative complications in the diabetic patients were considerably higher than the control group. The aim of this study was evaluation and compares the results and complication of Laparoscopic Cholecystectomy in diabetic and non-diabetic patients. A descriptive-analytical study was performed in the surgery ward of Shahid Mahallati Hospital of Tabriz on 60 patients who had undergone Laparoscopic Cholecystectomy at 2012–2014. The aim of this study was evaluation and compares the results and complication of Laparoscopic Cholecystectomy in diabetic and non-diabetic patients. Thirty diabetic patients and 30 non-diabetic patients, who were candidates for Laparoscopic Cholecystectomy, were enrolled into the study. The mean age of diabetic and non-diabetic patients was 49.90 ± 10.37 years and 53.66 ± 11.55 years, respectively ($P=0.189$). 11 patients in both groups were male and 19 of them were female ($P=1$). Post-operative complications were observed in 11 diabetic patients and 4 non-diabetic patients. The total complications of diabetic patients is significantly higher than non-diabetic patients ($P=0.037$), no significant difference was observed between the frequencies of complications of the two groups ($P>0.05$). The mean duration of operation on diabetic and non-diabetic patients was 57.22 ± 7.40 and 53.27 ± 11.19 minutes, respectively ($P=0.113$). The mean duration of hospitalization for the diabetic and non-diabetic patients was 56.86 ± 9.83 and 34.89 ± 7.11 , respectively. The mean duration of hospitalization of diabetic patients was significantly longer ($P<0.001$). The rate of development of symptomatic gallbladder diseases that require surgery is higher in diabetic patients. Results of the present study also suggest that the rate of outbreak of post-surgical complications is generally higher in diabetic patients than non-diabetics. In addition, the duration of hospitalization of diabetic patients is also longer than other patients

Introduction

About 10% of people suffer from gallstone and cholecystectomy is the most common

form of major surgery in western countries (Bates *et al.*, 1992). Laparoscopic

Cholecystectomy is a reliable and acceptable means of treating cholecystitis. However, it is more likely to be transformed into laparotomy as compared to elective Laparoscopic Cholecystectomy (Bickel *et al.*, 1996). Although Laparoscopic Cholecystectomy is considered the standard means of treating symptomatic gallstone, its role in the treatment of acute cholecystitis is not known fully. Therefore, there are still contraindications in this regard (Cox *et al.*, 1993).

This method is known as a first-line treatment method even for acute cholecystitis (Estes *et al.*, 1996). Studies were also carried out to compare medical and non-surgical treatment methods with emergency surgical interventions for the treatment of acute cholecystitis. However, acute cholecystitis can be a life threatening disease (Lubasch and Lode, 2000). In 1882, Laparoscopic Cholecystectomy was for the first time successfully carried out and in 1970 small-incision (S.I.C) Cholecystectomy was introduced. The latter method led to a decrease in the morbidity of patients (Dubois and Berthelot, 1982; Goco and Chambers, 1983). In 1987, laparoscopy was introduced as a form of operation by Philip Mort in France. This method gradually became the elective method for the treatment of gallstone (NIH Consensus conference, 1993).

Due to the existence of some technical problems and constraints, open Cholecystectomy is still widely used and even 5 to 15% of laparoscopic operations inevitably turn into open Cholecystectomy operations during operations. As a result operation time, costs and morbidity are increased (Rosen *et al.*, 2002; Paulo *et al.*, 2001). Conditions such as acute cholecystitis, gangrene, empyema of the gallbladder, obesity, pregnancy and previous

upper abdominal surgery were previously known as Laparoscopic Cholecystectomy contraindications. These conditions are today only known as risk factors of laparoscopy and only make this procedure harder (Lipman *et al.*, 2007; Ibrahim *et al.*, 2006). These risk factors are the causes of transformation of Laparoscopic Cholecystectomy to open Cholecystectomy (Simopoulos *et al.*, 2005).

On the other hand, prophylactic Cholecystectomy has indication in diabetic old patients. Therefore, even asymptomatic old diabetics are candidates for Cholecystectomy (Brunicardi *et al.*, 2005). Diabetic patients are more prone to some surgical complications due to their background diseases and therefore the rate of morbidity and mortality is higher in these patients. Hence, the best Cholecystectomy surgery for these patients is still not determined.

Diabetes Mellitus is the most common endocrine disease in the world. It is also difficult to determine the true prevalence of this disease in the world population due to the difference in its diagnostic measures (Braunwald *et al.*, 1998; Andreoli *et al.*, 2001; Schrier, 1999). However, according to the existing statistics, the prevalence of this disease in the world is 1 to 2% (Andreoli *et al.*, 2001a, 2001b).

The characteristics of this disease include the following: metabolic abnormalities, long-lasting complications (which involve the eyes, kidneys, nerves, arteries), and basal membrane lesions that can be spotted using electron microscopes (Schrier, 1999; Junquera, 1998). Due to the prevalence of diabetes mellitus and the possibility of operating diabetics, it is always necessary for the surgeon to have knowledge of diabetic patients' problems before, during

and after operation. The surgeon should also have adequate knowledge of the side effects of surgery in these patients and should know the means of coping with these side effects.

The health of diabetic patients is highly threatened by anesthesia and surgery (Sabiston, 1997; Schwartz, 1999) and these patients are prone to many medical disorders (Junquiera, 1998; Sabiston, 1997; Schwartz, 1999; Sadler, 1996; Guyton and Hall, 1998). Therefore, the side effects of such disorders can be intensified with surgery. In addition, stresses caused by surgery, trauma and infection lead to an increase in the production of the anti-insulin catabolic hormones. This consequence also adds to the difficulty caused by diabetes (Lawrence, 1994; Chapman, 1996; Shpitz *et al.*, 1995).

Concerning precise diabetes management and prevention of its complications it can be said that in kidney transplantation when a kidney is transferred from a donor (who does not suffer from diabetes mellitus and does not have a family history of diabetes) to a diabetic receiver, the kidney develops diabetic nephropathy lesions in the body of the receiver after 3 to 5 years. On the other hand, in diabetic patients treated by pancreas transplant, the transplanted kidney does not develop diabetic nephropathy. In addition, according to the existing reports, the lesions of kidneys suffering from diabetic nephropathy fade after the kidneys are transferred to healthy individuals (Sabiston, 1997; Schwartz, 1999).

These findings suggest that, hyperglycemia or some of the problems associated with diabetes-induced abnormal metabolism lead to some diabetic complications or provide for the emergence of diabetic complications. Other factors such as genetic factors play a role in this regard (Sadler, 1996) because there are patients whose diabetes is not

controlled properly for years but do not show the signs of such late complications. On the other hand, there are patients that are suffering from these complications at the time of diagnosis (Schrier, 1999; Andreoli *et al.*, 2001; Junquiera, 1998; Sabiston, 1997; Schwartz, 1999). The aim of this study was evaluation and compares the results and complication of Laparoscopic Cholecystectomy in diabetic and non-diabetic patients.

Materials and Methods

A descriptive-analytical study was performed in the surgery ward of Shahid Mahallati Hospital of Tabriz on 60 patients who had undergone Laparoscopic Cholecystectomy at 2012–2014. The aim of this study was evaluation and compares the results and complication of Laparoscopic Cholecystectomy in diabetic and non-diabetic patients.

In this study, 30 diabetic patients and 30 non-diabetic patients that underwent Laparoscopic Cholecystectomy were enrolled in to study. The demographic parameters, surgery information, laboratory findings and post operative results and complication of patients in both groups evaluated and collected. All patients underwent Laparoscopic Cholecystectomy by single surgeon.

All laboratory tests were checked by one laboratory. All patients followed for six months for results and complications.

Statistical analysis

The collected data were analyzed by SPSS-17 statistical software. The collected data were expressed as percentage and mean \pm SD. Continuous (quantitative) variables were compared by Independent samples and Paired t test. Categorical (qualitative)

variables were compared by contingency tables and Chi-square test or Fisher's exact test. P-value ≤ 0.05 was considered statistically significant.

Ethical considerations

Before including the patients in the study, the treatment methods along with its side effects and advantages were described to the patients. Therefore, the patients participated in the study with full awareness after their informed consent was obtained.

Results and Discussion

In this study, the operation results and complications of 30 diabetic patients and 30 non-diabetic patients, who were candidates for Laparoscopic Cholecystectomy, were examined. The following results were obtained:

The mean age of diabetic and non-diabetic patients was 49.90 ± 10.37 years and 53.66 ± 11.55 years, respectively (Chart 1). Therefore, there was no significant difference between the ages of the two groups ($P=0.189$). 11 patients in both groups were male and 19 of them were female ($P=1$). Table 1 shows the demographic findings for the two groups and Table 2 shows the experiment results.

Post-operative complications were observed in 11 diabetic patients and 4 non-diabetic patients. These complications are presented in Table 3, which indicates that although the total complications of diabetic patients is significantly higher than non-diabetic patients ($P=0.037$), no significant difference was observed between the frequencies of complications of the two groups ($P>0.05$).

The mean duration of operation on diabetic and non-diabetic patients was 57.22 ± 7.40 and 53.27 ± 11.19 minutes, respectively

(Chart 2). Therefore, no significant difference was observed between the duration of operation on the patients of the two groups ($P=0.113$).

The mean duration of hospitalization for the diabetic and non-diabetic patients was 56.86 ± 9.83 and 34.89 ± 7.11 , respectively (Chart 3). Therefore, the mean duration of hospitalization of diabetic patients was significantly longer ($P<0.001$).

Diabetes is a systematic disease that involves many body organs. The high prevalence of gallstone and acute acalculous cholecystitis (Feltis *et al.*, 1998) in these patients proves the involvement of the biliary system in these patients (Aucott *et al.*, 1993; Chapman *et al.*, 1996). Hahm *et al.* (1996) carried out ultrasonography on the gallbladder of diabetic patients and realized that the size of gallbladder in such patients is significantly and statistically higher than non-diabetic patients ($P<0.05$).

Friedman (1998) and Aucatt (1993) carried out studies and stated that the side effects of Laparoscopic Cholecystectomy in diabetic patients are higher than others. Forbes *et al.* (1996) also reported the development of liver abscesses in diabetic patients suffering from silent gallstone. In a study in Spain it was found out that 52.3% of patients with emphysematous acute cholecystitis suffer from diabetes (Garcia-Sancho Tellez, 1999). The present study was an attempt to examine post-surgical complications and Laparoscopic Cholecystectomy results in diabetic patients.

In a study carried out in 1996 on 308 diabetic patients and 318 patients forming the control group, the prevalence of gallstone in diabetics and non-diabetics was reported to be 32.7% and 20.8%, respectively (Bedirli, 2001).

The intraoperative and post-operative complications in the diabetic patients were considerably higher than the control group (Bedirli, 2001).

Similar to the results of the above mentioned study, results of the present study also suggest that the rate of outbreak of post-surgical complications was significantly higher in diabetic patients than non-diabetic patients ($P < 0.037$).

Another study reported that the rate of mortality caused by Laparoscopic Cholecystectomy in diabetics is higher than non-diabetics (Landau, 1992). In another study carried out in 1982 on 175 patients it was found out that diabetes mellitus is not a predictor for prognosis of patients in need of Cholecystectomy because renal diseases and vascular occlusion are more important factors in this regard (Walsh and Burney, 1982).

Fortunately, in the present study no post-surgical mortality was observed in the study groups.

Based on the results of some of the studies in this field, diabetic patients are more prone to cardiac complications during and after Laparoscopic Cholecystectomy surgeries compared to healthy individuals (Shpitz *et al.*, 1995).

According to scientific textbooks, since vascular occlusion and its specific pathophysiology contribute to the emergence of such conditions in diabetic patients, it is necessary to control blood sugar following and during surgeries. This is meant to reduce such complications (Paulo *et al.*, 2001).

In this study, the post- and pre-operative blood sugar levels of all diabetic patients

were carefully controlled using insulin and glucose infusion.

One of the most important complications caused by surgery in diabetics is wound infection. Diabetics are more prone to different infections (such as surgical infections) due to the defect of their immune system (Lawarence, 1994).

In this study, 4 diabetic patients and 1 non-diabetic patient experienced surgical wound infection and although the frequency of such infections was higher in diabetics, no significant statistical difference was observed ($P = 0.353$).

A similar study reported a complication rate of 21% and 9% for diabetic and non-diabetic patients, respectively. According to these studies, complications in diabetics are significantly higher than non-diabetics ($P < 0.05$) (Landau *et al.*, 1992).

In this study, the rate of outbreak of post-surgical complications in diabetic and non-diabetic patients was 36.66% and 13.33%, respectively.

Ikard *et al.* (1990) studied the relationship between post-surgical complications and blood sugar level. They stated that lack of control over blood sugar before and after surgery can lead to an increase in the prevalence of Laparoscopic Cholecystectomy complications in diabetic patients (Ikard, 1990).

Rasohoff *et al.* (1987) concluded that acute cholecystitis is more dangerous in diabetic patients than non-diabetics. Reidss (1993) also examined 664 Cholecystectomy surgical cases and the follow ups. He concluded that diabetic patients are more prone to surgical complications compared to other patients.

Table.1 Demographic finding of patients in two groups

| | Group | | P |
|-------------------------|---------------|---------------|-------|
| | Diabetic | Non-Diabetic | |
| Age(Year) | 49.90 ± 10.37 | 53.67 ± 11.56 | 0.189 |
| Diabetes duration(Year) | 9.27 ± 5.16 | - | - |
| Weight(Kg) | 55.73 ± 10.74 | 58.80 ± 13.17 | 0.327 |
| BMI | 21.06 ± 3.11 | 21.99 ± 3.28 | 0.266 |

Table.2 Laboratory finding of patients in two groups

| | Group | | P |
|----------------------------|--------------------|--------------------|--------|
| | Diabetic | Non-Diabetic | |
| Blood Sugar | 254.10 ± 31.46 | 120.77 ± 14.14 | <0.001 |
| Blood Urea Nitrogen | 70.73 ± 18.17 | 31.47 ± 8.58 | <0.001 |
| Creatinine | 1.81 ± .26 | .92 ± .29 | <0.001 |
| White Blood Cell | 17762.33 ± 7132.06 | 14684.67 ± 4850.49 | 0.055 |
| Hemoglobin | 12.27 ± 3.18 | 11.83 ± 1.71 | 0.512 |
| Platelet | 240.97 ± 78.53 | 264.73 ± 91.82 | 0.286 |
| Potassium(K ⁺) | 4.40 ± .69 | 4.18 ± .41 | 0.138 |
| Sodium (Na ⁺) | 147.97 ± 4.19 | 145.83 ± 4.96 | 0.077 |
| PT | 13.37 ± .60 | 13.38 ± .57 | 0.912 |
| PTT | 32.27 ± 2.20 | 32.83 ± 2.60 | 0.366 |
| INR | 1.13 ± .13 | 1.09 ± .11 | 0.158 |
| PH | 7.37 ± .05 | 7.39 ± .04 | 0.054 |
| HCO ₃ | 21.47 ± 2.18 | 22.35 ± 2.62 | 0.162 |
| Pa CO ₂ | 38.94 ± 3.87 | 39.26 ± 2.47 | 0.707 |
| O ₂ Sat | 95.83 ± 6.12 | 94.81 ± 5.84 | 0.510 |

Table.3 Complications of patients in two groups

| | Group | | P |
|---------------------|----------|--------------|-------|
| | Diabetic | Non-Diabetic | |
| Complications | 11 | 4 | 0.037 |
| Prolonged ileus | 1 | 0 | 1 |
| Fever | 4 | 2 | 0.671 |
| Nausea and Vomiting | 9 | 3 | 0.053 |
| Wound infection | 4 | 1 | 0.353 |
| Bleeding | 4 | 1 | 0.353 |

Chart.1 Age distribution of patients in two groups

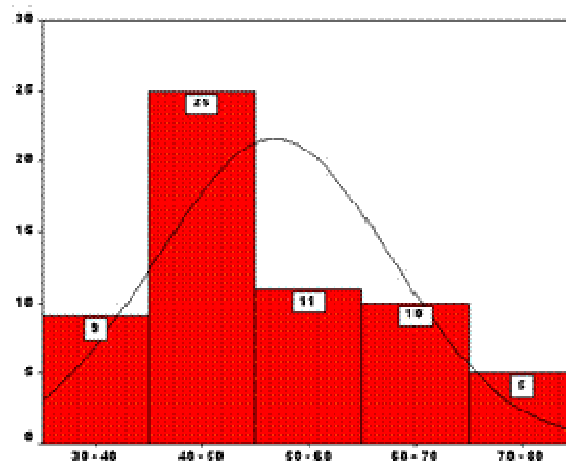


Chart.2 Distribution of surgery duration of patients underwent Laparoscopic Cholecystectomy in two groups

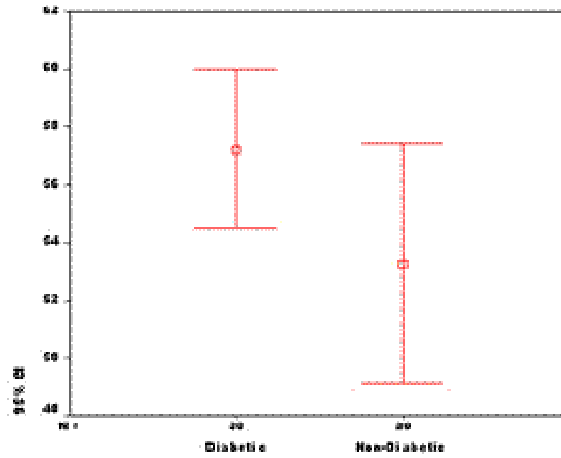
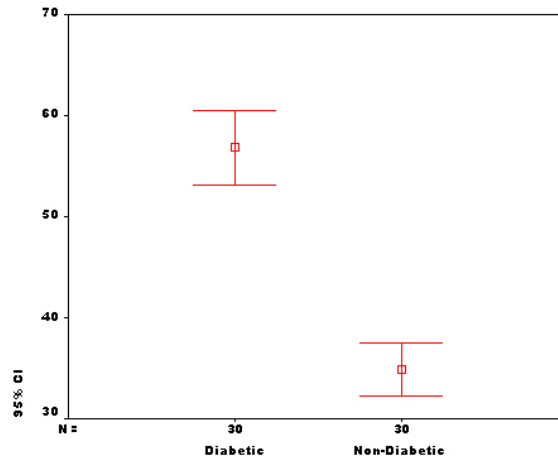


Chart.3 Distribution of admission duration of patients underwent Laparoscopic Cholecystectomy in two groups



In the study by Landau, 21% of diabetic patients and 9% of non-diabetic patients were diagnosed with acute cholecystitis ($P < 0.05$) (Landau *et al.*, 1992).

It can be said that diabetic neuropathy may disturb innervations of gallbladder and reduce its movements. As a result, the functionality of gallbladder is reduced, which is manifested as laxity, largeness, delay and weakness of cholecystectomy. All these consequences delay the outbreak of symptoms and timely diagnosis and treatment of gallstone (Hahm *et al.*, 1996; Garcia-Sancho Tellez *et al.*, 1999).

Cholecystectomy is the most common abdominal surgery in western countries and the elective method for this surgery is laparoscopy. Several studies have been so far conducted on application of Laparoscopic Cholecystectomy to diabetic patients (Syrakos *et al.*, 2004; Ros *et al.*, 2001). In the study by Ros, Harju and Vogenas as well as the meta-analysis by Purkayastha laparoscopy led to a reduction in the duration of hospitalization (Ros *et al.*, 2001; Harju *et al.*, 2006; Vagenas *et al.*, 2006; Purkayastha *et al.*, 2007). Only in Syrakos' study there was no difference in the duration of hospitalization of the laparotomy and laparoscopy groups (Syrakos *et al.*, 2004). In Syrakos' study, laparoscopy costs were significantly higher than other costs (Syrakos *et al.*, 2004).

In this study, no significant difference was observed between the duration of operation on diabetic and non-diabetic patients. However, the duration of hospitalization of diabetics was longer than non-diabetics. This difference shows the significant impact of diabetes on duration of hospitalization of such patients.

The conclusion of this study is the rate of development of symptomatic gallbladder diseases that require surgery is higher in

diabetic patients. Results of the present study also suggest that the rate of outbreak of post-surgical complications is generally higher in diabetic patients than non-diabetics. In addition, the duration of hospitalization of diabetic patients is also longer than other patients.

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