Postcholecystectomy Bowel Motion Changes and Diarrhea
A Prospective Study

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ABSTRACT

Background: Cholecystectomy is one of the most commonly performed surgery in surgical practice. It's clearly affect bowel motion regarding frequency and consistency. Postcholecystectomy diarrhea is considered the most common non-pain squuelae after surgery, despite that still the pathophysiology of condition is not fully understood. It is thought to be related to bile acid malabsorption and change of colonic transit time, in addition the associated risk factors, prevalence of the condition still not well defined.

Objectives: To evaluate change of bowel motion in patients with cholecystectomy, to define prevalence of postcholecystectomy diarrhea, nature, etiology and possible risk factors of postcholecystectomy diarrhea.

Methods: One hundred and fourteen patients included in the study who undergo cholecystectomy, all patients interviewed preoperatively and then after surgery at period 2 weeks, 3 months and 6 months after surgery all demographic data was collected and special consideration regarding bowel motion frequency and consistency was taken and according to Bristol diarrhea scale, WHO definition of diarrhea. We classified bowel motion consistency into (hard, well-formed, loose, watery) and identified patients with diarrhea, similarly patients with constipation is also identified.

Results: Forty-four patients (38.59%) developed postcholecystectomy diarrhea during period of study. Thirty-four (77.27%) were females and (10) (22.73%) were males. The mean number of bowel motion frequency per day increased from 1.1 before surgery to 1.9 in period between 2 weeks and 3 months after surgery, stool consistency form was also changed that hard bowel motion decrease from 35.1% before surgery to 8.8% in period between 2 weeks and 3 months and loose bowel motion from17.5% to 29.8% within 2 weeks after surgery.

Conclusion: Cholecystectomy show marked change in bowel habit in post cholecystectomy period. The postcholecystectomy diarrhea is common problem in postcholecystectomy period. The high BMI especially obesity grade C2, 3 and younger age group less than 40 years showed significant association with development of postcholecystectomy diarrhea, but the sex of the patient and type of surgery (laparoscopic and open surgery) show no significant association with development of postcholecystectomy diarrhea. Patients with cholecystectomy showed increase mean bowel frequency per day and change of bowel motion consistency from hard toward lose and watery bowel motion after cholecystectomy.

Keywords: Postcholecystectomy syndrome, Postcholecystectomy diarrhea, Bile acid malabsorption.

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Cholecystectomy is one of the most common operations in the world. Its most commonly performed abdominal procedures in the USA in 2012, where about 406,000 cholecystectomy operations were performed(1).

Most of the patients satisfied from result of cholecystectomy, but still a significant number of patients suffer either from the same symptoms before surgery or newly emerging symptoms that were not found before surgery. One of the most frequent problem after cholecystectomy is postcholecystectomy syndrome (PCS), which different group of disorders that affecting patients after cholecystectomy

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result in continuation of complain after surgery. The incidence of PCS varies from 5 to 40%[2].

Postcholecystectomy diarrhea (PCD) is the most common non-pain complain after cholecystectomy with an incidence varies greatly from a study to another, but large systemic review show prevalence rate of 9.1%[3]. Its pathophysiology, risk factor and aetiology are not fully understood. It seems to be associated with Bile acid malabsorption (BAM)[4]. The SeHCAT (23-selena-25-homotaurocholic acid) test that used for assessment of bile acid absorption show significant rate of BAM in which 25 out 26 patients who develop postcholecystectomy diarrhea in one study[5]. Good response to cholestyramine (bile acid chelating agent) support BAM as main causative factor[6]. Fibroblast growth factor 19 that produced in the terminal ileum regulates production of hepatic bile acid by negative feedback mechanism, reduction of this factor result in excess of bile acid in colon which in turn result in diarrhea, this factor was greatly reduced in patients with primary BAM[7]. The weight of stool in patients with PCD more than 200 g per day with increase of three to ten times total fecal bile acids content greater than normal[8]. Deoxycholic acid and chenodeoxycholic acid (bile acid) show stimulation of fluid secretion, increase colonic mucosal permeability and induce mucosal damage in experimental perfused colonic rabbit[9].

In addition, colonic transit time one month after surgery of cholecystectomy show marked decrease (38 ±5 hours), in comparison with that before surgery (51 ±5 hours). Patients with the PCD show colonic transit times acceleration similar to the patients with infectious diarrhea, (by 19 ±3 hours)[10].

The effect of cholecystectomy on the bowel habit can varies greatly from mild and transient change in the bowel function to well-recognized severe diarrhea that interfere with daily activity. Sometimes, the change of bowel function helps the patient by relieving troublesome previous constipation[11].

The aim of study is to evaluate change of bowel motion in patient with cholecystectomy, to define prevalence of PCD, nature, aetiology and possible risk factors of PCD.

Methods

This is a prospective cohort study involving 114 patients who underwent cholecystectomy at Al-Yarmouk teaching hospital, and one private hospital in Baghdad, Iraq. During the period from August 2016 to June 2017. Full information through history and physical examination was taken from each patient before surgery (age, gender, body weight, height, past medical history, association of fatty meal). Type of surgery whether laparoscopic or open surgery was recorded. Special consideration was given for history of bowel habit. Each patient evaluated regarding bowel function (consistency, frequency of defection per day) before and after surgery (10 days, 3 months and 6 months after surgery by direct interview or by contact through phone call). The body mass index was calculated for each patient.

Based on Bristol diarrhea scale[12] we design our evaluation to bowel function and define patient with diarrhea and constipation. We recorded the consistency of stool (hard, soft well-formed, loose and watery). The frequency of defection per day for each patient was recorded. According to WHO definition of diarrhea[13], patients with frequency of bowel motion more than 3 times per day with fluidly or semi-fluid in consistency was diagnosed as diarrhea, while patient with constipation identified by most commonly used definition of constipation[14] (bowel motion less of three or fewer per week) and is usually associated with hard stool (ROME CATERIA ш [15] and BRISTOL diarrhea scale[12]) help in the diagnoses of constipation. Patient with history of inflammatory disease and chronic diarrhea were excluded from study.

The SPSS program version 22 was used for statistical analysis. The results were expressed by mean and standard deviation

(SD) for continuous variables or with frequency and percentage for categorical variables. Person Chi-square test was used for comparison and measuring association. P-value less than 0.05 were considered to be statistically significant.

Results

During the period from August 2016 to June 2017, 114 patients were included in the study (26 males 22.81%, 88 females 77.19%), the mean age was 41.33±14.6 years. The mean body mass index (BMI) of the patients was 28.54±6.09 kg^2/m. The surgery was performed either by laparoscopic cholecystectomy in 44(38.6%) patient or by open cholecystectomy in 70(61.4%).

Forty-four patients (38.59%) developed PCD during the period of the study thirty-four were (77.27%) females and 10 (22.73%) males. The mean number of bowel motion frequency per day and diarrhea prevalence among patients during different time of study, (Table 2).

The relationship between development of PCD and patients' characteristics (age, sex, BMI, type of surgery), (Table 3).

Stool consistency chart for patients with cholecystectomy Versus time after surgery was recorded during the period of the study, (Figure 1). Where we have 40 (35.1%) patients with hard bowel motion before surgery, that become 20(17.5%), 10(8.8%), 18(15.8%) patients in periods within 2 weeks after surgery, 2 weeks to 3 months and 3 months to 6 months after surgery respectively. Well-formed bowel motion before surgery was in 54(47.4%) patients, that became 48(42.1%), 64(56.1%) and 72(63.2%) patients in the period within 2 weeks after surgery, 2 weeks to 3 months and 3 months to 6 months after surgery, respectively. Loose bowel motion before surgery in 20(17.5%) patients, become after surgery 34(29.8%), 30(26.3%) and 32(28.1%) patients in period within 2 weeks after surgery, 2 weeks to 3 months and 3 months to 6 months after surgery, respectively. While watery bowel motion was recorded in 18(15.8%), 26(22.8%) and 22(19.3%) patients in the period within 2 weeks after surgery, 2 weeks to 3 months and 3 months to 6 months after surgery, respectively.

Table 1: Baseline Characteristics of Study Sample

Variables	Value No. (%)
Number	114
Female	88 (77.19)
Male	26(22.81)
Age (year)	
≤ 40	50 (43.9)
41 – 60	52 (45.6)
> 60	12 (10.5)
Body weight no. (%)	
Normal weight	34 (29.8)
Over weight	40 (35.1)
Obese C1	22 (19.3)
Obese C2	12 (10.5)
Obese C3	6 (5.3)
Type of operation, no. (%)	
Laparoscopic cholecystectomy	44 (38.6)
Open cholecystectomy	70 (61.4)

Table 2: Frequency of bowel motion and diarrhea prevalence among patients during different time of study

Time Period	Mean number (SD) of bowel motion per day	Number (%) of patients with diarrhea
Before Surgery	1.1 (0.8)	0 (0.0)
0-2 weeks from surgery	1.6 (0.8)	18 (15.8)
2 weeks – 3 months from surgery	1.9 (1.1)	36 (31.6)
3 months – 6 months from surgery	1.7 (1.1)	26 (22.8)

*Some patients developed diarrhea during more than one-time period after surgery

Table 3: Relationship between development of PCD and patients' characteristics.

Character	Number (%) with PCD	P-value
Age; no. (%)		
≤ 40 yr.	26 (52.0)	0.023*
41 – 60 yr.	16 (30.8)	
> 60 yr.	2 (16.7)	
Sex;		
Males	10 (38.5%)	1.000
Females	34 (38.6%)	
Body weight; no. (%)		
Normal weight	14 (41.2)	
Over wt.	10 (25.0)	0.001**
Obese C1	6 (27.3)	
Obese C2	8 (66.7)	
Obese C3	6 (100.0)	
Type of cholecystectomy; no. (%)		
Laparoscopic	16 (36.4)	0.698
Open	28 (63.6)	

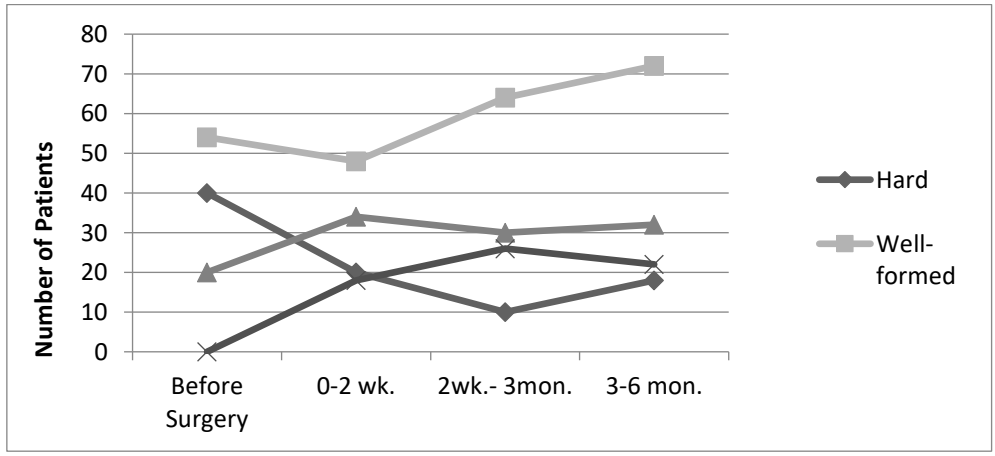

Figure 1: Stool consistency chart for patients with cholecystectomy versus time after surgery.

Table 4: Incidence of constipation in different time from cholecystectomy versus sex of patients.

Time	Sex no. (%)		
	Females	**Males**	**Total**
Pre-operative	30 (34.1%)	4 (15.4%)	34 (29.8%)
Within 2 weeks after surgery	12 (13.6%)	2 (7.7%)	14 (12.3%)
2 weeks to 3 month after surgery	10 (11.4%)	Zero (0%)	10 (8.8%)
3month to 6 month after surgery	20 (22.7%)	2 (7.7%)	22 (19.3%)

Box 1: Relation between fatty meal and PCD

Thirty-two patients reported relation between fatty meal and diarrhea out of total number of 44 patients with diarrhea

Discussion

The cholecystectomy is considered as one of the most commonly performed abdominal surgery in the world. The change of bowel habit and development of PCD are a well recognized squuelae of cholecystectomy, despite that the pathology and nature of change of bowel habit and PCD is not fully understood and thought to be related to BAM and change of colonic transit time. The prevalence is greatly varied from study to another ranging from 0.9% to 35.6%[16]. In present study 44 patients (38.59%) develop PCD which obviously in the upper limit of previously reported studies. This variation is most probably because were many studies carried on retrospectively[17,18] after long period after surgery may be make it difficult to report previous episodes of diarrhea, which will not give the real frequency of PCD and the difference of presentation of PCD which in most cases are short, mild, transient and episodic in nature which lead to underestimation of this clinical problem. In addition, the difference of patients views about defining diarrhea and many studies did not use scaling system to identify patients with diarrhea, all these factors might contribute to the difference in prevalence of PCD.

In the present study, the frequency of PCD increase with time after surgery reaching the maximum incidence at a period of (2 weeks to 3 months after surgery), then slightly decrease at period (3 months - 6 months after surgery). Eighteen patients (15.8%), 36 patients (31.6%) 26 patients (22.8%) develop PCD at period from (0-2 weeks), (2 weeks – 3 months) and (3 months – 6 months) after surgery, respectively. The mean number of bowel motion frequency for each patient also shows maximum increase at the same period by 1.1, 1.6, 1.9, 1.7 motion per day before surgery, (0-2 weeks), (2 weeks – 3 months), (3 months – 6 months) after surgery, respectively. So we noticed the maximum effect on the bowel function habits occur during the period of 2 weeks to 3 months after surgery. Moussavian[19] et al similarly show nearly similar result with number of patient reporting more than bowel motion per day increase in 12/48 (25%) before surgery to 24/48 (50%) and 21/48 (43%), at 4 and 12 weeks after cholecystectomy, respectively. The decrease in frequency of PCD with time may be due to the development of adaptive mechanism[20].

On other hand, stool consistency similarly did change with maximum effect toward loose and watery bowel motion in the period of (2 weeks – 3 months) after cholecystectomy increasing from 17.5% patient with loose bowel motion before surgery to 45.6% patient, 49.1% patient and 47.4% with loose and watery bowel motion after surgery at period (0-2 week), (2 weeks – 3 months), (3 months – 6 months), respectively. While hard bowel motion decrease dramatically in 35.1% patient with hard bowel motion before surgery to 8.8% patient at period of (2 weeks – 3 months)

after surgery but raise again at the end of 6 months after surgery to 15.8% patient with hard bowel motion which remain greatly lower than before surgery by 19.3%. This effect is beneficial for patients who suffer from constipation before surgery. These results nearly agree with Sauter et al[21] who show in his study an increase of patients reporting loose stools (from 2% to 47% and 33% before, at 4 weeks, and 12 weeks cholecystectomy, respectively)

Yueh et al[20] and Fisher et al[16] show a significant association between younger age group < 50 year, male sex and PCD, Fisher et al[16] also, show association between patients with high BMI and PCD but Yueh et al[20] show no association between BMI and PCD. In present study, there is a significant association between young age group < 40 years and PCD where 26 patients (52.0%) develop PCD in this age group (P-value = 0.023), but the gender shows no significant association with PCD, in present study (10 male patients with PCD (38.5%) and 34 female patients with PCD (38.6%) P value =1.000), Niranjan et al[22] also show significant association between PCD and younger age group.

In present study, there is a significant association between BMI and PCD where patients with normal weight, 14 patients (41.2%) develop PCD and those with obesity class C2 and 3 develop PCD in 8 patients (66.7%) patients 6(100.0%), P value =0.001. The type of cholecystectomy shows no significant association with PCD (P value=0.698).

Yueh et al[20] show low-fat diet has significant negative association with PCD at both one week and 3 months after cholecystectomy. Similarly, in present study, 32 patients reported a relation between fatty meal and PCD out of the total number of 44 patients with PCD, the effect of fatty meal may be related with production of bile salt, this association need further evaluation by other study to assess significance.

In the present study, the constipation decrease from 29.8% patient pre-operatively to 8.8% at (2 weeks – 3 months) post operatively then again elevated to 19.3%. This effect helps many patients with chronic constipation but unfortunately tend to decrease by time. Gui et al[23] showed 21 patients with pre-operative constipation decrease to 14 patients postoperatively during a follow up period after surgery for a mean of 31.1 month, while Hearing et al[24] showed in his study 34 patient with preoperative constipation before cholecystectomy decrease to 18 patients 2 - 6 months after surgery. Four patients in present study developed severe diarrhea and were treated by cholestyramine with good response (most of cases of PCD are mild, transient which can be tolerated by patient in addition of high cost of cholestyramine), Sciaretta et al[5] showed 92% of PCD patients improved clinically after treatment by cholestyramine, further study for assessment of the role of cholestyramine are recommended.

In conclusion; Cholecystectomy shows marked change in bowel habits in the post cholecystectomy period. The PCD is a common problem in the post cholecystectomy period, fortunately it tends to be mild, transient and most decrease with the time.

The high BMI especially obesity grade C2, 3 and younger age group (< 40 years) show significant association with the development of PCD, but the sex of the patient and type of surgery (laparoscopic and open surgery) show no significant association. Patients with cholecystectomy show increase of mean bowel frequency per day and change of bowel motion consistency from hard toward lose and watery bowel motion after cholecystectomy.

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