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STUDY OF PREOPERATIVE CLINICAL AND INVESTIGATIVE FACTORS PREDICTING DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY

Dr. Deepak Verma [1], Dr. Ratan [2], Dr. Nemi Chand [2]
[1] Senior Professor and Head of the Department, Department of Surgery, Dr. S. N. Medical College, Jodhpur, Rajasthan India
[2] Senior Resident, Department of Surgery, Dr. S. N. Medical College, Jodhpur, Rajasthan India

Abstract

Background: Laparoscopic cholecystectomy is one of the most commonly performed surgical procedure with the advantage of short hospital stay, cosmetic, less post-operative pain and early return to work and thus ultimately cost effective. However, certain factors can make the procedure difficult and such patients many do not enjoy benefit of laparoscopic procedure particularly longer hospital stay.

Aim: To determine various factors on clinical, pathological and radiological grounds to predict difficult laparoscopic cholecystectomy.

Material and Method: 200 patients admitted in surgical ward with a diagnosis of Chronic Calculus cholecystitis to be selected for laparoscopic cholecystectomy were subject of this study. Age, Sex, BMI, number of previous attack, previous abdominal surgery, past history of pancreatitis and jaundice, signs of acute cholecystitis, leucocytosis, CRP, Liver function tests, serum amylase and lipase, GB wall thickness, presence of pericholecystic fluid , status of GB and anatomical variation were various factors studied.

Results: Age > 50 years, male sex, BMI>30, more than 4 attacks, signs of cholecystitis, leucocytosis > 11,000/cu mm, increased GB wall thickness, presence of pericholecystic fluid and overdistended or contracted gall bladder are associated with difficult laparoscopic cholecystectomy.

Keywords: Prediction; Difficult; Laparoscopic Cholecystectomy.

1. Introduction

Gallstone disease is one of the most common problems affecting the digestive tract. The prevalence of gallstones is related to factors like age, gender, and ethnic background. In India the prevalence is estimated to be around 4% [1] changing incidence in India is mainly attributed to westernization of diet, change in socioeconomic structure and availability of ultrasound as investigation in both rural and urban areas. The National Institute of Health (NIH) consensus development conference in the year 1992 concluded that laparoscopic cholecystectomy provides a safe and effective treatment for most patients with symptomatic gallstones [2]. Laparoscopic cholecystectomy is the gold standard treatment for cholelithiasis. It has now become one of the most common operations performed by general surgeons. Since the introduction of laparoscopic cholecystectomy, the number of cholecystectomy performed in India has been increased due to widespread use of radiological investigation for screening. The advantages of laparoscopic cholecystectomy are earlier return to bowel function, less postoperative pain, cosmetic, shorter length of hospital stay, earlier return to full activity, and decreased overall cost. Attempts can be made in all cases of gall stone diseases with laparoscopic procedure except for patients with bleeding diathesis and patients not fit for general anesthesia. However, of all Laparoscopic Cholecystectomy, 1-13% requires conversion to an open for various reasons [3]. Thus, for surgeons it would be helpful to establish criteria that would assess the possibility of difficult laparoscopic cholecystectomy therefor higher risk of conversion particularly if can be done preoperatively. Preoperative prediction of the risk of conversion or difficulty of operation is an important aspect of planning laparoscopic surgery. The purpose of our prospective study was to analyze various risk factors and to predict difficulty difficult cholecystectomy preoperatively by clinical, pathological and radiological assessment.

Aim: The aim of our study was to evaluate various clinical, pathological and radiological factors to predict difficult laparoscopic cholecystectomy preoperatively.

2. Materials and Methods

The present prospective study was conducted in department of general surgery at MDM hospital attached to Dr. S.N. Medical College, Jodhpur (Rajasthan). 200 cases were taken and following individual factor were noted preoperatively in a predefined proforma. All cases were operated by single surgeon to avoid individual bias depending on surgeon's experience and skill. Patients with choledocholithiasis and other ailments like requiring additional surgical procedure and previous history of multiple abdominal wall surgeries (scarred abdomen) were also excluded.

Preoperative risk factors studied

	Factor	Limit
History	Age	< 50 / > 50 years
	Sex	Male / Female
	BMI	< 30 / > 30
	Number of previous attacks	< 4 / > 4
	Previous Abdominal Surgery	Present (One) / Absent
	Past History of Pancreatitis	Present / Absent
	Past History of Jaundice	Present / Absent
Clinical Examination	Signs of Acute Cholecystitis	Present / Absent

Pathological Findings	Leucocytosis	< 11,000 / > 11,000 /cu mm
	Liver Function Tests	Normal / Altered
	CRP	Positive / Negative
	Serum Amylase / Lipase	Normal / Altered
Radiological Findings		
(USG / MRCP)	GB wall thickness	Normal / Increased
	Pericholecystic Fluid	Present / Absent
	Status of GB	Normal / Altered
	Anatomical Variation	Present / Absent

Duration of surgery, deviation from the classical method of 4-port cholecystectomy using closed pneumoperitoneum from umbilical port, difficulty encountered during the procedure, remedial measure taken for difficulty and total duration of surgery will be recorded on proforma.

On the basis of surgeon's comment on difficult or easy cholecystectomy, average time taken for easy cases will be calculated and if the time taken is more than average time, it will be considered as difficult laparoscopic cholecystectomy. Each studied factor will be individually assessed statistically to evaluate if the particular factor is responsible for difficult laparoscopic cholecystectomy.

As mentioned earlier, all cases were performed by a single surgeon using CO_2 pneumoperitoneum with 10 – 15 mm Hg intraperitoneal pressure and using standard two 5 mm and two 10 mm ports. The study was approved by Institutional Ethical Committee with informed consent from participants.

3. Results

Table 1: Number of patients having Easy / Difficult LC

Postoperative Conclusion	Number	Percentage
Easy	108	54
Difficult	92	46

Table 2: Duration of Surgery in Easy versus difficult Lap. Cholecystectomy

Postoperative Conclusion	N	Percentage	Mean time duration of LC (In minutes)	P value
Easy	108	54	26.48±4.24	
Difficult	92	46	45.28±8.11	<0.0001
Total	200	-	-	-

Table 3: Individual Factor, Intraoperative time and Statistical values.

	Preoperative risk factors	Variable	Mean operative time(minutes)	%	P value	Significance
History	Sex	Male	36.05±7.29	26%		
		Female	29.12±7.92	74%	<0.001	Significant

	Age	≤50 years	28.36±7.11	63%	0.016	Significant
		>50 years	34.08±9.23	37%		
	BMI	<30	31.22±8.26	94%	0.024	Significant
		>30	40.23±5.91	2%		
Abdominal examination	Local signs of cholecystitis	Present	37.28±8.22	43%	<0.0001	Significant
		Absent	27.29±4.88	57%		
Past History	Recurrent (>4) attacks of cholecystitis	Present	39.09±7.84	64%	<0.0001	Significant
		Absent	30.36±4.53	36%		
	Past history of pancreatitis	Present	37.25±5.75	7%	0.056	Not Significant
		Absent	31.16±8.19	93%		
	Past history of abdominal surgery (ONE)	Present	29.39±5.40	13%	0.0481	Not Significant
		Absent	31.41±8.51	87%		
	History of jaundice	Present	35.33±5.60	6%	0.202	Not Significant
		Absent	31.32±8.26	94%		
Laboratory Investigations	CRP	Positive	37.38±8.0	42%	<0.0001	Significant
		Negative	27.10±4.63	58%		
	Leucocytosis	Present	38.35±9.93	20%	<0.0001	Significant
		Absent	29.28±6.50	80%		
	LFT	Altered	32.28±0.43	14%	0.617	Not Significant
		Normal	31.34±8.73	86%		
	S. Amylase and Lipase	Altered	36.33±7.23	3%	0.270	Not Significant
		Normal	31.03±8.18	97%		
Radiological Imagings	Thickness of GB wall	Increased	38.34±7.98	35%	<0.0001	Significant
		Normal	27.33±5.15	65%		
	Pericholecystic Fluid	Present	39.0±8.39	26%	<0.0001	Significant
		Absent	28.30±5.93	74%		
	Status of GB	Contract.	27.26±5.00	43%	<0.0001	Significant
		Distended	35.15±8.53	24%		
		Normal	25.25±1.5	33%		
	Anatomical Variation	Present	34.35±9.48	8%	0.234	Not Significant
		Absent	31.30±8.04	92%		

Statistically significant risk factors are age more than 50 years, male sex, BMI more than 30, recurrent attacks (more than 4), Leucocytosis more than 11,000/cu mm, Positive CRP, thick walled gall bladder, presence of pericholecystic fluid, contracted or overdistended Gall bladder. These factors in preoperative assessment indicate difficult laparoscopic cholecystectomy.

4. Discussion

Gallstone disease is one of the most common problems affecting the digestive tract. The prevalence of gallstones is related to factors like age, gender, and ethnic background. In India the prevalence is estimated to be around 4% (1). laparoscopic cholecystectomy provides a safe and effective treatment for most patients with symptomatic gallstones [2]. Laparoscopic cholecystectomy is the gold standard treatment for cholelithiasis. The advantages of laparoscopic cholecystectomy are earlier return to bowel function, less postoperative pain, cosmetic, shorter length of hospital stay, earlier return to full activity, and decreased overall cost. However, conversion to open from laparoscopic cholecystectomy depends on various factors besides experience of surgeon.

In present study, 54% patients had easy laparoscopic procedure and the time taken in completion of procedure was 26.48 +/- 4.24 minutes whereas in remaining 46% patients the procedure was difficult and took 45.28 +/- 8.11 minutes. The statistical difference was highly significant (p value <0.0001).

Mean duration of surgery was 35.65 ± 7.29 minutes in male patients and 29.62 ± 7.92 minutes in female patients (p value is <0.001 significant). Russel et al [4] have suggested that men tend to present late as they pay less attention to subtle symptoms, therefore, may have more advanced disease in form of adhesions, fibrosis, thick walled GB. Similarly mean duration of surgery in patients' ≤ 50 years was 29.66 ± 7.11 minutes and in > 50 years, it was 33.68 ± 9.23 minutes (p value 0.016 significant). Increased age is associated with an increased probability of multiple attacks of cholecystitis and also increased frequency of upper abdominal surgeries. Randhawa et al [5] found that patients more than 50 years surgery was associated with more difficulties.

Obesity causes difficulty in creation of pneumoperitoneum and port placement due to thick abdominal wall and umbilicus being placed downwards. Obesity also causes in difficulty in dissection in Calot's triangle because of excessive intraperitoneal and omental fat. Nachnani et al [7] and Hussain et al [8] have found BMI >30 to be significantly associated with difficulty in umbilical port entry and creating pneumoperitoneum. In present study also the difference in operating time in patients above BMI of 30 was statistically significant. BMI >27.5 was predictor of difficult cholecystectomy as demonstrated by Prashant et al [6].

In patients with local signs of cholecystitis, mean duration of surgery was 36.88 ± 8.22 minutes, which is statistically significant as compared to duration of surgery in patients without any sign of local inflammation. and without signs of inflammations (p value<0.0001)   Presence of acute cholecystitis with pericholecystitis makes LC difficult due to anatomical distortion of calot's triangle, adhesions and haemorrhage during procedure. Similar difficulties were observed by Alponat et al [9], Kama et al [10], and Vivek et al [11].

In patients with more than four recurrent attacks of symptoms, mean duration of surgery was 38.69 ± 7.84 minutes while in those with less than four attacks of recurrent attacks, it was 29.96 ± 4.53 minutes, p value is <0.0001 (statistically significant). Prashant et al [6] also reported similar findings in his study. Nidoni [12] reported that even more than two attacks will have significantly high risk of difficulty in laparoscopic cholecystectomy in a study of 180 patients.

In patients with leucocytosis, mean duration of surgery was 37.95±9.93 minutes and with normal leucocytes it was 29.28±6.50 minutes (p value <0.0001 statistically significant). Leucocytosis indicates ongoing inflammation due to active infection of biliary system leading to thickening of GB wall, pericholecystic edema/collection, adhesions to surrounding structures and GB distension [12].

In patients with CRP positive, duration of surgery was 37.38±8.0 minutes and negative CRP it was 26.70±4.63 minutes (p value <0.0001 - significant). Vivek et al [11] reported a strong association between CRP and difficult LC.

Radiological investigations like ultrasonography and MRCP are key investigations in cholelithiasis to know the status of gall bladder (normal or overdistended / contracted), presence of pericholecystic fluid and anatomical variation in ductal and or arterial system.

In patients with increased GB wall thickness duration of surgery was 38.34±7.98 minutes and without it was a 37.33±7.32 minutes (p value<0.0001). In patients with pericholecystic edema, mean duration of surgery was 39.0±8.39 minutes whereas without edema it was 28.30±5.93 minutes (p value <0.0001) Alphonat et al [9] and kama et al [10] have demonstrated similar results. Overdistended gall bladder is difficult to handle during laparoscopic cholecystectomy and contracted gall bladder is difficult to dissect particularly Calot's triangle dissection. In this study also normal GB could be removed in 25.25±1.5 minutes and it took longer to dissect overdistended and contracted GB. Singh et al [13] and Lal et al [14] reported similar results in their study.

Advantages of preoperative prediction of difficult laparoscopic cholecystectomy include information to patient and relatives regarding difficult procedure, higher chances of conversion to open procedure. In case of minimizing conversion, operating surgeon can ensure availability of additional equipment's like additional trocars, newer energy sources like harmonic scalpel / vessel sealer, ICG compatible comers or at least a senior consultant for patient's benefit. Counselling can also be done for prolonged hospital stay (15).

However, in patients with past history of pancreatitis, jaundice, abdominal surgery, altered LFT, raised serum. amylase or lipase, dilated CBD and anatomical variation were not associated with statistically significant difference in operative time of laparoscopic cholecystectomy.

5. Conclusion

We conclude that the difficult laparoscopic Cholecystectomy can be predicted preoperatively based on age more than 50 years, male sex, BMI more than 30, more than 4 attacks of cholecystitis, leucocytosis more than 11,000 per cu mm, increased GB thickness, pericholecystic oedema/collection and overdistended or contracted Gall bladder. Other factors like past history of jaundice or pancreatitis, previous abdominal surgery, altered liver function and amylase or lipase level and preoperatively detected anatomical variation does not influence ease of dissection in laparoscopic cholecystectomy

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*Corresponding author.
E-mail address: drdeepakv@ymail.com