

# The Impact of High BMI on Outcomes after Day Case Laparoscopic Cholecystectomy: A United Kingdom University Hospital Experience

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## Abstract

**Introduction:** Approximately 12-15% of the United Kingdom adult population have gallstones and patients with a high BMI are at an increased risk [1]. These individuals are considered to pose a high risk of anaesthetic and surgical complications. The authors performed a 3-year retrospective cohort study to evaluate both primary and secondary outcome measures in patients undergoing a laparoscopic cholecystectomy, stratified by BMI. A specific focus on the safety and success of the operation in obese and morbidly obese patients was performed.

**Methods:** A retrospective audit of 167 cholecystectomies performed at Milton Keynes University Hospital by a single surgical team over a three-year period from January 1st 2011–December 31st 2013. The patients were divided into six BMI groups: underweight ( $<18.5\text{kg/m}^2$ ), desirable weight ( $18.5\text{--}24.9\text{kg/m}^2$ ), overweight ( $25\text{--}29.8\text{kg/m}^2$ ), obese class I ( $30\text{--}34.9\text{kg/m}^2$ ), obese class II ( $35\text{--}39.9\text{kg/m}^2$ ) and morbidly obese Class

III ( $>40\text{kg/m}^2$ ).

**Results:** A total of 167 patients (49 males, 118 females) with ages ranging from 18–83 years were included in this study. Our overall conversion rate to open was 4.8%. The mean operating time, recorded from incision to the completion of the surgical closure, was 75 minutes. However, the operating time increased to a mean of 90 minutes in patients with a BMI  $>40$ . A total of 139 patients (83.2%) were discharged the same day and 13 (7.8%) within 2 days. The readmission rate within 30 days of surgery was 2.3%.

**Conclusions:** The authors conclude that day case laparoscopic cholecystectomy is a feasible, cost effective and safe treatment modality for symptomatic gallstones in individuals with a high BMI. It is important to pre-assess all individuals carefully identifying any anaesthetic concerns, with patient safety remaining a priority.

**Keywords:** laparoscopic cholecystectomy, day case, Body Mass Index.

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## Introduction

Approximately 12-15% of the UK adult population have gallstones, with up to 4% becoming symptomatic every year [1]. A high body mass index is a well-established risk factor. As a result, a large proportion of patients who require a cholecystectomy for symptomatic cholelithiasis fall into the overweight, obese or morbidly obese categories [2]. Laparoscopic cholecystectomy has become the gold standard for the treatment of symptomatic gallstones, offering a shorter length of hospital stay and reduced post-operative pain. The British Association of Day Surgery recommends that 75% of laparoscopic cholecystectomies could be performed as day cases annually [3]. Previous studies have shown similar rates of postoperative complications in obese and non-obese groups, with an increased operating time being the only consistent difference [4,5].

## Patients and Methods

A retrospective cohort study was undertaken over a 3 year period from January 1st 2011–December 31st 2013, on patients receiving their operation by a single surgical team. Data was retrieved from the theatre logbooks and the Electronic Medical Records System.

Parameters including co-morbidities and the American Society of Anaesthesiology grade were recorded. The patients were divided into six BMI groups: underweight ( $<18.5\text{kg/m}^2$ ), desirable weight ( $18.5\text{--}24.9\text{kg/m}^2$ ), overweight ( $25\text{--}29.8\text{kg/m}^2$ ), obese class I ( $30\text{--}34.9\text{kg/m}^2$ ), obese class II ( $35\text{--}39.9\text{kg/m}^2$ ) and morbidly

obese Class III ( $>40\text{kg/m}^2$ ). All patients underwent VTE (venous thromboembolism) assessment and subcutaneous low molecular weight heparin and/or anti-embolic stockings administered where appropriate. Anaesthesia was induced with propofol in all cases and maintained using sevoflurane. Anti-emesis was provided with intravenous cyclizine, dexamethasone along with intravenous fluids. Intravenous antibiotics were not routinely administered and were only given in cases of bile leak or empyema. Intravenous paracetamol was the drug of choice for preoperative and postoperative analgesia. On discharge, patients were advised to contact their general medical practitioner, the Surgical Assessment Unit or the Emergency Department if they had any concerns. The Clavien-Dindo classification was used to classify postoperative complications occurring within 30 days of the primary procedure [6].

## Inclusion and Exclusion Criteria

At pre-assessment clinic, all individuals with symptomatic uncomplicated gallstones [no history of severe pancreatitis] and an ASA grade of I-3 with adult company at home for 24 hours post operatively were considered for a day case procedure. Those individuals with complicated gallstones following a thorough assessment, were offered a day case procedure with the provision of overnight admission if required.

Those individuals with severe obstructive sleep apnoea requiring CPAP and those individuals with a high ASA grade of 4 were not considered for a day case procedure.

## Discharge Criteria

Patients were discharged on the same day of surgery if they were haemodynamically stable, mobilising safely, eating and drinking, passed urine and without significant pain, nausea or vomiting. Those individuals with a surgical drain remained overnight.

## Primary Outcomes Measures

Primary outcomes were classified as a successful day case laparoscopic cholecystectomy with discharge on the same day.

## Secondary Outcome Measures

Secondary outcomes were considered as a failed day case discharge in patients identified as a day case procedure pre-operatively. The reasons for a failed discharge were assessed.

## Results

A total of 167 patients [49 males, 118 females], with ages ranging from 18-83 years were booked for an elective day case procedure over a three-year period (Table 1). There were no significant demographic differences between the 6 BMI groups. The patients' BMI and co-morbidities were recorded (Tables 2,3). ASA grade was categorised as ASA I in 39 patients, ASA II in 95 and ASA III in the remaining 33 patients. Only 35 patients were classified as "desirable weight", with 15 patients morbidly obese. A total of 143 individuals had a pre-operative ultrasound scan and 11 underwent a CT scan of the abdomen. Liver function tests were performed in all cases. If a common bile duct stone was suspected on ultrasound scan, magnetic resonance cholangio-pancreatography was performed, followed by endoscopic retrograde cholangiopancreatography for clearance of the common bile duct. Balloon trawl and sphincterotomy were performed in 17 cases. The indication for LC was cholelithiasis or acute cholecystitis in 165 cases, with the other 2 patients requiring cholecystectomy for gallbladder polyps.

**Table 1** Laparoscopic cholecystectomies performed from 2011–2013.

	2011	2012	2013	Total
<b>Elective Day Case</b>	46	33	84	163
<b>Emergency Day Case</b>	1	0	3	4
<b>Total</b>	47	33	87	167

**Table 3** Documented co-morbidities in 167 patients.

	<b>Overweight 25–29.9kg/m<sup>2</sup></b>	<b>Obese Class I 30–34.9kg/m<sup>2</sup></b>	<b>Obese Class II 35–39.9kg/m<sup>2</sup></b>	<b>Morbidly Obese Class III &gt;40kg/m<sup>2</sup></b>
<b>Endocrinological</b> [diabetes,thyroid]	5	3	5	2
<b>Cardiac</b> [HTN,AF,CABG]	9	6	15	10
<b>Active malignancy</b> [colon, prostate]	2	4	5	0
<b>Respiratory</b> [asthma]	5	4	4	2
<b>Chronic kidney disease</b>	1	0	2	4
<b>Gastrointestinal</b> [cirrhosis]	1	0	1	0

Laparoscopic cholecystectomy was performed by a single team of four Consultant General Surgeons using a standard four port technique. Access to the abdomen was obtained by the open technique. Longer ports were available if required. Two cases of bile leak were observed intra-operatively. These patients had a recorded BMI of 29kg/m<sup>2</sup> [overweight] and 43kg/m<sup>2</sup> [morbidly obese] respectively.

Intra-operative antimicrobials were administered in 18 cases: IV co-amoxiclav [16] and if penicillin allergic, teicoplanin and gentamicin. Abnormal ductal anatomy, including Mirrizzi Syndrome and dense adhesions led to open conversion in 8 patients (4.8%) as shown in Table 4. The mean operating time, recorded from incision to the completion of the surgical closure, was 75 minutes. However, the operating time increased to 90 minutes with BMI >40 (Table 5). Five patients had a Robinson drain inserted (4 in overweight patients and 1 obese class 2). All were removed within 48 hours. The average length of hospital stay ranged from 1 to 10 days. The factors influencing a prolonged hospital stay included converting to an open procedure (n=8), drain insertion (n=5) and ongoing sepsis (n=4). There were no cases of gallbladder cancer on histology.

Four patients (2.3%) required readmission within 30 days of their operation (2 patients with pain, 1 with nausea and 1 with transient jaundice). No patient required immediate readmission within 48 hours.

## Discussion

Conventional abdominal surgery in the grossly obese individual is associated with an increased rate of wound infection, atelectasis, respiratory tract infection and thrombo-embolic events in the post-operative period. In addition, technical problems such as difficulty with access and retraction of the abdominal wall and viscera are encountered. Cholecystectomy remains the preferred treatment option for symptomatic cholelithiasis with laparoscopic cholecystectomy now considered the gold standard for more than two

**Table 2** Recorded BMI in all 167 patients.

<b>Underweight</b>	< 18.5	5
<b>Desirable weight</b>	18.5 – 24.9	35
<b>Overweight</b>	25 – 29.9	49
<b>Obese Class I</b>	30 – 34.9	41
<b>Obese Class II</b>	35 – 39.9	22
<b>Morbidly obese Class III</b>	>40	15

**Table 4** Indications for conversion to an open procedure.

Indication for conversion	No. of patients	Underweight	Desirable	Overweight	Obese Class I	Morbidly Obese
Abnormal ductal anatomy	1				1	
Mirizzi Syndrome	1					1
Adhesions	3			1	2	
Situs Ambiguous	1	1				
Perforation at fundus	1					
Haemangioma of liver	1			1		
<b>Total</b>	<b>8 [4.8%]</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>

**Table 5** Operating times and the mean duration of hospital stay.

BMI	<18.5	18.5–24.9	25–29.9	30–34.9	35–39.9	>=40
Completed as daycase	2	33	42	39	17	6
<b>Overnight stay</b>						
2 nights		1	6	2	1	3
3 nights	2					2
4 nights	1				2	3
5 nights		1				
6 nights					2	
8 nights			1			1
<b>Duration of Surgery (min)</b>						
Laparoscopic	60	70	75	80	89	90
Open		120		160		180
<b>Clavien Dindo Classification</b>						
Grade II [HAP]			1	1		
Biliary Stent			1			
Urology				1		
Post-Partum			1			

decades. In 2011, the Association of Anaesthetists of Great Britain and Ireland published joint guidance, recommending that patients' fitness for surgery should not be limited by assessment of BMI alone [7]. Our study, although limited by its retrospective design has shown that day case LC is safe in both obese and morbidly obese patients, with no increase in the rate of overnight stay.

Several studies reviewing the impact of BMI on laparoscopic cholecystectomies have suggested that the operation itself is no more difficult in obese patients and the laparoscopic approach is better suited to this patient cohort [8]. This is further supported by the findings of Tandon, with no significant differences in extension to overnight stay, rates of intra-abdominal collection or readmission between the BMI groups [9]. Tandon also showed an increase in the mean duration of surgery with increasing BMI and the difficulties encountered included port insertion and wound closure [9]. In our study, the mean difference in operating times between the desirable BMI and morbidly obese groups was 20

minutes. Although the amount of fat in the triangle of Calot may be greater in the grossly obese, careful dissection still allows identification of the relevant structures and their safe management.

Admittedly, some difficulty can be encountered in closing the fascia in the epigastric and infra-umbilical wounds, but this was avoided in our cases by using a purse string suture. The conversion rate reported in grossly obese patients ranges from 1.1% to 11.4%, but most reports show no significant difference from the rate in the non-obese [9].

In a study by Champault, a conversion rate of 4.5% in obese patients and 1.8% in non-obese patients was found [10]. Farkas showed that compared with normal weight patients, obese and even morbidly obese patients have no increased risk of conversion to open surgery, nor is there an increased risk of perioperative complications [11]. In our study, the conversion rate to an open procedure was 4.8%, stratified for BMI as follows: underweight (1), desirable weight (1), overweight (2), obese class III (3) and morbidly obese (1).

Our conversion rate compares favourably with published figures of 5-10% [12]. In our study, a bile leak was recognised in 2 cases at cholecystectomy and it has been reported that 25-32.4% of bile duct injuries are recognised at the index surgery [13].

In 2013, the Royal College of Surgeons England implemented a commissioning guide on gallstone disease, recommending a quality standard of <10% readmission rate after cholecystectomy within 30 days [14]. Several studies indicate a 30-day readmission rate of between 2-6%, due to abdominal pain and wound infection, usually at the umbilicus. Our readmission rate of 2.4%, attributed to nausea and non-specific abdominal pain, compares favourably with published figures [15,16]. Although the incidence of wound infection and pulmonary complications may be higher following open abdominal operations, most recent reports of LC in obese and non-obese patients showed no significant difference in complication rate or hospital stay.

Our study demonstrates that elective day case laparoscopic cholecystectomy is a safe and feasible treatment option in patients with a high BMI leading to a reduction in the costs associated with an inpatient stay, a reduction in the risk of hospital acquired infections and thromboembolic events. We do not feel that the small increase in the operating time has a significant impact on the running of the operating list.

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