

# Which Cholecystectomy do Medical Students Prefer?

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## ABSTRACT

**Introduction:** This study was undertaken to identify which minimally invasive technique medical students prefer for cholecystectomy and what factors determine their decision.

**Methods:** Brazilian medical students watched a video reviewing the advantages and disadvantages of six different surgical approaches to cholecystectomy: open surgery, conventional laparoscopy, mini-laparoscopy (MINI), single-incision laparoscopic surgery, natural-orifice transluminal endoscopic surgery, and robotic surgery. Respondents then answered questions about hypothetical situations in which the participants would be submitted to elective cholecystectomy.

**Results:** One hundred eleven medical students com-

pleted the survey, 60 females (54%) and 51 males (46%). Most students were 19–26 years old. When asked whether they would consider an open cholecystectomy if minimally invasive surgery (MIS) techniques were available, only 9% answered yes. Senior medical students were the least willing to consider open surgery ( $P = .036$ ). When asked if they would prefer conventional laparoscopy, MINI, or robotic surgery for their cholecystectomy, 85% of the women and 63% of the men chose MINI ( $P = .025$ ). When asked if they would consider a single-incision laparoscopic surgery or natural-orifice transluminal endoscopic surgery approach, 94 respondents (84%) answered no. When asked to rank which factors they consider the most important when choosing a surgical technique, they ranked safety of the procedure first (58%) and surgeon experience second (30%).

**Conclusion:** When Brazilian medical students were asked to select a surgical approach for cholecystectomy, most chose MINI. The preference for MINI was strongest amongst female medical students. Both female and male medical students ranked safety as the most important factor.

**Key Words:** Cholecystectomy, Choice, Minimally invasive surgery, Mini-laparoscopy, NOTES, Preference

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## INTRODUCTION

Operative procedures that are not only safe and effective surgery but also painless and scar less are the “Holy Grail” of surgery. The development of minimal access approaches has reduced the number and size of surgical incisions, reducing postoperative pain and speeding postoperative recovery.<sup>1</sup> Minimal access approaches to cholecystectomy now include “conventional laparoscopy” (1987), mini-laparoscopy (MINI; 1997), “robotic” (daVinci) surgery (2000), natural-orifice transluminal endoscopic surgery (NOTES; 2007), and single-incision laparoscopy (SILS; 2008).<sup>2</sup> While most studies regarding these procedures report postoperative pain, postoperative narcotic use, length of stay, and return to activity, fewer studies explore patient preferences. The purpose of this study was to address the perceptions and preferences of

medical students with respect to minimally invasive approaches to cholecystectomy.

## METHODS

An online, 18-item questionnaire was completed by 111 medical students from the University of Pernambuco (Recife, Brazil). Institutional review board (IRB) approval was not required for this survey. The questionnaire addressed hypothetical scenarios wherein the participants were to be submitted to an elective cholecystectomy (**Table 1**). Before answering the questionnaire, the students reviewed a 3-minute video demonstrating all six surgical techniques (<https://www.youtube.com/watch?v=Egy8sTUcjfk>). The video included information commonly included in a reasonable person standard operative consent process: diagrams of the operative setup, photos of the surgical equipment and instruments, photos of the abdominal incisions and surgical procedure, and general comments regarding the safety, postoperative pain, return to activity, and costs of the procedure.

### Statistical Analysis

Statistical analyses of the data were performed by a university biostatistician (DCS) using the R Project Statistical Computing software, version 3.3.1 ([www.r-project.org](http://www.r-project.org)). Continuous variables were expressed as medians and range. The  $\chi^2$  test was performed for categorical variables, where appropriate.  $P < .05$  was considered statistically significant.

## RESULTS

One hundred eleven medical students reviewed the video and completed the questionnaire. Sixty (54%) were female and 51 (46%) were male. The students represented all preclinical and clinical classes of a 6-year Brazilian medical school. Most were 19–26 years old (**Table 2**).

When asked if they would accept an open cholecystectomy if the minimally invasive surgery (MIS) techniques were available, only 9% of students answered affirmatively. The lower acceptability of an open approach was more apparent with medical students in their clinical years compared to students in their preclinical years ( $P = .036$ ). There was no difference based on the gender of the students ( $P = .350$ ).

When asked which minimally invasive technique they would prefer if all of the MIS techniques were available and equally safe, most chose MINI (64%), followed by conventional laparoscopy (14%) and robotic surgery (9%),

with no significant difference between genders ( $P = .214$ ; **Table 3**). When asked which technique they would prefer if they could choose only from the 3 most popular MIS techniques (conventional laparoscopy, MINI, and robotic surgery), 85% of women and 63% of men chose MINI ( $P = .025$ ).

When asked if they would consider a single-incision laparoscopic surgery (SILS) or NOTES cholecystectomy, understanding that the long-term safety of these approaches is still being established, 94 students (85%) answered that they would not consider a SILS or NOTES approach. There was no difference in this response between genders ( $P = .920$ ).

Medical students were asked to rank which 2 of the following factors they consider the most important when choosing an operative approach: procedure safety, surgeon experience, postoperative pain, postoperative recovery, cosmetic result, cost, or other. Respondents ranked safety of the procedure the most important factor (58%) and surgeon experience with the procedure the second most important factor (30%), with no significant difference between genders ( $P = .529$ ; **Table 4**).

## DISCUSSION

Cholecystectomy is one of the most commonly performed abdominal surgeries worldwide.<sup>3</sup> Laparoscopic cholecystectomy was introduced in 1987 and has become the procedure of choice for routine gallbladder removal.<sup>4</sup> Compared to open cholecystectomy, laparoscopic cholecystectomy has self evident and clearly demonstrated advantages including less postoperative pain, less need for opiate analgesics, shorter hospital stay, earlier return to full activity, improved cosmetic results, and better patient satisfaction.<sup>5</sup> Laparoscopic cholecystectomy is now a mature minimally invasive approach. Surgeons and patients are looking for ways to make the procedure even less invasive. With this in mind, MINI, SILS, robotic surgery, and NOTES have been developed.<sup>3,5,6</sup> The technical feasibility, safety, effectiveness, and other metrics of these procedures have been studied and reported.<sup>7–9</sup> Less well understood are patient and provider preferences regarding the newer MIS approaches. Which techniques do patients prefer, and why?<sup>10–17</sup>

Three prior studies have addressed patient perceptions concerning single-incision laparoscopic cholecystectomy (SILC). Hey studied preferences about SILC in 113 patients awaiting elective cholecystectomy in the United Kingdom.<sup>15</sup> Patients

**Table 1.**  
18-Item Questionnaire Completed by the Medical Students

1	At what university are you currently studying?
2	What is your gender?
3	What is your age?
4	What is your nationality and current residence?
5	What is your class in medical school?
6	Would you accept an open cholecystectomy if the minimally invasive techniques were available?
7	Would you consider NOTES or single incision (SILS) cholecystectomy even if you know that they are new procedures with incompletely established safety standards?
8	If all the techniques were equally safe, which one would you choose?
9	If only the minimally invasive techniques were offered to you, which one would you choose?
10	If your only option was NOTES, which route would you choose—transgastric, transvaginal, or transrectal?
11	If only single incision laparoscopy (SILS), MINI, or robotic surgery were offered to you, which one would you choose?
12	If only conventional laparoscopy, robotic surgery, or MINI were offered, which one would you choose?
13	What factor would you consider the most important when choosing the surgical technique? Safety of the procedure Experience of the surgeon Early recovery Cosmesis Post-operative pain Other
14	In the case that your MIS approach of choice was not available, what's your second option?
15	If only conventional laparoscopy, single incision, and robotic surgery were available, which one would you choose?
16	Which of the following factors would you consider the second more important when choosing the surgical technique? Safety of the procedure Experience of the surgeon Early recovery Cosmesis Post-operative pain Cost Other
17	If all techniques were equally safe, which would be your second choice?
18	If only new minimally invasive techniques were available, which would you choose? Single incision Conventional Laparoscopy Robotic surgery NOTES Mini-laparoscopy

were surveyed before and after they completed a questionnaire covering objective data on the outcomes of SILC and multiport laparoscopic cholecystectomy. After re-

viewing the objective data, 88% of patients preferred multiport cholecystectomy. Patients ranked risk of complications and postoperative pain above cosmetic results in

**Table 2.**

Sociodemographic Characteristics of the Medical Students Surveyed

Demographic Characteristic	N	%
Gender		
Male	51	46
Female	60	54
Total	111	
Age (years)		
19–22	61	55
22–26	36	32
26–30	13	12
>30	01	1
Total	111	
Medical school class		
1st	11	10
2nd	18	16
3rd	17	15
4th	41	37
5th	16	14
6th	08	7
Total	111	

**Table 3.**

Preferred Surgical Technique for Cholecystectomy

Preferred Technique	N	%
Mini-laparoscopy	71	64
Conventional laparoscopy	16	14
Robotic surgery	10	9
Single-incision laparoscopy	09	8
NOTES	04	4
Open surgery	01	1
Total	111	100

NOTES, natural-orifice transluminal endoscopic surgery.

determining their choice of procedure. Joseph surveyed 100 patients in Missouri (85% female; mean age, 43 years; 77% college educated) regarding their perspectives on SILC.<sup>12</sup> Patients had concerns about the lack of long-term results, and the majority would accept no additional risk to undergo SILC. When asked to rank pain, appearance (cosmesis), symptom resolution, personal cost, and risk of complications, they ranked symptom resolution (52%),

postoperative pain (20%), and risk of complications (19%) as most important. Only 27% were willing to spend >\$100 to undergo SILC. Rao et al<sup>10</sup> submitted a questionnaire to doctors, nurses, and patients evaluating their preferences amongst open surgery, conventional laparoscopy, SILS, and NOTES. The authors found that SILS was an acceptable and potentially preferable technique *if* its safety could be demonstrated in longer-term studies.

Four studies have addressed perceptions regarding NOTES cholecystectomy. Swanstrom et al<sup>17</sup> evaluated the attitude toward NOTES cholecystectomy in 192 preoperative clinic patients in Portland, OR, USA. For these patients, complication risks, recovery time, and postoperative pain were more important than cosmesis, cost, length of hospital stay, or anesthesia time. Patients choosing NOTES preferred it even if it carried a slightly greater risk that laparoscopic surgery, but their willingness to choose NOTES decreased as complications and cost increased. Bucher submitted an anonymous questionnaire to 300 Swiss females (median age, 35 years): 100 medical/paramedical personnel, 100 patients, and 100 general population.<sup>16</sup> Surveyees were asked about transvaginal NOTES, transumbilical laparoendoscopic single site surgery (LESS), and conventional laparoscopic cholecystectomy. Ninety-six percent of surveyees had concerns about transvaginal access. Worries included temporary abstinence from vaginal intercourse (76%), dyspareunia (68%), decreased sensibility during intercourse (43%), and infertility (23%). Teohet al<sup>14</sup> surveyed 200 patients (50% female) in an outpatient surgery clinic in Hong Kong. In this Asian-Chinese population, the cosmetic benefits of NOTES were preferred in 57% of surveyees, transvaginal NOTES was less acceptable to females than transoral or transanal access, and the most important aspects when choosing a surgical approach were the risk of complications (85%) and the cost of the procedure (58%). Sulz et al<sup>13</sup> surveyed 140 Swiss inpatients (65% female; mean age, 52 years) awaiting elective cholecystectomy regarding their risk behaviors (non-medical) and their perceptions about transgastric and transvaginal NOTES. Regarding transgastric NOTES, faster convalescence was considered the primary potential advantage and long-term stomach injuries the primary disadvantage. Risk-taking behavior (in the recreational domain of a risk attitude survey) was more common in those who opted for NOTES. Most patients still preferred standard laparoscopic cholecystectomy.

To the authors' knowledge, no prior study has simultaneously compared all currently available approaches to cholecystectomy: open surgery, conventional laparoscopy (4 trocars, two 10 mm and two 5 mm), MINI (4 trocars, one 10 mm and three 3 mm), SILS, robotic surgery, and NOTES (trans-

**Table 4.**

Response to the Question: “What Factor Would You Consider the Most Important When Choosing the Surgical Technique?”

	Procedure Safety		Surgeon Experience		Early Recovery		Cosmetics		Postop Pain		Other		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Women	34	57	21	35	03	5	01	2	01	2	0	0	60	100
Men	30	59	12	24	04	8	03	6	01	2	01	2	51	100
Total	64	<b>58</b>	33	<b>30</b>	07	6	04	4	02	2	01	1	111	100

Bold values denote the most important factors.

gastric, transvaginal, and transrectal). This is also the first such study conducted in South Americans and in medical students. In the current study, mini-laparoscopic cholecystectomy turned out to be the preferred approach, a finding which held for both females and males, across all years of medical school. The clinical results of MINI cholecystectomy are now fairly well established, with a moderate amount of level 1 evidence published. Randomized trials comparing MINI cholecystectomy to conventional laparoscopic cholecystectomy have found that MINI has less early postoperative pain (in the first 24 hours), better cosmesis (in the first 6 months), and no apparent disadvantage other than a marginally longer operative time.<sup>18–20</sup> MINI cholecystectomy as it is performed today also has advantages over the initial techniques and results published by Peter Goh, Michel Gagner, and other pioneers.<sup>20–25</sup> Contemporary MINI instruments have improved end-effector functionality, shaft durability, and device performance over early generation instruments, and low-friction designs also improve surgeon dexterity.<sup>22,23,26,27</sup>

Conventional laparoscopic cholecystectomy was the second most popular technique, and robotic surgery was the third most favored approach in this survey. Over the past decade, the use of robotic surgery has increased globally, across many specialties and procedures. Yet, use of the daVinci platform in general surgery continues to be debated extensively at professional medical association meetings, in scientific journals, and in the lay press. Debates primarily focus on concerns about unclear incremental patient benefits of robotic surgery (computer-assisted laparoscopy) over conventional laparoscopy and increased institutional/payer costs with robotics. While the robotic platform has well-established benefits for certain procedures like prostatectomy, the most appropriate applications in general surgery are still being established. Nevertheless, the robot is quite popular, and this study found that medical students selected it as their third most preferred approach for cholecystectomy.<sup>28</sup>

SILS and NOTES were the MIS techniques least preferred by the respondents. Short-term and long-term safety concerns remain with both of these approaches, and medical students reported that safety was their highest priority in selecting a surgical approach. SILS cholecystectomy has been found to have an increased risk of both bile duct injury and incisional hernia compared to conventional cholecystectomy.<sup>29</sup> NOTES cholecystectomy has unique and potentially serious complications compared to the other approaches.<sup>30–35</sup>

In the current study, participants chose procedure safety as the most important factor and surgeon experience as the second most important factor in how they decide upon a technique. It is reassuring that respondents were rightfully more concerned about procedure safety and effectiveness than about postoperative pain or cosmesis.

The greatest strength of this study is that it is the first to directly compare, in a single study, patient perceptions and preferences regarding all of the currently available MIS techniques for cholecystectomy. The potential limitations of this study include the generalizability of the findings based on the study population and the selection of content for the study video. The study population here was mostly Brazilian females in their twenties. What impact incision length and cosmetic outcome might have on decision making in this population compared to other patient populations is not known. It is noteworthy though that the respondents in this study did not rank cosmesis as a top factor in their decision making. Regarding the 3-minute education video viewed by the respondents immediately before they completed the questionnaire, one must assume that the information content and form in the video impacted the survey results. While advocates or critics of any of the techniques might wish that certain information had been presented differently in the video, the video

appears to be fairly well balanced and consistent in its content and form.

## CONCLUSION

When Brazilian medical students were asked to select a surgical approach for cholecystectomy, from all currently available options, most chose MINI. The preference for MINI was strongest amongst females. Conventional laparoscopy was the second most-often-selected technique and robotic surgery the third choice. Open surgery, SILS, and natural-orifice surgery were preferred less often. Both female and male medical students ranked safety of the procedure as the most important factor and surgeon experience as the second most important factor in selecting a surgical approach.

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