# **Original Research Article**

DOI: http://dx.doi.org/10.18203/2349-2902.isj20171136

# Patient preference matters: cholecystectomy for uncomplicated gallbladder diseases should be performed by single port laparoscopy

Juan M. Romero-Marcos<sup>1\*</sup>, M. Pau Carbonell-Aliaga<sup>1</sup>, José M. Muñoz-Pérez<sup>1</sup>, Silvia Tejada-Gavela<sup>2</sup>, Pilar Sanchis-Cortés<sup>2</sup>, J. Andrés Cifuentes-Ródenas<sup>1</sup>

<sup>1</sup>Department of Surgery, Hospital Son Llàtzer, Ctra. Manacor km 4, 07198, Palma de Mallorca, Balearic Islands, Spain <sup>2</sup>Experimental Laboratory, Research Unit, Hospital Son Llàtzer, IUNICS, Ctra. Manacor km 4, 07198, Palma de Mallorca, Balearic Islands, Spain

**Received:** 30 January 2017 **Accepted:** 27 February 2017

\*Correspondence:

Dr. Juan M. Romero-Marcos,

E-mail: jmromeromarcos@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

#### **ABSTRACT**

**Background:** Laparoscopic cholecystectomy for uncomplicated gallbladder diseases (UGD) is a low-complexity procedure with little morbidity. Single port approach (SPA) benefits are unclear. Our aim is to identify any advantages by evaluating both the clinical outcomes of this approach and also patient opinion, following a year of implementation in our institution.

**Methods:** Data from patients operated on during 2015 for UGD by SPA or conventional laparoscopic approach (CLA) were collected. Patients were asked to answer a telephone questionnaire 4-6 months after the operation.

**Results:** 47 patients were operated on by SPA (SP group) and 117 by CLA (CL group). No differences were found between preoperative variables, surgical time, morbidity, length of stay or wound complications. More SP group patients reported no pain at discharge (72.3 vs 54.7%, p=0.037). 138 patients answered the questionnaire. No significant differences were found when comparing overall satisfaction. Wound aspect satisfaction was higher in the SP group (100 vs 80.9%, p=0.001). A higher proportion of CL group patients felt that had they had fewer scars, they would be more satisfied (46.8 vs 9.1%, p <0.001), and 35.1% of them opined that their satisfaction would be greater had they been operated on by SPA. In the multivariate analysis, the only variable associated with maximum overall satisfaction was wound aspect satisfaction.

**Conclusions:** SPA is a valid alternative to CLA for UGD. It should be chosen when available, since it provides equal clinical outcomes, diminishes postoperative pain and is preferred by patients.

Keywords: Cholecystectomy, Laparoscopy, Patient satisfaction, Single port

# INTRODUCTION

Single port laparoscopic surgery has emerged in recent years as an advance intended to reduce surgical aggression. Theoretically, minimizing the number of ports and the total wound size should obviously have an impact not only on the aesthetical outcome but also on postoperative pain and wound-related complications. However, to date none of these benefits have been clearly demonstrated, and the technical limitations of the single

port approach and other obstacles such as the increased surgical time and surgical costs have relegated it as an option, so that it is not the standard procedure it was intended to be.<sup>1,2</sup>

The single port approach is mainly reserved for easy laparoscopic operations, although as the technique has evolved, many reports and studies have concluded that it is a safe and effective approach to many surgical conditions, offering similar or even improved outcomes

to those of the classical laparoscopic approach.<sup>3,4</sup> It is, nevertheless, a more stressful procedure that requires specific training. It also requires specific surgical instruments which may increase the total costs, although there are highly economical options intended to overcome this disadvantage.<sup>5-7</sup>

Single port laparoscopic cholecystectomy is one of the most broadly performed single port procedures. Its feasibility and safety have been reported in countless papers, and may have an impact on many postoperative such as postoperative pain, complications, aesthetic outcome and patient satisfaction, although it is still controversial.<sup>8-23</sup> From January 2015, a group of surgeons in our institution started to apply this technique to the treatment of uncomplicated gallbladder diseases. The objective of the current study was to validate it as an option over conventional laparoscopic cholecystectomy by evaluating the outcomes following a year of implementation, and to determine whether it offers any advantage over the classical multiport laparoscopic approach for the same indication.

### **METHODS**

The study protocol was evaluated and approved by the Ethics Committee. Data were collected for all patients in our institution during 2015 who were operated on by laparoscopic cholecystectomy for uncomplicated gallbladder diseases after obtaining a written informed consent. Data of patients operated on by single port laparoscopic approach were collected prospectively, while data of patients operated on by conventional three or four port laparoscopic approach were retrospectively gathered every three months. Thus, two groups of patients were defined: the single port group (SP group) and the conventional laparoscopy group (CL group).

Uncomplicated gallbladder diseases included any gallbladder disease requiring elective cholecystectomy, excluding cases with either current or previous acute cholecystitis, cholangitis, biliary sepsis, pancreatitis, porcelain or scleroatrophic gallbladder, neoplasms, choledocolithiasis, cirrhosis and previous or necessary intervention or instrumentation of the liver or the biliary tract. Patients younger than 18 years old or mentally impaired were also excluded from the study. Data were collected regarding demographic and intraoperative preoperative variables. variables. postoperative outcomes and follow-up.

Between 4 and 6 months after the operation, members of staff who had not been directly involved in their treatment attempted to contact all patients by telephone. The attempt was abandoned if the patient either refused to be interviewed, or after three unsuccessful attempts to contact them. If they agreed to it, a short telephone interview was then carried out regarding patient opinion

and satisfaction. The questionnaire comprised 12 questions, 9 of which were the same for both groups. All of them were short and concise questions, and could be answered by choosing a value on a scale from 1 to 5, choosing yes or no, or choosing better, equal or worse.

Continuous data are presented as mean (standard deviation) when following a normal distribution; otherwise they are presented as median (interquartile range). Qualitative data are presented as absolute values and percentage of the group. SPSS® version 20.0.0 (IBM, Armonk, New York, USA) was used for the statistical analysis. Categorical variables were compared using the Pearson test (X²) or the Fisher exact test, depending on the expected frequencies. Continuous variables were compared using the Student test (t) for those which had a normal distribution, or the Mann-Whitney test (U) for the remainder. A binary logistic regression model was used for the multivariate analysis. In all those tests, statistical significance was fixed from p <0.05.

## **RESULTS**

306 laparoscopic cholecystectomies were performed in our institution during 2015. Of these, 164 were indicated for uncomplicated gallbladder diseases. 47 patients were operated on by single port approach (SP group) while 117 were operated on by conventional (either three or four ports) laparoscopic approach (CL group). Demographic and preoperative characteristics of both groups are summarized in Table 1.

Intraoperative and postoperative outcomes summarized in Table 2. During the operation, diagnosis of complicated gallbladder disease was made in 8 patients of the SP group and in 6 patients of the CL group (17 vs 5.1%, p=0.026). Single port laparoscopic procedures were slightly longer, although not significantly so (54.8 vs 49.6 minutes, p = 0.085). In the SP group, an extra port was also added for one patient due to difficulties during hilar dissection, while another patient was converted to a four-port laparoscopic cholecystectomy after a finding of acute cholecystitis. No procedure in either group was converted to open surgery. There were significant differences between postoperative complications, most of them being Clavien I and corresponding to nausea or vomiting which delayed oral intake. More severe complications were observed in the CL group: 1 self-limiting cholestasis, 2 acute urinary retentions requiring urethral catheter, 1 acute coronary syndrome and 1 death due to septic complications after a biliary leak.

There were no differences in length of stay. Significantly, when leaving the hospital more patients in the SP group reported no pain (0 score in the Visual Analog Scale) than in the CL group (72.3 vs 54.7, p = 0.037).

**Table 1: Patient characteristics.** 

	Overall (n = 164)	SP group (n = 47)	CL group (n = 117)	р
Age (years)	53.68 (15) a	52 (41-64) <sup>b</sup>	54.3 (14.9) <sup>a</sup>	0.314
Sex ratio (F:M)	116:48	37:10	79:38	0.154
ASA				0.151
I	46 (28)	18 (38.3)	28 (23.9)	
II	112 (68.3)	29 (61.7)	83 (70.9)	
>II	6 (3.6)	0	6 (5.2)	
Supraumbilical surgeries	5 (3)	2 (4.3)	3 (2.6)	0.625
Weight (Kg)	77 (67-100) <sup>b</sup>	75 (63-83) <sup>b</sup>	79 (67-89) <sup>b</sup>	0.105
Height (cm)	163.5 (10.1) a	163 (9.6) <sup>a</sup>	163.7 (10.3) a	0.694
BMI (Kg/m <sup>2</sup> )	29.3 (5.6) <sup>a</sup>	28 (25-31) <sup>b</sup>	29.8 (6) <sup>a</sup>	0.119
Diagnosis				0.108
Cholelithiasis	156 (95.1)	43 (91.5)	113 (96.6)	
Polyps	8 (4.9)	4 (8.5)	4 (3.4)	
Symptomatic	143 (87.2)	38 (80.9)	105 (89.7)	0.123
Preoperative EDV	62 (37.8)	16 (34)	46 (39.3)	0.529
Time in waiting list (days)	194.7 (200) <sup>a</sup>	176.9 (184.3) <sup>a</sup>	201.9 (206.3) <sup>a</sup>	0.472

Values in parentheses are percentages unless indicated otherwise; values are amean (s.d) and bmedian (i.q.r). EDV, Emergency Department visits.

Table 2: Intraoperative and postoperative variables.

	Overall (n = 164)	<b>SP group (n = 47)</b>	CL group (n = 117)	p-value
Surgical devices				
3 or 4 ports			117 (100)	
Gloveport		16 (34)		
Lagiport ®		3 (6.4)		
Gelpoint ®		28 (59.6)		
Extra ports		2 (4.3)		
Conversion to open	0	0	0	
Complicated disease	14 (8.5)	8 (17)	6 (5.1)	0.026
Operative time (minutes)	51.1 (17.5) <sup>a</sup>	54.8 (17.5) <sup>a</sup>	49.6 (17.4) <sup>a</sup>	0.085
Clavien-dindo during hospitali	sation			0.344
0	142 (86.6)	40 (85.1)	102 (87.2)	
Ι	17 (10.4)	7 (14.9)	10 (8.5)	
II	4 (2.4)	0	4 (3.4)	
V	1 (0.6)	0	1 (0.9)	
Length of stay (days)	1.2 (1.1) <sup>a</sup>	1.1 (0.5) <sup>a</sup>	1.3 (1.3) <sup>a</sup>	0.392
VAS = 0 at discharge	98 (59.8)	34 (72.3)	64 (54.7)	0.037
PD EDV or rehospitalisation	11 (6.7)	3 (6.4)	8 (6.9)	1
PD Clavien-Dindo				0.771
0	147 (90.2)	42 (89.4)	105 (90.5)	
I	13 (8)	5 (10.6)	8 (6.9)	
II	1 (0.6)	0	1 (0.9)	
III	1 (0.6)	0	1 (0.9)	
IV	1 (0.6)	0	1 (0.9)	
Wound infection	6 (3.7)	3 (6.4)	3 (2.6)	0.356
Incisional hernia	3 (1.8)	1 (2.1)	2 (1.7)	1

Values in parentheses are percentages unless indicated otherwise; values are <sup>a</sup>mean (s.d). VAS, Visual Analog Scale. PD, post-discharge. EDV, Emergency Department visits.

Table 3: Questionnaire responses.

		<b>SP group</b> (n = 44)			<b>CL</b> group (n = 94)							
		1	2	3	4	5	1	2	3	4	5	
		<		=		>	<		=		>	p
		No				Yes	No				Yes	
1	I was adequately informed about my disease and the need for operation.	2.3	4.5	4.5	18.2	68.2	5.3	4.3	8.5	12.8	69.1	0.543
2	I felt well-treated during my hospitalisation.	0	0	2.3	20.5	77.3	2.1	1.1	2.1	13.8	80.9	0.684
3	I was given clear instructions at discharge.	4.5	6.8	9.1	18.2	61.4	4.3	5.4	4.3	10.8	75.3	0.500
4	I felt well-treated during the postoperative outpatient visit.	0	0	2.3	9.1	88.6	1.1	1.1	3.2	12.8	78.7	0.679
5	If I had to rate the postoperative pain $(1 = \text{no pain})$	36.4	25	15.9	6.8	15.9	43.6	28.7	16	4.3	7.4	0.552
6	My satisfaction with my wound aspect is	0	0	0	22.7	77.3	3.2	5.3	10.6	19.1	61.7	0.046
7	I think that I could have had fewer scars.	95.5				2.3	69.1				24.5	0.002
8	I would be more satisfied if I had had fewer scars.	90.9				9.1	53.2				46.8	0.000
9	If I had only had one wound, I think the pain would have been						22.3		47.9		7.4	
	If I had had more small wounds, I think the pain would have been	9.1		13.6		56.8						
10	If I had only had one wound, I think the aesthetic results would have been (1=worse, 3=same, 5=better)						1.1		29.8		58.5	
	If I hadhad more small wounds, I think the aesthetic results would have been (1=worse, 3=same, 5=better)	72.7		13.6		2.3						
11	If I had only had one wound, I think my satisfaction would be						0		60.6		35.1	
	If I had had more small wounds, I think my satisfaction would be	43.2		45.5		0						
12	My overall satisfaction is	2.3	0	9.1	18.2	70.5	2.1	2.1	8.5	24.5	62.8	0.782

Values are percentages referred to the total number of questionnaires answered by each group. "Don't know" answers are not recorded.

After discharge, no significant differences were found in the number of Emergency Department visits, the need for rehospitalisation or wound complications. 138 patients answered the telephone questionnaire (44 in the SP group and 94 in the CL group, 93.6 vs 80.3%, p = 0.035). The questions and results of these questionnaires are shown in Table 3. A higher proportion of SP group patients reported maximum overall satisfaction, although not reaching statistical signification (70.5 vs 62.8%, p=0.377). However, wound aspect satisfaction was significantly higher in the SP group (score 4 and 5, 100 vs 80.9%, p = 0.001). Moreover, more patients in the CL group opined that they could have had fewer scars (24.5 vs 2.3%, p = 0.002), and that had they done so, they would have been more satisfied (46.8 vs 9.1%, p< 0.001). In CL group, 22.3% of patients also opined that they would have had less pain, 58.5% that the aesthetic result would have been improved and 35.1% that their overall satisfaction would have been greater had they been operated on by single port approach.

In the bivariate analysis (Table 4), variables significantly associated with a maximum overall satisfaction (score 5) were older age, feeling well-treated during hospitalisation (score 5), a feeling that the patient was given clear instructions at discharge (score 5), feeling well-treated during the post-discharge visit (score 5, scores 4 and 5), wound aspect satisfaction (score 5, scores 4 and 5), not believing that fewer scars could have been left and not believing that satisfaction would be greater if fewer scars had been left. Variables significantly associated with a high overall satisfaction (scores 4 and 5) were older age, not needing postoperative Emergency Department visits or rehospitalisation, no complications after discharge, no morbidity, feeling well-treated during hospitalisation (score 5, scores 4 and 5), a feeling that the patient was

given clear instructions at discharge ( scores 4 and 5), feeling well-treated during the post-discharge visit (score 5, scores 4 and 5), no postoperative pain (score 5, scores 4 and 5), wound aspect satisfaction (score 5, scores 4 and 5) and not believing that fewer scars could have been left.

Univariate and multivariate logistic regression analysis were carried out in order to identify variables associated to a maximum overall satisfaction (Table 5). In the final multivariate model adjusted by age, the only independent variable which held signification was the wound aspect satisfaction (scores 4 and 5).

Table 4: Overall satisfaction analysis.

	Maximum overall satisfaction			High overal		
	( score $5, n = 90)$			(scores 4 an		
	Score 5	Score < 5	p	Score ≥ 4	Score < 4	p
Age (years)	60 <sup>a</sup>	50 <sup>a</sup>	0.006	58 <sup>a</sup>	44 <sup>a</sup>	0.004
PD EDV or rehospitalisation	3.3	12.5	0.065	2.5	35.3	< 0.001
PD Clavien-Dindo> 0	7.8	14.6	0.242	6.6	35.3	0.002
Overall morbidity	18.9	20.8	0.824	16.5	41.2	0.044
Q1 (scores 4 and 5)	85.6	79.2	0.337	85.1	70.6	0.162
Q2 (score 5)	92.2	56.2	< 0.001	84.3	47.1	0.001
Q2 (scores 4 and 5)	97.8	91.7	0.183	97.5	82.4	0.025
Q2 (scores 1 and 2)	1.1	4.2	0.277	0.8	11.8	0.040
Q3 (score 5)	82.2	47.9	< 0.001	72.7	52.9	0.095
Q3 (scores 4 and 5)	87.2	75	0.055	86	64.7	0.039
Q3 (scores 1 and 2)	5.6	20.8	0.009	8.3	29.4	0.022
Q4 (score 5)	93.3	60.4	< 0.001	86	52.9	0.003
Q4 (scores 4 and 5)	97.8	85.4	0.009	97.5	64.7	< 0.001
Q4 (score 1)	0	2.1	0.384	0	5.9	0.123
Q5 (score 5)	6.7	16.7	0.079	7.4	29.4	0.016
Q5 (scores 4 and 5)	12.2	20.8	0.180	12.4	35.3	0.025
Q5 (scores 1 and 2)	72.2	62.5	0.253	71.1	52.9	0.131
Q6 (score 5)	84.4	33.3	< 0.001	72.7	23.5	< 0.001
Q6 (scores 4 and 5)	97.8	66.7	< 0.001	90.9	58.8	0.002
Q6 (score 1)	0	6.2	0.040	0	17.6	0.002
Q6 (scores 1 and 2)	1.1	14.6	0.003	3.3	23.5	0.008
Q7 (yes)	8.9	33.3	< 0.001	13.2	47.1	0.002
Q8 (yes)	24.4	54.2	< 0.001	33.1	47.1	0.256

Values are percentages unless indicated otherwise; values are amedian. PD, post-discharge. EDV, Emergency Department visits. Variables in this table are exclusively those showing significant association with any of the satisfaction groups. The remaining variables show no association.

Table 5: Maximum overall satisfaction, univariate and multivariate analysis.

	Crude O.R.	C.I. 95% for crude O.R.	p	Adjusted O.R.	C.I. 95% for adjusted O.R.	p
Age	1.036	1.010 - 1.063	0.006	1.020	0.992- 1.050	0.163
Q6 (scores 4 and 5)	22.001	4.789 - 101.057	< 0.001	17.577	3.725 - 82.930	< 0.001
PD EDV or rehospitalisation	0.241	0.058 - 1.013	0.052			
Q2 (score 5)	9.222	3.534 - 24.069	< 0.001			
Q3 (score 5)	5.027	2.298 - 10.997	< 0.001			
Q3 (scores 1 and 2)	0.224	0.072 - 0.699	0.010			
Q4 (scores 4 and 5)	7.512	1.495 - 37.754	0.014			
Q4 (score 5)	9.172	3.340 - 25.190	< 0.001			
Q6 (score 5)	10.857	4.745 - 24.841	< 0.001			
Q7 (yes)	0.160	0.062 - 0.418	< 0.001			
Q8 (yes)	0.274	0.130 - 0.576	0.001			

PD = post-discharge. EDV = emergency department visits.

#### **DISCUSSION**

After evaluating all data regarding surgical variables and outcomes, the first conclusion is that single port laparoscopic cholecystectomy is at least as safe and effective as conventional laparoscopic cholecystectomy for the treatment of uncomplicated gallbladder disease. It is a feasible procedure that, in the worst scenario, can be turned into a conventional laparoscopy, which occurred once in our entire series and had no clinical relevance. The only negative consequences in adding ports to a single port procedure are the increase in overall cost and operative time. The first of these consequences has not been analysed in this study, although since the only difference in fungible material between the two approaches is that in the single port procedures a single port device is used instead of four ports (we use conventional laparoscopic instruments for the single port operations), it is easy for any institution to calculate its individual economic impact, which could even favour the single port approach. The second consequence, increased operative time, depends mainly on how much time it takes for the surgeon to realize that the procedure cannot be completed without adding extra ports.

There was, incidentally, a higher proportion of complicated gallbladder disease found intra-operatively in the SP group. This had no impact either in conversion rate or postoperative outcomes, specifically not increasing morbidity. This suggests, as has already been reflected in the literature, that indications for single port cholecystectomy can be extended to more complex conditions such as acute cholecystitis.<sup>24,25</sup>

Our study suggests an advantage in the SP group regarding postoperative pain, reflected in a greater proportion of patients significantly reporting absence of pain when leaving the hospital. This has already been expressed in many papers and, since the other postoperative outcomes remain equal, would favour the single port approach for the treatment of this condition. It has been argued against single port laparoscopy that there could be a higher rate of incisional hernia. <sup>26-31</sup> We did not find any such difference, and we actually believe that it is easier to close the fascial wound after single port laparoscopy because the larger skin incision facilitates the closing. Longer follow-up time should in any case be employed to re-evaluate whether incisional hernia rates continue to be equal in both groups.

We also tried to evaluate outcomes from the patient's point of view, hence the second part of the study. Many interesting conclusions can be drawn after analysing the results of the questionnaires. The first is that most of the patients operated on for uncomplicated gallbladder disease express high overall satisfaction regarding the whole process of care, and this high level of satisfaction is independent of the surgical approach. Patient satisfaction also seems to be more related to the information they receive or to behaviour towards them

than to the clinical outcomes of their operation, which may sometimes clash with the interests and beliefs of the professionals involved in their care. This has already been reflected in many studies regarding patient satisfaction.<sup>32,33</sup> However, this part of the study could have been biased because a higher proportion of the CL group patients refused to answer the questionnaire, and because morbidity in the 25 patients who did not answer the questionnaire was higher than in the rest of the patients. The effect of morbidity on overall satisfaction therefore remains uncertain.

In the multivariate analysis, the only variable independently associated with maximum overall satisfaction was wound aspect satisfaction, and although not directly improving overall satisfaction, single port approach significantly improved wound aspect satisfaction. Patients from both groups seemed to find advantages in the single port approach. In the SP group, only one patient thought that the aesthetic result would have been better had the intervention been carried out by multiport laparoscopic approach, and no patient thought that they would be more satisfied.

Conversely, in the CL group, nearly 60% of patients thought that the aesthetic result could have been better and 35% that overall satisfaction would be greater had they been operated on by single port approach. Thus, if patient preference had to be taken into account, the balance clearly leans towards the single port approach. Lack of concern for patient expectation has a negative impact on the appreciation of care and overall satisfaction, and can be a source of conflict between the patient and the health system.<sup>34-37</sup>

Since clinical outcomes are equal and patients seem to prefer the single port approach, the logical conclusion should be that uncomplicated gallbladder disease has to be operated on by single port laparoscopy. There are, however, some caveats. It should obviously be performed or at least offered where available and only if there are surgeons specifically trained in that procedure. Many surgeons attempt single port laparoscopy in the belief that it is merely an uncomfortable laparoscopy, and soon lose faith in the process.

It may be hard for a surgeon well-trained in laparoscopy to recognize that something as easy as a simple cholecystectomy might present a challenge, but it is undeniable that single port laparoscopic procedures give rise to an independent learning curve, which of course is shorter for experienced laparoscopists. Single port cholecystectomies are performed at our institution by hepatobiliary surgeons - experts in cholecystectomies of any grade of complexity with specific training in single port laparoscopy - while conventional laparoscopic cholecystectomies for uncomplicated gallbladder diseases are performed by all surgeons. This reflects our belief that single port cholecystectomies should be performed by dedicated surgeons.

# **CONCLUSION**

In conclusion, laparoscopic cholecystectomy for uncomplicated gallbladder diseases should be performed by single port approach, since it provides the same clinical outcomes as conventional three or four port laparoscopy, reduces postoperative pain, improves aesthetic outcomes and is preferred by patients.

#### **ACKNOWLEDGEMENTS**

Authors would like to thank Mr. Larry Hershon for his great support.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

institutional ethics committee

#### **REFERENCES**

- 1. Rhodes M. Critical appraisal of single port access cholecystectomy. Br J Surg. 2010;97:1481.
- 2. Ahmed MU, Aftab A, Seriwala HM. Can single incision laproscopic cholecystectomy replace the traditional four port laproscopic approach: a review. Glob J Health Sci. 2014;6:119-25.
- 3. Ye G, Qin Y, Xu S. Comparison of transumbilical single-port laparoscopic cholecystectomy and fourth-port laparoscopic cholecystectomy. Int J Clin Exp Med. 2015;8:7746-53.
- 4. Arezzo A, Passera R, Bullano A. Multi-port versus single-port cholecystectomy: results of a multi-centre, randomised controlled trial (MUSIC trial). Surg Endosc. 2016.
- 5. Khiangte E, Newme I, Phukan P. Improvised transumbilical glove port: a cost effective method for single port laparoscopic surgery. The Indian Journal Surg. 2011;73:142-5.
- 6. Colon MJ, Telem D, Divino CM. Laparoendoscopic single site surgery can be performed completely with standard equipment. Surg Laparosc Endosc Percutan Tech. 2011;21:292-4.
- 7. Singh M, Mehta KS, Yasir M. Single-incision laparoscopic cholecystectomy using conventional laparoscopic instruments and comparison with three-port cholecystectomy. Indian J Surg. 2015;77:546-50.
- 8. Chuang SH, Yang WJ, Chang CM. Is routine single-incision laparoscopic cholecystectomy feasible? a retrospective observational study. Am J Surg. 2015;210;315-21.
- 9. Erbella J, Bunch GM. Single-incision laparoscopic cholecystectomy: the first 100 outpatients. Surg Endosc. 2010;24:1958-61.
- Rao PP, Bhagwat SM, Rane A. The feasibility of single port laparoscopic cholecystectomy: a pilot study of 20 cases. HPB. Official J International Hepato Pancreato Biliary Association. 2008;10:336-40.

- 11. Magdaleno SH, Martin JR, Trunas BJ. Results of the first 100 single port laparoscopic cholecystectomies in a secondary care hospital. Cirugia Espanola. 2014;92:324-8.
- 12. Curcillo PG, Wu AS, Podolsky ER. Single-port-access (SPA) cholecystectomy: a multi-institutional report of the first 297 cases. Surg Endosc. 2010;24:1854-60.
- 13. Asakuma M, Hayashi M, Komeda K. Impact of single-port cholecystectomy on postoperative pain. Br J Surg. 2011;98:991-5.
- 14. Krajinovic K, Koeberlein C, Germer CT. The Incidence of trocar site hernia after single-port laparoscopic cholecystectomy-a single center analysis and literature review. J Laparoendoscopic Advanced Surgical Techniques. 2016;26:536-9.
- 15. Ostlie DJ, Sharp NE, Thomas P. Patient scar assessment after single-incision versus four-port laparoscopic cholecystectomy: long-term follow-up from a prospective randomized trial. J Laparoendoscopic Advanced Surgical Techniques. 2013;23:553-5.
- Lirici MM, Tierno SM, Ponzano C. Single-incision laparoscopic cholecystectomy: does it work? A systematic review. Surg Endosc. 2016;30:4389-99.
- 17. Allemann P, Demartines N, Schafer M. Remains of the day: biliary complications related to single-port laparoscopic cholecystectomy. World J Gastroenterol. 2014;20:843-51.
- 18. Bingener J, Ghahfarokhi LS, Skaran P. Responsiveness of quality of life instruments for the comparison of minimally invasive cholecystectomy procedures. Surg Endosc. 2013;27:2446-53.
- Chang SK, Wang YL, Shen L. A randomized controlled trial comparing post-operative pain in single-incision laparoscopic cholecystectomy versus conventional laparoscopic cholecystectomy. World Journal Surgery. 2015;39:897-904.
- 20. Gurusamy KS, Vaughan J, Rossi M. Fewer-thanfour ports versus four ports for laparoscopic cholecystectomy. Cochrane Database Syst Rev. 2014;CD007109.
- 21. Bury K, Pawlak M, Smietanski M. Single-incision port-site herniation: meta-analysis vs. nationwide cohort study. Hernia. Journal Hernias Abdominal Wall Surgery. 2016;20:11-2.
- Garg P, Thakur JD, Garg M. Single-incision laparoscopic cholecystectomy vs. conventional laparoscopic cholecystectomy: a meta-analysis of randomized controlled trials. J Gastrointest Surg. 2012;16:1618-28.
- Trastulli S, Cirocchi R, Desiderio J. Systematic review and meta-analysis of randomized clinical trials comparing single-incision versus conventional laparoscopic cholecystectomy. Br J Surg. 2013;100:191-208.
- 24. Beninato T, Kleiman DA, Soni A. Expanding the indications for single-incision laparoscopic cholecystectomy to all patients with biliary disease:

- is it safe? Surg Laparosc Endosc Percutan Tech. 2015;25:10-4.
- 25. Ikumoto T, Yamagishi H, Iwatate M. Feasibility of single-incision laparoscopic cholecystectomy for acute cholecystitis. World J Gastrointest Endosc. 2015;7:1327-33.
- 26. Ellatif ME, Askar WA, Abbas AE. Quality-of-life measures after single-access versus conventional laparoscopic cholecystectomy: a prospective randomized study. Surg Endosc. 2013;27:1896-906.
- 27. Pan MX, Jiang ZS, Cheng Y. Single-incision vs three-port laparoscopic cholecystectomy: prospective randomized study. World J Gastroenterol. 2013;19:394-8.
- 28. Agaba EA, Rainville H, Ikedilo O. Incidence of port-site incisional hernia after single-incision laparoscopic surgery. Journal Society Laparoendoscopic Surgeons. 2014;18:204-10.
- Alptekin H, Yilmaz H, Acar F. Incisional hernia rate may increase after single-port cholecystectomy. Journal Laparoendoscopic Advanced Surgical Techniques. 2012;22:731-7.
- Antoniou SA, Conde S, Antoniou GA. Single-incision laparoscopic surgery through the umbilicus is associated with a higher incidence of trocar-site hernia than conventional laparoscopy: a meta-analysis of randomized controlled trials. Hernia. Journal Hernias Abdominal Wall Surgery. 2016;20:1-10.
- 31. Julliard O, Hauters P, Possoz J. Incisional hernia after single-incision laparoscopic cholecystectomy: incidence and predictive factors. Surg Endosc. 2016;30:4539-43.
- 32. Kennedy GD, Tevis SE, Kent KC. Is there a relationship between patient satisfaction and favorable outcomes? Ann Surg. 2014;260:592-8.

- 33. Tsai TC, Orav EJ, Jha AK. Patient satisfaction and quality of surgical care in US hospitals. Ann Surg. 2015;261:2-8.
- 34. Ashraf AA, Colakoglu S, Nguyen JT. Patient involvement in the decision-making process improves satisfaction and quality of life in postmastectomy breast reconstruction. Journal Surgical Research. 2013;184:665-70.
- 35. Elwyn G, Frosch D, Thomson R. Shared decision making: a model for clinical practice. J General Internal Med. 2012;27:1361-7.
- 36. Kunneman M, Montori VM, Guarderas CA. What is shared decision making? (and what it is not). Academic Emergency Med. 2016.
- 37. Shirley ED, Sanders JO. Patient satisfaction: Implications and predictors of success. J Bone Joint Surg Am. 2013;95:69.
- 38. Mutter D, Callari C, Diana M. Single port laparoscopic cholecystectomy: which technique, which surgeon, for which patient? A study of the implementation in a teaching hospital. J Hepatobiliary Pancreatic Sci. 2011;18:453-7.
- 39. Feinberg EJ, Agaba E, Feinberg ML. Single-incision laparoscopic cholecystectomy learning curve experience seen in a single institution. Surg Laparosc Endosc Percutan Tech. 2012;22:114-7.
- 40. Solomon D, Bell RL, Duffy AJ. Single-port cholecystectomy: small scar, short learning curve. Surg Endosc. 2010;24:2954-7.

Cite this article as: Romero-Marcos JM, Carbonell-Aliaga MP, Muñoz-Pérez JM, Tejada-Gavela S, Sanchis-Cortés P, Cifuentes-Ródenas JA. Patient preference matters: cholecystectomy for uncomplicated gallbladder diseases should be performed by single port laparoscopy. Int Surg J 2017;4:1327-34.