ORIGINAL RESEARCH

International Journal of Surgery 11 (2013) 73–76

Contents lists available at SciVerse ScienceDirect

International Journal of Surgery

journal homepage: www.theijs.com

Original research

The need for training frameworks and scientific evidence in developing scarless surgery: A national survey of surgeons' opinions on single port laparoscopic surgery

H. Rehman [a,*], J.E.F. Fitzgerald [b], J. Frantzias [a], J. Lemon [c], I. Ahmed [d]

[a] Edinburgh Royal Infirmary, EH16 5JP, UK
[b] Chelsea & Westminster NHS Hospital Trust, 369 Fulham Road, London SW10 9NH, UK
[c] University of Aberdeen, UK
[d] Aberdeen Royal Infirmary, UK

ARTICLE INFO

Article history:
Received 16 August 2012
Received in revised form
22 October 2012
Accepted 27 November 2012
Available online 6 December 2012

Keywords:
Single port
Single incision
One incision
Scarless
Laparoscopic surgery
National survey
Training

ABSTRACT

Introduction: Single port/incision laparoscopic surgery (SPILS) is a recent innovation in minimally invasive surgery whereby operations are performed through a single point of entry. Despite the relative paucity of clinical data, the procedure is increasingly being used to minimise scarring and pain associated with the multiple entry points of traditional laparoscopic surgery. This study aimed to analyse the awareness, experience and opinions of British surgeons regarding SPILS.

Methods: Electronic, 13-item, self-administered, anonymous questionnaire survey distributed via national/regional surgical mailing lists and websites. Results were collated and analysed with SPSS v17.0 for Windows (SPSS, Inc, Chicago, IL).

Results: 342 fully completed responses received, including 72 (21%) Consultants and 189 (55%) higher surgical trainees. Overall 330 (96.5%) were aware of SPILS; there was no significant difference in awareness between grades. Only 37% had assisted or performed SPILS procedures. More consultants performed these than trainees (56.3 vs 32.0%, $p < 0.05$). Operative experience was limited, with only 6% of those undertaking SPILS performing $\geq$25 procedures, and 60% performing $\leq$5. 61.4% believed SPILS takes longer to perform, and 32.8% believed it has higher complication rate. Factors cited as limiting uptake included: lack of evidence (70%), insufficient training opportunities (78%), incorrect instrumentation (70%), increased cost (62%), and hospital policy (44.5%). Patient preference was considered to have negatively affected SPILS uptake by only 9% of respondents. A greater proportion of trainees (94.6% vs 78.9%) felt there were insufficient SPILS training opportunities ($p = 0.001$).

Conclusions: Although awareness of SPILS is high, operative experience is limited and negative perceptions regarding operating time and complications remain. The findings suggest future uptake relies strongly on the availability of evidence, training, instrumentation and reduced costs. Scientific studies are still awaited to assess effectiveness and provide clinical and economic evaluation.

Published by Elsevier Ltd on behalf of Surgical Associates Ltd.

1. Introduction

The introduction of laparoscopic surgery in the late 1980s revolutionised the practice of many surgical specialities.[1] Laparoscopic surgery offers less scarring, less blood loss, shorter length of hospital stay, quicker healing rates and reduces complications such as pain and wound infection.[2–5] Since the introduction of minimally invasive surgery, surgeons have strived to further advance the technology.

In the current era, endeavours to reduce surgical morbidity have resulted in new techniques emerging, both new innovations and hybrids of existing methods. One such technical development towards "scarless surgery" is Single port/incision laparoscopic surgery (SPILS). SPILS uses laparoscopic equipment introduced into the peritoneal cavity through a single, abdominal, skin incision, leaving a single scar, almost completely concealed within the umbilicus. To-date uptake has been limited in hospitals in the United Kingdom, despite many documented cases providing an evidence base for the proposed benefits: reduced postoperative pain, wound complications and better cosmetic results.[6]

New surgical innovations may take time to become established. In assessing their strengths, numerous factors must be evaluated

* Corresponding author.
E-mail address: haroon.rehman.06@aberdeen.ac.uk (H. Rehman).

1743-9191/$ – see front matter Published by Elsevier Ltd on behalf of Surgical Associates Ltd.
http://dx.doi.org/10.1016/j.ijsu.2012.11.018

including the implications for the patient and surgeon, procedural safety, health costs, complications, skill requirements and technological specifications. A survey has already been conducted by our department identifying patient preference for novel surgical innovations in an emergency setting, with SPILS preferred over other new procedures such as Natural Orifice Transluminal Endoscopic Surgery (NOTES).[7]

This national study aimed to analyse the awareness, experience and opinions of British surgeons regarding SPILS.

2. Methods

2.1. Definitions

For the purposes of this study, single port/incision laparoscopic surgery was defined in the broadest term: any procedure using specialised or conventional laparoscopic instruments through a single skin incision in the abdominal wall, regardless of fascial incisions or additional use of single port devices, percutaneous sutures or wires.

2.2. Questionnaire

As no validated questionnaire on this topic has been developed previously, a study-specific 13-item, self-administered, electronic survey was designed. This investigated the opinions of current surgical trainees on SPILS including awareness and experience with the specific techniques, and factors influencing uptake. This consisted of free text, binomial and 5-point Likert scale responses to rate level of agreement with items. Respondents were given the opportunity to make any additional comments. The questionnaire was piloted amongst local faculty and the feedback received was used to further refine the question items.

The completed questionnaire was distributed in the United Kingdom via national and regional surgical mailing lists and the Association of Surgeons in Training website. All trainees within current training programmes were invited to participate.

Responses were collected through the SNAP version 9 web-survey portal (Snap Surveys Ltd, Bristol, England). The authors gave due consideration to the ethical dimensions of this anonymous questionnaire survey and no concerns were identified. The questionnaire was optional and completion was taken as consent to participate.

2.3. Statistical analysis

Non-parametric statistical testing was used throughout analysis. The Stastical Package for the Social Science SPSS v15 (SPSS Inc., Chicago, IL, USA) was used to analyse weighting assigned to each item. Kruskal–Wallis one-way analysis of variance was used to detect difference in level of agreement between training groups. The probability value was used as the criterion for significance at $p \leq 0.05$.

3. Results

3.1. Demographics

Three hundred and forty-two fully completed responses were received. There were 257 male and 71 female respondents. Fig. 1 illustrates respondent's training grade.

Sixty-eight percent ($n = 233$) of all respondents were between 30 and 40 years old and the majority (88.6%) were 5 years post completion of medical degree. The largest specialty represented was general surgery (86%, $n = 234$), others specified included gynaecology (3.8%) and urology (0.9%).

3.2. Awareness and operative experience

Overall 96.5% of participants ($n = 330$) previously knew about SPILS of which 36.0% ($n = 123$) had performed procedures Fig. 2.Positive responses were received from both consultants and other grades (98.6 vs 95.9%), with no statistically significant difference between them ($p = 0.47$).

Notably, 77.3% of surgeons lacking operative experience stated SPILS procedures were not performed in their hospital.

Senior surgeons were involved in a higher number of operations Table 1. More consultants than any other grade performed SPILS ($p < 0.05$, 56.3% vs 32.0%).

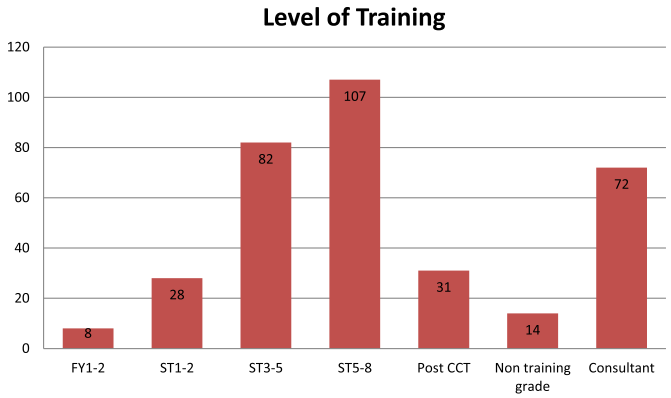

Fig. 1. Frequency distribution of all participants according to training grade.

3.3. Factors influencing uptake of SPILS

Table 2 shows the majority of surgeons disagreed that lack of interest from trainees and patient preference limited the use of SPILS in clinical practice. A greater proportion of trainees (94.6% vs 78.9%) felt there were insufficient SPILS training opportunities ($p = 0.001$). A greater proportion of non-consultant grades (85.6 vs 66.7%) also expressed patient preference did not affect uptake, but this did not reach statistical significance ($p = 0.21$).

77.6% deemed insufficient training opportunities a contributory factor to low uptake. There was inclination towards opinion SPILS takes longer to perform and has higher complication rate, 61.4% and 32.8% respectively. A greater proportion of non-consultants (89.6 vs 74.5%) felt there was lack of correct instrumentation ($p = 0.007$).

There was a significant difference between training grade in weightings given to Items 4 (prolonged operating time) and 8 (increased cost). ST3-8 trainees (registrar grade) thought SPILS procedures take longer to complete, the remaining groups remained undecided. ST3-5 trainees gave greater weighting to SPILS being a more expensive procedure.

69.1% of participants stated they agreed there was a lack of evidence on SPILS effectiveness. Hospital policy was considered by 44.5% as limiting factors to SPILS procedures.

3.4. Areas for improvement

Table 3 demonstrates the level of importance attached to item as a potential factor for improving the uptake of SPILS.

74.8% agreed an increase in training may improve uptake of SPILS, although those who had completed surgical training and consultant participants remained neutral.

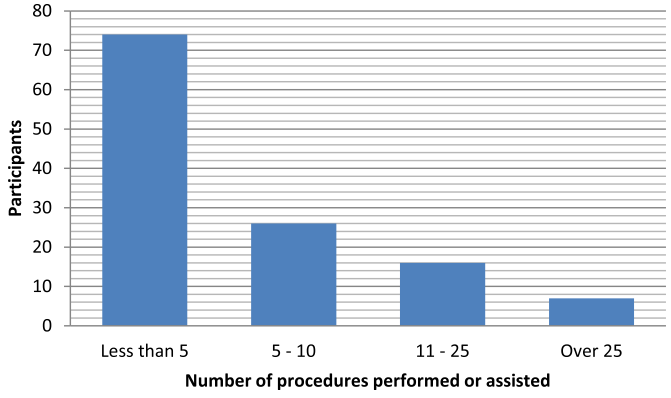

Fig. 2. Operative experience: number of procedures performed by those surgeons having performed or assisted SPILS.

Table 1
Operative experience of SPILS stratified by training grade.

Training grade	Number of SPILS procedures performed				Total
	Less than 5	5–10	11–25	Over 25	
FY1-2	0	1	0	0	1
ST1-2	7	1	1	0	9
ST3-5	18	8	1	0	27
ST5-8	16	5	5	1	27
Post CCT	8	6	5	0	16
Consultant	25	5	4	6	40
Total	74	26	16	7	123

86.4% or respondents attached importance to the requirement of Randomised Control Trials RCTS on SPILS, 9% remain undecided and 4.2% thought this was unimportant, with greater emphasis from senior grade surgeons including consultants.

3.5. Additional comments

A representative sample of additional free-text comments from respondents is provided in Table 4.

4. Discussion

This study identifies the awareness, experience and opinions of non-expert surgeons regarding the current status of SPILS procedures and is the first survey known to authors to do so. It presents issues limiting the wider application of SPILS and offers potential solutions. The main issues for surgeons are training and clinical evidence, rather than procedure related factors such as technical difficulty or healthcare policy.

The current evidence base for single incision surgery is sparse.[6] Much of the literature is commentary, or focuses on specific cases in pioneering centres with non-standardised outcomes. Presently, randomised controlled trials (RCTs) have demonstrated no significant difference in operative outcomeswith SPILS compared to conventional techniques,[8–10] although authors of some case series report improvements with the new techniques.[1,11,12]Operating time and complication rates await robust scientific testing, which is reflected in the uncertainty demonstrated towards this new technique by respondents in this study.

Operative experience in SPILS was low despite widespread awareness and demand for training. Practical experience did not correlate with a high caseload. These procedures are not currently part of institutional policies[6] and therefore trainee experience remains opportunistic. SPILS is predominantly learnt and performed at consultant level, by expert enthusiasts. Therefore the opportunities for trainee's to practice conventional operations are lost to "consultant learning" in departments undertaking SPILS and this may adversely affect training as well as trainee's views towards the technique.

It is out with the remit of this study to assess the role of SPILS in future practice. Should SPILS find a more secure position in clinical practice, it is important that current training deficits are addressed. Advanced skills can be certified through accredited skills courses, designed and offered by the Royal Surgical Colleges or Specialist Associations in partnership with industry. Additional training could also be delivered through national SPILS fellowships, such as the laparoscopic fellowships offered in colorectal and bariatric surgery.[13] Studies have shown that completion of a fellowship may give surgeons a preferential edge on referrals for advanced laparoscopic cases.[14]Fellowships in traditional laparoscopic surgery have been established without compromising the training centres outcomes,[15,16] although no such data exists for SPILS. Proficiency based virtual–reality simulator training, which has been shown to increase the performance level of a novice to that of an intermediately experienced laparoscopist, may also play a role.[17] Such simulator training may allow trainees to accelerate their early learning curve.

A striking feature of this data is that participants felt that patient preference for SPILS had little influence on its role in practice. It could be argued that a compelling incentive to learn new procedures comes from patients demand for "cutting edge" techniques which have gained over-generous media coverage. Ina recent survey by our department on preferences of surgical techniques it was found that SPILS was favoured more by non-medical groups than nurses and doctors and that SPILS was preferred over NOTES.[7]

Due to the fragmented nature of healthcare provision, the UK historically lags behind in medical technology.[18] The majority of

Table 2
Weighted median of participant response to items 1–11.

Limiting factor	Weighted median	P^a
1. Lack of interest from trainees	4	$P < 0.001$
2. Patient preference	4	$P < 0.001$
3. Difficult to learn	3	
4. Prolonged operating time	3	$P = 0.021$
5. Increased Risk of Complication	3	
6. Conservatism in British Health System	3	
7. Hospital Policy	3	
8. Increased Costs	3	$P < 0.001$
9. Not enough training opportunities	2	$P < 0.001$
10. Lack of correct instrumentation	2	$P < 0.001$
11. Lack of evidence effectiveness	2	

1 = strongly agree.
2 = agree.
3 = neither agree nor disagree.
4 = disagree.
5 = strongly disagree.
[a] Analysis of variance.

Table 3
Areas for improvement. Weighted median of participant response to items 1–5.

	Weighted median	P^*
More training opportunities	2	$P < 0.001$
Improved equipment design	2	$P < 0.001$
Cost effectiveness	2	
Better data collection (centralised registry)	2	$P = 0.004$
Availability of scientific evidence (RCTs)	2	$P = 0.031$

1 = very important.
2 = important.
3 = undecided.
4 = unimportant.
5 = very unimportant.
*Analysis of variance.

Table 4
Representative sample of free text comments.

Single port surgery has no real future in a cash-strapped NHS when the alternatives of multiport surgery are well established.
With shortening training time period, opportunities are already less than ideal for registrars.
A cultural shift towards SPILS will increased waiting time for patients
Currently no overwhelming advantage to overcome to tested methods and the learning curve
Safety of the procedure needs to be addressed
Interesting idea but the technology needs to improve
It is purely a cosmetic driven technique
Profile should not be increased outside specialist centres.
Interested in learning more.
Why make a laparoscopic case difficult? Life is too short!

case reports featuring SPILS are published abroad, notably the United States, which is perhaps indicative of the greater usage of "new" procedures in these areas, or the availability of funding to support their introduction. Cost effectiveness and conservative implementation of new surgical technology were limiting factors on which participants in this survey remained undecided.

Interestingly there was diversity of opinion on whether current instrumentation was adequate for SPILS. Trainee levels ST1-8 thought there was a lack of instrumentation; the remaining groups remained undecided and there was no relation to operative experience in SPILS. This finding may relate to the participants' position on the learning curve for conventional procedures. Senior trainees and consultants may be confident enough with current technology to attempt/adopt new techniques, but conclusions should be drawn cautiously.

This survey was designed on the premise that SPILS is being used in conjunction with conventional methods by specialists, as a new rather than experimental procedure. It does not collect opinions on the future of SPILS. Respondents were contacted through trainee mailing lists and websites hence responder bias cannot be excluded. The sample may represent surgeons with a vested interest in surgical education and technologies, who hold strong opinions on new or novel procedures. Furthermore, it is difficult to determine whether the sample represents surgeons with positive or negative experiences with SPILS because this was not tested directly.

Future research should focus of the international perspective on SPILS and the views of expert and more non-expert consultants in this field. The question: "what is the future for SPILS?" is one that will not be answered by advocates or adversaries of these procedures, but time.

There are indisputably many ethical issues that arise from the introduction of new technology in surgical practice. The independent surgeons' diligent pursuit of technical skill in new procedures may cost time and some inconvenience for patients, but should never jeopardise safety. Thus, the acquisition of surgical skills in SPILS should be sought in a wider educational framework with emphasis on knowledge and attitude, in addition to technical expertise.[19,20]

5. Conclusion

This survey demonstrates evidence showing improvement in surgical outcome, whilst maintaining patient safety, remains a prerequisite to the further uptake of SPILS. There is widespread interest amongst surgeons in SPILS and should it enter routine practice, healthcare providers will need to focus on increasing availability of training in these complex techniques for all grades of surgeon.

Ethical approval

None.

Funding

None.

Authors contributions

John Lemon – survey distribution and data collection.
Irfan Ahmed – survey design and revisions.
Edward Fitzgerald – analysis, write-up and data collection.
Haroon Rehman – survey design.
Joseph Frantzias – analysis, write up and revisions.

Conflict of interest

None.

References

1. Litynski GS. Profiles in laparoscopy: Mouret, Dubois, and Perissat: the laparoscopic breakthrough in Europe (1987–1988). *JSLS* 1999 Apr-Jun;**3**(2):163–7.
2. Ali U, Keus F, Heikens J, Bemelman W, Berdah S, Gooszen HG, et al. Open versus laparoscopic (assisted) ileo pouch anal anastomosis for ulcerative colitis and familial adenomatous polyposis. *Cochrane Database Syst Rev* 2009;(1):CD006267.
3. Cirocchi R, Abraha I, Farinella E, Montedori A, Sciannameo F. Laparoscopic versus open surgery in small bowel obstruction. *Cochrane Database Syst Rev* 2010;(2):CD007511.
4. Sauerland S, Jaschinski T, Neugebauer EA. Laparoscopic versus open surgery for suspected appendicitis. *Cochrane Database Syst Rev* 2010 Oct 6;**10**(10):CD001546.
5. Keus F, De Jong J, Gooszen H, Laarhoven C. Laparoscopic versus open cholecystectomy for patients with symptomatic cholecystolithiasis. Status and date: edited (no change to conclusions), published in 2006;1.
6. Rehman H, Rao AM, Ahmed I. Single incision versus conventional multi-incision appendicectomy for suspected appendicitis. *Cochrane Database Syst Rev* 2011 Jul 6;**7**(7):CD009022.
7. Rao A, Kynaston J, MacDonald ER, Ahmed I. Patient preferences for surgical techniques: should we invest in new approaches? *Surg Endosc* 2010;**24**(12):3016–25.
8. St Peter SD, Adibe OO, Juang D, Sharp SW, Garey CL, Laituri CA, et al. Single incision versus standard 3-port laparoscopic appendectomy: a prospective randomized trial. *Ann Surg* 2011;**254**(4):586.
9. Ma J, Cassera MA, Spaun GO, Hammill CW, Hansen PD, Aliabadi-Wahle S. Randomized controlled trial comparing single-port laparoscopic cholecystectomy and four-port laparoscopic cholecystectomy. *Ann Surg* 2011;**254**(1):22.
10. Gupta A, Shrivastava UK, Kumar P, Burman D. Minilaparoscopic versus laparoscopic cholecystectomy: a randomised controlled trial. *Trop Gastroenterol* 2005 Jul-Sep;**26**(3):149–51.
11. Palanivelu C, Rajan P, Rangarajan M, Parthasarathi R, Senthilnathan P, Praveenraj P. Transumbilical endoscopic appendectomy in humans: on the road to NOTES: a prospective study. *J Laparoendosc Adv Surg Tech* 2008;**18**(4):579–82.
12. Asakuma M, Hayashi M, Komeda K, Shimizu T, Hirokawa F, Miyamoto Y, et al. Impact of single-port cholecystectomy on postoperative pain. *Br J Surg* 2011;**98**(7):991–5.
13. Wyles SM, Miskovic D, Ni M, Kennedy RH, Hanna GB, Coleman MG. "Trainee" evaluation of the English National Training Programme for laparoscopic colorectal surgery. *Colorectal Dis* 2012.
14. Grover BT, Kothari SN, Kallies KJ, Mathiason MA. Benefits of laparoscopic fellowship training: a survey of former fellows. *Surg Innovation* 2009;**16**(4):283–8.
15. Clements RH, Leeth RR, Vickers SM, Bland KI. Incorporating laparoscopic fellowship does not increase morbidity or mortality in a university-based bariatric practice. *J Am Coll Surg* 2007;**204**(5):824–8.
16. Kothari SN, Boyd WC, Lambert PJ, Mathiason MA. Can an advanced laparoscopic fellowship program be established without compromising the center's outcomes? *Surg Innovation* 2008;**15**(4):317–20.
17. Larsen CR, Soerensen JL, Grantcharov TP, Dalsgaard T, Schouenborg L, Ottosen C, et al. Effect of virtual reality training on laparoscopic surgery: randomised controlled trial. *BMJ: Br Med J* 2009:338.
18. House of Commons Health Committee. *The use of new medical technologies within the NHS* 2004.
19. Schijven M, Bemelman W. Problems and pitfalls in modern competency-based laparoscopic training. *Surg Endosc* 2011;**25**(7):2159–63.
20. Gates EA. New surgical procedures: can our patients benefit while we learn? *Obstet Gynecol* 1997;**176**(6):1293–9.