http://dx.doi.org/10.1016/j.hpb.2017.08.028 HPB

ORIGINAL ARTICLE

Are the current difficulty scores for laparoscopic liver surgery telling the whole story? An international survey and recommendations for the future

Mark C. Halls[1], Daniel Cherqui[2], Mark A. Taylor[3], John N. Primrose[1], Mohammed Abu Hilal[1] & Collaborators of The Difficulty of Laparoscopic Liver Surgery Survey

[1]University Hospital Southampton, Southampton, United Kingdom, [2]Paul Brousse Hospital, Villejuif-Paris, France, and [3]Mater Hospital, Belfast, Northern Ireland, United Kingdom

Abstract

Background: Recent studies have suggested that the difficulty of laparoscopic liver resections are related to both patient and tumour factors, however the available difficulty scoring systems only incorporate tumour factors. The aim of this study was to assess the opinion of laparoscopic liver surgeons regarding the factors that affect the perceived difficulty of laparoscopic liver resections.

Method: Using a Visual Analogue Scale an international survey of laparoscopic liver surgeons was undertaken to assess the perceived difficulty of 26 factors previously demonstrated to affect the difficulty of a laparoscopic liver resection.

Results: 80 surgeons with a combined experience of over 7000 laparoscopic liver resections responded to the survey. The difficulty of laparoscopic liver surgery was suggested to be increased by a BMI > 35 by 89% of respondents; neo-adjuvant chemotherapy by 79%; repeated liver resection by 99% and concurrent procedures by 59% however these factors have not been included in the previous difficulty scoring systems.

Conclusion: The results suggests that the difficulty of laparoscopic liver surgery is not fully assessed by the available difficulty scoring systems and prompts the development of a new difficulty score that incorporates all factors believed to increase difficulty.

Received 12 June 2017; accepted 26 August 2017

Correspondence

Mohammed Abu Hilal, Department of Hepato-Biliary and Pancreatic Surgery, University Hospital Southampton NHS Foundation Trust, Tremona Road, Southampton SO16 2YD, United Kingdom. E-mail: abuhilal9@gmail.com

Introduction

The acquisition and mastery of a complex skill is conventionally achieved in a step-wise fashion, requiring the initial mastery of simple tasks with the addition of increasingly complex steps to achieve proficiency with more complex skills. Laparoscopic liver surgery has enjoyed an increase in its uptake in recent years[1] as a result of its excellent short and long-term outcomes.[2–5] However, its dissemination has been far slower than that seen with other laparoscopic specialities. Whilst, over 40% of colorectal resections are performed laparoscopically,[6,7] the same can not be said for laparoscopic liver surgery,[8] which is still limited to a handful of specialist tertiary liver centres due, in part, to the difficulty of the procedures.[9,10]

The European Guidelines Meeting for Laparoscopic Liver Surgery (EGMLLS) was held in February 2017 with the specific intent of developing guidelines for the safe expansion of laparoscopic liver surgery.[11] During the meeting the need for a step-wise progression in the training of laparoscopic liver surgeons was specifically highlighted. While the EGMLLS produced the first evidence based and expert validated clinical practice recommendations earlier publications have supported the notion of incremental increases in difficulty in order to develop technical competency prior to progressing to more complex resections.[8,12]

The Collaborators of The Difficulty of Laparoscopic Liver Surgery Survey are listed in Appendix A1.

Please cite this article in press as: Halls MC, et al., Are the current difficulty scores for laparoscopic liver surgery telling the whole story? An international survey and recommendations for the future, HPB (2017), http://dx.doi.org/10.1016/j.hpb.2017.08.028

In order that progressive steps may be taken during the training of a laparoscopic liver surgeon there must be an objective means of pre-operatively attributing difficulty to a given operation. Ban *et al.* (2014) proposed "a novel difficulty scoring system for laparoscopic liver resection" that highlighted five factors that made the resection of a neoplasm more difficult.[13] This has been followed recently by a classification system proposed by Kawaguchi *et al.* (2017), which groups operations by difficulty to allow for patient selection based on the experience of the surgeon.[14] These classifications correlate well with one another demonstrating that small peripheral resections in the left liver are less complex than large, central or postero-superior resections on the right. However, while these difficulty scoring systems provide useful guidance they are still not perfect as they focus entirely on tumour factors and resection type and overlook several patient factors that have been previously demonstrated to affect the difficulty of a laparoscopic liver resection including neo-adjuvant chemotherapy, repeated resection, body habitus/Body Mass Index (BMI), Age and diabetes.[15–20]

The recent publication by van der Poel *et al.* (2017) re-enforces the importance of a step-wise progression in the training of a laparoscopic liver surgeon[21] and the ability to pre-operatively estimate of the difficulty of a specific resection is integral to this. The current absence of a difficulty score that incorporates patient, surgeon and tumour factors suggests that not all the important variables have been adequately recognised. The aim of this study was to assess the opinion of international laparoscopic liver surgeons to establish the currently held beliefs as to which factors affect the difficulty of a laparoscopic liver resection and hence which factors should be considered for incorporation in future difficulty scoring systems.

Method

To establish which factors are currently regarded as influencing the difficulty of laparoscopic liver resections a comprehensive literature review was performed using Ovid Medline and Pubmed in July 2016. All studies in English with more than 10 patients describing "difficult" resections and those requiring "conversion" during laparoscopic liver surgery were reviewed. The results of this literature review were used to produce of an online survey of 26 factors (see Appendix A2 for survey) that was sent directly to 190 established laparoscopic liver surgeons and was disseminated through the E-AHPBA website to its members.

The survey required the recipients to use a modified Visual Analogue Scale (VAS) to rate how the 26 factors found during the literature review affected the difficulty of a resection. A VAS was selected as it has been demonstrated to be simple to use, reproducible and allow the production of quantitative data from subjective opinion.[22] The scale ranged from 0 (the associated factor does not affect the difficulty of a laparoscopic liver resection) through to 5 (the associated factor adds maximal difficulty to a laparoscopic liver resection). In addition, the respondents were also asked to provide an estimate of how many laparoscopic liver resections they had personally performed.

Although it is not possible to attribute a single, specific value to the number of procedures a laparoscopic liver surgeon must perform to be proficient numerous papers have reported that the learning curve for minor resections is between 20 and 60 procedures, while that for major resections is between 30 and 60 procedures.[23–26] Hence, a subgroup analysis was performed comparing the responses of those surgeons who had performed less than 100 procedures (still on the learning curve) with those who have performed more than 100 procedures (completed the learning curve) to establish the effect of increasing experience on the perception of difficulty in laparoscopic liver surgery.

For descriptive purposes the VAS scores were grouped as follows: 0 and 1 representing factors "*adding no or minimal difficulty to a laparoscopic liver resection*"; 2 and 3 "*adding moderate difficulty to a laparoscopic liver resection*" and 4 and 5 "*adding maximal difficulty to a laparoscopic liver resection*" with the mode (most frequent response) reported. A clinically significant change was defined as a categorical change e.g. from "*adding no or minimal difficulty to a laparoscopic liver resection*" to "*adding moderate difficulty to a laparoscopic liver resection*". Statistical analysis was performed on the original ungrouped data using IBM SPSS Statistics version 24. Tests for normality were performed using Kolmogorov–Smirnov and Shapiro–Wilk tests. The Mann–Whitney *U* test was used for non-parametric outcomes of binary variables and one-way ANOVA was used for comparison of multiple variables. Percentages are listed as whole numbers. Statistical significance was defined as $p < 0.05$.

Results

The survey returned 80 responses (42% response rate) from a mixed cohort of surgeons from Europe, Northern America and Asia with a collective experience of 7196 laparoscopic liver resections. The median (range) was 34 (<10 to >650) laparoscopic liver resections. Nineteen respondents (24%) had performed over 100 procedures and were responsible collectively for 5090 (71%) procedures, while 9 respondents (11%) had a personal experience of over 200 procedures and between them had a collective experience of 3810 (53%) procedures. Regarding centres the median (range) was 80 (5 to >300) liver resections annually with 5–65% of these performed laparoscopically.

The responses of the whole cohort are shown in Table 1. Factors associated with a clinically significant change in VAS are shown in Fig. 1. Subgroup analysis comparing median VAS of the factors between surgeons with a personal experience of less than or greater than 100 laparoscopic liver resections is shown in Table 2.

Discussion

This survey provides an accurate representation of the current opinion of international laparoscopic liver surgeons, both in

Please cite this article in press as: Halls MC, et al., Are the current difficulty scores for laparoscopic liver surgery telling the whole story? An international survey and recommendations for the future, HPB (2017), http://dx.doi.org/10.1016/j.hpb.2017.08.028