



Cost-effective laparoscopic cholecystectomy

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ABSTRACT

INTRODUCTION There is wide variation in costs, both theatre and ward, for the same operation performed in different hospitals. The aim of this study was to compare the true costs for a large number of consecutive laparoscopic cholecystectomy (LC) cases using re-usable equipment with those from an adjacent trust in which the policy was to use disposable LC equipment.

PATIENTS AND METHODS Data were collected prospectively between January 2001 and December 2007 inclusive for all consecutive patients undergoing LC by two upper gastrointestinal (UGI) consultants at the Royal Berkshire Hospital. Data were collected for all the instruments used, in particular any additional disposable instruments used at surgeons' preference. Sterilisation costs were calculated for all re-usable instruments. Costs were also obtained from an adjacent NHS trust which adopted a policy of using disposable ports and clip applicators. Disposable equipment such as drapes, insufflation tubing, and camera sheath were not considered as additional costs, since they are common to both trusts and not available in a re-usable form.

RESULTS Over 7 years, a total of 1803 LCs were performed consecutively by two UGI consultants at the Royal Berkshire Hospital. The grand total for 1803 LC cases for the re-usable group, including initial purchasing, was £89,844.41 (an average of £49.83 per LC case). The grand total for the disposable group, including sterilisation costs, was £574,706.25 (an average of £318.75 per LC case). Thus the saving for the trust using re-usable trocars, ports and clip applicators was £268.92 per case, £69,265.98 per annum and £484,861.84 over 7 years.

CONCLUSIONS This study has demonstrated that considerable savings occur with a policy of minimal use of disposable equipment for LC. Using a disposable set, the instrument costs per procedure is 6.4 times greater than the cost of using re-usable LC sets. It behoves surgeons to be cost-effective and to reduce unnecessary expenditure and wastage. There is no evidence to support use of once-only laparoscopic instruments on grounds of patient safety, ease of use or transmission of infection. If the savings identified in this study of two surgeons' work (savings of £484,861.84 in a 7-year period) was extended not only across the hospital but across the NHS, large savings could be made for laparoscopic cholecystectomy. Even greater savings would accrue if the results were extrapolated to cover all laparoscopic surgery of whatever discipline.

KEYWORDS

Cost analysis – Cholecystectomy – Laparoscopy – Equipment re-use – Disposable equipment

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Introduction

There is wide variation in costs, both theatre and ward, for the same operation performed in different hospitals. Several studies have compared the cost-effectiveness of laparoscopic compared to open surgery (laparoscopic cholecystectomy [LC], laparoscopic antireflux surgery, laparoscopic colorectal).^{1,2} These studies, however, concentrate on the costs of prolonged operation times and decreased hospital stay. A limited number of studies^{3,4} have examined, in detail, the comparative costs of one operation comparing use of disposable against re-usable laparoscopic equipment or with a large number of consecutive cases. In England and Wales, 50,000 LCs are performed annually in NHS hospitals. A policy of using re-usable instruments might

offer substantial cost savings. The aim of this study was to compare the true costs for a large number of consecutive LC cases using reusable equipment with those from an adjacent trust in which the policy was to use disposable LC equipment.

Patients and Methods

Data were collected prospectively between January 2001 and December 2007, inclusive, for all consecutive patients undergoing LC by two upper gastrointestinal (UGI) consultants at the Royal Berkshire Hospital. Their policy was to use re-usable instruments (group R). Data were collected for all the instruments used, in particular any additional disposable instruments used at surgeons' preference (*e.g.* Veress needle to

Table 1 Cost of laparoscopic cholecystectomy with a policy of using re-usable equipment (group R)

	<i>n</i> × cost (£)	Total (£)
Re-usable Aesculap ports per case (2 trocars + 4 sleeves)	2 × 65.44 4 × 71.38	416.40
<i>7 purchased sets</i>	<i>7 × 416.40</i>	<i>2,914.80</i>
Sterilisation and maintenance costs LC set	1803 × 29.71	53,567.13
Sterilisation of Hem-o-lok clip applicators	1803 × 3.85	6,941.55
<i>Total sterilisation costs</i>		<i>60,508.68</i>
Disposable Ethicon 12-mm ports	94 × 53.00	4,982.00
Hem-o-lok clips	1803 × 9.43	17,002.29
Veress needles	1027 × 4.32	4,436.64
<i>Total disposable costs</i>		<i>26,420.93</i>
Grand total		89,844.41
Cost per case		49.83

induce pneumoperitoneum and occasions when a disposable port was chosen over a re-usable one). Costs were also obtained from an adjacent NHS trust which adopted a policy of using disposable ports and clip applicators (group D).

For group R costs, initial outlay for re-usable Aesculap 10-mm and 5-mm trocars was £65.44 and sleeves for corresponding trocars £71.38. Disposable instruments that were additionally used in the group R were Veress needle (£4.32), Hem-o-lok clips (£9.43) and disposable ports (used in patients with previous open upper GI surgery) Ethicon Endopath xcel 12 mm (£55). In group R, costs of cleaning, sterilisation, wrapping, maintenance and repair for a LC set (two 10-mm and two × 5-mm ports, five graspers, scissors, light leads and diathermy leads and hook) were £29.71 per case. Additional trocars/sleeves cost £3.75 and sterilisation of Hem-o-lok clip applicators cost £5.85.

For group D, contract cost for Tyco Autosuture 12-mm trochar and sleeve was £57.24, 12-mm sleeve £38.00, Tyco Autosuture 5-mm trochar and sleeve £55.06, with additional sleeve £35.00. Disposable Tyco clip applicators cost £113.45 (preloaded with clips) totalling £298.75 per case. Contract cost for sterilisation of the remaining necessary re-usable instruments (graspers, scissors, leads, etc.) in group D was £20 per set.

Disposable equipment such as drapes, insufflation tubing, and camera sheath were not considered as additional costs, since they are common to both trusts and not available in a re-usable form.

In group R, sharpening of the trocars occurred once every 10–20 cases. The cost was quoted as negligible and incorporated into the overall sterilisation and maintenance costs as described above.

Results

Over 7 years, a total of 1805 LCs were performed consecutively by two UGI consultants at the Royal Berkshire Hospital. With the policy of re-usable ports and clip applicators the total cost for sterilisation was £60,508.68 (Table 1). Seven sets of the re-usable trocars and sleeves were purchased in this period (one set includes two trocars of 5-mm and 10-mm diameters with four corresponding sleeves) which totalled £2,914.80. Of the 1805 cases, additional disposable ports were used in 94 cases, pneumoperitoneum was established with a Veress needle in 1027 cases and Hassan access in 778 cases (all re-usable ports). The total cost for all disposables was £26,420.93 (Table 1). The grand total for 1805 LC cases for group R was £89,844.41 (an average of £49.83 per LC case).

Had disposable sets been used, total costs for disposable ports and clip applicators would be £538,646.25 with further sterilisation costs for remaining instruments totalling £36,060.00 (Table 2). The grand total for group D was £574,706.25 (an average of £318.75 per LC case).

Thus, the saving for the trust using re-usable trocars, ports and clip applicators was £268.92 per case, £69,265.98 per annum and £484,861.84 over 7 years.

Discussion

This study has demonstrated that considerable savings occur with a policy of minimal use of disposable equipment for LC. Using a disposable set, the instrument costs per procedure is 6.4 times greater than the cost of using reusable LC sets.

Table 2 Cost for equivalent case number of laparoscopic cholecystectomy with policy of disposable equipment (group D)

	<i>n</i> × cost (£)	Total (£)
Tyco autosuture 12-mm trocar and sleeve	1803 × 57.24	103,203.72
Tyco autosuture 12-mm additional sleeve	1803 × 38.00	68,514.00
Tyco autosuture 5-mm trocar and sleeve	1803 × 55.06	99,273.18
Tyco autosuture 5-mm additional sleeve	1803 × 35.00	63,105.00
Tyco clip applicator	1803 × 113.45	204,550.35
<i>Total disposables</i>		<i>538,646.25</i>
Sterilisation of laparoscopic instruments	1803 × 20.00	36,060.00
Grand total		574,706.25
Cost per case		318.75

These savings are even more relevant since this cost analysis assessed only two consultants for one procedure. If extended to include all laparoscopic procedures by these two consultants (including laparoscopic hernias, antireflux procedures and minimally invasive oesophagectomies and gastrectomies) or even further to include all laparoscopic procedures throughout the trust (such as laparoscopic lower gastrointestinal operations, urological and gynaecological operations) then significant savings would be made for the trust. Furthermore, if this policy were to be extended to trusts throughout the UK, the savings to the NHS would be substantial.

Decisions regarding choice of instruments and equipment for operative use are not made solely on cost considerations. The choice of instruments will depend on individual surgeon's perception of the advantages and disadvantages of individual instruments; this needs to be balanced against budgetary requirements. Many surgeons prefer disposable equipment. The reasons cited for use of disposable ports is variable, but most commonly that the hospital cannot adequately sharpen re-usable trocars or that the surgeon felt more 'comfortable' using disposable trocars. Some may prefer the first entry trocar to be disposable, although there is no evidence that this offers any advantage.

Reasons for use of disposable clip applicators are even more obscure. To apply six Hem-o-lok clips to the exposed cystic duct and artery takes only a few seconds more than by means of a disposable clip applicator. We have never encountered any visceral injury on account of the five 'extra' insertion/removal of the reusable single clip applicator.

Against the benefits of a re-usable policy are the initial purchase costs of the ports and instruments and costs of any repair/replacement parts, although in the 7-year period of this analysis, no ports have required replacing. All the originals are still in use.

Further benefits of a re-usable instrument policy is a reduction in plastic discardable packaging of once-only

equipment and also the costs of safe disposal of instruments, an additional cost that has not been analysed in this study, but is significant for the disposable group.

Conclusions

It behoves surgeons to be cost effective and to reduce unnecessary expenditure and wastage. There is no evidence to support use of once-only laparoscopic instruments on grounds of patient safety, ease of use, or transmission of infection. If the savings identified in this study of two surgeons' work (savings of £484,861.84 in a 7-year period) was extended not only across the hospital but across the NHS, large savings could be made for laparoscopic cholecystectomy. Even greater savings would accrue if the results were extrapolated to cover all laparoscopic surgery of whatever discipline.

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