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ORIGINAL ARTICLE

Total laparoscopic hysterectomy versus total abdominal hysterectomy in the treatment of benign gynaecological disease: a retrospective review over 5 years

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Abstract Hysterectomy remains one of the most common gynaecological procedures performed in the UK. However, unlike other parts of Europe and America, where laparoscopic hysterectomy (LH) rates have significantly increased, in the UK, abdominal hysterectomy (AH) rates remain high and often the first choice for many surgeons. The minimal access route offers significant patient benefits over open surgery, and the purpose of this study was to evaluate the role of total laparoscopic hysterectomy (TLH) versus total abdominal hysterectomy (TAH) in the management of benign gynaecological conditions. This retrospective study was carried out over a 5-year period, and 296 procedures were included. Outcome measures included operating time, estimated blood loss (EBL), intraoperative and postoperative complications, postoperative analgesia requirements and length of hospital stay. TLH was associated with a significantly lower mean operating time (63.4 versus 75.3 min, P = <0.001) and reduced EBL (145.1 versus 277.0 ml, P = <0.001). Intraoperative complications were significantly less in the TLH group (1.9 versus 7.0 %, P = 0.029) with no ureteric injuries noted. Postoperative complications were also lower (6.8 versus 15.6 %, P = 0.016). TLH was also associated with significantly less analgesia requirements, with fewer requiring breakthrough analgesia (6.2 versus 26.6 %, P = <0.001), and a significantly shorter inpatient hospital stay (1.7 versus 3.0 days, P = <0.001). The results from our study highlight that TLH is superior to TAH in all operative outcome measures. With adequate training and experience, TLH is a safe, reproducible technique that should be offered to all women requiring a hysterectomy for a normal sized uterus in the absence of significant adhesions.

Keywords Hysterectomy · Laparoscopy

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Background

Hysterectomy remains the most common gynaecological procedure performed in the UK, with an average 55,000 hysterectomies undertaken each year. Since the first laparoscopic hysterectomy (LH) was described by Reich et al. [1] in 1989, LH rates have increased significantly across parts of Europe and America. In Germany, for example, between 2007 and 2012, the rate of total laparoscopic hysterectomy (TLH) increased to approximately 30 % while total abdominal hysterectomy (TAH) rates fell significantly to 7 %. By comparison, however, abdominal hysterectomy (AH) rates in the UK remain high and were 62 % for the years 2011/2012 [2] and is often the first choice of hysterectomy for many surgeons. However, trends in the UK are changing, and there is a growing acceptance of the role of LH by many surgeons, despite relatively recent recommendations from bodies such as NICE in 2007 [3], ACOG in 2009 [4] and Cochrane in 2015 [5] advocating the vaginal route as the mode of first choice for hysterectomy.

Many safety concerns regarding LH stem from the eVALuate study [6], which failed to show any real advantage for a laparoscopic approach and reported high major complication rates of 11.1 %. However, increasingly more studies have shown LH to be a safe, reproducible technique associated with low complication rates [7, 8] and significant patient benefits including reduced blood loss [9] and hospital stay [10].

Despite this, unlike the rest of Europe and the America, the UK has failed to catch up and lags behind with regards to LH. The reason for this appears to be multifactorial, but certainly includes perceived historical safety concerns especially regarding urinary tract injury and the lack of training and mentorship.

We report on a series of 296 consecutive hysterectomies, performed for the treatment of benign gynaecological disease in our department between 2009 and 2014. The aim of this study was to evaluate the role of TLH versus TAH in the management of benign gynaecological conditions specifically comparing operative outcomes, such as operating time and estimated blood loss (EBL), and complication rates.

Methods

This study was carried out over a 5-year period in a teaching hospital and tertiary referral centre for endometriosis. Total abdominal and total laparoscopic hysterectomies performed for the treatment of benign gynaecological disease during that period were included.

Exclusion criteria included the following: malignancy, uterine size greater than 12 weeks, hysterectomy performed primarily for prolapse, hysterectomy performed in conjunction with the resection of deep infiltrating endometriosis including rectal resections and all subtotal hysterectomies including conversions from TAH.

Outcome measures included the following: operating time, estimated blood loss (EBL), intraoperative and postoperative complications, postoperative analgesia requirements and length of hospital stay. Intraoperative complications included bladder, bowel and ureteric injury and blood loss greater than 500 ml. Postoperative complications were subdivided into minor and major complications. Minor complications included urinary tract infections (UTI), postoperative ileus, wound infection, postoperative pyrexia >38 °C and vault haematomas conservatively managed. Major postoperative complications included significant bleeding requiring return to theatre, vault/wound dehiscence and vault haematomas requiring surgical intervention.

Data was analysed using SPSS (version 22). Descriptive statistical testing was utilised and a comparison of data made using the Mann-Whitney *U* test for continuous data and x^2 analysis for nominal data. *P* values of <0.05 were considered statistically significant.

Findings

From 2009 to 2014, 296 hysterectomies were performed. Of these, 161 (54.4 %) were performed laparoscopically, 128 (43.2 %) were performed abdominally and 7 (2.4 %) vaginally. During this period, the rate of TLH increased approximately sevenfold from 10 to 75 %, while the rate of TAH fell from 87 to 25 %. The rate of vaginal hysterectomy (VH) remained low at 0 to 5.7 % (Fig. 1). The main reason for this is that in our unit, VH is offered primarily for the treatment of prolapse and hence was excluded. Due to the low VH rates, the data was excluded from comparison and further statistical analysis.

Baseline characteristics between the two groups were comparable (Table 1).

Pain was the most common indication for surgery in the laparoscopic group (42.2 %) while heavy menstrual bleeding (HMB)/irregular bleeding predominated in the abdominal group (68.8 %) (Table 2).

TLH was associated with a significantly lower mean operating time (63.4 versus 75.3 min, *P* = <0.001) and reduced EBL (145.1 versus 277.0 ml, *P* = <0.001). Intraoperative complications were significantly less in the TLH group (1.9 versus 7.0 %, *P* = 0.029). Two bladder injuries were noted in the TLH group compared to one bladder injury and one ureteric injury in the TAH group. No bowel injuries were noted in either group. EBL greater than 500 mls was significantly greater in the TAH group (0.6 versus 5.5 %, *P* = 0.024) (Table 3). The conversion to laparotomy rate was 1.2 % (*n* = 2): one was converted due to excessive bleeding and the other due to extensive adhesions.

TLH was also associated with significantly lower total postoperative complication rates (6.8 versus 15.6 %, *P* = 0.016) for both minor (5.0 versus 13.3 %, *P* = 0.013) and major complications (1.9 versus 2.3 %, *P* = 1.00); however, for major complications, the difference was not statistically significant. The postoperative complications are summarised in Table 4.

Return to theatre rates were lower in the TLH group (1.9 versus 3.1 %, *P* = 0.704), with the most common reason in both groups being intra-abdominal bleeding. Analgesia requirements were significantly less in the TLH group. Oral analgesia was sufficient for 74.5 % in the TLH group compared to 10.9 % in the TAH group in whom PCA and/or epidural analgesia was utilised. Significantly fewer women in the TLH group required breakthrough analgesia (6.2 versus 26.6 %, *P* = <0.001), and TLH was associated with a significantly

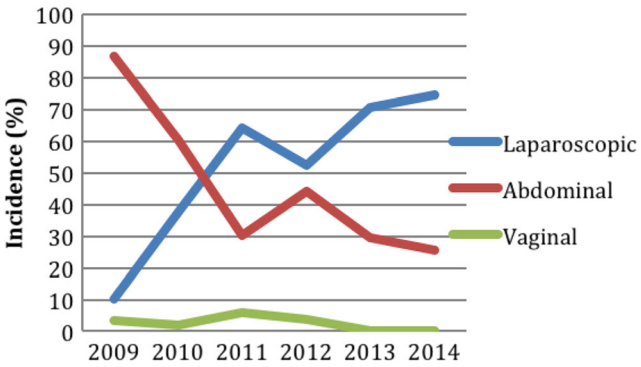

Fig. 1 Hysterectomy rates (%) over time

Table 1 Baseline patient characteristics

	Laparoscopy	Abdominal
Age (years)	43.7 (25–77)	45.3 (30–75)
BMI	30.0 (18–51)	28.1 (17–47)
Current smoker	30 (18.6 %)	20 (15.6 %)
Nulliparous	36(24.3 %)	21 (17.2 %)

Data presented as mean (range) or absolute numbers (%)

Table 3 Intraoperative parameters and complications

	Laparoscopy	Abdominal	*P* value
Operating times (min)	63.4 (20–147)	75.3 (34–155)	<0.001
Estimated blood loss (ml)	145.1(0–800)	277.0 (50–1300)	<0.001
Intraoperative complications	3 (1.9 %)	9 (7.0 %)	0.029

Data presented as mean (range) or absolute numbers (%)

shorter inpatient hospital stay (1.7 versus 3.0 days, $P = <0.001$). Postoperative readmission rates were also lower in the TLH group (3.1 versus 4.7 %, $P = 0.54$). The postoperative parameters are summarised in Table 5. The average uterine weights were comparable: 174 g in the laparoscopic group compared to 187 g in the abdominal group.

Discussion

Given the rapid uptake of LH as the predominant hysterectomy technique in the rest of Europe and America, it is certainly surprising that its uptake remains slow in the UK, where AH rates remain significantly higher than both LH and VH. The main reasons for this are clearly multifactorial, but may stem from a lack of training and mentorship and the historical concerns regarding the safety of LH.

The most recent Cochrane review [5] continues to advocate the use of VH over both AH and LH; however, it does highlight the benefits of laparoscopy, which include a more rapid return to normal activity and less febrile episodes postoperatively. Nonetheless, it reports a longer operating time and an increased risk of urinary tract injuries with LH.

When discussing LH complication rates, the most concerning research, particularly with regards to urinary tract injury, stems from the eVALuate study by Garry et al. [6]. It quoted significantly higher risks of urinary tract injuries with LH (OR 2.61, 95 % CI 1.22–5.60) and a high major complication rate of 11.1 %. However, since its publication, there has been significant criticisms of this study [7] [11], namely the varied experience of the 43 surgeons performing the procedures and the un-validated assumption that the learning curve for LH is approximately 20 cases. With this varied surgical experience, it can be hypothesised that the increased complication rates may have been a consequence of the relative inexperience of the surgeons rather than the technique of LH. Recent evidence suggests that the learning curve may require substantially more cases than 20 per year and the number of hysterectomies performed is likely to significantly impact complication rates [12–16]. Evidence regarding the learning curve published by Twijnstra et al. [15] suggests that there is a significant improvement in surgical outcome for up to 125 procedures, considerably higher than assumed in the eVALuate study. When looking at the effect of surgical volume on outcome, Wallenstein et al. [14] reported that the overall complication rates decreased from 6.2 % for low volume surgeons to 4.2 % for high volume surgeons.

In our study, the intraoperative complication rates were significantly less in the TLH group (1.9 versus 7.0 %, $P = 0.029$) with no ureteric injuries noted. This low complication rate is replicated in the wider literature [17–19]. Doganay et al. [18] reported no significant differences in the rates of bladder or ureteric injury associated with LH and VH; however, there were significant differences in the urinary tract injury rates when compared to AH. Thus, current evidence tends to suggest that AH is associated with the highest rate of urinary tract injury with the rates of injury for LH and VH being equivalent.

Table 2 Indications for surgery

	Laparoscopy	Abdominal
Pain	68 (42.2 %)	20 (15.6 %)
HMB/irregular bleeding	59 (36.6 %)	88 (68.8 %)
Pain and bleeding	14 (8.7 %)	8 (6.3 %)
Atypical hyperplasia/postmenopausal bleeding	11 (6.8 %)	6 (4.7 %)
Premenstrual tension	3 (1.9 %)	3 (2.3 %)
Severe dyskaryosis	4 (2.5 %)	1 (0.8 %)
Family history of ovarian cancer	1 (0.6 %)	0 (0.0 %)
Fibroids	1 (0.6 %)	0 (0.0 %)
Ovarian cysts	0 (0.0 %)	2 (1.6 %)

Data presented as absolute numbers (%)

Table 4 Postoperative complications

	Laparoscopy	Abdominal	*P* value
Total postoperative complications	**11 (6.8 %)**	**20 (15.6 %)**	**0.016**
Major complications	**3 (1.9 %)**	**3 (2.3 %)**	**1.00**
Intra-abdominal bleed	2 (1.2 %)	2 (1.6 %)	1.00
Vault haematoma requiring RTT	1 (0.6 %)	0 (0.0 %)	1.00
Abdominal wound breakdown	0 (0.0 %)	1 (0.8 %)	0.443
Minor complications	**8 (5.0 %)**	**17 (13.3 %)**	**0.013**
UTI	1 (0.6 %)	3 (2.3 %)	0.325
Wound infection	1 (0.6 %)	2 (1.6 %)	0.586
Ileus	2 (1.2 %)	3 (2.3 %)	0.658
Pyrexia >38	1 (0.6 %)	1 (0.8 %)	1.00
Urinary retention	1 (0.6 %)	1 (0.8 %)	1.00
LRTI	0 (0.0 %)	3 (2.3 %)	0.086
Vault haematoma	2 (1.2 %)	3 (2.3 %)	0.658

Data presented as absolute numbers (%)

We also found a significant reduction in EBL in the TLH group (145.1 versus 277.0 ml, $P = <0.001$) in keeping with other studies [19, 20]. Specifically for TLH, blood loss has been found to increase with uterine size [8] and increasing BMI [21].

Historically, it was suggested that the operating time associated with performing LH was likely to be increased when compared with open hysterectomy and this is the conclusion of the most recent Cochrane review [5]. However in our study, TLH was associated with a significantly lower mean operating time (63.4 versus 75.3 min, P = <0.001). One key feature to take into account is surgeon experience, and as described by Pather et al. [22], it does not appear to be any difference in operating times once the initial learning curve has been passed.

The anticipated decrease in postoperative pain associated with minimally invasive surgery is supported by the current literature [23, 24], and our data is in keeping with this. We found overall analgesia requirements to be significantly less in the TLH group with oral analgesia sufficient for 74.5 % compared to 10.9 % in the TAH group. Significantly fewer women in the LH group required breakthrough analgesia (6.2 versus 26.6 %, $P = <0.001$). Interestingly, Ghezzi et al. [24] also described a significant advantage with regards to postoperative pain when comparing LH to VH.

Table 5 Postoperative parameters

	Laparoscopy	Abdominal	*P* value
Return to theatre	3 (1.9 %)	4 (3.1 %)	0.704
Breakthrough analgesia needs	10 (6.2 %)	34 (26.6 %)	<0.001
Inpatient duration (days)	1.7 (1–6)	3.0 (1–11)	<0.001
Postoperative readmission	5 (3.1 %)	6 (4.7 %)	0.546

Data presented as mean (range) or absolute numbers (%)

One would also expect that hospital stay would be reduced when surgery is performed by the minimally invasive route and this is borne out by the literature [9, 22, 25]. Our data is again in keeping with this with the mean inpatient stay being significantly shorter in the TLH group (1.7 versus 3.0 days, $P = <0.001$). When compared to VH, Ghezzi et al. [24] reported that TLH was also associated with a shorter hospital stay.

With regards to overall postoperative complications, we found the rates significantly lower in the TLH group (6.8 versus 15.6 %, $P = 0.016$). Major complications were less (1.9 versus 2.3 %, $P = 1.00$), although this was not statistically significant; however, minor complication rates were significantly less (5.0 versus 13.3 %, $P = 0.013$). These complication rates are comparable to the wider literature. Karaman et al. [26] described a major complication rate of 1 % observed in a series of 1120 laparoscopic hysterectomies, while in another prospective series of 3190 laparoscopic hysterectomies, Donnez et al. [7] described a similarly low major complication rate of 0.37–0.51 %. Furthermore, Wright et al. [27–29] and Kondo et al. [25] reported similarly significant benefits of laparoscopic over open hysterectomy for both benign and malignant disease. Leiserkowitz et al. [30] reported that vascular and bowel injuries, pulmonary embolism and wound problems were all more common with TAH.

For many years, isolated case reports suggested that TLH carried an increased risk of vault dehiscence with commentators blaming suturing techniques and the use of energy to transect the vaginal vault thus delaying healing. This was further highlighted by Hur et al. [31] who reported that LAVH was associated with a four-fold increase in the risk of vault dehiscence when compared with VH. However, a more recent large study of 9973 hysterectomies by Koo et al. [32] demonstrated the highest vault dehiscence risk to be associated with TAH (0.6 %) and the lowest after TLH (0.2 %) with VH at 0.4 % ($P = 0.016$). In our data, no cases of vault dehiscence were noted in either group.

Finally, there are limitations with this study primarily being that is a retrospective review; however, with the benefits of the minimal access approach so clear, it could be argued that it would be unethical to perform any further randomised trials which offer suitable women an open approach. This study also has a relatively small sample size; however, it was the intention of the authors to assess the more straightforward hysterectomy, in effect the hysterectomies that should be performed using a laparoscopic approach as standard and not the more complex cases which are generally reserved for tertiary referral centres or those hysterectomies more amenable to the vaginal route. Hence, larger uteri (>12 week size), hysterectomies performed with deep infiltrating endometriosis and those performed purely for prolapse were excluded. It was for this reason also that supracervical laparoscopic hysterectomies and those requiring morcellation were excluded.

All our laparoscopic procedures were performed by 4 experienced surgeons, all following a standardised TLH technique. Ultrasonic energy and a uterine manipulator were used as standard. The closure of the vaginal vault was dependent on the surgeon with 56 % sutured laparoscopically and the remainder sutured vaginally.

Conclusions

There is now substantial evidence that routine AH is inferior to both LH and VH in all outcome measures. Since this is so, it is no longer feasible, or one can argue ethically correct, to support the routine use of AH to remove a normal size uterus. Our study highlights the significant benefits of LH including a shorter operating time, reduced EBL, less intraoperative and postoperative complications, less analgesia requirements postoperatively and a shorter inpatient stay. The real choice is between LH and VH, which seem equal in many outcome measures; however, there is increasing evidence that pain may be less and hospital stay shorter with the laparoscopic approach. Also a narrow vagina, lack of prolapse or the presence of abdominal pathology including adhesions, endometriosis and adnexal disease, largely preclude a vaginal approach. Also, with the increasing practice of prophylactic salpingectomy at the time of hysterectomy, a laparoscopic approach makes this technically more feasible. In effect, it should be as unacceptable to perform a routine TAH as it is currently to perform a routine open cholecystectomy, and women, dependent on the nature of the pathology, should be offered a minimally invasive procedure. In experienced hands, TLH is a safe, reproducible technique with low complication rates; however, significant training is required to attain this level of expertise. In order to bring this reality into effect in the UK, a major change in terms of surgical training and mentorship will be required and one which will hopefully be partially addressed by the nationwide LH training scheme currently being implemented by the BSGE.

Authors contribution R Mallick: Project development, data collection and analysis, manuscript writing.
J English: Project development, manuscript writing.
N Waters: Project development, manuscript writing.

Compliance with ethical standards

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Conflict of interest All authors declare no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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