Total laparoscopic hysterectomy for benign uterine pathologies: obesity does not increase the risk of complications

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BACKGROUND: This study was designed to investigate the intra-operative characteristics and the risk of intra- and post-operative complications in cases of total laparoscopic hysterectomy (TLH) in overweight, obese and non-obese patients.

METHODS: This cohort study includes all patients undergoing TLH for benign pathologies between January 1993 and June 2007 in Cochin university hospital (Paris). Demographic and surgical data were analysed. A comparison between overweight and obese patients versus non-obese patients and multivariate analyses were performed.

RESULTS: Of 1460 patients undergoing TLH, 101 patients (6.9%) had a BMI of 30 or higher and 338 (23.2%) were overweight. After adjustment with respect to the patients' characteristics and past history (age, parity, past history of laparotomies, previous Cesarean section, menopausal status), no significant difference was found whether in terms of intra-operative (haemorrhage, transfusion, thrombosis, ureter, bladder or bowel injuries) or post-operative complications (hyperthermia, infections, fistula). Concerning the intra- and post-operative characteristics of these patients, only a significantly longer operating time was noted in the case of obesity (RR = 1.80; CI 95%: 1.16–2.81).

CONCLUSIONS: In our experience, provided that the operating technique is meticulous, the intra- and post-operative complications are not increased in the case of obesity, although the operating time is longer.

Key words: total hysterectomy / operative laparoscopy / laparoscopic hysterectomy / complications / obesity
thanks in particular to the fast growth of bariatric surgery (Korenkov and Sauerland, 2007). This approach is currently considered to be suitable for obese patients because it is a minimally invasive technique, limiting the risk of infection and operative trauma. Moreover, laparoscopic surgery allows these patients at high thrombo-embolic risk to resume normal activities more quickly (Curet, 2000).

There is little documented evidence detailing morbidity after laparoscopic hysterectomy in obese patients (Ostrzenski 1999; Eltabakh et al., 2000; Holub et al., 2001; Heinberg et al., 2004; Obermair et al., 2005; Yu et al., 2005; Ghezzi et al., 2006; O’Hanlan et al., 2006; O’Gorman et al., 2009). The aim of this study was to determine the risk of intra- and/or post-operative complications for patients who require TLH, indicated for a benign uterine pathology.

Materials and Methods

Patients
Between January 1993 and June 2007, all the patients undergoing laparoscopic hysterectomy for a benign pathology in Cochin university hospital (Paris) were included in the study. Patients with cancerous lesions and patients with genital prolapse and/or urinary stress incontinence were excluded.

Patients with a body mass index (BMI) of 30 or more were considered as obese, as overweight with a BMI of 25 or more and as the non-obese with a BMI less than 25 (Gilmore, 1999).

Operative technique
All operations took place using a technique described previously (Chapron et al., 1994). The following are the main points in the operating technique: the first step is the bipolar coagulation then the section of adnexal pedicles followed by the dissection of the utero-vascular pouch, the bipolar coagulation of uterine pedicles, the coagulation of the cervico-vaginal vessels, the bipolar coagulation then section of utero-sacral ligaments then the last steps are the opening of the vagina on the anterior circumference and once the peritoneum had dropped, the patient is placed in the gynaecological position, the vaginal incision is terminated and the uterus extracted. The main characteristics of this technique are as follows: (i) all the operations consisted of total hysterectomy for a benign pathology; (ii) the duration of laparoscopic surgery was calculated starting from the adnexal phase (conservative or radical after having identified the route taken by the ureters) up until including the colpotomy; (iii) all the operations were carried out using re-usable equipment; (iii) haemostasis was achieved in every case with bipolar coagulation.

Data collection
The medical, intra- and post-operative data for each patient operated on between January 1993 and December 2000 were collected retrospectively (711 cases). The same data were collected prospectively for patients between January 1993 and December 2000 were collected retrospectively (711 cases). The same data were collected prospectively for patients operated between January 2001 and June 2007, based on a standardized questionnaire (790 cases).

For each operation, the following data were systematically collected and entered into a database: age, parity, gravity, post-menopausal status, BMI, indications for TLH, preoperative transvaginal ultrasound results, previous history of vaginal delivery, Caesarean section, adhesiogenous abdominopelvic surgery, operating time, associated surgical procedure during TLH (adhesiolysis, myomectomy, etc.), conversion to laparotomy, uterine weight, hospital stay, intra- and post-operative complications. By definition we considered the following situations as constituting a past history of previous adhesiogenous surgery (Leonard et al., 2007): history of two pelvic surgical operations via laparotomy, whatever the indication; history of one or more myomectomies; documented history of peritonitis or salpingitis; history of stage III or IV endometriosis; history of adhesiolysis in a context of pain or occlusion. Patients with a history of Caesarean section and/or simple appendicectomy were not considered as presenting a history of adhesiogenous surgery. Before discharge, all patients passed flatus or stool, were able to drink and eat solid food comfortably, and were comfortable on oral analgesia with adequate home support. The intra- and post-operative complications taken into account were the following: intra-operative haemorrhage exceeding 500 ml, need for transfusions, bladder, ureteral and intestinal injuries, re-operation, re-hospitalization, ureteral fistulas, pyelonephritis, hyperthermia >38°C.

Statistical analysis
Obese and overweight women were compared with the non-obese patients. For univariate statistical analysis we used the following tests: Pearson’s chi-square test for qualitative variables or Fisher exact test as appropriate; unpaired student’s t-test for quantitative variables. Odds ratios (OR) and 95% confidence intervals (95% CI) were calculated. Subsequently a logistic regression model was developed for each group. The parameter values of the final model were estimated by the maximum likelihood method. Variables associated at the threshold of P > 0.20 in univariate analysis were included in the logistic model as covariates.

Analyses were performed using SPSS 14.0 (Statistical package for the Social Sciences, SPSS for Windows release 14.0, SPSS Inc., Chicago).

Results
During the study period, 1501 patients underwent TLH. Forty-one (2.7%) patients were excluded due to incomplete data concerning their BMI.

For the 1460 remaining patients, the mean BMI was 23.6 kg/m² ± 4.0 (range: 15.6–43.51). Among these patients, 101 (6.9%) were classified as obese patients, 338 (23.2%) as overweight patients and 1021 (69.9%) as non-obese patients. The mean BMI of the obese group was 33.3 ± 3.2 (range: 30.0–43.5), of the overweight group was 26.8 ± 1.4 (range: 25.0–29.9) and of the non-obese group was 21.5 ± 1.9 (range: 15.6–24.9).

Indications for surgery were the following: menorrhagia and myoma (53.6%), menorrhagia without myoma (23.0%), pain (10.3%), poly-myomatous uterus (8.9%), adnexal mass (3.1%) and others (1.2%).

The medians of quantitative variables such as age, uterine weight, operating time (minutes) and hospital stay (days) were 47 years, 210 g, 120 min and 3 days, respectively.

Patient characteristics according to their BMI are presented in Table I. Age, parity, previous history of Caesarean section, past history of laparotomy and post-menopausal status were significantly greater in the obese group. Primi- or multi-parity and uterine weight were significantly greater in the overweight group.

Complications according to the BMI are presented in Table I with univariate analysis in Table II. The operating time, pre-operative haemorrhages and the duration of hospitalization were significantly greater in the case of obesity (4.0 versus 1.1%, P = 0.03; 147.6 ± 51.1 versus 129.4 ± 44.9, P < 0.001) and 3.8 ± 1.2 versus 3.4 ± 1.2, P = 0.004, respectively). Concerning the operating time and the duration of hospitalization, the difference between the non-obese and obese groups was 18.2 ± 4.8 (95% CI: 8.7–27.6) and 0.4 ± 0.1 (95% CI: 0.1–0.6), respectively. While obese patients suffered from post-operative
haemorrhage more frequently ($P = 0.03$), the rate of transfusion was borderline in the case of obesity ($P = 0.06$) (Table II). In the overweight group, only the duration of hospitalization was significantly greater (3.6 ± 1.3 versus 3.4 ± 1.2, $P = 0.02$) and the between-group difference was 0.2 ± 0.1 (95% CI: 0.0–0.3).

After multivariate analysis, only the operating time remained significantly longer for obese patients (RR = 1.80, 95% CI: 1.16–2.81) while the various complications investigated did not differ between the groups. No independent factor was found in the overweight group.

**Discussion**

Our results demonstrate that after TLH indicated for uterine benign pathologies, obesity does not increase the risk of intra- and post-operative complications. After multivariate analysis the duration of the operative procedure seems to be the only factor, which is significantly increased.

Although our study is one of the largest on the subject in terms of numbers, it does present two main limitations. Firstly, the first part of this work was retrospective with a risk of under-estimating the complications during that period. However, comparison of the intra- or post-operative complications rates between the two periods reveals no significant differences apart from the rate of hyperthermia $>38\,^\circ$C during the first period. Thus we consider the risk of presenting biased data is limited. Secondly, in spite of a large number of patients in this cohort, the relatively rarity of intra- and post-operative complications and low number of obese patients constitutes a limit on the statistical power of our analysis, moderating the interpretation of our results and of the multivariate analysis. It is possible that with a larger sample, significant differences would have been found. For instance, to find a statistically significant difference in transfusion in the case of obesity, with a statistical power of 80%, we would have needed approximately 3569 patients in the non-obese group and 350 in the obese group. In our population, the minimum detectable odds ratio is 7.71. For this reason significant and borderline results need to be taken into account.

Little information was found in the literature specifically concerning laparoscopic hysterectomy carried out for a benign pathology in the context of obesity (Holub et al., 2001; O’Hanlan et al., 2003; Heinberg et al., 2004). Only two studies specifically studied TLH results for obese patients (Holub et al., 2001; Heinberg et al., 2004). These were two retrospective, non-adjusted case history studies.
et al. (2004) classed patients in two groups: ‘obese’ (BMI $> 30$ kg/m$^2$) and ‘non-obese’ (BMI $\leq 30$ kg/m$^2$). In their work the authors reported that the intra-operative (inferior epigastric vessel injury; cystotomy; bowel injury) and post-operative (pelvic abscess; vaginal cuff haematoma, cellulitis or dehiscence; hyperthermia; vesicovaginal fistula; thromboembolic event; wound infection) complication rates, risk of laparoconversion and duration of hospitalization did not differ statistically between the two groups. However, the authors did report a significantly greater operating time and risk of loosing more than 500 ml of blood when BMI $> 30$ kg/m$^2$ (RR $= 1.6$, 95% CI: $1.2–2.0$ and RR $= 2.9$, 95% CI: $1.2–7.0$, respectively). These results are compatible with our data showing a significant longer operating duration and a borderline higher blood loss in the obese group. The second study (Holub et al., 2001) observed similar results. The operating time was slightly longer for patients in the obese group, with a difference close to being significant (99.54 ± 27.77 min versus 90.95 ± 29.99 min; $P = 0.06$). The intra- and post-operative complications, durations of hospitalization and amounts of blood loss did not differ significantly.

The results of laparoscopic surgery in obese patients have been analysed in other disciplines (Choban and Flancbaum, 1997; Lamvu et al., 2004). The recent retrospective comparative study by Corneille et al. (2007) compared the results of appendicectomy by laparoscopy and by laparotomy in this type of patients. There was no difference between the type of approach with respect to complications of the intra-peritoneal abscess type. The hospital stay was significantly shorter with laparoscopy, which prompted the author to conclude that this is the method to be preferred in obese patients. Senagore et al. (2003) observed that the results of laparoscopic colectomy in obese patients presented an additional risk of conversion to laparotomy and of failure of the sutures compared with the non-obese population, with other rates similar to those obtained by laparotomy. He concluded that the laparoscopic approach remains an advantage in these patients because of the reduced hospital stay. More recently, based on an analysis of a series of left colectomies via laparoscopy in 111 patients of whom 23 were obese, Leray et al. (2005) concluded that the results of the operation were not influenced by obesity. On the other hand, the hospital stay was significantly reduced thanks to the use of laparoscopy.

Obesity gives rise to a greater risk of infectious, parietal and thromboembolic complications in patients who generally present associated co-morbidity factors (Wilson and Reilly, 1993; Murphy et al., 2006; Rocha et al., 2006). It justifies specific management of anaesthesia (Ogunnaike et al., 2002), due to the increased intra-peritoneal

### Table II Total laparoscopic hysterectomy: results and complications according to the BMI (n = 1 460)

<table>
<thead>
<tr>
<th>Non-obese</th>
<th>Overweight</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OR (95% CI)</strong></td>
<td><strong>P</strong></td>
<td><strong>OR (95% CI)</strong></td>
</tr>
<tr>
<td>Age ≥ 47 (years)</td>
<td>Ref.</td>
<td>1.22 (0.95–1.5)</td>
</tr>
<tr>
<td>Parity ≥ 1</td>
<td>Ref.</td>
<td>1.33 (1.04–1.70)</td>
</tr>
<tr>
<td>Past history of Caesarean</td>
<td>Ref.</td>
<td>1.03 (0.71–1.49)</td>
</tr>
<tr>
<td>Past history of laparotomy</td>
<td>Ref.</td>
<td>0.93 (0.71–1.22)</td>
</tr>
<tr>
<td>Adhesiogenic past history</td>
<td>Ref.</td>
<td>0.85 (0.64–1.13)</td>
</tr>
<tr>
<td>Menopause</td>
<td>Ref.</td>
<td>1.19 (0.90–1.57)</td>
</tr>
<tr>
<td>No vaginal delivery</td>
<td>Ref.</td>
<td>0.81 (0.63–1.05)</td>
</tr>
<tr>
<td>Uterine weight (g) ≥ 210</td>
<td>Ref.</td>
<td>1.35 (1.05–1.74)</td>
</tr>
<tr>
<td>Adhesiolysis</td>
<td>Ref.</td>
<td>0.93 (0.69–1.23)</td>
</tr>
<tr>
<td>Operating time (min) ≥ 120</td>
<td>Ref.</td>
<td>1.26 (0.98–1.61)</td>
</tr>
<tr>
<td>Intra-operative haemorrhage</td>
<td>Ref.</td>
<td>1.10 (0.35–3.48)</td>
</tr>
<tr>
<td>Transfusion</td>
<td>Ref.</td>
<td>2.28 (0.51–10.23)</td>
</tr>
<tr>
<td>Bladder injury</td>
<td>Ref.</td>
<td>1.01 (0.27–3.74)</td>
</tr>
<tr>
<td>Ureteral injury</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>GI tract injury</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Conversion to laparotomy</td>
<td>Ref.</td>
<td>1.67 (0.95–2.98)</td>
</tr>
<tr>
<td>Hospital stay (days) ≥ 3</td>
<td>Ref.</td>
<td>1.32 (1.03–1.69)</td>
</tr>
<tr>
<td>Hyperthermia &gt;38°C</td>
<td>Ref.</td>
<td>1.27 (0.79–2.04)</td>
</tr>
<tr>
<td>Urinary infection</td>
<td>Ref.</td>
<td>0.37 (0.09–1.64)</td>
</tr>
<tr>
<td>Pyleonephritis</td>
<td>Ref.</td>
<td>0.50 (0.06–4.19)</td>
</tr>
<tr>
<td>Abscess, sidewall haematoma</td>
<td>Ref.</td>
<td>2.45 (0.96–6.26)</td>
</tr>
<tr>
<td>Ureteral fistula</td>
<td>Ref.</td>
<td>0.75 (0.08–6.77)</td>
</tr>
<tr>
<td>Thrombosis</td>
<td>Ref.</td>
<td>–</td>
</tr>
<tr>
<td>Re-hospitalization</td>
<td>Ref.</td>
<td>1.04 (0.51–2.09)</td>
</tr>
<tr>
<td>Repeat surgery</td>
<td>Ref.</td>
<td>2.56 (1.10–5.99)</td>
</tr>
</tbody>
</table>
pressures that are further aggravated by the Trendelenburg position. From the surgical point of view, it increases the difficulties encountered with installation and exposure (Eltabbakh et al., 1999). These specific difficulties are responsible for the increased operating time due to the precautions taken when creating the pneumoperitoneum and exposing the area to be operated.

Because of the statistical limits, these results cannot be generalized without great caution. Moreover, gynaecological teams who have less experience of laparoscopic hysterectomy may experience higher rate of complications. Although the operating time is longer and the rate of intra-operative haemorrhages probably higher, the rates of complications remain low in the case of overweight or obese patients. Laparoscopic surgery limits the risk connected with the parietal trauma due to laparotomy. Despite these limitations, our study suggests that laparoscopic hysterectomy seems to be, in the hands of an experienced team with well-standardized procedures, an excellent approach for carrying out total hysterectomy indicated for a benign pathology in obese patients, and is a good alternative to laparotomy even in these cases. Large and prospective studies are required to verify these results.

References


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