

Hospital Cost Comparison Between Abdominal, Vaginal, and Laparoscopy-Assisted Vaginal Hysterectomies

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Objective: To evaluate and compare the hospital charges for total abdominal hysterectomy (TAH), vaginal hysterectomy, and laparoscopy-assisted vaginal hysterectomy performed with the linear stapler.

Methods: Thirty cases of each of the three types of hysterectomies, performed at the same hospital by various surgeons, were selected at random. The authors did not participate in any of the cases evaluated. Operating room, postoperative hospitalization, and pharmacy costs were compared. Independent, two-tailed Student *t* test analysis was performed.

Results: The mean cost of performing laparoscopy-assisted vaginal hysterectomy with the linear stapler (\$7161.66) was significantly higher ($P < .05$) than that of both vaginal hysterectomy (\$4868.06) and TAH (\$4926.80). The cost of vaginal hysterectomy was nonsignificantly lower ($P > .05$) than that of TAH. The mean operating room supplies and equipment charge for laparoscopy-assisted vaginal hysterectomy with the linear stapler (\$2468.43) was, as expected, significantly higher ($P < .05$) than those for both abdominal (\$716.65) and vaginal (\$676.16) procedures. The average operating room time charge for laparoscopy-assisted vaginal hysterectomy (\$1264.56) was also significantly higher ($P < .05$) than for the other two procedures (TAH \$642.76, vaginal hysterectomy \$955.66). The mean total pharmacy charges were similar for all groups (\$1114.27 for laparoscopy-assisted vaginal hysterectomy, \$1163.16 for vaginal hysterectomy, and \$1098.71 for TAH). Reflecting the longer operating time for laparoscopy-assisted vaginal hysterectomy, the intraoperative pharmacy costs were significantly higher for this type (\$417.00) than for the TAH patients (\$290.62). The difference, however, was almost erased when postoperative pharmacy charges were in-

cluded, reflecting the lower cost of a shorter hospital stay in the laparoscopy-assisted vaginal hysterectomy group. Some savings were realized by laparoscopy-assisted vaginal hysterectomy when postoperative hospitalization charges were considered. The average hospitalization time was 2.3 days for laparoscopy-assisted vaginal hysterectomy, 3.0 days for vaginal hysterectomy, and 3.3 for TAH.

Conclusions: The cost savings expected with the advent of laparoscopy-assisted vaginal hysterectomy when performed with the linear stapler have not been realized at present. In most cost categories studied, the use of laparoscopy to perform a hysterectomy was associated with much higher costs. The predicted savings associated with the shorter hospital stay in these patients failed to offset the exorbitant intraoperative costs. However, when bipolar electrocoagulation with the CO₂ laser and reusable instruments replace staplers and disposables, respectively, the projected savings are appreciated. (*Obstet Gynecol* 1994;83:713-6)

The number of hysterectomies performed in this country remains second only to the number of cesareans.¹ Each year, approximately 650,000 hysterectomies are performed, one-third of them vaginally and the rest abdominally.^{2,3} Although only a minority of these procedures are facilitated by laparoscopy, this number appears to be growing as laparoscopy gains popularity.

Laparoscopy-assisted vaginal hysterectomy is indicated in women for whom vaginal hysterectomy is contraindicated and total abdominal hysterectomy (TAH) would be commonly performed. Summit et al⁴ recently showed that the cost of vaginal hysterectomy is \$4891, compared to \$7905 for laparoscopy-assisted vaginal hysterectomy performed with the linear stapler, when both are performed on an outpatient basis. One of the expected gains of laparoscopy was the cost savings of a shorter hospital stay. Therefore, it remains to be seen whether the cost savings will be realized

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Presented orally at the 41st Annual Clinical Meeting of The American College of Obstetricians and Gynecologists, Washington, DC.

with laparoscopy-assisted vaginal hysterectomy given its lower operative costs.

In this report, we studied our colleagues' results and compared and contrasted the hospital costs of abdominal, vaginal, and laparoscopy-assisted vaginal hysterectomy performed with the linear stapler. We determined whether there is a cost benefit when laparoscopy, as employed in this study, is used to perform a hysterectomy.

Materials and Methods

We used a computer-based random selection method to choose a total of 90 hysterectomies from a pool of cases performed between March 1, 1992, and September 1, 1992, at the same metropolitan hospital. Thirty cases of each procedure (laparoscopy-assisted vaginal hysterectomy with the linear stapler, TAH, and vaginal hysterectomy) were chosen. During this month, 247 hysterectomies were performed at the same hospital (58 laparoscopy-assisted vaginal hysterectomies with the linear stapler, 23 without the linear stapler, 102 TAH, and 64 vaginal hysterectomies). The examined cases were performed by multiple surgeons, excluding the authors (we do not routinely use the linear stapler for laparoscopic hysterectomy). The costs of operating room time, operating equipment, postoperative hospitalization, and pharmacy were reviewed retrospectively. To compare accurately the costs of the three types of hysterectomies, procedures performed in conjunction with the hysterectomies were also recorded.

Hysterectomies were considered "laparoscopy-assisted" only if operative laparoscopy was used for the hysterectomy itself. Any other application of the laparoscope, such as adhesiolysis and treatment of endometriosis, did not in itself qualify the hysterectomy as a laparoscopy-assisted procedure. For all procedures in this study group, at least the first two steps of the hysterectomy—bilateral desiccation and transection of the round and infundibulopelvic ligaments—

Table 1. Summary of the Results

	LAVH	TAH	VH
Total cost	\$7161.66	\$4926.80	\$4868.06
OR supplies	\$2468.43	\$716.65	\$676.16
OR time charge	\$1264.56	\$642.76	\$955.66
Total pharmacy charges	\$1114.27	\$1098.71	\$1163.16
Postoperative hospital stay (d)	2.3	3.3	3.0
Operating time (min)	131	66	99

LAVH = laparoscopy-assisted vaginal hysterectomy; TAH = total abdominal hysterectomy; VH = vaginal hysterectomy; OR = operating room.

Table 2. Adjuvant Procedures

	LAVH	TAH	VH
Anterior colporrhaphy	5	0	12
Posterior colporrhaphy	4	0	20
Retropubic bladder suspension	3	4	4
Appendectomy	0	2	0
Other	0	1	2

Abbreviations as in Table 1.

Salpingo-oophorectomy was not considered an adjuvant procedure.

were performed by laparoscopy. The disposable linear stapler was used for all laparoscopy-assisted vaginal hysterectomies in the study group. In most cases it was used on the infundibulopelvic ligaments, and the pedicles including the round, utero-ovarian, and broad ligaments.

All patients undergoing hysterectomy were admitted for inpatient postoperative care and were discharged after at least 36 hours of postoperative hospitalization.

Two-tailed Student *t* test analysis was used to compare the cost differences among the groups.

Results

Table 1 summarizes the results. The mean total hospital cost of laparoscopy-assisted vaginal hysterectomy was significantly higher ($P < .05$) than that for vaginal and abdominal hysterectomies. The cost difference between vaginal hysterectomy and TAH was not significant ($P > .05$). The mean operating room supplies and equipment charge was also significantly higher for laparoscopy-assisted procedures than for either abdominal or vaginal hysterectomy ($P < .05$). The mean operative time, and subsequently the average operating room time charge, were significantly higher for laparoscopy-assisted vaginal hysterectomy performed with the linear stapler than for both other procedures ($P < .05$). The mean total pharmacy charges were similar for all three groups. The intraoperative pharmacy costs were significantly higher for the laparoscopy-assisted vaginal hysterectomy group (\$417.00) than for the TAH patients (\$290.62), reflecting the longer operating time.

The number of adjuvant procedures differed among the three groups, with the most procedures performed at vaginal hysterectomy (Table 2). To evaluate the influence of ancillary procedures on the time and expense of the hysterectomies, we evaluated vaginal hysterectomies with and without anterior and posterior vaginal repair (Table 3). Although not statistically significant in our small sample ($P > .05$), the repair added to the cost of the procedure.

Table 3. Hospital Charges for Vaginal Hysterectomy With and Without Anterior and Posterior Colporrhaphy

	VH	VH with ant. and post. repair	VH with ant. repair	VH with post. repair
No. of patients	6	10	2	8
OR supplies and equipment	\$618	\$682	\$706	\$681
OR time charge	\$901	\$962	\$1023	\$973
Postoperative hospitalization (d)	3.0	2.9	3.5	3.0
Total cost	\$4688	\$4892	\$5120	\$4850

VH = vaginal hysterectomy; ant. = anterior; post. = posterior; OR = operating room.

Discussion

Rising health care costs have focused attention on the cost-benefit ratios of many common procedures. The United States has the highest hysterectomy rate among industrialized nations, with approximately 33% of American women undergoing a hysterectomy by age 60, at an annual cost of \$2-3 billion.³ Given that the procedure is usually indicated to improve the quality of life rather than cure life-threatening conditions, hysterectomy costs are becoming a major topic of interest.

In recent years, we have observed the introduction of medical and surgical alternatives to hysterectomy (GnRH analogues, endometrial ablation), parallel to the progression of minimally invasive surgery. These developments prompted the present trend of reappraising indications and procedural guidelines. In the current cost-conscious environment, the credibility of new techniques involves not only their clinical advantage but also their economic advantage. We may safely assume that the role of cost-benefit ratios in the validation of new alternatives will only grow in the coming years.⁵

As laparoscopic hysterectomy is clearly associated with a shorter hospital stay,⁶ it has often been assumed that laparoscopy would provide a cheaper alternative. The validity of this concept was disputed by Summit et al.⁴ These investigators compared the cost of laparoscopy-assisted vaginal hysterectomy to the cost of vaginal hysterectomy and found the former to be considerably higher than the latter.

This study also showed a higher cost for laparoscopy-assisted vaginal hysterectomy employing the linear stapler as compared to both TAH and vaginal hysterectomy. When comparing the costs of laparoscopy-assisted vaginal hysterectomy, one must specifically note which instrumentation was used, including

disposables versus reusables. In this study, and in the cases reported by Summit et al.,⁴ the laparoscopy-assisted procedures used disposable linear staplers for hemostasis and pedicle transection. The average contribution of the disposable staplers to the total cost (\$7162) of laparoscopy-assisted vaginal hysterectomy in this study was \$1620 (21%). This sum includes the disposable linear stapler with one clip and additional clips as required. This expense could have been eliminated by using bipolar electrocoagulation and reusable scissors.

Further, if reusable trocars were used, an additional savings of 12-16% would have been possible. After subtracting the charge for disposable trocars and staplers from the actual cost in this study, the cost of laparoscopy-assisted vaginal hysterectomy is comparable to the cost of TAH. We examined the cost of hysterectomy performed by the technique independently developed by us, as applied since our first hysterectomy in July 1987. We use the CO₂ laser for cutting and bipolar electrocoagulation for hemostasis. During the reported study period, two of us (CN, FN) performed 23 laparoscopy-assisted vaginal hysterectomies. We found that the mean cost of hysterectomy performed by our technique was \$4669, comparable to the cost of vaginal or abdominal hysterectomy.

In our comparison of TAH to vaginal hysterectomy, the longer operating time of vaginal hysterectomy may have been due to the number of adjunctive procedures. In fact, most vaginal hysterectomy patients (73%) also had anterior and/or posterior repair, whereas only 23% of TAH patients underwent an adjunctive procedure other than salpingo-oophorectomy (Table 2).

Dicker et al.⁷ showed that vaginal hysterectomy has significantly reduced the complication rate compared to TAH. In a recent randomized trial, the complication rates were similar between laparoscopy-assisted vaginal hysterectomy and conventional vaginal hysterectomy.⁴ Thus, a number of complications may be prevented by converting selected abdominal procedures to laparoscopy-assisted vaginal hysterectomies. In addition to the patient benefit, savings may be realized by lowering the rate of readmissions associated with postoperative complications.

For a comparative study to be unbiased, as many factors as possible must be similar, except the one factor under investigation. However, when comparing a new technique such as operative laparoscopy to established ones such as TAH and vaginal hysterectomy, this is an unattainable goal. Important contributions to the total expense include the intraoperative time and the length of hospitalization. All members of

the gynecologic operating room team were experienced in performing TAH and vaginal hysterectomy.

To reach a comparable level of expertise at operative laparoscopy, the infamous learning curve must be overcome not only by the surgeons, but by all members of the operating room team. Laparoscopic surgery demands new skills from everyone involved. Similarly, the postoperative care of these patients is different. After offering special training to the staff of postoperative units, emphasizing the different needs of a post-laparoscopy patient, the average stay after laparoscopy-assisted vaginal hysterectomy among our patients has dropped to 1.4 days, compared to the 2.3 reported in this study. Therefore, although as performed in this study, laparoscopy-assisted vaginal hysterectomy using the linear stapler was the more expensive alternative, this procedure is not sufficiently mature for a final comparison.

However, as with other laparoscopic procedures, laparoscopy-assisted vaginal hysterectomy is being propelled by a media-induced patient drive.⁸ Neugebauer et al⁹ demonstrated the impossibility of properly performing a randomized controlled study that takes into account selection bias factors.

Patients strongly favor laparoscopy-assisted vaginal hysterectomy because of the smaller incision, diminished postoperative pain, shorter hospital stay, and quicker return to normal activity. Because modern medicine values patient comfort and pain reduction, converting a laparotomy to a minimal access procedure has undeniable benefits. In the final analysis, it may be difficult to place a monetary amount on the decreased pain and discomfort achieved by performing laparoscopy-assisted vaginal hysterectomy instead of abdominal hysterectomy.

All studies to date, including this one, have failed to account for the saved work hours when TAH is converted to laparoscopy-assisted vaginal hysterectomy. The convalescence of patients following laparoscopic surgery may be 2-4 weeks¹⁰ shorter than that of TAH patients, and can be translated into significant savings.

This investigation shows that when hospital costs alone are considered, laparoscopy-assisted vaginal hysterectomy performed with the linear stapler is significantly more expensive than both TAH and vaginal hysterectomy. The cost savings of the shorter hospital stay failed to offset the high intraoperative costs of laparoscopy-assisted vaginal hysterectomy

performed with the linear stapler. These savings can be appreciated when laparoscopy-assisted vaginal hysterectomy is performed without the linear stapler and with reusable trocars, CO₂ laser, and bipolar electrocoagulation (videolaseroscopy).

Future studies may show different results; many of the equipment costs are subject to change because of both production developments and competitive marketing as more companies enter this burgeoning field.

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Received July 19, 1993.

Received in revised form November 19, 1993.

Accepted November 19, 1993.

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