

Minimally Invasive Gynecologic Surgery: Case Report

Total Laparoscopic Hysterectomy Under Regional Anesthesia

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BACKGROUND: Laparoscopic hysterectomies comprise a large proportion of all hysterectomies in the United States. Procedures completed under regional anesthesia pose a number of benefits to patients, but laparoscopic hysterectomies traditionally have been performed under general anesthesia. We describe a case of total laparoscopic hysterectomy under epidural anesthesia with the patient fully awake.

CASE: A 51-year-old woman with abnormal uterine bleeding underwent an uncomplicated total laparoscopic hysterectomy, bilateral salpingectomy, and excision of endometriosis. The procedure was completed under epidural anesthesia without intravenous sedation or systemic narcotics. Pneumoperitoneum with a pressure of 12 mm Hg and Trendelenburg to 15° allowed for adequate visualization. Anesthesia was achieved with midthoracic and low lumbar epidural catheters. Bilevel positive airway pressure was used for augmentation of respiratory function.

CONCLUSION: With a committed patient, adequate planning, and knowledge of the potential intraoperative complications, regional anesthesia is an option for select women undergoing laparoscopic hysterectomy.

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Teaching Points

1. Adequate ventilation and pain control can be achieved during laparoscopic hysterectomy under epidural anesthesia.
2. Proper visualization and exposure during total laparoscopic hysterectomy can be accomplished with limited Trendelenburg angle and CO₂ insufflation pressure.
3. Epidural anesthesia is an option for select cases of total laparoscopic hysterectomy with proper precautions.

General anesthesia is the preferred and predominant technique for laparoscopic hysterectomy because it controls surgical pain and improves patient comfort with pneumoperitoneum and Trendelenburg position. It provides a secure airway and allows for control of minute ventilation to reduce hypercarbia.

The benefits of regional anesthesia include reduction of general anesthetic side effects, which include nausea, vomiting, sore throat, dental injury, sedation and postoperative atelectasis, and hypoventilation. This also allows for earlier cognitive recovery in the immediate postoperative period, whereas longer term benefits have not been clearly demonstrated.¹

Most reports of spinal anesthesia in laparoscopic surgery involve laparoscopic cholecystectomy, with few cases of appendectomy and hysterectomy.^{2,3} Data on laparoscopic cholecystectomy are not applicable to hysterectomy because the former requires a reverse Trendelenburg position, resulting in more favorable pulmonary dynamics. Conversely, Trendelenburg position worsens pulmonary compliance, making it more challenging to manage the resultant hypercarbia.

CASE

The patient is a healthy 51-year-old woman, para 2, with a body mass index (BMI, calculated as weight (kg)/[height (m)]²) of 22 who was seen for abnormal uterine bleeding refractory to medical management and was found to have an enlarged, leiomyomatous uterus that measured 12×10.5×6.8 cm on pelvic ultrasonography. The patient elected definitive management with hysterectomy. She was deemed an unsuitable candidate for vaginal hysterectomy as a result of the size and location of the leiomyomas and the lack of uterine descent during pelvic examination. She sought a second opinion for a laparoscopic hysterectomy. The patient requested regional anesthesia as a result of persistent dizziness and cognitive changes for several



days after a previous dental procedure with deep sedation and significant sedation associated with the administration of systemic opioids in the past. Before the procedure, the patient was counseled extensively by the surgeon as well as by two anesthesiologists with expertise in general as well as regional anesthesia on the benefits and risks of undergoing regional anesthesia. She maintained a strong desire to proceed with laparoscopic hysterectomy under regional anesthesia. We outline the preoperative, intraoperative, and postoperative steps taken to ensure success of laparoscopic surgery under regional anesthesia.

The patient's airway findings suggested ease of mask ventilation and intubation by standard anesthetic examinations should regional anesthesia be converted to general anesthesia intraoperatively. The anesthesia team proceeded with epidural anesthesia using catheters placed at two levels (midthoracic and midlumbar) using locally administered anesthetic and no intravenous (IV) sedation for the placement of the epidurals. Once placed, the epidurals were dosed with ropivacaine 0.5%, a total of 6 mL through the lumbar epidural and 4 mL through the midthoracic epidural. After bolus dosing, infusions of 0.2% ropivacaine were initiated.

After appropriate positioning, the cervix was dilated and a Pelosi uterine manipulator was inserted. Bupivacaine was injected at the primary trocar site; thereafter, an open (Hasson) entry technique was used for initial entry at the umbilicus. Pneumoperitoneum was achieved with low-flow carbon dioxide, starting with a low pressure of 10 mm Hg and slowly increasing to high flow and a pressure of 12 mm Hg to achieve adequate visualization. The patient was placed into minimal Trendelenburg position (10–15°). A multiport laparoscopic hysterectomy then was undertaken using three 5-mm secondary trocars placed in the bilateral lower quadrants and the suprapubic area.

Laparoscopic examination revealed a 14-week-sized bulky leiomyomatous uterus with poor access to the posterior cul de sac. Therefore, an anterior approach for uterine artery ligation was used to control the blood supply to the uterus before completing the remaining steps of the hysterectomy.

As a result of right shoulder pain during the procedure, the right diaphragmatic cupola was sprayed with 10 mL of 0.25% bupivacaine and 100 micrograms of epidural fentanyl were given through the thoracic epidural, with significant improvement of shoulder pain. Total laparoscopic hysterectomy, bilateral salpingectomy, and excision of endometriosis from the uterosacral ligaments and posterior cul de sac were completed. The uterus was placed into a tissue retrieval bag and manually morcellated vaginally using a scalpel. The vaginal cuff was closed laparoscopically using Richardson's angle sutures and a unidirectional barbed suture. Cystoscopy confirmed an intact bladder and bilateral ureteral jets. Surgery was uncomplicated, operative blood loss was 75 mL, operative time was 245 minutes, and pathology showed a 445-g uterus with leiomyomas and adenomyosis and endometriosis of the uterosacral ligaments.

The patient tolerated the procedure well and was discharged home 4 hours postoperatively. Her postopera-

tive recovery after discharge was uneventful. She did not experience fatigue, sleep disturbance, nausea, or vomiting, and her bowel and bladder functions remained normal. Her pain was well controlled with nonsteroidal antiinflammatory drugs. She expeditiously returned to her regular activities, including resumption of ballroom dancing 6 days postoperatively, return to work 8 days postoperatively, and resumption of horseback riding 3 weeks postoperatively.

DISCUSSION

When compared with general anesthesia, regional anesthesia leads to quicker recovery in the immediate postoperative setting. Nausea and vomiting are greater with general anesthesia using inhalational anesthetic but can be minimized using total IV anesthesia with propofol.^{4–6}

Successful laparoscopic pelvic surgery under regional anesthesia depends on appropriate management of pain, anxiety, and expectations; ensuring adequate ventilation; and having contingency plans. Preoperatively, a thorough discussion of risks and benefits, alongside respect for patient autonomy, is imperative. Our patient understood the potential to convert to general anesthesia during surgery. The need to avoid IV sedation owing to the risk of aspiration was emphasized.

Intraoperatively, adequate pain control was maintained with the epidural without the need for IV narcotics or anxiolytics. Our patient received a mid-thoracic epidural and a mid-lumbar epidural. This achieved adequate anesthesia up to the level of T3–T4 without compromising the patient's breathing. Studies demonstrate that the incidence of shoulder pain that necessitates conversion to general anesthesia is reduced with higher spread of local anesthetics, most endorsing a T4 sensory block and possibly as high as the cervical roots (phrenic nerve).⁷

It is important to use the least degree possible of Trendelenburg. A 15° tilt was sufficient to retract the bowel and provide adequate visualization. To minimize shoulder pain, low CO₂ flow and low pressure of 10 mm Hg were used initially and slowly increased to high flow and a pressure of 12 mm Hg. Right shoulder pain was controlled by spraying bupivacaine on the undersurface of the diaphragm and the addition of epidural fentanyl.

Patient anxiety should be addressed before surgery. Communication with an empathetic anesthesiologist and surgeon during surgery may have helped reduce the patient's anxiety. The operating room staff kept the traffic and the noise level to a minimum during the procedure. The use of headphones was considered as an additional method to help reduce anxiety, but the white



noise produced by the bilevel positive airway pressure machine was sufficient and the patient actually fell asleep spontaneously during the hysterectomy.

Adequate pulmonary ventilation was also a concern. Laparoscopic hysterectomy requires Trendelenburg position, which poses challenges with adequate ventilation. Not only is it difficult to breathe against the pneumoperitoneum and the viscera, but the high level of epidural anesthesia may reduce the strength of the muscles of respiration. In other cases, the weight of the omentum and the viscera on the diaphragm may pose significant challenges in the obese patient. The solution to this clinical dilemma was the use of bilevel positive airway pressure. Although the positive pressure increases the depth and rate of diaphragmatic excursions, it also increases the movement of the pelvic viscera. However, this did not compromise the safety of the procedure. During conventional laparoscopic surgery under general anesthesia, surgeons depend on muscle relaxants and paralysis to facilitate peritoneal insufflation and maintain a steady field for the operation. Epidural anesthesia does provide muscle relaxation, but not to the level achieved with paralytic agents. Our case suggests that neither profound muscle relaxation nor completely steady pelvic viscera is imperative to the safe performance of the procedure. Our positioning protocol may have decreased the risk of inadvertent sudden movements of our awake patient that could pose a risk of injury while using electrosurgery.

We anticipated that a single-injection spinal anesthetic would not have provided adequate anesthesia owing to the expected length of the procedure. We concluded that a catheter technique needed to be used to allow for continued dosing and prolongation of anesthesia. An added benefit is the ability to provide postoperative analgesia, reducing opioid consumption and the associated sedation, hypoventilation, constipation, nausea, and vomiting.⁵

A spinal catheter was not used to avoid the risk of a spinal headache. In addition, dosing of local anesthetic in a spinal catheter to achieve a block of the second or third thoracic level is quite challenging to perform safely and accurately, especially with the effect of gravity with the Trendelenburg position. An additional potential benefit of regional anesthesia is rapid recovery and discharge; the patient was already awake and stable at the end of surgery, and recovery involved merely ambulating, voiding, and tolerating oral intake.⁶

A number of published reports have described the use of regional anesthesia in laparoscopic cholecystectomies.^{3,8,9} One report describes the use of combined spinal and epidural anesthesia for 42 patients undergoing laparoscopic cholecystectomy and eight patients undergoing

laparoscopic hysterectomy.² Two patients were converted to general anesthesia owing to shoulder pain. The authors reported no complications; however, details such as the patients' BMIs, surgical technique, uterine weight, or length of hospitalization were not included. Regional anesthesia also has been used for patients with significant cardiopulmonary morbidity undergoing abdominal gynecologic surgery owing to its usually better hemodynamic profile, improved perioperative analgesia, and avoidance of airway manipulation and positive pressure ventilation.⁴

Total laparoscopic hysterectomy under epidural anesthesia with bilevel positive airway pressure augmentation of respiratory function is a feasible procedure in a motivated patient. This approach can offer a valuable option for select patients with adequate cardiopulmonary reserve and easy airway management who prefer to minimize their exposure to general anesthesia. Several factors enabled our team to challenge the status quo and to tailor the surgical approach to minimize adverse effects without compromising the patient's safety. We attribute our success to adequate preoperative counseling, our patient's commitment, the application of scientific evidence, and the intense collaboration between the surgical and anesthesia teams.

REFERENCES

1. Newman S, Stygall J, Hirani S, Shaefi S, Maze M. Postoperative cognitive dysfunction after noncardiac surgery: a systematic review. *Anesthesiology* 2007;106:572–90.
2. Singh RK, Saini AM, Goel N, Bisht D, Seth A. Major laparoscopic surgery under regional anesthesia: a prospective feasibility study. *Med J Armed Forces India* 2015;71:126–31.
3. Donmez T, Erdem VM, Uzman S, Yildirim D, Avaroglu H, Ferahman S, et al. Laparoscopic cholecystectomy under spinal-epidural anesthesia vs. general anaesthesia: a prospective randomised study. *Ann Surg Treat Res* 2017;92:136–42.
4. Massicotte L, Chalaoui KD, Beaulieu D, Roy JD, Bissonnette F. Comparison of spinal anesthesia with general anesthesia on morphine requirement after abdominal hysterectomy. *Acta Anaesthesiol Scand* 2009;53:641–7.
5. Miller RD. *Miller's anesthesia*. 7th ed. Philadelphia (PA): Churchill Livingstone/Elsevier; 2010.
6. Gerges FJ, Kanazi GE, Jabbour-Khoury SI. Anesthesia for laparoscopy: a review. *J Clin Anesth* 2006;18:67–78.
7. Vretzakis G, Bareka M, Aretha D, Karanikolas M. Regional anesthesia for laparoscopic surgery: a narrative review. *J Anesth* 2014;28:429–46.
8. Kejrival AK, Begum S, Krishan G, Agrawal R. Laparoscopic cholecystectomy under segmental thoracic spinal anesthesia: a feasible economical alternative. *Anesth Essays Res* 2017;11:781–783.
9. Demiryas S, Donmez T, Erdem VM, Erdem DA, Hatipoglu E, Ferahman S, et al. Comparison of the effects of spinal epidural and general anesthesia on coagulation and fibrinolysis in laparoscopic cholecystectomy: a randomized controlled trial: VSJ Competition, 2nd place. *Wideochir Inne Tech Maloinwazyjne*. 2017;12:330–340.

