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ORIGINAL ARTICLE

Comparative study between robotic laparoscopic myomectomy and abdominal myomectomy

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KEYWORDS

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Abstract *Study objective:* To compare short-term surgical outcomes of robotic and abdominal myomectomy and to analyze the factors affecting the short-term outcomes.

Design: Retrospective study of a consecutive case series at Emory Saint Joseph's Hospital, Atlanta, USA.

Subjects and method: From February 2007 to June 2009, 122 patients with symptomatic leiomyomata underwent either robotic assisted laparoscopic myomectomy (RALM, $n = 77$) or abdominal myomectomy (AM, $n = 45$). The variables investigated included the type of surgery, age, BMI, gravity, parity, number of leiomyomata, diameter of largest tumor size, total operative time, estimated blood loss, and length of hospital stay.

Results: No significant differences were found between the two groups regarding age, gravity and parity. However, BMI, number of leiomyomata and tumor sizes were significantly higher in AM compared to RALM. The total operative time was significantly longer in RALM compared to AM. The total estimated blood loss and length of hospital stay were significantly lower in RALM compared to the AM group. The predicted odds of staying one day or less in the hospital for patients receiving RALM was 193.5 times the odds for patients receiving AM when adjusted for the number of leiomyomata and the tumor size. The probability of one day admission or less in the hospital was significantly increased for patients receiving RALM.

Conclusion: RALM has shorter hospital stay, less blood loss and increased operative time compared to AM, regardless of tumor size and number of tumors. Although operative time was increased with the RALM procedure, blood loss and hospital stay were integral outcomes in the study result.

1. Introduction

Leiomyoma is the most common pelvic benign tumor in female patients and the leading surgical indication for hysterectomy. Previous studies have shown that at least 20% of women between the ages of 25 and 64 yrs may require a hysterectomy

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for leiomyoma with a peak incidence around the age of 45 yrs [1]. Seventy percent of Caucasian women and more than 80% of African-American women have uterine leiomyomata by age 50 yrs [2]. Surgery is needed when leiomyomata are symptomatic (infertility, recurrent abortion, abnormal uterine bleeding, dysmenorrhea, dyspareunia, and pelvic/abdominal pressure) [3]. Since 1931, myomectomy has been described as the gold standard for the conservative surgical treatment of symptomatic leiomyomata for women desiring future fertility or uterine conservation [4]. The goal of a myomectomy procedure is to remove the visible and accessible leiomyomata and to reconstruct the uterine wall.

Traditionally, most cases of myomectomy are performed abdominally through a larger Pfannenstiel incision. Abdominal myomectomy (AM) is usually considered a more involved operation, associated with higher morbidity, blood loss and adhesion formation rates, compared to hysterectomy [5–7]. Today many cases of leiomyoma are treated with laparoscopic myomectomy which provides a minimally invasive surgery as a result of the advent of modern-day laparoscopic surgical technique and equipments [8]. Despite laparoscopic benefits, such as faster post-operative recovery, improved cosmetics, and potentially fewer post-operative adhesions compared with laparotomy [9], the existence of many technical challenges, such as enucleating the leiomyomata and repairing the uterine defect with multilayer sutured closure, is overwhelming. Computerized enhanced robotic surgery using the da Vinci® robotic surgical system has been proposed to overcome the limitations of the traditional laparoscopy while still benefiting from the advantages of the minimally invasive technique [10]. The robotic-assisted laparoscopic myomectomy (RALM) provides the surgeon with improved optics, a three dimensional view, and increased dexterity and precision. This facilitates excision of tumors and repair of uterine incisions.

A patient with symptomatic leiomyoma who desires uterine conservation is eager to know the difference of the outcome of each myomectomy approach. Statistical evaluation of total operative time, total estimated blood loss, and length of hospital stay for RALM vs. AM will help the patient in deciding which surgical procedure approach will be most appropriate for her particular medical condition in accordance with her gynecologist's advice.

The purpose of this study is to compare the short-term surgical outcomes of robotic-assisted laparoscopic myomectomy (RALM) and abdominal myomectomy (AM), including total operative time, total estimated blood loss and length of hospital stay.

2. Materials and methods

One hundred twenty-five consecutive patients underwent RALM or AM performed by the author at Emory Saint Joseph's Hospital of Atlanta from February 2007 to June 2009. Complete data were obtained on 122 patients, and 77 cases of RALM and 45 cases of AM were compared (Table 1).

The hospital electronic charts and the office documented electronic medical record (EMR) files provided patient information. All patients signed informed consent before surgery. Patients had a pelvic examination and a transvaginal ultrasound to confirm the presence of the leiomyomata, and number, sizes, and location of the tumors were recorded in a drawn picture of the uterus. This picture was brought to the operating room to guide the surgeon in locating the leiomyomata for excision. In the few occasions in which the location of the intramural leiomyoma during surgery was not easily located, laparoscopic ultrasound probe usage was very beneficial in identifying the tumor location and its size.

The following variables were recorded: the surgery type (1 = robotic, 0 = abdominal), the patient's age (years) at the time of surgery, BMI (kg/m^2), gravity, parity, number of leiomyomata, diameter of the largest tumor size (mm), total operative time (min), total estimated blood loss (ml), and length of hospital stay (days) after surgery.

Statistical analyses were performed using SAS 9.1 software (SAS Institute, Cary NC). Comparisons of the patient preoperative and post-operative characteristics were performed using Student's *t*-test for unequal variances. Multiple linear regression analyses were used to account for the factors that had impact on the total operative time and the total estimated blood loss. Hospital stay was coded as a binary response variable (<1 day = 1, >1 day = 2) to perform a logistic regression analysis to evaluate the factors that affect length of hospital stay. The alpha value was set to 0.05 for all of the analyses.

3. Operative procedures

The operative procedure of the da Vinci® robotic assisted laparoscopic myomectomy and the abdominal myomectomy will be described.

3.1. Operative procedure of da Vinci® robotic assisted laparoscopic myomectomy

All patients received general anesthesia and were placed in lithotomy position. Hysteroscopy with fractional dilatation and curettage was performed as a part of the operation to diagnose and treat thickened endometrium, endometrial polyps, and submucosal leiomyoma (if present) and to visualize the cornual opening of each fallopian tube, especially for infertility patients.

A uterine manipulator (V Care type by ConMed Inc., 60-6085) with a proper cup size was fitted in the uterus. A Foley catheter was inserted and attached to a urine bag for gravity. Injection of MARCAINE® 0.5% with epinephrine was performed subcutaneously in the trocar insertion sites. The skin of the center of the umbilicus was caught by Kocher clamp. A semicircular incision was made in the lower part of the umbilical circle with a knife blade size 15. The camera incision location was placed at a level in the midline of the umbilicus or above the umbilicus according to the patient's height and the size of the leiomyomatous uterus. The subcutaneous tissue was cut through until the rectus fascia was identified, and the rectus fascia was caught by two Kocher clamps. A small slit was made transversely in the fascia. Opening of the parietal peritoneum was made by Kelly forceps. Retaining sutures at each end of the slit in the fascia were made with 0 VICRYL™ (Polyglactin-J329 by Ethicon Inc.) in a CT-3 needle, and the ends of the sutures were caught by hemostat for traction. Insertion of Hasson trocar was anchored to the fascia with the sutures. CO_2 gas was insufflated with high pressure flow. The robotic zero angle laparoscope was inserted. With