ELSEVIER

JMIG The Journal of Minimally Invasive Gynecology

Review Article

Hemostatic Techniques for Myomectomy: An Evidence-Based Approach

Lisa Caronia Hickman, MD*, Alexander Kotlyar, MD, Shirley Shue, BS, and Tommaso Falcone, MD

From the Department of Obstetrics and Gynecology (Drs. Hickman, Kotlyar, and Falcone), Cleveland Clinic Foundation, Cleveland, Ohio, and Case Western Reserve University School of Medicine (Ms. Shue), Cleveland, Ohio.

ABSTRACT Uterine leiomyomas are the most common benign gynecologic tumor. They are also a significant cause of morbidity, necessitating treatments ranging from hormonal suppression to surgical intervention. Myomectomy, the removal of these highly vascular tumors, offers significant quality of life and fertility-sparing benefit for patients affected by uterine leiomyomas but with a risk of substantial intraoperative blood loss. This risk of hemorrhage leads not only an increased transfusion rate but also he need for hysterectomy and other potential operative complications. Numerous medical and surgical techniques have been developed to minimize potentially significant blood loss during abdominal, laparoscopic, and robotic-assisted myomectomies. Combined with judicious preoperative assessment, these techniques substantially enhance patient safety during a myomectomy and outcomes during recovery. Journal of Minimally Invasive Gynecology (2016) ■, ■–■ © 2016 AAGL. All rights reserved.

Keywords: Hemostasis; Leiomyoma; Myomectomy

Uterine leiomyomas are benign monoclonal neoplasms of unclear etiology that arise from myometrial smooth muscle cells. Leiomyomas are the most common benign gynecologic tumor, with an estimated incidence of 70% to 80% in women by age 50 years [1]. Risk factors for leiomyomas include increasing age, family history, and African American race. The clinical impact of leiomyomas can be variable. Most women with leiomyomas are asymptomatic; however, abnormal uterine bleeding, pelvic pain or pressure, and infertility are all possible manifestations of these tumors. The number, location, size, and behavior of the myomas (degeneration, prolapse) all have a significant impact on the associated clinical manifestations. The diagnostic modalities used for leiomyomas include physical examination findings (enlarged bulky, irregularly contoured uterine shape), transvaginal ultrasound, saline-infusion sonogram, hysteroscopy, and magnetic resonance imaging.

For some leiomyomas observation may be appropriate, especially in perimenopausal women, because decreasing estrogen levels may lead to myoma involution and improvement of clinical symptoms. Medical management may be an appropriate option for certain patients, especially those who are poor surgical candidates and use anti-inflammatory drugs, tranexamic acid, and hormonal therapies to reduce symptomatology. Radiologic interventional procedures, such as uterine artery embolization, can also be used in well-selected patients. When the decision is made to proceed with surgical management, one must consider the location, size, and number of myomas and the desire for future childbearing, because this will likely affect the surgical approach and technique (open, hysteroscopic, vaginal, or minimally invasive techniques) [2]. Patients must also be adequately counseled on the risks and benefits of surgical intervention, especially related to the risk of intraoperative hemorrhage. Blood loss during a myomectomy can vary from approximately 100 mL in a conventional laparoscopic case to twice that in an abdominal case, as demonstrated by Barakat et al [2]. Further, a retrospective study comparing surgical outcomes by route of myomectomy found that 6.5% of patients undergoing an abdominal approach and 1.1% of patients undergoing a minimally invasive approach (laparoscopic

There are no financial disclosures or conflicts of interest to report.
Corresponding author: Lisa Caronia Hickman, MD, Cleveland Clinic Foundation, 9500 Euclid Avenue A81, Cleveland, OH 44195.
E-mail: hickmal@ccf.org

Submitted December 25, 2015. Accepted for publication January 28, 2016.
Available at www.sciencedirect.com and www.jmig.org

1553-4650/$ - see front matter © 2016 AAGL. All rights reserved.
http://dx.doi.org/10.1016/j.jmig.2016.01.026

and robot-assisted) will require a blood transfusion [2]. Approximately 2% of patients will require conversion to a hysterectomy [2,3].

A variety of preoperative medical and intraoperative medical and surgical techniques are available to aid with hemostasis during myomectomy (Tables 1 and 2). The purpose of this review is to provide an evidence-based approach to myomectomy by comparing the medical and surgical interventions available for reducing blood loss.

Methods

We searched for published articles in Ovid-Medline, the Cochrane Library, and PubMed. The search syntax was tailored individually for each database but included the following main medical subject headings and text words: "myomectomy AND hemostasis," "myomectomy AND GnRH," "myomectomy AND prostaglandins," "myomectomy AND hemostatic agents," "myomectomy AND uterine artery occlusion," AND "myomectomy AND barbed suture." Our search was limited to studies from 1946 to 2016, with the last search performed in January 2016. We limited our selection to peer-reviewed articles including systematic reviews, meta-analyses, and prospective trials, preferably randomized controlled trials (RCTs). When none of these types of studies could be found to address a topic, retrospective studies were also included. Articles that were not published in English were used only if an English translation was available.

Search Results

The electronic and manual searches identified 1652 articles. Of these, 1608 were excluded based on lack of relevance for this review. In total, 45 articles were included for review in this article (Fig. 1).

Results and Discussion

Medical Interventions to Decrease Blood Loss

Gonadotropin-Releasing Hormone Agonists

Given the well-understood impact of estrogen on leiomyoma growth and maintenance, the utility of gonadotropin-releasing hormone agonist (GnRHa) treatment before myomectomy has been extensively studied. A Cochrane review examined the impact of GnRHa treatment before myomectomy and analyzed the outcomes of 14 RCTs of GnRHa versus no pretreatment and 6 trials evaluating GnRHa versus placebo [4]. All studies included reproductive-aged women undergoing either hysterectomy or myomectomy (open, laparoscopic, or hysteroscopic) who received 3 to 4 months of pretreatment with GnRHa or placebo before surgical intervention. The study revealed pretreatment with GnRHa had a small but significant positive impact on preoperative hemoglobin and hematocrit levels, likely secondary to an improvement in menorrhagia and therefore anemia. A reduction in intraoperative estimated blood loss (EBL) was also demonstrated in those receiving GnRHa before myomectomy (mean difference, −67.46 mL; 95% confidence interval [CI], −90.55 to −44.37). Only 1 trial demonstrated a significantly higher postoperative hemoglobin concentration in women treated with GnRHa versus no pretreatment (mean difference, .8 g/dL; 95% CI, .2–1.4). Other notable findings in the GnRHa group included a reduction in uterine volume and size, myoma volume, and duration of postoperative hospitalization. This analysis did not demonstrate a translation of decreased EBL to decreased transfusion requirement in the treatment versus control groups. Thus, the true clinical applicability of these data is not entirely clear. Given the relatively small number of laparoscopic myomectomies (LMs) included in this analysis, there was little evidence to support an added benefit of GnRHa on reducing blood loss in

Table 1

Impact of medical interventions on hemostasis during myomectomy

Intervention [reference]	Estimated intraoperative blood loss	Postoperative [Hb]	Transfusion rate	Operating time	Length of postoperative hospitalization
GnRHa [4,5]	↓	↑	No change	No change	↓
Intravaginal prostaglandin [6–8]	↓	↑/No change	↓/No change	↓/No change	No change
Vasopressin*[9,10]	↓	↑	↓	N/A	↓
Bupivacaine + epinephrine [11]	↓	N/A	N/A	↓	N/A
Oxytocin infusion† [12]	↓	N/A	↓	N/A	N/A
Gelatin thrombin matrix [13]	↓	↑	↓	N/A	↓
Fibrin sealant–coated suture [14]	↓	↑	N/A	↓	N/A
Intravenous tranexamic acid [15]	No change	N/A	No change	No change	N/A

[Hb] = hemoglobin concentration; GnRHa = gonadotropin-releasing hormone agonist; N/A = not applicable.
* Combination of vasopressin + pedicle ligation or vasopressin + rectal misoprostol showed more efficacious results.
† Only 1-time oxytocin infusion of 15 IU given at initiation of surgery demonstrated these results.