

Original Research

In Low- and Middle-Income Countries the Uterine Tourniquet during Open Myomectomy is a Simple and Efficient Method of Reducing Blood Loss

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Abstract

Background: Uterine fibroids are the most common form of benign uterine tumors. African women of reproductive age usually present late with large and numerous uterine fibroids. Conservative surgical treatment requires ways to reduce intraoperative bleeding. This study attempts to describe innovative methods in the efficient management of fibroids in low-and middle incomes countries. We demonstrate the efficiency of the uterine tourniquet during abdominal polymyomectomy in intraoperative bleeding reduction despite removal of numerous myomas. **Methods:** A prospective, descriptive and analytical review was conducted on 92 patients who underwent open myomectomy in the gynecology department of the university hospital of Cocody (Côte d'Ivoire) over 3 years (2019 to 2020). Intraoperative surgical steps include placing a uterine tourniquet before removal of the myomas. The variations in mean hemoglobin levels before and after myomectomies were compared. The significance level was set at 5% ($p < 0.05$). **Results:** The patients' mean age was 38.5 years old, and 39% were nulliparous. Abnormal vaginal bleeding was the main symptom (67.4%). On physical exam the uterine size varied significantly from 20 to 30 cm. The average number of uterine fibroids enucleated was ten. The mean duration of the procedure was 155 minutes with an estimated average blood loss of 250 mL. The mean difference between preoperative and postoperative hemoglobin levels was not significant ($p < 0.061$). Only four patients (4.3%) received a blood transfusion. **Conclusions:** Placing a uterine tourniquet allowed enucleation of several uterine fibroids with relatively reduced blood loss in abdominal myomectomies. This technique can be an alternative to embolization in countries with limited resources.

Keywords: uterine myomas; tourniquet; abdominal myomectomy; blood losses; hemoglobin level

1. Introduction

Uterine myomas are the most common benign disease of female genital tract, affecting 20 to 25% black women of reproductive age. Management of fibroids is challenging in low- and middle-income countries (LMICs) due to denial of the disease, late care due to socio-cultural beliefs, pre-conceived ideas concerning surgical treatment, multiple unsuccessful treatment attempts with traditional remedies, low literacy rates and financial constraints [1,2]. It is frequently diagnosed in women desiring conception. In women requesting fertility preservation surgery, a myomectomy can be done by laparotomy, laparoscopy or hysteroscopy depending on the size, site and type of fibroid [3]. In our country, abdominal myomectomies are most often performed because of unavailability of laparoscopy or hysteroscopy [3]. Myomectomies however are risky procedures and can result in serious complications, such as, excessive intraoperative bleeding. It is therefore essential to implement a procedure to reduce blood loss during surgery, particularly in the African context where blood products are scarce unavailable [1–3]. The objective of these surgical procedures was to significantly reduce intraoperative blood loss [4]. The goal of this study was to examine the effi-

ciency of uterine tourniquets in reducing blood loss during open myomectomies in a LMIC, where blood transfusion is unavailable.

2. Materials and Methods

A prospective descriptive and analytic study conducted was in the department of Obstetrics and Gynecology of the University Hospital of Cocody (Côte d'Ivoire) over 3 years (January 2019 to December 2021). It included 92 women of reproductive age who underwent an open myomectomy for uterine fibroids of any size, with initial placement of a urinary catheter as uterine tourniquet. Abdominal and endo-vaginal ultrasounds were used to map the uterine myomas (location, size and number). Magnetic resonance imaging (MRI) were requested but not done because our patients and their families had a limited income, thus unable to afford this relatively expensive examination income.

After laparotomy via the Pfannenstiel or Maylard approach, intraoperative evaluation of uterus, size and number of fibroids to enucleated was done. A securely tied uterine tourniquet was placed at the junction of the uterine body and isthmus before myoma enucleation (Fig. 1).



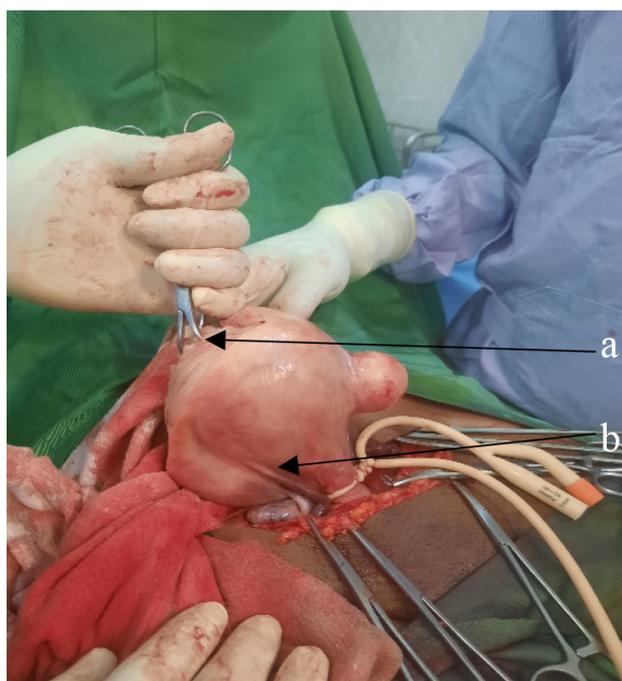


Fig. 1. Intraoperative view of uterine tourniquet placement. (a) Polymyomatous uterus. (b) Foley catheter tied at the uterine isthmus.

The operating time with the uterine tourniquet was 90 minutes. The tourniquet was discontinued as soon as the anatomical uterine structures appeared blue.

The tourniquet was re-applied 15 minutes later if continuation of surgery was necessary. After enucleation of all fibroids, simple or “U” uterine stitches were performed. Following removal of the tourniquet, hemostasis was checked and established with additional safety stitches as necessary. A hemoglobin level was checked before, and 48 hours after the surgical procedure to assess blood loss. Sociodemographic and clinical parameters, hemoglobin level, postoperative course, duration of hospitalization and need for blood transfusion were studied. Statistical analyze was performed using Epi Info 3.5.1 2008 software (centers for disease control and prevention (CDC), Atlanta, GA, USA) and Fischer exact test for comparison of average hemoglobin levels with a significance level of 5% ($t < 0.05$).

3. Results

3.1 Sociodemographic Characteristics of the Patients

The average age was 38.5 years, with extremes of 23 and 48 years. Nulliparous women represented 39%. The main reason for consultation was menstrual cycle disorders (67.4%). Table 1 shows the reasons for consultation.

3.2 Pre- and Intraoperative Evaluation of the Fibroids

The intraoperative mean uterine size was 30 cm with the smallest and largest being 16 and 35 cm, respectively.

Table 1. Summary of population features.

Variables	Number (n)	%
Reasons for consultation	n	%
Cycle disorders (metrorrhagia, menorrhagia)	62	67.4
Pelvic pain	24	26
Pelvic mass and heaviness	23	25
Infertility	7	17.9
Constipation and pollakiuria	9	9.8
Hydrorrhea	9	9.8
Surgical features	n	min-max
Mean number of fibroids (n)	10	3-30
Average size of fibroids (cm)	8	5-30
Average duration of intervention (min)	155	55-180
Average blood loss (mls)	250	

The uteri varied in size between: 20–28 cm (44%), 28–30 cm (35%) and 16–20 cm (21%). The number of enucleated myomas, duration of surgical procedure, and blood loss are summarized in Table 1.

3.3 Postoperative Data

The postoperative evaluation of hemoglobin levels, and the number of transfused patients is summarized in Table 1. There was no significant variation between the mean hemoglobin levels before and after surgery ($t < 0.061$), however, but four patients were transfused with packed red blood cells (4.3%). The average hospital stay was 3 days, with shortest to longest being 3 and 7 days, respectively. Eight patients had anemia postoperatively but did not require transfusion (8.7%). We noted 4 cases of delayed bowel movements with transient small bowel sub-occlusion in 3 patients.

The average of hemoglobin level varied from 12.78 g/dL before surgery to 11.19 g/dL after with no significant difference ($t < 0.071$).

4. Discussion

Uterine myomas are the most common benign disease of the female genital tract, particularly affecting of black women [1–4]. No medical treatment has proven to be effective so surgical management for symptomatic uterine fibroids is the treatment of choice [4]. Hysterectomy would eliminate the possibility of recurrence but this procedure is not readily accepted by women with a desire for pregnancy [3,4]. Conservative treatment (myomectomy) is very often associated with a significant risk of bleeding that may be life-threatening [3–6]. Nowadays there are several conservative surgical approaches that reduce intraoperative bleeding significantly [3]. Most of these procedures are not available in our countries despite the large fibroids observed in our patients.

It was therefore important to propose myomectomy techniques that prevent intraoperative hemorrhage [6].

One of these techniques has been used in our department for decades for generally very large uterine fibroids

(>8 cm) (Table 1). These voluminous uterine fibroids are partly related to a delay in diagnosis. This is often the case in poor countries due to low literacy levels and reliance on traditional treatment.

On the other hand, some of our patients have expressed fear of the surgical procedure due to concern of uterine removal, complications of surgery, socio-cultural beliefs presenting uterine fibroids as a mystical issue [5–7].

These large uterine fibroids, present a risk of hemorrhage estimated at 6% during their removal especially in the case of open polymyectomy [5].

Reduction of intraoperative bleeding requires use of several drugs, such as, gonadotrophin agonists, androgens and multiple inhibitors of steroidogenesis (Danatrol) for reducing the volume of fibroids prior to surgery [6]. Surgical primary ligation of the hypogastric arteries has even been proposed [7,8]. Some drugs have also shown effectiveness in reducing myomas size by 40–50%, for instance, mifepristone (anti-progestogen), and raloxifene (selective estrogen receptor modulator) [9]. However, progestin-based medical treatment has not shown any effect on uterine myoma size. Preoperative embolization consists of bilateral obliteration of the uterine arteries after selective catheterization. It is the reference technique in developed countries, allows “bloodless surgery”, and can be carried out only 3 hours before the operation [9,10]. Preoperative embolization allows obliteration of uterine arteries and significant reduction of arterial blood flow that result in bloodless surgery [10–12]. Embolization prevents necrosis from creating significant adhesions with neighboring organs and causes cleavage planes to disappear [13]. The indications for preoperative embolization are still poorly defined. However, it ought to be the preferred procedure for fertility preservation, although it exposes the patient to risks of ovarian alteration and adhesions with myomectomy. Moreover, histological studies [6] show that embolization reduces perfusion of the myometrium around the fibroid, a reduction that could compromise adequate uterine healing and increase the risk of uterine rupture in the event of pregnancy. Embolization use is relatively new in our country and still unavailable because it is very expensive. In our country the evaluation of embolization, in definitive/selective embolization of uterine fibroids was published only in 2019 [14]. Myomectomies by conventional surgery after placing a tourniquet at the uterine isthmus allowed bloodless removal of several myomas. In fact, there no variations in pre- and postoperative of hemoglobin levels ($t < 0.061$) (Table 1). The principle of the isthmic tourniquet is to temporarily devascularized the uterus by ligation of its pedicles at intra-ligamentary portion. Consequently, the uterine incisions are not very hemorrhagic, making enucleation and hemostasis easy and simple. Carefully placed uterine sutures were, leads to a reduction time of bleeding and quantity [15].

This is a definite advantage because of the of transfusion products in our practice (4.3%). Indeed, ordered but undelivered transfusions are a health security problem in our country [5]. The uterine tourniquet technique allows reduction of both intraoperative hemorrhage, and transfusion needs during abdominal myomectomies better than use of misoprostol [15–18], oxytocics [13], gonadotrophin releasing hormone (GnRH) agonists [10] and tranexamic acid [19–21]. The uterine tourniquet has also shown its superiority over bilateral primary ligation of hypogastric arteries, which is reserved for experienced surgeons [15].

Some authors systematically recommend this technique during abdominal myomectomies [19] as an alternative to arterial embolization in countries with limited resources [19–21]. Uterine ischemia is a risk with use of the uterine tourniquet, but it is not significant if the procedure lasts less than 90 minutes [22]. To reduce ischemia risk, when procedures are too long, it is necessary to remove, and reapply the tourniquet after at least 15 minutes [20–22].

A short average of hospital stay was observed in this study (3 days). The time of hospitalization was modified by the presence of a postoperative complication such as anemia, and a delay in return of bowel function. Other complications have been described in the literature [23] and the possibility of pregnancy after abdominal myomectomies [24,25].

5. Conclusions

The uterine tourniquet significantly reduces intraoperative hemorrhage in abdominal myomectomies. It is readily available, simple to use and effective in reducing intraoperative bleeding. It could be an alternative to arterial embolization in low- and middle-income countries, and thus should be widely promoted.

Availability of Data and Materials

The data that support the findings of this study are available from corresponding author but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Dehi Boston Mian *et al.*

Author Contributions

All authors (DBM, VL, VA, SA and FA) have contributed in extraction and drafting of the manuscript. DBM and VL have made the analysis of data, manuscript revision, design and revision, final statistical analysis. All authors read and approve this final manuscript.

Ethics Approval and Consent to Participate

We have obtained the approval (N 234554-CI/2020) of the Felix Houphouët Boigny University for the publication of this manuscript.

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Conflict of Interest

The authors declare no conflict of interest.

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