Effectiveness of pericervical tourniquet by Foley catheter reducing blood loss at abdominal myomectomy

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Summary

Objectıve: To evaluate effectivenes of pericervical tourniquet by Foley catheter reducing blood loss at abdominal myomectomy. *Materials and Methods:* Retrospective chart review of 67 cases, with symptomatic myoma uteri and undertaken abdominal myomectomy, was performed. Myomectomy was performed in Group 1 (n = 34) by Foley catheter tourniquet around both uterin vessels and in Group 2 (n = 33) the tourniquet was not performed. *Results:* The average blood loss during myomectomy was 286.4 ± 137.5 ml for the tourniquet group and 673.8 ± 172.3 ml for the control group. Postoperative blood transfusion was necessary in two patients from the control group. Technique significantly reduced the intraoperative blood loss and postoperative hemoglobin fall in patients. No serious complicatins occured on account of the tourniquet technique. *Conclusıons:* The pericervical tourniquet by Foley catheter is a safe and effective method for reducing blood loss during abdominal myomectomy, although it should be evaluated in a randomized controlled trial.

Key words: Abdominal myomectomy; Leiomyoma; Hemorrhage; Pericervical tourniquet.

Introduction

Leiomyomas, also known as fibroids or fibromas are seen as the most common benign uterine neoplasm of the female genital system. This is seen between the ratio of 20–30% in women at reproductive age. Leiomyomas are the most common indications for hysterectomy [1].

Fibroids may be asymptomatic, or may present with menorrhagia, pain, abdominal mass, pressure effects, infertility, or recurrent pregnancy loss. Approximately 25% of women with fibroids experience symptoms, such as heavy bleeding, pelvic pain, and pregnancy complications [2].

Although medications such as nonsteroidal anti-inflammatory drugs (NSAIDs) and hormonal therapy may be used to manage fibroid symptoms, some women require more aggressive forms of treatment [3].

Myomectomy, the surgical removal of myomas, is an important treatment option especially for women who desire to maintain or improve their reproductive potential [4]. Myomectomy has been associated with considerable blood loss intraoperatively and prolonged morbidity postoperatively [5, 6]. This is due to increased vascularity of the fibroid uterus. Uncontrolled hemorrhage may necessitate hysterectomy [7] and blood transfusion can be required in up to 20% of women after abdominal myomectomy [6]. Thus, several methods are employed to reduce blood loss during the operation. These methods are employed to reduce blood loss during the operation. These methods include pericervical tourniquet [2], vaginal misoprostol [8], injection of diluted vasopressin and analogues into the myometrium [9], intravenous oxytocin [10], preoperative use of gonadotropin releasing hormone agonist (GnRHa) [11], chemical dissection with sodium 2-mercaptoethane sulfonate (mesna) [12], tranexamic acid, myoma enucleation by morcellation, uterine artery embolization [10], and bilateral uterine artery ligation [13, 14].

In 1953, Rubin replaced Bonney's metal clamps with a single tourniquet around the cervix to achieve haemostasis during myomectomy [15]. The aim of this study is to investigate the effectiveness of the pericervical tourniquet technique.

Materials and Methods

The study was approved by the local ethical research committee (Application No.B.30.2.SEL.0.28.00.00/130-66). Informed consent form was obtained from each patient. This retrospective non-randomized controlled clinical study was carried out at the Depertment of Obstetrics and Gynecology at Mevlana University in Turkey, from August 2008 to January 2013.

A total of 67 patients recruited to the study were classified into two groups. The 34 patients assigned to group 1 (study group) underwent pericervical tourniquet by Foley's catheter (size 14-16), and 33 patients in group 2 (control group) received no intervention. At least one large symptomatic subserosal, intramural or submucous uterine myoma ≥ six cm and who underwent an abdominal myomectomy, was recruited to the study. The indications for surgery included pelvic pain, lower abdominal discomfort, abnormal uterine bleeding, menometrorrhagia, infertility, and pressure symptoms from a pelvic mass. Some women exhibited more than one indication. History taking, clinical examination, basic investigations (urine analysis, complete blood count, fasting plasma glucose levels, liver, and kidney functions) and vaginal examination, as well as abdominal and transvaginal sonography, were performed. Women complaining about abnormal uterine bleeding underwent endometrial biopsy. The patients with concurrent anticoagulant therapy, hypertension, and premalignant endometrial pathology were excluded from the study. Preoperative treatment with GnRHa were not prescribed.

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Figure 1. — Pericervical tourniquet was applied prior to myomectomy. Initially, a small hole was made in an avascular space in the broad ligament on either side of the uterine isthmus just lateral to the uterine vessels. Through a small hole in the broad ligament on each side of the uterus, a Foley's catheter was placed around the lower uterus.

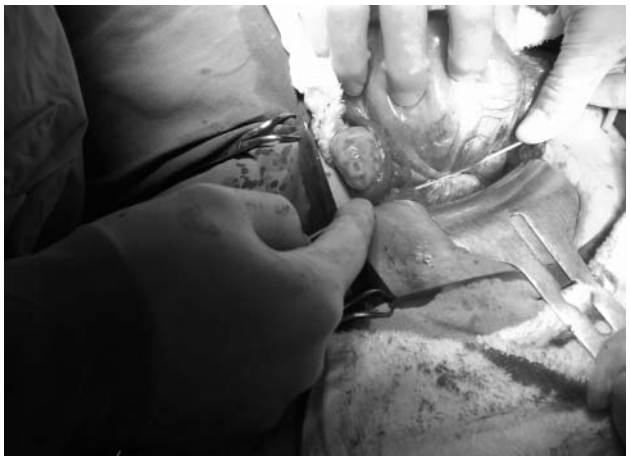

Figure 2. — By tightening the tourniquet sufficiently (over the arterial blood pressure), the blood flow to the uterus is arrested.

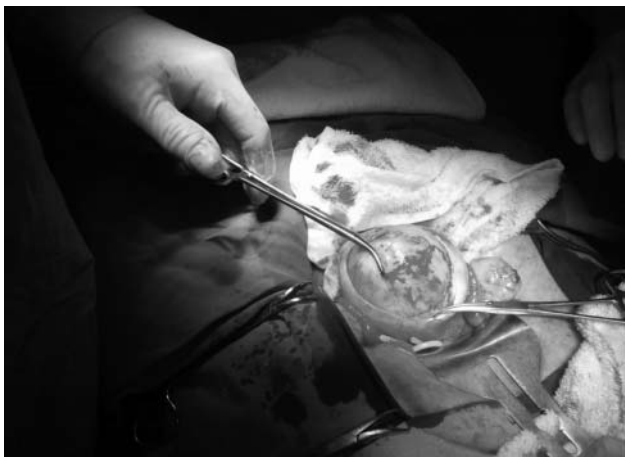

Figure 3. — Myomectomy can be performed in a bloodless field.

Pfannenstiel incision was performed in all patients. The surgical technique was always the same. Pericervical tourniquet were applied prior to myomectomy. Initially, a small hole was made in an avascular space in the broad ligament on either side of the uterine isthmus just lateral to the uterine vessels. Through a small hole in the broad ligament on each side of the uterus, a Foley's catheter was placed around the lower uterus (Figure 1). By tightening the tourniquet sufficiently (over the arterial blood pressure), the blood flow to uterus was arrested (Figure 2). Providing that the venous blood flow is blocked while the arterial blood flow is maintained, it can actually cause blood loss to increase by using the tourniquet. Myomectomy can then be performed in a bloodless field (Figure 3). After reconstruction of the uterus and the determination of adequate hemostasis in the uterus, the tourniquet was removed.

The tourniquet was not applied to the patients in the control group. Transfusions of blood were performed in every patient if the hemoglobin level was less than seven g/dl, or if vital signs were unstable according to hypovolemia.

Clinical data were collected from medical records. The primary outcome measures were estimated blood loss (the difference between soaked and dry towels and blood collected in a drainage system) and the need for blood transfusion. Secondary outcomes included duration of operation, need for intraoperative hysterectomy, postoperative hemoglobin, and hematocrit levels. These results were compared statistically in the study and control groups.

SPSS version 20 program was used for the statistical analysis of data. The Student's *t*-test, chi-square test (X^2), and Fischer exact test were used to compare the two groups. A p value <0.05 was deemed statistically significant.

Results

From August 2008 through January 2013, 67 patients who gave abdominal myomectomy were diagnosed with myoma uteri. The two groups were similar in age, marital status, main complaints, parity, largest myoma diameter, and myoma localization ($p > 0.05$) (Table 1). The most common indication for myomectomies was menorrhagia (47.1% vs 57.6%), followed by pelvic pain/mass (32.3% vs 30.3%), and abortion/infertility (20.5% vs 12.1%). Abdominal myomectomy was performed successfully in all patients. There was no need for hysterectomy or relaparatomy in the pericervical tourniquet group. None of the patients was given a blood transfusion in the intraoperative period. However, postoperative hemorrhage occurred in one patient in control group. The relaparatomy and five unit blood transfusion were performed in this patient but no transfusions were required in study group. None of the patients did not have damage to uterine artery and its branches related to tourniquet.

A giant myoma sized 25 x 20 cm was successfully removed from an unmarried patient aged 36 years in the study group by using pericervical tourniquet technique. The patient did not require blood transfusion in the postoperative period. Intraoperative photos of the case are included in Figures 4 and 5.

The number of myomas removed from the study group (average, 2.6 ± 1.3) was greater than that of the control group (average, 1.4 ± 0.7). ($p<0.005$) (Table 1). Multiple

Table 1. — *Socio-demographical data, main complaints, and myoma localizations of cases.*

Patient characteristics	Study group (n = 34)	Control group (n = 33)	*p* value
Age (years)	37.04 ± 6.7 (26-49)	34.74 ± 5.5 (23-43)	0.210
Marital status			
Married	27 (79.4%)	28 (84.8%)	1.00
Single	6 (17.6%)	5 (15.2%)	1.00
Divorced	1 (2.9%)	_	
Main complaints			
Menorrhagia	16 (47.1%)	19 (57.6%)	0.357
Pelvic pain/mass	11 (32.3%)	10 (30.3%)	0.895
Abortion/infertility	7 (20.5%)	4 (12.1%)	0.476
Parity	1.75 ± 1.32	1.70 ± 1.06	0.878
Number of myomas	2.6 ± 1.3 (1-6)	1.4 ± 0.7 (1-4)	0.001
Maximum myoma diameter (cm)	7.3 ± 5.0 (6-25)	6.8 ± 2.5 (6-12)	0.279
Myoma localization			
İntramural	20 (58.9%)	19 (57.6%)	0.931
Subserous	9 (26.4%)	13 (39.4%)	0.576
Submucous	4 (11.8%)	_	
İntraligamentary	1 (2.9%)	1 (3.0%)	1.00

Table 2. — *Intraoperative blood loss, average duration of operation, discharge time, preoperative and postoperative hemoglobin concentrations, and hematocrit value.*

Patient Characteristics	Study group (n=34)	Control group (n=33)	*p* value
Operative blood loss, ml	286.4 ± 137.5	673.8 ± 172.3	< 0.001
Duration of operation, min	61.5 ± 10.2	78.7 ± 14.6	< 0.001
Discharge time, day	2.9 ± 0.2	4.6 ± 0.3	< 0.001
Preoperative Hb, g/dl	12.4 ± 1.5	11.8 ± 1.6	0.252
Preoperative Htc, %	37.9 ± 3.7	36.4 ± 3.1	0.157
Postoperative Hb, g/dl	11.5 ± 1.4	9.9 ± 1.7	< 0.001
Postoperative Htc, %	34.8 ± 3.4	30.4 ± 3.6	< 0.001
Reduction of Hb, g/dl	0.875 ± 0.48	1.95 ± 1.26	< 0.001
Reduction of Htc, %	3.03 ± 1.53	5.8 ± 3.59	< 0.001

myomectomies was performed in 36 (53.7%) of the 67 patients in total. The average operating time was significantly less in the study group when compared with the control group (61.1 ± 10.2 vs 78.7 ± 14.6 minutes, $p < 0.001$) (Table 1).

İntraoperative blood loss was found to be lower in study group (286.4 ± 137.5 vs 673.8 ± 172.3 ml, $p < 0.001$). There was no statistically significant difference between the two groups in preoperative hemoglobin (Hb) concentrations and hematocrit (Htc) values. However, the average postoperative Hb concentrations were significantly higher in the study group compared with the control group (11.5 ± 1.4 vs 9.9 ± 1.7 g/dl, $p < 0.001$). Similarly, the average postoperative Htc levels were also significantly higher in the study group (34.8 ± 3.4 vs 30.4 ± 3.6) (Table 2). A significant difference was identified in the comparison of postoperative Hb/Htc decreases ($p < 0.03$) of both groups. The average postoperative hospital stay duration was significantly shorter in the study group when compared with the control group (2.9 ± 0.2 vs 4.6 ± 0.3 days, $p < 0.001$) (Table2).

No intraoperative complication occurred in all patients. Febrile morbidity was found in three patients (8.8%) in the study group and in four patients (12.1%) in the control group. There was no statistical difference between the two groups in this respect.

Discussion

The management of leiomyoma's in the young population should be conservative for the preservation of fertility. İn this case, myomectomy is an important alternative for treatment. However, the most important factor that limits the operations of myomectomy is bleeding in intraoperative uterine incision line [1, 6, 16]. Unless the hemorrhage is taken under control, hysterectomy and blood transfusion is required. Pericervical tourniquet method may be utilized in order to hinder this situation.

Figure 4. — Intraoperative appearance of the giant myoma.

Figure 5. — Giant myomectomy was performed with this technique.

The blood flow of uterine is mainly provided from arteria uterina, which branches out from arteria iliaca interna and arteria ovarica, branching out from aorta abdominalis, and these two end branches of arteries do anastomose in ligamentum proprium ovarica [17,18]. In the present study, the authors managed to reduce bleeding during myomectomy by reversibly arresting blood flow at uterine artery with pericervical tourniquet. Also ovarian blood flow was not blocked, so the ovarian functions were not affected. Due to collateral circulation during the operation, the authors did not have to open the tourniquet intermittently. Because a permanent suture was not used in the uterine artery, the authors consider that pericervical tourniquet did not affect the reproduction function.

Diluted vasopressin intramyometrial injection can be applied to reduce bleeding during hormonal tourniquet myomectomy operations [9, 19], but limited total dose (20 units diluted in 20 ml normal saline) and the need for intraoperative arterial or central monitoring are the disadvantages of the vasopressin application. Also bradycardia, cardiac arrest, and severe hypotension are the complications reported after the injection of intramyometrial vasopressin [20]. Local intramyometrial infiltration of low-dose vasopressin may cause lethal cardiopulmonary complications [21].

GnRHa can be effective in reducing blood loss in open myomectomy [11, 22]. The drugs must be used for three months before the operation. GnRHa are expensive and associated with estrogen deficient side-effects (such us hot flushes, change in breast size, vaginal symptoms). In addition, GnRHa therapy may alter the myoma-myometrium interface and induce the disappearance of small fibroids; therefore, it may increase the difficulty of fibroid enucleation and the incidence of recurrent fibroids [23].

Uterine artery embolization (UAE) may be an alternative surgery but the reintervention rate is higher at the medium and long terms. UAE cause shrinkage rather than removal of the myomas, and has limited efficacy when used with very large, multiple myomas [16]. Transient ovarian failure has also been reported as a complication of UAE [24]. This procedure should be reserved for women who have completed their child-bearing [25]. It is; therefore, evident that abdominal myomectomy still has a major role to play. There are no limitations on size and number of myomas, and there are good data showing improvement in outcomes of pregnancy following myomectomy [26].

During myomectomy operations, obstructing blood flow of the uterus and ovarian vessels completely [22, 27] should not be the primary goal. Otherwise, ovarian functions, fertility, and wound healing in the uterus may be adversely affected. Utero-ovarian ischemia may be lead to disseminated intravascular coagulation or hemolytic uremic syndrome [28].

The pericervical tourniquet method can be used safely in multiple leiomyomas as well as very large uterine leiomyomas (≥ 20 weeks) [29]. In the present study, myomectomy with a 25 x 20 cm giant leiomyoma could be performed while preserving the patient's uterus and this caused no excessive intraoperative hemorrhage. None of the patients had excessive intraoperative and postoperative hemorrhage in pericervical tourniquet group.

In conclusion; pericervical tourniquet method should be used to reduce bleeding during operations of abdominal myomectomy. The authors confirmed that the pericervical tourniquet technique was effective, safe, and easily applicable but large randomized controlled trials should be carried out.

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