

# Assessment of Blood Loss in Abdominal Myomectomy by Intramyometrial Vasopressin Administration Versus Conventional Tourniquet Application

MRIGANKA MOULI SAHA<sup>1</sup>, KHUSHBOO<sup>2</sup>, SUBHASH CHANDRA BISWAS<sup>3</sup>, HAJEKUL ALAM<sup>4</sup>,  
GOURI SANKAR KAMILYA<sup>5</sup>, MADHUMITA MUKHOPADHYAY<sup>6</sup>, SARBESWAR MONDAL<sup>7</sup>

## ABSTRACT

**Introduction:** Myomectomy is an invasive surgical procedure. It can be associated with intraoperative and postoperative complications like excessive haemorrhage. There are various methods to control haemorrhage like pharmacological and as well as mechanical methods.

**Aim:** This study was taken to compare intraoperative blood loss following abdominal myomectomy after receiving intramyometrial vasopressin or tourniquet application and to estimate post-operative reduction in haemoglobin & haematocrit values.

**Materials and Methods:** The study was a randomised single blinded parallel group study. Total 48 patients were included in this study according to inclusion and exclusion criteria. All patients were divided into two groups i.e. 'T' and 'V' group, 24 in each group. 'T' group received conventional tourniquet application and 'V' group received intramyometrial vasopressin administration. The analyses in this study were both sided and  $p < 0.05$  was considered significant statistically. The Software

used were Statistica version 6 (Tulsa, Oklahoma: Stat Soft Inc., 2001) and Graph Pad Prism version 5 (San Diego, California: Graph Pad Software Inc., 2007).

**Results:** The blood loss in the tourniquet group was significantly higher ( $p < 0.001$ ). Postoperative haemoglobin and haematocrit were lower in tourniquet group than vasopressin group. There was significant fall in haemoglobin and haematocrit in postoperative period in both group ( $p < 0.001$ ) but it was more in tourniquet group. Total five patients (three in tourniquet group and two in vasopressin group) had received one unit whole blood transfusion.

**Conclusion:** Intramyometrial vasopressin injection during myomectomy operation more effectively decreases the blood loss, need for blood transfusion and it causes less reduction in haemoglobin and haematocrit. Thereby it seems to be an effective method without having any risk of ischemic damage to the uterus.

**Keywords:** Benign tumor, Surgical haemorrhage, Uterine myomectomy

## INTRODUCTION

Uterine myoma originating from the myometrium of the uterus is the most common benign tumor in women. Various prevalence rates ranging from 20-40% are noted in different literatures. The incidence as per the histological diagnosis is much more than the clinical diagnosis. Approximately 60% of women above 45 years of age are harboring myoma [1]. Myoma is mostly asymptomatic. Size and location are the main factors that determine if a myoma leads to symptoms and problems. Important symptoms include abnormal uterine bleeding, abdominal discomfort, bloating, painful defecation, backache, urinary frequency or retention and infertility. It is associated with impairment of Health-Related Quality of Life (HRQOL) [2]. The presence of submucous and intramural myoma decreases fertility and its removal is beneficial [3]. Patients have multiple options in the management of uterine myomas including observation, medical therapy, uterine artery embolization, high intensity focused ultrasound ablation and as well as surgical methods like myomectomy and hysterectomy. Surgical removal is necessary when the myoma is symptomatic and resistant to medical management or interferes with reproduction. Although uterine artery embolization is now an effective way for managing symptomatic uterine myomas but its effect on future conception remains unclear [4]. Myomectomy is an invasive surgical procedure and can be done abdominally, laparoscopically or by robotic method. In our country more commonly myomectomy operation is performed by abdominal incision where the layered closure of

uterus can be achieved easily. Laparoscopic myomectomy requires additional equipments like morcellator because of its small port hole. Results of robotic myomectomy are yet to be proved better than laparoscopic method [5].

Myomectomy is associated with intraoperative and postoperative complications including excessive haemorrhage, pyrexia, visceral damage, thrombo-embolism, conversion to hysterectomy, blood transfusions, scar dehiscence in future pregnancy and many others [6]. Therefore proper haemostasis and layered closure of uterus following myomectomy are very important issues to minimize complications. Haemorrhage is a major concern in myomectomy operation. Bleeding can be prevented if dissection done through the avascular cleft or decreased with mechanical or pharmacologic methods. Use of uterine artery tourniquet during myomectomy causes significant decrease in blood loss. Recently Cochrane Library review discussed several pharmacologic agents to reduce blood loss during myomectomy [7]. One of the commonly used agents is vasopressin. Though it is already well established as a haemostatic agent but there are till date limited evidences and literatures in our country regarding its use by intramyometrial route during myomectomy operation.

## AIM

In this background this study was taken to compare intraoperative blood loss in abdominal myomectomy operation after receiving intramyometrial vasopressin administration or conventional

tourniquet application and to estimate postoperative reduction in haemoglobin and haematocrit.

## MATERIALS AND METHODS

The study was done from 1<sup>st</sup> December 2011 to 1<sup>st</sup> December 2012 at Department of Gynaecology, I.P.G.M.E&R, and Kolkata. Total 48 women of reproductive age group attended at outpatient department and admitted for myomectomy operation were selected according to inclusion and exclusion criteria and equally divided i.e. 24 patients in each vasopressin and tourniquet group. The sample size was calculated to detect the difference of 250 ml estimated blood loss with 80% power & 5% probability of type I error. Inclusion criteria were; women of reproductive age group having symptomatic myoma, not responding to medical therapy or asymptomatic myoma, sonologically diagnosed with desire for fertility, size of the uterus 10-16 wk, total number of myoma not more than three. Women not fulfilling inclusion criteria or having any bleeding diathesis, hypertension, cervical or low corporeal and lateral wall fibroid, unfit for anaesthesia, pregnancy were excluded from the study. The study was done after taking the permission from the institutional ethical committee in accordance with the ethical standards of the responsible committee on human experimentation (institutional) and with the Helsinki Declaration of 1975 that was revised in 2000.

After admission for myomectomy preoperative, intraoperative and postoperative data were collected in preformed structured proforma. Preoperative variables included the age of the patients, parity, marital status, previous abdominal surgeries, preoperative sonographic evaluation including the size, number, location and site of myomas, clinical uterine size, preoperative haemoglobin and haematocrit values. Randomization was done by using random number generator table.

During myomectomy the following things were noted as; number of myomas removed, weight of the removed myomas, operative time, intraoperative blood loss. Postoperative parameters included haemoglobin and haematocrit values (on day three uniformly), blood transfusion requirement in the postoperative period. Reduction in haemoglobin and haematocrit values was calculated from the differences in the preoperative and postoperative haemoglobin and haematocrit values. All operations were performed by same surgical unit involving the senior most consultants.

The default skin incision was transverse suprapubic (Pfannenstiel incision). Tourniquet group received sterile red rubber tube as tourniquet to occlude uterine vessels which was applied immediately before uterine incision and it was released in every 20 minutes to avoid the ischemic damage to uterus and unwanted thromboembolic events. The vasopressin group received intramyometrial vasopressin administration. Twenty units of vasopressin (1ml) diluted in 100 ml of normal saline in a dilution of 1:100 was used intramyometrially just before giving incision over myoma. The volume of vasopressin injected varied depending on the number of myomas to be removed. Estimated intraoperative blood loss was measured by adding the volume in the suction container after completion of each procedure with the estimated blood loss from weighing of the soaked laparotomy mop packs which was placed dry in the abdomen after opening the parietal peritoneum.

The estimated blood loss was considered as the primary outcome measure. Operative time for removal of myoma & securing haemostasis, any complication following administration of intramyometrial vasopressin or conventional tourniquet and blood transfusion requirements were measured as secondary outcomes.

## STATISTICAL ANALYSIS

Numerical variables were compared between both groups by Student's unpaired t-test. For paired comparisons the paired t-test

was used. The Chi-square test or Fischer's exact test was used for intergroup comparison of the categorical variables. The analyses in this study were both sided and  $p < 0.05$  was considered significant statistically. The Software used were Statistical version 6 (Tulsa, Oklahoma: Stat Soft Inc.) and Graph Pad Prism version 5 (San Diego, California: Graph Pad Software Inc.).

## RESULTS

Mean age in both groups were comparable. Most of the myomas were the intramural type and 14 wk size clinically in both groups. Nearly half of the patients underwent removal of two myomas in both groups [Table/Fig-1]. Preoperative haemoglobin and haematocrit values were comparable in both groups i.e. more than 10g/dl and 30% respectively [Table/Fig-1]. The mean weight of the myomas removed was  $110 \pm 15.95$  g in tourniquet group and  $109.4 \pm 22.13$  gm in vasopressin group [Table/Fig-2]. There was no significant difference found in respect of operative time. The amount of mean blood loss in the tourniquet group was  $467.9 \pm 74.50$  cc versus  $356.5 \pm 58.36$  cc in vasopressin group which was significantly higher in tourniquet group ( $p < 0.001$ ) [Table/Fig-2] and postoperative haemoglobin was lower in tourniquet group  $8.9 \pm 0.53$  g/dl in comparison to  $9.5 \pm 0.53$  gm/dl in vasopressin group ( $p = 0.001$ ) [Table/Fig-3]. There was more reduction of haemoglobin in postoperative period in tourniquet group. Postoperative haematocrit was lower in tourniquet group  $26.5 \pm 1.56\%$  in comparison to  $28.7 \pm 1.70\%$  with vasopressin group ( $p < 0.001$ ). Reduction in haematocrit value in postoperative period was more in tourniquet group [Table/Fig-3]. Blood transfusion was also required more i.e., five (20.83%) cases in tourniquet group but only in two (8.33%) cases of vasopressin group [Table/Fig-3]. Histopathological examination of the resected tissue showed leiomyoma in all patients and confirmed the diagnosis of uterine myoma.

Parameters	Tourniquet n = 24	Vasopressin n = 24	p-value
<b>Age(years)</b>			
Range	26-40	27-40	0.946
Median	33.4±4.22	33.5±4.23	
<b>Marital status</b>			
Married	20 (83.33%)	21 (87.50%)	1.000*
Unmarried	4 (16.67%)	3 (12.50%)	
<b>Parity</b>			
Nullipara	19 (79.17%)	18 (75%)	-
Primipara	5 (20.83%)	6 (25%)	
<b>Fibroid type:</b>			
Intramural	12 (50%)	13 (54.17%)	0.952
Submucosal	9 (37.50%)	8 (33.33%)	
Subserosal	3 (12.50%)	3 (12.50%)	
<b>Fibroid volume (cc):</b>			
Range	68.4 – 130.7	65.7 – 138	0.994
Mean	105.9±18.77	105.8±21.61	
<b>Fibroid size(wk):</b>			
Range	10-16	10-16	0.621
Mean	14.1±1.72	13.8±1.76	
<b>Pre- Op. Haemoglobin (g/dl):</b>			
Range	9.8-11.5	9.7-11.4	0.515
Mean	10.5±0.50	10.5±0.47	
<b>Pre- Op. Haematocrit (%):</b>			
Range	29.5 - 34.6	29.5 – 35	0.808
Mean	31.8±1.44	31.7±1.51	

[Table/Fig-1]: Preoperative baseline parameters.  
\* p-value calculated by Fisher's exact test 2-tailed.

Parameters	Tourniquet n = 24	Vasopressin n = 24	p-value
<b>Removed fibroid weight (g):</b>			
Range	90-140	80-180	0.911
Mean	110±15.95	109.4±22.13	
<b>Numbers of fibroid removed:</b>			
1	8 (33.33%)	8 (33.33%)	0.926*
2	12 (50%)	11 (45.83%)	
3	4 (16.67%)	5 (20.83%)	
<b>Operative time (min.):</b>			
Range	30-65	30-65	0.943
Mean	49.0±10.33	48.8±9.63	
<b>Blood loss (cc):</b>			
Range	370-560	300-520	<0.001
Mean	467.9±74.50	356.5±58.36	

[Table/Fig-2]: Intraoperative parameters.

\* Comparison of numerical variables between Groups 'T' and 'V' – Student's unpaired t test.

Parameters	Tourniquet n = 24	Vasopressin n = 24	p-value
<b>Post Op. Haemoglobin (gm/dl):</b>			
Range	8.1-10.4	8.4 -10.6	0.001
Mean	8.9±0.53	9.5±0.53	
Reduction in Haemoglobin (g/dl)	1.60±0.35	0.99±0.18	
p-value	<0.001 <sup>†</sup>	<0.001 <sup>†</sup>	
<b>Post Op. Haematocrit (%):</b>			
Range	24.5 – 31	23-32	<0.001
Mean	26.5±1.56	28.7±1.70	
Reduction in Haematocrit (%)	5.34±1.13	2.95±0.61	
p-value	<0.001 <sup>†</sup>	<0.001 <sup>†</sup>	
<b>Blood transfusion requirement:</b>			
No transfusion	19 (79.17%)	22 (91.67%)	0.416 <sup>‡</sup>
One unit whole blood transfusion	5 (20.83%)	2 (8.33%)	

[Table/Fig-3]: Postoperative parameters.

\* Value adjusted for one unit whole blood transfusion = 0.8 g/dl rise in haemoglobin and 2.5% rise in haematocrit.

† p-value calculated by Student's paired t test.

‡ p-value calculated by Fisher's exact test 2-tailed.

## DISCUSSION

The goal of a myomectomy operation is to remove all the visible and accessible myomas and then reconstruct the uterus. Clinical experience and pooled results of numerous studies suggest that myomectomy can result in considerable blood loss. Haemostasis at the time of surgery is an important issue for the success of the operation and patient's recovery. It has been proved that application of tourniquets to the uterine vessels during myomectomy significantly reduces intra-operative blood loss, the need for blood transfusion and postoperative morbidity. Significant reduction in blood loss has been also observed with the use of intramyometrial administration of vasopressin.

The use of vasopressin was first reported by Dillon in 1962 for abdominal myomectomy. Intramyometrial vasopressin injection promotes haemostasis during myomectomy via expression of vasopressin V1a receptor transcription in the myometrium that acts by constricting the smooth muscle in the walls of capillaries, small arterioles and venules. The unwanted irreversible ischemic damage to the uterus and thrombo-embolic complications of the mechanical methods can be avoided by pharmacologic methods [8]. It has been available in India since 2003 [9]. The saline and vasopressin solution enters through the avascular and least resistance pathway in between the myometrium and the pseudo capsule of myoma which subsequently accelerate in enucleating myoma by aquadissection [10]. So, in our study vasopressin was dissolved in normal saline by 1:100 dilutions. The

patient with multiple myomas often require the longer operative time. Intramyometrial vasopressin injection reduced the operative time and blood loss for myomectomy operation. Resistance index of the uterine artery is increased following local administration. Intramyometrial vasopressin injection is a potentially simple and quick method to facilitate complete resection of myomas [11]. But our study did not showed any significant difference of operative time in between both groups.

The use of vasopressin during myomectomy is a valuable pharmacological method to prevent haemorrhage. The use of vasopressin resulted less intraoperative blood loss than the tourniquet group [12]. In our study also lower fall in haemoglobin level and haematocrit values were observed in vasopressin group compared with the tourniquet group. Local use of diluted vasopressin during myomectomy compared with diluted epinephrine is also found to be very effective in reducing intraoperative blood loss [13].

Intramyometrial vasopressin administration is a useful method to control haemorrhage and as well as the requirement of blood transfusion. In our study also vasopressin group required less blood transfusion. The application of tourniquet over uterine arteries during abdominal myomectomy operation also decreases intra-operative blood loss, operation time and need for blood transfusion [14]. But the advantages of vasopressin over the tourniquet are without risk of any ischaemic damage to the uterus and thromboembolism.

Royal Australian and New Zealand College of Obstetricians and Gynecologists had performed a review considering the literatures published in their countries which comprised of the women undergoing abdominal myomectomy operation. They divided all the patients in to three groups like only vasopressin receiver, combined vasopressin and tourniquet receiver and no intervention for the purpose of comparing the estimated blood loss between each groups during abdominal myomectomy. Combined vasopressin and tourniquet was not associated with a statistically significant decrease in blood loss or need for blood transfusion than vasopressin alone [15]. In our study major complications like ureteric injury, bladder injury, bowel injury, breaching of uterine cavity were not encountered. Moreover electrosurgical coagulation for haemostasis and repeat laparotomy after surgery were not required in our study.

## CONCLUSION

Intramyometrial vasopressin injection during myomectomy operation more effectively decreases the intraoperative blood loss, need for blood transfusion and it causes less reduction in haemoglobin and haematocrit in postoperative period. It also eliminates the risk of unwanted irreversible ischemic damage to the uterus and thrombo-embolic events of mechanical methods.

## REFERENCES

- Okolo S. Incidence, aetiology and epidemiology of uterine fibroids. *Best Practice & Research Clin Obstet & Gynaecol.* 2008;22(4):571-88.
- Downes E, Sikirica V, Gilbert-Estelles J, Bolge SC, Dodd SL, Maroulis C, et al. The burden of uterine fibroids in five European countries. *Eur J Obstet Gynecol Reprod Biol.* 2010;152(1):96-102.
- Pritts EA, Parker WH, Olive DL. Fibroids and infertility: an updated systematic review of the evidence. *Fertil Steril.* 2009;91(4):1215-23.
- Kitson S, Macphail S, Bulmer J, et al. Is pregnancy safe after uterine artery embolisation. *BJOG.* 2012;119:519-21.
- Bedient CE, Magrina JF, Noble BN, Kho RM. Comparison of robotic and laparoscopic myomectomy. *Am J Obstet Gynecol.* 2009;201(6):566.
- Paul GP, Naik SA, Madhu KN, Thomas T. Complications of laparoscopic myomectomy: A single surgeon's series of 1001 cases. *Australian and New Zealand Journal of Obstet and Gynecol.* 2010;50:385.
- Kongnyuy EJ, Wiysongce CS. Interventions to reduce haemorrhage during myomectomy for fibroids. *Cochrane Database Syst Rev.* 2014;8:CD005355.
- Koshimizu T, Nakamura K, Egashira N, Hiroyama M, Nonoguchi H, Tanoue A. Vasopressin v1a and v1b receptors: from molecules to physiological systems. *Physiol Rev.* 2013;92:1813-64.

- [9] Mitra JK, Roy J, Sengupta S. Vasopressin: Its current role in anesthetic practice. *Indian J Crit Care Med.* 2011;15(2):71-77.
- [10] Modi R. Laparoscopic myomectomy with aquadissection and barbed sutures. *J Gynecol Endosc Surg.* 2011;2(1):47-52.
- [11] Wong AS, Cheung EC, Leung KT, Yeung SW, Leung TY, Fung TY, et al. Transcervical intralesional vasopressin injection in hysteroscopic myomectomy-description of a new technique. *J Laparo endosc Adv Surg Tech.* 2013;23(3):258-62.
- [12] American College of Obstetricians and Gynecologists. ACOG practice bulletin no. 96. Alternatives to hysterectomy in the management of leiomyomas. *Obstet Gynecol.* 2008;112(2):387-400.
- [13] Song T, Kim MK, Kim ML, Jung YW, Yun BS, Seong S, et al. Use of vasopressin vs epinephrine to reduce haemorrhage during myomectomy: a randomized controlled trial. *Eur J Obstet Gynecol Reprod Biol.* 2015;195:177-81.
- [14] Iftikhar R. Outcome of abdominal myomectomy. *Journal of Surgery Pakistan* 2009;14(2):85-88.
- [15] Kathiresan AS, Brookfield KF, Quintero VH, Verma U. Vasopressin versus a combination of vasopressin and tourniquets: a comparison of blood loss in patients undergoing abdominal myomectomies. *Australian and New Zealand Journal of Obstet and Gynecol.* 2011;51(1):79-83.

**PARTICULARS OF CONTRIBUTORS:**

1. Senior Resident, Department of Obstetrics and Gynaecology, IPGME&R, Kolkata, West Bengal, India.
2. Senior Resident, Department of Obstetrics and Gynaecology, AIIMS, Patna, Bihar, India.
3. Professor, Department of Obstetrics and Gynaecology, IPGME&R, Kolkata, West Bengal, India.
4. R.M.O., Department of Obstetrics and Gynaecology, IPGME&R, Kolkata, West Bengal, India.
5. Professor, Department of Obstetrics and Gynaecology, IPGME&R, Kolkata, West Bengal, India.
6. Professor, Department of Pathology, IPGME&R, Kolkata, West Bengal, India.
7. Assistant Professor, Department of Obstetrics and Gynaecology, IPGME&R, Kolkata, West Bengal, India.

**NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:**

Dr. Mriganka Mouli Saha,  
97 Rabindranagar, PO Dankuni, Dist Hooghly, West Bengal-712311, India.  
E-mail: itsmemriganka@yahoo.com

Date of Submission: **Oct 24, 2015**  
Date of Peer Review: **Dec 23, 2015**  
Date of Acceptance: **Feb 09, 2016**  
Date of Publishing: **May 01, 2016**

**FINANCIAL OR OTHER COMPETING INTERESTS:** None.