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Effect of Intravenous Tranexamic Acid as an Adjunct Haemostat with Pericervical Tourniquet on Perioperative Blood Loss Following Open Abdominal Myomectomy

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Abstract: Uterine fibroid is a common gynaecological tumour. Abdominal myomectomy is a common surgical treatment for these women. Open abdominal Myomectomy is associated with significant risk of hemorrhage and the need for perioperative homologous blood transfusion with its potential risks, complications and cost. Tranexamic acid is a synthetic lysine derivative with antifibrinolytic activity used in other surgical disciplines to reduce blood loss during surgery. Its efficacy in reducing blood loss when used as an adjunct to pericervical tourniquet has not been elucidated. In a double blind, placebo-controlled trial, we assessed the effect of intravenous tranexamic acid as an adjunct haemostat with pericervical tourniquet on perioperative blood loss following open abdominal myomectomy in 132 ASA I-II women, aged 18–65 years, who had abdominal myomectomy. The patients were randomly allocated to receive either intravenous Tranexamic acid 1gm (n=66) or placebo (n=66) pre-operatively on arrival in theatre immediately after securing an IV access. All the patients also had a peri-cervical tourniquet applied intraoperatively to secure haemostasis. The volume of intraoperative blood loss, haemodynamic changes associated with blood loss and the complications associated with the use of tranexamic acid were evaluated during the first 72 hours following surgery. One hundred and thirty one (131) patients completed the study; Tranexamic acid group 66 and placebo group 65. One patient in the placebo group had uncontrollable postoperative haemorrhage. This necessitated her having total abdominal hysterectomy. She was thus disqualified from the study. Blood loss was significantly lower in the tranexamic acid group. Mean intraoperatively mean arterial pressure (MAP) compared to baseline was lower in the placebo while the mean intraoperative pulse rate compared to the baseline was higher in the placebo group. The only notable perioperative complication was nausea and vomiting. There was no difference in occurrence of complications between the groups. This study shows that intravenous tranexamic acid as an adjunct haemostat with pericervical tourniquet reduced blood loss, provide better haemodynamic stability with acceptable side effects during abdominal myomectomy.

Keywords: Uterine Fibroid, Myomectomy, Blood Loss, Tranexamic Acid, Peri-cervical Tourniquet

1. Introduction

Uterine fibroid, also called uterine leiomyoma, or simply myoma is a benign tumour of the uterus. It is the commonest neoplasia of the uterus and autopsy studies indicate that between 20-50% of women over 30years of age have uterine fibroids of various sizes [1]. The commonest presenting symptom is abnormal uterine bleeding, with heavy and prolonged bleeding [2, 3].

Management of uterine fibroid can be medical or surgical. Options for surgical treatment include hysterectomy and myomectomy which can be carried out via hysteroscopy, laparoscopy, or as an open abdominal procedure with open

abdominal myomectomy being the most commonly used procedure especially when conservation of the uterus is desired [1, 4]. At the University of Maiduguri Teaching Hospital, open abdominal myomectomy was the treatment of choice for 64% of cases admitted with uterine fibroid [5].

Haemorrhage during abdominal myomectomy could be a great challenge as this increases the need for perioperative blood transfusion [4, 6, 7]. In a study of 91 women who underwent open abdominal myomectomy for uterine size greater than 16 weeks, the operative blood loss ranged between 50 to 3000 mL and 8% of the women were transfused with homologous blood [8]. A similar study on 58 women also reported blood loss of 159 to 2500mL while 12.8% of the women received homologous blood transfusion [6].

Homologous transfusion is associated with risks as; labelling errors, allergic reactions, infections, Transfusion Associated Circulatory Overload (TACO) and Transfusion Associated Acute Lung Injury (TRALI). Perioperative transfusion and anaemia have both been associated with increased complications and length of hospital stay in surgical patients [9-11]. It is thus pertinent to use any legitimate means including both pharmacological and non-pharmacological techniques to ensure minimal blood loss, thus avoiding the use of homologous blood transfusion.

In a Cochrane based study, several interventions to reduce blood loss have been explored and these include the use of vasopressin analogues, antifibrinolytic agents, gonadotrophin releasing hormone analogues, oxytocin, misoprostol and peri-cervical tourniquet [2, 12]. These studies drew conclusions from single agents versus placebo and none has utilized adjunct techniques against methods considered standard protocol in developing countries as Nigeria that mainly use peri-cervical tourniquet to reduce blood loss. The use of peri-cervical tourniquet is considered standard practice by most gynaecologists during open abdominal myomectomy at the University of Abuja Teaching Hospital. However, tourniquets are usually released every 30minutes to ensure uterine perfusion and this may increase the potential for increased blood loss. Tranexamic acid (TXA), is an antifibrinolytic agent that reversibly inhibits the activation of plasminogen, thus inhibiting fibrinolysis and reducing bleeding. Tranexamic acid has been used to reduce blood loss and the need for homologous blood transfusion in cardiac surgery, liver transplantation, and orthopaedic surgical procedures [13-15]. It is cheap and readily available.

This study sought to establish its effectiveness in further reducing blood loss when used along with peri-cervical tourniquet during open abdominal myomectomy under regional (combined spinal epidural) anaesthesia.

2. Materials and Experiments

Following ethical committee approval and written informed consent, a randomized, double-blind, placebo controlled study was performed. The exclusion criteria included: Patient refusal to have Regional Anaesthesia; Prior treatment using gonadotropin releasing hormone analogue; Family history of bleeding disorder; Current use of anticoagulant; History of deep vein thrombosis; Previous uterine fibroid embolization; Repeat myomectomy; Hypersensivity to local anaesthetic agent and study drug (TXA); Haemoglobin level of < 10g/dl; Platelet count of < 150,000 platelets per microliter of blood; Fixed cardiac output states; contra-indications to regional anaesthesia; Mental impairment and psychiatric disease; History of congestive heart failure; Valvular heart disease; Renal or hepatic disease and patients with a body mass index (BMI) > 35 kg/m^2). One hundred and thirty two (132) ASA 1–2 patients aged 18–65 years scheduled to undergo open abdominal myomectomy were enrolled into the study. A total of 131 patients satisfactorily completed the study (66 in the Tranexamic group and 65 in the placebo group). The outcome measures used in this study were intraoperative blood loss estimation, haemodynamic stability measured by intraoperative MAP and heart rate changes from baseline and side effects of study drug (TXA).

Assessment of blood loss was done by both volumetric (measuring the volume of blood in the cylinder and subtracting any other fluid used) and gravimetric (soaked swabs were weighed by electronic scale and blood loss estimated by subtracting the soaked weight from the dry weight and then multiplied by 1.050 to convert to volume in mL) methods [8].

Mean Arterial Pressure (MAP) and Heart rate were monitored every 2minutes immediately after instituting the subarachnoid block for the first 15minutes after the block, then every 5minutes subsequently.

Side effects of tranexamic acid were monitored every 8hours until 72 hours postoperatively and managed if they occurred. These included nausea, vomiting, diarrhoea and thrombosis (calf pain, oedema of the leg, superficial vein distension in calf, palpable cord on superficial veins in calf, chest pain, cough, haemoptysis and breathlessness). Patients were allocated in a double-blind manner using random numbers to receive either intravenous TXA 1 gm or placebo inside the theatre suite immediately after intravenous cannulation. Blinding and randomization were undertaken by two investigators not involved in patient evaluation. Other individuals involved in patients' care were unaware of which treatment group the patient belonged to.

Pre-operatively all patients were seen by the same anaesthetist to determine fitness for elective surgery, rule out exclusion criteria, provide information to the patient on the perioperative course, technique of anaesthesia and to allay anxiety. During the pre-anaesthetic review, written informed consent was obtained.

Demographic data was obtained from the patient's case file and these included age, weight, height, presenting symptom and uterine size. These were recorded on the preformed data collection form. A review of the relevant laboratory investigations such as, Full blood count and urinalysis was carried out. The preoperative haemogram and platelet count were recorded. The patients were classified according to the ASA physical status classification and were counselled on

ASA preoperative fasting guidelines. Solid food was discontinued 6hours before surgery while water was allowed until 2hours before surgery. Acid aspiration prophylaxis was given to patients with uterine size > 20 weeks using oral metoclopromide 10mg and ranitidine 150mg the night before and also 2hours before the procedure. Before the arrival of the patient in theatre, a "cockpit" drill was done and preparation made for both general and regional anaesthesia. Resuscitation drugs were also made available.

On arrival in the anaesthetic room, all patients had standard monitoring applied: heart rate, arterial blood pressure, oxygen saturation (SaO_2) and electrocardiogram. The anaesthetic procedure was standardized and all patients had combined spinal epidural block instituted at the level of L2 / L3 or L3 / L4. Three millilitres of 0.5% hyperbaric bupivacaine was injected for the subarachnoid block while an extradural catheter was left in place for the epidural drug injection. The epidural was activated 90minutes following the subarachnoid block. Five minutes following the administration of a 3-ml test dose of 2% lidocaine, 16–20 ml in 5ml aliquots of bupivacaine (5.6 mg/ml)) with epinephrine 1: 200 000 were administered epidurally. Additional boluses of 5 ml bupivacaine (5.6 mg/ml) were administered if there were signs of inadequate analgesia. A minimum interval of 30 min was observed between injections.

Intraoperative vital signs were recorded every 5minutes. These included heart rate, blood pressure, arterial oxygen saturation and continuous electrocardiogram (ECG). Other intra-operative variables recorded include: the length of surgery; blood loss and anaesthetic and surgical complications. Hypotension defined as systolic blood pressure less than 90mmHg was treated with Ephedrine in 3mg aliquot while bradycardia defined as heart rate less than 60 beats/per minute was treated with atropine 0.01mg/kg intravenously. If required, metoclopramide (10 mg) was given for nausea. If this was ineffective, then ondansetron (4 mg) was given.

All surgeries were performed by a Consultant Gynaecologist using Foleys catheter as tourniquet and applied to the base of the uterus close to the insertion of the utero sacral ligaments. The tourniquet was released intermittently (at 30minutes interval) during the surgery, reapplied after 2minutes and finally removed after the repair of the uterus. Blood loss estimation was done by both volumetric (measuring the volumes in the cylinder and subtracting any other fluid used) and gravimetric (soaked swabs weighed by electronic scale and blood loss estimated by subtracting the soaked weight from the dry weight and multiplied by 1.050 to convert to volume in mL) methods. Blood transfusion was done following the loss of ≥ 20% of patients total blood volume or any blood loss causing reduction in blood pressure of ≥ 20% from baseline and tachycardia of ≥ 20% of baseline values. Total number of units of blood transfused was noted.

At the end of surgery the epidural catheter was kept in place for 24hr for postoperative pain management. Subsequently, it was removed. Side effects of tranexamic acid were monitored every 8hours until 72hours postoperatively and managed, if they occur. These included nausea, vomiting, diarrhoea and thrombosis (calf pain, oedema of the leg, superficial vein distension in calf, palpable cord on superficial veins in calf, chest pain, cough, haemoptysis and breathlessness). To ensure blinding, postoperative assessment was not performed by the same physician who had performed the pre-operative evaluation.

Data was collected using a structured data collection form. Patients' age as at last birthday, sex, weight in kilogram, height of patient in centimeters, associated comorbid conditions, surgical diagnosis and procedure, duration of surgery and anaesthesia and other intraoperative data were recorded. Demographic data was analyzed using the Statistical Package for Social Science (SPSS) version 20 for windows. Summary of statistics was done using means and standard deviation and the results presented as tables, percentages. Tests of association for continuous variables were done using Student's t-test and Pearson's correlation. A p- value of less than 0.05 was considered statistically significant.

3. Result

One hundred and thirty one (131) patients completed the study; tranexamic acid group 66 and placebo group 65. One patient in the placebo group had uncontrollable postoperative haemorrhage. This necessitated her having total abdominal hysterectomy. She was thus disqualified from the study.

Baseline demographic and clinical characteristics of the women were comparable in the two groups for age, body mass index (BMI), uterine size and preoperative haemoglobin (Table 1). The mean age of the participants in the tranexamic acid group was 34.4±3.6 years and 35.9±5.5 years in the placebo group (p=0.072). The uterine size was comparable in both groups with mean uterine size of 23.9±6.4 weeks in the tranexamic acid group and 23.3±5.4 weeks in the placebo group (p=0.552). The mean preoperative haemoglobin in the tranexamic acid group was 11.0±0.9 g/dl and in the placebo group was 11.2±0.9g/dl (p=0.178).

The mean baseline measurements of heart rate, mean arterial pressure, respiratory rate and arterial oxygen saturation (SPO_2) were comparable in the two groups (p=0.767, 0.292, 0.962, 0.2123 respectively) [Table 2]. Also, the mean number of fibroids enucleated was comparable in the two groups, 14.8±9.3 and 15.5±6.1 in the placebo and tranexamic acid group respectively and this was not statistically significant (p=0.603) [Table 3].

Major blood loss > 1000 ml was recorded only among women in the placebo group [Table 4]. There were 22 cases of excessive blood loss (>1000ml), and all of these were in the placebo group. There was a statistically significant lower mean blood loss in the tranexamic acid group 415.4±173.2 (median=400, range=50–800 ml) compared to 807.5±366.6 (median=840, range 350–1900) ml in the placebo group ($p < 0.001$) [Table 4].

Table 1. *Demographic and clinical characteristics of the patients.*

	Group		t- Statistic	P-value
	Placebo	Tranexamic		
	Mean±SD	Mean±SD		
Age (years)	35.9±5.5	34.4±3.6	1.8153	0.072
BMI (Kg/m^2)	28.7±2.0	28.4±2.1	0.833	0.406
Uterine size	23.3±5.4	23.9±6.4	0.596	0.552
Preoperative Hb	11.2±0.9	11.0±0.9	1.355	0.178

Table 2. *Baseline haemodynamic variables.*

	Group		t-statistic	P-value
	Placebo	Tranexamic		
	n=65	n=66		
	Mean±SD	Mean±SD		
SBP (mmHg)	123.9±9.6	124.5±9.0	0.355	0.723
DBP (mmHg)	73.6±4.5	72.2±1.7	2.296	0.024*
MAP (mmHg)	92.4±5.0	91.6±2.8	1.054	0.292
PR (beats/minute)	72.5±3.0	72.6±3.1	0.298	0.767
RR (cycles/minute)	14.0±1.9	14.0±1.9	0.044	0.965
SPO_2 (%)	98.4±0.8	98.3±0.8	1.251	0.213

*significant at 0.05.

Table 3. *Mean number of fibroid enucleated.*

	Group		Mean difference	t-statistic	P-value
	Placebo	Tranexamic			
	n=65	n=66			
	Mean±SD	Mean±SD			
Number of fibroid	14.8±9.3	15.5±6.1	0.716	0.519	0.603

Table 4. *Comparison of intraoperative blood loss between groups.*

Blood loss (ml)	Group		Total n (%)	χ^2	P-value
	Placebo	Tranexamic			
	n=65	n=66			
	n (%)	n (%)			
< 500	11 (16.9)	48 (72.7)	59 (45.0)	49.119	<0.001*
500-1000	32 (49.2)	18 (27.3)	50 (38.2)		
>1000	22 (33.8)	0	22 (16.8)		
Blood loss (ml)	807.5±366.6¥	415.4±173.2¥	*Na*	7.809¶	<0.001*
Range	350-1900	50-800			
Median	840	400			

*significant at 0.05.

Table 7 shows the mean postoperative haemoglobin. In the tranexamic acid group, 33 (50%) of the women had a postoperative haemoglobin ≥ 10g/dl compared to the placebo group where only 18 (27.7%) of the women had a postoperative haemoglobin ≥10g/dl. There was a statistically significant lower mean postoperative haemoglobin in the placebo group 8.7±1.9g/dl (median=8.4, range=4-12) compared to the tranexamic acid group 9.3±1.1g/dl (median=9.8, range=7-11.5), (p=0.026) [Table 5].

The duration of surgery was noted to be longer in the placebo group 162.4±60.8minutes compared to the tranexamic acid group 117.7±25.9minutes (p < 0.001) [Table 6].

Intraoperative haemodynamic variables as seen in Table 7 shows that the mean measurements of the heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and respiratory rate (RR) in the tranexamic acid and placebo groups differed significantly. There was a statistically significant decrease in the mean arterial pressure (MAP) from baseline in the placebo group 75.4±13.4mmHg compared to the tranexamic acid group 84.2±15.2 (p=0.001). The mean intraoperative pulse rate was significantly increased from baseline in the placebo group 81.4 + 9.2 compared to the tranexamic acid group 74.3 + 6.4 (p < 0.001) [Table 8]. There was no significant difference in the mean oxygen saturation between the placebo and tranexamic acid groups [Table 8].

Side effects of tranexamic acid assessed showed that 5 women complained of nausea, 3 (4.5%) in the tranexamic acid group and 2 (3.1%) in placebo group (OR=0.7, CI=0.1–4.1) which was not statistically significant (p=0.661) while 2 women vomited, 1 (1.5%) in the tranexamic acid group and 1 (1.5%) in the placebo group (OR=1.0, CI=0.1–16.6) which was not statistically significant. No incidence of thromboembolic event was noted in any of the women.

Table 5. *Comparison of post-operative hemoglobin between groups.*

	Group		Total n (%)	χ^2	P-value
	Placebo	Tranexami c			
	n=65	n=66			
	n (%)	n (%)			
Postoperative Hb (g/dl)					
<10	47 (72.3)	33 (50.0)	80 (61.1)	6.855	0.009*
≥10	18 (27.7)	33 (50.0)	51 (38.9)		
Postoperative Hb (g/dl)	8.7±1.9¥	9.3±1.1¥	*Na*	2.265¶	0.026*
Range	4-12	7-11.5			
Median	8.4	9.8			

*significant at 0.05

Table 6. *Comparison of duration of surgery between groups.*

	Group		Mean difference	t-statistic	P-value
	Placebo	Tranexamic			
	n=65	n=66			
	Mean±SD	Mean±SD			
Duration of surgery (minutes)	162.4±60.8	117.7±25.9	44.657	5.456	<0.001*

*significant at 0.05.

Table 7. *Intraoperative haemodynamic variables.*

	Group		t-statistic	P-value
	Placebo	Tranexamic		
	n=65	n=66		
	Mean±SD	Mean±SD		
SBP (mmHg)	104.6±15.3	114.5±17.5	3.446	0.001*
DBP (mmHg)	62.1±12.0	67.7±11.8	2.685	0.008*
MAP (mmHg)	75.4±13.4	84.2±15.2	3.481	0.001*
PR (beats/minute)	81.4±9.2	74.3±6.4	5.129	<0.001*
RR (cycles/minute)	15.8±2.3	14.7±3.1	2.785	0.006*
SPO2 (%)	97.9±1.1	98.0±0.9	0.331	0.741

*significant at 0.05.

Table 8. *Comparison of difference betwween mean baseline and intraoperative haemodynamic variables between groups.*

	Group		t-statistic	P-value
	Placebo	Tranexamic		
	n=65	n=66		
	Mean±SD	Mean±SD		
SBP (mmHg)				
Baseline	123.9±9.6	124.5±9.0	0.355	0.723
Intraoperative	104.6±15.3	114.5±17.5	3.446	0.001*
DBP (mmHg)				
Baseline	73.6±4.5	72.2±1.7	2.296	0.024*
Intra-operative	62.1±12.0	67.7±11.8	2.685	0.008*
MAP (mmHg)				
Baseline	92.4±5.0	91.6±2.8	1.054	0.292
Intra-operative	75.4±13.4	84.2±15.2	3.481	0.001*
PR (beats/minute)				
Baseline	72.5±3.0	72.6±3.1	0.298	0.767
Intra-operative	81.4±9.2	74.3±6.4	5.129	<0.001*
RR (cycles/minute)				
Baseline	14.0±1.9	14.0±1.9	0.044	0.965
Intra-operative	15.8±2.3	14.7±3.1	2.785	0.006*
SPO_2 (%)				
Baseline	98.4±0.8	98.3±0.8	1.251	0.213
Intra-operative	97.9±1.1	98.0±0.9	0.331	0.741

*significant at 0.05.

4. Discussion

This study assessed the efficacy of intravenous tranexamic acid as an adjunct haemostat to pericervical tourniquet on perioperative blood loss during open abdominal myomectomy. The findings of this study indicate that intravenous tranexamic acid reduced the volume of blood loss amongst women undergoing open abdominal myomectomy when used as an adjunct haemostat to pericervical tourniquet. Also, postoperative haemoglobin was higher among women that received intravenous tranexamic acid, compared to their counterparts that received placebo. The mean intraoperative systolic blood pressure, diastolic blood pressure and mean arterial pressure were significantly reduced when compared to baseline in the placebo group compared to the tranexamic acid group. The mean pulse rate measured intraoperatively was significantly higher when compared to the baseline in the placebo group than in the tranexamic acid group. However, symptoms of nausea and vomiting (which necessitated the use of IV metoclopramide) were noted. There was no incidence of thromboembolic event.

Uterine fibroids are diagnosed in 25% of women of reproductive. [16]. It was reflected in this study in which the women fell within the reproductive age group. Uterine fibroid is a common reason for gynecological consultation in most Nigerian hospitals [17].

The efficacy of intravenous tranexamic acid as demonstrated in this study is in accordance with the results of previous studies that compared intravenous tranexamic acid to placebo, reporting a lesser blood loss with tranexamic acid when compared to placebo [12, 18-21]. The use of intravenous tranexamic acid resulted in less intraoperative blood loss, 415.4±173.2ml (median=400) in the tranexamic acid group compared with 807.5±355.6ml (median=840) in the placebo group. This is similar to the finding by Shaaban et al [20] in 2015 that evaluated the efficacy of tranexamic acid in reducing blood loss during and after open abdominal myomectomy for patients with three (3) or more uterine fibroids [20]. The tranexamic acid group showed a lower amount of blood loss (407ml) when compared to the placebo group (677ml) with a p-value < 0.01. In the Shaaban et al study treatment with tranexamic acid resulted in a decrease in risk of perioperative blood loss by 40%.

Similarly, two different studies by Nahla et al [18] and Caglar et al [21], found that intravenous tranexamic acid reduced blood loss during open abdominal myomectomy. In the study by Nahla et al [18], blood loss was noted to be less (721.71±211.78) in the group that received intravenous tranexamic acid compared to 1080±126.07 in the placebo group [18]. Similarly, in the study by Caglar et al [21], the authors reported that intravenous tranexamic acid decreased the perioperative blood loss during excision of myoma in the tranexamic acid group (804±482 ml) compared to the placebo group (1047±617 ml) [19]. However, the volume of blood loss in the two studies above (both in the tranexamic acid and placebo group) is higher when compared to the finding of this present study. This is probably due to the application of peri-cervical tourniquet in both groups in this present study. The use of pericervical tourniquet is a common practice in our institution. The use of pericervical tourniquet as the Foley's catheter to occlude the uterine blood supply has been shown to reduce blood loss during myomectomy [4, 12]. Also, myomectomy without uterine blood vessel occlusion results in so much haemorrhage that it is not recommended for uterine sizes greater than 12 weeks [22].

Overall, the results of the present study is in keeping with the trend observed in the literature that intravenous tranexamic acid reduces blood loss during abdominal myomectomy, when compared with placebo. On the contrary, Sammy et al [9] in a study on the use of intravenous tranexamic acid as an adjunct haemostat to ornipressin during open myomectomy in 34 patients noted no significant difference in blood loss between the two groups with a median blood loss in the ornipressin group (n=17) and ornipressin plus tranexamic acid group of 398ml and 251ml respectively (p=0.361) [9]. In the Sammy et al [9] study the technique of anaesthesia, rank of the surgeon, uterine size, location and the number of fibroid enucleated were not mentioned. Caglar et al [21] emphasized the importance of the above parameters in perioperative blood loss during myomectomy.

In this study, the mean baseline systolic blood pressure, diastolic blood pressure and mean arterial pressure were significantly more reduced in the placebo group than in the tranexamic acid group when compared to the mean intraoperative values (p=0.001, p=0.008 and p=0.001). The mean pulse rate was also significantly higher in the placebo group compared to the tranexamic acid group (p=0.001). Sudden blood loss of moderate degree causes fall in blood pressure, which is compensated for by baroreceptor mediated rise in heart rate and vasoconstriction. This is reflected in this study where blood loss was associated with a reduced blood pressure and an increase in heart rate.

Five (5) women complained of nausea, 3 (4.5%) in the tranexamic acid group and 2 (3.1%) in the placebo group (OR=1.0, CI=0.1–16.6) but this was not statistically significant (p=0.661).). Also, two (2) women vomited, 1 (1.5%) in tranexamic acid group and 1 (1.5%) in placebo group (OR=1.0, CI=0.1–16.6). This was also not statistically significant. These symptoms were treated with 10mg of metoclopramide administered intravenously. There was no incidence of thromboembolic event noted in any of the women in this study. In a randomized control trial on reducing blood loss during open myomectomy with intravenous versus topical tranexamic acid, Nahla et al [18] reported side effects of nausea, vomiting and diarrhea. However similar to the findings in this study, these were not statistically significant (p=0.102, 0.87 and 1.00). There was also no incidence of thromboembolic event. Inspite of the fact that tranexamic acid administration has shown a risk for complication like thrombosis and embolism due to its

antifibrinolytic effect, thromboembolic events have not been reported in most of the studies [18-21].

All the participants in this study had pericervical tourniquet application. This is standard practice in our institution. The use of peri-cervical tourniquet as the Foley's catheter to occlude the uterine blood supply has been shown to reduce blood loss during myomectomy [4, 12]. Using a combination of tranexamic acid plus tourniquet as was done in this study was more efficacious in reducing blood loss compared to studies that used only tranexamic acid [18, 21]. Blood loss during myomectomy is primarily incurred while operating on the uterus and can be affected by factors like; uterine size, number of fibroids removed, rank of surgeon and technique of anaesthesia [23-25]. Thus, it was ensured that all surgeries were done by a consultant gynaecologist using combined spinal epidural anaesthesia. The mean uterine size and number of fibroids enucleated in both groups were comparable. As a result they had no effect on blood loss in this study.

5. Conclusion

Blood loss during open abdominal myomectomy is significantly reduced when tranexamic acid is used as an adjunct haemostat to pericervical tourniquet. The percentage contribution of tranexamic acid to this loss is not known and was not evaluated in this study. Blood transfusion during operative procedures is often the consequence of intraoperative blood loss. While blood transfusion may be necessary, it is still undesirable. However it is unknown whether despite the reduced blood loss, tranexamic acid when used as an adjunct haemostat to pericervical tourniquet will result in reduced need for homologous blood transfusion in the perioperative period. This should be the subject for another study.

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