Original Article
DOI: https://doi.org/10.70749/ijbr.v3i5.1509

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://induspublishers.com/IJBR
ISSN: 2960-2793/ 2960-2807

Comparison of Transamine and Vasopressin for Peri-Oprative Blood Loss in Patients Undergoing Myomectomy: A Prospective Analysis

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ARTICLE INFO

Keywords: Myomectomy, Tranexamic Acid (TXA), Vasopressin, Perioperative Blood Loss, Blood Transfusion, Hemodynamic Stability, Gynecological Surgery, Uterine Fibroids.

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Declaration
Authors' Contribution
All authors equally contributed to the study and approved the final manuscript..

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History
Received: 04-03-2025 Revised: 25-04-2025
Accepted: 18-05-2025 Published: 31-05-2025

ABSTRACT

Background: Significant perioperative blood loss is frequently linked to myomectomy, a surgical operation used to remove uterine fibroids. This can result in consequences such anemia, hemodynamic instability, and the requirement for blood transfusions. Common hemostatic medications used to reduce blood loss include tranexamic acid (TXA) and vasopressin. Research on their relative efficacy in myomectomy is still ongoing, nevertheless. **Objective:** The purpose of this study is to evaluate how well Vasopressin and TXA reduce perioperative blood loss in patients having myomectomy. Hemodynamic stability, transfusion needs, intraoperative blood loss, and postoperative recovery results are all assessed in this study. **Methodology:** At Combined Military Hospital Lahore, 200 patients undergoing myomectomy participated in a prospective study. Patients were split into two groups, each with 100 participants: Group A (TXA) and Group B (Vasopressin). We gathered and examined information on hemodynamic stability, postoperative recovery, intraoperative blood loss, and transfusion requirements. **Results:** Compared to TXA (400 ± 50 mL), vasopressin showed a marginally higher reduction in intraoperative blood loss (350 ± 45 mL). Compared to the TXA group (12%), fewer patients (8%) in the Vasopressin group suffered from severe blood loss (>500 mL). Compared to the TXA group (15%), the Vasopressin group (10%) required fewer blood transfusions. Vasopressin also led to reduced postoperative hemoglobin decreases, shorter hospital stays (3 ± 1 days vs. 3.5 ± 1 days), and improved hemodynamic stability. Vasopressin, however, has been linked to certain cardiovascular hazards such arrhythmias and hypotensive episodes. **Conclusion:** Vasopressin and TXA both work well to reduce perioperative blood loss after myomectomy. Vasopressin showed excellent hemostatic control, which improved recovery results and decreased blood loss and transfusion requirements. However, cautious patient selection is required due to its cardiovascular adverse effects. TXA is still a safer option, especially for people who are at risk for cardiovascular disease. In order to improve blood management techniques in gynecological surgery, more extensive research is required.

INTRODUCTION

Women enlarge myomectomy because they want to preserve fertility or relieving symptoms caused by uterine fibroids (Pritts et al., 2015). Myomectomy is one of the major problems related to perioperative blood loss that can cause severe morbidity, prolonged hospitalization and need of blood transfusions (Friedman et al., 2018). Two out of the most commonly explored pharmacological therapies in search of blood loss reduction during the intraoperative stage are tranexamic acid

(TXA) and vasopressin (Sentilhes et al., 2015). However, both of these medications are still being studied to determine how well they reduce blood loss during myomectomy.

A technique called laparoscopic myomectomy is a minimally invasive form of surgical treatment of symptomatic uterine fibroids that are in place in reproductive aged women. New data show very low complication and conversion to laparotomy (Bean et al., 2017) rates associated with these operations; these operations are very successful with proper patient selection; laparoscopic myomectomy compared to other surgical techniques has a shorter hospital stay, lower postoperative pain scores, and no difference in leiomyoma recurrence possibility (Shen, Q et al., 2015). The prediction of blood loss associated with robotic and laparoscopic myomectomies in comparison to open myomectomies is

also associated with a reduced transfusion (Meurs et al., 2017) ∗(Ton, R et al., 2015).

The synthetic lysine analog tranexamic acid acts as an antifibrinolytic drug by stopping plasminogen activation and plasmin activity, and thereby preventing bleeding and stabilizing blood clots (Roberts et al., 2013). TXA has the ability to dramatically reduce both blood loss and the need for transfusion in a variety of surgical settings such as orthopedic, cardiac, and obstetric cases (Gayet-Ageron et al., 2018). In gynecological surgery, specifically those of myomectomy which have a high risk of bleeding the intraoperative blood loss is successfully lowered by TXA (Wright et al., 2012).

The powerful vasoconstrictor vasopressin causes vasoconstriction and decreases blood flow to the myometrium, thus is frequently used during gynecologic surgery to decrease blood loss (Descargues et al., 2011). So far, local infusion of vasopressin in myometrium has proven to improve surgical outcome while substantially reducing intraoperative blood loss (Worley et al., 2018). H however, use of this drug has been restricted to regular use in some therapeutic contexts due to the possible cardiovascular effects of this drug, like arrhythmias and hypertension (Jain et al., 2019). Although evidence regarding vasopressin and TXA to minimize blood loss during myomectomy is still being researched, conflicting findings have been observed from trials (Miller et al., 2020).

Perioperative blood loss is the total amount of blood lost during and right after surgery and has a big influence on patient outcomes (Shakur-Still et al., 2018). Schwartz et al. (2017) explained that myomectomy may result in excessive blood loss necessitating blood transfusion, hemodynamic instability and prolonged recovery. The surgical technique, fibroid size and location, the presence of other medical problems, use of medication to control bleeding, such as TXA and vasopressin, are also some factors that affect perioperative blood loss.

Management of blood loss during myomectomy is an endeavor that presents both high prevalence of fibroids among women of reproductive ages and associated surgical risks (Bulun, 2013). Despite the efficacy of TXA and vasopressin in reducing blood loss (Novikova et al., 2020), a direct comparative analysis is needed to identify the superior drug based on safety and efficacy as well as its impact on surgical outcomes. This study compares the efficacy of TXA and vasopressin in reducing in perioperative blood loss in myomectomy patients with the purpose of providing evidence-based guidelines for clinical practice.

The purpose of this study is to contribute to important understanding of perioperative blood control strategies by comparing the effectiveness of different medications in order to improve surgical outcomes and patient safety in gynecological practice (Sentilhes et al., 2015).

LITERATURE REVIEW

Excessive perioperative blood loss during myomectomy is frequently due to hemostatic problems, thereby requiring the use of hemostatic medications to avoid problems and to further improve surgical results. Several pharmacological medications such as vasopressin and transamine (tranexamic acid) have been studied for their effectiveness of reducing intraoperative blood loss. This review examines available data comparing hemostatic properties, safety profile and clinical implications of transamine and vasopressin in myomectomy.

Synthetic antifibrinolytic drug, transamine, prevents plasminogen activation and stabilizes clot formation to limit bleeding (Roberts et al. 2013). It is effective in a number of medical specialties including gynecology, in lowering blood loss and the requirement for transfusions (Shakur-Still et al., 2018).

A number of research has been made to assess the function of transamine in myomectomy. According to Wright et al. (2012), patients receiving Transamine had significantly less intraoperative blood loss compared with those that did not. According to a systematic study by Gayet-Ageron et al (2018), transamine similarly lowers perioperative hemorrhage without increasing thromboembolic events. The results suggest that transamine is a useful medication to minimize blood loss during myomectomy and other gynecologic procedures.

The powerful vasoconstrictor vasopressin has been used extensively to lower uterine perfusion and enhance hemostasis and therefore reduce blood loss in gynecologic surgery (Descargues et al., 2011). In fact, there are numerous studies that confirm its efficiency in myomectomy and show that it can reduce intraoperative bleeding and improve surgical visibility (Worley et al., 2018).

But vasopressin's systemic cardiovascular effects have attracted criticism. However, Jain et al. (2019) state that vasopressin is useful in preventing blood loss but some patients experience bradycardia, arrhythmias and temporary hypertension. Though, Miller et al. (2020) investigation confirmed vasopressin as a hemostatic agent in myomectomy as it was well tolerated by the majority patients undergoing gynecologic surgery.

As far as we know, there is still no research going on a direct comparison of vasopressin and transamine in myomectomy. According to some research,

Transamine's antifibrinolytic action is preferred, because it lowers bleeding without causing vasoconstriction (Sentilhes et al., 2015). However, while vasopressin has immediate hemostatic effects with constrictive qualities, these may present a cardiovascular risk in patients at risk (Jain et al., 2019).

Schwartz et al.'s (2017) meta-analysis found that transamine and vasopressin are potent hemostatic drugs that, when compared to other hemostatic drugs in myomectomy, did significantly decrease intraoperative blood loss. In patients with preexisting cardiovascular disease, however, transamine was associated with improved safety.

Myomectomy is one of the principal indications for its use, and pharmacological agents such as Transamine and vasopressin are part of the surgical and non surgical management strategies of HMB. The leading cause of gynecologic intervention is one of HMB and, though hysterectomy is commonly utilized to treat HMB,

Myomectomies are increasingly favored over hysterectomies because they offer woman who may desire to preserve fertility, Munro (2007) further supported the use of antifibrinolytic drugs such as Transamine in myomectomy to help reduce perioperative blood loss because they were effective in controlling HMB. Two per procedure treatments, vasopressin and transamine, have been proven to be effective in decreasing perioperative blood loss after myomectomy, and reducing the need for drastic treatments such as hysterectomy may be achieved by optimizing surgical results to achieve efficient blood loss control. Hence transamine represents an antifibrinolytic approach with a very good prognosis of adverse cardiovascular effects whereas vasopressin has an immediate vasoconstrictive effect. The clinical consequences of high blood loss in gynecologic surgery make more comparative study required to determine the best pharmacological approach to hemostasis in myomectomy.

RESEARCH OBJECTIVE

The aim of this study was to compare both Vasopressin and Tranexamic Acid (TXA) for effectiveness in lowering perioperative blood loss in patients having myomectomy. The technical name of uterine fibroids removal is myomectomy. Problems such anemia, hemodynamic instability, and need for blood transfusion may occur. An antifibrinolytic drug called tranexamic acid blocks plasminogen activation and decreases bleeding by an antifibrinolytic activity, whereas vasopressin is a strong vasoconstrictor and decreases bleeding by a vasoconstrictor activity. The purpose of this study will be to determine the best agent for maximizing surgical outcomes, improving patient safety, decreasing blood loss and blood transfusion requirements during myomectomy, based on intraoperative and postoperative blood loss, blood transfusion requirements, and hemodynamic stability.

METHODOLOGY

This study was to compare the effectiveness of Vasopressin and Tranexamic Acid (TXA) in decreasing perioperative blood loss in patients with myomectomy. The work is qualitative and prospective. The study was done at Combined Military Hospital Lahore. Among them were 200 who were about to have myomectomy. Patient selection using purposive sampling included age (25–45 years), findings of symptomatic fibroids on disease history questionnaire and point of care ultrasound and scheduled surgical procedure. Exclusion criteria included patients who had history of known hypersensitivity to either tranexamic acid or vasopressin, coagulopathies, or pregnancy.

Surgeon observations, patient feedback and intraoperative assessments of blood loss were the sources of qualitative data. The additional parameters chosen to be recorded were the need for blood transfusion, intraoperative hemodynamic stability, and postoperative recovery.

Thematic analysis of surgeons' and patients' qualitative comments was used to interpret the data. Similarly, variations from transfusion rates, blood loss, and recovery results were also comparatively tabulated in the study.

RESULTS

Table 1

Patient Demographics

Variable	Group A (TXA)	Group B (Vasopressin)
Number of Patients	100	100
Mean Age (years)	35 ± 5	34 ± 6
BMI (kg/m^2)	26 ± 3	25 ± 2
Parity	2.3 ± 1.1	2.4 ± 1.2

Table 2

Intraoperative Blood Loss (mL)

Blood Loss (mL)	Group A (TXA)	Group B (Vasopressin)
Mean Blood Loss	400 ± 50	350 ± 45
Patients with >500mL loss	12%	8%

Table 3

Blood Transfusion Requirements

Transfusion Needed	Group A (TXA)	Group B (Vasopressin)
Required Transfusion	15%	10%
Units Transfused (mean)	1.5 ± 0.5	1.2 ± 0.4

Table 4

Intraoperative Hemodynamic Stability

Variable	Group A (TXA)	Group B (Vasopressin)
Mean BP (mmHg)	110/70	108/72
Heart Rate (bpm)	85 ± 6	82 ± 5
Hypotensive Events	10%	5%

Table 5

Postoperative Recovery and Complications

Outcome	Group A (TXA)	Group B (Vasopressin)
Mean Hospital Stay (days)	3.5 ± 1	3 ± 1
Post-op Hemoglobin Drop (g/dL)	1.8 ± 0.5	1.5 ± 0.4
Post-op Pain Score (VAS 1-10)	5 ± 1	4 ± 1
Surgical Site Infection	5%	3%

DISCUSSION OF RESULTS

Demographics of the two groups were no differing importantly with regard to mean age, BMI or parity. This commonality ensures that any differences in blood loss and recovery results that are observed are most likely not patient individual factors, but rather the drug difference that was given.

The intraoperative blood loss occurred at a mean of 350 ± 45 mL in the

Vasopressin group and 400 ± 50 mL in the TXA group. In addition, less patients in Vasopressin group (8%) than in TXA group (12%) had severe blood loss (> 500 mL). These results suggest that the reduction of intraoperative bleeding during myomectomy might be achieved marginally better with vasopressin.

As it turned out, a higher number of blood transfusions were required by the TXA group (15%) compared to the Vasopressin group (10%). In addition, the group treated with Vasopressin had received an average of 1.2 ± 0.4 transfusion units, while the group treated with TXA had 1.5 ± 0.5 transfusion units. This confirms the trend that

Vasopressin decreases hemorrhage, and blood transfusion can be avoided.

The stability of intraoperative Hemodynamic parameters of both groups were constant. Finally, in contrast to the TXA group, whose mean heart rate was 85 ± 6 bpm, the mean heart rate of that of the Vasopressin group was 82 ± 5 bpm. The Vasopressin group had fewer hypotensive episodes (5%) compared to that of the TXA group (10%), which may suggest that Vasopressin improves intraoperative hemodynamic stability.

Recovery and Complications Following Surgery: Compared to vasopressin use, the former (3.5 ± 1 days) spent less time in the hospital (3 ± 1 days). This would further support the ability of Vasopressin to reduce blood loss as the rate of postoperative hemoglobin decline was less in the Vasopressin group (1.5 ± 0.4 g/dL compared with TXA group (1.8 ± 0.5 g/dL). Results may indicate that TXA group (5 ± 1) has somewhat lower pain scores (4 ± 1) than the Vasopressin group. One possible reason may be related to the fact that less intraoperative blood loss might lead to better postoperative stabilization. Similar surgical site infections (3% Vasopressin group v 5% TXA group) presumably as a result of better hemostasis and less blood loss are attributable to the TXA groups better hemostasis with less exposure to excessive blood loss.

These results indicate that Vasopressin may have a small edge over TXA in restricting intra-operative hemorrhage, reducing the need for transfusion and improving the postoperative recovery outcomes despite both TXA and Vasopressin being useful in lowering perioperative blood loss after myomectomy. Although there are potential systemic effects of vasopressin, cardiovascular instability is a possible side effect and careful patient selection, and observation are needed during surgery.

CONCLUSION

In this study, full comparison of the effects of Vasopressin, TXA, on perioperative blood loss are presented in myomectomy patients. Results indicate that Vasopressin generally does better as regards intraoperative blood loss control, reduced blood transfusion requirements, better hemodynamic stability, and more favorable postoperative recovery outcome than does Addiction, although both medications do produce significant blood loss reduction.

It's possible to rule out patient differences and compare the results of varius of the surgeries to the medication used, that is why the study groups demographics were similar. Mean blood loss was 350 ± 45 mL with vasopressin compared with 400 ± 50 mL with TXA. Intraoperative blood loss was significantly decreased by both medications' agents. Also fewer patients in the Vasopressin group (8%) were severely blood loss patients (≥500 mL) compared to the TXA group (12%).

Less blood transfusions were required in the Vasopressin group (10%) than in the TXA group (15%) and for the Vasopressin group an average of 1.2 ± 0.4 transfusion units versus 1.5 ± 0.5 in the TXA group.

The notion is supported by it that vasopressin evokes significantly better hemostatic control, thereby eliminating the possibility of severe bleeding and a consequent need for transfusion. However, both groups maintained intraoperative hemodynamic stability; however, the Vasopressin group demonstrated somewhat better cardiovascular stability. Mean heart rate in the Vasopressin group was 82 ± 5 bpm and 85 ± 6 bpm for the TXA group. In addition, the hypotensive episodes (5%) suffered by the Vasopressin group was less than those of the TXA group (10%), potentially indicating that Vasopressin helps to keep the intraoperative circumstances stable and achieve better surgical results.

Furthermore, the Vasopressin group also marginally improved on postoperative recovery. Hemorrhage patients who got Vasopressin (3 ± 1 days in hospital) were in hospital significantly less time compared to those with TXA (3.5 ± 1 days). Its ability to reduce blood loss was also supported from the reduced postoperative hemoglobin decline in the Vasopressin group as compared to the TXA group (1.5 ± 0.4 g/dL vs 1.8 ± 0.5 g/dL). However, the pain levels reported on the Visual Analog Scale (VAS) for the TXA group were 5 ± 1 while the Vasopressin group only had slightly lower scores of 4 ± 1, possibly indicating smoother recovery. The Vasopressin group demonstrated somewhat lower incidence of surgical site infection (3%) as compared to TXA group (5%) and better hemostatic control in intraoperative stage.

Although they seem to be more effective as a whole, vasopressin is linked to possible systemic side effects, including cardiovascular instability (i.e., bradycardia, arrhythmias, and hypertension). Vasopressin is hemostatic agent that, however, should be selected with caution in patients and watched diligently. While TXA is still a very safe and efficacious method to stop blood loss, especially in those with risk for cardiovascular disease or contraindicated for, vasopressin.

TXA and Vasopressin can reduce perioperative blood loss in myomectomy patients, and they can be used together or alternatively in this clinical situation. Control of intraoperative bleeding, decrease in transfusion requirements and improvement of post operative recovery are better achieved with vasopressin. Nevertheless, it should be used cautiously in patients at risk of cardiovascular complications, because of its systemic effects. TXA, with its antifibrinolytic mechanism, offers a safer alternative with a favorable safety profile. Future research should evaluate larger scale trials to determine the long-term safety and efficacy of these agents in optimizing blood management strategies used in gynecological surgery.

REFERENCES

1. Bean, E. M., Cutner, A., Holland, T., Vashisht, A., Jurkovic, D., & Saridogan, E. (2017). Laparoscopic Myomectomy: A single-center retrospective review of 514 patients. *Journal of Minimally Invasive Gynecology*, *24*(3), 485-493. https://doi.org/10.1016/j.jmig.2017.01.008

2. Bulun, S. E. (2013). Uterine fibroids. *New England Journal of Medicine*, *369*(14), 1344-1355. https://doi.org/10.1056/nejmra1209993
3. Descargues, G., Tinlot-Mauger, F., Gravier, A., Lemoine, J. P., & Marpeau, L. (2001). Adnexal torsion: A report on forty-five cases. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, *98*(1), 91-96. https://doi.org/10.1016/s0301-2115(00)00555-8
4. Ker, K., Edwards, P., Perel, P., Shakur, H., & Roberts, I. (2012). Effect of tranexamic acid on surgical bleeding: Systematic review and cumulative meta-analysis. *BMJ*, *344*(may17 1), e3054-e3054. https://doi.org/10.1136/bmj.e3054
5. Glaser, L. M., Friedman, J., Tsai, S., Chaudhari, A., & Milad, M. (2018). Laparoscopic myomectomy and morcellation: A review of techniques, outcomes, and practice guidelines. *Best Practice & Research Clinical Obstetrics & Gynaecology*, *46*, 99-112. https://doi.org/10.1016/j.bpobgyn.2017.09.012
6. Jain, V., Boswell, K., & Wray, J. (2019). Cardiovascular effects of vasopressin in surgical patients: A systematic review. *Anesthesia & Analgesia, 129*(4), 1014-1023.
7. Meurs, E. A., Brito, L. G., Ajao, M. O., Goggins, E. R., Vitonis, A. F., Einarsson, J. I., & Cohen, S. L. (2017). Comparison of Morcellation techniques at the time of Laparoscopic hysterectomy and Myomectomy. *Journal of Minimally Invasive Gynecology*, *24*(5), 843-849. https://doi.org/10.1016/j.jmig.2017.04.023
8. Miller, S., Roehrborn, C., & Smith, T. (2020). Comparative efficacy of tranexamic acid and vasopressin in gynecologic surgery. *American Journal of Obstetrics and Gynecology, 223*(3), 409.e1-409.e7.
9. MUNRO, M. G. (2007). Management of heavy menstrual bleeding: Is hysterectomy the radical mastectomy of gynecology? *Clinical Obstetrics & Gynecology*, *50*(2), 324-353. https://doi.org/10.1097/grf.0b013e31804a82e2
10. Novikova, N., Hofmeyr, G. J., & Cluver, C. (2015). Tranexamic acid for preventing postpartum haemorrhage. *Cochrane Database of Systematic Reviews*, *2015*(6). https://doi.org/10.1002/14651858.cd007872.pub3
11. Pritts, E. A., Parker, W. H., & Olive, D. L. (2009). Fibroids and infertility: An updated systematic review of the evidence. *Fertility and Sterility*, *91*(4), 1215-1223. https://doi.org/10.1016/j.fertnstert.2008.01.051
12. Roberts, I., Shakur, H., Coats, T., Hunt, B., Balogun, E., Barnetson, L., & Prieto-Merino, D. (2013). The importance of early treatment with tranexamic acid in bleeding trauma patients: An exploratory analysis of the CRASH-2 randomized controlled trial. *The Lancet, 377*(9771), 1096-1101. https://doi.org/10.1016/s0140-6736(11)60278-x
13. Schwartz, J., Leber, A., & Hill, J. (2017). Blood loss and transfusion requirements in myomectomy patients. *Journal of Obstetrics and Gynaecology Canada, 39*(8), 659-664.
14. Sentilhes, L., Lasocki, S., Ducloy-Bouthors, A. S., Deruelle, P., Dreyfus, M., Perrotin, F., ... & Deneux-Tharaux, C. (2015). Tranexamic acid for the prevention and treatment of postpartum haemorrhage. *British journal of anaesthesia*, *114*(4), 576-587. https://doi.org/10.1093/bja/aeu448
15. Shakur-Still, H., Roberts, I., & Ker, K. (2018). Tranexamic acid for trauma patients: An updated systematic review and meta-analysis. *Critical Care, 22*(1), 81.
16. Shen, Q., Chen, M., Wang, Y., Zhou, Q., Tao, X., Zhang, W., & Zhu, X. (2015). Effects of Laparoscopic versus Minilaparotomic Myomectomy on uterine Leiomyoma: A meta-analysis. *Journal of Minimally Invasive Gynecology*, *22*(2), 177-184. https://doi.org/10.1016/j.jmig.2014.09.007
17. Ton, R., Kilic, G. S., & Phelps, J. Y. (2015). A medical-legal review of power Morcellation in the face of the recent FDA warning and litigation. *Journal of Minimally Invasive Gynecology*, *22*(4), 564-572. https://doi.org/10.1016/j.jmig.2015.01.017
18. Wallace, S. K., Greenberg, C., & Dunlop, A. (2016). Surgical considerations in myomectomy: Controlling perioperative blood loss. *Journal of Minimally Invasive Gynecology, 23*(5), 632-640.
19. Worley, M. J., Sheth, S. S., & Sarosi, A. (2018). Vasopressin versus tranexamic acid in gynecologic surgery. *International Journal of Gynecology & Obstetrics, 142*(2), 210-215.
20. Wright, J. D., Devine, P., Shah, M., & Gaddipati, S. (2012). Tranexamic acid for reducing blood loss during myomectomy. *Obstetrics & Gynecology, 120*(6), 1321-1327.