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Role of Tranexamic Acid in Prevention of Seroma Formation after Ventral Herioplasty

Faiz ur Rehman, Aamir Ali Khan, Muhammad Kashif, Zia Ullah, Muhammad Ali, Muhammad Ibrahim Shuja

Abstract:

Objective: The aim of this study was to explore the role of tranexamic acid in prevention of seroma formation after ventral herioplasty.

Study Design and Setting: The present cross-sectional study was carried out at the department of general surgery Bacha Khan Medical Complex / Gajju Khan Medical College – SWABI from January 2025 to June 2025 after taking permission from the research team of the hospital.

Methodology: In our study, Non-probability consecutive sampling approach was used for sample collection. A total of 100 individuals diagnosed with ventral hernia repair were included. All individuals were treated with the standard-only mesh. A vacuum drain was used to measure the seroma's volume. One gram of intravenous tranexamic acid was administered following skin closure, and 500 mg of oral tranexamic acid was administered for 12 hours on the 5th post-operative day. On daily basis the drain output was recorded. When the output was less than 30 milliliters per day, the drain was removed. SPSS version 24 was used for analysis of data.

Results: A total of 100 individuals participated in this study out of which 70(70%) were females and 30 (30%) were males. The mean age of the study participants was 81.05±41.75 years. In 84 individuals (84%) the seroma resolved within five days after surgery, but in 16 individuals (16%) it took longer than five day.

Conclusion: The current study concluded that Tranexamic acid significantly lowers the development of for seromas following surgery ventral hernia repair.

Key Words: ventral hernia repair, seromas, tranexamic acid

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INTRODUCTION

The bulging of all or part of the contents of the abdominal cavity due to a weakening in the abdominal wall is known as an abdominal hernia. [1–3] A non-inguinal, non-hiatal defect in the abdominal wall's fascia is known as ventral hernia. Approximately 350,000 ventral hernia procedures are performed each year. General surgeons frequently operate to fix these abnormalities in the abdominal wall. Surgery is usually advised for those with symptomatic hernias, acceptable surgical risk, or those who are more likely to experience hernia-related complications. Someone may have an impact on a person's quality of life, result in hospital stays, or even cause death in certain situations. The most common surgery done globally is hernia repair is 10–14%.[4] There are two primary types of ventral hernia that are acquired and congenital. Although the great majority of hernias seen and treated by general surgeons are acquired, some people have ventral hernias from birth and live with them for extended periods of time before having them surgically fixed. Acquired ventral hernias are frequently caused by trauma, recurrent stress on the abdominal wall's naturally weak spots, and prior surgery that resulted in an incisional hernia.[5] Pain, swelling, or fullness at the location of the hernia are the typical symptoms of an abdominal wall hernia, and however these might vary depending on

the posture or Valsalva manoeuvre. The expansion may be erythematous or result in an asymmetry in some situations where a hernia has been choked or confined. Although a history and physical examination are usually sufficient to diagnose an abdominal hernia, excessive obesity, a significant risk factor, may restrict the examination. Because hernias can alter with activity or simply standing, it is crucial that the patient be evaluated in a variety of postures throughout the examination.[6] Patients who have significant procedures, such as mesh repair for abdominal hernias, are more likely to develop seroma. There is a greater chance of seroma development and related problems the larger the mesh repair area. In addition, age, the quantity of tissue removed, prior operations, heparin or oral anticoagulant usage, and a history of seroma are other risk factors. [6] 5.6% to 42% of instances of mesh-assisted abdominal hernia surgeries result in postoperative seroma.[7] The accumulation of fluid that happens following surgery is known as a seroma. There is debate over the aetiology of seroma development. It is thought to be the gathering of lymphatic fluid, inflammatory exudates, serum, and liquid fat behind a skin flap.[8]

Many parameters, such as the extent of dissection and the technique used to raise the skin flap—electrocautery, knife, or scissors—influence the quantity and duration of seroma production. Because the plasmin system has fibrinolytic action in the lymphatic and serum systems, it also aids in fluid collection. Fibrin complexes also have a role in lymph and blood leaking from the arteries.[9] There are several methods for managing and preventing seroma.[10] After surgery, suction drains are utilized to track the quantity of seroma. [11, 12] Larger seromas are treated with needle aspiration, but most serom as go away on their own. Antibiotics are frequently needed for infected seromas, and occasionally surgery is required. Tranexamic acid can be used to stop the production of seromas.[13] This artificial antifibrinolytic drug is derived from the amino acid lysine. Despite the appropriate use of bleeding control techniques, surgical bleeding may occur when fibrinolysis surpasses coagulation. The purpose of tranexamic acid is to prevent fibrinolysis. It stops plasminogen from being activated to plasmin. It can be given intravenously or orally.[14] The present study was carried out to find the role of tranexamic acid in prevention of seroma formation after ventral herioplasty.

METHODOLOGY

The present cross-sectional study was carried out at the department of general surgery Bacha Khan Medical Complex / Gajju Khan Medical College – SWABI from January 2025 to June 2025 after taking permission from the research team of the hospital (Ref No: 016/BKMC/2024, date:December/18/2024). Non-probability consecutive sampling approach was used for sample collection. A total of 100 individuals of both genders and different age group (ranged 21-61 years) diagnosed with ventral hernia repair were included while individuals who had bleeding disorders, strangled hernias cirrhosis and uncontrolled diabetes mellitus excluded. Anticoagulant medication had to be discontinued five days before to surgery by the participants. Clinical history and laboratory results were documented. Using pelvic and abdominal ultrasonography, the defect's size and content were assessed. All individuals were treated with the standard-only mesh. A vacuum drain was used to measure the seroma's volume. One gram of intravenous tranexamic acid was administered following skin closure, and 500 mg of oral tranexamic acid was administered for 12 hours on the 5th post-operative day. On daily basis the drain output was recorded. When the output was less than 30 milliliters per day, the drain was removed. SPSS version 24 was used for analysis of data. Descriptive statistics were used to show numerical and categorical data and were presented in frequencies and percentages.The results were categorized based on age and gender and presented in tables. To determine statistical significance the Chisquare test was employed. P-values less than.05 were regarded as statistically significant.

RESULTS

A total of 100 individuals participated in this study out of which 70(70%) were females and 30 (30%) were males. The mean age of the study participants was 81.05±41.75 years. Out of the total participants 12(12%) 21-32 years old, 26 (26%) were between the ages of 33 and 41, and 38 (38%) were between the ages of 42 and 61 years. Participants were categorized based on these factors in order to ascertain the effect of age and gender on seroma development as presented in table 1. In 84 individuals (84%) the seroma resolved within five days after surgery, but in 16 individuals (16%) it took longer than five day as presented in table 2.

DISCUSSION

"Inguinal" means groin. An inguinal hernia is a protrusion in the groin. The bulge is a bag of fat, peritoneum, and bowel that has slipped through a weak region in the abdominal muscles and into the groin. A hernia can be pushed back or reduced automatically when lying down. Hernias can make it unpleasant to bend and lift weights. You may find it difficult to accomplish daily chores.

Surgical repair is the sole cure.[8] Inguinal hernia is a prevalent

Table 1. Factors affecting the development of seromas

Factors	Stratification	Patients no	Mean ±SD	P value
Gender	Male	30	84±24.24	0.728
	Female	70	104±47.85	
Age in years	21-41	38	80.04±40.64	0.188
	42-61	38	108.76±50.83	

Table 2. The relationship between post-operative days and seroma reduction

Post-operative days	Patients number	percentage	Mean ±SD
Above 5 days	84	84%	84±24.24
Less than 5 days	16	16%	130±43.87

surgical condition, among abdominal wall hernias. The frequency is high among adult males. Inguinal hernias, which develop when a portion of the intestine or fatty tissue pushes through a weak spot in the groin or scrotum, are the most frequent type of hernia in men. This is because of the structure of the inguinal canal, a groin channel that accounts for around 75% of all hernias and is more prone to weakening in men. The prevalence of inguinal hernias is unknown. Approximately 500,000 instances of inguinal hernia are reported to medical experts each year. Worldwide surveys indicate that untreated inguinal hernias affect 5-7% of males. However, approximately the same percentage of males have surgical repair.[9] Inguinal hernia instances in the US result in more work days missed than any other chronic intestinal ailment. Every year, around 400,000 people limit their activities severely.[10] Patients with untreated inguinal hernias may experience problems such as intestinal blockage and strangulation. The risk of problems is greater in older guys. Inguinal hernias are common and serious medical problems. Limited information is known on the risk factors for inguinal hernia. Three case-control studies linked inadequate education and manual job to an increased incidence of inguinal hernia. Rural origin was identified as a risk factor for females. Symptoms of prostatic hypertrophy were reported among men having hernias in another study. Strenuous exertion was also found a risk factor [11] A hernia is an illness when the tissues of the abdominal region protrude from a weak area on the abdomen. It is mostly caused by the intestine or omentum bulging due to an abdominal wall abnormality. Hernias often require surgery to be corrected, and they may develop between the hips and the chest.[12] There is a significant chance of seroma production after major surgical procedures like hernia repair. Risk factors include age, anticoagulant usage, the location of the dissected tissue, and previous history of surgery & seroma development. Seroma development is caused by a number of unavoidable events, such as overuse of cautery, dissection in the plane under Scarpa's fascia, and use of sclerosants, among others. If this seroma becomes infected and cannot be drained, it might result in wound infection and dehisces. [13] Serum is the fluid that is collected, while seroma is the term used after surgery. It occur as a result of blood vessel and lymphatic injury leaking. These are frequently evacuated via suction drains. These drains can also be used to monitor the fluid collected in the closed cavity.[14] Following abdominal hernia repair, seroma develops in 5.6%–42% of patients.[15] Below the skin, there is swelling, and the fluid has a clear or yellow appearance. The fluid may turn purulent or blood-stained when infected.[16] A smaller volume of fluid can be handled conservatively, but a greater volume necessitates either needle aspiration or open drainage.[17] When mesh is used for hernia repair, fluid builds up. The larger the area mended with mesh, the higher the chance of seroma production. It is possible to prevent seroma production by using tranexamic acid.[18] Because of its anti-fibrinolytic properties, it stops and manages excessive bleeding in the early phases of recovery. Transexamic acid (TXA) is used in hernia repair surgery to reduce bleeding and fluid collection, hence preventing the formation of a seroma, a common postoperative complication. It acts as an anti-fibrinolytic agent. In the setting of hernia repair, particularly with mesh installation (hernioplasty), surgical tissue injury can cause bleeding from tiny blood vessels & damaged lymphatics, leading in the buildup of serous fluid. Reduces bleeding and stabilizes clots. Post-operative bleeding is reduced by 34% when tranexamic acid inhibits the activation of plasminogen to plasmin.[14] The number and duration of seroma production after surgery are determined by factors such as tissue dissection extent and surgical procedures. Over time, several treatments have been implemented to address seroma development and its associated problems. Tranexamic acid has been shown to reduce seroma development when administered systemically. It also promotes wound healing. This study demonstrated that tranexamic acid effectively reduces seroma development. Although prosthesis-related infections are uncommon, they remain a significant issue. This occurs in around 5% of restorations and causes delays in recovery. Major risk factors include pre-existing skin infections or ulcers, excessive obesity, and clogged or perforated bowels. Seroma is a frustrating complication for both surgeons and patients. Anxiety, pain, repeated follow-up visits, higher expenditures, and feeling poorly can all contribute to morbidity. Seroma promotes bacteria growth, which can lead to wound dehiscence and septicemia. [19] The present study was carried out to find the Role of tranexamic acid in prevention of seroma formation after ventral herioplasty. A total of 100 individuals participated in this study out of which 70% were females and 30% were male .our study findings are similar to the study conducted by Zubair, et all[20] in which females were predominant. Our study results are also parallel to the study of Ahmed, in which female were 75% and male were 25%.[24] But the findings of our study are contrasted with Gulzar et al [5] in which the male were female were 45 % and male were 65%. We provided one gram of tranexamic acid to one hundred individuals who had been diagnosed with the repair of a ventral hernia. Participants were categorized based on these factors in order to ascertain the effect of age and gender on seroma development as presented in table 1. In 84 individuals (84%) the seroma resolved within five days after surgery, but in 16 individuals (16%) it took longer than five day. A similar study was conducted by Tarar et al. on 110 individuals with ventral hernia repair.[21] They reported that 81% seroma resolved within five days after surgery which and the results of their study are comparable to the present study. Hernia affects the abdominal wall. Non-lingual and non-hiatal abnormalities in the abdominal wall fascia are known as ventral abdominal hernias. Ten to fifteen percent of all surgical procedures carried out worldwide involve the standard surgical procedure known as hernia repair.[16]

Following a laparotomy, muscle-splitting incision, or laparoscopy, the likelihood of having a hernia is 10%, 5%, and 1%, respectively. After hernia repair, seromas are frequently seen, especially when there is extensive tissue disturbance and a broad area involved. It is a collection of serum, lymphatic fluid, liquefied fat, and inflammatory exudates; its etiology is unknown. The length of time and quantity of seroma are affected by a number of variables, such as the depth of dissection and the technique used to raise the skin flap (such as electrocautery or a knife). If left untreated, seromas become infected.[22] additionally, it raises the chance of infection. It is a great place for bacteria to grow and can lead to deadly side effects such wound dehiscence and septicemia. Seroma was a frequent post-hernia repair consequence in this study. Age and gender had no effect on seroma formation, according to other research assessing the risk factor for seroma formation. Seromas are common after hernia repair, particularly for large hernias with significant tissue disruption. The exact cause of seroma development is unclear, however it is thought to be the accumulation of liquefied fat, serum, inflammatory exudates, and lymphatic fluid beneath the skin flap.

Seroma formation varies and is regulated by factors such as dissection extent and method of raising the skin flap (electrocautery or knife). Untreated seromas can become contagious. Tranexamic acid improves wound healing by successfully reducing postoperative serous fluid and seroma development.[2] Utako Okamoto made the discovery of tranexamic acid (TXA) in 1962. It is a well-known medication used for treating or preventing heavy menstruation, serious trauma, postpartum hemorrhage, surgery, tooth extraction, and nasal bleeding. The WHO's list of essential medications now includes it as well. In high-income, middle-income, and low-income nations, TXA is a cheap therapy that is thought to be very cost-effective. It can be injected into a vein or taken orally. Every 6 to 8 hours, a gradual intravenous injection of 1 g (1 ampoule of 10 ml or 2 ampoules of 5 ml) of tranexamic acid is recommended. This is comparable to 15 mg/kg body weight. It is a safe medication for those with chronic liver illness since individuals with hepatic impairment do not need to modify their dosage. Tranexamic acid has a proven effect in reducing bleeding during orthopedic procedures, according to many researches. Consequently, fewer transfusions are required after surgery. In these situations, the TXA has been injected intra-articularly, utilized to irrigate the surgical site, or both. Transexamic acid reduced seroma, serous fluid, and post-operative soreness in 81% of patients, according to a research.[23] The results of our study demonstrated that it successfully lowers seroma formation. Post-operative drainage is decreased when 1g of tranexamic acid is taken on daily basis .[23] The results of our study showed that the mean duration of seroma in the majority of patients was ten days. Our study's strength is that tranexamic acid seems to be an independent factor in seroma reduction.

Similar type of study was conducted recentrly to evaluate the seroma reduction and Role of tranexamic acid in ventral hernia repair. The research comprised a total of 80 patients. Of the patients, 25% were men and 75% were women. The patients' ages ranged from 20 to 60 years. Average age was 45 years. In 81% of individuals, seroma resolved after 5 days, but in 19%, it took longer.[24] which support our study findings. Attempts to lower systemic levels of the medication via topical treatment at the surgical site constitute another strategy to address safety concerns with TXA. In this context, the Journal of Bone & Joint Surgery reported the findings of a clinical trial comparing the use of topical TXA against intravenous administration in patients having primary total knee arthroplasty.[25] Research indicates that following hernia surgery, seroma development is reduced. In a randomized double-blind trial, Poeran et al. [26]demonstrated that peri-operative and post-operative administration of tranexamic acid 1gm three times daily significantly reduced the mean post-operative seroma drainage volume in 160 women undergoing lumpectomy or mastectomy with axillary clearance when compared to patients receiving a placebo (283 versus 432 ml, $P < 0.001$). Tranexamic acid therapy also reduced the prevalence of postoperative seroma development (27 versus 37%, $P = 0.2$). After mesh hernioplasty, tranexamic acid decreases the development of post-operative seromas in individuals with ventral hernia repair. Additionally, it shortens the duration of drain removal following surgery. We conclude that administering tranexamic acid in split doses lowers the patient's total costs and morbidity and facilitates an early return to normal life. One of the most frequent issues that general surgeons handle worldwide is ventral hernias. There are several methods for repairing ventral hernias described in the literature, but the most common one at the moment is hernioplasty, which may be performed either openly or laparoscopically. Prolene mesh is the most often utilized form of mesh in hernioplasty because it reduces the likelihood of recurrence. But in the present study we used the standard-only mesh. Further large scale studies are needed to evaluate the potential role of tranexamic acid in prevention of seroma formation after ventral herioplasty.

There are several limitations of our study. Its study design is cross-sectional; a retrospective study design will allow results to be compared with those of the control group.

CONCLUSION

The current study concluded that Tranexamic acid significantly lowers the development of seromas following surgery for ventral hernia repair.

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Authors Contribution:
Faiz ur Rahman: Primary researcher, conception, acquisition, analyzing the data and writing manuscript
Aamir Ali Khan: Primary researcher, conception, acquisition, analyzing the data and writing manuscript
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