

To Assess the Efficacy of Tranexamic Acid to Prevent Seroma Formation at Donor Site of Latissimus dorsi Flap

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ABSTRACT

Objective: To assess the efficacy of tranexamic acid to prevent seroma formation at donor site of latissimus dorsi flap.

Study Design: Quasi experimental study

Place and Duration of Study: This study was conducted at the Department of Plastic Surgery, Jinnah Burn & Reconstructive Surgery Center/Allama Iqbal Medical College, Lahore from March 2015 to December 2018.

Materials and Methods: Fifty patients who required latissimus dorsi flap for reconstruction were enrolled. After approval from ethical committee, informed consent was taken. Diluted tranexamic acid (20ml of 25mg/ml) was infiltrated at the donor site before closure of the wound. Suction drains were placed. 500mg tranexamic acid was given intravenously, thrice daily for 4 days. Ultrasound was performed on second day and after one week of removal of drains to quantify the seroma.

Results: The suction drains showed <30 ml in 15 patients on first post-operative day and were removed on the same day. Two days after drain removal ultrasound confirmed 35 out of 50 patients showed no seroma on second day while 94% of the patients showed no collection of fluid one week after removal of drains.

Conclusion: Tranexamic acid is highly effective to control the seroma formation over the donor site of latissimus dorsi flap.

Key Words: Tranexamic acid, Latissimus dorsi flap, Seroma

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INTRODUCTION

Pedicled and free latissimus dorsi flap is one of the key flap for reconstruction in the armamentarium of plastic surgeons. It is used as a reconstructive tool for soft tissue coverage of trunk¹⁻⁵, both upper and lower extremities,⁶⁻⁹ head and neck,¹⁰⁻¹⁵ and breast.¹⁶⁻¹⁹ It has advantages of reliable vascular pedicle, safety and ease of use, wide arc of rotation, massive muscle mass and size used to cover large areas, predictable cutaneous pedicle and usage as a functional muscle.²⁰

Donor site seroma is one of the most common complications associated with latissimusdorsi flap.

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The rate of seroma formation is as low as 5% and as high as 96%. Seroma is defined as collection of fluid at the donor site assessed clinically or detectable with ultrasound. Seroma results from disruption of vessels and lymphatics and mainly comprises of tissue fluid.²¹

Many treatment and preventive strategies have been reported to overcome the seroma formation at the donor site of latissimus dorsi flap. These include negative pressure wound therapy,²² PGA fabric,²³ quilting sutures²⁴ and fibrin glue.²⁴ In one of the latest studies conducted by Yan and colleagues, the incidence of seroma formation was 53.3%, however, they concluded in their study that 87.5% of patients developing seroma formation over the donor site of latissimus dorsi flap did not require any treatment and seroma would resolve over time. The mean duration of seroma resorption was 6.8±1.4 weeks. They recommended that no preventive measures and treatment regimens should be adopted to overcome seroma. The drawback in their study is that the patients developing seroma usually suffer from anxiety and discomfort for 4-9 weeks, moreover, there are chances of wound dehiscence.

The role of tranexamic acid as a pro inflammatory agent has been proven. In a randomized double blind trial published in British journal of surgery in 1994,²⁵ it was found that administration of tranexamic acid 1gm three times a day resulted in significant reduction in

mean post operative drainage volume compared with the patient given placebo treatment after breast cancer surgery. The frequency of seroma formation reduces in 37% after tranexamic acid administration as compared to 27% with placebo treatment having P value of 0.2. Considering the effectiveness of tranexamic acid as an agent to reduce seroma and unsolved problem of seroma formation at the donor site of latissimus dorsi flap, we decided to conduct a study to assess the effectiveness of tranexamic acid to control postoperative seroma formation at the donor site of latissimus dorsi flap.

MATERIALS AND METHODS

This quasi experimental study was conducted at Jinnah Burn and Reconstructive Surgery Centre, Lahore from 1st March 2015 to 31st December 2018. A total of 50 patients were included. All the patients in between 12-60 years of age undergoing surgery with latissimus dorsi flap were included in the study. The patients having hypertension, diabetes mellitus and bleeding diathesis were excluded. The informed consent was taken. All the patients underwent surgery with latissimus dorsi flap as a reconstructive tool. Flap dissection was done with scissors instead of electrocautery. Before closure of the wound, 5 ml of 100mg/ml tranexamic acid (TA) was mixed with 15 ml of normal saline. The prepared solution thus contained 20 ml of 25mg/ml of tranexamic acid. The solution was prepared to increase infiltration points and decrease complications with diluted TA. Suction drains were placed in all patients. Tranexamic acid (500mg) was given intravenously, thrice daily, for 4 days. Ultrasound was done on 2nd day after removal of drains having less than 20 ml in 24hours. Second ultrasound was done one week after 1st ultrasound to rule out any recurrent seroma. All the data was entered in the Performa. The data was analyzed by SPSS-20.

RESULTS

Most of the patients were in between age group of 35-55years with genders is shown in Table 1. Out of 50 patients, in 35 patients there was no fluid collection in drain on the first post-operative day.

Table No.1: Demographic information of the patients

Variable	No.	%
Age (years)		
10 -35	5	10.0
36-55	13	26.0
56-75	32	64.0
Gender		
Male	30	60.0
Female	20	40.0

The drain was removed on the first post-operative day and ultrasound was performed 2 days after the drain removal to confirm the presence of seroma. In 15 patients out of 50, there was less than 30 ml of fluid. After one week of drain removal, 94 percent of the patients showed no collection of seroma on ultrasound (Tables 2).

Table No.2: Drain of fluid

Drain	No.	%
After 2 days		
Nil	35	70.0
<30 ml	15	30.0
After 2 weeks		
Nil	47	94.0
<30 ml	3	6.0

DISCUSSION

In reconstructive surgery, one of the most reliable flaps to cover large defects is latissimus dorsi flap. Due to its large volume and surface area it can be used to reconstruct large defects of head and neck, extremities, breast and trunk. It can also be used as a functional muscle, pedicled or as a free flap.²⁴ After lot of dissection at the back while raising the muscle, a relatively large raw area is created that may result in seroma formation at the donor site after surgery. The seroma rates may be as high as 96%.²¹

In order to define the probable causes of seroma formation, Schwabegger et al,²⁶ conducted a study in 1997. They found two important reasons for seroma. These are "friction of the wound layers" and fat necrosis. In their opinion, fat necrosis can be reduced by avoidance of electrocautery during the flap elevation. Usage of scalpel instead of electrocautery reduced the incidence of seroma from 98% to 38 %. In order to reduce the shearing forces between the wound layers, a variety of methods have been advocated in the literature. Out of all these prescribed techniques, one of the successful treatment option is quilting sutures. It is known as Crippendale technique and was first described by Titley et al in 1997.²⁵ The technique can reduce seroma from 0% to 45.6%. The drawback of quilting sutures is that it causes pain, limited shoulder movements and it is time consuming.²²

The second important technique to reduce dead space at the donor site after LAD flap is negative pressure wound therapy (NPWT). Angspatt and colleagues found that the rate of seroma formation after the drain removal decreases to 15 % after usage of NPWT as compared to 70% in the control group. However, it is costly, time consuming and there are chances of skin blebs formation. The major drawback of NPWT is to perform a secondary procedure for wound closure.²² Itani and colleagues²³ worked on another root cause to reduce the seroma. According to them the major causative agent is lymphatic disruption and increased

vascular permeability due to extended dissection. The leaked lymphatics and vascular fluid accumulates in the dead space and produces seroma. So, they used poly glycolic acid (PGA) fabric that prevent seroma. PGA is a biodegradable polymer that provokes inflammatory reaction resulting in fibrosis and subsequent tissue adhesions. They found significant reduction of seroma after drain removal and the time taken to resolve seroma was also reduced ($P < 0.01$).

Since seroma formation is caused by excessive leakage from vessels, so any intervention that effectively stops bleeding could reduce this seroma and hematoma formation, theoretically. Tranexamic acid (TA) is one such drug. It blocks lysine-binding sites on plasminogen, so preventing plasminogen to be converted into its activated form plasmin.²⁷ As a result, fibrinolysis is prevented. Prevention of fibrinolysis promotes coagulation and hence reduces seroma and hematoma. TA could be used orally, intravenously, topically and can be infiltrated into the wound. Although, there is controversy regarding dosage of TA but suggested dosage are 1-2 gm. During major surgeries, TA intravenous administration have reduced blood transfusion need by 32-37% and measureable post-operative bleeding by 34 %.²⁸ High doses of TA can cause renal impairment and increase risk of seizures. TA can also be used topically. Topical application has reduced bleeding in cardiac and orthopedic surgery as proven by many studies.²⁸

Ausen and colleagues²⁸ also found that drain fluid production was reduced to 39 % as compared to the control group after usage of TA. Virani and colleagues²⁹ published their work in 2016 on role of TA infiltration at the wound site to reduce blood loss in patients with peritrochanteric fractures. They in filtered 2 gm of TA both in subfacial and intramuscular plane before the wound closure and compared it with the control group. They found the preoperative hemoglobin fell from 10.9gm% to 9.5gm% in TA group. In control group, the hemoglobin fell from 10.8gm% to 9.2gm%. There was no statistical significant difference with $P = 0.36$ in both groups. Similarly they also measured postoperative blood loss, which was 190.3ml in TA group and 204.3 ml in control group. The P value was equal to 0.25, showing no statistical significance. The blood transfusion after the surgery in the control group was 17.1% and in TA group was 14.9%. From their results they concluded that TA infiltration doesn't play a role to stop post-operative bleeding. However they recommended further studies.

Since, the use of TA at donor site of latissimus dorsi have never been prescribed in literature, as far our knowledge, so we used combination of local infiltrations and systemic TA to reduce postoperative seroma formation. We found that in all the patients, there was no significant seroma formation within 24 hours after surgery. The drain was taken out on first

post-operative day. Ultrasound was performed two days after the drain removal. 15 out of 50 patients showed less than 30 ml of serous fluid at the donor site, while 35 patients showed no fluid at the donor site. The second ultrasound was performed after one week of drain removal to rule out any redundant seroma at the donor site. After one week, we found that in 94% of the patients there was no recurrent seroma and no collection of fluid. However, in 6 % of the patients there was less than 30 ml of fluid which was managed conservatively and no intervention was required. Our study supports the usage of TA both locally and systemically to prevent seroma formation at donor site of latissimus dorsi flap.

CONCLUSION

Tranexamic acid is highly effective to control seroma at the donor site of latissimusdorsi flap. It is cost effective and easy to administer. It increases patient comfort and decreases anxiety of the patient. Moreover, all the complications of seroma formation could be decreased by local and systemic use of tranexamic acid.

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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