

# Effect of subcutaneous tumescent fluid on skin graft donor site bleeding, pain and healing

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## Abstract

**Introduction:** Tumescent is a dilute solution of lidocaine, epinephrine, and sodium bicarbonate that is injected in the subcutaneous tissue. In this study we aim to compare the blood loss during harvesting graft, to compare the post operative pain in donor site, to compare the healing of donor site. Between grafts taken from subcutaneous injected tumescent fluid area and where no fluid is injected. **Methodology:** 25 patients with indication for skin grafting is selected and Intra operative 2 donor sites will be selected one will be infiltrated with tumescent and other with no solution, Bleeding during graft harvesting will be calculated for both sites, postoperative pain comparison for 3 days, and healing will be recorded. Comparison will be made between donor areas infiltrated with tumescent and without. **Results:** Donor sites intra operative bleeding during harvesting graft was an average of 7.80ml with tumescent solution and 11.80ml with no fluid. Post operative Pain was suppressed on day 1, mildly suppressed on day 2, and not suppressed on day 3 in tumescent group. Donor sites healed in an average of 8.04 days with tumescent solution and 9.24 days with no fluid. **Conclusion:** This study shows that, tumescent fluid used in harvesting graft will safely decrease the blood loss, postoperative pain and will heal faster.


**Keywords:** Tumescent fluid, skin graft, donor site.

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## INTRODUCTION

Tumescent is a dilute solution of lidocaine, epinephrine, and sodium bicarbonate that is injected in the subcutaneous tissue. The epinephrine is the most important ingredient as it causes vasoconstriction. The tumescent technique has several advantages, such as: it hydro dissects the fat facilitating its removal; it protects the underlying organs bringing up the skin; it reduces bleeding and the possibility of fat embolism by the collapse of the vessels induced by the tumescence and the vasoconstrictor action of epinephrine; and it reduces the possibility of infection, increasing the antibiotic effect of

lidocaine with the bicarbonate. The composition of tumescent fluid is Lidocaine (2%) 10.0 ml, Adrenaline (1:1000) 0.4 ml, NaHCO<sub>3</sub> (8.4%) 4.0 ml, Saline 40.0 ml.<sup>1</sup> In this study we compared the blood loss during harvesting graft, to compare the post operative pain in donor site, to compare the healing of donor site. Between grafts taken from subcutaneous injected tumescent fluid area and where no fluid is injected.

## MATERIAL AND METHODS

A Case Control Study was conducted in patients who were ready for skin grafting in department of surgery, Yenepoya medical college from September 2016 to December 2016. Clearance from the institutional ethical committee was obtained. 25 patients between age group 20-50 years who required skin grafting where included in the study. Diabetic patients and patients who tested positive for beta-hemolytic streptococci were excluded from the study. In every patient 2 donor sites were selected, 1 site was infiltrated with tumescent fluid and the other site was not infiltrated with anything. We compared the amount of bleeding during graft harvesting, postoperative pain control, healing of the donor site between 2 donor sites in the same patient. Data were

analysed using Independent t test for blood loss variable and Pearson Chi-Square test for healing variable.

## RESULTS

Bleeding, pain, healing were measured between donor sites injected with tumescent fluid and with no fluid before graft harvesting. Donor sites intra operative bleeding during harvesting graft was an average of 7.80ml with tumescent solution and 11.80ml with no fluid. The reduction in blood loss among test group compared to control group is statistical significant i.e.  $P < 0.003$

**Table 1:** Comparison of intra operative bleeding during graft uptake between test and control sites in ml.

	Test	Control
N	25	25
Mean	7.80	11.80
S.E	0.712	0.757
95 CI	6.33-9.27	10.24-13.36
Median	5	10

N-No of cases, S.E- Standard Error

The physiological response to injury on POD 1 was suppressed, on POD 2 was mildly suppressed and POD 3 was not suppressed. On POD 1, 68% patients have less pain on tumescent solution injected donor site compared to no fluid. On POD 2, 12% patients and less pain on tumescent solution injected donor site compared to no fluid. On POD 3, there was no difference in pain.

**Table 2:** Comparison of postoperative pain between test and control donor sites

	Percentage of (T<C)	Percentage of (T=C)
POD 1	68	32
POD 2	12	88
POD 3	0	100

T-Test, C-Control, POD-Post Operative Day

Donor sites healed in an average of 8.04 days with tumescent solution and 9.24 days with no fluid. Number of healing days is reduced for test group when compared to control group is statistical significant i.e.  $P < 0.001$

**Table 3:** Comparison of healing of test and control donar site in days

	Test	Control
N	25	25
Mean	8.04	9.24
S.E	0.286	0.266
95 CI	7.45-8.63	8.69-9.79
Median	7.0	9.0

N-No of cases, S.E- Standard Error

## DISCUSSION

The tumescent solution for local anaesthesia in liposuction procedures was developed by Klein in 1975. Containing 0.05 to 0.1% lidocaine and 1:1 million adrenaline in 1L of saline, it allowed safe usage of 5 times the recommended maximum of doses of anaesthetic with vasoconstrictor, which was 7mg/kg. Sodium bicarbonate (NaHCO<sub>3</sub>) was added to Klein's formula aiming to reduce the pain of infiltration and to increase the antibiotic action of lidocaine. One of most used solutions in dermatologic surgery<sup>1</sup> is:

- Lidocaine 2% 10.0mL
- Adrenaline 1:1,000 0.4mL
- NaHCO<sub>3</sub> 8.4% 4.0mL
- Saline 40.0mL

The effectiveness of the solution (rule of four) in reducing bleeding, in the anaesthetic action and in the stability of blood pressure during and after surgery has been proven in over 1,000 procedures in various body regions. It was used in tumour excisions with direct closure or with flaps, dermabrasion, zit scarring elevation and removal, cryosurgery, after curettage and electrocoagulation, or CO<sub>2</sub> laser vaporization in the scalp, face, arms and legs.<sup>2</sup> A skin graft can be classified as split thickness or full thickness. Split grafts are harvested from the skin by tangential excision with some sort of sharp blade. The most common technique involves the use of a gas driven or electric dermatome in which thin sharp blade oscillates at high speed within an enclosed rectangle space as the machine is moved along the skin. By changing the gauge that determines the distance between the moving blade and its rigid superstructure, grafts of varying thickness can be taken. Various types of free hand knives are also available for split grafting. The thickness of the graft depends on the angle of moment and pressure applied and the distance between the blade and the roller bar (e.g. Humby knife, Braithwaite knife)<sup>3</sup>. Bleeding in the present study during harvesting graft was an average of 7.80ml with tumescent solution and 11.80ml with no fluid. Similar studies where bleeding was reduced, Robetson *et al.*<sup>4</sup> did a case-control study, where tumescent technique significantly reduced blood loss during burn surgery, they reported as this technique significantly reduced intra operative blood loss. Fujito *et al.*<sup>5</sup> reported a study showing successful excision of burn scar with no intra operative bleeding. Gacto *et al.*<sup>6</sup> study showed reduced intra operative bleeding in donor site injected tumescent fluid verses saline. Pain in the present study, On POD 1, 68% patients had less pain on tumescent solution injected donor site compared to no fluid. On POD 2, 12% patients had less pain on tumescent solution injected donor site compared to no fluid. On POD 3, there was no difference in pain. Similar studies where pain was reduced, in Blome-

Eberwein S<sup>7</sup> study Pain reported on day 1 was 2.38/10 in the tumescent site and 3.38/10 in the saline site (P = 0.21). Prasad *et al.*<sup>8</sup> showed skin graft harvest using tumescent local anaesthesia as the sole anaesthetic technique in Severe post-burn neck contracture release. Gacto *et al.*<sup>6</sup> study showed reduced post operative pain in donor site injected tumescent fluid verses saline. Healing was comparatively faster in the present study with tumescent fluid. Donor sites healed in an average of 8.04 days with tumescent solution and 9.24 days with no fluid. Similar results were shown in these studies, Blome-Eberwein S<sup>7</sup> *et al* study showed, donor sites healed in an average of 16.1 days with modified tumescent solution and in 16.4 days with saline and, Gacto *et al.*<sup>6</sup> study showed accelerated re-epithelialisation at donor site injected with tumescent fluid.

## CONCLUSION

This study shows that, tumescent fluid used in harvesting graft will safely decrease the blood loss, postoperative pain and will heal faster.

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