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Original Research Article

Effect of stellate ganglion block on graft re-exploration rates in free flap graft placement surgeries in patients with head and neck cancer: a randomized controlled trial

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ABSTRACT

Background: Free flap reconstruction is frequently used after extensive head and neck cancer surgery. Sympathetic blockade may improve flap perfusion by reducing vasospasm. This study evaluated whether stellate ganglion block (SGB) reduces graft re-exploration in head and neck free flap surgeries.
Methods: In this double-blinded randomized controlled trial, 70 patients undergoing free flap reconstruction were randomized to receive ultrasound-guided SGB with bupivacaine and triamcinolone (test group) or saline (control group). The primary outcome was grafting re-exploration. Secondary outcomes included graft failure and block-related adverse effects.
Results: Baseline demographic and intraoperative characteristics were comparable between groups. Graft failure occurred in 5 patients in the control group and 2 patients in the test group (OR 3.33, 95% CI 0.55–20.22). Re-exploration was required in 1 patient in the control group and none in the test group (OR 3.36, 95% CI 0.13–88.39). No block-related adverse events occurred.
Conclusion: Stellate ganglion block was safe and showed a trend toward reduced graft-related complications, although statistical significance was not achieved. Larger studies are needed to confirm these findings.

Keywords: Stellate ganglion block, Free flap, Head and neck cancer, Graft failure, Graft re-exploration

INTRODUCTION

Head and neck cancer (HNC) is among the most common malignancies in India, accounting for nearly 30% of all cancers in the country.[1] A large proportion of patients present at an advanced stage because of delayed diagnosis, poor awareness, and limited access to healthcare facilities.[2] Consequently, these patients often require extensive surgical resection involving the oral cavity, pharynx, larynx, or surrounding soft tissues, resulting in major functional and cosmetic defects.[3,4]

Reconstruction using microvascular free flaps has therefore become an integral component of modern head and neck oncologic surgery, allowing restoration of speech, swallowing, airway protection, and facial contour with superior functional outcomes compared to conventional pedicled flaps.[5]

Despite advances in microsurgical techniques and perioperative care, free flap reconstruction continues to be associated with significant rates of graft compromise and re-exploration.[6] Vascular thrombosis, vasospasm, and impaired flap perfusion remain important causes of flap failure, often necessitating urgent re-exploration and increasing patient morbidity, duration of hospitalization, and healthcare costs. One study reported graft re-exploration rates as high as 34% following free flap surgery.[7] Strategies that improve flap perfusion and reduce vasospasm may therefore improve graft survival. Regional sympathetic blockade can produce vasodilation by inhibiting sympathetic vasoconstrictor tone, thereby potentially enhancing tissue blood flow and microvascular perfusion.[8] Previous studies using thoracic paravertebral blockade at T1–T2 levels have demonstrated improved flap temperature and perfusion in free flap surgeries.[9]

This primary objective of this study to assess the effect of stellate ganglion block on graft re-exploration rates in free flap graft placement surgeries in patients with head and neck cancer. The secondary objectives were on intraoperative hemodynamic stability (assessed by need for vasopressors or BP lowering agents) and stellate ganglion block related adverse effects.

METHODS

This study was a double blinded randomized clinical trial conducted in the department of Onco-Anesthesiology, BLK- Max Hospital, New Delhi between September 2024 to June 2025. The study was approved by the hospital ethical committee (EC/AARCE/APPROVALLETTER/ SEPTEMBER/2024/61). Patients with head and neck cancer scheduled for free flap graft placement surgeries who were between 18-75 years of age and were either American Society of Anesthesiologists (ASA) grade II or III were included in the study. Those with hypersensitivity to local anesthetics (LA), coagulation disorders, due to severe systemic medical problems (ASA class IV-VI), recent myocardial infarction, glaucoma, pre-existing counter lateral nerve palsy, severe emphysema or cardiac conduction defects were excluded from the study. After recruitment, the patients were randomly allocated to test (T group) or control (C group) respectively. The randomization was be performed by using a computer-generated random number table. Allocation concealment will be achieved by using sealed opaque envelopes containing the patient's allocation. The patient as well as surgical team including the treating surgeons will be blinded to the allocation. The patients in the T group underwent SGB procedure with bupivacaine and triamcinolone while the C group will undergo SGB procedure with normal saline.

Routine pre-operative fasting for 6-8 hrs prior to surgery was ensured. Patients were premedicated with Inj. pantoprazole 40 mg i.v and Inj. ondansetron 4 mg iv. Awake endotracheal intubation under fiberoptic bronchoscope guidance was performed. After intubation, Inj. fentanyl 2 ug/kg intravenously, Inj. Propofol 1-2 mg/kg and Inj. rocuronium 0.9 mg/kg was given intravenously. Inj. fentanyl 50 mics/hour infusion was started and continued till extubation. The patient was kept supine with the neck slightly extended and the head slightly rotated contralaterally to the approached side. The site was cleaned and draped, and the transducer was placed perpendicular to the tracheal axis at the cricoid cartilage and was moved inferiorly until the superior aspect of the thyroid gland is visualized. Later, the transducer was relocated laterally to visualize the anterior aspect of the Chassaignac's tubercle on the C6 transverse process. The carotid artery, internal jugular vein, thyroid gland, trachea, longus colli, and longus capitis muscle, prevertebral fascia, the root of C6 spinal nerve, and transverse process of C6 was identified. Color Doppler was used to detect the position of the vessels. With an in-plane approach, the needle was placed beside the trachea with a lateral to medial direction. The tip was maneuvered to reach the prevertebral fascia of the longus colli muscle located between the posterior aspect of the carotid artery and the tip of the C6 anterior tubercle. An aspiration test was done to avoid the suction of blood or cerebrospinal fluid, then 1 ml of normal saline was injected, and the diffusion of the injectate was seen in real-time. Once the fluid spread along the paravertebral fascia to the stellate ganglion was confirmed by visualization, full dose of drug was given: T group: Inj. bupivacaine 0.25% (8 ml) with Inj. triamcinolone 40 mg; C group: normal saline 8 ml.

Intraoperative hypotension was treated by fluid bolus, Inj. ephedrine 6 mg followed by noradrenaline infusion as required while bradycardia was treated by Inj. atropine 0.6 mg. Intraoperative hypertension was treated by NTG infusion and tachycardia was treated by metoprolol 5 mg IV. Total dose of these agents was noted.

Sample size was calculated based upon a graft re exploration rate reported in HNC of 22.7% as reported by Hyun et al and a 16.7% decrease in graft re exploration by using a paravertebral block as reported by Habib et al.9,10 Therefore, with a graft re exploration rate of 18.8% with SGB and 22.7% without SGB and assuming a clinically superiority margin of 20% (δ=0.2), for achieving an 80% power at the 5% level of significance , a sample size of 35 patients per group was taken.

The primary outcome was grafting re-exploration, and secondary outcomes included graft failure and block-related adverse effects. Continuous variables were analyzed using the Mann–Whitney U test, while categorical variables were analyzed using Fisher's exact test. Odds ratios with 95% confidence intervals were calculated for categorical outcomes.

RESULTS

Seventy patients were analyzed (control group n=35 test group n=35). Baseline demographic and biochemical characteristics were comparable between groups (Table 1).

Intraoperative fluid administration and use of vasoactive and antihypertensive medications were similar between groups (Table 2).

Graft-related outcomes are shown in Figure 1. Graft failure occurred in 5 patients in the control group and 2 patients in the test group (odds ratio 3.33, 95% CI 0.55–20.22). Re-exploration was required in 1 patient in the control group and none in the test group (odds ratio 3.36, 95% CI 0.13–88.39). Both confidence intervals crossed unity, indicating no statistically significant difference. No block-related adverse events were observed.

Table 1: Intraoperative fluids and medications.

Variable	Control (n=35)	Test (n=35)	P value
Age (years)	58 (49–70)	53 (48–59.5)	0.24
Weight (kg)	65.8 (60.0–79.9)	77.4 (64.4–86.2)	0.13
Hemoglobin (g/dl)	13.8 (13.0–14.6)	13.75 (12.85–14.83)	0.91
Total leukocyte count (×10³/µl)	7.8 (6.6–9.1)	7.6 (6.4–8.9)	0.84
Blood urea (mg/dl)	24.0 (17.6–31.1)	26.0 (18.0–31.9)	0.67
Serum creatinine (mg/dl)	0.88 (0.76–0.97)	0.85 (0.75–1.00)	0.79
Total bilirubin (mg/dl)	0.53 (0.50–0.62)	0.77 (0.44–0.96)	0.11
AST (U/l)	26.0 (21.5–35.5)	33.2 (21.0–38.9)	0.18
ALT (U/l)	20.0 (19.5–37.1)	35.0 (33.0–51.3)	0.07
PT–INR	1.00 (0.98–1.11)	1.00 (0.97–1.10)	0.95

Table 2: Graft failure and re-exploration.

Variable	Control (n=35)	Test (n=35)	P value
Crystalloid volume (ml)	5000 (4063–5275)	4500 (4500–5000)	0.21
Colloid volume (ml)	500 (125–500)	500 (0–500)	0.88
Ephedrine use	14 (82.4%)	15 (83.3%)	0.91
Noradrenaline use	3 (17.6%)	4 (22.2%)	0.71
Nitroglycerin use	2 (11.8%)	2 (11.1%)	1.00
Metoprolol use	3 (17.6%)	3 (16.7%)	1.00
Labetalol use	2 (11.8%)	1 (5.6%)	0.59

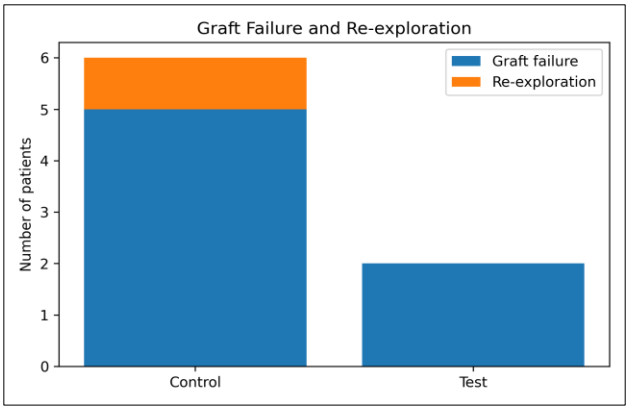

Figure 1: Comparison of graft failure and re-exploration between control and test groups.

DISCUSSION

In this randomized controlled trial, stellate ganglion block did not result in a statistically significant reduction in graft failure or re-exploration rates. However, the direction of effect consistently favored the intervention group, with fewer adverse graft outcomes observed.

There are no previous studies of SGB in patients undergoing free flap surgeries for HNC. However, a small study of just four cases showed potential of SGB to prevent vasospasm after digital microsurgical procedures.[11] Similar benefits were reported in another study using axillary brachial plexus block.[12] The lack of benefit in our study may be attributable to several factors. This study was conducted at a high-volume centre where large number of free flaps are being performed monthly. Highly experience plastic surgeons have a low rate of graft re exploration and failure- this may have attenuated the benefits expected with SGB.[13] At a lower volume centre this procedure may show higher benefit. Secondly, the comparator arm was also undergoing a sham SGB procedure- while Injection of saline may not produce a full sympathetic block, it is possible that mechanical effects led to a transient sympathetic attenuation. This may have attenuated the observed benefits from SGB. Lastly, the trend towards a lesser graft re-exploration in the SGB group indicates that a larger sample size may have shown a clear benefit with SGB.

The absence of statistical significance in the present study should be interpreted in the context of the limited sample size and the wide confidence intervals observed for the primary outcomes. Wide confidence intervals indicate

imprecision in effect estimation and do not necessarily imply absence of a true biological or clinical effect.[14] Importantly, the direction of effect consistently favored the SGB group, with lower rates of graft failure and re-exploration compared to controls. The observed point estimates therefore suggest the possibility of a clinically meaningful benefit that may not have reached statistical significance because the study was underpowered to detect relatively small but important differences in outcomes.

The potential beneficial effects of SGB are biologically plausible. Sympathetic blockade can improve microvascular circulation by attenuating vasospasm, reducing catecholamine-mediated vasoconstriction, and enhancing tissue perfusion.[15] Improved blood flow may be particularly relevant in free flap surgeries, where vascular compromise is a major determinant of graft failure. Previous studies evaluating sympathetic blockade techniques in reconstructive microsurgery have similarly demonstrated improvements in flap temperature, perfusion, and vascularity. In the present study, SGB was not associated with increased vasopressor requirements, hemodynamic instability, or block-related adverse effects, supporting the safety and feasibility of this intervention in the perioperative setting. Given these findings, larger multicentric randomized controlled trials with adequate statistical power are required to more definitively evaluate the effect of stellate ganglion block on graft survival and re-exploration rates in head and neck free flap reconstruction surgeries.

CONCLUSION

SGB is a safe adjunct to general anesthesia in head and neck free flap reconstruction. Although this study was underpowered to demonstrate statistical significance, the observed reduction in graft-related complications suggests potential benefit that warrants confirmation in larger randomized controlled trials.

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REFERENCES

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin. 2021;71:209-49.
2. Kulkarni MR. Head and Neck Cancer Burden in India. Int J Head Neck Surg. 2013;4:29-35.
3. Bhandari S, Singh R, Mehndiratta S, Dadhich M. The impact of facial disfigurement and self-image anxiety on the quality of life of head and neck cancer patients. Oral Oncol Rep. 2024;10:100518.
4. Nogueira TE, Adorno M, Mendonça E, Leles C. Factors associated with the quality of life of subjects disfigurement due to surgical treatment of head and neck cancer. Med Oral Patol Oral Cir Bucal. 2018;23:e132-7.
5. Gabrysz-Forget F, Tabet P, Rahal A, Bissada E, Christopoulos A, Ayad T. Free versus pedicled flaps for reconstruction of head and neck cancer defects: a systematic review. J Otolaryngol Head Neck Surg. 2019;48:13.
6. Copelli C, Tewfik K, Cassano L, Pederneschi N, Catanzaro S, Manfuso, A et al. Management of free flap failure in head and neck surgery. Acta Otorhinolaryngol Ital. 2017;37:387-92.
7. Geiger EJ, Basques BA, Chang CC, Son Y, Sasaki CT, McGregor A, et al. Pedicle versus free flap reconstruction in patients receiving intraoperative brachytherapy. J Plast Surg Hand Surg. 2016;50:227-32.
8. Goswami U, Jain A. Anaesthetic implications of free-flap microvascular surgery for head and neck malignancies – A relook. J Anaesthesiol Clin Pharmacol. 2021;37:499-504.
9. Habib AMA, Zanaty OM, Anwer HF, Abo Alia D. The effect of paravertebral block on maxillofacial free flap survival. Int J Oral Maxillofac Surg. 2017;46:706-11.
10. Hyun SJ, Ahn S-H. Risk of Microvascular Anastomosis Performed in Previous Treated Neck. Korean J Otorhinolaryngol-Head Neck Surg. 2021;64:811-9.
11. Zor F, Ozturk S, Usyilmaz S, Sengezer M. Is stellate ganglion blockade an option to prevent early arterial vasospasm after digital microsurgical procedures? Plast Reconstr Surg. 2006;117:1059-60.
12. Su HH, Lui PW, Yu CL, Liew CS, Lin CH, Lin YT, et al. The effects of continuous axillary brachial plexus block with ropivacaine infusion on skin temperature and survival of crushed fingers after microsurgical replantation. Chang Gung Med J. 2005;28(8):567-74.
13. Demir A, Kucuker I, Keles MK, Demirtas Y. The effect of learning curve on flap selection, re-exploration, and salvage rates in free flaps; A retrospective analysis of 155 cases. Microsurgery. 2013;33:519-26.
14. Trkulja V, Hrabač P. Confidence intervals: what are they to us, medical doctors? Croat Med J. 2019;60:375-82.
15. Ichinose M, Nakabayashi M, Ono Y. Difference in the integrated effects of sympathetic vasoconstriction and local vasodilation in human skeletal muscle and skin microvasculature. Physiol Rep. 2019;7:e14070.

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