

Comparison of Bipolar Vessel Sealing System versus Suture Ligation in Selective Neck Dissection in Patients with Oral Cancer

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Abstract

Introduction: Major head and neck surgery involve dissections close to crucial structures such as nerves and vessels. For this reason, it is very important to use safe instruments for dissection and hemostasis. In a wide variety of surgical procedures, advanced vessel sealing devices are replacing traditional techniques for vessel ligation.

Aim: Our study aimed to compare the bipolar vessel sealing system versus suture ligation in selective neck dissection in patients with oral cancer.

Methods: This prospective comparative study was conducted to compare the outcome of the bipolar vessel sealing system versus suture ligation in selective neck dissection in patients with oral cancer. Out of 40 patients enrolled in the study, 20 patients were in Group A (bipolar vessel sealing system) and 20 patients in Group B (Suture ligation). The outcome measures recorded were blood loss, operating time, duration of hospital stay, pre-operative blood transfusion, Fromme's surgical field scale, post-operative pain, and drainage volume. Treatment protocol and follow-up protocol were followed and the results were statistically analyzed and discussed.

Results: Out of 40 patients, 20 patients had bipolar vessel sealing system and 20 patients had suture ligation. In bipolar vessel sealing system of 20 patients, 12 patients were male and 8 patients were female, mean value of blood loss is 26.84 ± 22.34 ml, operating time is 48.56 ± 5.48 min, duration of hospital stay is 12.92 ± 1.28 days, mean value of post-operative pain in day 0 is 3.5 ± 1 , day 1 is 3.1 ± 1 , day 2 is 1.8 ± 0.5 , and day 3 is 1.1 ± 0.5 , and drainage volume (ml) in 24 h is 72.48 ± 28.46 , 48 h is 24.57 ± 18.29 , and 72 h is 7.24 ± 6.7 . In suture ligation of 20 patients, 15 patients were male and 5 patients were female, mean value of blood loss is 39.28 ± 16.44 ml, operating time is 54.22 ± 4.14 min, duration of hospital stay is 13.87 ± 1.42 days, mean value of post-operative pain in day 0 is 4.01 ± 0.9 , day 1 is 3.8 ± 1.1 , day 2 is 2.4 ± 0.6 , and day 3 is 1.6 ± 0.8 , and drainage volume (ml) in 24 h is 98.28 ± 36.87 , 48 h is 41.28 ± 21.24 , and 72 h is 18.29 ± 9.45 .

Conclusion: Bipolar vessel sealing system is more efficacious in terms of reducing blood loss, operating time, and better surgical field than conventional suture ligation. Thus, bipolar vessel sealing system is more advantageous compared to the traditional techniques, from both a clinical and economic point of view.

Key words: Bipolar vessel sealing system, Selective neck dissection, Suture ligation

INTRODUCTION

Prevention of blood loss during surgery is very significant and thus minimizing the intraoperative bleeding which not

only provides a clear surgical field, reducing the risk of damage to vital structures but also helps in decreasing pre-operative complications such as hemorrhage or hematoma.

The use of suture ligation to achieve hemostasis continues to remain the gold standard in surgery despite having many disadvantages such as being time-consuming, risk of knot slippage, inflammation, poor wound healing, and foreign body reactions.^[1] However, it is very difficult to use in the smaller fragile vessels. Electrocautery and conventional diathermy require cautious use as they may cause inadvertent thermal damage to the adjacent tissues.^[2] Conventional

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bipolar diathermies, although safer than monopolar, are effective only for vessels of smaller size.^[2] These drawbacks have led to the development of new techniques such as ultrasonic scalpels and electrothermal bipolar vessel sealer (EBVS). These technologies have reported advantages such as time-saving and reduction in blood loss.

An EBVS has been developed as an alternative to suture ligatures, hemoclips, staplers, and ultrasonic coagulator for ligating vessels and tissue bundles. The instrument seals vessels up to 7 mm in diameter by denaturing collagen and elastin within the vessel wall and surrounding connective tissue. This novel hemostatic device is a safe, effective, and time-saving alternative to other methods for surgical hemostasis in different surgical operations. The EBVS utilizes a combination of mechanical pressure and high-frequency electrical energy to bring about hemostasis.^[3,4] The thermal injury from EBVS is limited to <1.5–3 mm from the coagulated tissues.^[2,4,6]

MATERIALS AND METHODS

This prospective comparative study was conducted to compare the outcome of the bipolar vessel sealing system versus suture ligation in selective neck dissection in patients with oral cancer under different study parameters such as age, blood loss, operating time, duration of hospital stay, pre-operative blood transfusion, drainage volume, post-operative pain, and Fromme's surgical field scale.

The study population consisted of patients with oral cancer CT1No, CT2No who reported to our department. Informed consent was obtained from all the patients before inclusion in the study. Adults above the age of 18 years with the American Society of Anesthesiologists physical status of classes I and II were included in the study. Patients below 18 years of age and those with comorbidities such as diabetes and bleeding disorders, pregnancy, previous surgery, or neck irradiation were excluded from the study.

A total of 40 patients were divided into Group A and Group B of 20 patients, each using computer-generated randomization. In Group I, bipolar vessel sealing system and in Group II suture ligation were used for achieving hemostasis. Conventional monopolar and bipolar diathermy was used for smaller blood vessels (<2 mm in diameter) in both groups.

All the procedures were performed under general anesthesia by the same surgical team to avoid any inter-operator bias. The standard protocol for selective neck dissection was followed. Level I, II, and III cervical lymph nodes along with the submandibular salivary gland were dissected. Level IV cervical lymph was also removed in

tongue subsite only. The various structures sealed or ligated included the facial artery and veins, submandibular duct, superior thyroid vein, external jugular vein, and common facial vein.

In Group A ($n = 20$), the bipolar vessel sealing system was used to ligate the vessels or structures (up to 7 mm in diameter), thinner tissues or vessels, one seal was performed, and for larger vessels, the double seal technique was used. Bipolar vessel sealing system was first applied distally, closer to the structures to be removed and then 3–4 mm proximally. Surgical clips or any other hemostatic aids were not used in either group. In Group B ($n = 20$), 2–0 silk/vicryl was used to ligate the vessels using the conventional knot-tying technique.

RESULTS

Of 40 patients, 20 patients had bipolar vessel sealing system and 20 patients had suture ligation. In bipolar vessel sealing system of 20 patients, 12 patients were male and 8 patients were female, and in suture ligation, 15 patients were male and 5 patients were female [Table 1].

Of 40 patients, the mean age group in the bipolar vessel sealing system is 54.23 ± 14.28 , and in conventional suture, ligation is 49.44 ± 12.56 [Table 2].

Of 40 patients, in bipolar vessel sealing system mean value of blood loss is 26.84 ± 22.34 ml, operating time is 48.56 ± 5.48 min, and duration of hospital stay is 12.92 ± 1.28 days, and in conventional suture ligation mean value of blood loss is 39.28 ± 16.44 ml, operating time is 54.22 ± 4.14 min, and duration of hospital stay is 13.87 ± 1.42 days [Table 3].

Table 1: Sex distribution between the two groups

Gender	BVS	Conventional
Male	12	15
Female	8	5

Table 2: Age distribution between the two groups

Age	BVS	Conventional
Mean±SD	54.23±14.28	49.44±12.56

Table 3: Blood loss, time for neck dissection, and duration of hospital stay between two groups

Variables	BVS	Conventional
Blood loss (ml)	26.84±22.34	39.28±16.44
Time for neck dissection (min)	48.56±5.48	54.22±4.14
Duration of hospital stay (days)	12.92±1.28	13.87±1.42

Of 40 patients, 8 patients in the bipolar vessel sealing system had a pre-operative blood transfusion, and in conventional suture ligation, 9 patients had pre-operative blood transfusion [Table 4].

Of 40 patients, in bipolar vessel sealing system Fromme's surgical field scale 0 is 3.5, 1 is 49.44, 2 is 30.48, 3 is 16.29, 4 is 3.5, and 5 is 0, and in conventional suture ligation system Fromme's surgical field scale 0 is 3.5, 1 is 11.24, 2 is 18.44, 3 is 48.57, 4 is 18.44, and 5 is 0 [Table 5].

Of 40 patients, in bipolar vessel sealing system mean value of post-operative pain in day 0 is 3.5 ± 1 , day 1 is 3.1 ± 1 , day 2 is 1.8 ± 0.5 , and day 3 is 1.1 ± 0.5 and in conventional suture ligation mean value of post-operative pain in day 0 is 4.01 ± 0.9 , day 1 is 3.8 ± 1.1 , day 2 is 2.4 ± 0.6 , and day 3 is 1.6 ± 0.8 [Table 6].

Of 40 patients, in bipolar vessel sealing system drainage volume in 24 h is 72.48 ± 28.46 , 48 h is 24.57 ± 18.29 , and 72 h is 7.24 ± 6.7 , and in conventional suture ligation drainage volume in 24 h is 98.28 ± 36.87 , 48 h is 41.28 ± 21.24 , and 72 h is 18.29 ± 9.45 [Table 7]. There was no rebleeding and mortality in both groups.

DISCUSSION

The bipolar vessel sealing system has been hypothesized as an alternative to suture ligation with advantages of reduced blood loss, operating time, and better perioperative outcomes. We evaluated the system in terms of blood loss, operating time, quality of the surgical field, post-operative pain, and duration of hospital stay.

Our results showed that the bipolar vessel sealing system was advantageous in reducing blood loss and operating

time, providing a better surgical field, without increasing the perioperative morbidities when compared to suture ligation in selective neck dissection.

In our study, the blood loss during neck dissection in Group A was significantly less than in Group B. Several other authors have reported significantly less blood loss for the bipolar vessel sealing system compared to suture ligation.^[7-9] Thus, it is statistically significant.

In our study, the operating time for neck dissection is reduced in Group A compared to Group B which is similar to several other studies.^[7-12] Thus, it is statistically significant.

In our study, the quality of the surgical field was significantly better in Group A than in Group B which was obviously due to less intraoperative bleeding with the bipolar vessel sealing system. Thus, it is statistically significant.

In our study, post-operative pain score was low in Group A compared to Group B which is similar to other studies. Thus, it is statistically significant.

In our study, drainage volume in Group A is low compared to Group B which is similar to other studies.^[10] Thus, it is statistically significant.

Most studies that have compared the hospitalization time reported no significant difference between the two groups, similar to our findings.^[12-15]

In our experience, the vessel sealing system was easy to use without any technical difficulties and had a short learning curve. It is less time-consuming and tedious than suture ligation and does not have the risk of knot slippage and foreign body reaction. The reduction in blood loss is especially useful for patients presenting with advanced stages of the disease, often associated with anemia. Although the device is expensive, it can

Table 4: Pre-operative blood transfusion between the two groups

Pre-operative blood transfusion	BVS	Conventional
Yes	8	9

Table 5: Fromme's surgical field scale between the two groups

Fromme's surgical field scale	BVS	Conventional
0	3.5	3.5
1	49.44	11.24
2	30.48	18.44
3	16.29	48.57
4	3.5	18.44
5	0	0

Table 6: Post-operative pain between the two groups

Pain	BVS	Conventional
Post-operative day 0	3.5 ± 1	4.01 ± 0.9
Post-operative day 1	3.1 ± 1	3.8 ± 1.1
Post-operative day 2	1.8 ± 0.5	2.4 ± 0.6
Post-operative day 3	1.1 ± 0.5	1.6 ± 0.8

Table 7: Drainage volume between the two groups

Drainage volume (h)	BVS	Conventional
24	72.48 ± 28.46	98.28 ± 36.87
48	24.57 ± 18.29	41.28 ± 21.24
72	7.24 ± 6.7	18.29 ± 9.45

be reused, in contrast to standard diathermy which is disposable, thus being more cost-effective. Another drawback is the size of the tip of the instrument which has poor grasping qualities compared to standard bipolar forceps. It may sometimes feel cumbersome while dissection and is not suitable for coagulating smaller vessels for which the standard monopolar or bipolar cautery is needed.

CONCLUSION

The bipolar vessel sealing system is a safe device for achieving hemostasis in neck dissection procedures. It significantly reduced operating time and blood loss, providing a better surgical field without increasing the perioperative complications or morbidity. Patient compliance was better in terms of reducing post-operative pain compared to the suture ligation. Thus, we recommend the use of the EBVS for neck dissection procedures.

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