

Blood Loss with Use of the Shaw Scalpel® for the Treatment of Oral Cancer

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The Shaw scalpel® was used in seven radical operations for oral cancer. The amount of bleeding and postoperative exudate and the occurrence of postoperative complications were compared with that from 12 operations performed with the conventional steel scalpel. The blood loss during the radical neck dissection performed with the Shaw scalpel was 39% of the control value, and no blood transfusions were necessary. There was no increase in the amount of postoperative exudate in the Shaw scalpel group compared with the control group. Skin incision with the Shaw scalpel was accompanied by superficial wound dehiscences in three patients, which healed without any treatment.

Extensive bleeding is not uncommon in the radical operation of carcinomas occurring in the oral region because it is one of the most highly vascularized areas. The electrosurgical unit (ESU) is often used to advantage to reduce this blood loss, but it may create tissue damage that leads to postoperative complications such as wound dehiscence. Since the Shaw scalpel (Oximérix, Inc., Mountain View, Cal.) is capable of producing a skin incision and hemostasis at the same time, it was compared with the conventional steel scalpel for its ability to control bleeding and to prevent wound dehiscence in a series of patients who underwent radical operations for treatment of oral carcinoma.

Materials and Methods

The Shaw scalpel was used in seven patients who underwent radical neck dissections. Hemimaxillectomy or extensive resection of primary lesions followed by reconstruction with a deltopectoral (DP) flap were performed in three cases in conjunction with the radical neck dissections. Patients in whom radical neck dissections were performed with the conventional steel scalpel served as a control group. Surgical intervention in these patients included either resection of the primary lesion and/or im-

mediate reconstruction plus radical neck dissection in four patients. The remaining eight patients had only a radical neck dissection. These operations were started with the radical neck dissection. The hemostatic effects were evaluated by measuring total blood loss, blood loss in relation to operating time and the amount of postoperative exudate collected in a continuous suction unit. In addition, the occurrence of wound dehiscence and postoperative infections were studied.

Results

The total blood loss in the eight patients treated by only a radical neck dissection with the conventional method ranged from 450 ml to 2000 ml, with a mean of 1102 ml, whereas it decreased to 39% of the control value (430 ml) when the Shaw scalpel was used (Tables 1, 2). Blood transfusion was not needed in any patient in the latter group. Bilateral neck dissections, resection of the mandible and two-thirds of the tongue, dissection of oral floor and immediate reconstruction of the resulting defect with a DP flap were carried out in case 6. It took 10 hours, but the blood loss was only 1595 ml. This was approximately half of the blood loss encountered during a similar operation in the control group. The blood loss measured every 30 minutes is shown in Figures 1 and 2. The blood loss during the first 60 minutes of the operation averaged only 38 ml in the Shaw scalpel group, whereas the blood loss in the conventional scalpel group was 235 ml. The total blood loss in these groups was 121 ml and 470 ml, respectively, by the end of the next hour.

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Table 1. Total Blood Loss by Type of Procedure in Patients Operated on with the Shaw Scalpel

| | Age (Years) | Sex | Diagnosis | Blood Loss (ml) | Transfusion (ml) | Other Operations |
|--|-------------|-----|-------------------|-----------------|------------------|--|
| Radical neck dissection* | | | | | | |
| Patient 1 | 47 | M | Ca. of Mandible | 387 | — | |
| Patient 2 | 65 | M | Ca. of Tongue | 213 | — | |
| Patient 3 | 69 | M | Ca. of Tongue | 465 | — | |
| Patient 4 | 61 | M | Ca. of Tongue | 667 | — | |
| Radical neck dissection - hemimaxillectomy | | | | | | |
| Patient 5 | 61 | M | Ca. of Max. Sinus | 1,253 | 1,200 | |
| Radical neck dissection - deltopectoral flap | | | | | | |
| Patient 6 | 53 | M | Ca. of Oral Floor | 1,595 | 1,200 | Bilateral neck dissection; amputation of mandible; Two-thirds resection of tongue; oral floor dissection |
| Patient 7 | 37 | M | Ca. of Tongue | 1,444 | 1,200 | Amputation of mandible; hemiresection of tongue; oral floor dissection |

* Mean blood loss of patients 1-4 = 430 ml.

Table 2. Total Blood Loss by Type of Procedure in Patients Operated on with a Conventional Steel Scalpel

| | Age (Years) | Sex | Diagnosis | Blood Loss (ml) | Transfusion (ml) | Other Operations |
|--|-------------|-----|--------------------|-----------------|------------------|--|
| Radical neck dissection* | | | | | | |
| Patient 8 | 55 | M | Ca. of Tongue | 2,000 | 2,000 | |
| Patient 9 | 51 | M | Ca. of Mandible | 1,500 | 1,500 | |
| Patient 10 | 39 | F | Ca. of Tongue | 700 | 600 | |
| Patient 11 | 67 | M | Ca. of Lower Lip | 1,725 | 1,600 | |
| Patient 12 | 65 | M | Ca. of Mandible | 836 | 640 | |
| Patient 13 | 65 | M | Ca. of Buc. Mucosa | 1,104 | 1,000 | |
| Patient 14 | 62 | M | Ca. of Tongue | 450 | — | |
| Patient 15 | 60 | F | Ca. of Mandible | 500 | 800 | |
| Radical neck dissection - hemimaxillectomy | | | | | | |
| Patient 16 | 54 | M | Ca. of Buc. Mucosa | 3,579 | 3,600 | Hemimandibulectomy |
| Radical neck dissection - deltopectoral flap | | | | | | |
| Patient 17 | 35 | M | Ca. of Tongue | 3,400 | 3,000 | Hemiresection of tongue; oral floor dissection |
| Patient 18 | 26 | M | Ca. of Tongue | 3,045 | 3,000 | Hemiresection of tongue; oral floor dissection |
| Patient 19 | 23 | F | Ca. of Mandible | 2,176 | 2,200 | Hemimandibulectomy; partial resection of cheek |

* Mean blood loss of patients 8-15 = 1,102 ml.

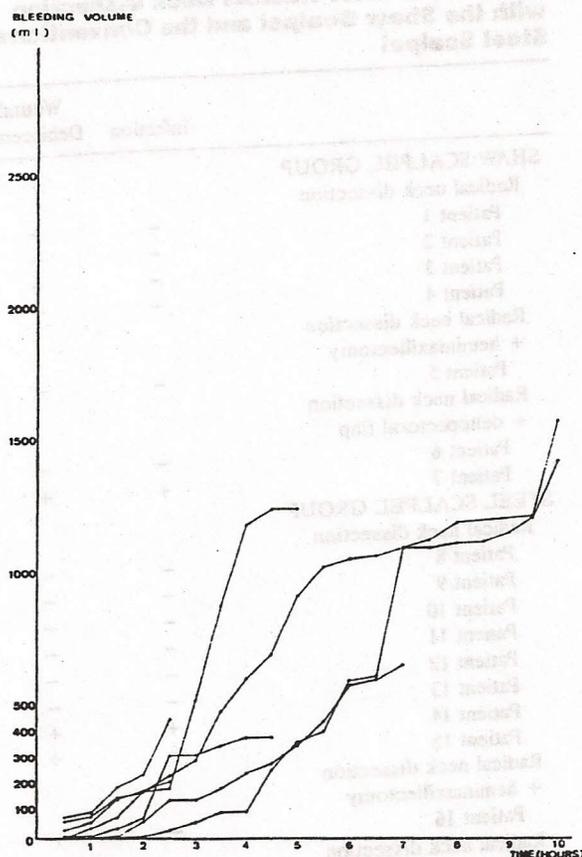


FIGURE 1 (left). Volume of blood lost in Shaw scalpel group.

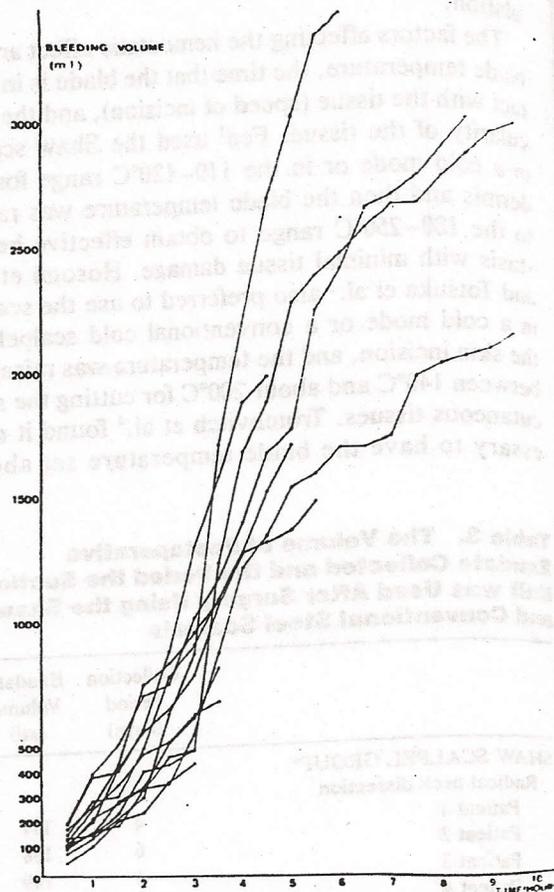


FIGURE 2 (right). Volume of blood lost in control group.

The total volume of exudate collected in the suction unit is shown in Table 3. In contrast with the 340 ml in the control group, the exudate collected during the 4.7 postoperative days averaged 360 ml in the Shaw scalpel group. Therefore, the use of the Shaw scalpel is not accompanied by an increase of the postoperative exudate. As shown in Table 4, postoperative infection occurred in one patient and wound dehiscence in three patients of the seven operated with the Shaw scalpel. In the control group, postoperative infection occurred in one patient and wound dehiscence in four of the 12 patients. These dehiscences were noted on removal of the sutures but healed spontaneously without an additional surgical procedure.

Discussion

Bleeding is a matter of great concern for surgeons, because it obscures the area of operation, increases operative time, and has adverse local and systemic effects on patients. The current study has

shown that these adverse effects can be greatly reduced in patients having radical operations for oral carcinoma with the aid of the Shaw scalpel. This scalpel has many advantages.

1. It resembles the usual surgical scalpel in size, shape, and sharpness, and it provides a greater tactile sensation than the ESU.
2. Hemostasis is achieved with less difficulty and blood loss is markedly reduced.
3. It decreases the necessity of blood transfusion.
4. A better visualization of the surgical site is obtained.
5. It can be used in a cold mode.
6. The blade materials are both nontoxic and nonhemolytic.¹
7. Incision and sealing of blood vessels are accomplished with less tissue damage than when the ESU is used. In general, the tissue damage resulting from ESU extends to 5 mm from the incision margin, but it is confined to less than 1 mm when the scalpel is used.²
8. No electric current passes through the patient. Therefore, a ground plate is not needed and muscle

or tissue adjacent to nerves can be cut without stimulation.

The factors affecting the hemostatic effect are the blade temperature, the time that the blade is in contact with the tissue (speed of incision), and the vascularity of the tissue. Fee¹ used the Shaw scalpel in a cold mode or in the 110–120°C range for the dermis and then the blade temperature was raised to the 180–250°C range to obtain effective hemostasis with minimal tissue damage. Hosomi et al.² and Totsuka et al.³ also preferred to use the scalpel in a cold mode or a conventional cold scalpel for the skin incision, and the temperature was raised to between 140°C and about 200°C for cutting the subcutaneous tissues. Tromovitch et al.⁴ found it necessary to have the blade temperature set above

Table 3. The Volume of Postoperative Exudate Collected and the Period the Suction Unit was Used After Surgery Using the Shaw and Conventional Steel Scalpels

| | Collection Period (days) | Exudate Volume (ml) |
|--|--------------------------|---------------------|
| SHAW SCALPEL GROUP* | | |
| Radical neck dissection | | |
| Patient 1 | 4 | 171 |
| Patient 2 | 6 | 188 |
| Patient 3 | 4 | 149 |
| Patient 4 | 7 | 756† |
| Radical neck dissection + hemimaxillectomy | | |
| Patient 5 | 6 | 334 |
| Radical neck dissection + deltopectoral flap | | |
| Patient 6 | 5 | 479‡ |
| Patient 7 | 4 | 449 |
| STEEL SCALPEL GROUP§ | | |
| Radical neck dissection | | |
| Patient 8 | 4 | 170 |
| Patient 9 | 2 | 90 |
| Patient 10 | 3 | 173 |
| Patient 11 | 5 | 693 |
| Patient 12 | 4 | 179 |
| Patient 13 | 6 | 340 |
| Patient 14 | 4 | 181 |
| Patient 15 | 6 | 172 |
| Radical neck dissection - hemimaxillectomy | | |
| Patient 16 | 8 | 781 |
| Radical neck dissection - deltopectoral flap | | |
| Patient 17 | 2 | 590 |
| Patient 18 | 4 | 305 |
| Patient 19 | 6 | 412 |

* Mean exudate volume of Shaw scalpel group = 360 ml.

† Not only postoperative exudate but also chyle was collected.

‡ Total volume of right and left side.

§ Mean exudate volume of steel scalpel group = 340 ml.

Table 4. Occurrence of Infection and Wound Dehiscence after Radical Neck Dissection with the Shaw Scalpel and the Conventional Steel Scalpel

| | Infection | Wound Dehiscence |
|--|-----------|------------------|
| SHAW SCALPEL GROUP | | |
| Radical neck dissection | | |
| Patient 1 | - | + |
| Patient 2 | - | - |
| Patient 3 | - | + |
| Patient 4 | - | - |
| Radical neck dissection + hemimaxillectomy | | |
| Patient 5 | - | - |
| Radical neck dissection + deltopectoral flap | | |
| Patient 6 | - | - |
| Patient 7 | + | + |
| STEEL SCALPEL GROUP | | |
| Radical neck dissection | | |
| Patient 8 | - | - |
| Patient 9 | - | - |
| Patient 10 | - | - |
| Patient 11 | - | - |
| Patient 12 | - | - |
| Patient 13 | - | - |
| Patient 14 | + | + |
| Patient 15 | - | + |
| Radical neck dissection + hemimaxillectomy | | |
| Patient 16 | - | + |
| Radical neck dissection + deltopectoral flap | | |
| Patient 17 | - | - |
| Patient 18 | - | - |
| Patient 19 | - | + |

150°C for most of their work since this allows a quick, easy cut through the skin and subcutaneous tissues and at the same time coagulates almost all bleeders encountered. In this study, the scalpel was used at about 190°C for incising skin and muscle and for formation of the skin flaps during radical neck dissection and was found to be quite advantageous because blood transfusion was not needed due to the decrease of blood loss over the conventional method. According to Levenson et al.,⁵ when the incision of burned skin (150 cm²) to the muscle-investing fascia and muscle was accomplished with the scalpel heated to 180°C, blood loss was about 10% of that seen when the conventional steel scalpel was used.

Totsuka et al.³ reported that the volume of postoperative exudate increased and the period that the continuous suction unit was needed was prolonged in the Shaw scalpel group. There was, however, no such tendency in our patients. There was also no

increase of postoperative infection in the Shaw scalpel group, as compared to the control group, similar to what was reported by Levenson et al.⁵ As for wound dehiscence, no difference between groups was found. Wound dehiscence on the surface of the skin was seen in three patients in the Shaw scalpel group, but the wound closed spontaneously without any suturing. Postoperative complications were not encountered, but further follow-up is needed to evaluate the effect of the Shaw scalpel on postoperative scar formation.

References

1. Fee WE Jr: Use of the Shaw scalpel in head and neck surgery. *Otolaryngol Head Neck Surg* 89:515, 1981
2. Hosomi Y, Makimoto K, Kanoh Y, et al: Experimental study with the Shaw scalpel system and its clinical application. *Pract Otol Kyoto* 76:2929, 1983
3. Totsuka Y, Kida M, Usui Y, et al.: Clinical studies of the Shaw scalpel in oral surgery. *Jpn J Oral Maxillofac Surg* 30:504, 1984
4. Tromovitch TA, Glogau RG, Stegman SM, et al: The Shaw scalpel. *J Dermatol Surg Oncol* 9:316, 1983
5. Levenson SM, Gruber DK, Gruber C, et al: A hemostatic Scalpel for burn debridement. *Arch Surg* 117:213, 1982

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