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Parotid Gland Surgery Using the Shaw Hemostatic Scalpel

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• **Twenty-five patients who underwent parotid gland surgery using the Shaw Hemostatic Scalpel (group 1) were compared with 25 patients who had similar surgery using conventional techniques (group 2). Overall, the patients in group 1 had less blood loss and shorter operative times. In patients who underwent superficial parotidectomy, the incidence of temporary partial facial nerve paralysis was 31% in the experimental group *v* 43% in the conventional group. The mean number of branch paralyses per patient was one in group 1 *v* 1.9 in group 2, and time to recovery of full function was 50% less in group 1. The Shaw Hemostatic Scalpel is a safe, efficacious instrument for use in parotid gland surgery.**

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Achieving operative hemostasis using conventional means occupies a substantial amount of operating time and is necessary to prevent the most common surgical complication. It also represents drudgery to the surgeon and increases operative time. Desiccation of bleeding vessels using conventional electrosurgical units (ESUs), while effective, creates substantial tissue damage. Some surgeons choose to tie off troublesome bleeders rather than produce the additional tissue damage that is associated with the ESU. Parotid gland surgery involves the additional consideration of facial nerve function following the removal of benign or malignant tumors. Use of ESUs near the facial nerve is fraught with the potential complication of facial nerve paralysis; the small capillary bleeding that ensues when using conventional techniques slows the tempo of the operation and may temporarily obscure the facial nerve branch. The Shaw Hemostatic Scalpel (Oximetrix, Inc, Mountain View, Calif) works best where small capillary bleeding typically obscures visibility (eg, parotid gland surgery), but since the first clinical report appeared,[1] we have received numerous inquiries as to its safety regarding the facial nerve. The purpose of this article is to compare and contrast facial nerve function in patients undergoing parotid gland surgery using the Shaw Hemostatic Scalpel *v* conventional techniques.

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PATIENTS AND METHODS

Fifty patients undergoing parotid gland surgery at Stanford (Calif) University Medical Center during 1981 and 1982 were studied. None had previous surgery, and all had normal facial nerve function preoperatively. In 25 patients, the Shaw Hemostatic Scalpel was used (group 1). They were compared with the remaining 25 patients in whom conventional techniques were used (group 2). Most of the surgery was carried out by senior residents with close faculty supervision. All procedures performed on patients in group 1 were supervised by one of us (W.E.F.). A modified Blair incision was made in all cases, and the facial nerve trunk was identified after its exit from the stylomastoid foramen and dissection proceeding from proximal to distal along the facial nerve. The nerve was dissected from the overlying parotid tissue using a clamp, and the parotid gland was sectioned using the Shaw Hemostatic Scalpel in group 1 and a cold Bard-Parker blade or scissors in group 2. If a neck dissection was required, the upper limb of the modified Blair incision was extended medially, and a second horizontal incision was made inferiorly in a neck crease. Operative times were taken from the anesthesia record and included time for prepping, draping, and bandaging at the conclusion of the procedure. Blood loss was determined by weighing soiled sponges, although in three cases in the conventional group, the anesthesiologist's estimate was used.

Facial nerve function was recorded as totally intact, totally paralyzed, or partially intact. The patients were followed up weekly during the first postoperative month and monthly thereafter until their facial nerve function recovered fully.

RESULTS

Table 1 illustrates the overall results of our study. More total parotidectomies were performed in group 1, and only in that group were neck dissections performed. Fifty-two percent of the patients had no postoperative facial nerve deficit; 4% required total or partial facial nerve sacrifice secondary to tumor invasion determined at the time of surgery. Temporary, partial facial nerve weakness occurred in 44% of patients (38% of those who underwent superficial parotidectomy and 62% of those who underwent a total parotidectomy). No patient suffered a total, temporary nerve paralysis. In group 2, one patient required sacrifice of the marginal mandibular nerve, and one patient required total nerve sacrifice secondary to cancer invasion and therefore did not recover facial nerve function; these two patients were excluded from further analysis. Those patients who had high-grade malignant neoplasms (high-grade mucoepidermoid, malignant mixed tumor, high-grade adenocarcinoma, squamous cell carcinoma, or undifferentiated carcinoma) underwent postoperative irradiation therapy.

Excluding those patients in group 1 who underwent modified neck dissections, the mean operative times and blood loss are shown in Table 2. Note that the operative times and blood loss for the superficial parotidectomy patients in group 1 are significantly less than they were in group 2. Although the reduction in blood loss is not surprising, the reduction in operative time is, in view of the fact that the surgeon must cut more slowly when using the Shaw Hemostatic Scalpel in order to achieve the increased hemostasis. The time saving probably reflects the fewer number of times the operation must be stopped to achieve hemostasis.

Table 3 shows those branches of the facial nerve that were weakened by the surgical procedure and their time to recovery in the superficial parotidectomy group. The marginal mandibular nerve was the most commonly affected branch, followed by the buccal branch, with an equal number of cases involving the zygomaticotemporal and frontal branches. The average time to recovery was 1.75 months in group 1 (range, 0.5 to four months) *v* 3.5 months (range, 1.5 to five months) in group 2. Five patients in group 1 had an individual nerve branch weakened or paralyzed by the procedure, producing one branch per patient in group 1 *v* 19 branches in ten patients in group 2, or 1.9 branches per patient.

In patients who underwent total parotidectomy, the marginal mandibular nerve was more commonly paretic after surgery than any other branch. In group 1, seven patients had 12 branches affected for a mean of 1.7 weakened branches per patient *v* four branches in one patient in group 2. In group 1, the average time to recovery was 4.2 months *v* three months in group 2.

Table 1.—Entire Study Group

Variable	Shaw Hemostatic Scalpel	Conventional Technique	Total
Type of procedure, No.*			
SP	14	21	35
SP and ND	2	0	2
TP	8	4	12
TP and ND	1	0	1
Mean operative time, min	169	175	172
Mean blood loss, mL	202	269	235
Seventh nerve sacrificed, No.	0	2	2
Postoperative seventh nerve function, %			
Normal	52	52	52
Partially intact	48	48	44†
Totally out	0	0†	0
Time to seventh nerve recovery, mo	2.45	2.7	2.5

*SP indicates superficial parotidectomy; ND, modified neck dissection; and TP, total parotidectomy.
†Excludes two patients whose nerves were deliberately sacrificed.

Table 2.—Entire Group Excluding Patients With Neck Dissections*

	Shaw Hemostatic Scalpel		Conventional Technique	
	SP (n = 14)	TP (n = 8)	SP (n = 21)	TP (n = 4)
Mean operative time, min	125	213	171	200
Mean blood loss, mL	107	337	256	366

*SP indicates superficial parotidectomy; TP, total parotidectomy.

Table 3.—Facial Nerve After Superficial Parotidectomy

	Shaw Hemostatic Scalpel Group (n = 16)		Conventional Technique Group (n = 21)	
	No.	Mean Recovery Time, mo	No.	Mean Recovery Time, mo
Paretic branch				
None	11.0	0.0	12.0	0.0
Frontal	1.0	4.0	3.0	2.3
Zygomatic	0.0	0.0	4.0	3.8
Buccal	1.0	0.75	4.0	4.0
Marginal mandibular	3.0	1.3	8.0	3.8
Patient average	1.0	1.75	1.9	3.5

COMMENT

Causes of facial nerve paralysis following surgery of the parotid gland include deliberate or inadvertent resection of the nerve, local pressure on the nerve during dissection, too forceful stretching of the nerve, crush injury to the nerve while clamping or tying a small bleeder, postoperative edema producing neuropraxia, postoperative hematoma producing pres-

sure on the nerve, and radiation-induced fibrosis when interstitial implants are used. Heat damage to the nerve by inappropriate use of a thermal scalpel system or electrocoagulation of bleeding vessels in close proximity to the nerve can also be added to this list.

Miehlke[2] believes that postoperative paralysis can never be predicted and that the surgeon can only partly control its occurrence. He claims that there is no relationship between the amount of stretching and retraction and the development of paresis. While we agree in general with the unpredictability of that occurrence, our data shows total parotidectomy is associated with a higher incidence of temporary paralysis and that the time to full recovery is longer than when superficial parotidectomy is performed. This suggests that retraction or stretching of the nerve produces an increased incidence of temporary paresis.

The reported incidence of facial nerve weakness following superficial parotidectomy varies. Frazell[3] reported an 11.9% incidence of temporary and a 2.6% incidence of permanent facial palsy following excision of benign mixed tumors; it is likely that some of these cases involved techniques other than superficial parotidectomy, including enucleation with or without interstitial radioactive implants. Conley[4] states that "approximately 50% [of patients] have a mild, temporary weakness" of the facial nerve following parotid surgery, which is similar to our experience. He also states that "in approximately 80% of the tumors of the parotid gland, there should be no significant surgical injury to the facial nerve system, and consequently no serious post-surgical effect on the movement of the face." Eneroth[5] states that permanent facial paralysis is rare but that temporary paresis (partial or total) occurs in 10% to 20% of cases, with recovery time varying from weeks to months.

Our data support the belief of Work and Bailey[6] that the cervicofacial division of the facial nerve was the most vulnerable to damage, followed by the buccal branch; the "zygomatic-frontal branch" was least prone to injury. Our data also support the general belief that permanent total facial nerve paralysis following parotid surgery does not usually occur unless the nerve is deliberately sacrificed. In our series, temporary partial paralysis (one or two branches) occurred more often than is reported by most authors but agrees with the findings reported by Conley.[4] This fact, we suspect, represents more critical observation and reporting rather than carelessness in technique.

The differences in findings between our two groups of patients were small. On the basis of blood loss alone, one could hardly be convinced that using the Shaw Hemostatic Scalpel produces greater advantages over conventional techniques. While the raw numbers do favor the Shaw scalpel, no patient required blood transfusion, and so the differences might not be meaningful. On the other hand, although the incidence of facial weakness was similar between the groups, the number of weakened branches per patient and time to recovery was 50% less in the group operated on with the Shaw scalpel than in the conventional group. While the overall results might be similar, the emotional and physical inconvenience to both the patient and the surgeon was substantially less in the former group.

Are these differences important? In the small number of cases of total parotidectomy, there is no apparent advantage to using the Shaw Hemostatic Scalpel other than the subjective impression of better nerve visibility. Whether or not an increased number of patients in both groups would show a difference remains to be determined. On the other hand, the differences in operative time in the superficial parotidectomy group of patients is indeed important when one considers that it currently costs $9.90/min for our operating room time. This results in a mean savings of $455 per patient (46 × $9.90) in operating costs alone. These savings exclude the additional time charged by an anesthesiologist, which is substantial. The cost savings more than offset the cost of an average of five blades per operative case (less than $10 per blade) or a total of not more than $50 for use of the Shaw Hemostatic Scalpel.

The intent of this article is not to extol the financial virtue of using the Shaw Hemostatic Scalpel, although this is a consideration. Rather, it is to point out that the use of a thermally activated scalpel system is *not* deleterious to facial nerve function postoperatively and that in fact the converse is true. Based on more than six years' experience with this instrument, we conclude that its greatest usefulness is in parotid gland surgery because of decreased hazard to the facial nerve as compared with conventional techniques. Surgeons who are inclined to change their techniques by deliberately slowing their incisions through the parotid gland using the Shaw scalpel will find the instrument extremely beneficial. There is no increased hazard to facial nerve function with the use of this instrument. In fact, data indicate that there is less hazard in terms of a decreased number of paretic branches per patient and a more rapid recovery of facial nerve function.

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