Tissue Welding Forceps Usage in Superficial Parotidectomy: A Clinical Assessment

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Tissue welding forceps (TWF) have been used effectively in a number of surgical procedures including blood vessel harvesting and tonsillectomy. Our objective was to assess the safety and efficacy of TWF usage in superficial parotidectomy. We performed a retrospective review of 25 patients between November 2002 and July 2006 who underwent superficial parotidectomy using TWF. The inpatient and outpatient records were reviewed for diagnosis, operative times, estimated blood loss, and postoperative facial paresis. Only one of the 25 patients (4%) who underwent superficial parotidectomy using TWF had transient postoperative facial weakness and no procedure had blood loss of greater than 150 cc. This initial evaluation suggests that use of TWF is safe in superficial parotidectomy and may help reduce the development of postoperative facial paresis.

IN PERFORMING HEAD and neck extirpative surgery around cranial nerves that are to be preserved, hemostasis is of the utmost importance. This has lead to a search for newer surgical techniques and instrumentation. Pressure assisted tissue welding forceps (TWF) technology (Starion Instruments, Inc., Sunnyvale, CA) was first described in general surgical use by Dr. Michael Treat in March 2001 at the American Gastrointestinal Endoscopic Surgery meeting.[1] The first TWF tonsillectomy was performed in 2002.[2] The technology has been previously described[2, 3] and briefly consists of a variable output direct current generator (Fig. 1) that supplies current to a thin nichrome wire, imbedded in one tine of insulated forceps (Fig. 2). The forceps has a built-in pressure switch proximally that is activated as the forceps is closed. Electric current flows to the forceps when a foot pedal is depressed and the pressure switch is activated. The combination of pressure and heat allow for simultaneous severing of tissue and sealing of blood vessels. The tissue temperature recordings obtained adjacent to the forceps during tonsillectomy study[2] led to our interest in using this technology in parotid surgery. The TWF used the principle of electrocautery, where a heated object is applied directly to tissues[4] as opposed to electrosurgery, where radiofrequency energy is used to generate heat within tissue without heating the instrument itself.[5]

We first began to use TWF in parotid surgery in November 2002. We have felt that the technique is both safe and efficient and have reviewed our past 3½ years of experience with regard to complications and ease of use.

Methods

After receiving institutional review board approval, a retrospective analysis of 30 consecutive patients who underwent TWF parotid surgery from November 2002 to July 2006 in a community hospital setting was carried out. Patients having total parotidectomy, preexisting facial palsy, or associated neck dissections were excluded, leaving 25 patients for evaluation. All patients were adults with diagnosis of both benign and malignant disease. The 25 patients (Table 1) were ages 25 to 88 years. There were six patients with malignant tumors (Table 2), 16 with benign tumors, and three with chronic sialoadenitis. All surgical procedures were performed by one of two surgeons (RGM or BIW) over a period of 44 months. The patient records, both inpatient and outpatient, were reviewed for operative times, estimated blood loss, and postoperative complications of bleeding, facial nerve paresis, salivary fistula, and gustatory sweating. This data was then compared with previous reports using other parotid dissection technologies.

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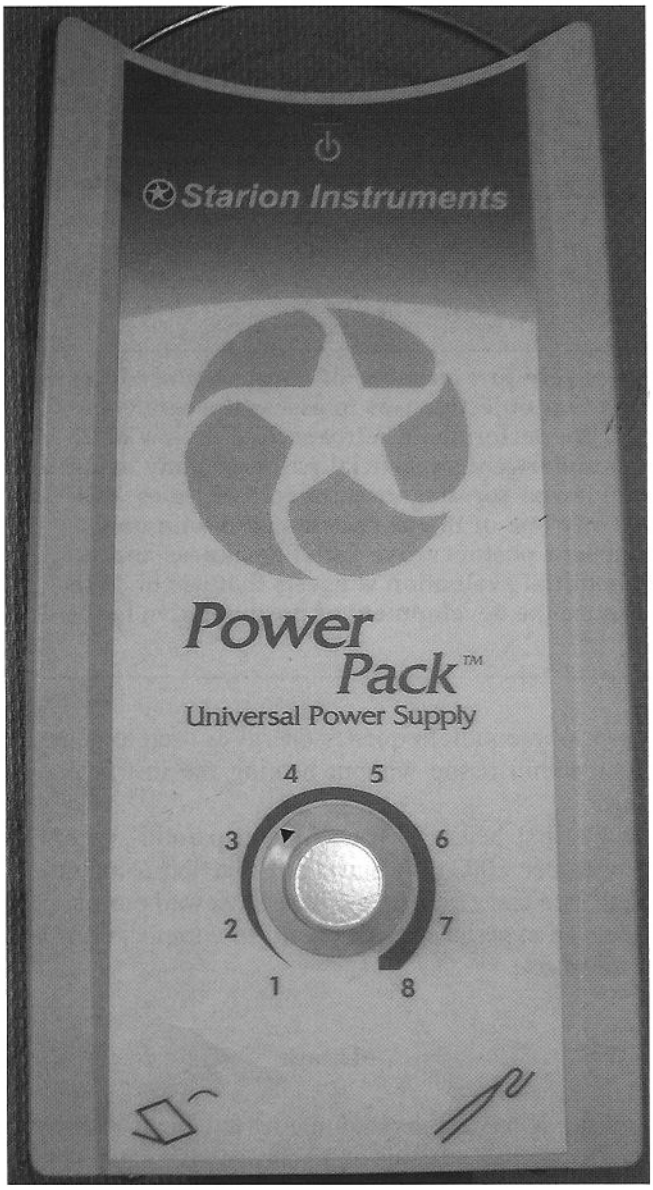

FIG. 1. A variable output direct current generator.

Surgical Technique

All patients were administered general anesthesia and, in 10 patients, facial nerve monitoring was carried out using the NIM II (Medtronic, Minneapolis, MN). All patients received an intravenous dose of antibiotic and steroid. A modified Blair incision was made in each case and flaps elevated to expose the parotid gland and masseteric muscle fascia. The parotid gland was then dissected from the anterior border of the sternocleidomastoid muscle and the tragal cartilage. The posterior belly of the digastric muscle was dissected to identify the main trunk of the facial nerve as it exited the stylomastoid foramen. In no case did the facial nerve require retrograde dissection. A fine clamp was then used to dissect the overlying superficial lobe of the parotid gland from the exposed underlying facial nerve. The TWF with the insulated tine toward the nerve was then used to grasp the tissue between the tines of the dissecting clamp (Fig. 3). The tissue was then sealed and severed (Fig. 4). This maneuver was then repeated until all the peripheral branches of the facial nerve were dissected. A Penrose drain was used for post operative drainage.

Results

The average age of the patients was 58.9 years, ranging from 25 to 88 years, with 10 males and 15 females. The average operative time was 155.6 minutes, with a range of 95 to 240 minutes. Average blood loss was 71.6 cc, with a range of 30 cc to 150 cc. There were no instances of delayed bleeding. Three patients experienced seroma formation requiring needle aspiration. One patient with a large pleomorphic adenoma experienced forehead weakness immediately postoperatively, which cleared by 6 weeks. There were no wound infections encountered and no instances of clinical Frey's syndrome were noted.

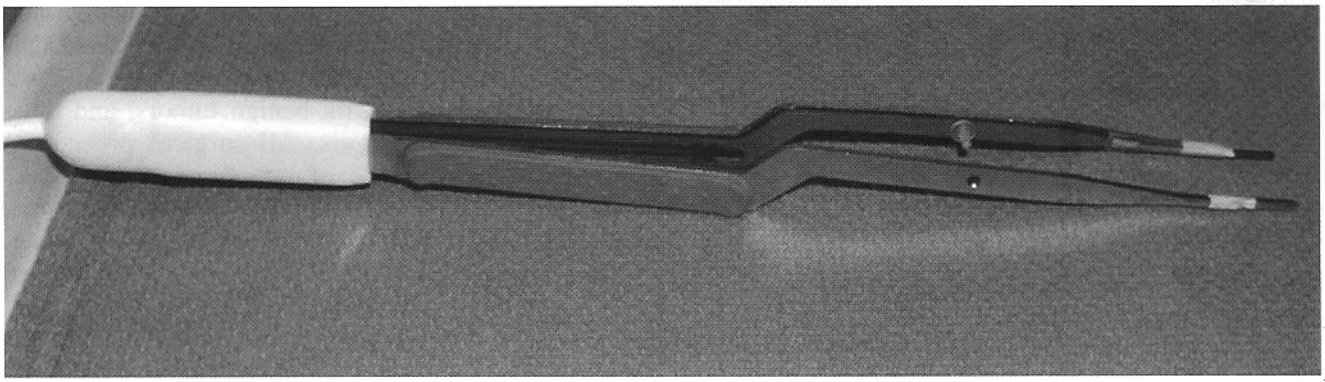

FIG. 2. Tissue welding forceps.

TABLE 1. *Tissue Welding Superficial Parotidectomy Demographics*

Patient Demographics	Number
Total Patients	25
Age (mean)	58.9
(range)	25–88
Female	15
Male	10
CN VII Intraoperative Nerve Integrity Monitoring	11 (44%)

CN, cranial nerve.

TABLE 2. *Tissue Welding Superficial Parotidectomy Diagnosis*

Neoplastic	**22**
Malignant	
Mucoepidermoid Ca	2
Basal Cell Adeno Ca	1
Merkel cell Ca	1
Squamous cell Ca	1
Follicular lymphoma	1
Benign	
Pleomorphic adenoma	**10**
Warthin's tumor	6
Inflammatory	3
Sialoadenitis	2
Sialolithiasis	1

Ca, carcinoma.

Discussion

Facial nerve palsy after parotid surgery is one of the most frequent complications of the procedure. It may be caused by inadvertent severing of nerve branches during the dissection or by pressure, thermal, or stretching injuries to the nerve.[6] Identification of the facial nerve and its branches during superficial parotidectomy is absolutely necessary to avoid injury to the nerve. This task is made more difficult in patients with large tumors or inflammatory disease. Meticulous hemostasis makes nerve dissection much safer. Whether the main trunk of the facial nerve is identified or retrograde dissection is carried out, the nerve tissue must be carefully identified. Facial nerve dissection using cold instrumentation usually involves using a clamp to spread tissue lateral to the facial nerve where it may be cut with a knife or scissors and bleeding points controlled with either ligature or bipolar cautery. In an attempt to improve upon this technique, a number of surgical instruments that both cut and seal tissue have been introduced. Instruments such as the Shaw scalpel

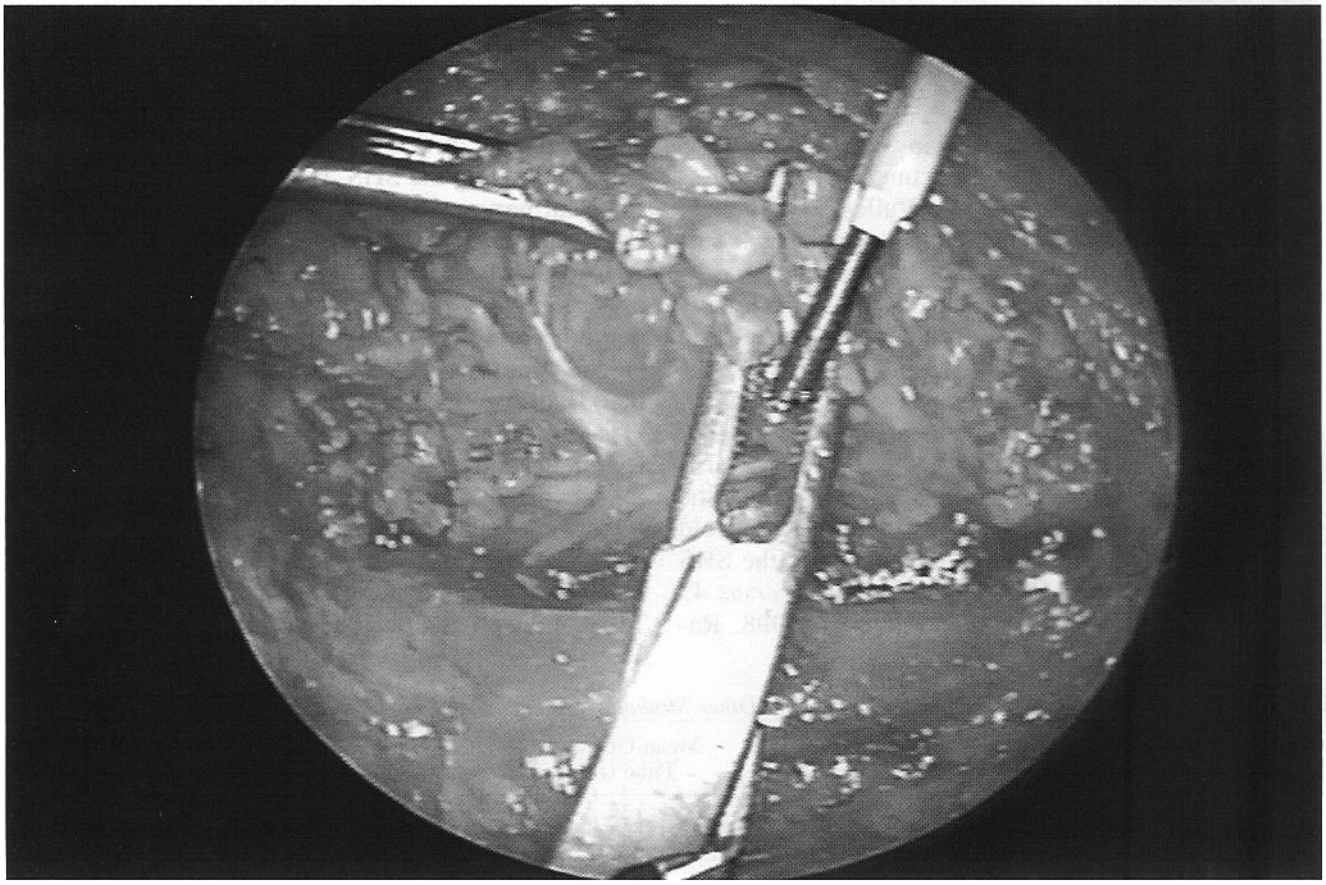

FIG. 3. Tissue welding forceps grasping tissue over dissecting clamp.

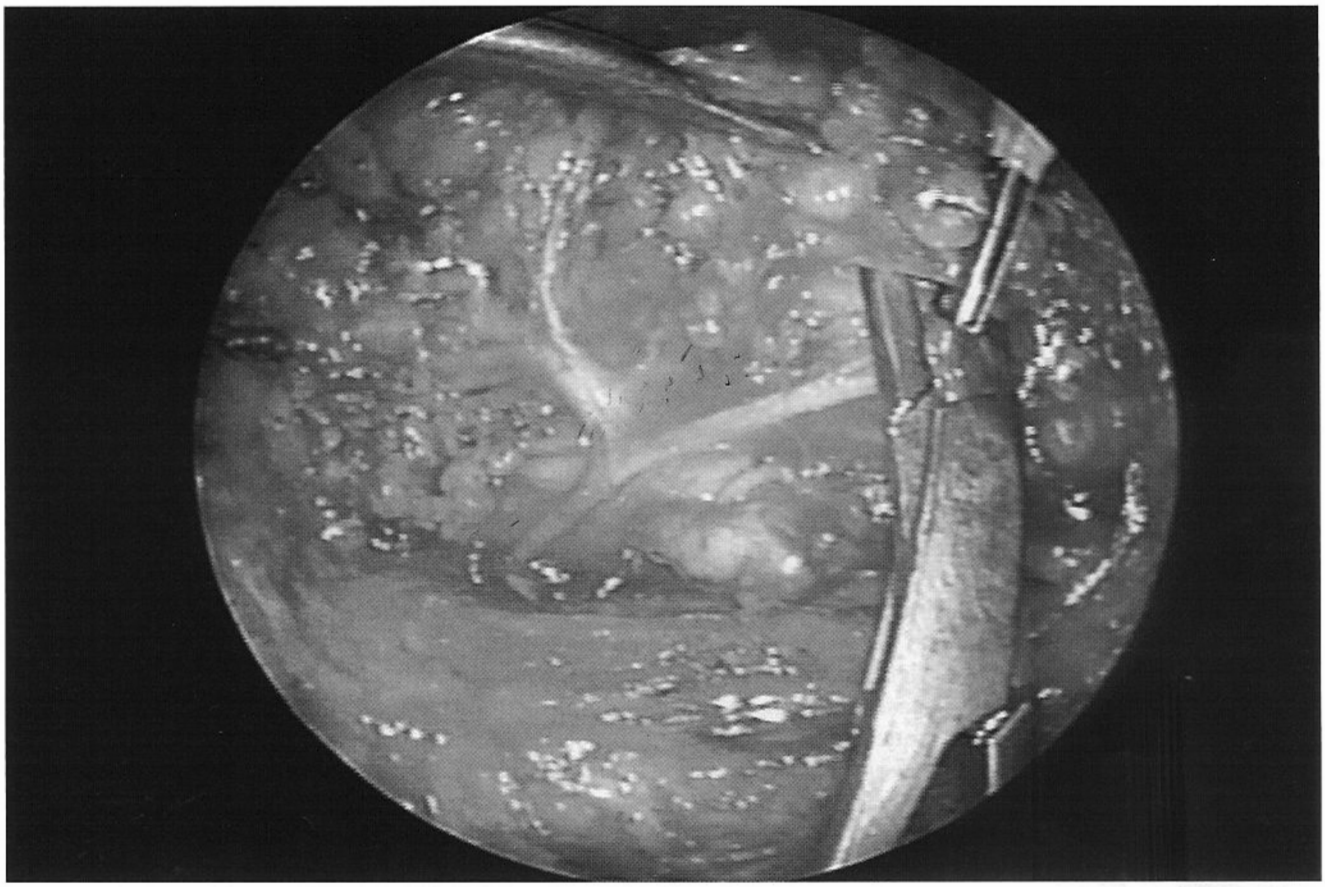

FIG. 4. Tissue welding forceps sealing and severing tissue lateral to the facial nerve.

(SHS, Oximetrix, Inc., Mountain View, CA),[7] harmonic scalpel (HS, Ethicon, Cincinnati, OH)[8] and Ligasure Precise instrument (LP, Valleylab, Boulder, CO)[9] have all been described in head and neck surgery. These instruments and the use of facial nerve monitoring systems have held the promise of safer and more efficient parotid surgery. Fee and Handen,[10] in 1984, compared SHS to cold dissection in parotid surgery. Fourteen of their patients had superficial parotidectomy using the SHS and 26 patients using cold dissection. The mean blood loss was 107 cc for SHS and 265 cc for cold dissection. Mean operative time was 125 minutes for SHS and 171 minutes for cold dissection. Thirty-one per cent of patients in the SHS group had a temporary seventh nerve palsy *versus* 43 per cent in the cold dissection group. In 1998, Ramadan et al.,[6] in their series of 26 superficial parotidectomies using the SHS, had a 54 per cent incidence of facial nerve weakness compared with 14 per cent incidence in 28 patients who had cold dissection. Blankenship et al.,[8] in 2004, reported on 19 patients undergoing HS parotidectomy *versus* 21 patients undergoing cold dissection parotidectomy. The mean operative time for HS was 167 minutes with 38 mL of blood loss *versus* a mean operative time of 195 minutes with 60 mL of blood loss for the cold dissection technique. Transient facial nerve weakness was noted in one patient with HS (5.3%) and three with cold dissection (14.7%). Colella et al.,[9] in 2005, reported on 17 patients using LP and 18 patients using cold dissection. The mean operative time using LP was 136.4 minutes *versus* 155.8 minutes for cold dissec-

TABLE 3. *Comparison of Tissue Welding Forceps to Other Modalities in Superficial Parotidectomy*

Modality	Patient Number	Mean Operative Time (min)	Mean Blood Loss (mL)	% CN VII Palsy
Shaw Scalpel[10]	14	125	107	31
Harmonic Scalpel[8]	19	167	38	5.3
Ligasure Precise[9]	17	136.4	Not available	12
Tissue Welding Forceps	25	155.6	72	4

tion. Two patients in the LP group had postoperative facial weakness and three in the conventional group also had facial weakness. The incidence of facial palsy after superficial parotidectomy has been reported in the range of 10 to 50 per cent[11–13] and permanent total facial paralysis is felt to be unusual unless the nerve is deliberately sacrificed.[10] The House-Brackmann scale is used to assess facial weakness. Even patients with transient significant weakness of the periorbital muscles may have significant postoperative morbidity. Fortunately, however, weakness attributable to dysfunction of the upper divisions of the facial nerve are less common than weakness in cervicofacial branches of the nerve.[10]

In our case series, only one patient had transient forehead weakness and no difficulty with eye closure. Referable to operative times and blood loss during surgery, our mean operative time of 155.6 minutes and blood loss of 71.6 cc compares favorably to other methods for superficial parotidectomy (Table 3).

The reported incidence of Frey's Syndrome, or gustatory sweating, varies widely in the literature. The incidence of reported clinical Frey's Syndrome varies from 14 to 83 per cent and from 43 to 100 per cent when objective testing is performed.[14] This variability is felt to be related to how carefully the findings of gustatory sweating are sought.[15] In our series, we found no cases of clinical gustatory sweating, but no starch iodine or other biosensor studies were conducted.

Our experience to date using TWF in superficial parotid surgery has been quite positive. The main advantage, other than ease of use, is that when using TWF, no current passes through the patient and the facial nerve monitor is not disabled. We are presently working with the instrument manufacturer to further modify the forceps to allow the insulated tine to be used directly as a nerve dissector. We feel that a future study directly comparing the various surgical technologies available for parotidectomy is warranted.

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