The Amatsu Tracheoesophageal Shunt Operation for Voice Restoration After Total Laryngectomy

PICHIT SITTITRAI, M.D.*,
NANTIGAR SANSUWAN, M.D *

Abstract

Vocal rehabilitation after total laryngectomy using tracheoesophageal shunt with sphincter mechanism or Amatsu's operation was performed in 12 patients at the department of Otolaryngology, Chiang Mai University from January 1993 to December 1998. Serviceable voice was attained within 10-14 days postoperatively. The success rate of voice restoration was 75 per cent with a good maximum phonatory time of 8 seconds. Tracheal aspiration which was found in 4 patients was managed conservatively without complication.

The Amatsu tracheoesophageal shunt is a single stage operation which provides the patients with a good success rate of voice restoration, few complications, easy learning, and prosthesis free.

Key word : Amatsu Operation, Tracheoesophageal Shunt, Voice Restoration, Laryngectomy

SITTITRAI P & SANSUWAN N
J Med Assoc Thai 2001; 84: 229-233

Total laryngectomy is a procedure usually reserved for patients with advanced staged laryngeal carcinoma. This procedure alters respiration, deglutition, and verbal communication(1). The inability to speak is considered the greatest of the difficulties facing the patient. Vocal rehabilitation can be attained by the three most common methods, electrolarynx, esophageal speech, and tracheoesophageal speech(2). The hand-held electrolarynx produces a mechanical voice, uses batteries, and requires the user to carry it(3). The esophageal speech has the disadvantage of a long-lasting, complicated learning process. Only about 26-62 per cent of laryngectomees achieve functional esophageal speech proficiency(4). The concept of tracheoesophageal speech is creating a passage-way that would permit the free flow of air from the trachea into the esophagus. The

* Department of Otolaryngology, Faculty of Medicine, Chiang Mai University, Chiang Mai 50200, Thailand.

vibrating column of air in the pharynx will generate the sound and the understandable speech can be formed by the oral cavity[5].

Tracheoesophageal speech is reported to have better intelligibility and fluency than the traditional esophageal speech and electrolaryngeal speech[6,7]. Tracheoesophageal speech with the use of voice prosthesis has become an important method of speech rehabilitation after total laryngectomy since the introduction of the Blom-Singer prosthesis[8]. However, the cost of the prosthesis, the limited device lifetime, and the requirement of regular replacement and maintenance procedure are the problems.

Since 1959, when Conley[9] introduced the tracheoesophageal fistula with the use of vein graft, a number of shunt procedures have been developed but aspiration into the trachea and stenosis of the fistula are still substantive problems[10-14].

To prevent tracheal reflux, the tracheoesophageal shunt with esophageal muscle as a sphincter was described by Amatsu[15]. This procedure was performed in our patients and the results of this surgical technique are reported.

MATERIAL AND METHOD

From January 1993 to December 1998, 12 patients with laryngeal cancer treated by total laryngectomy and Amatsu tracheoesophageal shunt operation were included in this study. There were 10 men and 2 women, ranging in age from 51-68 years (mean, 58 years). The primary sites were the glottic region in 8, the supraglottic region in 3, and the hypopharynx in 1 patient. Prophylactic selective lateral neck dissection was done in 4 patients with glottic carcinoma and modified radical or radical neck dissection was done in all 4 patients with supraglottic and hypopharyngeal carcinoma. No patients had preoperative radiation therapy and 4 patients underwent postoperative radiation therapy (Table 1). The minimum follow-up time was 1 year. Results of the operative procedure were retrospectively reviewed.

Indication and surgical techniques

Candidates for Amatsu tracheoesophageal shunt operation include any motivated laryngectomy patient with good pulmonary reserve and no subglottic or tracheal extension of the tumor. In hypopharyngeal cancer, the remaining pharyngeal mucosa should be wide enough for loosely closed over the 16 Fr nasogastric tube.

Details of Amatsu tracheoesophageal shunt technique were described in his original paper[15]. Briefly, on completing the total laryngeal resection, the anterolateral part of five cartilaginous tracheal rings are removed. The membranous part (posterior wall) up to the level of the first tracheal ring measuring 2 cm in width and 3 cm in length is used as an inferiorly based flap. An 8 mm midline vertical incision is made starting 2 mm below the superior margin of the flap, entering the esophageal lumen. Both incised margins are approximated by using mucosa-to-mucosa sutures to create a tracheoesophageal shunt. A-14 Fr- soft rubber catheter is inserted

Table 1. Summary of patients.

Patient No.	Age	Sex	Tumor	Post-operative Radiation	Phonation	Aspiration	Remarks
1	52	M	Glottic $T_3N_0M_0$	-	good	-	
2	56	M	Glottic $T_3N_0M_0$	-	good	-	digit compression during swallow
3	61	M	Glottic $T_4N_0M_0$	-	good	-	
4	60	M	Glottic $T_3N_0M_0$	-	good	-	digit compression during swallow
5	63	F	Glottic $T_3N_0M_0$	-	good	-	
6	54	M	Supraglottic $T_3N_1M_0$	+	aphonia	-	tracheal wall necrosis
7	68	M	Glottic $T_3N_0M_0$	-	good	minimal	catheter insertion during swallow
8	59	M	Glottic $T_4N_0M_0$	-	good	minimal	catheter insertion during swallow
9	52	F	Supraglottic $T_3N_2M_0$	+	aphonia	-	shunt closure
10	57	M	Hypopharynx $T_3N_2M_0$	+	aphonia	+	had recurrent tumor
11	58	M	Supraglottic $T_3N_2M_0$	+	fair	-	catheter insertion while sleeping
12	56	M	Glottic $T_3N_0M_0$	-	good	-	

from the tracheal side into the esophagus. A mucosal tunnel which later will lie underneath the skin flap just above the tracheostoma is formed by approximating both lateral margins of the tracheal flap. Bilateral superiorly based muscular flaps measuring 7x15 mm are obtained from both lateral walls of the esophagus at the level of the mucosal tunnel. The ends of the muscular flap are approximated over the mucosal tunnel just below the shunt level. After closing the pharyngeal defect, the constrictor muscles are sutured loosely over the pharyngeal suture line. The suction drains are placed and the wound is then closed as a routine total laryngectomy procedure.

RESULTS

There was no immediate postoperative complication. The nasogastric tube was taken out and oral feeding was started between 10-14 days after the operation. The soft rubber catheter was then removed and the patient was trained to inhale air deeply, close the tracheostoma with the thumb and expire air through the shunt while creating the speech. All 12 patients developed initial speech in 10-14 days. The patient with hypopharyngeal carcinoma had recurrent tumor at the neopharynx causing shunt obstruction 3 months after treatment and died 2 months later. One patient had necrosis of the posterior tracheal wall and the esophageal wall protruded through the shunt, he cannot speak but can swallow well without aspiration. One patient had shunt closure and refused any kind of voice rehabilitation. One patient has mild degree of shunt stenosis which requires insertion of the soft rubber catheter through the shunt at night. These latter three patients were the ones who had supraglottic cancer and received postoperative radiation therapy. The result of intelligible voice in our patients was 75 per cent. The average maximum phonatory time was 8 seconds.

In terms of deglutition, two patients needed to have the soft rubber catheter in the shunt while eating because of the large diameter of the shunt lumen. Two patients have to press their fingers over the tracheostoma to occlude the mucosal tunnel only when drinking. The rest can tolerate all types of diet well. No patient developed aspiration pneumonitis.

DISCUSSION

The single stage tracheoesophageal shunt with sphincter mechanism described by Amatsu [15] can be performed in any motivated patient who requires total laryngectomy with or without neck dissection. The serviceable voice can be regained as early as 10-14 days after the operation. The average maximum phonatory time is 8 seconds (1.9 seconds in esophageal speech, 25 second in normal speech[16]). The success rate of voice restoration in our patients was relatively good (75%) compared with 26-62 per cent of esophageal speech[4] and 30-93 per cent of tracheoesophageal speech with prosthesis[17-19]. The causes of our failure were tumor recurrence, tissue necrosis around the shunt, and shunt stenosis. Postoperative radiation may be the cause of tissue necrosis and shunt stenosis.

There have been reports of complications from tracheoesophageal speech with prosthesis including mediastinitis, cervical cellulitis, cervical spine fracture, aspiration of prosthesis, salivary leakage around the prosthesis, and false tract created by the patient[20-22]. The only minor complication found in our patients was leaking of liquid diet in 4 patients and this problem was managed by soft rubber catheter insertion or manual pressing over the shunt during eating.

Ideal vocal rehabilitation after total laryngectomy should provide the patients with fluent, intelligible speech, easy to learn, have minimal morbidity, have a high success rate, prosthesis free, hand free, and not compromising the cancer resection[23]. Although Amatsu tracheosophageal shunt procedure does not fulfill all these conditions, this single stage operation with a good success rate and low complications should be one of the procedures of choice in vocal rehabilitation after total laryngectomy.

(Received for publication on June 22, 2000)

REFERENCES

1. Blom ED, Singer MI, Hamaker RC. Total laryngectomy with voice preservation. In: Fried MP. ed. the larynx : a multidisciplinary approach. Boston, Little, Brown 1988: 517-30.
2. Snyderman NL. Surgical vocal rehabilitation. In: Paparella MM, Shumrick DA, Gluckman JL, Meyerhoff WL. eds. Otolaryngology. Philadelphia, W.B. Saunders 1991: 2371-8.
3. Duguay MJ, Fendo P. Jr. The process of postlaryngectomy rehabilitation. In: Fried MP. ed. The larynx : a multidisciplinary approach. Boston, Little, Brown 1988: 603-13.
4. Gates G, Ryan W, Cooper J. Current status of laryngectomee rehabilitation : I. Results of therapy. Am J Otolaryngol 1982; 3: 1-7.
5. Conley JJ, DeAmosti F, Pierce MK. A new surgical technique for the vocal rehabilitation of the laryngectomized patient. Ann Otol Rhinol Laryngol 1958; 67: 655-64.
6. Pindzola RH, Cain BH. Acceptability ratings of tracheoesophageal speech. Laryngoscope 1988; 98: 394-7.
7. Brasnu D, Strome M, Buchaman LC, et al. Voice evaluation of myomucosal shunt after total laryngectomy : comparison with esophageal speech. Am J Otolaryngol 1989; 10: 267-72.
8. Singer MI, Blom ED. An endoscopic technique for restoration of voice after laryngectomy. Ann Otol Rhinol Laryngol 1980; 89: 529-33.
9. Conley JJ. Vocal rehabilitation by autogenous vein graft. Ann Otol Rhinol Laryngol 1959; 68: 990-4.
10. Asai R. Laryngoplasty after total laryngectomy. Arch Otolaryngol Head Neck Surg 1972; 95: 114-9.
11. Serafini I, Arslan M. Reconstructive laryngectomy : report of the first 35 cases. Ann Otol rhinol Laryngol 1972; 81: 479-80.
12. Calcatera TC, Jafek BW. Tracheoesophageal shunt for speech rehabilitation after laryngectomy. Arch Otolaryngol Head Neck Surg 1971; 94: 124-8.
13. Kamon RM. Vocal rehabilitation in the laryngectomized patient with a tracheoesophageal shunt. Ann Otol Rhinol Laryngol 1974; 83: 445-51.
14. Strome M, Mustol TA, Kelly JH. Voice rehabilitation following laryngectomy. Arch Otolaryngol Head Neck Surg 1986; 112: 1168-71.
15. Amatsu M, Makino K, Kinishi M, Kokubu M. Primary tracheoesophageal shunt operation for postlaryngectomy speech with sphincter mechanism. Ann Otol Rhinol Laryngol 1986; 95: 373-6.
16. Robbins J. Acoustic differentiation of laryngeal, esophageal, and TE speech. J Speech Hear Res 1984; 24: 577-85.
17. Lau W, Wei W, Ho C, Lam K. Immediate tracheoesophageal puncture for voice restoration on laryngopharyngeal resection. Am J Surg 1988; 156: 269-72.
18. Quer M, Burgues-Vila J, Garcia-Crespillo P. Primary tracheoesophageal puncture *vs* esophageal speech. Arch Otolaryngol Head Neck Surg 1992; 118: 188-90.
19. Kao W, Mohr R, Kimmel C, Getch C, Silverman C. The outcome and techniques of primary and secondary tracheoesophageal puncture. Arch Otolaryngol Head Neck Surg 1994; 120: 301-7.
20. Silver FM, Gluckman J, Donegan JO. Operative complications of tracheoesophageal puncture. Laryngoscope 1985; 95: 1360-2.
21. Andrews JC, Michel RA, Hanson DG, Monahan GP, Ward PH. Major complications following tracheoesophageal puncture for voice rehabilitation. Laryngoscope 1987; 97: 562-7.
22. Manni JJ, van Den Broek P. Surgical and prosthesis related complication using the Groningen button voice prosthesis. Clinic Otolaryngol 1990; 15: 515-23.
23. Stiernberg CM, Bailey BJ, Calhoun KH, Perez DG. Primary tracheoesophageal fistula for voice restoration : the university of texas medical branch experience. Laryngoscope 1987; 97: 820-4.

การฟื้นฟูการพูดหลังตัดกล่องเสียงออกทั้งหมดด้วยวิธีของอามัตสึ

พิชิต สิทธิไตรย์, พ.บ., นันทิการ์ สันสุวรรณ, พ.บ.**

ได้ทำการศึกษาผู้ป่วย 12 ราย ที่ได้รับการผ่าตัดกล่องเสียงออกทั้งหมด และฟื้นฟูการพูดโดยการผ่าตัดซ่อมเสริมด้วยการทำทางเชื่อมต่อระหว่างหลอมลมคอและหลอดอาหาร รวมทั้งใช้กล้ามเนื้อหลอดอาหารเป็นหูรูดป้องกันการไหลของน้ำลายลงหลอดลมตามวิธีของ อามัตสึ ณ ภาควิชาโสต นาสิก ลาริงซ์วิทยา คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่ ระหว่างเดือนมกราคม 2536 ถึง เดือนธันวาคม 2541 ผลการศึกษาพบว่า ผู้ป่วยเริ่มเปล่งเสียงได้ 10–14 วันหลังผ่าตัด เมื่อติดตามการรักษาต่อ มี 75 เปอร์เซ็นต์ ของผู้ป่วยสามารถพูดติดต่อสื่อสารกับผู้อื่นได้เป็นอย่างดี สาเหตุของการพูดไม่ได้เกิดจากมะเร็งกลับคืนมาใหม่ และการตีบของทางเชื่อมต่อ ผู้ป่วย 4 รายมีอาหารน้ำไหลลงหลอดลมระหว่างการรับประทานซึ่งแก้ไขด้วยการใช้มือกดหรือใส่สายสวนที่ทางเชื่อมต่อหลอดลมกับหลอดอาหาร โดยไม่พบภาวะแทรกซ้อนใด ๆ

คำสำคัญ : การผ่าตัดอามัตสึ, ทางเชื่อมต่อระหว่างหลอดลมและหลอดอาหาร, การฟื้นฟูการพูด, การผ่าตัดกล่องเสียง

พิชิต สิทธิไตรย์, นันทิการ์ สันสุวรรณ
จดหมายเหตุทางแพทย์ ฯ 2544; 84: 229–233

* ภาควิชาโสต นาสิก ลาริงซ์วิทยา, คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่, เชียงใหม่ 50200