

The Amatsu's Tracheoesophageal Shunt: Analysis of 84 Cases

*Orlando Barreto Zocratto, †Mauro Becker Martins Vieira, ‡Amélio Ferreira Maia, §Ariane Cardoso Ferreira, §Laura Tassis Lorangeira, §Mariana Nassur Rancanti Penido, and ||Lucas Leandro Araújo Silva, *||Ouro Preto, †‡Belo Horizonte, and §Ipatinga, Minas Gerais, Brazil

Summary: Introduction. Amatsu's tracheoesophageal shunt can be indicated for vocal rehabilitation in candidates to total laryngectomy. It is performed in the period of the procedure of total laryngectomy and has been indicated due to its technical facility, exemption from the use of voice prosthesis, and lack of additional costs for its maintenance.

Objective. To evaluate the results obtained with the Amatsu's tracheoesophageal shunt, along 14 years of experience, in two Brazilian hospitals.

Study Design. Clinical retrospective.

Material and Method. From 1991 to 2005, eighty-four patients were submitted to the Amatsu's tracheoesophageal shunt. Seventy-seven (91.7%) were male and seven (8.3%) female, aged between 30 and 82 years, mean age of 57.5 years, and an average age of 52 years. All patients had squamous cell carcinoma of larynx and/or hypopharynx. Sixty-eight (81.0%) were stage III or IV. They were submitted to total laryngectomy and the Amatsu's tracheoesophageal shunt was performed during the tumor removal surgery. The following variables were analyzed: acquisition of intelligible speech, vocal recovery time after surgery, and the occurrence of specific surgical complications of the shunt (pulmonary aspiration).

Results. Seventy-six patients were evaluated with respect to the effectiveness of the technique. Fifty-three (70.0%) presented vocalization by the shunt; in 46 patients (60.5%), the speech was fully intelligible. The time required for restoration of speech was 12–87 postoperative days. Of the 83 patients evaluated in relation to the development of complications, 25 (30.1%) presented aspiration by the shunt during oral ingestion. In 23 patients (27.7%), the aspiration was managed conservatively without complications. Two patients (2.4%) required surgical closure of the shunt due to intractable aspiration.

Conclusion. Vocal rehabilitation with the Amatsu's tracheoesophageal shunt is effective in most patients who underwent total laryngectomy. It can be evidenced by the acquisition of intelligible speech in most patients. The aspiration, although often, is not shown to be a limiting complication.

Key Words: Amatsu–Tracheoesophageal shunt–Vocal rehabilitation–Total laryngectomy.

INTRODUCTION

A total laryngectomy is often used in the treatment of advanced tumors of the larynx and pharynx. The main postoperative sequel of this technique is the loss of speech and their consequences in the patient's life quality. One of the surgical options for vocal rehabilitation after total laryngectomy, whose principle is tracheoesophageal speech, can be the tracheoesophageal shunt without prosthesis.^{1–4} The principle behind tracheoesophageal speech is the diversion of exhaled air into the pharynx via a permanent, surgically constructed shunt tracheoesophageal. The pharyngoesophageal segment above the shunt vibrates, producing a neovoice.²

Among the tracheoesophageal shunts for phonation without the use of valve prosthesis, the one proposed by Amatsu is the most attractive, considering the neosphincteric mechanism created, which reduces the risk of aspiration.^{1,3–5} The procedure can only be performed primarily in the perioperative period of total laryngectomy. It can be performed on almost any candidate for laryngectomy, and the rehabilitated voice, usually, has a good quality. Other advantages are the technical easiness, the exemption from the use of the prosthesis after their confection, lower costs associated with its performance, and the absence of additional maintenance costs.^{3,6–11}

The objective of this research was to disclose the results of the procedure obtained with the Amatsu's tracheoesophageal shunt, given its advantages, the low disclosure, and the scarcity of publications on the subject.

MATERIALS AND METHODS

In the period of 1991–2005, 84 patients were submitted to the Amatsu's tracheoesophageal shunt. Seventy-seven (91.7%) were male and seven (8.3%) female, aged between 30 and 82 years, mean age of 57.5 years, and an average age of 52 years. All patients had squamous cell carcinoma, being that 65 (77.4%) located in the larynx [glottis (n = 26), supraglottis (n = 14), subglottis (n = 1), and transglottic (n = 24)] and 19 (22.6%) in the hypopharynx [pyriform recess (n = 16) and retrocricoid area (n = 3); of these 19 cases, six had invasion of the

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From the *Department of Surgery, School of Medicine, Federal University of Ouro Preto – UFOP, Ouro Preto, Minas Gerais, Brazil; †Clinic of Otorhinolaryngology and Head and Neck Surgery, Felício Rocho Hospital, Belo Horizonte, Minas Gerais, Brazil; ‡Clinic of Otolaryngology and Head and Neck Surgery, Felício Rocho Hospital, Belo Horizonte, Minas Gerais, Brazil; §Instituto Metropolitano de Ensino Superior – IMES, Ipatinga, Minas Gerais, Brazil; and the ||Federal University of Ouro Preto – UFOP, Ouro Preto, Minas Gerais, Brazil.

Address correspondence and reprint request to Orlando Barreto Zocratto, Department of Surgery, School of Medicine, Federal University of Ouro Preto – UFOP, Ministro Orozimbo Nonato,

n° 589, 1002 (Torre 1), Vila da Serra, Nova Lima, Minas Gerais 34.000-000, Brazil. E-mail: obzocratto@gmail.com

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aryepiglottic fold and/or the arytenoid cartilage]. Regarding the staging of the American Joint Committee on Cancer, six (7.1%) were in stage II, 36 (42.9%) in stage III, and 32 (38.1%) in stage IV; in 10 cases (11.9%), the data did not allow the accurate staging. The main reasons that precluded the correct staging were secondary changes to the previous treatment and incomplete data from the medical records. Neoadjuvant radiation therapy was used in 18 patients (21.4%). All patients underwent tumor resection by total laryngectomy. Neck dissection was performed in 58 patients (69.0%) [unilateral ($n = 31$) and bilateral ($n = 27$)]. Neck dissection was jugular selective type in 26 patients and radical type in 32 patients. There was need for use of myocutaneous pectoralis major flap in seven patients and deltopectoral fasciocutaneous flap in one patient. Forty-seven patients (55.9%) received complementary postoperative radiotherapy. The Amatsu's tracheoesophageal shunt was conducted during the tumor resection surgery.

The following variables were evaluated: speech quality, time of voice recovery after operation, and the occurrence of specific surgical complication of the shunt (pulmonary aspiration). Complications such as the development of pharyngocutaneous fistula, tracheostoma stenosis, and surgical site infection have not been evaluated by the impossibility of attributing their occurrence exclusively to the shunt because it may result from the total laryngectomy itself.

The technique consists of six basic steps performed in this order¹: creation of posterior tracheal flap, elevation of the esophagus muscular wall flap bilaterally, latero-lateral tracheoesophageal anastomosis, formation of tracheoesophageal shunt, approximation of the esophageal muscle flaps, and closure of the hypopharynx.

RESULTS

Eight patients were excluded of the analysis of the effectiveness of the procedure, but they were evaluated in relation to the development of postoperative complications: one patient (1.2%) because he progressed to death in the immediate postoperative period due to clinical complications and seven patients were lost to follow-up. Of the 76 patients evaluated with respect to the effectiveness of the procedure, 53 (70.0%) developed vocalization by the shunt; in 46 (60.5%), the speech was fully intelligible. Twenty-three patients (30%) failed to achieve vocal rehabilitation through the shunt and were submitted to other techniques of rehabilitation, without any limitation.

The time required for speech re-establishment was evaluated in 30 patients. It was 12–87 days postoperatively, with a mean of 66 days and a median of 45 days after the surgery.

Of the 83 patients assessed in relation to the development of complications, 25 (30.1%) presented aspiration by shunt during oral ingestion. In 23 patients (27.7%), the aspiration occurred (temporarily) only during the intake of liquids and was controlled (in 21 patients) by dietary education (intake of small amounts of liquids) and compressing the shunt during the deglutition. Only two patients (2.4%) required surgical closure of the shunt due to intractable aspiration. The surgical

occlusion was performed under local anesthesia on an outpatient basis.

DISCUSSION

What is expected of vocal rehabilitation is to acquire good quality voice without impairing the cancer therapy, the nonoccurrence of pulmonary aspiration in such a way that the patient can be maintained only by oral feeding, exempt the use of hands for vocalization; that the rehabilitation be the most precocious as possible with minimal need for care and training after surgery; that does not require prosthesis; and that is low cost and compatible with postoperative radiotherapy when this is indicated.

Amatsu's tracheoesophageal shunt operation with sphincter mechanism can be performed on almost any candidate for laryngectomy.^{3,5,11} The broad indication of the technique is demonstrated in our material, which includes patients with a wide age range, with different clinical staging, already submitted to radiotherapy, candidates for neck dissection, and/or postoperative complementary radiotherapy. Quin *et al*³ reported effective speech rehabilitation results after total laryngectomy even with postoperation radiation therapy. The rehabilitated voice, usually, has a good quality. Eight patients were excluded of the analysis of the effectiveness of the procedure (one patient because he progressed to death in the immediate postoperative period and seven patients were lost to follow-up). In these cases, the low period of observation precluded the analysis of the effectiveness, given that the vocal rehabilitation can occur even months after the operation. We obtained a rate of 70.0% of success with the technique, what we consider very satisfactory. Similar results, with success rates higher than 70.0%, have been described in the literature.^{9–11}

The time required for speech re-establishment was 12–87 days postoperatively. It was higher than that obtained by Sittitrai and Sansuwan⁹ that was within 10–14 days postoperatively. However, the study of these authors included only 12 patients.

All patients, except the one that progressed to death in the immediate postoperative period due to clinical complications, were assessed in relation to the development of complications. We include the seven patients that were lost to follow-up once the complication evaluated (aspiration) may develop shortly after the operation. The pulmonary aspiration was the most frequently reported complication in other studies.^{3,6,11,12} The aspiration, although often ($n = 25$, 30.1%), not shown to be a limiting complication. In 23 (27.7%) patients, the aspiration occurred only during the intake of liquids and was easily controlled by dietary education (intake of small amounts of liquids) and compressing the shunt during the deglutition. Only two patients (2.4%) required surgical closure of the shunt due to intractable aspiration. The choice of shunt closure was not only due to aspiration but also by the fact that both did not obtain satisfactory vocal rehabilitation with the technique. The surgical occlusion was performed under local anesthesia on an outpatient basis. In a series of Sittitrai and Sansuwan,⁹ the pulmonary aspiration, which was found in four patients, was managed conservatively without complications.

The rehabilitation of laryngectomized patients has increased. The development of the method of speaking has enabled these patients to communicate again and regain most or all their previous activities. In our view, the main advantages of the Amatsu technique are: technical facility, exemption from the use of any prosthesis after its confection, broad indication, good quality voice, high success incidence, compatibility with radiotherapy, easy apprenticeship, and absence of additional maintenance costs. This latter feature is extremely important and should be taken into consideration, especially in underdeveloped countries.

The shunt described by Amatsu requires the use of one hand to vocalization. The use of the hands during speech can be eliminated using a valved prosthesis (valved stoma button that flaps shut with forceful exhalation) into the tracheostoma the same manner as tracheoesophageal puncture (TEP). Their disadvantages are the lack of guarantee of intelligible speech and the occurrence of possible complications, such as the occurrence of postoperative aspiration and tracheostoma stenosis.⁹⁻¹¹ Another disadvantage is the fact that the procedure can only be performed primarily with laryngectomy. There is no possibility of performing the shunt secondarily. Otherwise, the TEP using a prosthetic valve can either be done primarily at the time of laryngectomy or as a secondary procedure when wound healing is complete. The completion of secondary shunt (usually 6 months after completion of radiation therapy) allows the acute radiation reaction and thickening in the peristomal tissues and mucosa to regress for rapid fistula epithelialization.⁴ However, a stoma of at least 1 cm in diameter is required, so stomoplasty is often done simultaneously with the puncture procedure. As relative contraindications could mention, the pulmonary reserve reduced to the point where there is no sufficient air pressure to produce the voice and the patient's demotivation for using the voice. Its absolute contraindication is the involvement of the trachea by extension of a subglottic neoplasm.^{3,9}

There has been a decrease indication of the Amatsu's shunt over the years. This fact can be explained by the reduction in total laryngectomy indication and, principally, because the low disclosure of the procedure. There has been an effort in recent years to develop and validate strategies, both surgical and nonsurgical that enable the highest cure rate associated with the preservation of the greater number of physiological functions of the larynx. There is also an increased use in our midst of organ preservation protocols with the association of chemotherapy with radiotherapy. The treatments and the cure rates are getting better and the complications are decreasing. However, in advanced tumors, the surgical treatment stays indispensable. The increase in the socioeconomic status of the assisted population decreased the percentage of advanced tumors that are candidates for total laryngectomy. There was

more indication and performance of partial and subtotal procedures such as laryngectomy supracricoid. The quality of voice rehabilitation obtained is far superior to that obtained by nonsurgical methods, as demonstrated in previous work.^{2,3} As mentioned above, we credit the current decrease in the number of procedures to the low disclosure and knowledge of such a procedure, which is limited in the literature.

CONCLUSION

Vocal rehabilitation with the Amatsu's tracheoesophageal shunt is effective in most patients who underwent total laryngectomy, which can be evidenced by the acquisition of fully intelligible speech. The aspiration, although often, is not shown to be a limiting complication. Due to the low cost and good results obtained, the Amatsu's tracheoesophageal shunt remains as one of the methods for vocal rehabilitation of patients who were submitted to total laryngectomy, especially in "underdeveloped countries" and for those who have limitations for other types of vocal rehabilitation.

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