

## MODIFIED TECHNIQUE OF TOTAL LARYNGECTOMY

*Predrag Spirić<sup>1</sup>, Sanja Spirić<sup>2</sup> and Milan Stanković<sup>2</sup>*

Surgical technique of total laryngectomy is well presented in many surgical textbooks. Essentially, it has remained the same since Gluck and Soerensen in 1922 described all its details. Generally, it stresses the U shape skin incision with releasing laryngeal structures and removing larynx from up to down. Further, pharyngeal reconstruction is performed with different kinds of sutures in two or more layers and is finished with skin suture and suction drainage. One of worst complications following this surgery is pharyngocutaneous fistula (PF). Modifications proposed in this article suggests vertical skin incision with larynx removal from below upwards. In pharyngeal reconstruction we used the running locked suture in submucosal plan with „tobacco sac“ at the end on the tongue base instead of traditional T shaped suture. Suction drains were not used.

The aim of study was to present the modified surgical technique of total laryngectomy and its impact on hospital stay duration and pharyngocutaneous fistula formation. In this randomized study we analyzed 49 patients operated with modified surgical technique compared to 49 patient operated with traditional surgical technique of total laryngectomy. The modified technique of total laryngectomy was presented. Using modified technique we managed to decrease the PF percentage from previous 20,41% to acceptable 8,16% ( $p=0,0334$ ). Also, the average hospital stay was shortened from 14,96 to 10,63 days ( $t=-2.9850$ ;  $p=0.0358$ ).

The modified technique of total laryngectomy is safe, short and efficient surgical intervention which decreases the number of pharyngocutaneous fistulas and shortens the hospital stay. *Acta Medica Medianae 2010;49(4):39-42.*

**Key words:** *laryngeal neoplasms, laryngectomy, cutaneous fistula*

ENT Clinic, Clinic Center Banja Luka, Bosnia and Herzegovina<sup>1</sup>  
ENT Clinic, Clinic Center Niš, Serbia<sup>2</sup>

Contact: Predrag Spirić  
ENT Clinic, Clinic Center Banja Luka  
12 beba bb, 78000 Banja Luka, Bosnia and Herzegovina  
E-mail sanjapre@inecco.net

### Introduction

Laryngeal cancer is one of the most frequent cancers of the head and neck. It accounts for about 1% of all cancers and 20% of head and neck cancers. Predicting factors for laryngeal cancer are smoking, alcohol abuse and genetics. Early diagnosis is essential for effective treatment. In stage I, the chances for the 5-year survival rate are over 95%. It goes down with late stages and for stage IV it is less than 60%. Laryngeal cancer can be treated by surgery, radiotherapy, chemotherapy and with the combination of these modalities. Early stage of cancer, stages I and II are treated by radiotherapy or endoscopic surgery with LASER or other means of this kind of surgery, while late stages III and IV are often treated with surgical intervention called total laryngectomy. The first total laryngectomy was performed by

Theodor Billroth from Vienna in 1873 and patient died seven months after. Bottini from Turin in Italy performed total laryngectomy and the patient lived ten years after (1-3). These interventions were followed by serious complications as infection and aspiration, and the death rate was up to 40%. Gluck developed a two-stage procedure with tracheostomy and stoma formation as the first stage with the purpose of laryngo-tracheal separation, and, after two weeks, total laryngectomy. Later with Soerensen, he developed a one-stage procedure similar to the current procedure. All authors later described this procedure in a similar way. It is interesting that some improvements, except new suture materials, have not been considered recently. PF remains the main problem in this operation and we should pay more attention to surgical technique and investigate the possibilities for improvement.

### Aim

The aim of this study was to present modifications of surgical technique of total laryngectomy. We also wanted to prove that this technique is safe, make hospital stay shorter and decrease the incidence of PF formation.

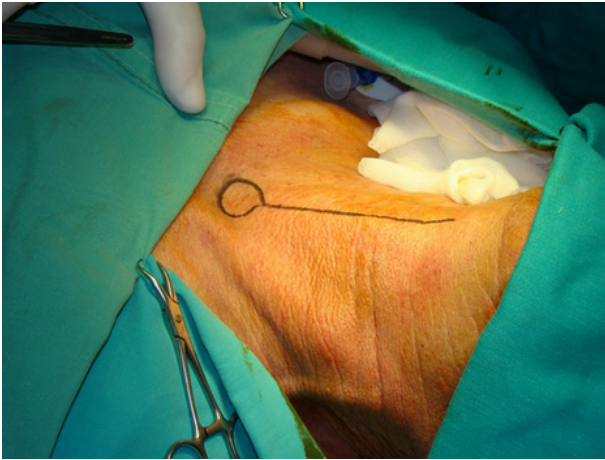


Figure 1. Vertical skin incision plan

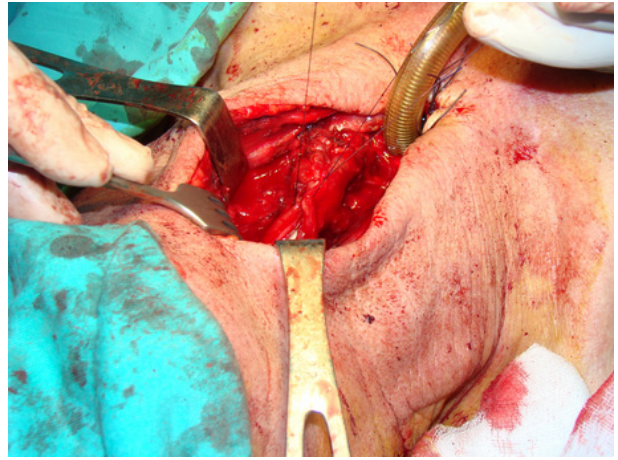


Figure 4. Running locked suture

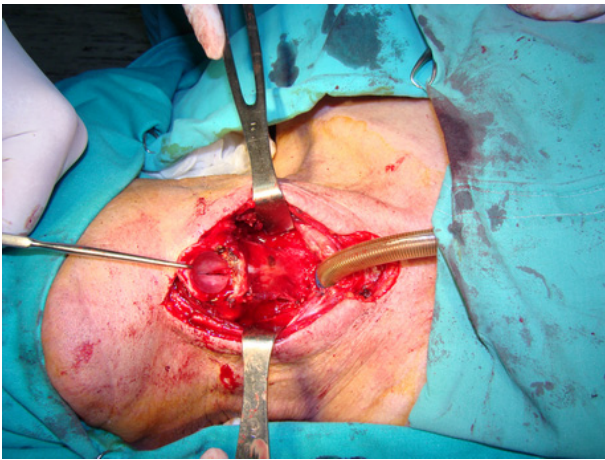


Figure 2. Laryngotracheal separation with direct view of subglottic space

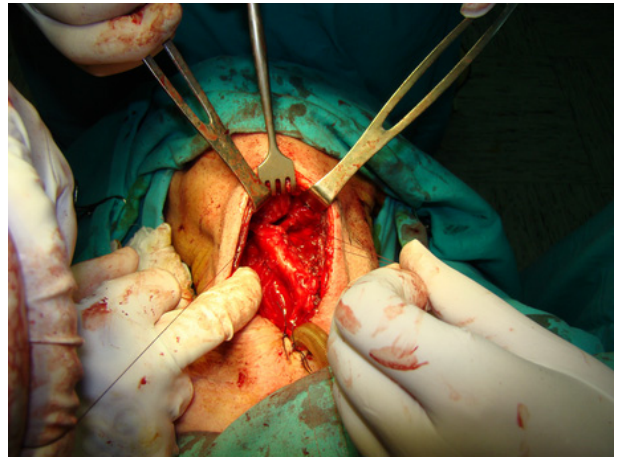


Figure 5. "Tobacco sac" end suture

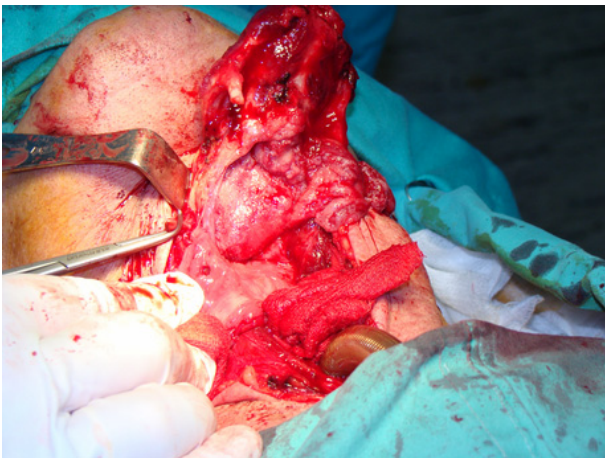


Figure 3 Direct view of tumor site



Figure 6. End of the operation-no suction drains

### Material and methods

This study included 49 patients with indication for total laryngectomy operated with a new modified technique compared with 49 patients operated in classical fashion. All patients were randomized. We used the same suture material with slight differences in antibiotic prophylaxis choice.

Short description of modification of technique in the first group of patients:

First, there was a suggestion to perform a vertical skin incision. We come to the conclusion that the U-shaped incision was actually the myocutaneous flap and it takes time to heal, it traps clots of blood and air, which sometimes compromises wound healing. It seems that some parts of this flap have secondary healing with

possible influence on the PF formation. Vertical cut is a classic wound with full thickness edges and can be easily closed (Figure 1).

Secondly, we performed a laryngotracheal separation and laryngeal pull from below. We found it easier to approach in this way and have a better view of the tumor site (Figures 2 and 3).

Thirdly, the wound was closed with the running locked suture with "tobacco sac" at the end. The suture was started 1cm below the hypopharyngeal wound lower edge and the needle was run through the submucosal layer avoiding the laceration of mucosa. Free edges of mucosa were left outside the wound in the hypopharyngeal lumen (Figures 4 and 5).

Eventually, there were no suction drains in the wound site (Figure 6).

The control group was operated with the U-shaped skin incision; the larynx was removed from the upper to the lower structures; individual sutures were used for the hypopharyngeal reconstruction and double suction drains were placed at subplatysmal level for 48 hours.

## Results

There were 49 patients in the experimental group with modification of technique and 49 patients in the control group. In first group there were three female patients and five in the second one. Average age in first group was 61,22 years and 62,25 years in the second group. It is the age that most authors describe (4,5). Most of the patient were older than 55 years (Table 1).

Table 1. Age of the patients by groups

Age at the time of operation	First group		Second group		Total	
	Patient No	%	Patient No	%	Patient No	%
Less than 55 years	14	28.57	12	24.49	26	26.53
55 to 64 years	17	34.69	19	38.78	36	36.73
65 and more	18	36.73	18	36.73	36	36.73
Average age	61.22		61.24		61.23	
Standard deviation	9.02		7.96		8.46	

There were no life-threatening complications in both groups. The major complication was PF.

In our study, there were 4 PFs or 8,16% compared with the control group involving 10 PFs or 20,41%.

There was statistical significance between these groups ( $\chi^2=4.523$ ;  $df=1$ ;  $p=0.0334$ ). When we compare our results with the results reported in the literature, different percentage of PF occurrence can be observed (4-6,8-11) (Table 2).

Table 2. Fistula by groups of patients

Fistula	Experimental group		Control group		Total	
	Patient No	%	Patient No	%	Patient No	%
Yes	4	8.16	10	20.41	14	14.29
No	45	91.84	39	79.59	84	85.71

The hospital stay after the operation was analyzed. Average hospital stay in experimental group was 10,63 and in other one was 14,96 days (Table 3).

Table 3. Average hospital stay by groups

Postoperative Hospital stay	Experimental group	Control group	Total
Average days	10.63	14.96	12.80
Standard deviation	6.58	7.72	7.46

By applying the T-test, we found statistically significant difference between these two groups ( $t=-2.9850$ ;  $p=0.0358$ ). The same influence on hospital stay was found by other authors (7).

## Discussion

Traditionally, most of the surgeons accept the surgical technique used for the last twenty to thirty years. We noticed that many features are not necessary and even undermine the main goal of surgery - to be safe, fast, and with no complications. The general approach through the U-shaped incision is actually a musculo-cutaneous flap. This flap needs healing as any other flap in surgery. It traps air and clots, thus increasing the risk of infection. Drains that we put below such a flap additionally compromise the wound healing. Having all this in mind, we suggested vertical incision with less trauma and better chance for healing. If some kind of neck dissection is needed, we perform a new dissection incision which is still less traumatic than the U-shaped incision. We also decided to lift the larynx from below which we find easier with better tumor site view. This also spares hypopharyngeal mucosa as much as possible in order to obtain more of the tissue for the following reconstruction. Suture is maybe a crucial change that was applied. Individual suture does not provide watertight closure as one of the elements preventing the PF formation, so that a running locking suture was proposed with "tobacco sac" on the base of the tongue. With this approach, we eliminate the weakest point for the PF formation - T-shaped suture on the upper part of pharynx. If we look on the impact of this technique on the PF formation, the effects were obvious and also statistically proven. Hospital stay was significantly shortened, which was also statistically evident. We have to say that this time could be even shorter but some factors

other than surgical wound, made us keep the patients in hospital (patient comfort of prolonged stay in hospital was accepted, patients living far away were kept longer etc.).

These are the results of the ten-year experience with this new approach to total laryngectomy. All these modifications made this technique simple and faster with fewer complications what we found in our results.

## Conclusions

Modified surgical technique of total laryngectomy is a safe and fast procedure. It decreases the rate of PF with the impact on patient morbidity. Patients treated with this surgical procedure have shorter hospital stay. The use of this modifications makes benefit for patient, surgeon and hospital.

## References

- Hawkins JE, Schacht J. Sketches of Otolaryngology: part 7 - The Nineteenth-Century Rise of Laryngology. *Audiol Neurotol* 2005;10:130-3.
- Feldmann H. Diagnosis and therapy of diseases of the larynx in the history of medicine. Part III. After the invention of laryngoscopy. *Laryngorhinootologie* 2002; 81(8):596-604.
- Absolon KB, Keshishian J. First laryngectomy for cancer as performed by Theodor Billroth on December 31, 1873: a hundred anniversary. *Rev Surg* 1974; 31(2):65-70.
- Akduman D, Naiboğlu B, Uslu C, Oysu C, Tek A, Sürmeli M, Kiliçarslan Y, Yanilmaz M. Pharyngocutaneous fistula after total laryngectomy: incidence, predisposing factors, and treatment. *Kulak Burun Bogaz Ihtis Derg* 2008;18(6):349-54.
- Nakamizo M, Kamata S, Kawabata K, Nigauri T, Hoki K. Pharyngo-cutaneous fistula after total laryngectomy. *Nippon Jibiinkoka Gakkai Kaiho* 1997;100(2):213-9.
- Boscolo-Rizzo P, De Cillis G, Marchiori C, Carpenè S, Da Mosto MC. Multivariate analysis of risk factors for pharyngocutaneous fistula after total laryngectomy. *Eur Arch Otorhinolaryngol* 2008; 265(8):929-36.
- Esteban F, Delgado-Rodríguez M, Mochón A, Solano J, Soldado L, Solanellas J. Study of in-patient hospital stay following total laryngectomy: multivariable retrospective analysis of a 442 total laryngectomies. *Acta Otorrinolaringol Esp* 2006 Apr;57(4):176-82.
- Virtaniemi JA, Kumpulainen EJ, Hirvikoski PP, Johansson RT, Kosma VM. The incidence and etiology of post-laryngectomy pharyngocutaneous fistulae. *Head Neck* 2001;23(1):29-33.
- Galli J, De Corso E, Volante M, Almadori G, Paludetti G. Postlaryngectomy pharyngocutaneous fistula: incidence, predisposing factors, and therapy. *Otolaryngol Head Neck Surg* 2005;133(5):689-94.
- Mäkitie AA, Niemensivu R, Hero M, Keski-Säntti H, Bäck L, Kajanti M, et al. Pharyngocutaneous fistula following total laryngectomy: a single institution's 10-year experience. *Eur Arch Otorhinolaryngol* 2006; 263(12):1127-30.
- Wakisaka N, Muroso S, Kondo S, Furukawa M, Yoshizaki T. Post-operative pharyngocutaneous fistula after laryngectomy. *Auris Nasus Larynx* 2008; 35(2): 203-8.

## MODIFIKOVANA TEHNIKA TOTALNE LARINGEKTOMIJE

*Predrag Spirić, Sanja Spirić i Milan Stanković*

Hirurška tehnika totalne laringektomije je poznata i opisana je u svim standardnim udžbenicima otorinolaringologije i hirurģije glave i vrata. Suštinski je ostala nepromenjena od vremena Gluck-a i Soerensen-a iz 1922. godine kada su je detaljno opisali. Ona naglašava potrebu pristupa kroz „U“ kožni rez sa skeletizacijom larinksa i otvaranjem i preparacijom odozgo prema dole. Potom, faringealna rekonstrukcija ide uz izbor nekoliko varijacija potkožnih šavova u dva ili više slojeva sa šavom kože. Na kraju je obavezno predviđena aktivna sukciona drenaža obostrano, najčešće 48 časova. Kao najteža komplikacija navodi se faringokutana fistula. Modifikacije predložene u ovom radu predviđaju vertikalni rez kože sa podizanjem larinksa odozdo nagore. U rekonstrukciji farinksa predložen je produženi šav sa zaključavanjem koji ide u submukoznom sloju. On se završava šavom duvanke pri bazi jezika umjesto tradicionalnog T šava. Autori nisu koristili sukcionu drenažu.

Cilj rada bio je prikazati modifikovanu tehniku totalne laringektomije i njen uticaj na nastanak faringokutane fistule kao i dužinu hospitalnog lečenja. U studiji smo nastojali da dokažemo prednosti modifikovane tehnike nad klasičnom tehnikom totalne laringektomije. U ovoj studiji je analizirano 49 bolesnika operisanih modifikovanom tehnikom a koji su upoređeni sa 49 bolesnika operisanih klasičnom tehnikom totalne laringektomije. Studija je randomizirana. Prikazana je i korišćena metoda modifikovane tehnike totalne laringektomije. Broj bolesnika sa faringokutanom fistulom je statistički signifikantno manji kod bolesnika koji su operisani modifikovanom tehnikom (8,16% u odnosu na 20,41%,  $p=0.0334$ ). Dužina hospitalizacije kod bolesnika operisanih modifikovanom tehnikom je statistički signifikantno manja od grupe operisane klasičnom tehnikom (10,63 u odnosu na 14,96,  $t=-2.9850$ ;  $p=0.0358$ ).

Modifikovana tehnika totalne laringektomije je sigurna, kratka i efikasna hirurģka tehnika kojom se smanjuje broj faringokutanih fistula i dužina hospitalizacije u poređenju sa tradicionalnom tehnikom. *Acta Medica Medianae* 2010;49(4):39-42.

**Ključne reči:** laringijalna neoplazma, laringektomija, kutana fistula