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*Source / Izvornik:* **Collegium antropologicum, 2012, 36, 313 - 315**

**Journal article, Published version**

**Rad u časopisu, Objavljena verzija rada (izdavačev PDF)**

*Permanent link / Trajna poveznica:* <https://um.nsk.hr/um:nbn:hr:184:021557>

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*Download date / Datum preuzimanja:* **2024-06-17**



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# Voice Rehabilitation of Broca's Aphasia Following Total Laryngectomy

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## ABSTRACT

*Total laryngectomy, as a consequence of carcinoma of the larynx, results in loss of speech function. Cerebrovascular stroke is the leading cause of reduced speech production ability, and thereby communication difficulties. The case is presented of a 60-year-old male patient who suffered stroke five years after a total laryngectomy. Speech rehabilitation was hampered due to the depressive state of the patient. Although contraindicated, the secondary voice prosthesis was implanted. Only at that moment the patient showed willingness and motivation for speech rehabilitation. The aim of this presentation is to demonstrate that not all neurological disorders are contraindicated for implantation of voice prostheses.*

**Key words:** total laryngectomy, stroke, Broca's aphasia, speech rehabilitation, voice prosthesis

## Introduction

Malignant tumours of the larynx account for 1.9% of all malignant tumours. They are more prevalent in men than in women, and affect predominantly older people. A complete extirpation of the larynx (laryngectomy totalis) is performed in late stages of the disease. In the new anatomic conditions, the upper respiratory tract has no longer a respiratory function, breathing takes place through the tracheostoma and phonation is impossible.

Effective voice rehabilitation following a total laryngectomy is essential as it ensures improved quality of life for the patient, and resocialization<sup>1,2</sup>. Today, speech rehabilitation of laryngectomees is achieved by: oesophageal speech, use of an electrical generator of sound – electrolarynx, tracheoesophageal puncture and insertion of tracheoesophageal voice prosthesis.

Voice prostheses are devices developed to restore voice and speech after a total laryngectomy<sup>3</sup>. They are made of medical grade silicone and contain a one-way valve, holding the tracheoesophageal fistula open for speech, to reduce the risks of food and liquid aspiration into the trachea<sup>4</sup>. During an operative procedure the device is inserted between the trachea and the oesophagus. It does

not produce sound automatically but directs the air from the lungs towards the neopharynx, and the sound is then produced by air pressure vibrating the pharyngoesophageal mucosa<sup>5,6</sup>. We differentiate primary implantation of prostheses during the operative procedure of laryngectomy from secondary implantation several months or years after laryngectomy<sup>7-9</sup>. Implantation of prosthesis is considered contraindicated in case of uncooperative patients, and serious cardiopulmonary or neurological disorders<sup>10</sup>.

Cerebrovascular stroke is the leading cause of reduced speech production ability, and subsequent communicational difficulties. Brain impairment occurs most often on the side opposite the paralysis. Aphasia is an acquired speech disorder, i.e. loss or disturbance of already acquired or existing vocal ability, as a result of a cerebral lesion of various aetiologies.

Broca's aphasia results from a damage of the frontal lobe of the dominant hemisphere. Symptoms differ depending on the location and size of the lesion. Speech production ability is poor and articulation deficient, with only a few short sentences. The patient expresses himself

exclusively by using nouns and action verbs<sup>11</sup>. Comprehension is much better than expression, although with certain difficulties. One of the most important symptoms of such aphasia is abnormal repetition of loudly spoken words. The majority of the patients have difficulty reading aloud or are unable to do so at all. By observing handwriting of these patients, it is noticeable that the letters appear larger and poorly formed, and some are even omitted or incorrectly written<sup>11</sup>. In most cases aphasia is accompanied by paresis or paralysis of the right side of the body, with severe hand impairment. Failure to recognise the patients' needs leads to their frustration.

## Case Report

The paper presents the case of a 60-year-old man, referred to our Clinic in February 1999 on account of long-term hoarseness. A routine examination revealed planocellular carcinoma of the larynx (T3 N0 M0). Total laryngectomy was performed and the patient was referred to logopaedic therapy in order to learn oesophageal speech. Being unable to master air deglutition, the patient was supplied with an electrolarynx. In August 2004 he suffered a stroke and was diagnosed with Hemiparesis cerebrialis lat dex cum aphasia sensomotoria. (Figure 1) The patient turned up for a logopaedic examination as late as January 2005 when Broca's aphasia, agraphia and alexia, were determined. He did not use the speech aid and was depressive because of his inability to communicate with people outside the immediate family, so he avoided such contacts. The patient had no motivation for therapy. In May 2006, notwithstanding contraindications, he was fitted with the secondary voice prosthesis, Provox II (Atos Medical, Hörby, Sweden). Sound was



Fig. 2. Vega prosthesis in the tracheoesophageal fistula.

produced as early as the second day and he quickly mastered the speech technique. Just then the patient began to show willingness and motivation for rehabilitation of damaged expressive speech function. He also improved his reading and writing. There were occasional difficulties with sequentiality of sounds (which led to paraphasia), however he was not abandoning speech. Lost thematic words the patient tried to explain descriptively or by using other words or gestures. He joined the group of laryngectomees and completed olfactory rehabilitation. In May 2010 a Vega prosthesis (Atos Medical, Hörby, Sweden) was implanted, after which the quality of his voice improved. (Figure 2) The patient has enrolled in an individual course for learning German, within the pilot project of the institution for adult education »Dante«.

## Discussion

Pulmonary driven speech is a basic reflex for oral communication that patients even with cognitive brain impairment have no trouble to regain. In contrast oesophageal speech requires the acquisition of an unnatural technique which might be too complicated for laryngectomised patients, especially if they have cognitive impairments.

Although implantation of voice prosthesis is considered contraindicated in patients with stroke by Koscielny<sup>10</sup>, this example illustrates the possibility of their successful rehabilitation. It is important not to lose optimal time for recovery and efficacy of logopaedic therapy in order to achieve best results. Motivation and cooperation of the patient are preconditions.

Besides the significant effect on voice rehabilitation, prosthesis implantation considerably improved the patient's mental state. The aim of our Clinic is not only to cure patients but to rehabilitate them, so they could improve the quality of their lives.

## Conclusion

The learning of a new method of voice production is a long-term process, which requires great patience, but



Fig. 1. CT of the brain four months after stroke. Well defined hypodense lesion of approximately 4 cm diameter is visible in the supratentorial area, left parieto-occipally, cortically and subcortically, corresponding to the previous ischemic stroke. A smaller hypodense lesion of a similar genesis is visible on the left frontal area.

eventually pays off seeing that the patient communicates normally with his surroundings. Implantation of the voice prosthesis has proved to be of decisive importance for the patient's resocialization.

### Acknowledgements

We thank ATOS for their donation of the Vega prosthesis, Mrs. Bulić Šimić and Mr. Marušić for their unselfish work and support.

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### REHABILITACIJA GOVORA U LARINGEKTOMIRANOG PACIJENTA S BROKINOM AFAZIJOM

#### SAŽETAK

Totalna laringektomija uzrokovana karcinomom larinksa ima za posljedicu gubitak govorne funkcije. Cerebrovaskularni inzult (CVI) je vodeći razlog smanjene mogućnosti govorne produkcije, a time i komunikacijskih poteškoća. Prikazan je slučaj 60-godišnjeg pacijenta koji je 5 godina nakon totalne laringektomije doživio CVI. Zbog depresivnog stanja pacijenta rehabilitacija je bila otežana. Unatoč kontraindikacijama ugrađena mu je sekundarna govorna proteza. Tek tada je pacijent počeo dobivati volju i motivaciju za govornu rehabilitaciju. Cilj ovog prikaza je ukazati da nisu svi pacijenti s neurološkim poremećajima kontraindicirani za ugradnju govorne proteze.