

## Laser surgery as the organ sparing treatment for vocal cord carcinoma. Cost benefit relation in 100 cases

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Nowadays, there are three internationally accepted, almost equally effective treatment options for the early vocal cord cancer: radiotherapy, cordectomy via thyrotomy or partial vertical laryngectomy and endolaryngeal cordectomy commonly performed with laser. The latter method was applied on 100 patients between May 1987 and May 1994. The cost of the laser cordectomies was analysed by the authors. Local control rate after single laser cordectomy alone was 87% and together with salvage therapy the success rate was 98%. The voice preservation was 97%, and one patient remained canulated following a salvage partial laryngectomy. The average cost of one patient's treatment - taking into consideration the salvage interventions as well - was about 66 thousand HUF (appr. 390 \$) per patient, according to the actual prices of the Hungarian Health Care Insurance. In case of radiotherapy or vertical partial laryngectomy as primary treatment the estimated costs were much higher: approximately 143 thousand and 210 thousand HUF (appr. 800 \$ and 1400 \$). These facts suggest that the endolaryngeal laser chordectomy is an effective and cost-conscious management option for primary treatment of T1 and selected cases of T2 glottic cancer.

**Key words:** laryngeal neoplasms-surgery; vocal cords; laser surgery

### Introduction

Nowadays, there are three internationally accepted, almost equally effective treatment options for the early vocal chord cancer: radiotherapy, cordectomy via thyrotomy or partial vertical laryngectomy and endolaryngeal cordectomy commonly performed with laser. However, with the increased insurance constraints, physicians must now consider treatment costs along with medical decision-making to provide cost-effective treatment. The costs of laser cordectomies were analysed by the authors, taking into consideration also the costs of the necessary salvage therapy and compared to the estimated costs of other treatment modalities.

### Patients and procedure

At the ENT Clinic of Szent-Györgyi Albert University (Hungary) 100 laser cordectomies were per-

formed between May of 1987 and May of 1994 as a primary treatment for T1 and selected cases of T2 glottic cancer. The average follow-up period was 75 months (31 - 116 months). There were 93 male and 7 female patients with an average age of 62 (range 35 to 90 years) at the time of the first operation. Vocal cord lesions were staged by the TNM classification as follows: 8 carcinomas *in situ*, 65 T1a, 23 T1b, and 4 T2 carcinomas. All patients were treated under intratracheal anesthesia through laryngomicroscopic approach with TUNGSRAM TLS-61 type CO<sub>2</sub> laser device. The average hospitalisation period was 4 days, and the average total recovery time (the complete reepithelisation) was considered to be at least 6 weeks. All patients, except one (T1b), had a close follow-up.

### Cost analysis

To determine the total cost of the treatment in this group of patients, the costs of all the procedures were added together. The costs for each type of procedure were calculated by the actual prices of

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UDC: 616.22-006.6-089.849.1

Hungarian Health Care Insurance Office (based on the all-patient DRG-10 system of USA). Prices of these single procedures were the following: laryngomicroscopy, laser cordectomy (LC) and endolaryngeal laser excision (LE) were approximately 33 900 HUF (200 \$), partial laryngeal surgery (PL), laryngectomy (L) as a salvage therapy, and neck dissection (ND) were approximately 205 000 HUF (1200 \$). Radiotherapy (RT) treatment per admitted patient was approximately 68 600 HUF (400 \$). The expected cost of the PL and RT were extrapolated to a theoretic group of 100 patients according to the expected primary cure rate and further necessary salvage therapy on the basis of the data presented in the literature. In order to simplify the calculation L was mentioned under the salvage therapy in the study.

### Results

Primary LC: 87 patients demonstrated a successful local control following the primary laser cordectomy, but one contralateral vocal cord carcinoma and one late regional metastasis occurred. These failures were treated by LC and ND.

The histological examination revealed 2 incomplete resections. The first patient underwent a RT and later on a L. The second one was salvaged by PL.

Local recurrence occurred in 10 cases. Four of them were salvaged by RT and two of these patients were laryngectomized later, whereas in one case the histological examination didn't prove malignancy. Another 4 patients had a repeated endolaryngeal LE. In one of them further LE was made and later on PL. Two patients were salvaged by primary PL, and one was laryngectomized later.

Up to the time of the study, we have lost 8 patients altogether. Two of them died because of cancer, and 6 died of intercurrent disease. The voice preservation was 97% and among these patients only one – who underwent PL earlier – remained canulated. One patient (T1b) was lost from the follow up, however, at the last control, he was found to be tumor-free for one year following the surgery.

In short, the treatment modalities used in 100 patients, were: 100 LC, 7 LE, 4 PL, 3 L, 1 ND, 5 RT. The average treatment costs of all therapeutic interventions per patient was estimated at about 66 000 HUF (appr. 390 \$).

### Discussion

Following primary PL for T1 glottic lesions, the highest primary cure rates mentioned in the literature - with a minimum follow-up of 2-3 years - are as follows: Rothfield *et al.* 94%,<sup>1</sup> Lacourrey *et al.*<sup>2</sup> 93%. According to these data, the average cure rate was found to be approximately 94%. Extrapolating to a theoretic group of 100 patients, there would be 100 partial laryngeal resections and further 6 „salvage” laryngectomies (the diagnostic laryngomicroscopy is covered by the price of PL). The average treatment cost per patient was approximately 210 000 HUF (appr. 1240 \$).

Following primary RT, 67% and 93% primary cure rates were achieved by Davis *et al.*<sup>3</sup> and Mendenhall *et al.*<sup>4</sup>, respectively. Hence, the average cure rate would be expected 80%. Extrapolating to 100 patients we would count with 100 diagnostic laryngomicroscopies, 100 primary RT and a further 20 salvage L. One patient's average total cost would be approximately 143 000 HUF (840 \$).

In our 15 year series, the glottic cancer was found in 48% of all laryngeal tumors and was, in 90%, diagnosed as T1-T2 lesion. Early glottic lesions are one of the main groups of the laryngeal cancer. This ratio could be increased by improving early diagnosis, which gives importance to the „cost-benefit” analysis of the treatment of early glottic cancers.

In general practice, better quality of voice could be retained after RT than following LC. According to our experience, a very good quality of voice could be expected especially after LC for T1 glottic lesions. The objective voice analysis, carried out by Cragle and Brandenburg,<sup>5</sup> showed no significant differences between the voice qualities after laser chordectomy and irradiation. Among all three treatment options, L is the most commonly used salvage intervention for recurrence following RT. Therefore, one must be very careful when choosing RT as primary treatment of the vocal cord carcinoma. We agree with the opinion of Saphsay *et al.*,<sup>6</sup> that irradiation as a primary treatment should be used only in patients with high risk factors.

PL as a primary treatment was found to be very inconvenient in early vocal cord lesions in spite of the good cure rate, because of the external approach, and with decanulation- and aspiration-related difficulties, long admission time, and last but not least, because of the worst voice condition.

We conclude that the primary cure rate of LC was found to be more than 85% and, with the secondary salvage attempts, the cure rate could be higher than 95%.<sup>6-8</sup> According to our calculations LC was the cheapest treatment option of all. Similar cost rates were arrived at by Myers *et al*<sup>9</sup> in the USA in 1994.

In the hand of a skilled surgeon the most recommended treatment for glottic T1 lesions would be the LC, which is supported also from the financial point of view.

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