Surgical approach and results of treating two subcategories pT2 glottic carcinoma of the larynx

Rajko M. Jović, Karol Čanji, Slobodan M. Mitrović, Vladimir Kljajić, Danijela Dragičević

SUMMARY

Background: *T2 glottic carcinoma is a nonhomogenous localization of laryngeal carcinoma with two subcategories. The aim of the study was to retrospectively analyze the results of surgically treated pT2 glottic carcinomas and to determine the importance of subcategories of glottic carcinomas in diagnostics, surgical treatment, and patients' survival.*

Methods: *During the period 1990-2000, 71/701 (10%) patients were diagnosed. with pT2 glottic carcinoma. All patients were treated with different surgical techniques.*

Results: *Total laryngectomy was performed in 14/71 patients. Involvement of anterior commisure in local spreading of the cancer was found in 24/71 patients; total laryngectomy was performed in 13/24 and reconstructive surgery in 11/24. Selective resection of neck was done in 49 patients and metastases were found in 2 of these patients. Out of fifty-seven patients who had reconstructive laryngeal surgery local disease recurrence appeared in 8 patients. These 8 patients were treated with total laryngectomy. Overall 5-year survival was 90.1% with a slight difference between subcategories (89.1% subcategory I; 93.7% subcategory II) which was not statistically significant ($p>0.05$). Disease free 5-year survival was 83.6% with a difference between subcategories (81.1% subcategory I; 93.3% subcategory II) which was not statistically significant ($p>0.05$).*

Conclusion: *Spreading of glottic carcinoma toward supraglottic and subglottic structures complicates exact preoperative evaluation of tumor size regardless to preoperative diagnostic procedures. Just owing to that, larger surgical resections performed bring more radicalness with less percentage of local recurrence and better effects on overall survival and disease free survival rate.*

Key words: *Laryngeal Neoplasms; Glottis; Otorhinolaryngologic Surgical Procedures; Laryngectomy; Neoplasms Recurrence, Local; Survival Rate*

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[1]Clinical Center of Vojvodina, Novi Sad, Serbia

Correspondence to: Prof. Dr. Rajko M. Jović, ENT Clinic, Clinical Center of Vojvodina, Novi Sad, Hajduk Veljkova 1-9, Novi Sad, Serbia

E-mail: rajkojov@EUnet.yu

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INTRODUCTION

According to the newest classification of malignant tumors dating from 2002 UICC (1), T2 glottic tumors do not represent homogenous category of malignant tumors. Besides cancer of the vocal cord with deep infiltration and impaired mobility to this category belongs cancer of the vocal cord with spreading to supraglottic or subglottic level. It makes TNM classification of malignant tumors imperfect, and when it comes to diagnostic procedures it requires systematic approach, especially considering endoscopic and radiological evaluation of precise local spreading of tumor. It brings quality to treatment planning as well as to applied therapy which makes local recurrence less possible. Since there are no regional lymph node metastases in early stages of disease, local surgical therapy in this stage, well indicated, usually means good tumor control. In local tumor spreading evaluation, clinical examination is extremely important since it shows the mobility of vocal cords. Impaired vocal cord mobility occurs due to deep tumor infiltration or cricoarytenoid junction involvement. The difference is extremely important in selecting surgical procedure (2). In large number of countries, standard treatment for T2 glottic laryngeal carcinomas is laser endoscopic surgery or radiation therapy. Differences in oncological radicalness and voice preservation are small. Classical approach using open surgical procedures is left for less developed countries where modern, above all laser technology, is not available.

The aim of this study is to retrospectively analyze the results of surgically treated T2 glottic carcinomas of the larynx and to determine the importance of different subcategories of T2 glottic carcinoma (those with vocal cord infiltration and impaired mobility and those with spreading to subglottic and supraglottic part of the larynx) in diagnostics, surgical treatment, and survival.

PATIENTS AND METHODS

This study represents retrospective analysis of results in treating 71 (10.1%) patients with pT2 glottic carcinoma of the larynx among overall 701 patients, who were diagnosed and treated during the period 1990-2000. Among them there were 69 men and 2 women with average age 56.1 (41-72). Diagnosis was made by clinical examination, direct laryngomicroscopy, and endoscopy with usage of optic instruments 0 and 70 degrees. Radiological evaluation using CT or MRI was available in small number of patients in this period, and therefore it had no importance in final estimation of local tumor spreading. Therefore in evaluation of treatment results we used pT category of local spreading of the carcinoma.

Classification of patients was made according to UICC from 2002. All patients were primarily treated with open surgical techniques. To analyze the influence of ways in local tumor spreading on diagnostic approach and election of surgical technique, we divided all patients into two subcategories. Subcategory I included pT2 glottic carcinomas with impaired vocal cord mobility and subcategory II included pT2 glottic carcinomas with spreading to subglottic and supraglottic level with preserved or impaired mobility. Since T2 glottic carcinoma does not represent a homogenous localization of laryngeal carcinomas in treatment of the patients with T2 glottic carcinoma, functional reconstructive surgery of the larynx and total laryngectomy were performed. Vertical partial laryngectomies were primarily done without tracheostomy and with reconstruction of the hemilarynx using external per-

ichondrium of the ala of the thyroid cartilage, prelaryngeal fascia, and epiglottis.

Tracheostomy was performed in patients with of heavy breathing due to complications after collapse of laryngeal structures, swelling of reconstructed hemilarynx with consecutive narrowing of respiratory tract.

In horizontal partial laryngectomies tracheostomy was obligatory as well as the use of nasogastric feeding tube postoperatively, later swallowing rehabilitation, and decannulation.

Patients after total laryngectomies were without nasogastric feeding tube, with parenteral feeding during first four postoperative days, and oral feeding after that period. In case of pharyngocutaneous fistula nasogastric tube was placed for further feeding until the fistula was closed either spontaneously or surgically.

After the surgical treatment and postoperative swallowing, voice and speech rehabilitation were done, patients were followed regularly. During the first postoperative year they were followed up every two months, during the second postoperative year every three months, and later every six months until the fifth postoperative year. After that period local examination was performed once a year. Since certain number of patients did not come on regular controls after fifth postoperative year, data about them were taken from Center for registration of malignant tumors in Vojvodina, Oncology Institute of Vojvodina in Sremska Kamenica. All patients included in this study were followed at least five postoperative years.

Along with standard statistical procedures, Kaplan-Meier method was used for counting of 5-year survival. In survival comparison in two subcategories of patients, long-rank test was used. Data were analyzed with SPSS for Windows software 7.5.

RESULTS

Squamous cell carcinoma with various differentiation grade (G1=59, G2=7, G3=2) was diagnosed in 68/71 (95.8%) patients, verrucous carcinoma was found in 2/71 (2.8%), and 1/71 (1.4%) patient had embryonal myosarcoma.

Glottic carcinoma with impaired mobility of vocal cords was verified in 55/71 patients, while vocal cord carcinoma with local spreading in larynx was diagnosed in 16/71 (Table 1).

Table 1. Ways of spreading of pT2 glottic laryngeal carcinoma with good or impaired mobility of vocal cords (subcategory II)

Ways of spreading of pT2 glottic laryngeal carcinoma	N	%
Arythenoid	4	25
Petiolus of the epiglotis and ventricular band	1	6.25
Subglottic	5	31.25
Another vocal cord	2	12.5
Arythenoid and subglottic	2	12.5
Interarythenoid incissura	2	12.5
Total	16	100.0

Anterior commissure involvement was found in 24/71 patients. In subcategory I anterior commissure was involved by tumor in 15/55 patients without spreading through the thyroid cartilage. In subcategory II, among other structures, tumor invaded anterior commissure in 9/16 patients.

Total laryngectomy was performed in 13/24 (54.2%) patients with anterior commissure involvement and in 11/24 (45.8%) patients reconstructive laryngeal surgery was done. All patients with verified tumors were primarily treated surgically (Table 2).

Table 2. Types of applied surgical treatment in both subcategories of pT2 glottic carcinoma of the larynx

Types of applied surgical treatment	I subgroup	II subgroup	Σ	%
Horizontal glottectomy	1	0	1	1.4
Hemilaryngectomy	27	1	28	39.4
Frontolateral laryngectomy	8	1	9	12.7
Subtotal laryngectomy	17	2	19	26.8
Total laryngectomy	2	12	14	19.7
Total	55	16	71	100.0

Total laryngectomy was performed in 14/71 patients. The indications for this procedure in patients with T2 glottic carcinoma were: poor general condition of patient with impaired lung function (3/14); vocal cord carcinoma after radiation therapy of the vocal cord ten years before due to carcinoma (1/14); tumor spreading into the arytenoid with impaired mobility of vocal cords (6/14); involvement of both vocal cords, subglottic region and anterior commissure was found (2/14); previous tracheotomy due to narrowing of respiratory tract caused by large vocal cord carcinoma (2/14).

Selective neck dissection on the side of involved hemilarynx was performed in 49 patients, while in 11 patients it was done on both sides. Positive lymph node metastasis were found in 2/49 patients.

Nasogastric feeding tube was used in 19 patients after subtotal laryngectomy and in 3/14 patients who underwent total laryngectomy due to postoperative pharyngocutaneus fistula. In two cases fistula closed spontaneously, while in one case it required surgical closure using local flap.

Tracheostomy was performed in 25/57 patients during reconstructive laryngeal surgery. All patients treated with subtotal laryngectomy had tracheostomy which was made during the primary surgical intervention. Postoperative performed tracheostomy was indicated in 2/9 patients after frontolateral laryngectomy and in 4/28 patients after hemilaryngectomy due to breathing difficulties.

Decannulation of tracheostomized patients took place during the period from 7 days to 3 months after the operation; 3/71 patients had postoperative wound bleeding which was managed with surgical revision in 2 cases; among 71 operated patients one had died. Wound infection occurred in 9/71.

Positive marginal specimen was found in one out of 57 patients after reconstructive laryngeal surgery. Postoperative radiotherapy was applied in 13/71 patients. Local recurrence occurred in 8/55 patients after reconstructive laryngeal surgery; in subcategory I it occurred in 6/55 patients, and in 2/16 of patients in subcategory II (Table 3).

Table 3. Appearance of local recurrences according to the type of surgical treatment

Types of applied surgical treatment	Number of recurrences in subcategory I	Number of recurrences in subcategory II	Total	%
Hemilaryngectomy (28)	4	0	4	14.3
Frontolateral laryngectomy (9)	1	1	2	22.2
Subtotal laryngectomy (19)	1	1	2	10.5
Total	6	2	8	11.3

Lymph node metastases were diagnosed in 3/71 patients; two of them had local recurrence as well. Additional surgery of locoregional recurrence in 8 patients included total laryngectomy and in two patients radical neck dissection was required.

Another primary carcinoma was verified in 4/71 patients (after 2 hemilaryngectomies, one frontolateral and one subtotal laryngectomy). It included one tongue carcinoma, two bronchial carcinomas and one esophageal carcinoma, which occurred in first two years after laryngeal carcinoma operation in three patients and seven years after in one patient.

Overall 5-year survival was 90.1% (Figure 1a) with no statistically significant difference between two subcategories ($p>0.05$) (Figure 1b). Five-year disease free survival was 83.6% (Figure 1c) with no statistically significant difference between two subcategories ($p>0.05$) (Figure 1d). Although clinical significance persisted, statistical significance could be expected in larger subcategories of patients.

DISCUSSION

T2 glottic laryngeal carcinomas present nonhomogenous group of tumors which involves tumors with deep infiltration with impaired mobility of the vocal cord and glottic tumors with spreading into subglottic and supraglottic region (Figure 2)

Since TNM is the first clinical classification based on diagnostic findings including radiological diagnostic procedures (CT and MR) and endoscopic evaluation, it is to be expected that certain number of tumors previously classified as T2 tumors, after histopathological analysis of operative specimen will show the characteristics of T3 glottic carcinoma. Because large number of patients during the period of study analysis did not have radiological examination and preoperatively made T classification was not an adequate one we used pT2 category as more reliable in evaluation of treatment results. It was the reason for fewer number of T2 clinically verified glottic carcinomas (10.1%). This participation of pT2 glottic carcinomas is significantly smaller than in the series published by Pan et al. (3), whose percentage was 32.88% and in Eckel's series where it was 27.2% (4).

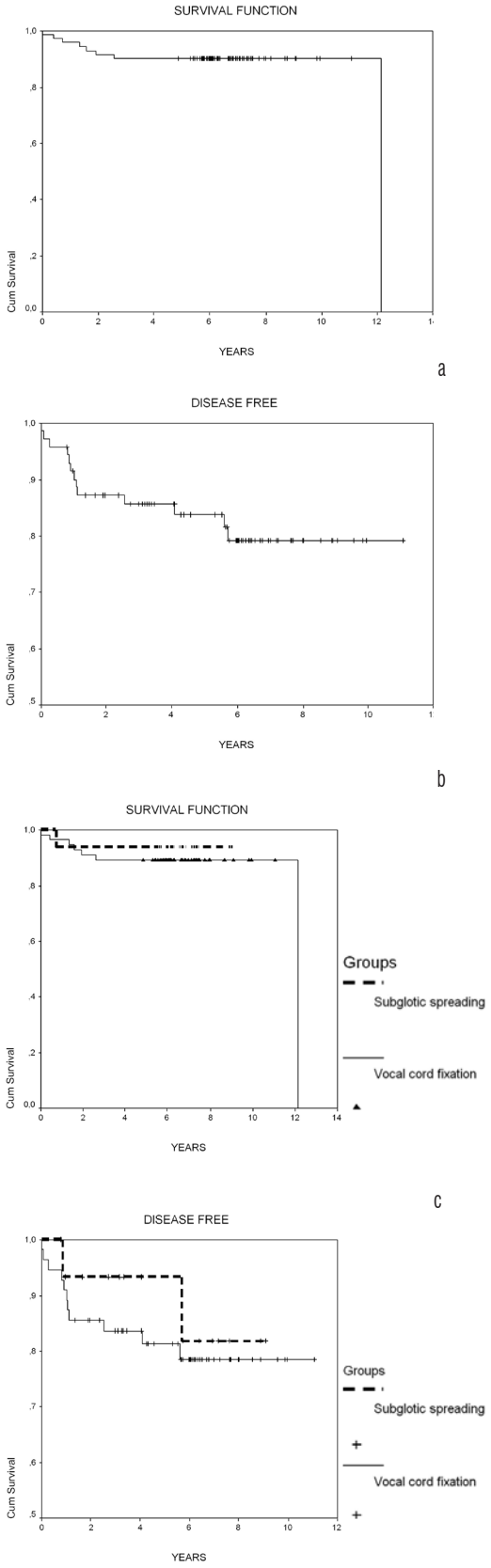

Figure 1. Overall and disease free survival patients with pT2 glottic carcinoma of the larynx, a) Overall 5-year pT2 glottic carcinoma of the larynx according Kaplan Meier method; b) 5-year disease free survival in all patients; c) Overall 5-year survival in subcategory I and II according to Kaplan Meier method; d) 5-year disease free survival in subcategory I and II according to Kaplan Meier method

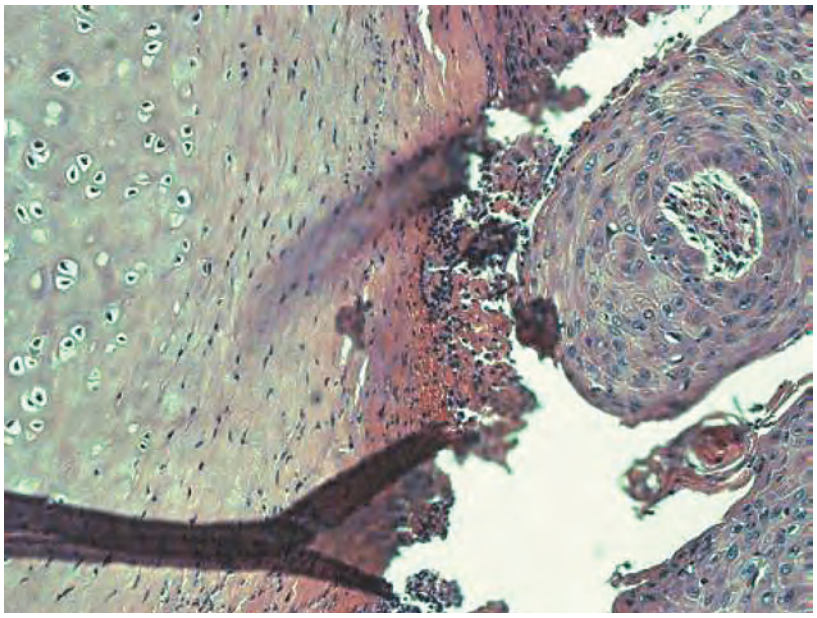

Figure 2. Glottic cancer with invasion of internal perichondrium

Squamous cell carcinoma with various differentiation grades was the most frequent category of carcinoma (95.8% patients), while other types of malignant tumors were rare. Vocal cord tumor in its local spreading from the mucosal layer infiltrates deeper structures making the mobility of vocal cords impaired 3.5 times more often than it spreads into supraglottic and subglottic parts of larynx.

In establishing the indications for surgical treatment, besides patient's general condition, it is the local extension of carcinoma that influences the application of reconstructive laryngeal surgery in the subcategory I or total laryngectomy in subcategory II.

Except for the three patients (2 in subcategory I and 1 in subcategory II) who had total laryngectomy due to poor general condition and impaired lung function, the main indication for total laryngectomy in other patients was local extension of tumor into supraglottic and subglottic region (68.5% patients in the subcategory II).

Total laryngectomy as the most radical surgical resection of intralaryngeal carcinoma was performed in 14/71 patients with pT2 glottic carcinoma. However, it still presents too large resection for relatively well bordered vocal cord malignancy with bad functional results.

It was performed in 2 cases of vocal cord carcinomas and more often in carcinomas with spreading into supraglottic and subglottic parts. Since glottic tumors have small incidence of lymphatic metastasis due to poor lymphatic drainage of vocal cords overall survival of all operated patients was much higher. Anterior commissure involvement by carcinoma was found in 24 patients; 13 of these patients had total laryngectomy which made percentage of local recurrence of carcinoma smaller than it would be expected after reconstructive laryngeal surgery. Results of Eckel (4) show that spreading of tumor into anterior commissure led to local recurrence of carcinoma in 37.1% patients after laser laryngeal surgery, while Persky and et al. (5) notice local recurrence in T1 carcinomas with involvement of anterior commissure in 12% patients.

For all carcinomas with anterior commissure invasion it is much safer to perform subtotal supracricoid laryngectomy than the frontolateral laryngectomy in which Laccourreye and et al. (6) find high rate of local recurrence. Results of Targa et al. (7) did not show important influence of anterior commissure involvement by carcinoma on overall survival, which shows that the importance of spreading of carcinomas into anterior commissure and its influence on local tumor recurrence is still not clear. Many authors consider the anterior commissure invasion an important factor in planning the operative treatment (8-10).

Subtotal laryngectomy in our series of operated patients would be enough radical surgical intervention for all patients with pT2 carcinomas in which total laryngectomy was performed because of its good functional results, except for 3 patients with poor general condition and impaired lung function, as other authors confirmed (11,12). Lack of experience in surgical treatment of laryngeal malignancies at the beginning of this study was the important factor in indicating total laryngectomy for these patients.

Alternative to surgical therapy is radiotherapy (with limitations for radiotherapy in anterior commissure tumors) and it gives better results when applied twice a day than once a day (5,13,14).

Patients operated by vertical partial laryngectomy were not electively tracheostomized, even there are authors who perform tracheostomy in these patients (15). These operations can be made without tracheostomy thus avoiding the bad influence on postoperative course and recovery of patients.

Even when the tracheostomy was performed in patients after vertical partial laryngectomy during the postoperative period they were all decannulated. The main reason for performing tracheostomy in these patients is collapse of reconstructed hemilarynx in early postoperative period. As an alternative to this kind of reconstruction Giovanni et al. (16) used of epiglottis (16) in two cases of their series while in largest number of patients the external perichondrium of thyroid cartilage alae and prelaryngeal fascia were used.

Local recurrence occurred in 14.5% patients who had reconstructive laryngeal surgery. Almost the same percentage occurred after laser endolaryngeal surgery of T2 glottic carcinoma in series published by Eckel (15.4%), while Johnson et al. (17) find the recurrence in 18.4% of patients. Laser endolaryngeal surgery of T2 glottic laryngeal carcinomas has no advantage when it comes to better resection of tumors with smaller percentage of local recurrence. Its advantages are: smaller postoperative morbidity, shorter hospitalization, no swallowing disorders and tracheostomy, and the possibility to apply reconstructive laryngeal surgery when indicated due to local recurrence.

Eckel (4) performed reconstructive laryngeal surgery in 45.7% patients with local recurrence after laser endolaryngeal surgery, while in our series all patients with local recurrence were operated using total laryngectomy. In making the decision which treatment to apply in patients with local recurrence of tumor it is very important to have regular postoperative follow ups at every two months. Unfortunately, irregular follow up during the first postoperative year is very often in our patients and it makes the diagnosis of local recurrence of carcinomas delayed. By then, tumor can be so spread that only total laryngectomy is radical enough.

The occurrence of another primary carcinoma in older patients and patients with survival after five years can be expected. Another primary carcinoma occurred in 5.6% of our patients which is a smaller percentage than in series by Johnson et al. (17) where another primary carcinoma was discovered in 29% of patients with T2 carcinomas. The occurrence of another primary carcinoma has the important influence on overall survival.

Local control of disease during the five year period was achieved in 83.6% of operated patients with big differences between subcategories I and subcategory II. Data clearly show that spreading of carcinoma into supraglottic and subglottic region in the subcategory II is the indication for larger and more radical surgical resections such as total laryngectomy which led to better results as it was expected. Five year disease free survival, according to Thomas et al. (12), was in the range from 86% to 96%, with pointing that anterior commissure and arythenoid involvement decreases this level to 75%.

Achieved overall five year survival in 90.1% of operated patients speaks of high percentage of survival in patients with T2 glottic carcinomas. Giovani and et al (16) report five-year survival for T2 glottic carcinomas in 86%. Better results in overall five year survival are achieved in subcategory II 93.37%, with no significant difference from subcategory I where it was achieved in 89.1% of patients. Patients from subcategory I underwent reconstructive laryngeal surgery with dominance of vertical partial laryngectomies (63.6% operated patients), which are associated with higher local tumor recurrence rate.

CONCLUSION

T2 glottic carcinomas present nonhomogenous group of malignant laryngeal tumors divided into two subcategories which differ in diagnostics applied surgery disease prognosis. Vocal cord carcinomas with its impaired mobility as a sign of deeper invasion, present smaller diagnostic problem, but the election of surgical approach is very important in preventing of local tumor recurrence which is higher in this group of patients. Spreading of vocal cord carcinomas toward supraglottic and subglottic parts makes the exact diagnosis and estimation of local tumor size more difficult regardless of preoperative diagnostics. Larger surgical resections results in smaller percentage of local recurrence and better effects on overall survival and disease free survival . Spreading of glottic carcinoma toward supraglottic and subglottic structures complicates exact preoperative evaluation of tumor size regardless to preoperative diagnostic procedures. Just owing to that, larger surgical resections performed bring more radicalness with less percentage of local recurrence and better effects on overall survival and disease free survival rate.

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Conflict of interest

We declare no conflict of interest.

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