Cricohyoidoepiglottopexy vs Near-Total Laryngectomy With Epiglottic Reconstruction in the Treatment of Early Glottic Carcinoma

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Objective: To compare functional and oncological outcomes of cricohyoidoepiglottopexy (CHEP) and near-total laryngectomy with epiglottic reconstruction (NTLER) techniques in early glottic carcinoma.

Design: Case series, clinical study.

Setting: Two tertiary care referral centers.

Patients: Seventeen patients with T1b glottic squamous cell carcinoma were treated with CHEP and 21 were treated with NTLER.

Main Outcome Measures: Fundamental frequency, maximum phonation time, maximum phonation intensity, Voice Handicap Index, and GRBAS (grade, roughness, breathiness, asthenia, and strain) scale were used to evaluate voice. Nasogastric tube removal times and late postoperative aspiration scales were used to evaluate swallowing ability.

Results: Fundamental frequency (P = .78), maximum phonation time (P = .44), and maximum phonation intensity (P = .94) measurements were not significantly different in the 2 groups. There was also no significant difference in mean Voice Handicap Index score (P = .62), mean decannulation time (P = .25), time to nasogastric tube removal (P = .12), or clinical grades of late postoperative aspiration (P = .87) between the 2 groups. The mean Voice Handicap Index score was 55.58 in the CHEP group and 52.78 in the NTLER group. According to the GRBAS scale, overall voice quality was moderately altered in both groups. All patients were successfully decannulated. In the CHEP and NTLER groups, the mean decannulation times were 27 and 20 days, respectively, and the nasogastric tubes were removed after an average of 23 and 17 days. The overall (Kaplan-Meier) survival rate was 94% in the patients who underwent CHEP and 90% in the patients who underwent NTLER (P = .76). The disease-free survival rates were 100% and 76% in the CHEP and NTLER groups, respectively (P = .07).

Conclusions: Functional and oncological results appear to be similar with both treatment methods. If open surgery is planned, the choice between these procedures mainly depends on the experience and preference of the surgeon.


Conservative laryngectomy and radiotherapy have long been advocated for the treatment of early glottic carcinoma. Both cricohyoidoepiglottopexy (CHEP) and near-total laryngectomy with epiglottic reconstruction (NTLER) allow comprehensive oncological control and conserve laryngeal function in patients with early glottic carcinoma.1,2 They also allow complete resection of the true and false vocal folds and removal of the entire or greater part of the thyroid cartilage.

Both techniques have increased in popularity over the last few decades as a result of advantages such as preservation of speech and swallowing without a permanent tracheotomy. The accumulation of experience has led many authors to report their functional results and oncological outcomes as well as the pros and cons of each technique individually.1,4 However, the current literature lacks a comparative study in terms of functional and oncological results. Our goal was to compare (1) perceptual and objective acoustic parameters, (2) short- and long-term respiratory and swallowing functions, and (3) oncological outcome after CHEP and NTLER techniques in early glottic carcinoma.

Methods

Patients

The medical records of 38 patients who were treated with surgery for T1b glottic squamous cell carcinoma were analyzed, and the patients were invited by telephone to the clinic for voice evaluation. Seventeen patients (mean age, 52 years; age range, 39-67 years) were treated with CHEP, and 21 patients (mean age,
alteration; 2, moderate alteration; and 3, severe alteration).8

The physical influences of the voice disturbances were
determined, with no significant difference in decannulation time
between the 2 treatment modalities in any of the
parameters except the GRBAS scale and clinical grading of late post-
operative aspiration, which were evaluated with the Mann-
Whitney U test. Statistical significance was set at P<.05. All
values were expressed as mean (SD).

STATISTICAL ANALYSIS

Early assessment of swallowing included removal time of naso-
gastric tube and initiation of oral feeding without restriction. Late postoperative aspiration was evaluated using the scale
developed by Leipzing9 and Pearson10 (0, no problems or comp-
lications; 1, occasional cough, no clinical problems; 2, con-
sistent cough, worsening with meals or swallowing; and 3, pul-
monary complications).

ACOUSTIC AND SPEECH ANALYSES

Acoustic analyses were performed with a commercially avail-
able software system (Dr Speech Version 4.30; Tiger DRS Inc, Seattle, Wash) a minimum of 6 months after surgery. The follow-
ing parameters were assessed in each patient: (1) fundamental frequency, (2) maximum phonation time, and (3) maxi-
mum phonation intensity.

VOICE PERCEPTION ANALYSIS

The Voice Handicap Index was used to evaluate self-perceived emotional, physical, and functional effects of vocal dysfunction based on Likert analysis of the patient’s responses (minimum score, 0; maximum score, 120). A Voice Handicap Index score of 18 points or more or a Voice Handicap Index subscale parameter of 8 points or more was indicative of deterioration in voice quality.7

Psychoacoustic evaluation was performed by audio record-
ings during vowel prolongation and conversational speech, which were analyzed by an experienced listener. The listener was in-
structed to use the GRBAS (grade, roughness, breathiness, asthe-
nia, and strain) scale of Hirano,6 which rated the parameters on
a 4-point equal-appearing interval scale (0, normal voice; 1, slight
alteration; 2, moderate alteration; and 3, severe alteration).

RESPIRATION AND SWALLOWING

Early assessment of swallowing included removal time of naso-
gastric tube and initiation of oral feeding without restriction. Late postoperative aspiration was evaluated using the scale
developed by Leipzing9 and Pearson10 (0, no problems or comp-
lications; 1, occasional cough, no clinical problems; 2, con-
sistent cough, worsening with meals or swallowing; and 3, pul-
monary complications).

STATISTICAL ANALYSIS

Kaplan-Meier survival analysis was used to compare the over-
all and disease-free survival rates between the 2 patient groups,
and the t test was used to compare all the functional param-
eters except the GRBAS scale and clinical grading of late post-
operative aspiration, which were evaluated with the Mann-
Whitney U test. Statistical significance was set at P<.05. All
values were expressed as mean (SD).

RESULTS

ACOUSTIC AND SPEECH ANALYSES

The fundamental frequency was 94.69 (14.20) Hz in the
CHEP group and 96.65 (25.57) Hz in the NTLER group; the difference was not significant (P = .78). The maximum phonation time was 7.24 (1.11) seconds in the CHEP group and 6.95 (1.08) seconds in the NTLER group, and the difference was not significant (P = .44). The maximum phonation intensity was 81.43 (10.78) dB in the CHEP group and 81.73 (11.25) dB in the NTLER group, with no sig-
nificant difference (P = .94).

VOICE PERCEPTION ANALYSIS

The total VHI score was 55.58 (17.98) in the CHEP group and
52.78 (14.62) in the NTLER group. The patients in both groups
were equally handicapped, and the difference in the
total scores was not significant (P = .62) (Figure 1). The emo-
tional (CHEP, 16.53 [12.50]; NTLER, 15.63 [9.62])
and functional (CHEP, 20.94 [6.83]; NTLER, 17.88 [6.83])
disabilities in voice were equal in both groups of subjects.
The physical influences of the voice disturbances were scored at 17.88 (7.88) in the CHEP group and 15.50 (5.69)
in the NTLER group (P = .30).

Figure 2 shows the results of a subjective evalua-
tion of a patient’s voice using the GRBAS scale. Overall
voice quality was moderately altered in both groups. The
grades were 2.02 (0.93) and 2.18 (0.71) in the CHEP and
NTLER groups, respectively. There was no significant difference between the 2 treatment modalities in any of the
evaluation parameters (Figure 2).

RESPIRATION AND SWALLOWING

All patients in both groups were successfully decannu-
lated, with no significant difference in decannulation time
(P > .05). The mean decannulation time was 27.00 (22.84)
days in the CHEP group. One patient with type 1 diabe-
tes in the CHEP group needed the tracheotomy for 110
days, until the wound breakdown completely healed. The
cannula was removed after an average of 20.00 (15.81)
days in the NTLER group.

Nasogastric tubes were removed after 23.00 (13.58)
days in the CHEP group and after 17.00 (11.36) days in
the NTLER group. There was no significant difference
in oral feeding initiation times between the 2 groups
(P>.05). None of the patients developed pulmonary com-
lications as a result of late aspiration. Seven of the pa-
tients in the CHEP group and 6 of the patients in the
NTLER group reported no aspiration during the meals.
Based on the clinical grading of postoperative aspiration
assessment, 9 patients in the CHEP group and 9 pa-
tients in the NTLER group presented with grade 1 aspi-
ration. One patient in each group reported consistent
worsening of cough with liquids only (grade 2). The dif-
ference in clinical grades of late postoperative aspira-
tion was not significant (P=.84).

ONCOLOGICAL RESULTS

The overall survival rate was 94% in the CHEP group and
90% in the NTLER group (P=.76) (Figure 3). Disease-
free survival rates were 100% and 76% in the CHEP and
NTLER groups, respectively (P=.07) (Figure 4). There
was no recurrence in the CHEP group. One patient died
of a cerebrovascular accident in postoperative month
8. In the second group, 4 tumor recurrences were ob-
served. One patient with a recurrent tumor died of un-
controlled disease in postoperative month 29. Two of the
remaining tumors were local recurrences that required
total laryngectomy. One patient underwent postopera-
tive radiation therapy and a neck dissection for a re-
gional recurrence at the second cervical level. One of the
patients with local recurrence in the NTLER group died
of myocardial infarction in postoperative month 19.

COMMENT

The proper treatment method for early glottic carci-
noma has been debated since the late 1970s. Both sur-
gery and radiation therapy prove to have similar cure
rates. Superior quality of voice is the main reason for
choosing radiation therapy. On the other hand, the dis-
advantages of radiation therapy include long-term on-
cological problems and hidden costs such as work missed
by the patient and family members, traveling time, and
traveling distance. Furthermore, infiltration of the tu-
mor into the cartilage of the anterior commissure was
shown to significantly decrease local control in patients
treated with radiotherapy. Endoscopic carbon dixoide
laser surgery has recently emerged as a major therapeu-
tic option for patients with early glottic carcinoma. In
experienced hands, oncological results similar to those
achieved with primary radiotherapy or open surgery may
be attained with endoscopic surgery. However, accord-
ting to some authors, involvement of the anterior com-
missure by tumor is still considered a contraindication
to endoscopic resection. Moreover, endoscopic resec-
tion of the anterior commissure is technically challeng-
ing for many surgeons.

Both CHEP and NTLER have been used to treat early
larynx carcinoma since the 1970s. There are numer-
ous reports evaluating functional and oncological re-
sults of CHEP, but there are few reports in the En-
glish-language literature regarding the individual use of
NTLER. In this study, we aimed to compare the 2 tech-
niques regarding quality of speech, swallowing func-
tion, decannulation times, and oncological outcome.

Although there are optimistic reports regarding voice
quality in patients who have been treated with CHEP and
NTLER, we found that voice quality was negatively af-
fected in both of our groups of patients. The fundamental
frequency was equally below the normal range in both
groups, and as a result, the voice tone was deeper. Be-
cause both techniques destroy normal glottic closure,
laryngeal resistance and loss of air during phonation lead to
a reduction in maximum phonation time and intensity. In
the current study, the maximum phonation times and in-
tensities were found to be equally below the normal limit
in both groups, resulting in an inability to increase the voice

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volume. Alterations in the objective voice parameters negatively influenced the patients’ self-perceived emotional, physical, and functional status uniformly in both groups (Figure 1). Listener evaluation scores, according to the GRBAS scale, were 2.02 and 2.18 in the CHEP and NTLER groups, respectively, indicating a moderate alteration in voice quality (Figure 2).

Theoretically, CHEP could be expected to influence deglutition more negatively than NTLER because the former procedure requires transection of the constrictor muscles along the thyroid cartilage, elevation of the pyriform sinuses mucosa at the internal surface of the thyroid cartilage, and disarticulation of the cricothyroid joints. In the NTLER procedure, constrictor muscles remain untouched and dysfunction of the laryngeal nerves is less likely. However, we did not observe a significant difference in swallowing functions between both techniques. The mean initiation of oral feeding was 23 days in the CHEP group and 17 days in the NTLER group (P = .05). Furthermore, in the long term, the swallowing function was as good in the CHEP group as in the NTLER group.

The oncological rationale of supracricoid laryngectomy is based on the concept that the extent of the tumor should not change the amount of thyroid cartilage removed. The entire thyroid cartilage should be removed for better oncological control. Transcartilaginous access of vertical laryngectomies requires more subperiosteal resection and violates the firm cartilage barrier as well, resulting in higher recurrence rates. In the present study, the incidence of tumor recurrence was higher in the NTLER group: there were 4 recurrences, 3 of which were salvaged with subsequent surgical procedures and 1 case in which the patient died of uncontrolled disease. In the CHEP group, no tumor recurrence was observed. However, the overall survival rates were not significantly different between the 2 groups. The disease-free survival rate was 100% in the CHEP group and 76% in the NTLER group. Despite the remarkable difference in disease-free survival rates between the 2 groups, no statistical significance was detected (P = .07).

As a result, objective measurements of voice were negatively influenced in both groups. Self-perceived effects of vocal dysfunction were equally negative in all patients. In both groups, the listeners assessed voice quality as moderately altered. The differences in decannulation times and swallowing functions were not significant between the 2 groups. Although the incidence of oncological failure was higher in the NTLER group, the overall and disease-free survival rates were not significantly different.

In conclusion, the functional and oncological results with the CHEP and NTLER procedures appear to be similar. If open surgery is the planned treatment method, the choice between these procedures mainly depends on the experience and preference of the surgeon.

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