ORIGINAL ARTICLE

A Clinical Study on T₁ Glottic Cancer Treated by Laser Technique

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Abstract

It is commonly accepted that radiotherapy is a first choice for treatment of T₁ glottic cancer. However, side effects caused by irradiation are sometimes troublesome to a patient and to a physician. Among side effects, oncogenic problem and late radiation change are most undesirable and may become fatal. Hence, we avoid radiation therapy especially for younger aged patients. We prefer surgical therapy to radiotherapy for such a case. In our clinic, laser therapy has been employed. A laser beam is introduced through an operation microscope and a lesion can be microscopically vaporized. In this study, a survey of 40 patients with T₁ glottic cancer submitted to laser surgery was reviewed. From those patients 25 were T₁a and 15 were T₁b. From our experience, laser vaporization is recommendable for T₁ glottic cancer in younger aged patients. However, in order to obtain cure rate comparable to radiation therapy, the indication must be correctly designated.

Key words: laser surgery, larynx, laryngeal carcinoma, glottic cancer, vocal folds

Introduction

No one can deny that laser beam is a very useful tool in medicine today. The main advantages of laser are its capacity in obtaining a complete tissue vaporization.
without contact, sterile operating field, minimal edema formation, postoperative painless
and especially reduced bleeding during operation.

It was Strong and Jako who first reported the use of laser in the larynx in 1972. The CO₂ laser equipment connected to an operating microscope has its beam focused just on the operating field. It is reflected through a movable mirror, being easily handled and guided in all direction on the visually magnified operating field. It is a cutting tool of high precision.

The possibility of total tissue destruction by vaporization without bleeding makes laser a very convenient tool, for example in securing a safe airway in obstructive laryngeal lesions. So it is possible to avoid tracheotomy or tumor debulking through external approach.

It is commonly accepted that radiotherapy is the first choice as a treatment of T₁ glottic cancer, offering a high cure rate and good voice preservation. However, some undesirable inconveniences are observed, such as:

1) prolonged treatment (5 to 8 weeks);
2) temporary side effects as throat discomfort, or sometimes more serious changes as necrosis of skin and peripheral mucosal tissue;
3) later radiation effects as oncogenic changes.

Hence, since only little voice difference is observed between post laser and post radiotherapy patients⁴,⁵ it seems to be convenient to avoid those side effects, preferring laser therapy especially in younger aged patients. However, in order to obtain the same cure rate, the indication of laser must be correctly designated. Therefore, this study has been performed by clinical survey to clarify when and how to indicate laser alone with definitive cure intention.

**Material and Methods**

During 6 years, since September 1982 to October 1988, 40 patients (38 male and 2 female) have been treated with CO₂ laser because of T₁ glottic cancer. The mean age was 61 years ranged from 43 to 90 years. From those patients, 25 were T₁a and 15 were T₁b lesion cases.

A NiiC CO₂ laser unit, model-60Z connected to a Zeiss operating microscope has been employed in continuous mode with power varying from 8 to 20 watts. All patients were submitted to conventional general anesthesia with endotracheal tube covered by aluminum foil, to avoid endotracheal explosion. The tracheal lumen just below the sub-glottic space is also filled by small wet cotton ball, in order to protect the cuff and the mucosa. After vaporization, the burned tissue is carefully removed by a wet small cotton ball to certify the complete destruction of the lesion. Further biopsy specimens are obtained from the margins. Especially in cases of anterior comissure involvement,
Laser Surgery for $T_1$ Glottic Carcinoma

Table 1 Treatments Carried Out

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser alone</td>
<td>27</td>
</tr>
<tr>
<td>Laser+radiation</td>
<td>12</td>
</tr>
<tr>
<td>Laser+total laryngectomy</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 2 Reasons Determined Adjuvant Radiation

<table>
<thead>
<tr>
<th>Reason</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC involvement</td>
<td>5</td>
</tr>
<tr>
<td>Large tumor</td>
<td>4</td>
</tr>
<tr>
<td>Entire VF involvement</td>
<td>3</td>
</tr>
<tr>
<td>Extention to whole bilateral VF</td>
<td>1</td>
</tr>
</tbody>
</table>

AC=anterior comissure, PV=processus vocalis, VF=vocal fold.

the cartilage in this region is also biopsied.

From those 40 patients, 27 were treated with laser alone, with definitive cure intention. Among them, 6 underwent laser treatment after radiation failure. The other 13 patients were submitted to laser vaporization plus radiation therapy, although one of them was laryngectomized few days later, because it was a $T_1b$ case after radiation failure (Table 1). The reasons that determined the adjuvant therapy were anterior comissure involvement in 5 cases, large tumor in 4 cases, entire vocal fold involvement in 3 cases and tumor extending to whole bilateral vocal folds in 1 case (Table 2).

Results

Among those 27 patients that received only laser therapy as definitive treatment, 19 were $T_1a$ lesion and the other 8 were $T_1b$. Anterior comissure was involved in 9 cases ($8 T_1b$ and $1 T_1a$); vocal process was involved in 2 cases (both $T_1a$); anterior comissure and vocal process were involved in 1 $T_1a$ case, and the other 15 cases were lesions that compromised only the free edge of vocal fold (Table 3). The mean follow up was 19.2 months.

Recurrence was observed in 2 cases, of which one was $T_1b$ (without vocal process involvement) and the other was $T_1a$ with anterior comissure and vocal process involvement after radiation failure.

From those 12 patients that received laser therapy and adjuvant therapy, 6 were $T_1a$ and 6 $T_1b$ lesion. Anterior comissure was involved in 6 cases ($1 T_1a$ and $5 T_1b$); vocal process was involved in 1 $T_1a$ case; both anterior comissure and vocal process were involved in 3 cases ($2 T_1a$ and $1 T_1b$) and the other 2 cases were $T_1a$ lesion with
anterior comissure and vocal process free of involvement (Table 4). One recurrence among T1b without vocal process involvement was observed. The mean follow up in this group was 22 months ranged from 6 to 48 months. All patients received radiation dose from 60 to 66 Gy except one who received 34 Gy.

The patient who was submitted to laryngectomy, was free of disease 47 months later.

**Table 3 Laser Alone with Curative Intention**

<table>
<thead>
<tr>
<th>n. cases</th>
<th>T1a</th>
<th>T1b</th>
<th>recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC involvement</td>
<td>9</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>PV involvement</td>
<td>2</td>
<td>2</td>
<td>—</td>
</tr>
<tr>
<td>AC+PV involvement</td>
<td>1</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>Only free edge</td>
<td>15</td>
<td>15</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
<td>19</td>
<td>8</td>
</tr>
</tbody>
</table>

**Table 4 Laser Plus Adjuvant Therapy (Radiation)**

<table>
<thead>
<tr>
<th>n. cases</th>
<th>T1a</th>
<th>T1b</th>
<th>recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC involvement</td>
<td>6</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>PV involvement</td>
<td>1</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>AC+PV involvement</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Only free edge</td>
<td>2</td>
<td>2</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Discussion

The treatments available today for glottic cancer are radiation therapy and surgery. Especially T1 type can be treated with high cure rate if well managed. So, determining the proper treatment is a hard and challenging job to the physician and to the patient, considering the results, voice preservation, side effects, age of patient and the extention of the lesion.

In our experience we have observed variable anatomical distribution of the lesion, such as: some involving the anterior comissure, some that compromise the vocal process, some that involve both anterior comissure and vocal process, T1b lesions and those that extend only on the free edge of one vocal fold. Radiation therapy is the method conceded by most surgeons as the first choice for those various types of T1 glottic cancer. They advocate good voice preservation and efficiency, reserving surgery for treatment of recurrent cases.
The voice sparing surgical techniques are mainly hemilaryngectomy, cordectomy and endoscopic excision. If designated for carefully selected cases, the rate of cure can be compared to radiation. It seems that lesions involving the free edge of one vocal fold or those ones that involve but don't cross the anterior comissure are suitable for cordectomy. Displacement of ventricular fold should be carried out in order to reconstruct a new glottis in such a case.\(^1\) Hemilaryngectomies are indicated for those lesions extending from vocal process to anterior comissure, crossing it but not more than few millimeters.

The main goal of any treatment of carcinomatous lesion is the total destruction of the neoplastic cells. Those cases of more extensive lesions which are impossible for excision with voice sparing surgery have been treated with radiotherapy. However, since the first report by Strong about laser use, even those larger T\(_1\)b lesions involving the anterior comissure or the vocal process have been treated by this method. So, laser came as an alternative to radiotherapy as treatment of T\(_1\) glottic cancer.

Now, more than 15 years after the introduction of laser in laryngeal surgery, the results of its use are not so good as expected. In our experience, anterior comissure involvement seems to be associated to worse results, as well as those cases with extension to the vocal process. In our opinion, those cases of worse results are due to the difficulty in total vaporization of the tumor or incomplete determination of the extension of the lesion. It is not easy, for example, to be sure that the cartilage at the anterior comissure is not involved even biopsy is made just following the laser vaporization. We are aware that in the beginning of our experience we used laser alone to some more extensive T\(_1\) lesions, as those crossing the anterior comissure or extending to the vocal process. But more recently we have tried to associate another therapy, as radiation, in such a case. In this association, however, it is impossible to determine which one plays the main role.

Nowadays, concerned for those disadvantages of the radiotherapy, we try to avoid this method, whenever it is possible. Although the voice sparing is worse with hemilaryngectomy or cordectomy or even laser, we prefer surgical approaches. Especially for patients in fourth or fifth decade of life, we consider that the later side effects as oncogenic changes are an important point to be avoided. In fact, the voice quality is worse with surgical management, but our patients had referred that their voice is useful and enough to life activity. Some authors\(^4,5\) have compared the voice quality between post radiation patients and post laser patients and they have noted only a little difference. So whenever it is possible, radiation should be reserved for aged patients or for those ones that refuse surgical therapy.

Other authors and we have noted that the laser is a good alternative for those cases where the lesion meets the free edge of the vocal cord. Some selected cases of anterior comissure involvement can also be treated by this method. But the most im-
important point of view is that laser is merely an instrument. So it is possible to obtain the same results with conventional surgery as cordectomy, hemilaryngectomy or simple excision of the lesion when those techniques are correctly indicated.

**Conclusion**

1. From those 40 patients included in our study, a total of 3 recurrences were observed. All cases had anterior comissure involvement.

2. Two recurrences (1 T1b and 1 T1a) occurred among those 27 patients treated with laser alone.

3. The other 1 recurrent case was a T1b lesion from those 12 patients treated with laser plus radiation.

From the above, it may be said that laser vaporization is an effective alternative for some selected T1 glottic carcinomas. Anterior comissure or processus vocalis involvement seem to be associated with worse results.

**References**