

## Radiotherapy for T<sub>1</sub> glottic carcinoma: impact of anterior commissure involvement

A. A. MAHESHWAR, F.R.C.S., D.L.O., C. C GAFFNEY, F.R.C.R.\*

### Abstract

The clinical notes of all new patients with T<sub>1</sub> squamous cell carcinoma of the glottis seen in one head and neck cancer unit between 1989 and 1996 were reviewed. Fifty-three patients were treated with radical radiotherapy and of these 42 (79.2 per cent) had no loco-regional recurrence, after a median follow-up of seven years. Eleven (20.8 per cent) developed local recurrence and were treated with salvage surgery. Fourteen of the 53 (26.4 per cent) tumours involved the anterior commissure and eight of these 14 (57.1 per cent) developed recurrence, whereas only three of the 19 (15.8 per cent) tumours arising from the anterior half of the fold but not involving the anterior commissure had recurrence. None of the remaining tumours recurred. This difference is statistically significant ( $p < 0.001$ ). Anterior commissure involvement is a predictor of poor response to radiotherapy. This may be the result of understaging as none of the cases had computed tomography (CT) scans performed. Technical radiotherapy factors may also be important, although in all cases of anterior commissure involvement steps were taken to ensure adequate radiation dose to this region.

**Key words:** Carcinoma; Squamous Cell; Larynx; Glottis; Radiotherapy

### Introduction

Approximately 50 per cent of laryngeal squamous carcinomas are confined to the vocal folds (stage T<sub>1</sub>, glottis). These tumours are often diagnosed early, patients presenting with a hoarse voice. Whilst there is some controversy about the treatment of T<sub>2</sub> lesions of the glottis with different authors recommending either surgery or radiotherapy, the preferred treatment option for T<sub>1</sub> tumours is widely accepted to be radiotherapy. High local control rates of 90 per cent or more have been widely reported with low morbidity.<sup>1,2</sup> In most cases local failure can be effectively treated with salvage surgery.

The purpose of this study was to audit the results of treatment of T<sub>1</sub> squamous carcinoma of the glottis diagnosed in one unit and to assess the possible reasons for treatment failure.

### Materials and methods

Between 1989 and 1996, 58 patients with T<sub>1</sub> glottic carcinomas were diagnosed at the University Hospital of Wales. Five cases were excluded from this review: one refused treatment, three cases were lost to follow-up and one was a case of mucoepidermoid carcinoma. All the remaining 53 cases were histologically confirmed squamous cell carcinomas. Of these, 49 were men and four women. The

age range was 39 to 81 years and the mean was 65 years.

The tumours were staged according to the UICC staging system as being T<sub>1a</sub> if one vocal fold was involved and T<sub>1b</sub> if both the folds were involved. The vocal fold mobility was normal in all cases and there were no nodal metastases. Forty-seven (88.7 per cent) of the cases were T<sub>1a</sub> and two were T<sub>1b</sub> (3.8 per cent). In the other four cases, the exact location of the tumour was not recorded in the case notes.

All 53 cases were treated with primary radiotherapy. Patients were treated with a perspex immobilization shell. A minimum dose of 63 Gy in 30 fractions over six weeks was given using parallel opposed fields. The target volume was centred on the vocal folds and included the thyroid and cricoid cartilages. Wax bolus was added to the anterior aspect of the shell in cases of anterior commissure involvement.

The period of follow-up ranged from four to 10 years, with a medium follow-up of seven years.

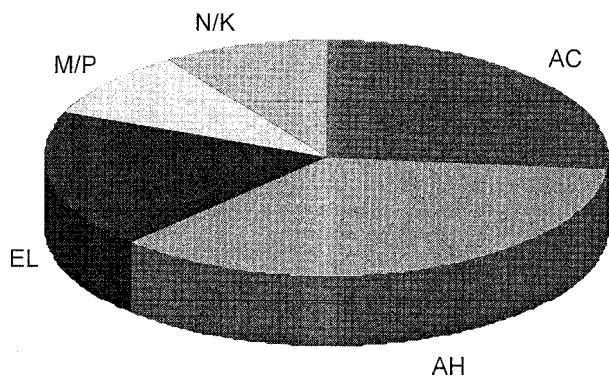
### Results

In 14 out of 53 cases (26.4 per cent) the anterior commissure was involved, and in 19 cases (35.8 per cent) the anterior half of the vocal fold but not the anterior commissure was involved. The entire length

From the Department of Otolaryngology, University Hospital of Wales, Cardiff and the Department of Clinical Oncology\*, Velindre Hospital, Cardiff, UK.

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SITE OF TUMOUR



AC: Anterior Commissure; AH: Anterior Half without involvement of anterior commissure; EL: Entire length without involvement of anterior commissure; M/P: Middle and Posterior thirds; N/K: Not Known

FIG. 1  
Site of tumour.

of the fold without involvement of the anterior commissure was noted in 10 cases and tumour involvement was noted in the middle and posterior aspect of the fold in five cases. In the other five cases, we were unable to determine the site of involvement from the case notes (Figure 1).

Thirty-eight patients are alive, 32 of these being disease-free. The other six patients had recurrence and received further treatment. Fifteen patients have died, of whom, five had recurrence and received further treatment. Six had metachronous carcinomas and four died of unrelated causes (Table I).

Eleven (20.8 per cent) cases had recurrence. The site of recurrence and the treatment instituted is shown in Table II. At the time of writing, 38/53 (71.2 per cent) are disease-free. Of the 32 who are disease-free and alive, four have been followed up for four years and the rest for more than five years, the mean being seven years.

Six (11.3 per cent) patients developed a second metachronous cancer which was unrelated to the primary, including one case of carcinoma of the pinna, three cases of lung carcinoma, one carcinoma of the sacrum and the other case had carcinoma of the lungs and liver.

Eight of the 14 cases (57.14 per cent) which had anterior commissure involvement had loco-regional recurrence. Three of the 19 cases with anterior half of the vocal fold involvement (15.78 per cent) had recurrence. None of the other patients, without anterior commissure or anterior fold involvement,

TABLE I  
DISEASE STATUS

Alive		Dead		
Disease-free	Recurrence	Recurrence	Metachronous	Unrelated
32	6	5	6	4

TABLE II  
SITE AND TREATMENT OF RECURRENCE

Site of recurrence	No of cases	Treatment given
Larynx	6	All 6 had total laryngectomy
Neck	4	2 had radical neck dissection 1 had palliative radiotherapy 1 had no further treatment
Thyroid	1	Thyroidectomy + radiotherapy
Total	11	20.8% had recurrence

had recurrence. Using the Chi squared test, this difference was found to be statistically significant with  $p < 0.001$  (Table III).

Discussion

This study identified 58 cases of T<sub>1</sub> carcinoma of the glottis in seven years. These are the cases diagnosed in one hospital in South Wales and treated by one radiotherapist. This figure compares with various other studies where the number of cases range from 75 to over 150.<sup>3,4</sup>

There is a large variation in the incidence of tumours affecting the anterior commissure. Franchin<sup>5</sup> *et al.*, have quoted an incidence of 5.5 per cent, whereas Burke<sup>3</sup> *et al.*, had 25 per cent. In our study 26.4 per cent of the tumours involved the anterior commissure. This has a significant impact on the overall recurrence rate, since tumours involving the anterior commissure region have a significantly higher failure rate. The recurrence rate after primary radiotherapy for T<sub>1</sub> tumours of the glottis in our study was 20.75 per cent, i.e. the control rate was 79.25 per cent. Other authors, who have also treated T<sub>1</sub> tumour of the glottis with primary radiotherapy only, have reported control rates varying from 82 to 93 per cent (Table IV).<sup>1-4,6-8</sup>

Since our overall control rate does not compare favourably with some of the published results from the western world, and anterior commissure involvement seems to adversely affect outcome, we have examined control rates specifically in tumours involving the anterior commissure. A few of the above named authors have found no difference in the control rates between tumours involving the anterior commissure, compared to those that did not involve it. Pellitteri *et al.*,<sup>6</sup> found cure rate in tumours involving the anterior commissure was 93 per cent and when not involving the anterior commissure was also 93 per cent. Hirota *et al.*,<sup>9</sup> found significant improvement in control rates in tumours not invol-

TABLE III  
RECURRENCE RATE AND SITE OF TUMOUR

Site of tumour	No. of cases	No. recurred	Percentage
Anterior commissure	14	8	57.1
Anterior half	19	3	15.8
Entire length	10	0	-
Middle and posterior	5	0	-
Not known	5	0	-
Total	53	11	20.8

TABLE V  
 LOCO-REGIONAL CONTROL RATES OF T<sub>1</sub> GLOTTIC CARCINOMAS  
 TREATED WITH PRIMARY RADIOTHERAPY

Control rates compared with other reports		
Author	No. of cases	Control rate %
Medini <i>et al.</i> <sup>1</sup>	129 cases	92
Akine <i>et al.</i> <sup>4</sup>	154 cases	89
Klintonberg <i>et al.</i> <sup>2</sup>	129 cases	90
Burke <i>et al.</i> <sup>3</sup>	75 cases	87
Pellitteri <i>et al.</i> <sup>6</sup>	113 cases	93
Reddy <i>et al.</i> <sup>7</sup>	114 cases	82
Rudoltz <i>et al.</i> <sup>8</sup>	91 cases	80
Our report	53 cases	79.25

ving the anterior commissure, approximately 90 per cent when compared with those involving the anterior commissure of 67 per cent (Table V).<sup>4,6-10</sup>

Rucci *et al.*<sup>11,6-10</sup> has performed extensive embryological studies to prove that the anterior commissure region develops from a single mesenchymal band during the seventh to eighth week of intra-uterine life. This region consists of intermediate lamina of thyroid cartilage, Broyles' ligament, insertion of the fibres of the vocal folds and the connective tissue between Broyles' ligament and the conoid ligament.

Kirchner *et al.*<sup>12</sup> has suggested that the possible reason for the higher failure rate in tumours involving the anterior commissure is that this region receives a lower dose during radiotherapy. Hirota *et al.*<sup>9</sup> treated 14 cases with gross anterior commissure tumour with 70–72 Gy and 16 similar cases with 60–62 Gy. Using this higher dose, he found a significant improvement in the cure rates for anterior commissure tumours. We have treated our cases with a standard dose of 63 Gy of radiotherapy. Wax bolus was added to the anterior aspect of the treatment shell to avoid a potential underdose in this region.

With regard to the role of scanning in tumours of the glottis, there are varied reports, some of which support the benefits of scanning. Zbaren *et al.*<sup>13</sup> has suggested that magnetic resonance image (MRI) scanning is more sensitive but less specific than CT scans in diagnosing thyroid cartilage invasion in glottic tumours. He also suggested that MRI overestimates the bulk of tumour and hence these cases tend to be over treated and vice versa with CT scans. However, we have not routinely scanned our new patients with T<sub>1</sub> tumours of the glottis.

With regards to the modality of treatment, our practice differs from a few of the other authors. There are a few reports of surgery being the first

option in the treatment of T<sub>1</sub> tumours of the larynx. Rucci *et al.*<sup>14</sup> practices cordectomy as the first line of treatment. In fact Tambolini *et al.*<sup>15</sup> has commented that 'Most Italian physicians treat T<sub>1</sub> tumours with surgery'. At our hospital radiotherapy in common with most UK practice has always been the first line of treatment for T<sub>1</sub> squamous cell carcinomas of the glottis. Kanonier *et al.*<sup>16</sup> and Franchin *et al.*<sup>6</sup> have both performed conservative laryngeal surgery in cases with post-radiotherapy recurrence with good results. In our study, six cases had laryngeal recurrence, all of these being treated with salvage laryngectomy.

In future we plan to scan those cases which clinically involve the anterior commissure area. Hopefully this may identify if there is more extensive disease, or thyroid cartilage involvement, and help assess the bulk of the tumour. We plan to continue using primary radiotherapy as treatment but to re-audit our results critically in the future with the benefit of this information. We recognize that there are limitations to scanning, especially with regard to thyroid cartilage involvement.

### Conclusion

Radiotherapy is widely accepted as the first line of treatment for T<sub>1</sub> carcinomas of the glottis, although a few authors prefer conservative, voice preservation surgery as the first line of treatment. With either modality it is widely accepted that the control rate for the first line of treatment is in the region of 85 to 90 per cent. This review of T<sub>1</sub> carcinomas of the glottis treated with radiotherapy as first line revealed less satisfactory results. We attribute this to the higher proportion of tumours involving the anterior commissure region in our study. Our results shows a poorer prognosis with a higher loco-regional failure rate for tumours involving the anterior commissure region and confirms the findings of others. One possible reason for this maybe understaging and for this reason we plan to scan all patients with anterior commissure involvement in the future.

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TABLE V  
 SIGNIFICANCE OF ANTERIOR COMMISSURE (AC) INVOLVEMENT IN VARIOUS REPORTS

Author	No. of cases	Tumour control rates		Significance
		AC involved %	Not involved %	
Mittel <i>et al.</i> <sup>10</sup>	147	82	85	–
Pellitteri <i>et al.</i> <sup>6</sup>	113	93	93	–
Rudoltz <i>et al.</i> <sup>8</sup>	91	84	79	–
Hirota <i>et al.</i> <sup>9</sup>	151	58	90	+
Reddy <i>et al.</i> <sup>7</sup>	114	67	88	+
Akine <i>et al.</i> <sup>4</sup>	154	81	91	+
Our report	53	57.1	92.3	+

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Address for correspondence:

Mr A. A. Maheshwar,  
88 Ynysddu,  
Pontyclun,  
Mid Glam CF72 9UB, UK.

Fax: 01633 257191

E-mail: Maheshwar@Compuserve.com

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