

## Interjugular neck dissection and post-operative irradiation for neck control in advanced glottic cancers – are we justified?

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### Abstract

At the Kidwai Memorial Institute of Oncology, advanced laryngeal cancers are subjected routinely to primary surgery and/or post-operative radiotherapy (RT). The surgery consists of wide field laryngectomy which entails total laryngectomy, ipsilateral/bilateral thyroid lobectomy, bilateral paratracheal clearance, and bilateral clearance of levels 2, 3 and 4 lymphatics. Post-operative RT is indicated in event of the following histopathological (HPE) situations to consolidate local-regional control: (1) T<sub>4</sub> primary; (2) significant subglottic extension; and (3) jugular/paratracheal metastatic deposits. This prospective study highlights the therapeutic efficacy of this protocol at our centre in 45 consecutive T<sub>4</sub>/T<sub>3</sub> glottic cancers and specifically evaluates the role of interjugular dissection and/or post-operative RT in prevention of regional recurrence. Fifty-two per cent of primary lesions needed a post-surgical upstaging as against 14 per cent of the neck lesions. Accordingly 91 per cent of the cases (41/45) qualified for post-operative RT and 82 per cent (37/41) complied with the prescribed schedule. Recurrent disease in the lateral neck was noted in 2/37 who received the prescribed schedule and 1/4 non-compliant cases; while a recurrent central neck disease was noted in 1/37 and 1/4 of these cases respectively. All cases were followed-up for a period of two years and 66 per cent of the evaluable cases for a period of five years. This study confirms conclusively that our treatment schedule yields extremely gratifying two-year local-regional control rates of 89 per cent which translates into a two and five-year actuarial survival rate of 92 and 70 per cent respectively.

**Key words:** Laryngeal neoplasms; Neck dissection; Radiotherapy

### Introduction

Head and neck surgeons have now realized that the key to successful disease control in advanced laryngeal cancers lies in aggressive treatment directed to the central neck (Harris and Butler, 1968; Harrison, 1975; De Santo, 1984). Analysis of a large number of laryngeal cancers (Stages I–IV) subjected to functional neck dissection (levels 1–5) revealed a 20 per cent occult metastatic rate exclusively in the 197 supraglottic cancers and none amongst the 33 glottic cancers (Gavilan and Gavilan, 1989) without elucidating the patterns of metastasis amongst the different nodal groups. This aspect was addressed by Candela *et al.* (1990) and Byers *et al.* (1988) who advocate a bilateral clearance of levels 2–4 in laryngeal cancers with N<sub>0</sub> and N<sub>1</sub> necks and clearance of levels 1 and 5 in cases where frozen section examination of these nodes reveal metastatic deposits and/or there is obvious intraoperative evidence of extra-laryngeal spread. Byers *et al.* (1988) found no statistically significant difference in pathologically N<sub>0</sub> and N<sub>1</sub> necks which were subjected to bilateral anterior jugular dissection with and without adjuvant RT. Yuen *et al.* (1984) advocated a combined modality treatment in the form of wide field laryngectomy and

post-operative RT in all laryngeal cancers with positive nodal disease on HPE in the face of vastly improved local control rates at their centre.

This prospective study carried out over a five-year period (1985–1989) at the Kidwai Memorial Institute of Oncology, specifically addresses the following issues in 45 cases of T<sub>3</sub>/T<sub>4</sub> glottic cancers subjected to primary surgery and/or post-operative RT: (a) nodal patterns of metastasis; (b) regional control after interjugular dissection and post-operative RT; (c) patterns of regional failures; and (d) survival rates at three and five years – whether there is an attribution due to recurrent neck disease or not.

### Methods and materials

Forty-five T<sub>3</sub>/T<sub>4</sub> glottic tumours studied over a five-year period (1985–1989) were subjected to primary surgery in the form of wide field laryngectomy as described by Jackson and Babcock (1931). This entailed the resection of the total larynx with its adnexa, unilateral/bilateral thyroid lobectomy, bilateral anterior jugular dissection (levels 2–4) and bilateral paratracheal dissection; a classic radical neck dissection (RND) was performed on nodes >3 cm

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Accepted for publication: 10 July 1993.

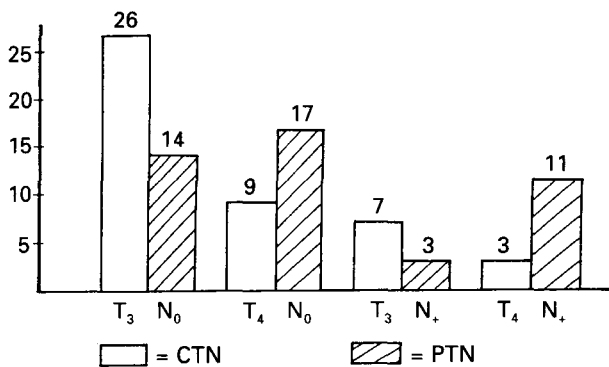


FIG. 1

Distribution of T<sub>3</sub>T<sub>4</sub> glottic cancers by stage (n = 45)

(N<sub>2</sub>/N<sub>3</sub>). In this study only 5/90 necks at risk received a classic RND while the rest underwent an interjugular clearance at levels 2, 3 and 4 lymphatics in addition to bilateral paratracheal dissection. Suspicious nodal disease at surgery was subjected to a frozen section control so as to facilitate an oncologically satisfactory clearance. Confirmation of metastatic disease alerted the surgeon to a more meticulous oncosurgical clearance of nodal levels at risk i.e. levels 2-4 and paratracheal lymphatics and if necessary to convert to a comprehensive nodal dissection of levels 1 and 5 as well.

Lesions with the following HPE were offered post-operative RT: (i) T<sub>4</sub> lesions showing infiltration of soft tissues of the neck; (ii) lesions with significant subglottic extension; (iii) positive metastatic deposits in jugular and/or paratracheal lymphatics.

Post-operative RT was commenced within four to six weeks of surgery on a Telecobalt unit. The dose schedule consisted of 50-55 Gy given over a five to six weeks period at the rate of 180-200 cGy per fraction. The tracheostoma received an additional boost of 500-800 cGy in tumours with significant subglottic extension and or positive paratracheal metastasis. The technique consisted of a parallel opposed AP/PA open fields with 4:1 loading extending from mastoid tip to root of neck. Spinal cord protection with a lead shield was instituted after 42 Gy. Superior mediastinal and parastomal irradiation boosts was achieved utilizing the mini-mantle technique of Wang (1974).

Post-operative RT was offered to 41 cases based on their unfavourable HPE, and 37 completed the proffered schedule. All cases were available for a two year follow-up while 66 per cent were followed-up for five years or more. Survival was studied using the life-table method.

**Results**

Figure 1 reveals the post-surgical stage based on HPE. Figure 2 shows the correlation between the clinical and

| Stage | Primary | Neck |
|-------|---------|------|
| ▲     | 52%     | 14%  |
| ▬     | 40%     | 76%  |
| ▼     | 8%      | 10%  |

FIG. 2

Post surgical staging T<sub>3</sub>T<sub>4</sub> glottic cancers (n = 45)

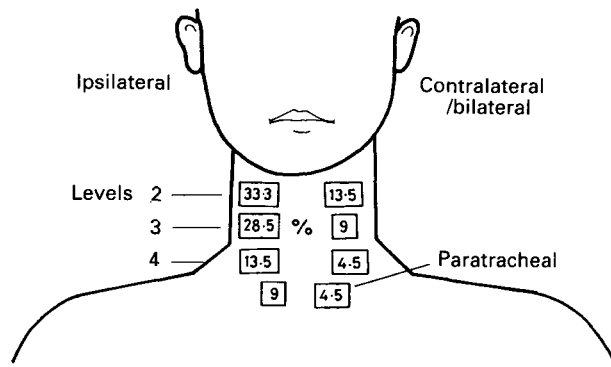


FIG. 3

Patterns of nodal deposits in 22 necks with positive HPE.

post-surgical stage. Figure 3 indicates the patterns of nodal deposits encountered in 22 nodes with positive metastasis. Post-operative RT was indicated in 41/45 cases as per the schedule at our centre (Table I). However 37/41 complied with the prescribed post-operative RT.

Local-regional failures were observed in 3/37 (Table II) of those that received the combined schedule and these were detected in the ipsilateral neck in one (12 months), contralateral in the other (10 months), while the last manifested with a recurrent disease in the soft tissues of the central neck (18 months).

Analysis of HPE revealed a post-surgical stage of T<sub>4</sub>N<sub>0</sub>M<sub>0</sub> in all the recurrences mentioned in this paper. Amongst the four non-compliant cases who did not receive post-operative RT prescribed for unfavourable HPE, two developed local-regional failures, i.e. one stomal recurrence at two months (a pT<sub>4</sub>N<sub>1</sub> lesion) and a recurrent lateral neck nodal metastasis at six months (a pT<sub>3</sub>N<sub>2</sub>c lesion). Death attributable to local-regional recurrences was seen in 3/5 cases; while 2 metachronous necks were amenable to a salvage RND. By contrast, amongst the four cases in which post-operative RT was withheld because of favourable HPE, none recurred local-regionally.

Besides these five local-regional failures, three manifested with failures at distant sites only at intervals of two, four and five years after treatment. All cases were followed-up for a period of two years and 66 per cent were observed for a period of five years or more. At two years the local-regional control rate was 89 per cent. The three and five year actuarial survival rates by the life table method were 92 and 70 per cent respectively.

**Discussion**

Neck metastasis in T<sub>4</sub>/T<sub>3</sub> glottic cancers are clinically evident in 15-20 per cent of the cases and occult metastatic diseases have been encountered in 15 per cent sub-

TABLE I  
POST-OPERATIVE RADIOTHERAPY AND CONTROL RATES

| Post-operative RT        | Total number of patients (n = 45) | Local-regional failure | Control |
|--------------------------|-----------------------------------|------------------------|---------|
| Received                 | 37                                | 3*                     | 92%     |
| Not indicated            | 4                                 | Nil                    | 100%    |
| Indicated - not received | 4                                 | 2                      | 50%     |

\*Two subsequently salvaged.

TABLE II  
PATTERNS OF LOCAL-REGIONAL FAILURE

| Stage                          | Prior to tracheostomy | Post-operative radiotherapy | Time      | Recurrence | Site               | Status   |
|--------------------------------|-----------------------|-----------------------------|-----------|------------|--------------------|----------|
| T <sub>4</sub> N <sub>0</sub>  | -                     | +                           | 10 months |            | Contralateral neck | Salvaged |
| T <sub>4</sub> N <sub>1</sub>  | +                     | -                           | 2 months  |            | Stomal             | Dead     |
| T <sub>4</sub> N <sub>0</sub>  | -                     | +                           | 18 months |            | Central neck       | Dead     |
| T <sub>3</sub> N <sub>2c</sub> | +                     | Incomplete                  | 6 months  |            | Lateral neck       | Dead     |
| T <sub>4</sub> N <sub>0</sub>  | -                     | +                           | 12 months |            | Lateral neck       | Salvaged |

jected to an elective bilateral anterior neck dissection (Byers *et al.*, 1988). Data from two major cancer centres in the world (Byers *et al.*, 1988 – the M.D. Anderson Hospital; Candela *et al.* 1990 – M.S.K. Cancer Centre) indicate the preferential metastasis in advanced laryngeal cancers to levels 2–4 jugular nodes as well as the paratracheal lymphatics. This correlates well with the nodal patterns of metastatic disease encountered in this study (Figure 3). Important to observe here is the predilection for spread to bilateral levels 2 and 3 and the paratracheal lymphatics. A glance at the patterns of nodal recurrences indicate (Tables II and III) that while two neck recurrences occurred at level 2 (one in the ipsilateral and the other in the contralateral neck – both pT<sub>4</sub>N<sub>0</sub> lesions) the last was detected at level 4 and paratracheal lymphatics (a pT<sub>3</sub>N<sub>2c</sub> lesion). Candela *et al.* (1990) have advocated a comprehensive clearance of nodal levels 1–5 in lesions that reveal an extralaryngeal spread i.e. a T<sub>4</sub> tumour.

Experiences from this study indicate the efficacy of post-operative RT in controlling 14/17 T<sub>4</sub>N<sub>0</sub> lesions (Table 3). The two that recurred in the lateral neck were fortunately amenable to surgical salvage by a RND. RT portals employed by our radiation oncologists span from the mastoid tip to the clavicle and necessarily include the tumour bed as well as the draining lymphatics (levels 1–5). Our results therefore do not overwhelmingly support the execution of a comprehensive neck dissection in the face of a T<sub>4</sub> primary as both recurrences were essentially *in-field* at levels 2 and 4 which might have been inadvertently missed by the surgeon or overlooked by the pathologist due to a sampling error. More importantly it becomes evident that primary surgery in the form of wide field laryngectomy and post-operative RT has succeeded in controlling 12/14 necks with metastatic deposits (Table III); one died secondary to an *in-field* level 2 recurrent neck disease that occurred in a neck staged post-surgically as N<sub>2c</sub>, while the other (a pN<sub>1</sub> neck) succumbed to recurrent disease in the soft tissues of the central neck. Fortunately 2/3 recurrent neck diseases that occurred in necks post-surgically staged as N<sub>0</sub> (presumably a geographical 'miss', an erroneous HPE or a biological failure attributable to tumour resistance) were amenable to a disease control by a salvage RND while the third succumbed to a central neck recurrence.

TABLE III  
LOCAL-REGIONAL CONTROL BY STAGE (n = 45)

| pTNM           | PERCENTAGE CONTROL (NO. CONTROLLED/TOTAL NO.) |                |             |
|----------------|---|----------------|-------------|
|                | N <sub>0</sub>                                | N <sub>+</sub> |             |
| T <sub>3</sub> | 100% (14/14)                                  | 67% (2/3)      | 94% (16/17) |
| T <sub>4</sub> | 82% (14/17)                                   | 91% (10/11)    | 86% (24/28) |
|                | 90% (28/31)                                   | 86% (12/14)    |             |

N<sub>0</sub>: MICROSCOPICALLY NEGATIVE NODES; N<sub>+</sub>: MICROSCOPICALLY POSITIVE NODES.

In the final tally 3/5 local-regional recurrences (only one lateral neck metastasis) died due to their disease. Two out of these had unfavourable HPE, for which post-operative RT was advised but not complied with by the cases. Ultimately, the combined schedule failed in only 1/37 with unfavourable HPE. By contrast none of the four cases with favourable HPE who received only surgery and from whom post-operative RT was withheld recurred. These results make a strong case for the need to identify lesions by meticulous HPE that may merit a combined schedule of primary surgery and post-operative RT and ensure this protocol to obtain gratifying local-regional control rates and improved survival. Yuen *et al.* (1984) have demonstrated a significant advantage in instituting timely post-operative RT for lesions with unfavourable HPE. This correlates well with an earlier report from this centre (Deo *et al.*, in press).

## Conclusions

In this report we have specifically addressed the issue of neck control in T<sub>3</sub>/T<sub>4</sub> laryngeal lesions and conclude:

- Laryngeal cancers metastasize preferentially to jugular nodes levels 2–4 and to paratracheal lymphatics.
- Bilateral anterior jugular dissection (levels 2–4) and paratracheal lymphatics clearance reliably help identify levels of nodal deposits.
- Post-operative RT in unfavourable HPE (both for primary and neck lesions) consolidates local-regional control rates and therefore can maximize neck control even in the face of nodal metastasis encountered in limited lymphadenectomy specimens in clinically N<sub>0</sub>/N<sub>1</sub> necks.
- The role of comprehensive neck clearance (RND/modified RND) in advanced laryngeal lesions may be relegated only to a clinically N<sub>2</sub>/N<sub>3</sub> neck.

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