

REVIEW ARTICLE

PAROTID SPARING IRRADIATION FOR THE HEAD AND NECK
CANCERS

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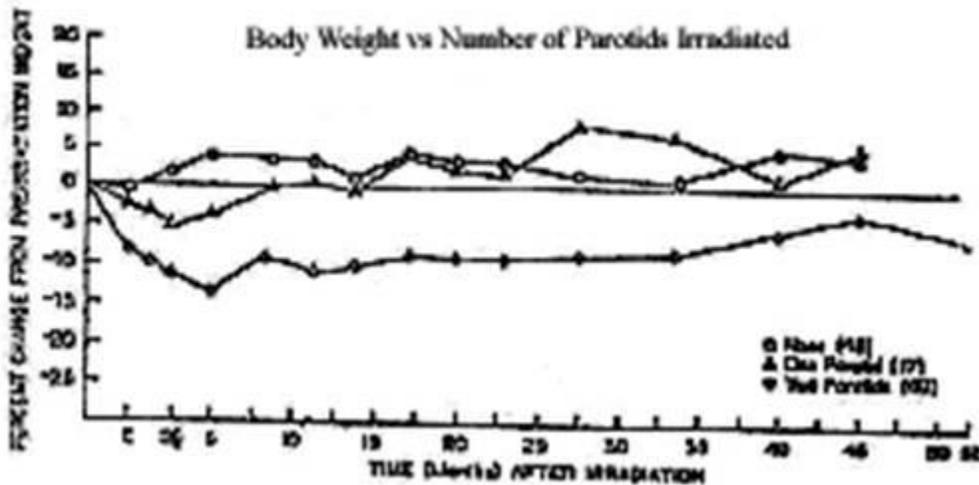
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INTRODUCTION

Parotid sparing is usually accomplished by irradiating the ipsilateral side of the neck while avoiding the opposite parotid. Tumor site, size, pathology and risk of lymphatic metastases dictate the specific anatomy and the amount of tissue that must be irradiated. It has been shown that approximately two third of the patients receiving radical radiation therapy for head and neck cancer experience weight loss¹.

The amount of weight loss is maximal at three months after irradiation and recovers slowly thereafter. Weight loss during and immediately after treatment is due to acute mucosal reaction, whereas at three to six months later it is due to xerostomia and its sequelae. The greatest weight loss is experienced by patients whose parotid glands are irradiated during the course of treatment for cancers of the oral cavity and oropharynx. Parotid gland function can be spared with three dimensional treatment planning with unilateral head and neck cancers².

Retrospective analysis of 114 irradiated head and neck cancer patients showed that weight correlated with parotid function^{3,4}. When both parotids were irradiated body weight fell to a nadir of minus 14 %, then gradually rose over the ensuing four years but never fully recovered. When one parotid was irradiated and the opposite was avoided, weight fell to a nadir of minus 4 % of the initial weight, fully recovered with in one year and paralleled the weigh of the controls whose parotids were not irradiated (Figure 1).



It was concluded that body weight depends on parotid function and can be maintained at normal levels as long as one parotid remains intact.

RATIONALE

There are certain cancers of the head and neck where small size, lateralization and diminished risk of contralateral metastases make it possible to localize the irradiation in such a way that the opposite parotid is spared. Consider the incidence of contralateral lymphatic metastases at presentation for lateralized cancers of the oral tongue, retromolar trigone, anterior tonsillar pillar, floor of mouth and tonsillar fossa as shown in Table 1, and for laryngo-pharynx Table 2.

Table-1: (Ref-12)- Incidence of contralateral lymphatic metastases at presentation as a function of site

Site	No of patients	%
Nasopharynx	82/169	48.5
Base of Tongue	53/85	28.6
Pharyngeal wall	25/149	16.7
Soft Palate	13/80	16.2
Supraglottic Larynx	43/267	16.1
Tonsillar Fossa	16/140	11.4
Hypopharynx	28/267	10.4
Oral Tongue	16/302	5.3
Retromolar Trigone Area	11/227	4.8
Floor of Mouth	11/258	4.3

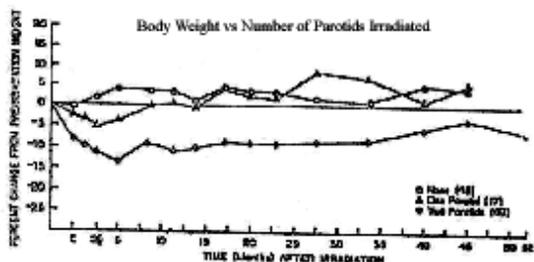
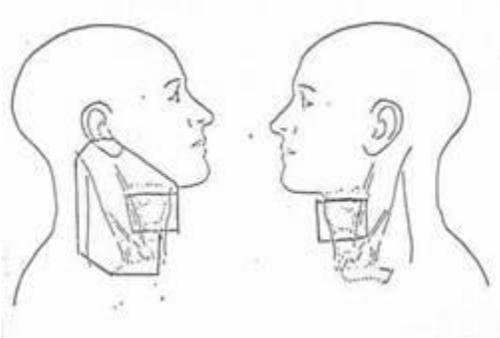


Table-2: (Ref 13)- Incidence of contralateral lymphatic metastases as a function of origin for cancers of the larynx and pharynx.

Origin	Min. F/Up	Contralateral L.N/Total	%
Glassoepiglottis	24 months	17/35	49
Marginal Supraglottis	24 months	4/31	13
Central Supraglottis	48 months	3/29	10
Pyriform Sinus	30 months	4/49	8
Transglottic fixed	24 months	2/34	6
Transglottic mobile	24 months	0/11	0

Cancers of the valleculae, base of tongue and epiglottis are midline and obviously have an increased incidence of bilateral lymph nodes while those originating in the pyriform sinus, marginal and central supraglottis have a low incidence of spread to the opposite side of the neck^{5,6} Table 2.



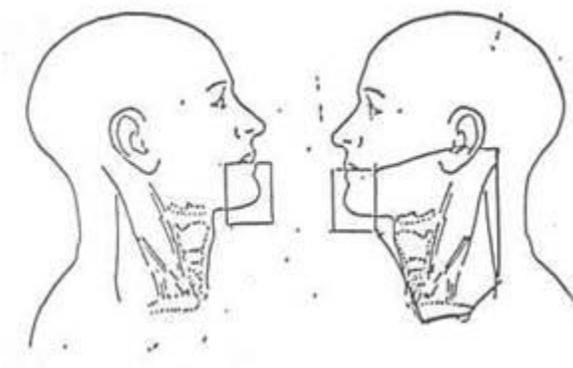
Thus there are certain cancers of the head and neck whose incidence of contralateral neck metastases is low enough that parotid sparing is appropriate.

Dr. O’ Sullivan at Princess Margaret Hospital studied 86 tonsil and 26 oral cavity cancer patients with (T1-4, N0-N1) cancers treated with homo-lateral parotid sparing radiation techniques⁶. He found out that failures in the un-irradiated contralateral neck were unusual after minimum follow-up of 5 years Table 3.

Table 3 (Ref 13)- Lymphatic metastases to the un-irradiated contralateral side of the neck.

I/L Neck	C/L neck Failure /Total	%
N0	1/18	1
N+	2/34	6

Sparing of the parotid glands translates into objective and subjective improvement of both xerostomia and quality of life in patients with head and neck cancers receiving radiation therapy^{7,8}.



This suggests that patients with appropriately selected lateralized lesions of the oral cavity and tonsil can be irradiated with homo-lateral parotid sparing techniques without compromising overall control of the tumor.

TECHNIQUES

The techniques of irradiation used to spare anatomy and function are basically three:-

I. Limitation of Field Size for very small cancers with diminished risk of lymphatic spread, e.g., cancers of the true vocal cord.

II. Unilateral Wedge Pair or Electron Beam Techniques for small lateralized cancers with diminished risk of contralateral neck metastases, e.g., small cancers of the anterior tonsillar pillar.

III. The Use of Oblique Beams and three dimensional conformal treatment planning to cover the primary tumor and first echelon of lymphatics with sparing of the opposite parotid, e.g., cancers of the postero-lateral margin of the oral tongue.

1. LIMITED FIELD SIZE

One of the ways of saving salivary functions is to avoid major salivary glands by using small fields. For example, small opposed fields are used to irradiate patients with cancers of the true vocal cord, supra-glottic larynx, hard palate and anterior oral tongue and floor of mouth. A single parotid can be saved by using parallel opposed photon fields limited to the larynx and electron beam for the ipsilateral neck when treating small lateralized cancers of the trans-glottic or supra-glottic larynx (Figure 2).



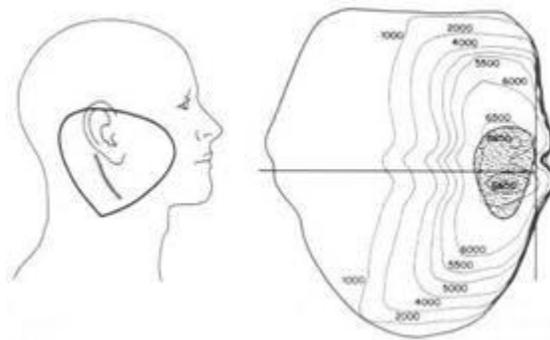
Similarly, parallel opposed photon fields in front-of the parotids along with electron beam irradiation of the ipsilateral neck can be used to save the opposite parotid of patients with small cancers in the anterior part of the oral cavity (Figure 3).

Figure-3: Parallel opposed photon fields for small cancers in the anterior part of the oral cavity with ipsilateral electron fields to spare the opposite parotid Ref. ⁹

II. UNILATERAL TECHNIQUES

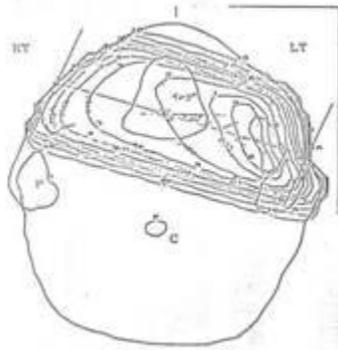
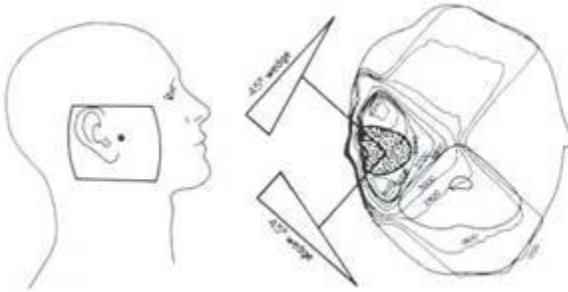
Wedge pair or electron beam techniques of irradiation can be used to irradiate patients with cancers of the skin, parotid, external ear (Figure 4,5)⁹ and buccal mucosa, tonsil and anterior tonsillar pillar. It is important to select patients with small lesions or surface lesions whose risk of contralateral neck metastases is small. Altogether small lateralized cancers of the oral cavity and faucial arch seldom exhibit lymphatic spread to opposite side of the neck. Thus unilateral parotid sparing techniques are rational and do much to preserve salivary function.

Figure 4: Uni-lateral wedge arrangement for parotid treatment and isodose distribution using wedged pair⁹



III. OBLIQUE BEAMS AND 3-DIMENSIONAL TREATMENT PLANNING

Oblique beams may be used to irradiate more posteriorly located cancer of the oral cavity not amenable to the small field of irradiation anterior to the parotid glands. The oblique beams include the ipsilateral parotid and the entire oral tongue but exclude the opposite parotid (Figure 6).



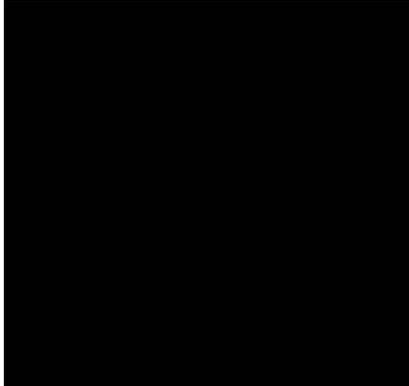
SUMMARY

Several authors have shown that xerostomia restricts nutritional intake and limits the ability of patients to maintain normal weight^{1,3}. When both parotids are irradiated, patients never fully regain their normal weight, however if one parotid is irradiated the patients are able to fully recover their weight within the year. There are certain sites in the head and neck where small and lateralized cancers with diminished risk of contralateral neck metastases can be treated with parotid sparing techniques, i.e., oral cavity, retromolar trigone, anterior tonsillar pillar, tonsillar fossa, and true vocal cord. In these sites it is appropriate to spare the opposite parotid and closely observe the un-irradiated neck.

Based on Dr. O' Sullivan's long term follow up of patients with cancers of the oral cavity and tonsil, we are encouraged that patients can be irradiated with homo-lateral parotid techniques without jeopardizing loco-regional control⁶. Hazuka et al and Maesa et al suggested that three dimensional treatment planning may allow the use of parotid sparing techniques in patients who otherwise would not have been considered candidates using conventional radiotherapy techniques^{10,11}.

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