



The role of ^{125}I interstitial brachytherapy for inoperable parotid gland carcinoma

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ABSTRACT

PURPOSE: The treatment of inoperable parotid gland carcinoma is challenging and controversial. The purpose of this paper was to present our experience in treating this malignancy using ^{125}I interstitial brachytherapy.

METHODS AND MATERIALS: Thirteen patients with advanced carcinomas of the parotid gland were included and treated with ^{125}I interstitial brachytherapy in Peking University School and Hospital of Stomatology from January 2003 to December 2015. All patients were treated with ^{125}I interstitial brachytherapy as a sole modality for the primary tumor. Furthermore, all of them were treated with neck dissection with/without adjunctive external beam radiotherapy for the neck, simultaneously. The prescription dose of interstitial brachytherapy was 140–160 Gy.

RESULTS: Median followup was 56 months (range: 8–105 months). The 2-year and 5-year local control rates were 91.7% and 58.2%, respectively. The 2-year and 5-year overall survival rates were 100% and 61%, respectively. No cervical lymph node metastasis was observed during the followup. No interstitial brachytherapy-related severe complications occurred. Facial nerve function was preserved well.

CONCLUSIONS: ^{125}I interstitial brachytherapy is a feasible and effective treatment for inoperable parotid gland carcinomas without severe complications. And neck dissection with/without external beam radiotherapy is necessary for patients with cervical metastasis or at high risk of cervical metastasis. © 2017 American Brachytherapy Society. Published by Elsevier Inc. All rights reserved.

Keywords:

Brachytherapy; Parotid gland; Carcinoma; Neck dissection; Inoperable

Introduction

Parotid gland carcinoma is relatively rare and represents about 3–6% of head and neck malignancies (1, 2). Surgery is the mainstay treatment for parotid gland carcinoma (2). Radiotherapy is commonly recommended as an adjunctive therapy for patients at high risk of local recurrence (3, 4).

Although external beam radiotherapy, neutron radiation, and chemotherapy have been reported as a usage for parotid gland carcinoma, optimal modalities for inoperable carcinomas of parotid gland (medically or surgically inoperable) have not yet been fully realized. Radiotherapy with dose equivalent to at least 66 Gy in 33 fractions for the primary tumor and involved nodes is recommended for patients with inoperable carcinomas of parotid gland (1, 5). Nevertheless, the clinical results are not satisfactory. For patients treated with radiotherapy alone, the locoregional control at 5 years was 4–50% (1, 5, 6). As for patients with high level of T classification or histologic grade, the prognosis was even worse.

As an alternative, ^{125}I interstitial brachytherapy had the advantage of being highly conformal, which resulted in a high local control (LC) in salivary gland carcinomas (7). In this study, ^{125}I interstitial brachytherapy for inoperable parotid carcinomas was reported. Furthermore, neck dissection with/without external beam radiotherapy for the neck was performed for these cases at high risk of cervical metastasis.

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Methods and materials

Patients' characteristics

In this study, 13 patients with advanced carcinomas of the parotid gland were treated with ^{125}I interstitial brachytherapy in our hospital from January 2003 to December 2015. Eight of these patients were female and five were male, ranging from 8 to 82 years old (median, 54 years) by the time of diagnosis.

Fine needle aspiration biopsy and/or incisional biopsy were performed for histologic diagnosis. The histologic types of the 13 patients were shown as follows: mucoepithelioid carcinoma (2/13, one intermediate grade, one high grade), oncocytic carcinoma (2/13), adenoid cystic carcinoma (2/13), epithelial-myoepithelial carcinoma (2/13), myoepithelial carcinoma (2/13), acinic cell carcinoma (1/13), salivary duct carcinoma (1/13), and adenocarcinoma not otherwise specified (1/13). According to the staging criteria of the Union for International Cancer Control seventh edition, the patients were staged. Distant metastasis at the very onset was observed in 2 patients with myoepithelial carcinoma and adenoid cystic carcinoma, respectively. Clinically positive cervical nodes were observed in 4 patients. The baseline characteristics of all patients were shown in Table 1.

Treatment strategy

The inclusion criteria of patients with locally advanced parotid gland carcinomas were as follows: tumors were inoperable; patients refused surgery which may result in facial palsy; and patients suffered from other diseases as surgery contraindication. All patients were treated with

^{125}I interstitial brachytherapy as a sole modality for the primary tumor in the parotid gland region. Furthermore, all of them were treated with neck dissection simultaneously.

The incision was designed as a large arc to keep away from the radiation target area, which may reduce the influence of radiation on the incision healing, especially for those patients who were treated with interstitial brachytherapy in the parotid region and external beam radiotherapy in the neck.

Seven patients with cervical metastasis in the pathologic examination were received external beam radiotherapy for the neck area.

Interstitial brachytherapy in the parotid gland region

The brachytherapy treatment planning system (Beijing Atom and High Technique Industries Inc., Beijing, China) was used to create preplans based on patients' CT images. The planning target volume was outlined to cover the tumor with a 0.5-cm margin. The planned dose (or matched peripheral dose) of the ^{125}I interstitial brachytherapy was 140–160 Gy, and the planned dose was 130 Gy for patients who received radiotherapy before. ^{125}I implantation was performed with individual template and/or CT guidance according to the preplan. The individual template made through rapid prototyping technique contained all the information of preplan including needle pathway and face features simultaneously. Hollow interstitial needles were inserted into the target area from different directions to avoid bone, major blood vessels, and vital organs, and ^{125}I radioactive seeds were implanted permanently with individual template and/or CT guidance. Quality verification was performed for all patients. The activity of ^{125}I (model 6711, China Institute of Atomic Energy; half-life 59.4 days) was ranging from 18.5 to 33.3 MBq per seed. The actuarial D_{90} (the dose delivered to 90% of the target volume) was 144.5–192.6 Gy (median 153.6 Gy). The V_{100} (the percentage of the target volume receiving at least 100% of the prescription dose) of each patient was more than 95%, and the V_{150} (the percentage of the target volume receiving at least 150% of the prescription dose) for all cases was less than 50%. The procedure of ^{125}I interstitial brachytherapy was described in detail in Fig. 1.

Seven patients with positive lymph nodes in the pathologic examination received adjunctive external beam radiotherapy for the neck area after neck dissection. The target area was away from the parotid tumor area treated with brachytherapy, which could avoid severe toxicities. The dose of external beam radiotherapy was 56–66 Gy (conventional fractionation; 2 Gy/d).

The patient with myoepithelial carcinoma observed lung distant metastases at the very onset received radiation to the lung lesion. The patient with multiple lung metastases of adenoid cystic carcinoma did not received any treatment to the lung lesions.

Table 1
Characteristics of patients

Age (y): mean (range)	53 (8–82)
Gender (no. of patients)	
Male	5
Female	8
Tumor site (no. of patients)	
Skull base involved	4
Skull base not involved	9
Facial nerve function	
Facial nerve palsy	2
Facial nerve without palsy	11
Tumor size (no. of patients)	
≤6 cm	8
>6 cm	5
With distant metastasis at the very onset (no. of patients)	2
Primary tumor (no. of patients)	11
Recurrence tumor (no. of patients)	2
Prior treatment of recurrence tumors (no. of patients)	
Surgery	1
Surgery and radiotherapy	1
Grade (no. of patients)	
Low grade	4
High grade	9

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