Short- to Mid-Term Evaluation of CT-Guided 125I Brachytherapy on metastatic Head and Neck

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Authors: H. Xin-wei, J. De-chao, W. Gang; Zhengzhou/CN
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Purpose

to evaluate the feasibility and the short- and medium-term clinical effects of 125I implantation in recurrent or metastatic Head and Neck cancer.
Methods and Materials

Characteristics of patients

From January 2008 to May 2011, 35 patients (23 males and 12 females, the age ranges from 39 to 71, median 56 years) with recurrent or metastatic head and neck cancer after operation#radiotherapy or chemotherapy et al, were enrolled in this study.

Of all patients, primary cancer local recurrence in 15 cases, local regional lymph invasion or transfer in 20 cases. The procedures were performed under local anesthesia and the \( ^{125} \)I seeds were implanted under the guidance of CT. The total lesions were 42 and the max diameter of each lesion ranges from 2cm to 9cm, median 4.2cm.

Pre-planning

Before the procedure, based on plain CT-scan images (Picker CT-Twin Flash CT scanner, Elscint, Haifa, Israel) of each individual tumor, we made a treatment plan for each patient using a computerized treatment planning system (TPS) (BT-RSI model TPS, YuanBo, Beijing, China). A careful delineation of the tumor target volume was performed in every CT slice (slice thickness, 5 mm). Based on these three perpendicular diameters within the target tumor and a prescribed matched peripheral dose (MPD) of 90 to 160 Gy, TPS generated a dose-volume histogram (DVH), isodose curves of different percentages, and calculated the position (coordinates) of brachytherapy applicator, dose and number of implanted seeds.

CT-guided 125I brachytherapy

The patients were fasted for 2 hours and given sedatives and local anesthesia before the procedure. Following the planned positions, a 3-mm incision was made on the skin, and a brachytherapy applicator was inserted into the tumor under the guidance of CT at a distance of 0.5 to 1.0 cm from each other. Precautions were taken to avoid puncture of large blood vessels or important organs such as intestine, bile ducts, etc. For tumors with a thickness of no more than 1.0 cm, the interstitial planar (surface) implants were used. 125I seeds with an activity of 0.8 mCi were implanted into the tumor and these seeds had anti-tumor activity within a distance of 1.7 cm. After the procedure, the catheters were retracted and incision bound and compressed. Antibiotics and hemostatics were routinely given for three days post-procedure. On post-procedure day 1, a routine chest X-ray was performed to evaluate the lung and heart functions. Within one month, a CT scan was performed to verify the position and intensity of 125I seeds according to TPS. For tumors showing insufficient radioactivity, more 125I seeds were implanted.

Follow-up
From month 2 and every 2 to 3 months post-procedure, follow-up was complemented by spiral CT or Positron Emission Tomography-CT (PET-CT) examination.

**Evaluation criteria**

According to World Health Organization (WHO) response evaluation criteria for solid tumor, we compared the products (P) of two largest and perpendicular diameters within the tumor under CT examination before and after the procedure. The efficacy of 125I brachytherapy was classified as follows. 1) Complete response (CR) was defined as complete disappearance of tumor, no tumor or only accumulative metal granule shadow detectable by imaging analysis. 2) Partial response (PR) was defined as the shrinkage of tumor with the P value decreasing by $\geq 50\%$ compared to the pre-procedure value. 3) No change (NC) was defined as a P-value decrease of $< 50\%$ or increase of $< 25\%$ compared to the pre-procedure value. 4) Progression of disease (PD) was defined as a P-value increase of $\geq 25\%$ or the appearance of new tumor foci. Local control rate (LCR) was calculated as $(\text{CR} + \text{PR})/ \text{total No. of cases} \times 100\%$.
Results

After 40 months follow-up (median 13 months), 24/42 obtained CR, 11/42 obtained PR, 5/42 NC and 2/42 PD in 4 months, the clinical response rate was 83.3% CR+PR; and overall 1- and 2- and 3- year survival rate were 88.4%, 72.4% and 45.2%, respectively, the median survival time was 31 months (fig.1)

Fig. 1: overall survival analysis of 35 cases of head and neck cancer patients relapse and metastasis, and 7 patients were killed during followup

References: - Zhengzhou/CN

The rate of pain relief was 17/23 73.4%; Complications in the long term were 4 hyperpigmentation at operative sites, 3 insensible feeling on lateral cheeks, 2 oral arescent, 1 headache combined infection, No other severe complications such as hemorrhhoa ,acute pulmonary embolism , local abscess, sinus tract, leakage of cerebrospinal fluid were encountered in all patients(fig.2-4).
**Fig. 4:** CT scans of a patient with recurrence tumor of nasopharyngeal carcinoma (a), and 4 months after treatment, most of the tumor had been eliminated (c)  

*References:* - Zhengzhou/CN
Fig. 2: PET-CT scans of patient with local lymph node metastasis nasopharyngeal carcinoma(a) and 4 months after treatment, most of the tumor had been eliminated (b)

References: - Zhengzhou/CN
Fig. 3: CT scans of a patient with recurrence tumor of palpebral ministry malignant tumor(a,b,c), and 4 months after treatment, most of the tumor had been eliminated (d,e,f)

References: - Zhengzhou/CN
Conclusion

CT guided radioactive seed $^{125}$I implantation procedure can be a simple, safe and effective method in treating recurrent or metastatic Head and Neck cancer, which can ease the pain of patients and improve the qualities of patients' lives and obtain good clinical effects with minimal damage and few complications.
References


