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ORIGINAL ARTICLE

Local control of glomus tumors of the head & neck by radiation therapy and surgery

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Summary

Purpose: *Glomus tumors are rare tumors, highly vascular and typically radiosensitive. Therapeutic options include surgery, radiation therapy (RT), embolisation or any combination of them, but the appropriate treatment still remains a challenge. The purpose of this study was to report the results of local control of 7 patients with glomus tumors treated with surgery and external beam RT (EBRT).*

Methods: *All of the patients underwent primary surgery and then postoperative EBRT. Follow-up was calculated from the date of initiation of EBRT and ranged from 3 to 15 years (mean 7.14, median 6.2). The likelihood of local control was analysed using the Kaplan-Meier product limit method. We also analysed the average duration of response between two groups of patients with different doses of EBRT as well as the presence of acute and late EBRT complications.*

Results: *Local control was obtained in 6/7 (85.7%) patients. Moreover, local control was achieved in 3/4 (75%) patients with recurrent glomus tumors, while in patients with postoperative residual disease local control was obtained in 3/3 (100%) of them. Patients who received <50 Gy (n=2) had shorter average duration of response compared to patients who received >50 Gy (n=5; p=0.248). There were no severe treatment complications.*

Conclusion: *Surgery and RT represent an appropriate treatment approach for advanced glomus tumors with acceptable complications.*

Key words: glomus tumors, local control, radiation therapy, surgery

Introduction

Glomus tumors are rare neoplasias, typically radiosensitive, highly vascular, and arise from the chief cells of the paraganglia. Their nomenclature is connected with their site of origin: glomus jugulare, glomus tympanicum, carotid body and glomus vagale. Glomus tympanicum tumors of the temporal bone usually originate in the middle ear cavity along the tympanic or auricular nerves [1-3]. Glomus jugulare tumors originate in the adventitia of the dome of the jugular bulb, often causing cranial nerve dysfunction (VII-XII) with progressive bone destruction from continued growth. Among these two tumor types, very few tumors are malignant or metastasize.

The goal of treatment is the control of growth and prevention of neurological deficits [4,5], but the appropriate treatment for many of these tumors still remains a challenge [6]. Therapeutic options include surgery, RT, embolisation or any combination of these options [7,8]. However surgical resection of extensive tumors is frequently associated with excessive morbidity, including damage to vascular structures and cranial nerves [6,9]; therefore it is usually combined with EBRT.

The purpose of this study was to report the results of local control of 7 patients with glomus tumors treated by surgery and postoperative external beam RT at the Institute of Oncology and Radiology of Serbia.

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Methods

This retrospective study included 7 patients with glomus tumors treated with surgery and postoperative EBRT at the Institute of Oncology and Radiology of Serbia from 1996 through 2007. All patients suspected of having a glomus tumor were admitted to confirm the diagnosis and to define the treatment strategy. All patients were classified retrospectively according to the McCabe and Fletcher classification [10], using history and physical examination, CT and MRI scans. All patients had clinical stage III disease. After diagnosis, patients were operated and treated with postoperative EBRT.

The inclusion criteria were histologically proven diagnosis, clinical stage III and age over 18 years.

Three patients had glomus tympanicum, and 4 glomus jugulare. All patients had undergone resection of the primary tumor; 4 patients had total tumor resection and 3 subtotal resection. Of the 4 patients with total tumor resection, 3 were reoperated for relapsed disease 1,3 and 4 years after the first operation, and the 4th patient underwent vascular embolization for relapsed disease. All 4 patients had recurrent tumors (after 4, 4, 9 and 6 years) and RT was recommended. In the other group of 3 patients with subtotal resection, postoperative EBRT was performed immediately after surgery because of residual tumor. Pretreatment evaluation included CT in 6 patients and MRI and angiography in one patient. Two patients were treated with Co-60 and the other 5 with 6MV X-rays. RT doses are shown in Table 1. No patient treated by RT received less than 40 Gy.

Follow-up was calculated from the date of initiation of RT for all patients. For the first 5 years patients were followed every 2-6 months and annually thereafter with clinical examination and CT and /or MRI of the area of interest. Patients follow-up ranged from 3-15 years (mean 7.14 years, median 6.2).

Local control was defined as no evidence of disease progression based on patient's symptoms, physical findings, and/or follow-up CT/MRIs and included stable disease, partial regression and complete regression. The likelihood of local control was analysed using the Kaplan-Meier product limit method [11]. We also analysed the average duration of response comparing two groups of patients: one with total RT dose <50 Gy and the other one with total RT dose >50 Gy.

Acute and late RT complications were also analysed [1].

Results

The age range at the initial presentation was 19 to 71 years (mean 52). There were 4 female and 3 male patients. The most common symptoms before treatment were tinnitus, hearing loss, cranial nerve deficits, headache, vertigo and otorrhea (Table 2).

Local control included complete remission, partial remission and stable disease. Local control for all lesions was obtained in 6 (85.7%) of 7 treated patients (Figure 1). For this group of 6 patients, the follow-up period was 4,5,6,7,10 and 15 years. In recurring patients after surgery and then EBRT, local control was achieved in 75% them (3 of 4 patients), while in patients with the same therapeutic approach but without recurrence local control was obtained in 100% of them (3 of 3 patients) (p=0.038; Figure 2). Patients who received total EBRT dose < 50 Gy (n=2) had shorter average duration of response (5 years) compared to 5 patients who received > 50 Gy with average duration of response of 8 years (p=0.248; Table 3). Moreover, the only patient who died of progressive disease (CT scan revealed a pulmonary nodule and lung biopsy confirmed metastatic paraganglioma) had received a modest dose of 40 Gy. Three patients achieved complete response with EBRT and 4 had partial response (Table 3; Figure 3).

Table 1. Patient distribution by dose of radiation therapy

Dose (Gy)	*Patients, N (%)*	*No. of patients with disease progression*
40-50	2 (28.57)	1
50-60	3 (42.85)	0
>60	2 (28.57)	0

Table 2. Presenting symptoms

Symptoms	*Patients, N (%)*	*Average duration (years)*
Tinnitus	2 (28.57)	4.5
Hearing loss	4 (57.14)	4.8
Otalgia	4 (57.14)	2.9
Vertigo	1 (14.29)	1.5
Otorrhea	4 (57.14)	3.1

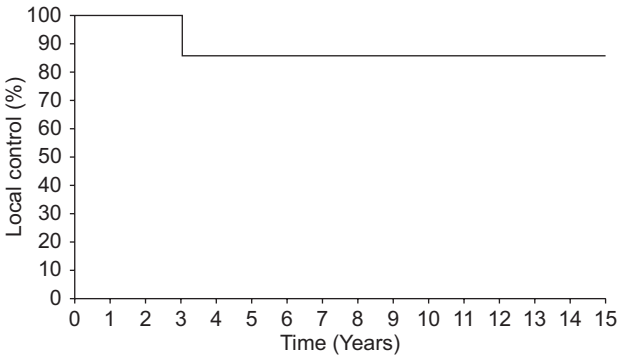


Figure 1. Local control for 7 patients with glomus tumors.

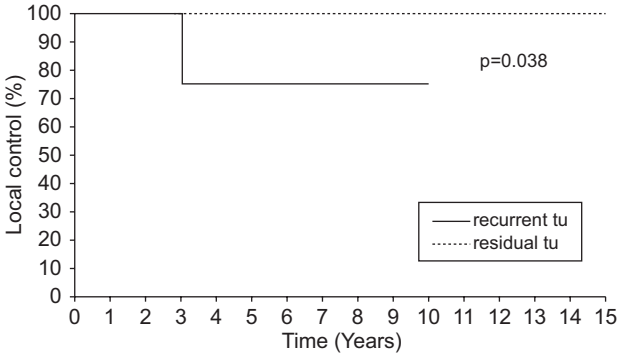


Figure 2. Local control for patients with residual and recurrent glomus tumors (p= 0.386).

Table 3. Tumor control by RT dose

	RT dose	*RT dose*
	<50 Gy	>50 Gy
No. of patients (%)	2 (28.57)	5 (71.42)
RT		
Photons and electrons	1 (14.29)	4 (57.14)
Electrons	1 (14.29)	1 (14.29)
No. of patients with CR	1 (14.29)	2 (28.57)
No. of patients with PR	1 (14.29)	3 (42.86)
Average duration of response (years)	5	8
No. of patients with progression	1 (14.29)	0

RT: radiotherapy, CR: complete response, PR: partial response

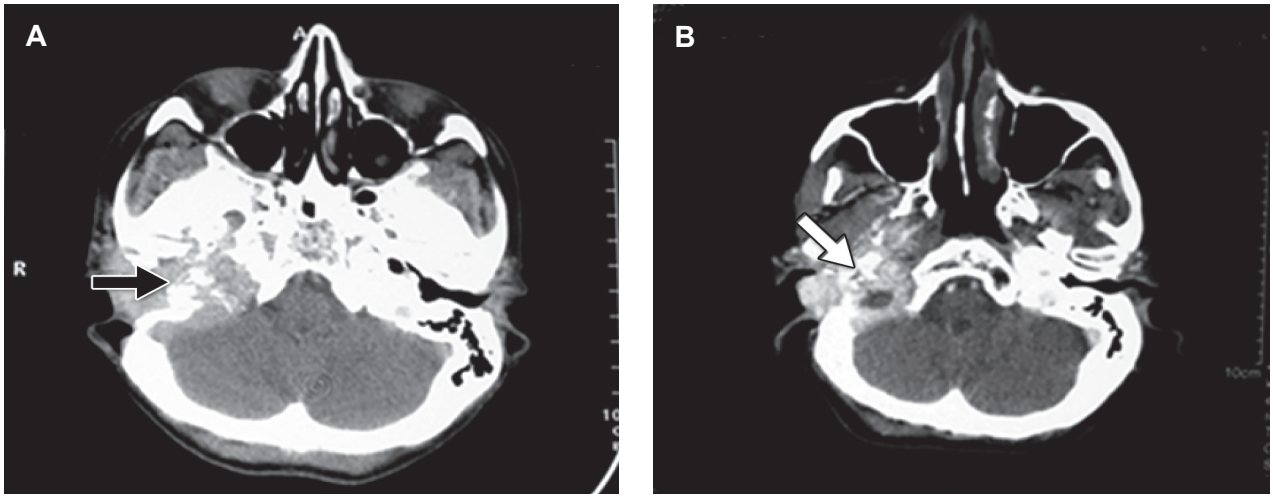
Analysis of acute and late RT side effects showed that during EBRT one patient developed severe radiation mucositis (grade III) after 2.5 weeks of EBRT (receiving total dose 21.8 Gy in 13 fractions) which led to an unplanned treatment interruption. She subsequently continued and completed treatment as scheduled. One patient who was treated with RT after two surgical interventions developed profound hemorrhage and after its control, he continue his therapy.

During follow-up one patient developed 7th nerve palsy 6 months after RT, which resolved spontaneously. He was irradiated in 2002 and received total EBRT dose 65 Gy. No other patient developed a cranial nerve deficit after irradiation in the absence of local recurrence. There were no late complications after EBRT or radiation-induced second primary malignancies.

Discussion

The decision to use irradiation or surgery for glomus tumors is based primarily on the risk of treatment complications [9]. For early-stage temporal bone tumors with a low risk of surgical complications, the recommended treatment is primary resection aiming at cure. For more advanced lesions, RT and surgery are usually recommended [5,12,13]. Glomus tumors may spread intracranially and their great vascularity makes their surgical removal very difficult. Postsurgical neuropathy of the IX-XII cranial nerves was noticed in 31-81% of patients, while neuropathy of the facial nerve was present in 16-23% [14,15]. After surgical tumor resection, long-term follow up is necessary because recurrence is seen in 16-18% of the cases [16]. Because of the risk of recurrence after surgery, postoperative RT was recommended as adequate treatment approach for advanced glomus tumors. Also, with this therapeutic approach, excellent control rates and small number of complications were achieved. In our group, all 7 patients were in advanced clinical stage III and all underwent surgical resection and postoperative RT.

With improvement of the RT equipment and techniques and better understanding of the natural history of tumor, many authors have demonstrated that RT is a highly effective treatment for glomus tumors, but the optimal dose of RT still remains undefined [17]. Lamer et al. in their review of 45 RT-treated cases confirmed that a modest dose of RT (3500 cGy in 3 weeks) was sufficient for control of glomus tumors [17,18]. There are now many published series suggesting that a moderate dose of 50 Gy in 25 fractions (2 Gy per fraction over 5 weeks) offers a high probability for tumor control [5,8,19]. In our study, 2 patients received < 50 Gy and 5 > 50 Gy. The average dose of 55 Gy which is an adequate dose according to literature; there is no evidence that higher doses improve the already high likelihood of tumor control.



Pretreatment CT of endocranium

Posttreatment CT of endocranium

Figure 3. A: Cranial CT scan from a patient with a glomus tumor before RT (arrow). **B:** Cranial CT scan of the same patient after RT showing reduction of tumor mass (arrow).

RT has continuously been challenged because of the rare documentation of complete disappearance of the tumor, judged by lack of changes in histology and radiographic changes after treatment. Several studies show that most of the irradiated patients have symptomatic benefit [16,19,20]. All of our patients had symptomatic benefit and in 87.5% of them tumor control was achieved (3-15 years). Moreover, in the group of patients treated with RT immediately after surgery 100% tumor control was obtained, while in patients treated with RT because of recurrent tumor many years after surgery tumor control was achieved in 75% of the cases.

Powell et al. noted significant complications in 2 (4%) of 46 patients treated with RT alone; both patients developed a 7th cranial nerve palsy [18]. Of note is that the patients received doses of 64 Gy and 66 Gy, respectively, which are considerably higher than the current recommended doses for glomus tumors [18,21]. In our study one patient developed a 7th nerve palsy after treatment, which resolved spontaneously. He received total tumor dose 65 Gy at the time. There were no severe complications or radiation-induced second primary malignancies in our patient group.

What remains controversial in the surgery and RT literature is the definition of cure and/or local control. Obviously, long-term follow-up is the key for the analysis of treatment outcome as well as morbidity, but the definition of local control in glomus tumors remains unclear.

In summary, glomus tumor is a unique neoplasm because of its unusual predilection for a particular site of origin, as well as for the difficulties in the management posed mainly by its rich vascularity. Primary treatment should be either surgery or RT: resection if feasible with acceptable morbidity and RT for advanced lesions not amenable to surgery or for surgical failures.

Acknowledgement

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