



Case Series

Multidisciplinary management of external auditory canal carcinoma: Insights from a case series

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ABSTRACT

Primary squamous cell carcinoma (SCC) of the external auditory canal (EAC) is an exceptionally rare malignancy with limited literature on optimal management and outcomes. This case series details the multimodality management of three patients with SCC of the EAC treated at a single institution. The treatment approach for all patients involved surgical intervention followed by adjuvant radiotherapy using intensity-modulated radiation therapy (IMRT), with one patient also receiving concurrent chemotherapy. At a follow-up of up to 28 months, all three patients achieved locoregional control of their disease. Both acute and late treatment-related toxicities were manageable and favorable, with all patients maintaining a good quality of life post-treatment. This series reinforces that a combination of surgical resection and adjuvant IMRT is an effective standard of care for locally advanced EAC tumors, providing excellent locoregional control with an acceptable toxicity profile. Further studies are warranted to optimize long-term outcomes.

Keywords: External auditory canal, Squamous cell carcinoma of temporal bone, Intensity modulated radiation therapy, Multimodality therapy

INTRODUCTION

Squamous cell carcinoma (SCC) of the temporal bone is an exceptionally rare condition, accounting for only 0.2% of all head and neck tumors.^[1] Its annual incidence ranges from 1 to 6 cases per million people.^[2] This type of cancer can originate in various parts of the temporal bone, including the external auditory canal (EAC), middle ear, mastoid, or petrous apex.^[3] Association with chronic suppurative otitis media has been noted.^[2,3] Symptoms are nonspecific and preclude an early diagnosis. Ear pain, ear discharge, and signs and symptoms that may mimic otitis, cholesteatoma, and polyp are the most common early manifestations. Patients with advanced disease are seen with invasion of surrounding structures, particularly the periauricular soft tissues, the parotid gland, the temporomandibular joint, and the mastoid.^[4] Due to the rarity of this condition, there is no clearly established standard treatment approach. However, surgical resection with negative margins followed by concurrent chemotherapy and radiation therapy is the most commonly performed approach.^[1] Extensive disease, positive margins, dural

and cranial nerve involvement, facial nerve paralysis, and moderate to severe pain on presentation have been noted as poor prognostic factors.^[5] Reported 5-year survival rates range from 40-70% but decrease to 20% in advanced disease, with local recurrence as the main cause of death.^[6,7] We present this article in accordance with the CARE reporting checklist (available at <https://tro.amegroups.com/article/view/10.21037/tro-23-19/rc>).

CASE SERIES

Three cases of SCC of EAC, middle ear, or mastoid antrum were seen in our institution from November 2021 until July 2023, including two females and one male. All procedures carried out in this study adhered to the ethical guidelines set by the institutional and/or national research committees, as well as the principles outlined in the Helsinki Declaration (revised in 2013). Written informed consent was obtained from all patients for the publication of this case series and any associated images. A copy of the consent form is available for review by the editorial office upon request.

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Case 1

A 46-year-old male with no comorbidities and no addiction status complained of pain with secretion of pus from the right ear for more than 1 year. In the computed tomography (CT) scan, there was a soft tissue lesion in the right EAC. Excision of that mass was done at the ear, nose and throat (ENT) department, which on histopathological examination turned out to be an invasive keratinizing SCC. He was referred for external beam radiotherapy (EBRT), being treated with departmental 6MV Linear accelerator (LINAC) with 54 Gy in 27 fractions over 5 weeks in view of a negative but close surgical margin. The treatment period was uneventful. He was on regular follow-up and again complained of pain in the same ear after 6 months of completion of radiation. MRI was done and it revealed, an enhancing lesion in the margin of the right EAC, implying as regrowth of a mass [Figure 1]. On biopsy, it came out as SCC. Thereafter, he was treated with extensive surgery, including right temporal bone resection. The histopathological report of the specimen of periosteum over the right temporal bone, soft tissue from the mastoid tip, and resected bone showed moderately differentiated SCC, with lateral and superior resection margins that were grossly involved. The rest of the margins were free, lymphovascular, and perineural invasion were not present. Depth of invasion was 2 mm from the tumor surface, and no lymph node was seen, pathologically AJCC 8th pT₃N₀M_x. Post-operative contrast-enhanced Magnetic resonance imaging (MRI) of

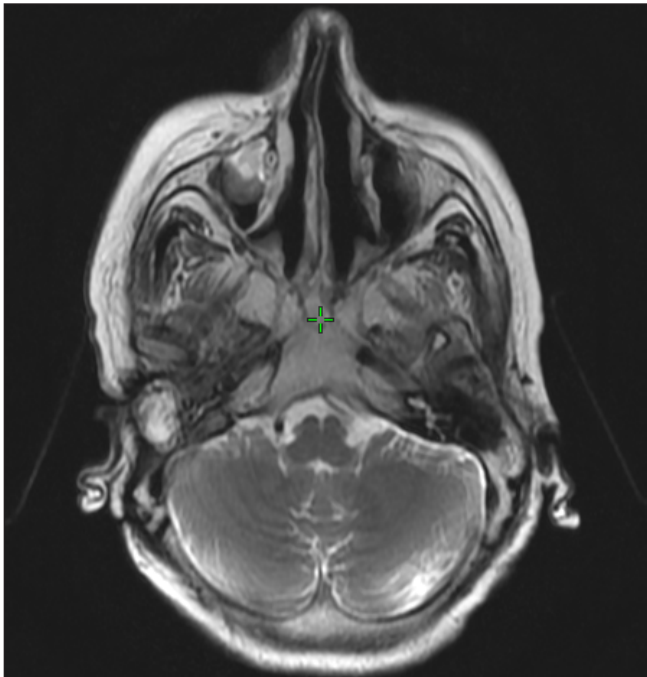


Figure 1: Axial section of contrast-enhanced MRI showing hyperintense areas of mass lesion epicentered at the external auditory canal and the right temporal bone.

the temporal bone revealed mild enhancing T2 hyperintense content noted in the right middle ear and mastoid cavity with obliterated Right EAC. Further treatment option was discussed through a multidisciplinary tumor board at our institution. It was decided to start reirradiation, but the dose was to be confirmed after considering the dose received by the organ-at-risk (OAR) in the previous EBRT, as given just 13 months before. Conformal re-irradiation was given in 6MV LINAC by Rapid-Arc technique with 54 Gy in 30 fractions over 6 weeks. The reirradiation period was also almost uneventful, except for complaining of mild pain. No severe (Grade 3 or 4) toxicities were observed. The patient has been under follow-up at regular intervals since then (for the last 25 months) at both radiation oncology and ENT outpatient department (OPD). He is doing gradually well with no complains at present.

Case 2

A 62-year-old female with no comorbidities but a history of tobacco chewing for the last 35 years, presented at the ENT OPD with complaining of right sided ear pain for the last 8 months. She had a history of ear discharge since her childhood, but took no treatments at that time. On high-resolution CT (HRCT) temporal bone, chronic mastoiditis with minimal right middle ear collection was seen. Audiometry showed severe mixed hearing loss in the right ear, while normal hearing sensitivity in the left ear. An MRI study ear (plain & contrast) was done. In MRI, there was a wide area of bone destruction with associated enhancing soft tissue mass involving the right petro-mastoid bone. The collection was also noted within a few right mastoid air cells. Intrapetrousal part of the right Internal Carotid artery (IAC) is seen partially encased with preserved distal flow. There was compression of the distal part of the right sigmoid sinus with secondary obliteration. Left transverse as well as sigmoid sinuses were well-enhancing. Patient underwent Right Cortical Mastoidectomy with biopsy from EAC mass. Histopathological examination showed well-differentiated infiltrating keratinizing SCC. Postoperative Contrast-enhanced MRI (CEMRI) of the face and neck was done afterwards. It revealed an ill-defined, fairly enhancing soft tissue mass lesion of size 30x23 mm in the right mastoid antrum and extending into the right middle ear cavity with protrusion into the right EAC, likely neoplastic. Metastatic workup was done and showed negative results. After post post-right cortical mastoidectomy, there was residual disease on CEMRI. She was planned for salvage EBRT in 6MV LINAC and received 60 Gy in 30 fractionations over 6 weeks by Intensity modulated radiotherapy (IMRT). This period was uneventful with no serious adverse reactions. Now, after radiation, she has been in follow-up in both the ENT and Radiation Oncology department routinely for the last 28 months, and currently has no complains.

Case 3

A 63-year-old female with no comorbidities and no addiction presented at radiation oncology OPD with complains of right ear discharge for the last 2 years. She had undergone right cortical mastoidectomy with type III tympanoplasty and temporal fascia grafting. A specimen of papillomatous in the right middle ear mucosa of EAC was sent for histopathological examination, which showed SCC (WHO Grade I) with focal keratinization in the middle ear and EAC. No lymphovascular or perineural invasion was found. No comment on surgical margin status was reported. Post-operative HRCT of the temporal bone was done [Figure 2], on which there was collection in the right external canal with bony erosion, collection was also seen in the right mastoid with erosion of bones, suggestive of a neoplastic lesion. She was planned for chemoradiation under 6MV LINAC. Three treatment volumes are prescribed using the Simultaneous Integrated Boost technique of 66 Gy, 60 Gy, and 54 Gy, respectively, in 30 fractions over 6 weeks. Weekly concurrent chemotherapy was given with injection Cisplatin at a dose of 40 mg/m². The treatment period was uneventful, with no serious adverse reactions of chemo-radiotherapy was seen. Treatment was completed 24 months ago. Now she is under follow-up at a regular interval with no complains at present.

DISCUSSION

Cancer of the EAC poses diagnostic challenges, particularly when accompanied by chronic otitis externa or invasive



Figure 2: Axial section CT image showing a post-operative part of the temporal bone, and the blue structure indicates of planning target volume for radiation therapy. CT: Computed tomography.

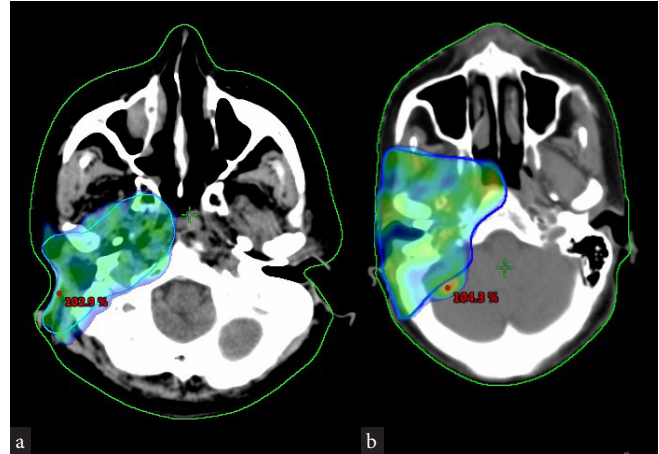


Figure 3: Dose color wash showing 95% coverage of the Planning Target Volume (PTV).

disease. Key prognostic factors, such as facial nerve paralysis, parotid gland involvement, middle ear invasion, and lymph node metastasis, can be identified through clinical evaluation and imaging. Treatment typically involves a combination of extensive surgery and radiotherapy [Figure 3], with outcomes heavily dependent on local tumor control. However, such aggressive therapies often result in significant long-term side effects. A 2022 study by Laskar *et al.*^[8] at TMH evaluated the long-term outcomes of definitive and adjuvant radiation therapy for SCC of the EAC and temporal bone. The study concluded that surgery followed by adjuvant therapy remains the standard approach for these cancers. IMRT was recommended as the preferred radiation modality due to its lower risk of late complications. The study also found that elective nodal irradiation is generally unnecessary in the adjuvant setting for EAC and temporal bone SCC. Among 89 patients (median age 54 years), 65 received adjuvant radiotherapy, while 24 underwent definitive radiotherapy. Neoadjuvant chemotherapy was administered to 12 patients to improve resectability, with 8 proceeding to surgery. The 5-year local control, event-free survival, and overall survival rates were 66.2%, 57.8%, and 63.5%, respectively. Local recurrence was the most common failure pattern (40.4%). After a median follow-up of 61 months, locoregional failure occurred in only five patients, none of whom had received elective nodal irradiation. Multivariable analysis indicated that adjuvant radiotherapy yielded superior outcomes compared to definitive radiotherapy. Additionally, IMRT was associated with significantly lower rates of severe late subcutaneous fibrosis (8.7% vs. 38.1%) compared to conventional 3D-CRT techniques.^[8] A meta-analysis by Takenaka *et al.*^[9] involving 752 EAC patients reported a 5-year overall survival rate of 57%. Survival rates varied by treatment modality: 53.5% for surgery ± radiotherapy, 85.7% for preoperative chemoradiotherapy, 43.6% for definitive chemoradiotherapy,

and 0% for postoperative chemoradiotherapy. Most patients in this analysis were treated with the conventional 3D-CRT technique. In the IMRT era, Chen *et al.* reported outcomes for 11 EAC patients treated with postoperative IMRT, achieving 2-year local control and overall survival rates of 70.7% and 67.5%, respectively.^[10] Similarly, Saijo *et al.* reported a 3-year disease-specific survival rate of 100% in surgically managed T3 patients, compared to 75% in those treated with chemoradiation ($p=0.31$).^[11] Interestingly, Takenaka *et al.*'s meta-analysis^[9] favored preoperative chemoradiotherapy as the optimal approach, with a hazard ratio of 0.18. However, this conclusion was based on a small subset of only seven patients. Kiyokawa *et al.* reported just two nodal failures among 45 clinically node-negative EAC patients, both of whom had not undergone elective neck dissection or neck radiotherapy.^[12] Despite advancements in skull base surgery, neuroradiology, anesthesiology, and oncology, diagnosing and treating EAC malignancies remain challenging due to their rarity and the complex anatomy of the temporal bone. Treatment decisions must consider tumor pathology, disease stage, patient health and preferences, and the clinician's expertise. While survival rates have improved over the decades, further efforts are needed to enhance diagnostic accuracy, refine treatment strategies, and minimize long-term complications.

CONCLUSION

For locally advanced tumors of the EAC, the standard treatment should involve radical surgical resection followed by adjuvant IMRT. Elective neck nodal irradiation is generally unnecessary in postoperative cases where the neck has been surgically addressed and shows no pathological involvement. Despite aggressive radiotherapy, the risk of early local recurrence remains significant, highlighting the need for further optimization of radiation techniques to enhance local control. Advanced imaging methods, such as PET-CT scans, and innovative radiotherapy approaches, including Cyberknife and proton therapy, should be explored through multi-institutional collaborative studies to improve outcomes.

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