Article

The use of radio wave scalpel "Surgitron" in the surgical treatment of the outer ear neoplasms

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Abstract: The number of ENT organs diseases continues to grow, and therefore the problem of combating these diseases has been and remains relevant in otorhinolaryngology. The least studied of all the ENT organs neoplasm are ear tumors. *Aims*: to increase the efficiency of surgical treatment of neoplasms of the outer ear using a radio wave scalpel "Surgitron". *Patients and Methods*. The work is based on the results of treatment of 230 patients (146 in the main and 84 in the control groups) with tumor-like formations, benign and malignantouter ear tumors. *Results*. The first place in the structure of ear neoplasms in the main group was occupied by tumor-like formations - 58 patients (40%), benign tumors were somewhat less common - 48 patients (33%), and even less often - malignant neoplasms (40 patients, 27%). Most often, the auricle neoplasms were removed without the underlying cartilage (in 60 patients; 56.6%). Limited tumors (I-II stage) were removed under local anesthesia with 1% solution of novocaine with the addition, in the absence of contraindications, 5 drops of 0.1% solution of adrenaline per 10 ml of novocaine. After detachment of the tumor with skin and perichondrium from the underlying cartilage, an incision was made using a Surgitron radio wave scalpel, after which the tumor was removed within healthy tissues without cartilage resection. A strip of healthy skin around a benign tumor should be at least 3 mm. The surface of the cartilage at the bottom of the wound was examined under an operating microscope. The cartilage undamaged by the tumor had a smooth, shiny surface. Bleeding during the operation was minimal, stopped with the help of Surgitron, in the coagulation mode. In 1 patient with senile keratosis, in which the neoplasm was localized on the anterior surface of the auricle, the tumor was removed with a section of cartilage tissue. *Conclusion*. The use of the radio wave scalpel "Surgitron" in surgical interventions for outer ear neoplasms can reduce the time of the operation, reduce blood loss to a minimum, the time of wound epithelialization and the length of the patient's stay in the hospital. Comparison of the number of recurrences according to the result of using a radio wave scalpel and the classical surgical method (for tumor-like formations - 12% and 24.2%, respectively, for benign tumors - 8.3% and 40%, for malignant tumors - 30% and 70%) indicates a high effectiveness of surgical treatment using "Surgitron".

Keywords: tumor-like formations, benign and malignant outer ear neoplasms, radio wave scalpel "Surgitron".

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1. Introduction

The number of ENT organs diseases continues to grow, and therefore the problem of combating these diseases has been and remains relevant in otorhinolaryngology. The least studied of all the ENT organs neoplasm are ear tumors.

Tumors and tumor-like formatios of the auricle and external auditory canal are represented by: congenital fistulas developing from the remains of the first branchial fissure; cysts and scars

after mechanical, chemical and thermal injuries; keloids, congenital and acquired nevi; senile hyperkeratosis; chronic nodular chondrodermatitis, atheromas; histiocytosis (eosinophilic granuloma); skin horn [1].

Quite rarely, auricle and external auditory canal benign tumors are encountered [2], characterized by a great variety of histological structure. In the first place among them are papillomas [3], less common are hemangiomas, osteomas, ceruminomas, fibromas, chondromas, and lipomas.

Malignant ear tumors account for up to 2% of all malignant tumors and from 5 to 12% of ENT organs tumors. Of these, the auricle accounts for 85%, the external auditory canal - 10% [4].The main methods treatment of patients with outer ear tumors is surgical.

One method that increases the effectiveness of such interventions is the use of a radio wave scalpel [5, 6, 7]. In the literature, there are single reports on the removal of ear cancer using a radio wave scalpel [8].

Aims: to increase the efficiency of surgical treatment of neoplasms of the outer ear using a radio wave scalpel "Surgitron".

2. Patients and Methods

The work is based on the results of treatment of 230 patients (146 in the main and 84 in the control groups) with tumor-like formations, benign and malignantouter ear tumors.

The first place in the structure of ear neoplasms in the main group was occupied by tumor-like formations - 58 patients (40%), benign tumors were somewhat less common - 48 patients (33%), and even less often - malignant neoplasms (40 patients, 27%). The distribution of patients depending on the histological structure and primary localization of the neoplasm is presented in Table 1.

Table 1. Comparative characteristics of the treatment effectiveness of the studied groups of patients with tumor-like formations, benign and malignant neoplasms of the external ear (N=230).

Parameter	Main group (N=146)	Control group (N=84)	Difference between groups (%)
Duration of surgery (min)	41	49	16
Intraoperative blood loss (ml)	49	86	43
Wound healing time (weeks)	3,0	3,8	21
Length of stay in hospital (days)	13	17	24

The patients were aged 20 to 80 years, of which 64 (43.9%) were men and 82 (56.1%) were women. The auricle was the primary localization of the formation in 81 (55.4%) patients, the external auditory meatus - in 65 (44.6%).

In the control group, as in the main group, the first place was occupied by tumor-like formations - 33 patients (39%), the second - benign tumors - 30 patients (36%), the third - malignant neoplasms - 21 (25%) patients. There were 49 (58%) women in the control group, 35 (42%) men.

The auricle turned out to be the primary localization of the neoplasm in 53 (63%) patients, the external auditory meatus - in 31 (37%) patients.

The study began with a thorough history taking. To resolve the issue of the nature of the tumor, it is very important to determine the duration of the disease. The development of tumor-like, benign neoplasms occur within a few years, malignant - within a few months. We determined the time and sequence of the appearance of the first signs of the disease, its duration and the sequence of appearance of the patient's complaints, we judged the primary localization and direction of tumor growth. Outer ear neoplasms are characterized by a constant increase in symptoms.

The auricle is available for examination by the patient and the doctor; therefore, neoplasms of this localization are detected much faster than tumors of the external auditory canal. In all 135 patients with ear tumors in both groups of patients, the first sign of the disease was the appearance of the tumor itself. As a rule, it appeared for no apparent reason.

External auditory canal neoplasms are inaccessible for direct examination and develop asymptomatically for a certain time. Due to the anatomical features of the external auditory canal, its innervation, and the fact that the tumor grows in confined spaces, one of the leading symptoms in these cases was pain (16 patients). Pain and itching were followed by serous or purulent discharge from the ear canal mixed with blood (16 patients). Increasing in size, the tumor obturates the auditory canal, hearing loss appears according to the type of sound conduction disorder (16 patients).

On palpation, pastosity or hardening of the soft tissues of the parotid region and neck on the side of the lesion, their pain and enlargement were determined.

Computer tomography (CT) and magnetic resonance imaging (MRI) were used to determine the boundaries of the neoplasm and decide on the extent of the surgical intervention.

Surgical interventions were performed in 106 patients with benign tumors and tumor-like formations of the auricle and external auditory canal.

In all operated patients, the intervention was performed using a radio wave scalpel "Surgitron". There were no contraindications for the use of the latter in our study.

3. Results

Most often, the auricle neoplasms were removed without the underlying cartilage (in 60 patients; 56.6%). Limited tumors (I-II stage) were removed under local anesthesia with 1% solution of novocaine with the addition, in the absence of contraindications, 5 drops of 0.1% solution of adrenaline per 10 ml of novocaine. After detachment of the tumor with skin and perichondrium from the underlying cartilage, an incision was made using a Surgitron radio wave scalpel, after which the tumor was removed within healthy tissues without cartilage resection. A strip of healthy skin around a benign tumor should be at least 3 mm. The surface of the cartilage at the bottom of the wound was examined under an operating microscope. The cartilage undamaged by the tumor had a smooth, shiny surface. Bleeding during the operation was minimal, stopped with the help of Surgitron, in the coagulation mode. In 1 patient with senile keratosis, in which the neoplasm was localized on the anterior surface of the auricle, the tumor was removed with a section of cartilage tissue. In this observation, it was not possible to produce hydraulic detachment of tissues (perchondrium).

Resection of the auricle was performed in 3 patients (2.9%) with a cutaneous horn that partially destroyed the cartilaginous tissue of the auricle.

In our observations, there were 11 patients with auricular hemangioma, in whom the histological examination was performed only after surgical intervention. Biopsy in such cases is associated with the risk of intense bleeding, since we are talking about branched pulsating hemangiomas.

Hemangioma was removed within healthy tissues using a Surgitron radio wave scalpel after the tumor was sutured with a double twist suture (from above, behind, in front of the tragus along the posterior wall of the external auditory canal, a through U-shaped suture through the cavum conchae). With diffuse cavernous hemangiomas and other vascular tumors, when the border of the pathological focus is fuzzy, it is better to increase the strip of healthy skin around the tumor, up to 5 mm or more. Removal of vascular tumors, as a rule, is accompanied by severe bleeding, which is stopped by Surgitron in the coagulation mode.

Benign tumors and tumor-like formations of the external auditory canal in 40 patients were removed endourally with a Surgitron radio wave scalpel. Benign neoplasms of the cartilaginous part of the external auditory canal were most often removed with the perichondrium under local anesthesia. In 2 patients, due to the prevalence of the process, the tumor was removed by behind-the-ear access.

Patients with outer ear cancer were divided into 2 groups of equal size: 20 patients (13.7%) each with basal cell and squamous forms. In 18 (45%) cases, the tumors were localized on the auricle, in 22 (55%) cases, in the external auditory canal.

Before surgery, all patients underwent a biopsy to verify the diagnosis, after which surgical interventions were performed using a Surgitron radio wave scalpel.

In the surgical treatment of patients with auricle neoplasms in I-II stages of prevalence, we used various types of resection. Wedge-shaped resection of the auricle was performed more often (in 15 patients); when the tumor occupied 1/3 or more of the auricle, the latter was completely removed (in 3 patients).

12 patients with a malignant tumor process in the membranous-cartilaginous region underwent resection of the external auditory canal. Surgical intervention was performed under endotracheal anesthesia using a radio wave scalpel "Surgitron". After surgical treatment, patients were sent for radiation therapy.

Patients with malignant tumor invasion into the parotid salivary gland (stage III-IV) underwent resection of the external auditory canal with resection of the parotid salivary gland (7 cases). In 3 patients, the tumor extended beyond the external auditory meatus into the temporomandibular joint, tympanic cavity, and temporal bone, and in one case it grew into the cranial cavity. These patients underwent resection of the temporal bone and articular process of the lower jaw. The radio wave scalpel in this group of patients was used to work with soft tissues and coagulate the postoperative cavity.

The data on surgical interventions for the outer ear neoplasms in the control group (N=84) were taken from the archive.

These patients underwent surgical interventions by the classical method (using a scalpel). In view of the fact that the types of operations are identical with those interventions that were performed in the main group, only their structure and analysis are given below.

In the control group, as in the main group, the most common surgical intervention on the auricle was the removal of a neoplasm without underlying cartilage (37 patients, 59%). A tumor was removed along with the underlying cartilage in 1 patient with senile keratosis. Ear resection (wedge-shaped) was performed in 2 patients (3%) about the skin horn.

Benign tumors and tumor-like formations of the external auditory canal were removed endourally in 22 cases (35%). In 1 patient with a ceruminoma with a widespread process, the tumor was removed by behind-the-ear access.

Patients with malignant tumors of the external ear, basal cell carcinoma (11; 13%) and squamous cell carcinoma (10; 12%) were also operated on using the classical surgical method. In 16 cases, the tumor was localized on the auricle, in 5 cases - in the external auditory canal.

All patients underwent biopsy prior to surgery to verify the diagnosis. Most often, a wedge-shaped resection of the auricle was performed (in 10 patients); the auricle was completely removed in 6 patients for the same indications as in the main group. 2 patients with a tumor process in the membranous-cartilaginous region underwent resection of the external auditory canal.

Patients in whom a malignant tumor had grown into the parotid salivary gland (there were 2 of them) underwent resection of the external auditory canal with resection of the salivary gland. In 1 patient, the tumor grew beyond the external auditory canal into the temporomandibular joint, tympanic cavity, and temporal bone; this patient underwent resection of the external auditory canal with resection of the articular process of the lower jaw and resection of the temporal bone.

When all the tumors were removed, due to the good blood supply to the external ear, intense bleeding was noted, which was stopped mechanically (tight tamponade) or by ligation of the bleeding vessel.

The study groups of the main (146 patients) and control (84 patients) belong to the same general population and there were no statistically significant differences between them in terms of age, gender, localization of the formation, stage of the tumor and its histological structure.

In each of the groups, we tried to determine the duration of the surgical intervention, intraoperative blood loss, the time of wound healing, and the time of the patient's stay in the hospital. Surgical intervention performed using the Surgitron radio wave scalpel allows to reduce blood loss by 43% and reduce the total duration of the operation by 16% compared to the classical surgical method of treatment.

During surgical intervention using the Surgitron radio wave scalpel, bleeding can be stopped with the help of a coagulator, which significantly reduces the amount of intraoperative blood loss (main group). Radio wave scalpel "Surgitron" is characterized by high ablasticity and minimal trauma, which allows to accelerate the process of wound healing by 21% and reduce the length of the patient's stay in the hospital by 24%.

All patients with ear neoplasms after surgical treatment with the help of a radio wave scalpel "Surgitron" we observed in dynamics.

Patients with tumor-like and benign tumors were examined once every 2 months for the first 6 months, once every 3 months for the second 6 months, and then once a year. Patients with malignant neoplasms require closer monitoring: in the first year - 1 time per month, the second - 1 time in 2 months, and then – once a year. The follow-up period of the last group of patients is at least 5 years.

In patients with tumor-like formations, relapses were noted in 7 (12%) cases. Atheromas recurred in 4 cases, keloid, senile keratosis and cutaneous horn - in one observation. 44 (76%) patients were observed without recurrence, the connection was lost with 7 patients.

In patients with benign neoplasms, relapses were noted in 4 (8.3%) cases: one recurrence of squamous papilloma and hemangioma, 2 relapses of ceruminoma. At the same time, after surgical treatment, relapses of benign ear tumors were observed in 33.5% of cases [2].

In stages I and II, a malignant auricle tumor was detected in 9 cases, in the external auditory canal - in 15 cases. In stages III and IV, malignant tumors were detected in 16 patients. The neoplasm originated from the auricle in 9 cases, and from the external auditory meatus - in 7 cases.

28 patients (70%) were observed without signs of recurrence and metastasis from 1 to 5 years. Relapses were detected and 12 patients (30%) were reoperated

4. Discussion

According to the results of our studies [9-14], relapses of tumor-like formations, benign and malignant tumors were observed in only 23 (15.7%) patients, confirming the effectiveness of the use of the Surgitron radio wave scalpel in this pathology.

Patients in the control group were called for examinations and a retrospective analysis of relapses of neoplasms was carried out at the same time as in patients of the main group.

In patients with tumor-like formations, relapses were noted in 8 (24.2%) cases. 17 (51.6%) patients were observed without signs of recurrence. Communication was lost with 8 (24.2%) patients. This is consistent with data obtained in other studies [15-19].

In patients with benign neoplasms, relapses were noted in 12 (40%) cases. No signs of recurrence were observed in 14 (47%) patients [19, 20]. Communication was lost with 4 patients (13%).

When localized on the auricle, the malignant tumor recurred in 11 (50%) cases, in the external auditory canal - in 4 (20%). 6 patients (30%) are observed without signs of recurrence and metastasis from 1 to 3 years [20-22]. Relapses were detected and 15 patients (70%) were operated on again.

5. Conclusions

Thus, the study of the features of the clinic and diagnosis of outer ear neoplasms showed that tumors of the auricle manifest themselves much faster than tumors of the external auditory canal. Diagnosis requires careful history taking and examination of the ear and parotid region; at the same time, special attention should be paid to subtle symptoms of the disease. When the tumor becomes available for inspection, and the symptoms are obvious, it is easy to make a diagnosis, but it is difficult to treat the patient and hope for good treatment results. Surgical intervention has been and remains the main method of treating patients with tumors and tumor-like formations of the external ear, and the results of treatment of these patients depend on the duration of the disease, the initial location, extent and histological structure of the tumor.

The use of the radio wave scalpel "Surgitron" in surgical interventions for outer ear neoplasms can reduce the time of the operation, reduce blood loss to a minimum, the time of wound epithelialization and the length of the patient's stay in the hospital. Comparison of the number of recurrences according to the result of using a radio wave scalpel and the classical surgical method (for tumor-like formations - 12% and 24.2%, respectively, for benign tumors - 8.3% and 40%, for malignant tumors - 30% and 70%) indicates a high effectiveness of surgical treatment using "Surgitron".

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References

1. Antoniv VF. Ear neoplasms. Clinic, diagnosis, treatment. TSOLIUV. 1983; 20 p. (in Russian).
2. Popadyuk VI. Early diagnosis and treatment methods for ear neoplasms. Dis. doctor of med. Sciences. 2003 (in Russian).
3. Chernolev AI, Grishina AS, Popadyuk IV. Diagnostics and treatment of some tumors of the external ear. Russian otorhinolaryngology 2012, 3; 172 -176 (in Russian).
4. Lyubskaya OG. Combined treatment of patients with malignant ear tumors: author. dis. Dr. med. Sciences. Moscow; 1997; 31. (in Russian).
5. Antoniv TV. Endolaryngeal surgery for cancer of the larynx: Dis. Ph.D. Sciences. Moscow; 2004. (in Russian).
6. Pluzhnikov MS, Ryabova MA, Karpishchenko SA. Radiofrequency scalpel in surgery of the maxillofacial region and laryngopharynx. Materials of the international congress "Radio wave surgery at the present stage" 2004, 220 – 224 (in Russian).
7. Errison E, Graf J, Hultcrantz E. Pediatric tonsillotomy with radiofrequency technique: long-term follow-up. Laringoscope. 2006; 116 (10): 1851 - 1856.
8. Ryabova MA, Ermakov VN, Plotkina OV, Ulupov MYu. A case of successful surgical treatment of squamous cell skin cancer of the auricle using an Ellman Surgitron radiofrequency scalpel. Folia Otorhinolaryngologica. 2007;13; 14 - 17.
9. Nemechek AJ, Amedee RG. Tumors of the external ear. J La State Med Soc. 1995;147(6):239-42
10. Alshaikh NA, Eleftheriadou A. Juvenile nasopharyngeal angiofibroma staging: An overview. Ear Nose Throat J. 2015;94(6):E12-22.
11. Thompson L. Lymphangioma. Ear Nose Throat J. 2006;85(1):18-9
12. Okada T, Saito K, Takahashi M, Hasegawa Y, Fujimoto Y, Terada A, Kamei Y, Yoshida J. En bloc petrosectomy for malignant tumors involving the external auditory canal and middle ear: surgical methods and long-term outcome. J Neurosurg. 2008;108(1):97-104
13. Nicoli TK, Atula T, Sinkkonen ST, Korpi J, Vnencak M, Tarkkanen J, Mäkitie AA, Jero J. Ear canal and middle-ear tumors: a single-institution series of 87 patients. Acta Otolaryngol. 2022;142(2):132-139
14. Leferink VJ, Nicolai JP. Malignant tumors of the external ear. Ann Plast Surg. 1988;21(6):550-4

15. Ramsey MJ, Nadol JB Jr, Pilch BZ, McKenna MJ. Carcinoid tumor of the middle ear: clinical features, recurrences, and metastases. Laryngoscope. 2005;115(9):1660-6.
16. Liu G, Chen F, Li JN, Liu SX. Carcinoid tumor of the middle ear: a case report and review of literature. Int J Clin Exp Pathol. 2014 15;7(10):7105-9
17. Guidi M, Buccoliero A, Trabalzini F. Middle Ear Neuroendocrine Tumor: A Case Report and Review of the Literature in Pediatric Population. J Int Adv Otol. 2021;17(2):150-155
18. Bierry G, Riehm S, Marcellin L, Stierlé JL, Veillon F. Middle ear adenomatous tumor: a not so rare glomus tympanicum-mimicking lesion. J Neuroradiol. 2010;37(2):116-21
19. van der Lans RJL, Engel MSD, Rijken JA, Hensen EF, Bloemena E, van der Torn M, Leemans CR, Smit CFGM. Neuroendocrine neoplasms of the middle ear: Unpredictable tumor behavior and tendency for recurrence. Head Neck. 2021;43(6):1848-1853
20. Marchioni D, Alicandri-Ciufelli M, Gioacchini FM, Bonali M, Presutti L. Transcanal endoscopic treatment of benign middle ear neoplasms. Eur Arch Otorhinolaryngol. 2013;270(12):2997-3004
21. Elsahy NI. Acquired ear defects. Clin Plast Surg. 2002;29(2):175-86
22. Fang CH, Sun J, Jyung RW. Malignant otitis externa. Ear Nose Throat J. 2015;94(4-5):136-8.