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Clinical Cases of Neoplasms of the Nasopharynx Using the Potential of Magnetic Resonance and Computed Tomography in Diagnosis and Staging

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Abstract

The incidence of nasopharyngeal carcinoma of the nasopharynx in Russia in 2021 was 0.73 cases, and the mortality rate was 0.27 cases per 100,000 population, while the incidence in men is 6.3 times higher than in women. Nasopharyngeal carcinoma is one of the oncological diseases, often asymptomatic and debuting with the appearance of cervical lymphadenopathy. Conducting a comprehensive radiation examination of the patient (a combination of magnetic resonance imaging and computed tomography), allows for a full-fledged local staging of the pathological process in nasopharyngeal carcinoma. To identify the primary focus and local staging, radiation examination methods are used, in particular, computed tomography and magnetic resonance imaging (MRI, staging according to the T and N criteria). Positron emission tomography (CT, staging according to criterion M) is used to identify distant lesions. This article presents a clinical case of diagnosis of enlarged cervical lymph nodes with detected squamous cell carcinoma. The patient was referred for radiation examination to determine the localization of the primary focus and local staging (CT, MRI). The results of the examination allowed us to conclude the importance of conducting a comprehensive radiation examination and the correct staging of the process to determine the optimal zone for radiation therapy.

Discipline: Medicine, Immunology.

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1 Introduction

Nasopharyngeal carcinoma is one of the oncological diseases, often asymptomatic and debuting with the appearance of cervical lymphadenopathy. The tumor focus, as the experience of specialists shows, will be able to develop in absolutely every human organ. nasopharyngeal tumor is a real malignant neoplasm of the nasopharynx, originating from its epithelial tissue [1].

This form of cancer is considered quite rare. Its share among the total cancer incidence does not exceed 0.01-0.02%. At the same time, a tumor is diagnosed in representatives of the male Mongoloid race [2]. Its localization is the nasopharynx behind the nasal cavity, the area of the back of the mouth, as well as the throat itself. The symptoms of pathology in the early stages of its occurrence are nonspecific, and therefore early diagnosis is quite difficult [3].

2 Literature Review

The defeat of the neck lymph nodes in this type of cancer negatively affects survival rates, increasing the risk of distant metastases. When examining a patient with cervical lymphadenopathy of unclear genesis and suspected nasopharyngeal cancer, a biopsy of the pathological lymph node with histological examination is performed [4]. To identify the primary focus and local staging, radiation examination methods are used, in particular, computed tomography and magnetic resonance imaging (MRI, staging according to the T and N criteria) [5-8]. Positron emission tomography (CT, staging according to criterion M) is used to identify distant lesions [9-11].

Objectives of magnetic resonance imaging and computed tomography:

- • identification of voluminous education, clear definition of localization
- • assessment of the prevalence in the surrounding soft tissues (fascial spaces, organs, lymph nodes, fiber)
- • assessment of the prevalence in bone tissues (skull bones, bone channels, skull base openings, spine)
- • assessment of the involvement of intracranial structures (cavernous sinus, meninges, brain parenchyma)
- • assessment of the involvement of cranial nerves (extracranial and intracranial segments)
- • determination of probable perineural, perifascial, perivascular tumor growth.

Parameters of staging according to criterion T for nasopharyngeal carcinoma (Tx and Tis cannot be visualized by radiodiagnostics):

T1 – a tumor within the nasopharynx, or the tumor spreads into the oropharynx, or the nasal cavity without spreading into the parapharyngeal space.

T2 – a tumor with a spread into the parapharyngeal space.

T3 – the tumor spreads to the base of the skull / paranasal sinuses.

T4 – a tumor with intracranial spread and/or damage to the cranial nerves, spreading into the orbit, the fossa, the masticatory space.

Staging parameters according to criterion N:

N0 – there is no lesion of regional lymph nodes

N1 – metastases in the cervical lymph nodes above the supraclavicular fossa on the side of the lesion no more than 6 cm/single-bilateral retropharyngeal metastases no more than 6 cm in the largest dimension.

N2 – bilateral metastases in cervical lymph nodes up to 6 cm above the supraclavicular fossa.

N3 – metastases to lymph nodes more than 6 cm or located below the cricoid cartilage

3 Material and Methods

Patient P., 52 years old, in October 2021, turned to a surgeon about an enlargement of the cervical lymph nodes on the left. One of the lymph nodes is dotted, squamous cell carcinoma has been detected. The patient was sent for radiation examination in order to determine the localization of the primary focus and local staging (CT, MRI in January 2021).

MRI was performed on a PHILLIPS Ingenia 1.5 Tesla high-field MR tomograph using an extended scanning protocol, including before contrast introduction [12]:

- T2 ax, slice thickness 4.0mm (0.4), T2 sag. slice thickness 4.0mm (0.4);
- STIR cog, slice thickness 3.5mm (0.3), STIR ah slice thickness 4.0mm (0.3);
- T1 cor slice thickness 3.5mm (0.3);
- T1 fs ah, slice thickness 4.0mm (0.4);
- DWI ah with b-factors 0, 100, 800 with the construction of ADC maps, cut thickness 4.0mm (0.4).

After contrast is introduced:

- T1 cor, sag, ax, cut thickness 3.5mm (0.3).

The CT study was performed on an Aquilion Rgime 160 computed tomograph with a 0.5mm slice thickness using a standard protocol, without contrast enhancement [13,14].

4 Results and Discussion

During the MRI study, the following changes were revealed.

- In the nasopharyngeal mucosal space, a solid formation of a homogeneous structure performs both Rosenmuller pits, pushing the structures of the Morgagni sinus forward (Figure 1), causing compression of the pharyngeal sections of the auditory tubes and leading to stagnation of the secretion in the pyramids of the temporal bones (Figure2). Pharyngeal constrictors are intact.

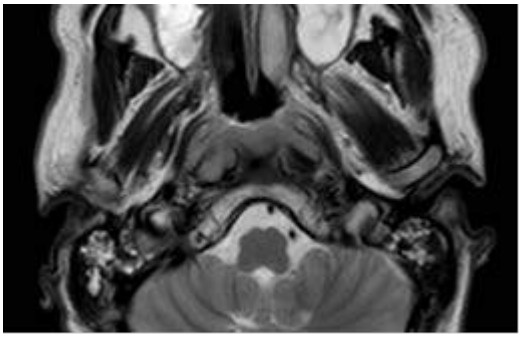

Figure 1: Solid formation of a homogeneous structure, performing both Rosenmuller pits, pushing the structure of the Morgagni sine ahead.

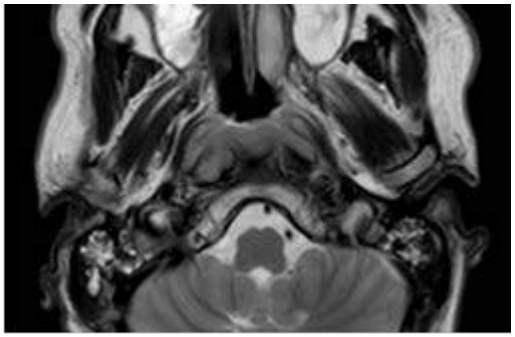

Figure 2: The cells of the pyramids of the temporal bones are made of a pathological substrate**.**

- Infiltration of the anterior part of the base of the occipital bone, the posterior part and the wings of the sphenoid bone, primarily associated with the growth of formation along the pharyngeal-basilar fascia (Figure 3).
- The spread of infiltrate to the cavernous sinus with lysis of its walls, more significant on the right, respectively, with damage to its structures: oculomotor (III), block (IV), diverting (VI) cranial nerves, ocular (V1) and maxillary (V2) branches of the trigeminal nerve (Figure 4).

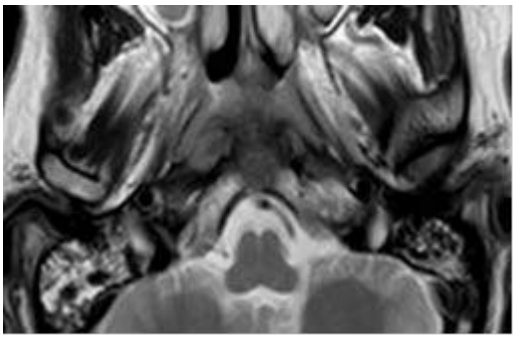

Figure 3: Infiltration of the anterior part of the base of the occipital bone at the level of attachment of the pharyngeal basilar fascia.

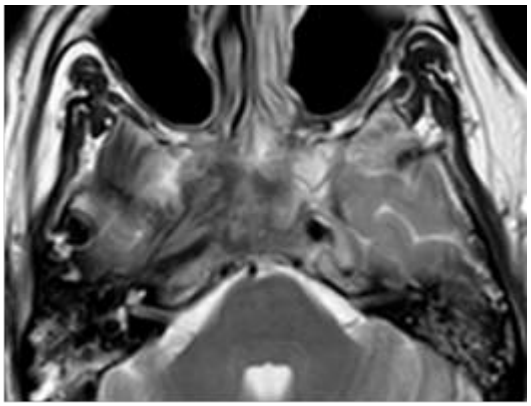

Figure 4: Infiltrate spreading to the cavernous sinus with lysis of its walls, more significant on the right.

- The lower wall of the sinus of the sphenoid bone with pathological contents in its lumen was lysed (Figure 5).

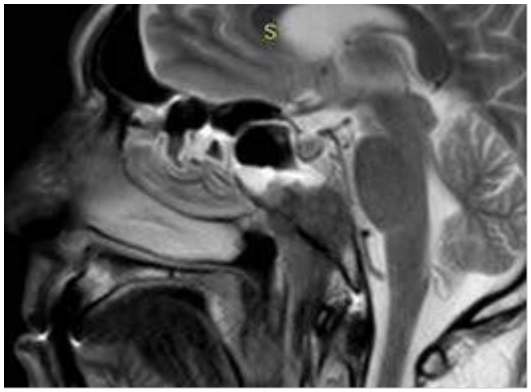

Figure 5: The lower wall of the sinus of the sphenoid bone with pathological contents in its lumen is lysed.

- Reactive changes in the dura mater in the form of its thickening and accumulation of contrast along the inner contour of the right middle cranial fossa (Figure6), the brain parenchyma is not involved in the pathological process.

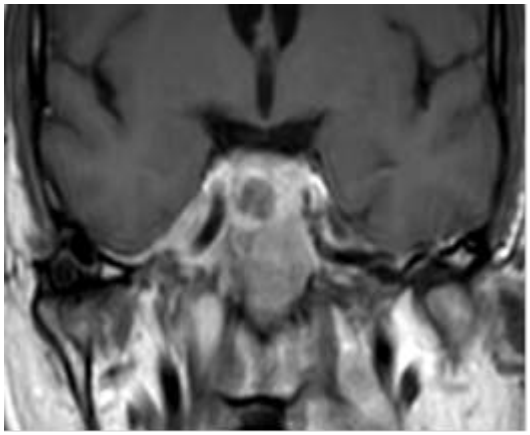

Figure 6: Reactive changes of the dura mater in the form of thickening and accumulation of contrast along the inner contour of the right middle cranial fossa.

- On the left, the retropharyngeal lymph node (Rouviire) with a diameter of 12.0 mm along the short axis (Figure 7).

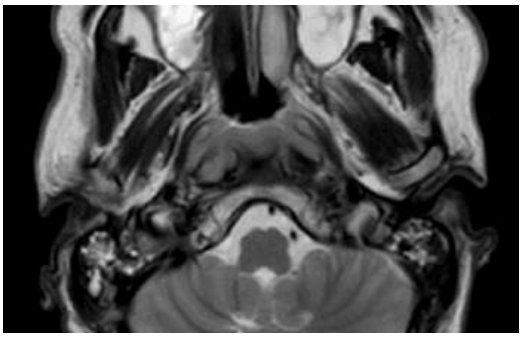

Figure 7: Left retropharyngeal lymph node

- There is no contact spread into the adjacent parapharyngeal, carotid, retropharyngeal, parotid, chewing spaces on both sides.
- On the left, multiple secondarily altered (according to the Nod-RADS classification) neck lymph nodes of groups IIa, IIb, III, IV, Va, Vb (according to the surgical classification of neck lymph nodes), (Figure 8).

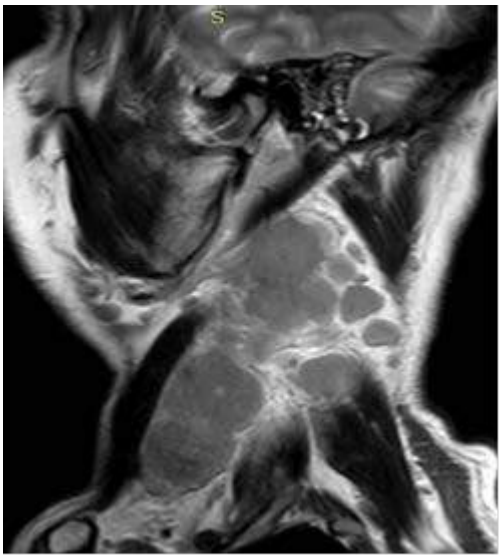

Figure 8: Secondary altered cervical lymph nodes

During the CT study, the following changes were revealed.

1. On the right, the walls of the Vidian canal are totally destroyed - perineural growth along the Vidian nerve (a branch of the facial nerve), as well as the posterior wall of the pterygoid fossa or pterygoid ganglion (Figure 9).

Figure 9: On the right, the walls of the Vidian canal and the posterior wall of the pterygoid fossa are totally destroyed. On the left, the wall of the Vidiev Canal is partially destroyed.

2. On the left, the medial wall of the Vidian canal is locally destroyed.
3. On the right, the torn opening (part of the wall of the canal of the internal carotid artery) is expanded and deformed – the cause of perivascular tumor growth into the cavernous sinus (Figure 10).

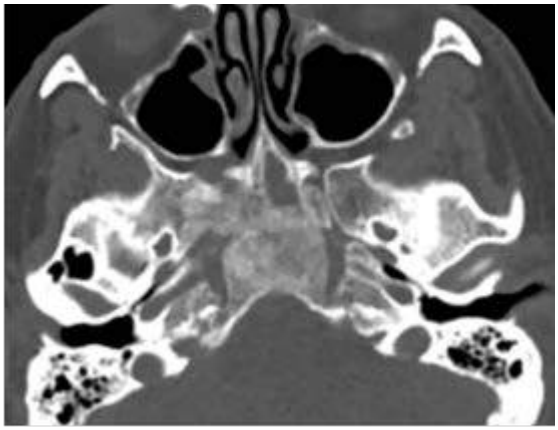

Figure 10: The torn hole is widened on the right.

Taking into account the classification of TNM (2018), local staging of the pathological process was carried out:

T-criterion: T4 - The tumor has an intracranial spread and/or involves cranial nerves, larynx, eye socket, parathyroid gland and/or spreads beyond the lateral pterygoid muscle.

N-criterion: N1 - Metastases with a maximum size of no more than 6 cm in the cervical lymph node/nodes on the side of the lesion, or bilateral metastases with a maximum size of no more than 6.0 cm in the pharyngeal lymph nodes above the caudal edge of the cricoid cartilage.

5 Conclusion

Conducting a comprehensive radiation examination of the patient (a combination of magnetic resonance imaging and computed tomography) allows for a full-fledged local staging of the pathological process in nasopharyngeal carcinoma. With this nosology, an assessment of the soft tissues of the head and neck, adjacent membranes and brain structures is required, which is analyzed in more detail during an MRI examination. In addition, an assessment of the skull bones and bone channels is mandatory, which is evaluated in more detail during the CT examination. Only a comprehensive scan makes it possible to clearly determine the presence of perivascular, perineural and perifascial tumor growth. In turn, proper staging allows the patient to choose the optimal zone for radiation therapy, since incomplete irradiation due to underestimation of the prevalence of the process will potentially lead to relapse.

6 Availability of Data and Material

Data can be made available by contacting the corresponding author.

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