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Etiology and Differential Diagnoses of Nuchal Tumors: A Study of 61 Cases

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Abstract. *Background/Aim: Compared to other cervical localizations, masses of the nuchal region are rare in the clinical practice of otolaryngologists. This study presents the relevant etiologies of nuchal tumors. Patients and Methods: This study included 61 cases (5.3%) from 1,150 consecutive cervical biopsies/neck tumor excisions between 2010 and 2022. Lipomatosis or Madelung fat neck diagnoses were excluded. Results: Seventy-seven percent of the biopsies included lymph node tissue. Among the patients, 26 were female and 35 were male. The average diameter of the tumors was 3.5 cm (1.5-9 cm). Of the 33 non-malignant formations (54%, 42.3 years), lymphadenopathy (e.g., toxoplasmosis and tuberculosis) was found in 58% of cases. Lipomas were most common among benign tumors (8 out of 14). Malignant tumors (46%, 63.4 years) included lymphomas (10 cases, 6 recurrences) and metastases (18 cases). The metastases were predominantly squamous cell carcinomas of the pharynx (9 cases, 5 recurrences) and the skin (7 cases, 4 recurrences), as well as two cases of adenocarcinomas from the lung and pancreas. Conclusion: Indications of the malignant genesis of a nuchal mass include older patient age and a history of carcinomas in the head and neck region. In carcinomas of the posterior and parietal scalp and neck skin, the nuchal region should be included in the staging and follow-up examinations.*

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Tumors of the nuchal region are rare compared to other cervical localizations in the daily practice of otolaryngologists. This may result in comparatively low experience and uncertainty when patients present with these findings (Figure 1).

Anatomical boundaries include the superior nuchal line and external occipital protuberance (cranial), an imaginary line through C7 (caudal), the nuchal ligament (medial), and a vertical line from the posterior wall of the auditory channel to the middle part of the trapezius muscle (lateral). Ventrally and anteriorly, the nuchal region borders on level V (according to the AAO-HNS level system). In a cadaver study, Veenstra *et al.* (1) detected an average of four lymph nodes in the nuchal region. Most of them were localized in the subcutaneous tissue, and fewer underneath the superficial fascia of the trapezius muscle (1).

The spectrum of possible causes for nuchal tumors is diverse and can be challenging in individual cases. Please consider revising as: When new nuchal masses occur, it is crucial to determine the underlying disease and exclude the possibility of malignancy, necessitating further diagnostic procedures.

To the best of our knowledge, no study has investigated the etiologies of nuchal tumours and important parameters for their differential diagnosis. Therefore, this topic is addressed in the current study.

Patients and Methods

Patients. This retrospective study includes patients who underwent cervical biopsies/neck tumor excisions at our tertiary otolaryngology hospital over a period of 12 years, from 2010 to 2022. Lipomatosis or Madelung fat neck diagnoses were excluded.

Figure 1. *Unknown nuchal tumor of a 56-year-old male patient.*

Table I. *Diagnoses of the nuchal tumors of the present study.*

Nuchal masses	58
Non-malignant	33
Lymphadenitis	19
Non-specific	12
Toxoplasmosis	5
Tuberculosis	2
Others	14
Lipoma	8
Cylindroma	1
Hemangioma	2
Atheroma	2
Fibroma	1
Malignant	28
Metastases	18
Squamous cell carcinoma	16
Pharyngeal	9
Skin	7
Adenocarcinoma	2
Pancreas	1
Pulmonary	1
Malignant lymphoma	10
Malignant Hodgkin	5
Non-Hodgkin lymphoma	4
Myelodysplastic syndrome	1

Indications for a biopsy were diagnosis of a previously unknown disease, recurrence of an already known one, or a strong patient request. The cases presented here exclusively involve excisional biopsies primarily performed either for therapeutic (benign tumors) or for diagnostic purposes. Usually, the neck mass was visualized using sonography and, in fewer cases, by computed tomography. In two cases, the indication for a biopsy resulted from the vote of the interdisciplinary tumor board after a PET-CT showed unclear nuchal findings.

Ethics. All investigations were conducted in accordance to accepted clinical practice and in compliance with the medical principles of the Declaration of Helsinki and German Federal Law. Prior to treatment, informed consent was obtained from all patients for both the surgical procedure and the scientific evaluation. An ethics approval for the retrospective data analysis was obtained (ethics commission of the Brandenburg State Medical Association in Germany, 2024-1-BO).

Statistical analysis. Statistical analysis was performed using IBM SPSS Statistics 23 (Armonk, NY, USA). To compare patient age, we used the *T*-test for unpaired samples. The p-values ≤0.05 were regarded as significant.

Results

This study includes the data of 61 patients (5.3%) of 1,150 consecutive cervical biopsies/neck tumor excisions. Of the patients, 35 were males and 26 females. Table I summarizes the diagnoses of the nuchal masses of this study, which included 33 non-malignant (54%) and 28 malignant (46%) histological results. The mean age was 52.0 years (range=11-83 years). The mean age of patients with malignant tumor diseases was significantly higher than that of patients with non-malignant diseases (63.4 years *versus* 42.3 years, p=0.0001).

The primary presentation reasons were mostly painless nuchal masses, which caused concern for the patient (51 cases). Eight patients presented with nuchal masses that were painful and affected neck mobility. In two cases with unclear nuchal findings in PET-CT, a biopsy was performed for the histological clarification of a previously unknown metastatic tumor. One patient had no symptoms, and the second patient previously complained of neck pain.

The median size of the nuchal masses was 3 cm (range=1.5-9 cm) on clinical examination. Out of 61 masses, 47 (77%) were located within a lymph node.

In 33 of 61 cases (54%), a non-malignant formation was diagnosed, which was mostly caused by lymphadenopathy (19 of 33 cases; 57.6%). The most frequent finding was toxoplasmosis (5 cases), followed by tuberculosis (2 cases). These two patients originated from Russia and India. Surgeries resulting in an inflammatory histological diagnosis of lymphadenopathy were performed in 13 out of 19 cases, driven by strong patient or parental wishes within the context of carcinophobia.

Benign tumors were predominantly lipomas (8 out of 14 benign tumors; 57%, Figure 2). These cases typically exhibited a long history of complaints as well as typical clinical and sonomorphological parameters. The excision

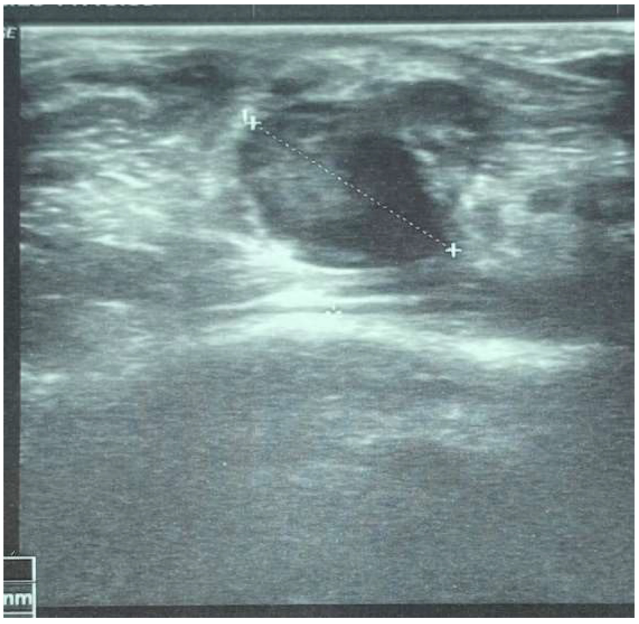

Figure 2. *Ultrasound image shows a well-defined and hypoechoic mass without posterior sound enhancement. The histological report described a lipoma.*

was usually performed to improve the patient's subjective impairment by the tumor mass. In benign tumors, surgical resection confirms the final histological diagnosis and simultaneously serves as a therapeutic intervention.

In 28 of 61 cases (46%) a malignant disease was identified, with the majority (64.3%) being metastatic diseases (Table I). In 16 out of 18 cases the primary tumors were located in the head and neck. In eight cases, the cancer origin was the pharynx and in seven cases the skin. In two cases with pharyngeal cancers, the primary tumor was a gigantic pharyngeal carcinoma with further lymph node metastases detected in levels II, III, and IV (according to AAO-HNS). In five cases, nuchal metastases were secondary manifestations, which occurred 1-3 years after the initial diagnosis of the primary tumor; in two of the five cases we studied, nuchal metastases were the only manifestation of recurrence. In the other three cases, metastases were found in the whole body (Table II).

In patients with nuchal metastases from skin cancer, the tumor origin was the parieto-occipital skin in three out of seven patients. Here, the nuchal metastases were found in the primary tumor staging. In four patients, nuchal metastases were diagnosed 6 to 20 months after the initial diagnosis of the skin carcinoma.

In two cases, the nuchal biopsy confirmed the diagnosis of a distant primary carcinoma of the pancreas and lung. In both cases, generalized manifestation of the primary tumors was already known. The remaining ten cases were malignant lymphomas. Among these, in six out of ten cases, we confirmed tumor recurrence after the initial diagnosis of lymphoma was performed in another neck level up to eight years before.

Table II. *Nuchal metastases – time of manifestation.*

Primary tumor	Total	Primary diagnosis	Recurrent disease
Pharynx	9	4	5
Skin of the head	7	3	4
Distant primary tumors	2	2	0

Discussion

Nuchal tumors are comparatively rare in an otolaryngologist's outpatient clinic. In this study, 5.3% (61 of 1,150) consecutive cervical biopsies/tumor resections were performed in the nuchal region. The majority of biopsies were lymph nodes (77%). In 14 cases, benign tumors were resected.

The mean age of the patients with malignant findings was significantly higher than that for patients with non-malignant histologies, which is in line with the literature and comparable to investigations of other anatomical regions, *e.g.*, supraclavicular (2).

Anamnesis, clinical examination, and ultrasound together provide a sufficiently reliable diagnosis, usually allowing for the exclusion of malignant origins. A fine needle aspiration cytology (FNAC) was rarely performed in this series (3). Complete removal of the nuchal mass (*e.g.*, benign tumor, metastasis) or discomfort from tumor formation indicated surgery. The occipital region is relatively superficial without dangerous structures and FNAC can easily be performed at the outpatient clinic. However, the diagnostic accuracy of the FNAC depends on the expertise of the pathologists involved.

In the majority of cases in our series (19 out 33; 57.6%), benign histologies were caused by inflammatory lymph node enlargement. In this study, toxoplasmosis caused nuchal lymph node enlargement in five cases (4). The occipital lymph nodes may react to inflammation in the drainage area or to various childhood diseases, such as measles or rubella (5). Tuberculosis in cervical lymph nodes of international patients is a remarkable differential diagnosis. Tissue for histological and microbiological investigation is necessary to confirm the diagnosis and to test for antibiotic resistance. Moreover, infiltration of the skin is a sign of specific inflammation (2).

Eight out of 14 non-malignant tumors in our series were lipomas with a definable capsule formation (Figure 2); the remaining four cases included cylindroma, hemangioma, fibroma, and atheroma. On mesenchymal neoplasms of

different histological differentiation, various individual reports and case series can be found in the available literature (6). Several authors propose the existence of so-called "distinctive fibrocartilaginous masses" as a separate entity, with a predilection for the posterior head and neck region. These neoplasms include spindle cell lipoma, pleomorphic lipoma, and nuchal fibroma, with a suspected traumatic genesis (7). In the present case of a nuchal fibroma, the history of a traffic accident with a deceleration trauma was documented.

This study included a higher proportion of men (57%), which is in line with earlier studies showing malignant squamous cell carcinomas of the pharynx and the skin more frequently in male. Non-malignant histological results were equally distributed between men and women. Nuchal metastases are very rare in patients with primary tumors of the upper aerodigestive tract. The estimated frequency is less than one percent in this department and in the available literature (8). In this study, nuchal metastasis of primary tumors were gigantic pharyngeal carcinomas with lymph node metastases reaching the nuchal region *via* the lateral cervical field. Additionally, we found nuchal recurrence metastases, which may be explained by an altered lymphatic drainage as the result of the previous therapy (Figure 3) (9, 10).

If metastatic disease is suspected, radiological investigations of the head, neck, thorax, and upper abdomen should be performed. Endoscopic examination and histological confirmation of the metastasis can be performed. Therapeutic options depend on the tumor, stage of recurrence, and previously performed therapy. Advice on the therapeutic approach should be discussed by an interdisciplinary tumor board (of tumor head and neck surgeons, radio therapeutic oncologists, medical oncologists). Therapeutic options include surgical revision, radiation therapy, and systemic oncological therapy. In our experience, surgical revision with adjuvant radiation therapy is often possible because the nuchal region is typically not situated within the primary radiation field.

Nuchal metastases of cutaneous carcinomas are found in primary tumors localized in the posterior and parietal scalp and neck skin. The importance of nuchal lymph nodes for the metastases of cutaneous primary tumors has to be emphasized (11, 12). Thus, evaluation of the nuchal lymph nodes in primary staging and follow-up in patients with cutaneous squamous cell carcinoma of the posterior and parietal scalp and neck skin is advisable. In this context, we propose extending the topographical classification of cervical lymph nodes to 10 levels, which include the nuchal as well as the parotideal and buccal lymph nodes (13).

Malignant lymphoma was the second most common malignant tumor entity in our series, and the importance of recurrences after initial diagnosis is striking. In latter cases, the first confirmation of the lymphoma was typically obtained within another cervical lymph node station. We have been able to demonstrate the importance of malignant lymphomas in both nodal and extranodal localization for our patients previously. Good biopsy access is certainly also an explanation (2, 14).

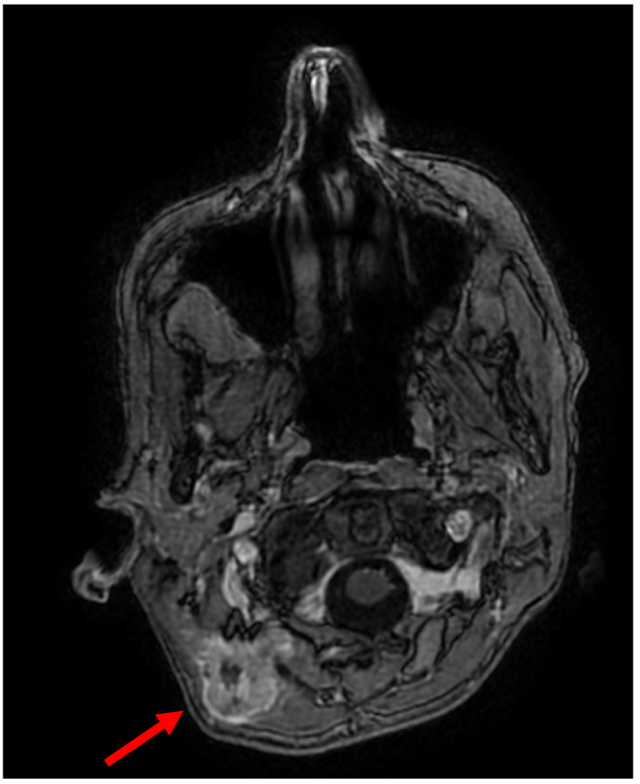

Figure 3. *Magnetic resonance imaging scan showing a nuchal tumor that is hypointense and has poorly defined borders. The histological result indicated metastatic squamous cell carcinoma.*

The (hematogenous) distant metastases of infraclavicular primary tumors or other tumor entities originating from the mesenchyma are reported casuistically in literature. Both cases in this study were confirmed by biopsy after a PET-CT. In one case, the patient also complained of pain in the nuchal region. Nuchal metastases are a sign for tumor spread (15-17).

Limitations of the study include its retrospective design and the presentation of results from a single center, which focusses on head and neck cancer treatment. Further studies should investigate the extent to which the results can be extrapolated to the general population. Specifically, research should focus on how these findings can be practically applied by an ENT doctor.

Conclusion

In a wide range of different etiologies, this study identified a significant proportion of malignant nuchal masses. Indications

of the malignant genesis of a nuchal mass include older patient age and a history of carcinomas of the head and neck region. For carcinomas affecting the posterior and parietal scalp as wells as the neck skin, the nuchal region should be included in the staging and follow-up examinations.

Funding

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Conflicts of Interest

The Authors have no conflicts of interest to declare in relation to this study.

Authors' Contributions

Franzen: wrote the manuscript, designed the study; Buchali: revised the manuscript; Coordes: revised the manuscript.

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