

CT Evaluation of Squamous Cell Carcinoma of the Nasopharynx

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ABSTRACT: Squamous cell carcinoma is the most common type of neoplasia which affects the mucosa of the upper aero-digestive tract. Nasopharyngeal carcinoma is a unique disease with clinical behavior, epidemiology, and histopathology that is different from that of squamous cell carcinomas of the head and neck. For malignant tumors such as SCC, rapid growth may occur even though there are no previous clinical signs. Enlargement of a cervical lymph node, as the first presenting feature of neoplasia, is not uncommon, particularly with certain "silent" site, such as nasopharynx. Therefore, clinical examination must be complemented by radiological examination for the assessment of size, thickness and depth of the tumor, the degree of bone tissue invasion, and to detect the presence of enlarged lymph nodes. A total of 16 cases of patients were studied using CT, all diagnosed and operated with squamous cancer with localization in the nasopharynx.

KEYWORDS: Computed tomography, nasopharynx, squamous cell carcinoma

Introduction

The most frequent type of cancer which affects the mucosa of the upper aero-digestive tract is the squamous cell carcinoma, which accounts 89% of all cancer types [1].

Rhinopharyngeal carcinoma (also known as NPC) is a distinct disease with different symptomatology, epidemiology, and histopathology from the squamous cell carcinomas arising in head and neck [2].

This type of neoplasia develops from the epithelial cells of the rhinopharynx mucosa and frequently arises from the lateral wall of the pharynx usually in Rosenmuller fossae [3].

Nasopharyngeal carcinoma has an extremely unbalanced endemic distribution [4], and although is rare in some parts of world [5], it is endemic in certain regions, especially in Southeast Asia (accounting for 40% of all incident NPC cases worldwide) [6,7], northern Africa (10-20% of childhood malignancies in Africa) [2], and Alaska [8].

Epidemiologically, the NPC affects both sexes, with a gender ratio of 3:1 in favor for males [2], and affecting individuals with age between 40 and 60 years, with two age peaks which appear in the decades of life II and VI [9-13].

Rhinopharyngeal cancer is due to the combined effect of genetic inheritance, living behavior influence, such as the exposure to carcinogen chemicals, and tobacco smoking, and also Epstein-Barr viral coinfection [2,3,14-22].

In the case of neoplasia, a rapid growing may happen even if there are no previous clinical signs [23].

Size increase of lymph nodes in the neck, as prime sign of neoplasia, is a common feature, especially in this discreet area, such as nasopharynx [24].

Therefore, the clinical examination should be completed with a radiological examination [25] for the assessment of tumor development [26], the degree of bone tissue invasion [23], as well as to detect the presence of enlarged lymph nodes [27].

Material and methods

In this study, 16 patients were analyzed, all of whom were diagnosed and operated with squamous cell cancer with localization in the rhinopharynx.

The selection period of the patients analyzed was spread over a period of 4 years (between 2014 and 2017).

The following criteria were used in the selection of cases:

- The patients' age to be between 40 and 75 years;
- The diagnostic of the patients to be squamous cell carcinoma with nasopharyngeal localization, exophytic shape;
- Patients without metastases.

Computed tomography (CT) was used in all 16 cases under study, this being necessary both for the diagnosis of nasopharyngeal neoplasias and for their staging.

The characteristics of the equipment, the contrast agent used and the technique of its administration were as follows:

- CT-Siemens Duo Emotion, multislice of 2mm, contigue, FOV 200, KV 130, mA 100, mAs 58.

- Iodinated water-soluble contrast substance, 350mg/ml, administered intravenously with the injector, with a flow rate of at least 2.5ml/sec, with a delay of 25 seconds until the first postcontrast acquisition.

- Multiplanar Reconstruction (MPR) in the other 2 plans (sagittal and coronal).

- Bone window reconstruction.

Results

The 16 cases analyzed were exophytic carcinomas, which were prominent in the pharyngeal lumen.

From this group of 16 patients with neoplasia affecting the rhinopharynx, depending on the anatomical region in which the presence of neoplasia was identified by the CT exam, the number of patients whose tumor mass was limited as loco-regional extension only to the anatomical area of the nasopharynx is 4 (25%); in the studied group, most patients (62.5%) had simultaneous involvement of nasopharynx and the oropharynx without being able to clearly identify the starting point (Table 1, Fig.1).

It can be also seen the predominance of this neoplasia in male patients regardless of the extent of tumor mass (Table 1).

Neoplasms that affected concomitantly rhinopharynx, oropharynx and hypopharynx were found in 2 patients (as seen in Table 1, Fig.2), and were described as parietal tumor thickening or exophytic tumor masses.

In the study group it was identified 5 cases of well differentiated squamous cell carcinoma, 4 cases of intermediate differentiated SCC and 3 low differentiated SCC cases; in this study were found 4 cases with undifferentiated SCC.

From the point of view of the structure, all the studied tumors had a heterogeneous structure on both native and postcontrast phases, with irregular ill-defined contour in all cases.

On computed tomography was found that well differentiated squamous cell carcinomas had areas of necrosis in 3 cases, and intermediate differentiated SCC feature necrosis in half of the cases with this type of SCC; all of the cases with poorly differentiated SCC, and one case of undifferentiated carcinoma had intratumoral necrosis (Table 2).

The difference between the types of SCC cannot be performed with the CT exam, even if it is used in the diagnosis and staging of this malignant tumor, but only through the anatomopathological examination.

This assessment could only be related to the degree of contrast enhancement of the tumor mass, but which is in fact only a sign of the degree of neoformation vessels in the tumor and is not necessarily a criterion for assessing the degree of cellular multiplication.

Most tumors analyzed in the study showed a moderate contrast enhancement, accounting 87.5% of cases (Fig.3), and in only 2 cases it was observed that contrast medium enhancement was intense (Table 3).

The majority of cases that are located only in the rhinopharynx, have sizes less than 4cm (maximum diameter), except the case of a patient with SCC intermediate differentiated which had endocranial extension, with distruction of the etmoid, but does not invade the wall of the orbit and the skull base, but completely invades the rhinopharinx.

The other cases were represented by large tumors, infiltrating at least another level of the pharynx.

For the staging of a neoplasia by computed tomography, the involvement of the lymph nodes is a necessary assay.

Analyzing the 16 patients with SCC in the nasopharynx, with regard to the size of adenopathies in the study group, the following results are described in Table 4.

It can be observed that, in half of the cases analyzed, the adenopathies had dimensions over 2cm, and disposing in blocks in 87.5% of the cases (Fig.4).

Adenopathic blocks were identified also in the dimensional group of "1-2cm", but in a much smaller percentage (20%).

Table 1. The distribution of cases according to the location of the neoplasia and the sex of the patients

Localization	No. of cases	No. male cases	No. female cases
RF	4	3	1
RF+OF	10	10	0
RF+OF+HF	2	1	1

Legend: RF=rhinopharynx, RF+OF=rhinopharynx+oropharynx, RF+OF+HF=rhinopharynx+oropharynx+hypopharynx



Fig.1. Neck CT-native (A), arterial phase (B), and the venous phase (C): tumor mass developed at the left fossa of Rosenmüller

Table 2. The distribution of cases according to the presence of tumor necrosis in relation to the histological type

Necrosis	Well differentiated SCC	Intermediate differentiated SCC	Poorly differentiated SCC	Undifferentiated SCC
Present	3	2	3	1
Not present	2	2	0	3

Legend: SCC=squamous cell carcinoma

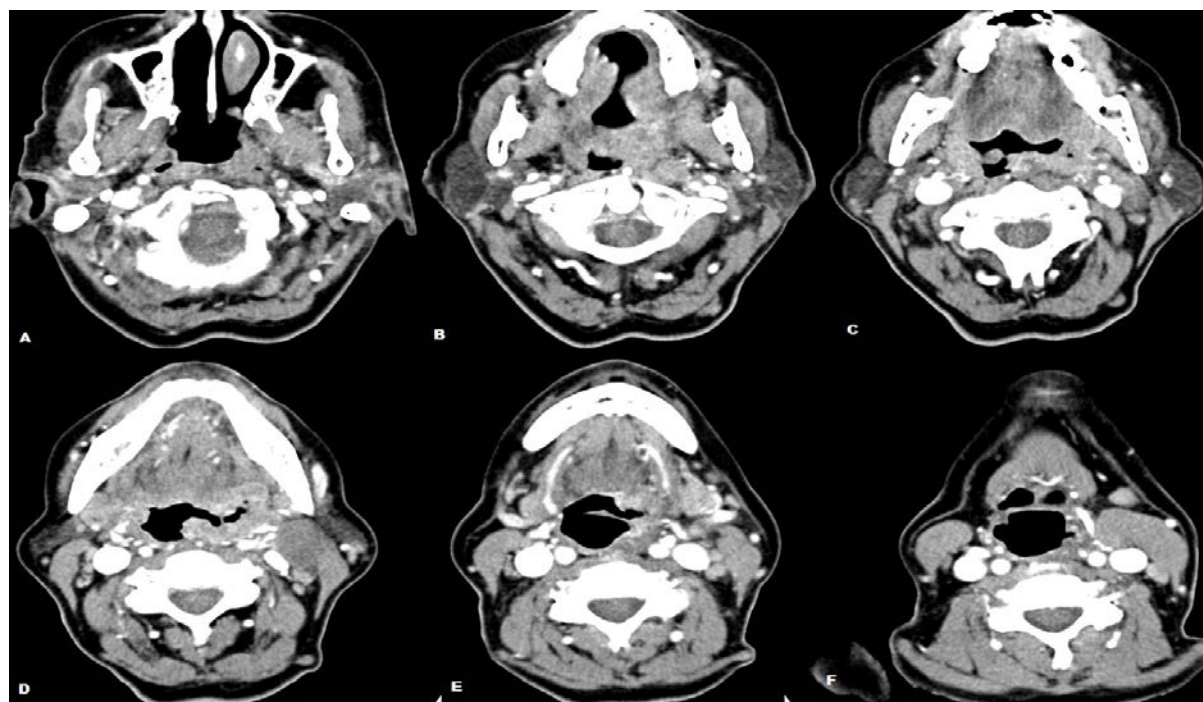


Fig.2. Neck CT-arterial phase: extensive tumor mass in the left latero-posterior wall of pharynx (C) occupying the fossa of Rosenmüller (A), including the left palatine tonsil (B), extended to the left parapharyngeal space (D), infiltrates the left margin of the epiglottis (E), and partially occupies the left epiglottic vallecula (F)

Table 3. The distribution of cases according to the contrast enhancement of tumor in relation to the histological type

Contrast enhancement	Well differentiated SCC	Intermediate differentiated SCC	Poorly differentiated SCC	Undifferentiated SCC
None	0	0	0	0
Low	0	0	0	0
Moderate	4	4	2	4
Intense	1	0	1	0

Legend: SCC=squamous cell carcinoma



Fig.3. Neck CT-arterial phase: tumor mass in the right lateral wall of nasopharynx, protruding in the lumen of the pharynx, with moderate inhomogeneous enhancement

Table 4. The distribution of cases according to the size of the adenopathies

Size	<1cm		1-2cm		>2cm	
	Isolated	In blocks	Isolated	In blocks	Isolated	In blocks
Aspect						
No. of cases	3	0	4	1	1	7



Fig.4. Neck CT-venous phase: left-side necrotic jugular adenopathic block in a patient with invasive squamous cell carcinoma moderately differentiated

Discussion

Rhinopharyngeal cancer represents about 70% malignant tumors of the nasopharynx, with a low frequency in the Caucasian population, but with high rate in Asians [28,29].

Malignant tumors, such as SCC, may show a rapid growing, even if clinically nothing has been identified [30].

Therefore, a radio-imaging examination should be performed. [25].

The signs and symptoms of nasopharyngeal carcinoma can be subtle and unspecific often. They are frequently linked to the loco-regional infiltration or distant invasion, and also the possible metastasis from the tumor [5].

These could be represented by neck lymph nodes enlargement, nasal obstruction, epistaxis, nasal leakage, and neurologic, ear and eyes impairment [5].

From the morphological point of view the tumor can be: infiltrating type, ulcerating type, or exophytic type [17].

The individuals usually accuse regional symptoms, like nose bleeding and obstruction, as well as deafness, ear pain, headache, and cranial nerve damages [2].

Nevertheless, the rhinopharynx is known as a discreet area from the clinical point of view; hence, the neck adenopathies and metastasis can be the prime manifestation of the disease [9-13,31].

Computed tomography is usually the first imaging method used to evaluate and staging nasopharyngeal tumors, as it can evaluate the size and extension of the tumor [26], assess areas that are not accessible from a clinical point of view [32], and can highlight the existence of bone involvement and metastatic lymph nodes [26]. And so, after CT examination, the stadialization of neoplasia is upgraded in more than one third of patients [27].

In a study conducted by Wani [5], SCC affected in most cases the male patients (72.3%), with the male: female ratio of 2.61:1, being similar with the ratio described by Dong et al [33]. In our study, a predominance of male sex was also observed, with a percentage of 87.5%, but with a male: female ratio of 7:1.

Other studies presents the same high rate of the disease in males [3,14,19,21,22,34-40].

Also, it is stated in paper of Wani [5] that women with nasopharyngeal cancer have good prognosis, and more than 80 % of them survive at 5 year. The favorable outcome of women with this type of neoplasia was assign to the rapidly

diagnosis and therapy, as well as some female's intrinsic factors [41].

A balance of the histological types of neoplasia can be observed, the cumulative percentages of each type not having a significant difference.

On the other hand, in the group studied by Frare [42], the undifferentiated form of SCC was found in only 7.15% of patients, and in Douglas's study [43], this form was identified in 66% of the subjects studied; however, Tao presents in his study [44] a percentage of just 1.5% of all cases with well-differentiated type of SCC and Boia [45] said that well-differentiated type and its variants are noticed in 5 to 10 percent of patients with nasopharyngeal cancer, represented by keratin producing cells [46,47].

It can be observed that there is no concordance of the studies presented in the literature on the frequency of the histological form, although those forms influence the therapeutic conduct and thus, the survival of the patients.

For the assessment of the full characteristics of the tumor, by computed tomography, is necessary the evaluation of the degree of contrast enhancement of the lesion [23].

It is considered that SCC masses usually showed significant enhancement [48], but in our study the intense contrast enhancement was observed in just 12.5%.

In TMN staging of a neoplasia, one of the criteria is the size of adenopathies. Highlighting a tumor mass along with the presence of any neck adenopathy on CT images is a statement that the identified lesion is malignant [23].

Regional infiltration of the tumor, neck adenopathies and the metastasis are the most valuable elements, which are all encountered in TNM system [5].

Abundant lymph vessels underneath the nasopharyngeal mucosa space result in higher frequency of lymph node metastasis diagnosis in NPC patients, and those patients come to the hospital primarily for masses in the neck [33].

In a survey of 271 new cases marked as NPC, 75.3% had lymph node metastases [49].

Another study showed that the percentage increased to 80% during MRI examinations [50].

In the study of Tang [6], from a total of 2366 patients, the rate of LN metastasis was 81.1%, and bilateral LN involvement was observed in 52.3% of patients, and in another paper [33] lymph nodes were invaded with rates of 64.8%.

The presence of necrosis in metastatic adenopathies is strictly related to their mode of appearance, being determined by primary neoplasia [51,52].

Withal, can be noticed the importance of the tumor size, as well as the degree of tumor differentiation [53].

In this study it is observed that adenopathies above 2cm commonly form adenopathic blocks.

In NPC patients, besides affecting the lymph nodes, parapharyngeal space, and skull base were commonly invaded with rates of 81.3%, and 53.3% respectively [33].

Impairment of the base of the skull is due to the expansion towards the cranium of the tumor from the nasopharynx, and this extension is seen in approximately 30% of the cases with nasopharyngeal cancer [54].

Brennan [3] stated that nasopharyngeal carcinoma, can extend to the base of the skull or the palate, nasal cavity or oropharynx.

Also, Ngan et al [55] presented a case of a patient in which the CT scan showed intracerebral extension by NPC over the skull base and extensive cerebral edema surrounding the invading tumor.

In our analysis, we found that the majority of cases the tumors extended in parapharyngeal spaces and to the others levels of the pharynx, except one case of a patient with SCC intermediate differentiated which had endocranial extension.

The cases with endocranial invasion have poor prognosis, and reflects the aggressiveness of the tumor and the progressive stage of neoplasia [5].

Conclusion

Imaging plays an important role in the staging of nasopharyngeal carcinoma.

Exact staging is necessary because treatment depends directly on the stage of neoplasia. CT allows the evaluation of tumor extension, including tumor spread in the parapharyngeal spaces, bones and intracranial involvement, which cannot be clinically or endoscopically assessed.

The volume of the tumor can be established by the CT examination, as well as it can guide on the levels of its invasion.

CT scanning can provide the staging of neoplasia that can guide the ENT surgeon to choose a therapeutic strategy and also provide the anatomopathologist with information on the tumor's characteristics.

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