The role of cross-sectional imaging in suspected nasopharyngeal carcinoma

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ABSTRACT

INTRODUCTION Nasopharyngeal carcinoma is a rare neoplasm in the UK. The current gold standard for detection is endoscopic examination under anaesthesia of the nasopharynx with biopsy. Many clinicians are now advocating cross-sectional imaging as the primary investigation. The objective of this study is to evaluate the role of cross-sectional imaging in detecting nasopharyngeal carcinoma and ultimately to avoid unnecessary biopsy.

MATERIAL AND METHODS This is a retrospective uncontrolled case series review of patients who were investigated for suspected nasopharyngeal carcinoma between 2009 and 2017 at York Teaching Hospital NHS Foundation Trust. At present, any suspected nasopharyngeal carcinoma requires biopsy. Search terms used were 'endoscopic biopsy of nasopharynx', 'endoscopic examination + biopsy nasopharynx'. The main outcome measures are reported histological and radiological features of malignancy. Only patients who had imaging prior to the biopsy were included.

RESULTS A total of 144 patients had endoscopic examination under anaesthesia of the nasopharynx with biopsy. Approximately one-third of these patients had cross-sectional imaging before the biopsy. The study revealed that magnetic resonance imaging had 100% sensitivity and 84% specificity; however, the endoscopic examination under anaesthesia and biopsy had only 88% sensitivity. This is due to a negative histological finding despite radiological characteristics of nasopharyngeal carcinoma in some patients. However, the specificity was 100%.

CONCLUSION The study supports magnetic resonance imaging as the primary investigation in patients with suspected nasopharyngeal carcinoma followed by endoscopic examination under anaesthesia and biopsy in cases with suspicious findings on imaging only.

KEYWORDS

Nasopharyngeal neoplasms – Magnetic resonance imaging

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Introduction

Nasopharyngeal carcinoma is a rare type of head and neck cancer. It accounts for approximately 2–3% of all head and neck cancer diagnosed in the UK, but it is more common in south China, North Africa and Alaskan populations.¹ Factors that increase risk include exposure to the Epstein-Barr virus, a diet containing dimethylnitrosamine, such as salt-cured fish, or genetic abnormalities.¹ Patients with nasopharyngeal carcinoma can present with a number of symptoms including unilateral conductive hearing loss due to otitis media with effusion, nasal symptoms such as unilateral nasal obstruction or epistaxis, cranial nerve neuropathy and neck node metastasis.¹ Many of these symptoms are also frequently seen in far less serious medical conditions and nasopharyngeal carcinoma is often detected when the patient is referred with another diagnosis in mind. Examination by an otolaryngologist would include nasal endoscopy to look for any sign of a growth in the nasopharynx.

The current gold standard for detecting nasopharyngeal carcinoma is endoscopic examination under anaesthesia of the nasopharynx (EUA NP) with biopsy.¹ Biopsy can also be performed in the clinic, although this is not common in our practice. Positive clinical findings during endoscopic examination rely on the primary tumour being visible in the nasopharynx. If the tumour is submucosal or within the fossa of Rosenmüller, it may not be seen or biopsied.^{2,3} If there is a neck mass, this is suspicious for metastatic spread of a cancer and this would be investigated with fine needle aspiration cytology.⁴

Cross-sectional imaging has been used to stage nasopharyngeal carcinoma that has been confirmed on biopsy, for 20 years,^{5,6} and its merits as a diagnostic tool have also been described.^{7,8} Currently, magnetic resonance imaging (MRI) or computed tomography (CT) of the head, neck and chest are not used as a primary investigation for nasopharyngeal carcinoma, probably due to concerns about whether it is able to detect small mucosal cancers of the

aerodigestive tract. Thus, histological examination remains the only modality that confirms cancer at present.

The aim of this retrospective review is to compare the accuracy of MRI and CT with the current practice of endoscopic guided biopsy, and subsequently, to determine whether imaging is able to detect cancers that were missed at biopsy, and to determine whether imaging can safely identify a group of patients that do not have nasopharyngeal carcinoma and therefore they can avoid unnecessary endoscopic examination under anaesthesia.

Materials and methods

This is a retrospective uncontrolled case series review of all cases that were investigated for suspected nasopharyngeal carcinoma using EUA PNS and biopsy between 2009 and 2017 at York Teaching Hospital NHS Foundation Trust. Currently, any patient with suspected nasopharyngeal carcinoma is most likely to have EUA NP and biopsy. Therefore, to identify these patients accurately, the waiting list search engine was used looking for the following terms: endoscopic biopsy of nasopharynx, endoscopic examination + biopsy nasopharynx. The results were separated into negative or positive histological findings. To minimise any bias in methodology, only patients who had CT and/or MRI prior to the EUA NP and biopsy were included in this analysis.

Results and analysis

A total of 144 patients who underwent EUA NP were included in the study. The mean age is 51.6 years (range 17–86 years). The study revealed that a 105 male patients were included (mean age 50.7 years, range 17–86 years) and 39 female patients (mean age 52.9 years; range 25–85 years). Three patients from the MRI group and five patients from the CT group were excluded because they had their scans after the biopsy. All these patients had a flexible nasopharyngeal endoscopic examination in the outpatient clinic. The main indications for EUA PNS were unilateral nasal obstruction (20%), unilateral otitis media with effusion with or without abnormal mass in the nasopharynx (70%), and an incidental finding of a nasopharyngeal lesion on imaging that had been arranged for a different pathology (5%).

The procedures were performed under general anaesthesia by a middle grade in ear, nose and throat (staff grade, registrar, associate specialist) or a consultant grade. The data revealed that 29% and 23% received an MRI or CT, respectively, prior to EUA NP and biopsy.

In other cases, both imaging and biopsy were requested simultaneously, during outpatient consultation, yet coincidentally a biopsy was taken prior to imaging. A handful of patients had imaging requested under another specialty and had incidental radiological findings in the nasopharynx that were then biopsied. Patients with recurrent negative biopsy results and high clinical suspicion underwent imaging for further investigation. Various investigation modalities were analysed, including MRI, CT, flexible nasal endoscopy and histological findings. Both MRI and CT have 100% sensitivity and 100% negative predictive value,

Table 1 Comparison of investigation modalities (%).

	MRI	CT	FNE	Biopsy
True negative (%)	19	33	11	88
False negative (%)	0	0	6	2
True positive (%)	7	39	10	10
False positive (%)	3	27	74	0
Sensitivity (%)	100	100	64	88
Specificity (%)	84	55	13	100
Positive predictive value (%)	67	60	12	100
Negative predictive value (%)	100	100	67	98
Accuracy (%)	88	73	21	98

CT, computed tomography; FNE, flexible nasal endoscopy; MRI, magnetic resonance imaging.

which supports avoiding EUA NP and biopsy if there are no suspicious findings on cross-sectional imaging. The data analysis is demonstrated in Table 1.

Discussion

The study compared different modalities in the investigation of nasopharyngeal carcinoma including clinical examination, MRI, CT and histology. In this group of 144 patients, 22 (15%) had a confirmed diagnosis of nasopharyngeal carcinoma. Approximately, one-third of these patients had a cross-sectional imaging (MRI, CT) prior to the procedure (29%, 23%, respectively). Some 17% of patients had a normal nasopharyngeal mucosa during outpatient examination. However, they had other associated suspicious findings such as unilateral otitis media with effusion, neck mass or unilateral otalgia. A cross-sectional imaging study was requested prior to biopsy in all these patients.

Owing to negative histological examination, despite radiological features of cancer, only 12% of patients had nasopharyngeal carcinoma on histopathological study alone out of overall nasopharyngeal carcinoma cases.

MRI and CT have 100% sensitivity and a 100% negative predictive value, however MRI has a higher specificity and positive predictive value. Flexible nasal endoscopy and biopsy are much less sensitive (64% and 88%, respectively), meaning that patients undergoing these investigations may have lesions that are not detected. Biopsy is 100% specific, making this the investigation of choice once a lesion is demonstrated on imaging. The study revealed similar findings to King *et al.*⁶ However, it included CT in the comparison between different modalities. Nevertheless, a larger prospective study is required aiming to perform MRI followed by biopsy in all suspected cases of pathology to provide a higher level of evidence prior to identify the MRI as a gold standard modality of investigation for nasopharyngeal carcinoma.

Conclusion

The study has revealed that nasopharyngeal carcinoma can be ruled out if there are no suspicious findings on MRI or CT. MRI is superior to CT in detecting tumours. It has identified submucosal cancers that have been missed during the endoscopy examination and during biopsy. The study supports MRI as the primary investigation in patients with suspected nasopharyngeal carcinoma, followed by examination of the nasopharynx under anaesthesia and biopsy only in cases with suspected radiological features of nasopharyngeal carcinoma on MRI, to avoid any unnecessary invasive diagnostic procedures. This review also highlights the need for a larger multicentre trial aiming to identify the significance of MRI in any suspected nasopharyngeal carcinoma.

References

1. Simo R, Robinson M, Lei M *et al.* Nasopharyngeal carcinoma: United Kingdom National Multidisciplinary Guidelines. *J Laryngol Otol* 2016; **130**(Suppl. S2): S97–S103.
2. Wei WI, Sham JS, Zong YS *et al.* The efficacy of fiberoptic endoscopic examination and biopsy in the detection of early nasopharyngeal carcinoma. *Cancer* 1991; **67**(12): 3,127–3,130.
3. Sham JS, Wei WI, Kwan WH *et al.* Fiberoptic endoscopic examination and biopsy in determining the extent of nasopharyngeal carcinoma. *Cancer* 1989; **64**(9): 1,838–1,842.
4. National Institute for Health and Care Excellence. *Cancer of the Upper Aerodigestive Tract: Assessment and Management in People Aged 16 and Over*. NICE guideline NG36. London: NICE; 2016 (last updated 2018).
5. Olmi P, Fallai C, Colagrande S *et al.* Staging and follow-up of nasopharyngeal carcinoma; magnetic resonance imaging versus computerized tomography. *Int J Radiat Oncol Biol Phys* 1995; **32**: 96–800.
6. King AD, Lam WW, Leung SF *et al.* MR imaging of local disease in nasopharyngeal carcinoma: tumour extent vs tumour stag. *Br J Radiol* 1999; **72**: 734–741.
7. King AD, Vlantis AC, Bhatia KSS *et al.* Primary nasopharyngeal carcinoma: diagnostic accuracy of MR imaging vs that of endoscopy and endoscopic biopsy. *Radiology* 2011; **258**: 531–537.
8. King AD, Vlantis AC, Yuen TWC *et al.* Detection of nasopharyngeal carcinoma by MR imaging: diagnostic accuracy of MRI compared with endoscopy and endoscopic biopsy based on long-term follow-up. *Am J Neuroradiol* 2015; **36**: 2,380–2,385.