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Lateral cystic neck masses in adults: a ten-year series and comparative analysis of diagnostic modalities

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Main Article

Mr G H Jones takes responsibility for the integrity of the content of the paper

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Abstract

Background. In adults, the solitary lateral cystic neck mass remains a diagnostic challenge with little solid material to target for cytology and few clues on imaging modalities to suggest underlying malignancy.
Method. This study was a retrospective review of patients presenting with a lateral cystic neck mass to a tertiary academic head and neck centre over a 10-year period.
Results. A total of 25 of 157 cystic lesions were subsequently malignant on paraffin section histopathology, with the youngest patient being 42 years. In the age cohort over 40 years, 30 per cent of males and 10 per cent of females were diagnosed with malignancy. The ipsilateral palatine tonsil was the most common primary site (50 per cent). A total of 85 per cent of cases demonstrated integrated human papillomavirus infection. Age, male sex and alcohol were significant risk factors on univariate analysis. Ultrasound-guided fine needle aspiration cytology and magnetic resonance imaging represented the most accurate pre-open biopsy tests.
Conclusion. The authors of this study advocate for a risk-stratified, evidence-based workup in patients with solitary lateral cystic neck mass in order to optimise timely diagnosis.

Introduction

The solitary lateral cystic neck mass in adults remains a diagnostic challenge for head and neck surgeons. The majority of published studies report a benign congenital cyst as the most common diagnosis in the absence of any other signs or symptoms of head and neck cancer; however, the rates of malignancy vary widely (9–72 per cent), with a direct positive correlation with increasing age.[1–8]

Diagnostic uncertainty creates significant anxiety for patients, and reliance on inaccurate investigations may result in delayed or inappropriate management for concealed malignant disease in, for example, the oropharynx or thyroid.

A number of series have been published in an attempt to quantify the diagnostic accuracy of investigations, although these often focus on a single diagnostic modality. Ultrasound can be used to examine the thickness of the cyst wall and the presence of solid elements to help guide fine needle aspiration cytology (FNAC) or core needle biopsy.[9] Computed tomography (CT) and magnetic resonance imaging (MRI) are useful to examine potential primary tumour sites and assess the anatomy surrounding the cystic mass for surgical planning, although their ability to differentiate benign and malignant neck masses is often limited.[10,11] Fluorine-18 fluorodeoxyglucose positron emission tomography-CT (PET-CT) is gaining popularity in the workup of cystic neck nodes,[12] but limitations include incidental false-positive findings in other organ systems in up to 33 per cent of head and neck cancer patients and significant doses of ionising radiation; a cost-benefit advantage has not been proven.[13] Fine needle aspiration cytology is useful in the diagnosis of solid neck masses but is often limited in lesions extensively affected by cystic degeneration because of a paucity of cellular material to target with resultant poor diagnostic accuracy.[14] For cystic neck masses, the sensitivity and specificity yields improve as more viable solid material is obtained (open biopsy is better than core needle biopsy which is better than FNAC). The sensitivity for FNAC, core needle biopsy and frozen section has been quoted as 59 per cent, 83 per cent and 93 per cent, respectively, and specificity has been reported as 83 per cent, 100 per cent and 92 per cent, respectively.[15] Although open biopsy obtains the greatest diagnostic accuracy, there are historical concerns regarding neck contamination and potential spillage or dissemination of cancer cells.[16,17] However, evidence suggests that tumour seeding from the head and neck is a very rare occurrence.[18,19]

We present our 10-year experience of investigating the solitary lateral cystic neck mass in adults, representing the largest published series of this clinical presentation to date.

These numbers allow both a comparative analysis of diagnostic accuracy for a wide range of investigative modalities and regression analysis of variables that may increase the risk of a subsequent malignant diagnosis. Finally, we suggest a management algorithm to help stratify investigations for patients with these lesions and minimise time to diagnosis.

Materials and methods

Case identification and review

All patients presenting with a solitary lateral cystic neck mass to our tertiary academic head and neck centre between 2009 and 2019 inclusive were identified. We retrospectively reviewed operating theatre records, electronic patient records, and the head and neck cancer registry to collect demographic data, reports or outcome of investigations, histopathology reports, and final diagnosis.

Exclusion criteria included: less than 18 years of age, midline lesions, primary skin lesions (basal cell carcinoma, sebaceous cyst), multiple synchronous pathological lymphadenopathy and an obvious primary tumour on oral inspection or flexible endoscopy. Cases were also excluded if there was an obvious primary thyroid lesion on ultrasound that was later confirmed by thyroid excision histology. Human papillomavirus (HPV) testing of tissue potentially from primary oropharyngeal malignancies became routine midway through the study period and included in-situ hybridisation and immunohistochemistry for p16 protein; both were required for viral confirmation.

Literature review

In order to identify comparable case series, we searched the Medline electronic database for English-language articles between January 1990 to July 2020 using the following search terms: lateral neck cyst and lateral cervical cyst. We identified additional references by screening bibliographies of identified series.

Data analysis

Likelihood ratios predicting the presence of malignancy based on a positive result in each investigative modality were calculated, given a positive test result (sensitivity divided by 1-specificity) and a negative test result (1-sensitivity divided by specificity). Further, the accuracy of each test (i.e. the overall probability that a patient is correctly classified as having benign or malignant disease) was calculated (sensitivity × prevalence + specificity × (1 − prevalence). All analysis was performed using Microsoft Excel® and SPSS® statistical software (version 22).

Overview

A total of 558 cases were identified from our initial case search. Following application of inclusion criteria and removal of duplicates, a total of 164 cases were identified with final histopathological diagnosis available for 157 patients (Table 1). This comprised 25 cases with a final diagnosis of malignancy and 132 benign cysts. The histopathological diagnosis was confirmed from either the primary tumour or cystic node. A total of 2 of 25 malignant cases had a diagnosis of differentiated thyroid carcinoma, both of which were diagnosed by cyst excision. The other 23 malignancies were squamous cell carcinoma (SCC). In these cases, a primary tumour was visualised on panendoscopy in nine cases. In the remaining 14 cases, clinicians performed tonsillectomies and guided biopsies of the high-risk sites (post-nasal space and tongue base) and identified a further 8 tumours. In the group with subsequently confirmed benign cysts ($n = 132$), rigid endoscopy was performed 24 times at the time of the initial excision, and biopsies of high-risk sites were performed in 16 cases including 5 tonsillectomies, all without yield of malignant tissue.

Table 1. Final pathological diagnosis

Parameter	Patients (*n*)
Benign*	
– Branchial cyst	126
– Oncocytic cystadenoma	2
– Schwannoma	2
– Mucocele	1
– Warthin's tumour	1
Malignant†	
– Squamous cell carcinoma	23
– Differentiated thyroid carcinoma	2

*n = 132; †*n* = 25

For the SCC cases, the ipsilateral palatine tonsil was the most common site of primary tumour (13 of 23), followed by cancer of unknown primary disease (6 of 23). Base of tongue and hypopharynx were the site of primary disease in two cases each. No contralateral primary tumour to a cystic node was identified. Importantly, of 13 malignant cases tested for HPV, 11 were determined positive. The number of neck cysts presenting per year remained stable for the whole study period.

Age distribution

There were no cases of malignancy under the age of 40 years. The rate of malignancy increased with age, but did not rise above 31 per cent as a proportion of total cases per decade age group (Figure 1).

Risk factors

Univariate logistic regression was performed to identify variables associated with malignancy (Table 2). Three significant risk factors were identified: increasing age by year (odds ratio, 1.06, $p \leq 0.001$), male sex (odds ratio, 3.89, $p \leq 0.010$) and heavy alcohol intake (odds ratio, 4.63, $p \leq 0.017$). Smoking was not an associated risk factor in this disease presentation as a whole; however, both patients discovered to have hypopharyngeal malignancy had heavy smoking and alcohol intake.

Investigations

We performed over 740 investigations in our series, in addition to histopathology, although some investigations may have been performed prior to referral to our unit and were therefore not obtainable. Choice of investigation was dependent on primary clinician preference and departmental guidelines at the time of clinical review, although these were subject to numerous changes over the 10-year series. The

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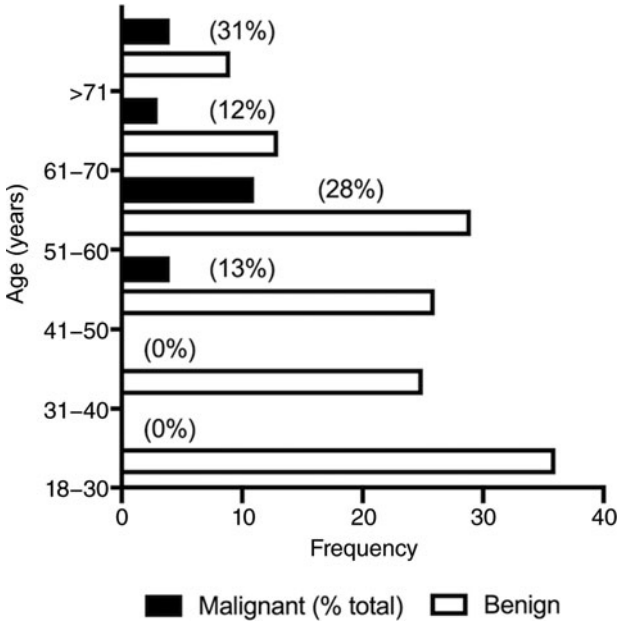

Fig. 1. Squamous cell carcinoma and benign cases arranged by age group. The percentage of total malignant cases per age group are in brackets.

diagnostic parameters of each investigation individually and in combination were analysed, and prior to open biopsy. As stand-alone investigations, ultrasound-guided FNAC and PET-CT demonstrated the highest specificity (92.25 per cent) and sensitivity (65.38 per cent), respectively (Table 3). At this initial stage in the management pathway, ultrasound-guided FNAC alone and the combination of ultrasound-guided FNAC with MRI provided the greatest accuracy (80.25 per cent and 80.49 per cent, respectively). However once proceeding to open biopsy, frozen section had a sensitivity and specificity of 72.73 per cent and 100 per cent, respectively, with an accuracy of 95.64 per cent.

Further analysis on time to diagnosis was performed for all patients, grouping investigations by the number performed for each patient (Table 4). Interestingly, there was no significant

Table 2. Model estimates for univariate logistic regression

Variable	Frequency (*n* (*n* malignant cases))	Odds ratio (95% confidence interval)	*P*-value
Age (years)	157 (25)	1.06 (1.03–1.09)	<0.001*
Gender			
– Female	70 (5)	1	
– Male	87 (20)	3.89 (1.38–10.95)	0.010*
Smoking			
– Never	59 (7)	1	
– Ex-smoker	36 (3)	0.68 (0.16–2.80)	0.624
– Current	49 (10)	1.91 (0.67–5.45)	0.230
– Missing	13 (5)		
Alcohol			
– <14 units/week	119 (11)	1	
– >14 units/week	16 (5)	4.63 (1.31–15.20)	0.017*
– Missing	22 (9)		

*$P < 0.05$ indicates statistical significance

Table 3. Diagnostic test metrics

Test	Ultrasound-guided FNAC	MRI	PET-CT	Ultrasound-guided FNAC & MRI	Ultrasound-guided FNAC & PET	MRI & PET	All imaging	Frozen section
Sensitivity (%)	25.00	24.00	65.38	40.75	64.29	62.96	66.67	72.73
95% CI	10.69–44.87	9.36–45.13	44.33–82.79	22.39–61.20	44.07–81.36	42.37–80.60	46.04–83.48	39.03–93.98
Specificity (%)	92.25	82.98	37.97	88.32	60.58	61.31	59.12	100.00
95% CI	86.21–96.22	69.19–92.35	27.28–49.59	81.73–93.18	51.88–68.82	52.62–69.51	50.40–67.44	92.60–100.00
Positive predictive value (%)	41.18	42.86	25.76	40.74	25.00	24.29	24.32	100.00
95% CI	22.59–62.68	22.65–65.77	19.98–32.52	26.46–56.77	19.09–32.01	18.32–31.45	18.71–30.99	N/A
Negative predictive value (%)	85.00	67.24	76.92	88.32	89.25	89.36	90.00	95.06
95% CI	81.98–87.59	61.39–72.60	64.68–85.85	84.61–91.23	83.22–93.28	83.46–93.32	83.83–93.98	88.00–98.06
Positive likelihood ratio	3.22	1.41	1.05	3.49	1.63	1.63	1.63	N/A
95% CI	1.34–7.74	0.55–3.61	0.76–1.46	1.83–6.66	1.15–2.30	1.14–2.33	1.17–2.28	N/A
Negative likelihood ratio	0.81	0.92	0.91	0.67	0.59	0.6	0.56	0.27
95% CI	0.65–1.01	0.71–1.18	0.50–1.66	0.49–0.92	0.35–0.99	0.36–1.01	0.32–0.98	0.10–0.72
Accuracy (%)	80.25	62.50	44.76	80.49	61.21	61.59	60.37	95.64
95% CI	73.16–86.17	50.30–73.64	35.05–54.78	73.59–86.25	53.33–68.69	53.68–69.06	52.44–67.91	86.87–99.24

CT of the neck was only performed in two patients so was excluded from analysis. Positive predictive value, negative predictive value and accuracy are dependent on disease prevalence. FNAC = fine needle aspiration cytology; MRI = magnetic resonance imaging; PET = positron emission tomography; CT = computed tomography; CI = confidence interval; N/A = insufficient data to compute

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Table 4. Summary table for time to diagnosis against number of investigations (excluding histopathology)

Investigations (*n*)	Patients (*n*)	Malignancies in group (*n* (%))	Time to diagnosis (days)		
			Median	IQR	Range
2	19	1 (5)	71	51–139	16–229
3	38	1 (3)	62	41–102	12–359
4	48	5 (10)	43	29–80	15–207
5	35	11 (31)	71	47–90	19–149
6	16	7 (44)	73	48–105	40–221

One patient's 'time to diagnosis' was classified as an outlier and removed from analysis. IQR = interquartile range

Table 5. Comparison of published series on lateral cystic neck masses

Series	Jones *et al.**	Tabet *et al.*[15]	Franzen *et al.*[7]	Stefanicka *et al.*[8]	Grønlund *et al.*[4]	Koch *et al.*[2]	Gourin & Johnson[3]
Country	UK	Canada	Germany	Slovakia	Denmark	Germany	USA
Year	2021	2019	2019	2019	2016	2018	2000
Patients (*n*)	157	135	133	111	135	131	121
Malignancy (*n* (%))	25 (16)	83 (61)	41 (30)	11 (10)	19 (14)	12 (9)	12 (10)
Age (years)							
– Median	48	54	44	40	39	39	38
– Range	16–83	41–59	5–91	18–77	3–80	3–69	18–69
Youngest SCC diagnosis (years)	42	Not stated	>40	35	39	39	44

*This article. SCC = squamous cell carcinoma

correlation between number of investigations and time to diagnosis.

Outcome data

Four deaths were noted in the positive malignancy cases, with both hypopharyngeal SCC patients succumbing to disease within a year of diagnosis. Another patient died four years after treatment of metastatic recurrence, and the other patient died of breast cancer without receiving any treatment. The 5-year overall survival in the oropharyngeal primary and unknown primary group was 87.5 per cent ($n = 21$).

Published series

We have summarised important demographic data and comparisons between the present study and other large series in the literature (Table 5).

Discussion

In this series, we reported outcomes from a 10-year cohort of patients presenting to our tertiary head and neck centre with unilateral solitary cystic masses. The aim was to guide our stratification of investigations and provide tailored advice for our patients about their risk of malignancy. We failed to find any malignancies in patients under 40 years. Smoking was not a significant risk factor in this group, and the number of investigations performed did not appear to adversely lengthen the time to diagnosis. We also provide novel data for the accuracy of combinations of different investigations in solitary lateral cystic neck mass.

Despite routine p16 testing only being introduced midway through our series, 85 per cent of those tested were positive, demonstrating integrated HPV infection. This is likely to account for why the traditional risk factor of smoking was not of significance, and therefore we disagree with the approach of utilising this information in a risk-based approach to management.[20] Age over 40 years (odds ratio, 1.06 per year of age; $p \leq 0.001$), male gender (odds ratio, 3.89; $p \leq 0.010$) and alcohol intake (odds ratio, 4.63; $p \leq 0.0170$) were significant variables on univariate analysis and should be considered when counselling patients, supporting several recent studies.[7,8,15] The youngest patient with malignancy in our cohort was 42 years.

The number of investigations performed did not appear to affect the timeframe of the patient pathway; in addition to resource considerations, this study provides important outcome data on individual and combined imaging modalities to help organise the most efficient and accurate test order. The highest overall accuracy (i.e. the weighted average of the sensitivity and specificity) is found with ultrasound-guided FNAC (80.25 per cent; 95 per cent confidence interval (CI): 73.16–86.17 per cent). Adding cross-sectional imaging in the form of an MRI to the ultrasound improves the sensitivity (from 25.00 to 40.75 per cent), increases the positive likelihood ratio (from 3.22 to 3.49), reduces the negative likelihood ratio (from 0.81 to 0.67) but does not significantly affect the accuracy (80.49 per cent; 95 per cent CI: 73.59–86.25 per cent). We therefore recommend an initial investigation order set of ultrasound-guided FNAC and MRI in these cases as a minimum prior to proceeding to an open biopsy. We can reassure patients that this combination of modalities gives the highest pre-biopsy accuracy, together with the highest chance of subsequently confirming disease in the event of a positive test.

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FNAC sensitivity varies widely in the literature, and results obtained from cystic lesions demonstrate significantly lower accuracy. Tabet *et al.* performed a comprehensive cytopathological analysis of 135 cystic lesions, resulting in a positive predictive value of 92 per cent, and a sensitivity of 59 per cent,[15] both significantly higher than the present series. However, with a malignancy rate in their studied cohort of 72 per cent, this represented a detection rate far in excess of other published series. Their reasoning that this may be because of the tertiary nature of their unit appears to be contradicted by our study but more likely represents the inclusion of partially necrotic lesions within their cohort. However, we believe inclusion of purely cystic lateral neck masses provides a more clinically relevant cohort to help guide management of this distinct clinic presentation group. Indeed, a previously published series of 2702 general head and neck aspirates from our unit[21] reports sensitivity, specificity, positive predictive value, negative predictive value and accuracy rates of 89.5 per cent, 98.5 per cent, 97.3 per cent, 94.0 per cent and 95.1 per cent, respectively, demonstrating the difficulty of prebiopsy tests when dealing with purely cystic lateral neck masses.

Adding PET-CT imaging to the ultrasound-guided FNAC and MRI combination significantly reduced the accuracy of the results in our series (60.74 per cent; 95 per cent CI: 52.80–68.29 per cent). However, PET-CT does have the highest sensitivity (70.83 per cent), albeit with the lowest specificity (37.97 per cent) and therefore a higher risk of false alarms and incidental findings as well as a high radiation dose (about 25 mSv compared with about 6 mSv for a CT of the thorax). These findings are consistent with other published series, the most comparable being the study by Sokoya *et al.*,[22] who similarly published a 10-year retrospective series reporting a sensitivity and negative predictive value for detecting malignancy by PET-CT in unknown primary head and neck squamous cell carcinoma of 73.1 per cent and 68.9 per cent, respectively.

With its low specificity in this clinical scenario of solitary lateral cystic neck mass, we propose PET-CT should be reserved until after malignancy has been confirmed, optimising the use of this resource and minimising the risk of false alarms for patients who often then require further invasive investigations to rule out co-existing pathology (e.g. colonoscopy of the lower gastrointestinal tract). This timing will allow further imaging of the potential primary sites (if no evidence was found on primary examination) in keeping with international recommendations.[23]

Should the above investigations fail to diagnose malignancy, open biopsy is the 'gold standard' for diagnosis. We emphasise that adding further pre-biopsy investigations to ultrasound-guided FNAC and MRI does not aid surgical planning and may actually reduce the accuracy of the diagnostic test battery. In the cases where frozen section was utilised, it was found to be a highly accurate adjunct during open biopsy. Sigel and Fisch eloquently demonstrated how operating on the neck can change the lymphatic drainage.[24] This was important at a time when radical surgery was used as the sole treatment modality, which made frozen section especially important. Frozen section of a lymph node was popularised in the setting of cancer of unknown primary to confirm the diagnosis while the neck was open and to avoid delaying definitive surgery. In modern times, the use of frozen section in neck cysts remains controversial. In our series, the use of frozen section is insufficient to completely exclude malignancy (sensitivity 73 per cent), which led to false reassurance and delayed treatment in 3 of 11 subsequently confirmed cancer patients on paraffin histopathology, consistent with other published work.[7]

Based on our findings, we propose a diagnostic algorithm for the management of solitary lateral cystic neck mass (Figure 2). Several authors including Franzen *et al.* have suggested performing a panendoscopy, biopsies and tonsillectomy on anyone over the age of 40 years prior to cyst excision.[7] In their series, they reported a malignancy rate of up to 80 per cent in the older age group, which justifies this approach. We found a much lower malignancy rate of 10 per cent for females over 40 years and 30 per cent for males over 40 years. We therefore believe the excess morbidity and time delay (25 per cent will remain cancer of unknown primary) does not justify a blanket

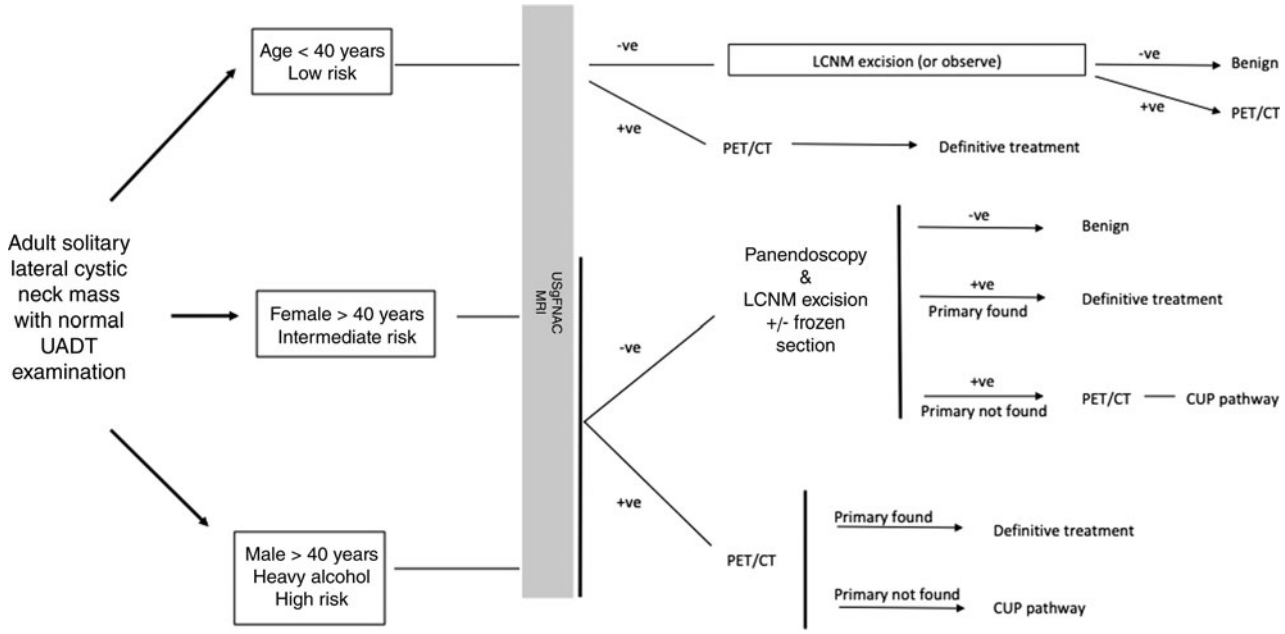

Fig. 2. Proposed investigation pathway for management of adult lateral cystic neck masses. -ve = negative; +ve = positive; LCNM = lateral cystic neck mass; PET-CT = positron emission tomography-computed tomography; UADT = upper aerodigestive tract; USgFNAC MRI = ultrasound-guided fine needle aspiration cytology magnetic resonance imaging; +/- = with or without; CUP = cancer of unknown primary

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biopsy approach in the absence of a clinically evident primary lesion. This would affect the utility of subsequent PET/CT imaging. From our series, half the patients with a subsequently confirmed malignant cystic node had an identifiable primary on rigid endoscopy. We therefore recommend a rigid endoscopy in patients over the age of 40 years at the time of cystic mass excision (intermediate to high risk). If a primary lesion is clinically evident at this more detailed mucosal examination, it is biopsied, and the planned cyst excision is abandoned. In the absence of a primary lesion but with subsequently confirmed malignancy and negative PET-CT, formal ipsilateral tonsillectomy and tongue base mucosectomy forms the second procedure as part of modern standard of care for cancer of unknown primary management. In our series, 50 per cent of the malignancies were in the ipsilateral palatine tonsil.

- The solitary lateral neck cyst presents a diagnostic challenge
- No standardised investigation pathway exists
- Squamous cell carcinoma of the ipsilateral tonsil is the most common site of primary with human papillomavirus disease prevalent
- Age over 40 years, male sex and high alcohol intake (not smoking) were significant risk factors for malignancy
- Ultrasound-guided fine needle aspiration and magnetic resonance imaging in combination represent the most accurate pre-open biopsy tests
- Panendoscopy and biopsy of suspicious mucosal lesions (not blind biopsy) should be performed at the time of open biopsy in high-risk individuals

Several studies have demonstrated no impact on survival when excision biopsy is performed on a solitary neck node prior to radical radiotherapy.[25–27] Indeed, the combined 5-year overall survival in this series, including the oropharyngeal and unknown primary cases, was 87.5 per cent, comparing favourably with our published outcomes for all HPV positive and negative SCC (83 per cent and 53 per cent, respectively),[28] which is reassuring. However, we hope that optimisation of the investigation strategy will help improve our pre-open biopsy diagnostic rate and potentially help to reduce the overall pathway time by reducing uncertainty regarding investigations.

Limitations

The retrospective nature of this series means that interpretation must be considered in this context. Recommended investigations were subject to intra-departmental changes and clinician preference over the course of the 10-year study period and may introduce selection bias for the investigations selected. Half of the 139 total MRI scans performed in our cohort were excluded from analysis because of indeterminate reports that failed to indicate a likelihood of malignancy from the cystic lesion appearance (when combined with a negative oropharynx for radiological primary lesion). We believe these omissions have only underscored the potential final test metrics for MRI, especially specificity and negative predictive value, and we still advocate this modality as an important anatomical baseline and oropharyngeal screen prior to cystic mass excision. Core needle biopsy has been advocated by a number of large series and guidelines[23,29] as a second line investigation but has not been included in this series because of the paucity of cases where it was utilised. Safety appears to be supported by published series and seeding risk is similarly rare.[21,30] It remains a viable alternative second line investigation to fine needle aspiration, although in our experience the limitation of having very little solid material to target in these cystic lesions is not improved by use of a wider calibre core biopsy needle and should not delay progression through the diagnostic pathway to open biopsy. HPV-positive cases increased in the second half of the collection period, but this is likely because of increased testing rather than prevalence. The number of oropharynx SCC cases remained stable throughout the study period from 2008 to 2018.

Conclusion

The most common causes of a solitary lateral cystic neck mass are benign cysts of branchial origin. However, 16 per cent of patients with this presentation will harbour a malignancy (30 per cent males and 10 per cent females over 40), most commonly HPV-positive SCC from the ipsilateral oropharynx. Following a thorough history and physical examination, we recommend ultrasound-guided FNAC and MRI as initial investigations that provide the highest accuracy and then a risk-stratified approach based on age, gender and alcohol intake. The traditional head and neck risk factor of smoking is not indicative. With a low specificity and positive predictive value, PET-CT imaging should be reserved for confirmed malignant cases without an identified primary lesion to image potential high-risk sites. If a solitary, indeterminate high-risk cystic lesion is confirmed, we advise early excision of the mass for paraffin section histology, combined with an upper aerodigestive tract examination.

Competing interests. None declared

References

1 Flanagan PM, Roland NJ, Jones AS. Cervical node metastases presenting with features of branchial cysts. *J Laryngol Otol* 1994;**108**:1068–71
2 Koch E-M, Fazel A, Hoffmann M. Cystic masses of the lateral neck - proposition of an algorithm for increased treatment efficiency. *J Craniomaxillofac Surg* 2018;**46**:1664–8
3 Gourin CG, Johnson JT. Incidence of unsuspected metastases in lateral cervical cysts. *Laryngoscope* 2000;**110**:1637–41
4 Grønlund S, Mey K, Andersen E, Rasmussen ER. The true malignancy rate in 135 patients with preoperative diagnosis of a lateral neck cyst. *Laryngoscope Investig Otolaryngol* 2016;**1**:78–82
5 Granström G, Edström S. The relationship between cervical cysts and tonsillar carcinoma in adults. *J Oral Maxillofac Surg* 1989;**47**:16–20
6 Cinberg JZ, Johns ME, Molnar JJ, Vogl SE. Cervical cysts: cancer until proven otherwise? *Laryngoscope* 1982;**92**:27–30
7 Franzen A, Günzel T, Buchali A, Coordes A. Cystic lateral neck lesions: etiologic and differential diagnostic significance in a series of 133 patients. *Anticancer Res* 2019;**39**:5047–52
8 Stefanicka P, Gnojcakova N, Kurinec F, Profant M. Incidence and clinical predictors of cystic squamous cell carcinoma metastases in lateral cervical cysts. *J Laryngol Otol* 2019;**133**:430–5
9 Baatenburg de Jong RJ, Rongen RJ, Verwoerd CD, van Overhagen H, Laméris JS, Knegt P. Ultrasound-guided fine-needle aspiration biopsy of neck nodes. *Arch Otolaryngol Head Neck Surg* 1991;**117**:402–4
10 Goyal N, Zacharia TT, Goldenberg D. Differentiation of branchial cleft cysts and malignant cystic adenopathy of pharyngeal origin. *Am J Roentgenol* 2012;**199**:216–21
11 Mittal MK, Malik A, Sureka B, Thukral BB. Cystic masses of neck: a pictorial review. *Indian J Radiol Imaging* 2012;**22**:334–43
12 Abadi P, Johansen A, Godballe C, Gerke O, Høilund-Carlsen PF, Thomassen A. 18F-FDG PET/CT to differentiate malignant necrotic lymph node from benign cystic lesions in the neck. *Ann Nucl Med* 2017;**31**:101–8
13 Britt CJ, Maas AM, Kennedy TA, Hartig GK. Incidental findings on FDG PET/CT in head and neck cancer. *Otolaryngol Head Neck Surg* 2018;**158**:484–8

https://doi.org/10.1017/S0022215122000469 Published online by Cambridge University Press

14 Layfield LJ, Esebua M, Schmidt RL. Cytologic separation of branchial cleft cyst from metastatic cystic squamous cell carcinoma: a multivariate analysis of nineteen cytomorphologic features. *Diagn Cytopathol* 2016;**44**:561–7
15 Tabet P, Saydy N, Letourneau-Guillon L, Gologan O, Bissada E, Ayad T *et al.* Cystic masses of the lateral neck: diagnostic value comparison between fine-needle aspiration, core-needle biopsy, and frozen section. *Head Neck* 2019;**41**:2696–703
16 Martin H, Romieu C. The diagnostic significance of a lump in the neck. *Postgrad Med* 1952;**11**:491–500
17 McGuirt WF, McCabe BF. Significance of node biopsy before definitive treatment of cervical metastatic carcinoma. *Laryngoscope* 1978;**88**:594–7
18 Shinohara S, Yamamoto E, Tanabe M, Maetani T, Kim T. Implantation metastasis of head and neck cancer after fine needle aspiration biopsy. *Auris Nasus Larynx* 2001;**28**:377–80
19 Shyamala K, Girish HC, Murgod S. Risk of tumor cell seeding through biopsy and aspiration cytology. *J Int Soc Prev Community Dent* 2014;**4**:5–11
20 Gillison ML, D'Souza G, Westra W, Sugar E, Xiao W, Begum S *et al.* Distinct risk factor profiles for human papillomavirus type 16-positive and human papillomavirus type 16-negative head and neck cancers. *J Natl Cancer Inst* 2008;**100**:407–20
21 Tandon S, Shahab R, Benton JI, Ghosh SK, Sheard J, Jones TM. Fine-needle aspiration cytology in a regional head and neck cancer center: Comparison with a systematic review and meta-analysis. *Head Neck* 2008;**30**:1246–52
22 Sokoya M, Chowdhury F, Kadakia S, Ducic Y. Combination of panendoscopy and positron emission tomography/computed tomography increases detection of unknown primary head and neck carcinoma. *Laryngoscope* 2018;**128**:2573–5
23 Civantos FJ, Vermorken JB, Shah JP, Rinaldo A, Suárez C, Kowalski LP *et al.* Metastatic squamous cell carcinoma to the cervical lymph nodes from an unknown primary cancer: management in the HPV era. *Front Oncol* 2020;**10**:593164
24 Sigel ME, Fisch UP. The effect of surgery on the cervical lymphatic system. *Laryngoscope* 1965;**75**:458–74
25 Ellis ER, Mendenhall WM, Rao PV, McCarty PJ, Parsons JT, Stringer SP *et al.* Incisional or excisional neck-node biopsy before definitive radiotherapy, alone or followed by neck dissection. *Head Neck* 1991;**13**:177–83
26 Akkina SR, Kim RY, Stucken CL, Pynnonen MA, Bradford CR. The current practice of open neck mass biopsy in the diagnosis of head and neck cancer: a retrospective cohort study. *Laryngoscope Investig Otolaryngol* 2019; **4**:57–61
27 Zenga J, Graboyes EM, Haughey BH, Paniello RC, Mehrad M, Lewis JS Jr *et al.* Definitive surgical therapy after open neck biopsy for HPV-related oropharyngeal cancer. *Otolaryngol Head Neck Surg* 2016;**154**:657–66
28 Dalton CL, Milinis K, Houghton D, Ridley P, Davies K, Williams R *et al.* Transoral laser microsurgery and radiotherapy for oropharyngeal squamous cell carcinoma: equitable survival and enhanced function compared with contemporary standards of care. *Eur J Surg Oncol* 2020;**46**:2042–9
29 National Comprehensive Cancer Network. Head and Neck Cancers/Occult primary (OCC1) (version 1.2020). In: https://www.nccn.org/professionals/physician_gls/pdf/head-and-neck.pdf [15 February 2021]
30 Shah KSV, Ethunandan M. Tumour seeding after fine-needle aspiration and core biopsy of the head and neck - a systematic review. *Br J Oral Maxillofac Surg* 2016;**54**:260–5

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