

# Head & Neck FNA clinics: Imaging & cytopathology

*(it may be one-stop, but it takes two to tango)*

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**Guy's and St Thomas'**  
NHS Foundation Trust



# A little (UK) background...

- *Improving outcomes in head and neck cancers* - National Institute for Health and Clinical Excellence (NICE) 2004.
- Need to speed up diagnosis and treatment
- Recommendation establishment of specialist clinics for patients with neck lumps.
- Model: one-stop breast lump clinics (cytopathology and image guidance).

# Rationale

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## **Patient experience:**

- Avoids multiple visits.
- Sampling is minimally invasive – experience akin to a blood test.

## **Risk profile:**

- Low risk (esp. if US-guided to avoid neurovascular structures).

## **Reliability:**

- Diagnosis of many common H&N neoplasms e.g. SCC, pleomorphic adenoma, thyroid cancers can be made on cytology.

## **Speed:**

- Rapid onsite assessment by a consultant pathologist enables same day diagnosis and decision-making.

# How we do it?

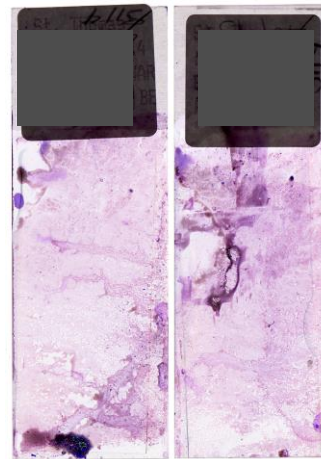
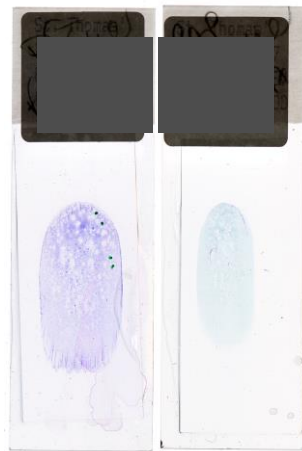
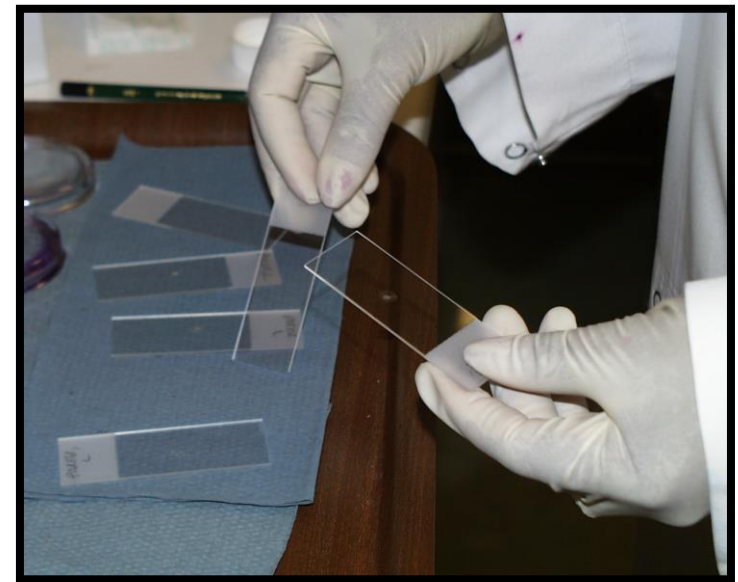
1. Patient seen by surgeon.
2. Referral to radiologist for US assessment and FNA.
3. Slide preparation by biomedical scientist.
4. Rapid onsite assessment by consultant cytopathologist.

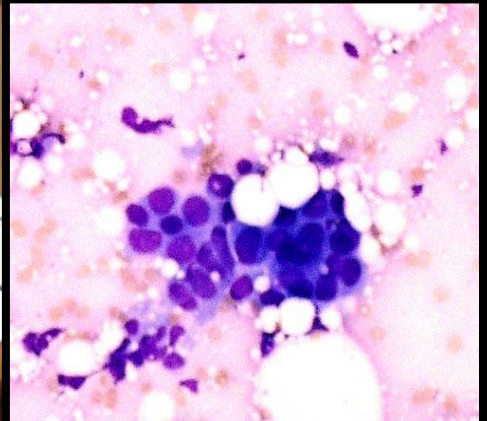
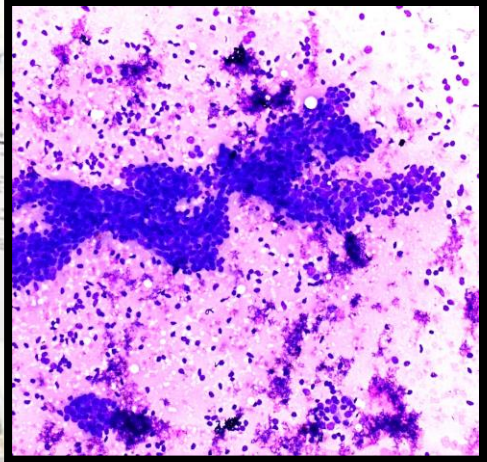


Radiology set-up



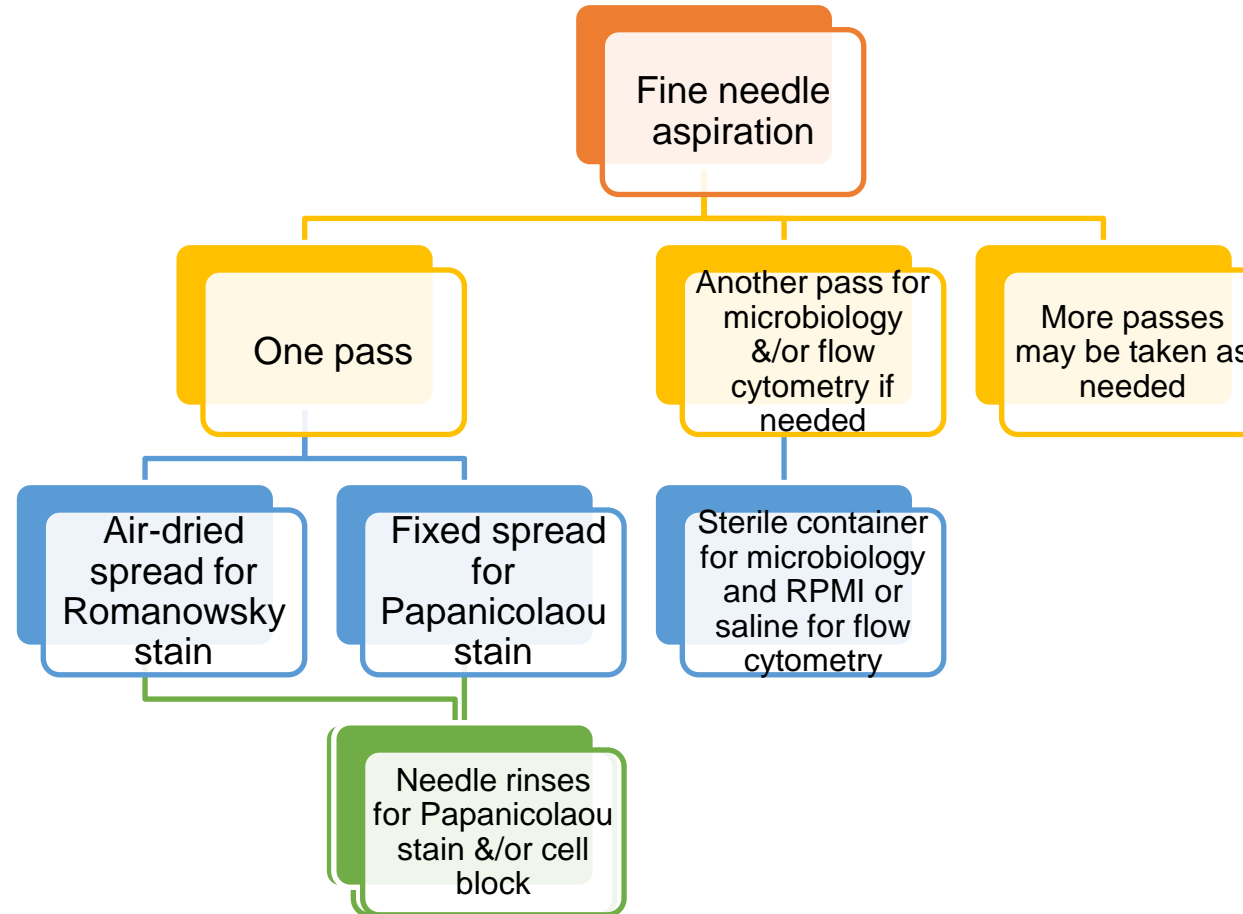
**Mistakes are more likely to be made on suboptimal diagnostic material ...**







# ROSE & triage of specimen

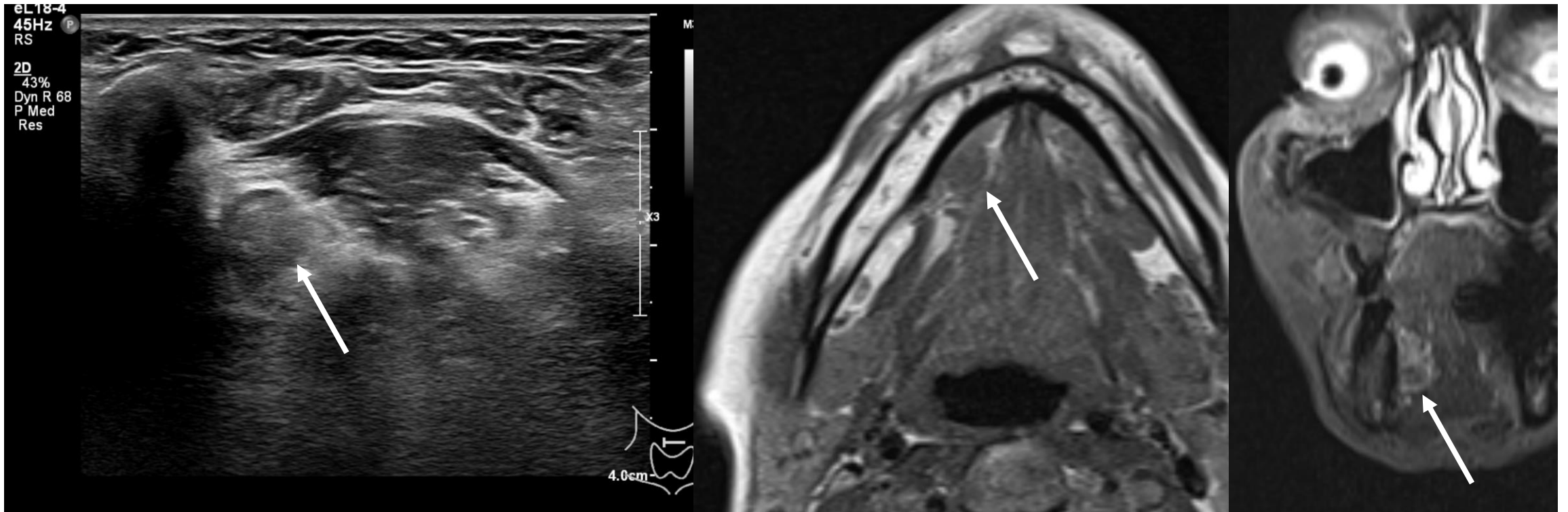


# Case examples

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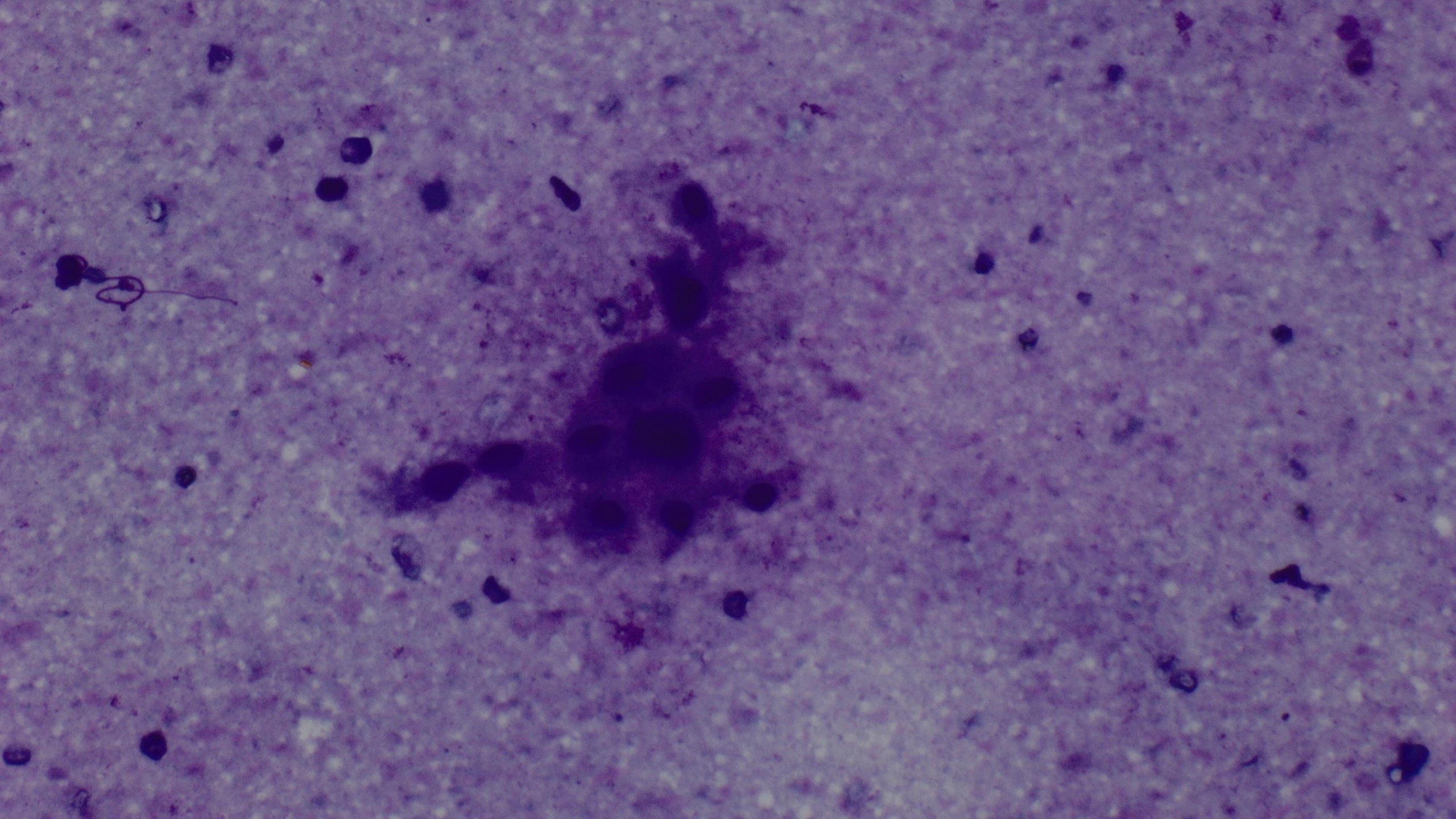
# Case 1

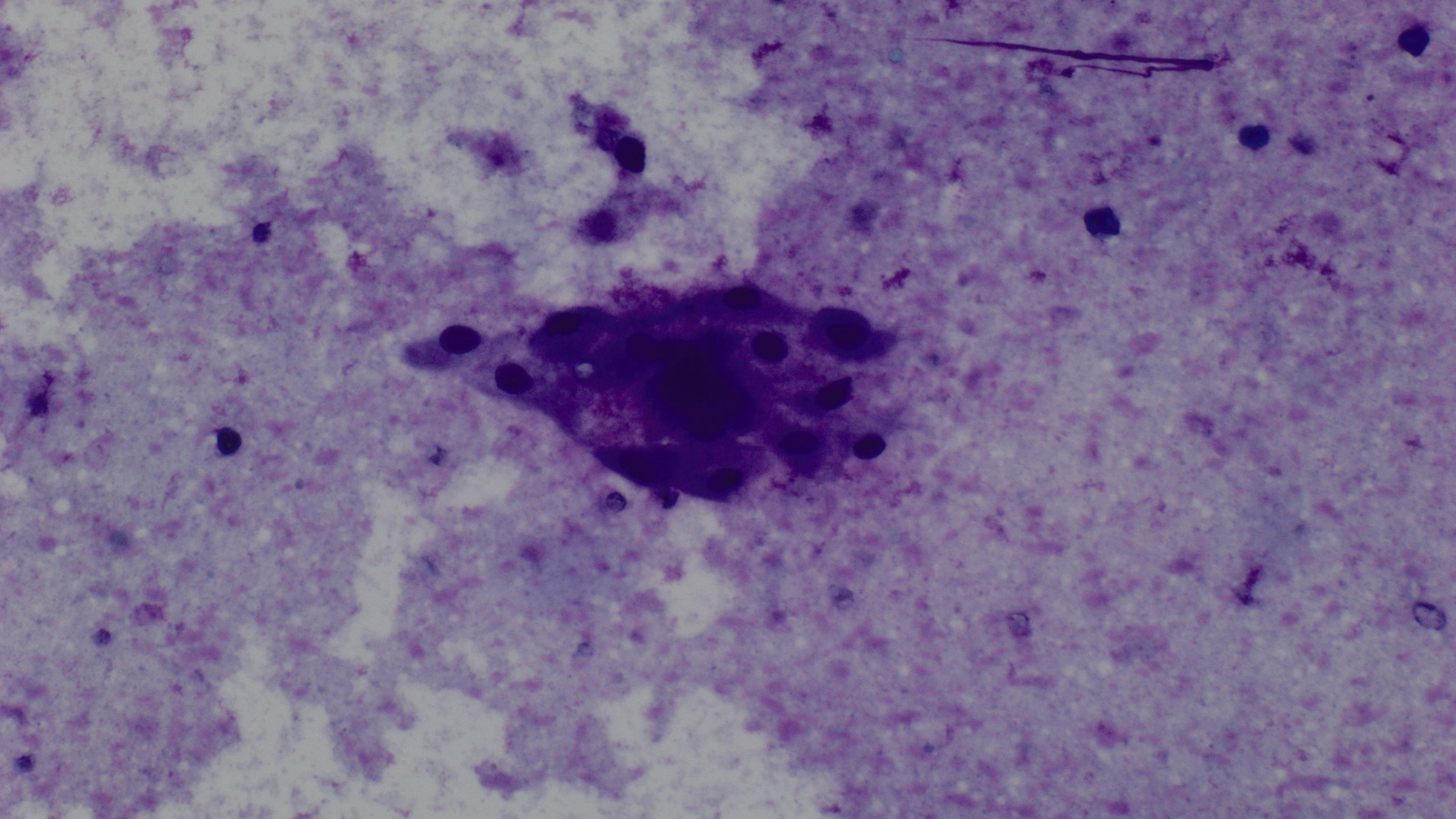
- 65 year old with intermittent pain and swelling floor of mouth

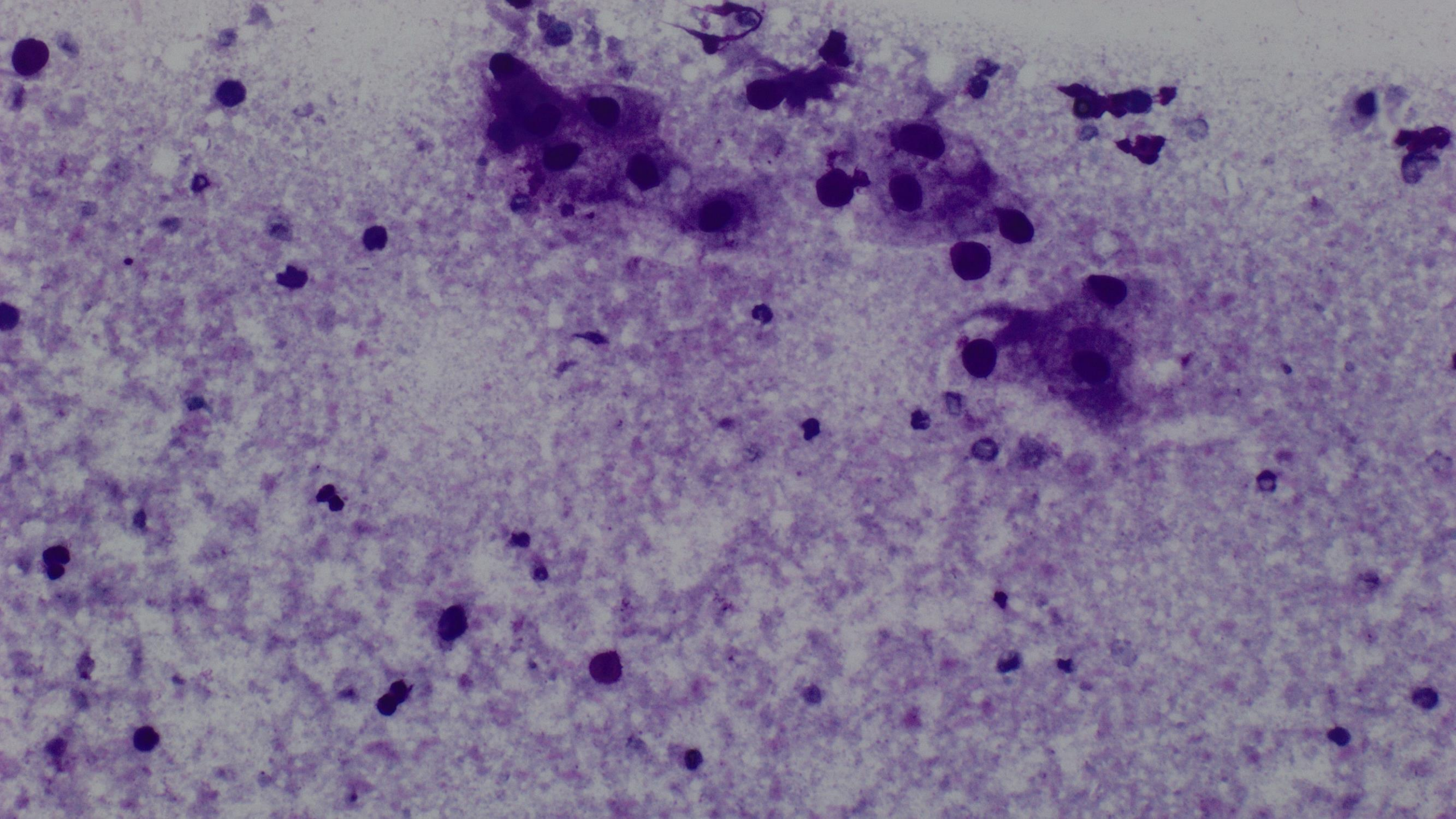


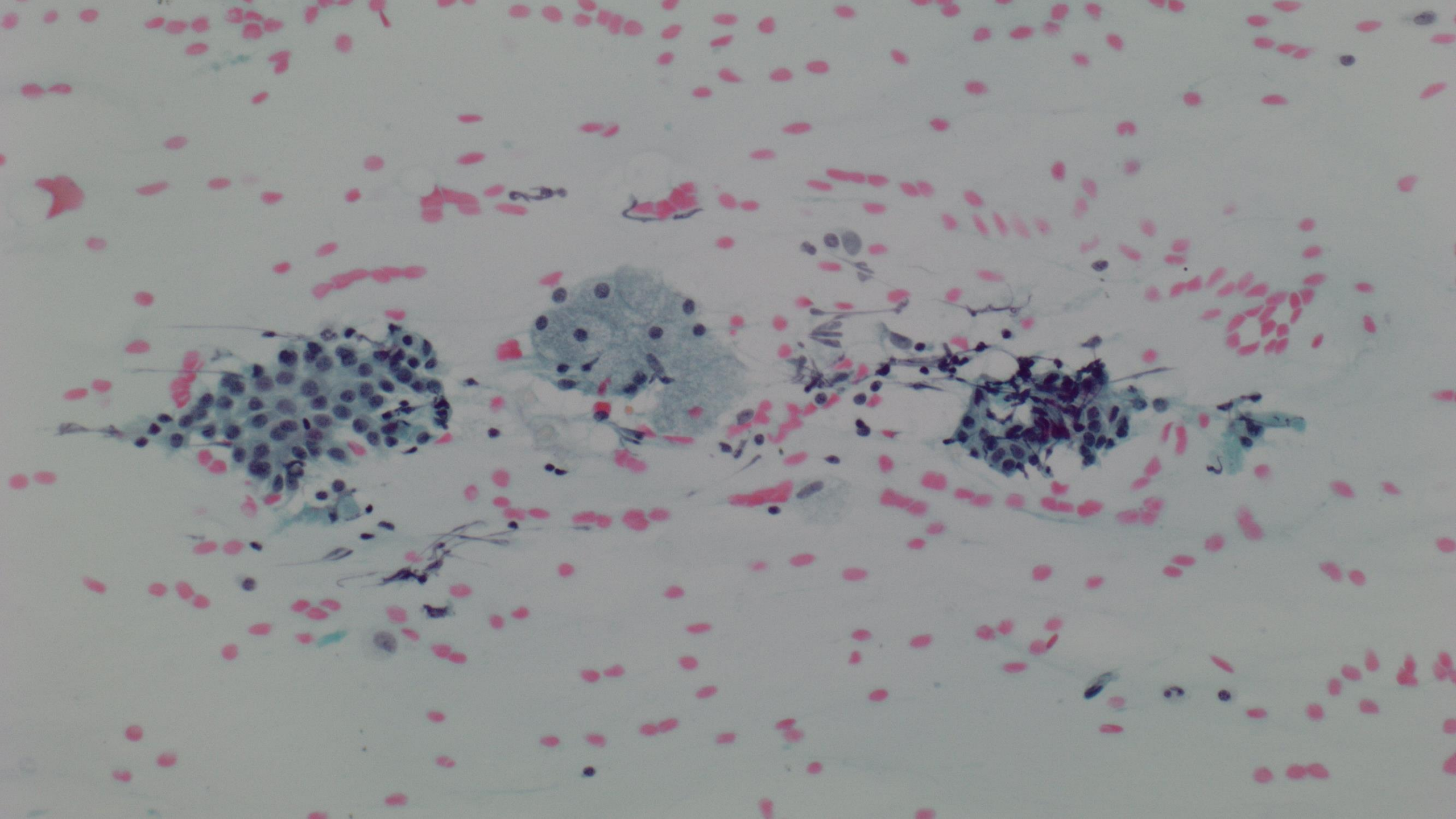


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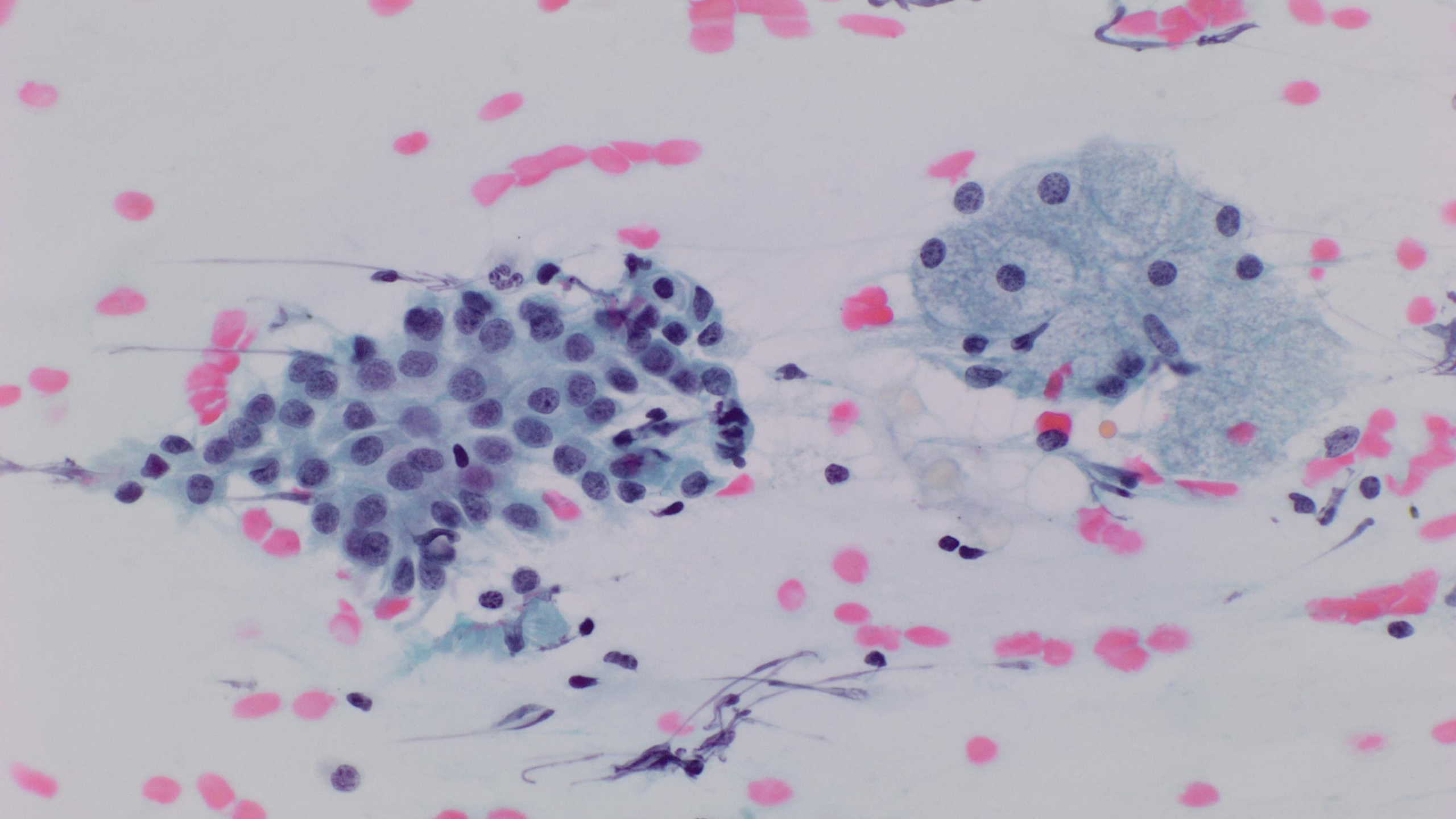












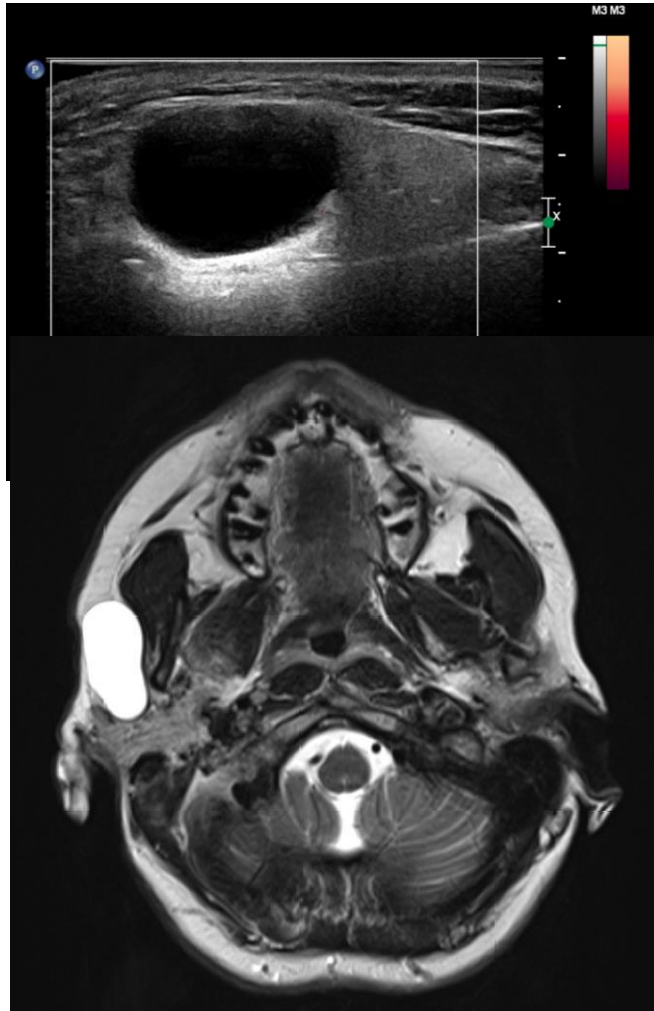
# Cytological diagnosis

- MAML2 gene rearrangement demonstrated on the Pap stained slide
- Mucoepidermoid carcinoma (Milan class VI: Malignant)

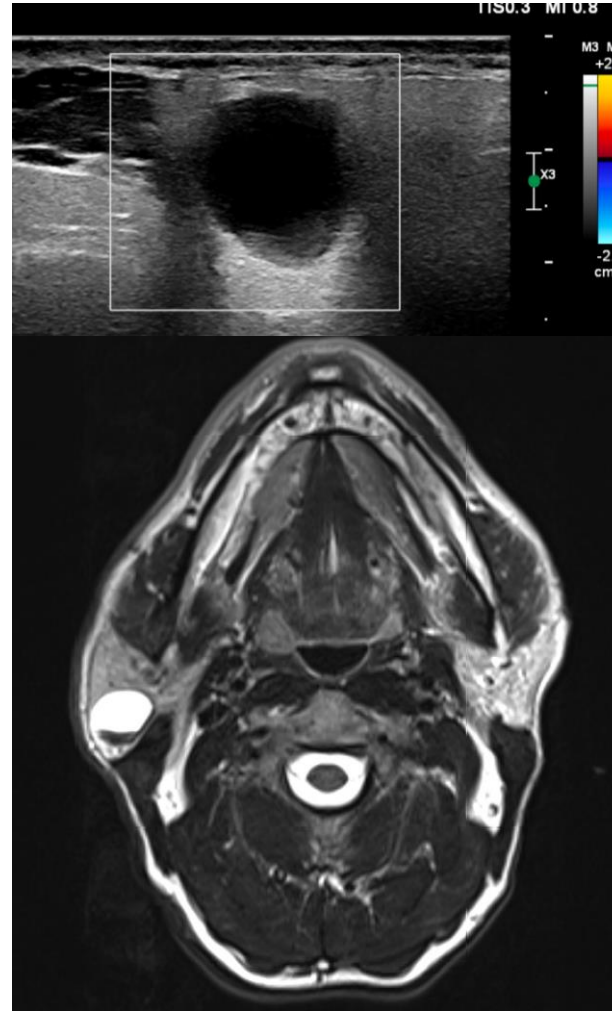
# Notes on radiological assessment of salivary gland lesions

- Significant cross-over in appearances
- Ultrasound is superior to cross-sectional imaging in submandibular glands and can be superior for sublingual glands (if accessible)
- MRI is superior to ultrasound/CT for parotid lesions

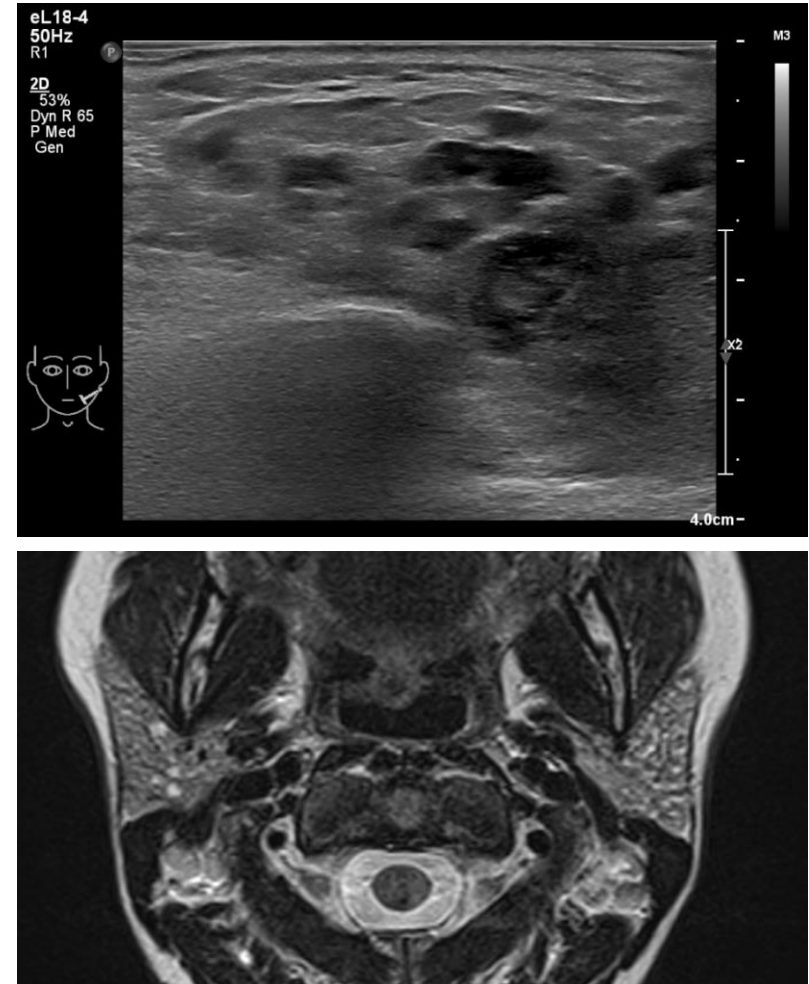
# Simple cystic lesions



Sialocele

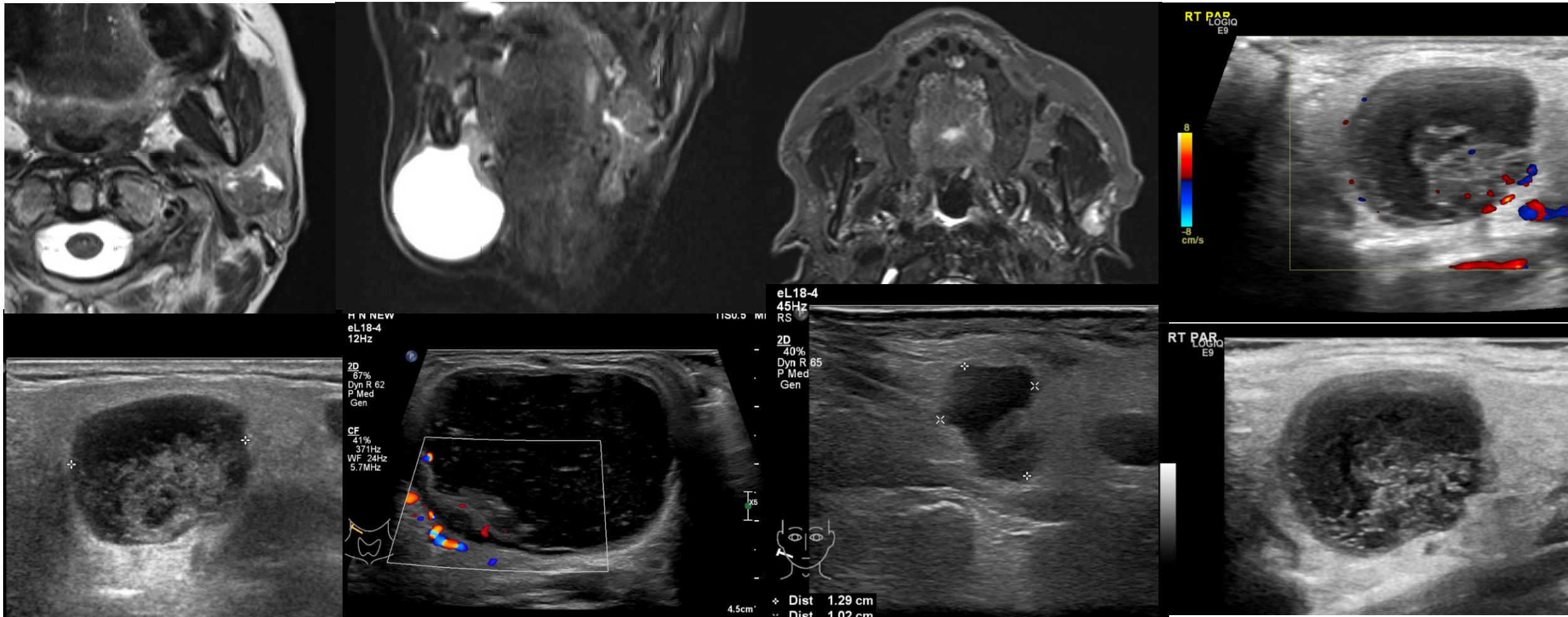


Lymphoepithelial cyst



Sjogren's disease

# Complex cystic lesions



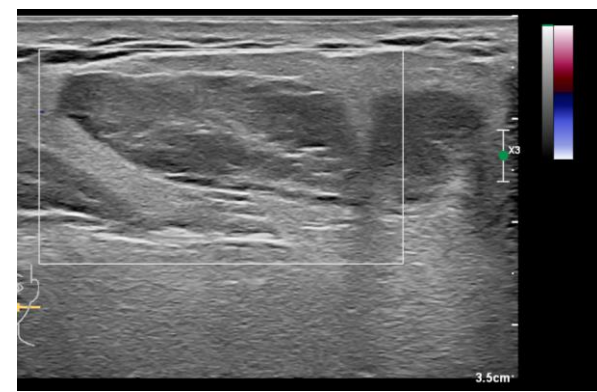
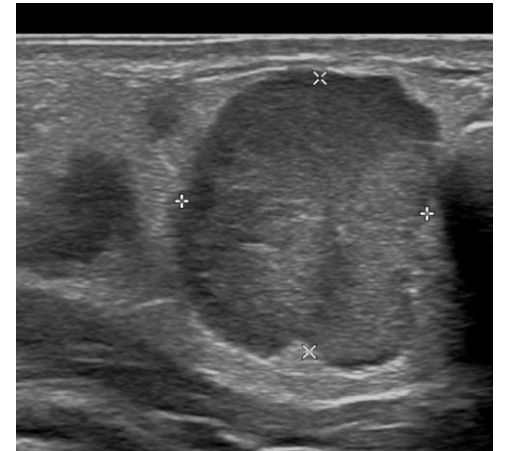
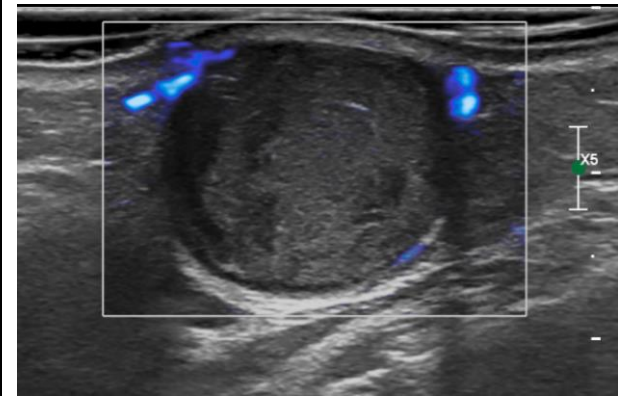
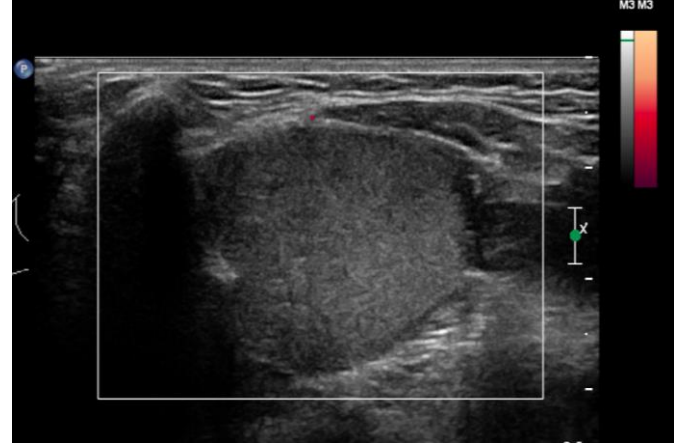
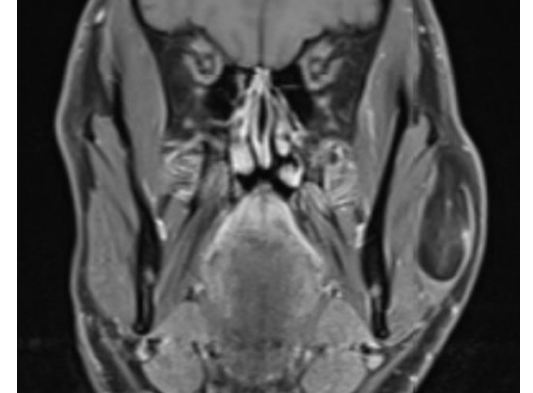
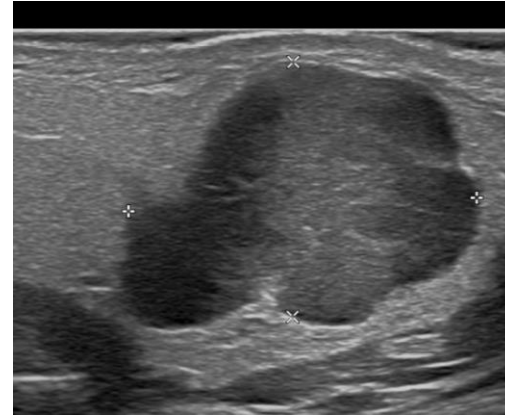
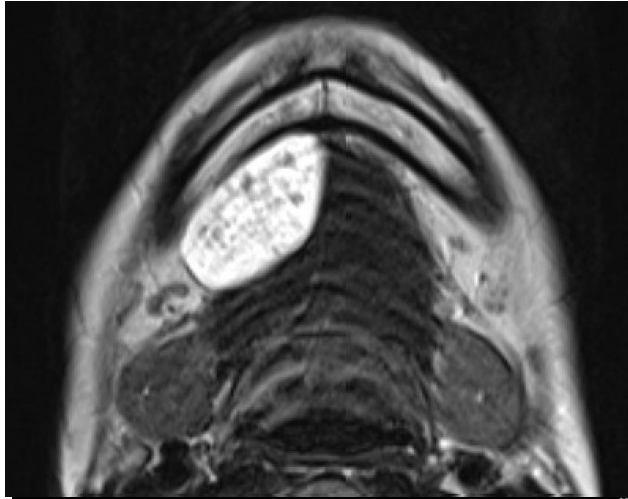
Warthin tumour

SCC met

SCC met

Mucoepidermoid ca.

# Benign – solid & pseudosolid masses



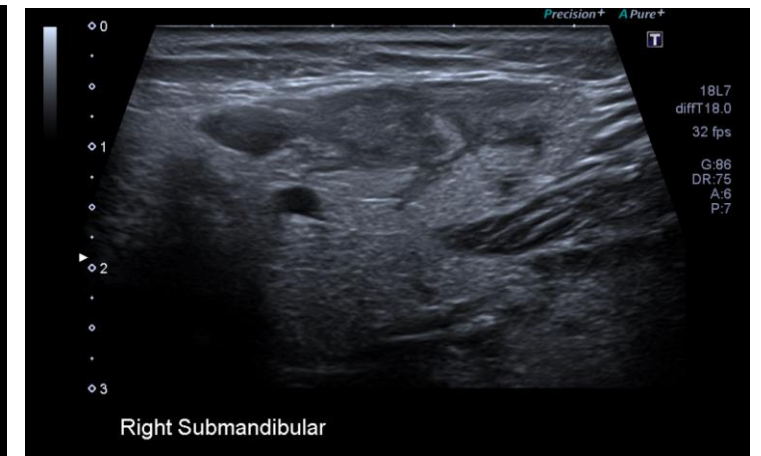
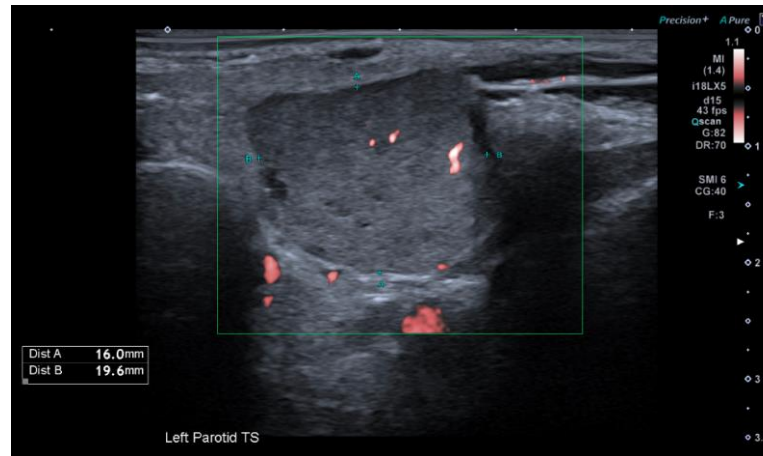
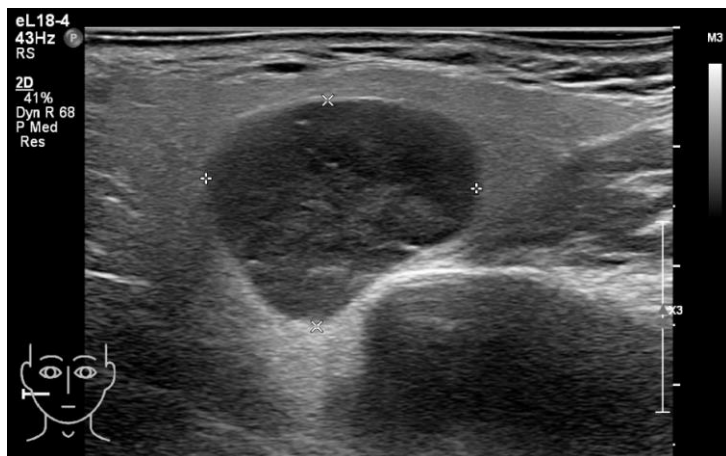
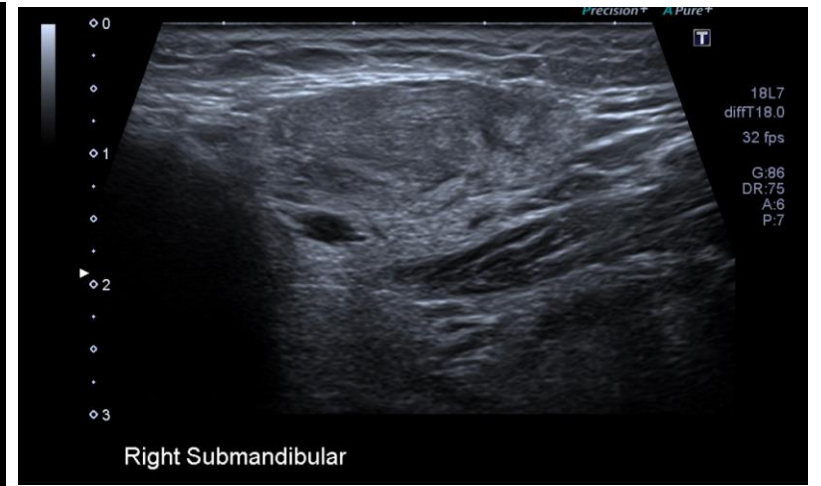
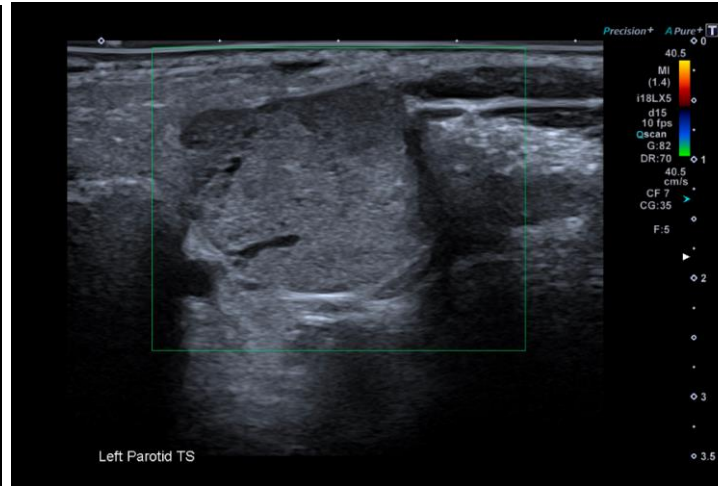
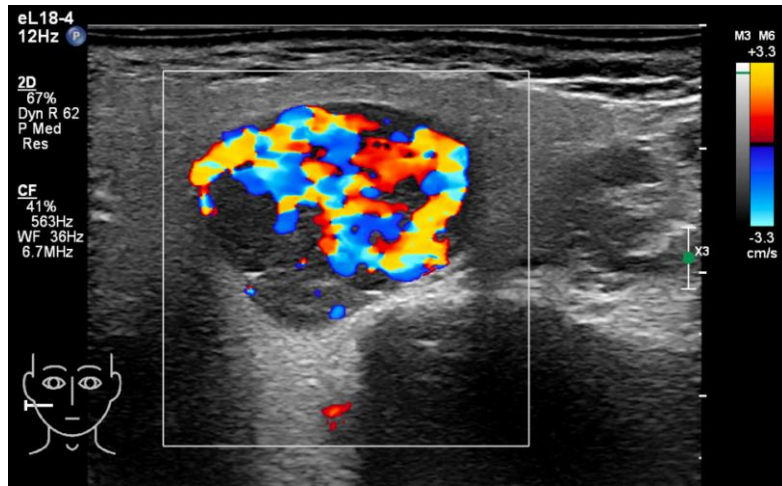
Dermoid cyst

Epidermal inclusion cyst

Pleomorphic adenoma

Lipoma

# Malignant – solid masses



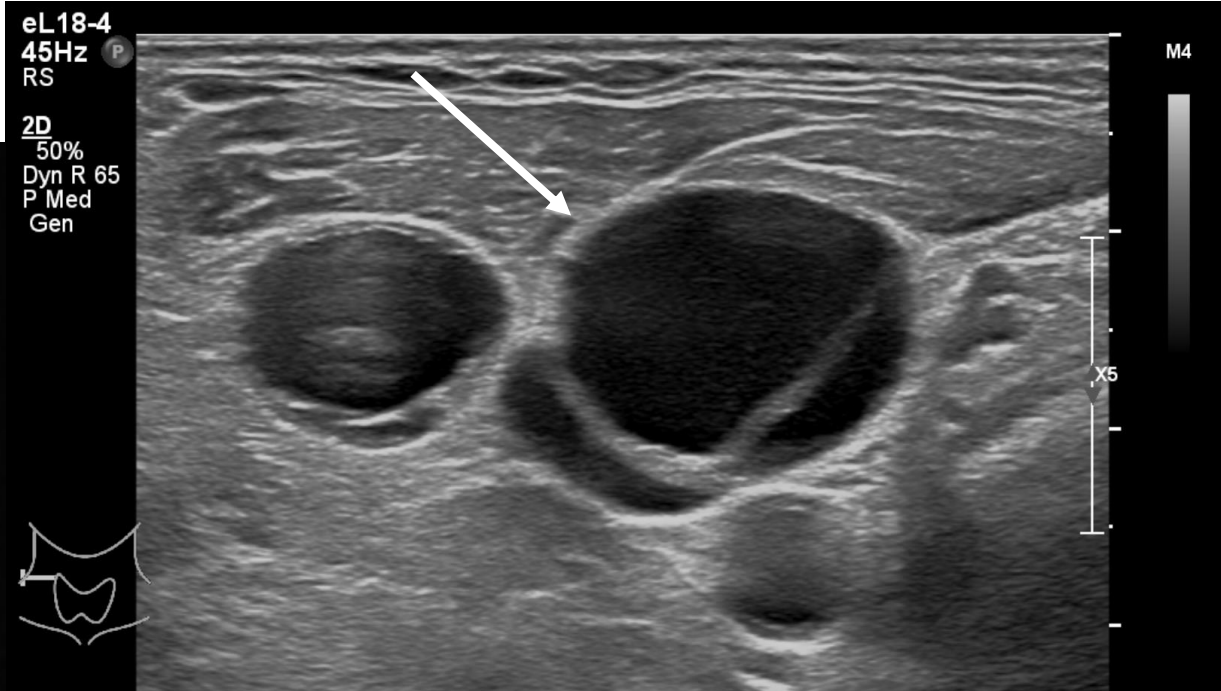
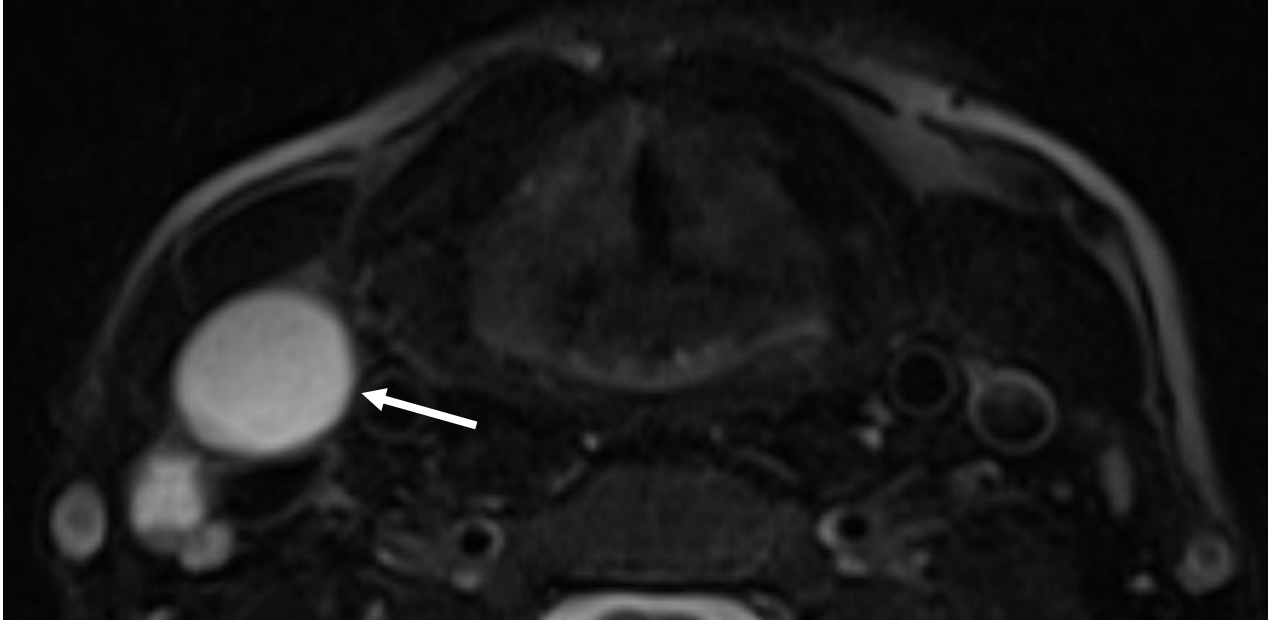
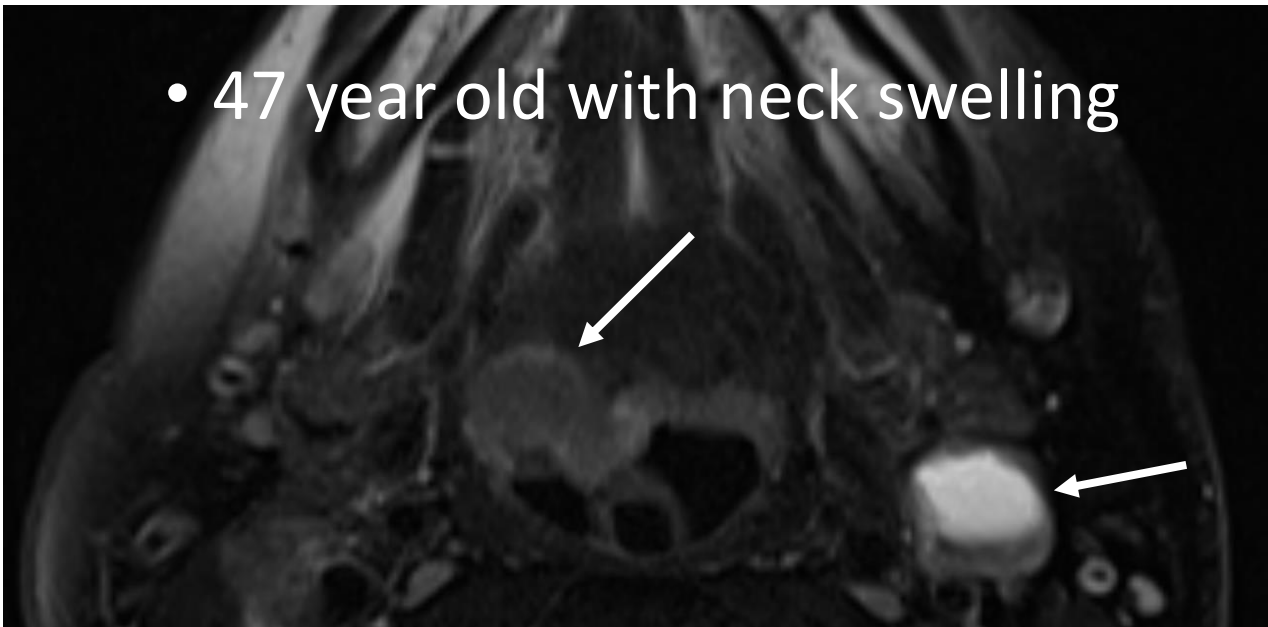
Basal cell carcinoma

Acinic cell carcinoma

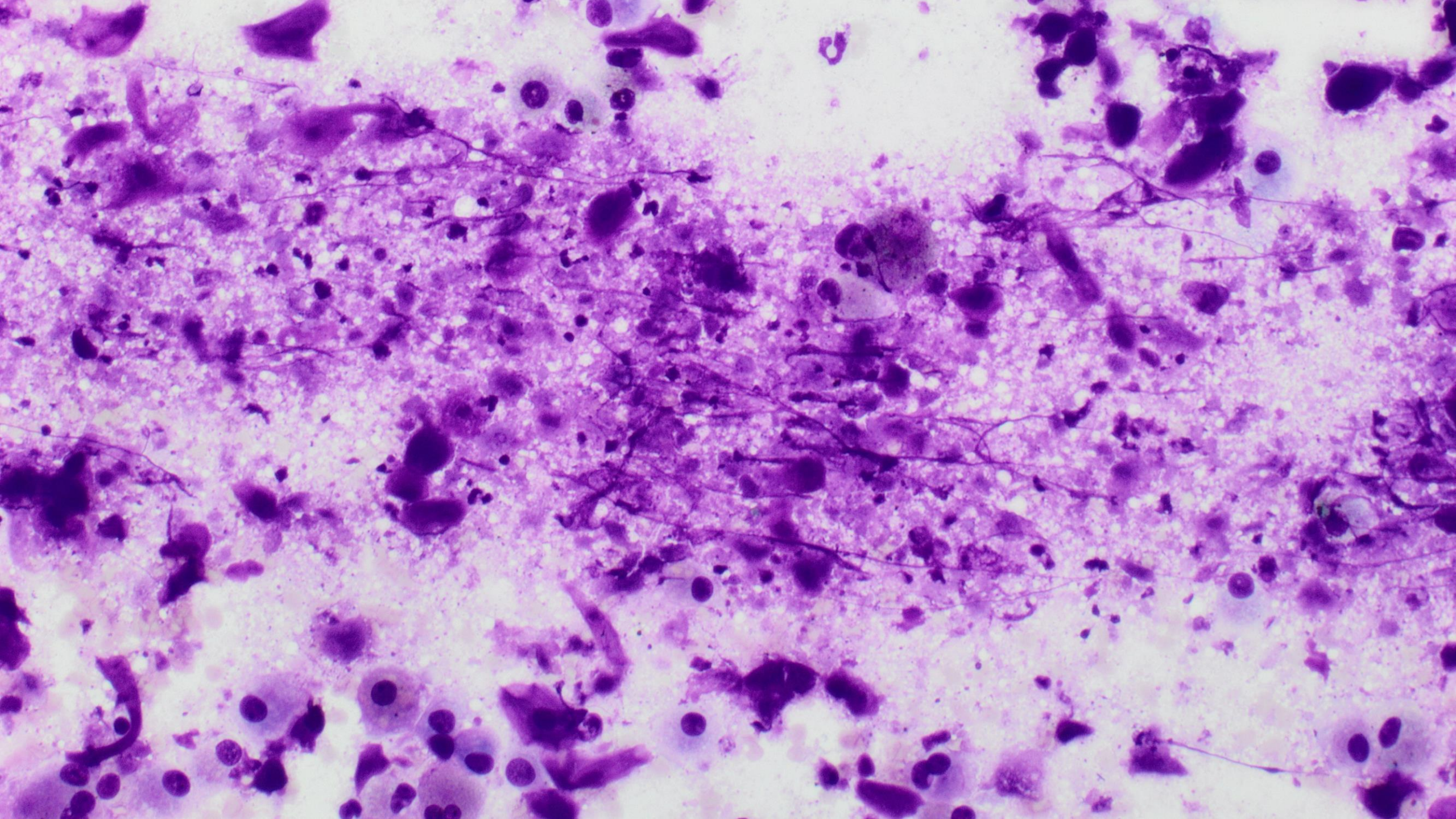
Adenoid cystic carcinoma

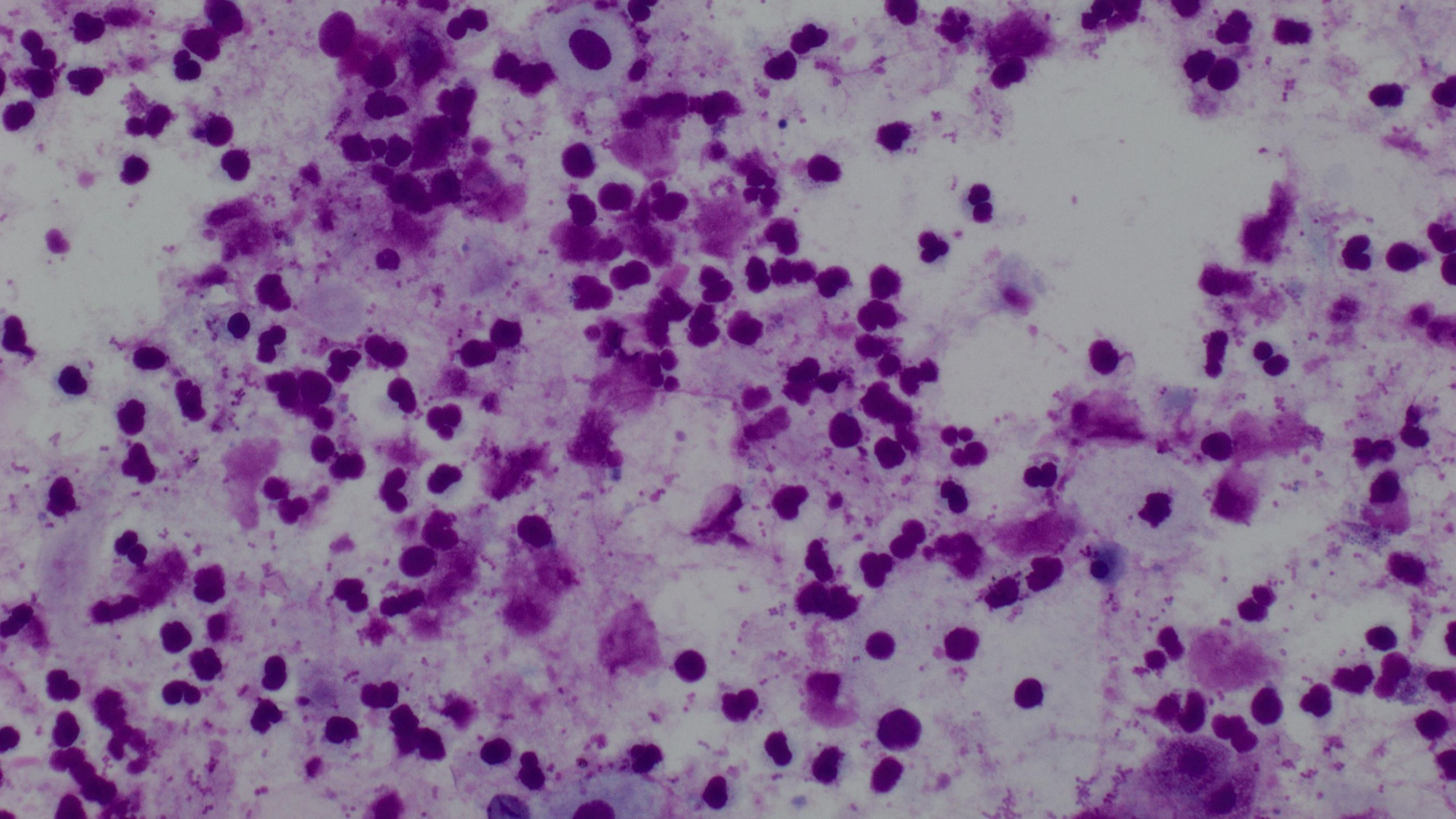
# Case 2

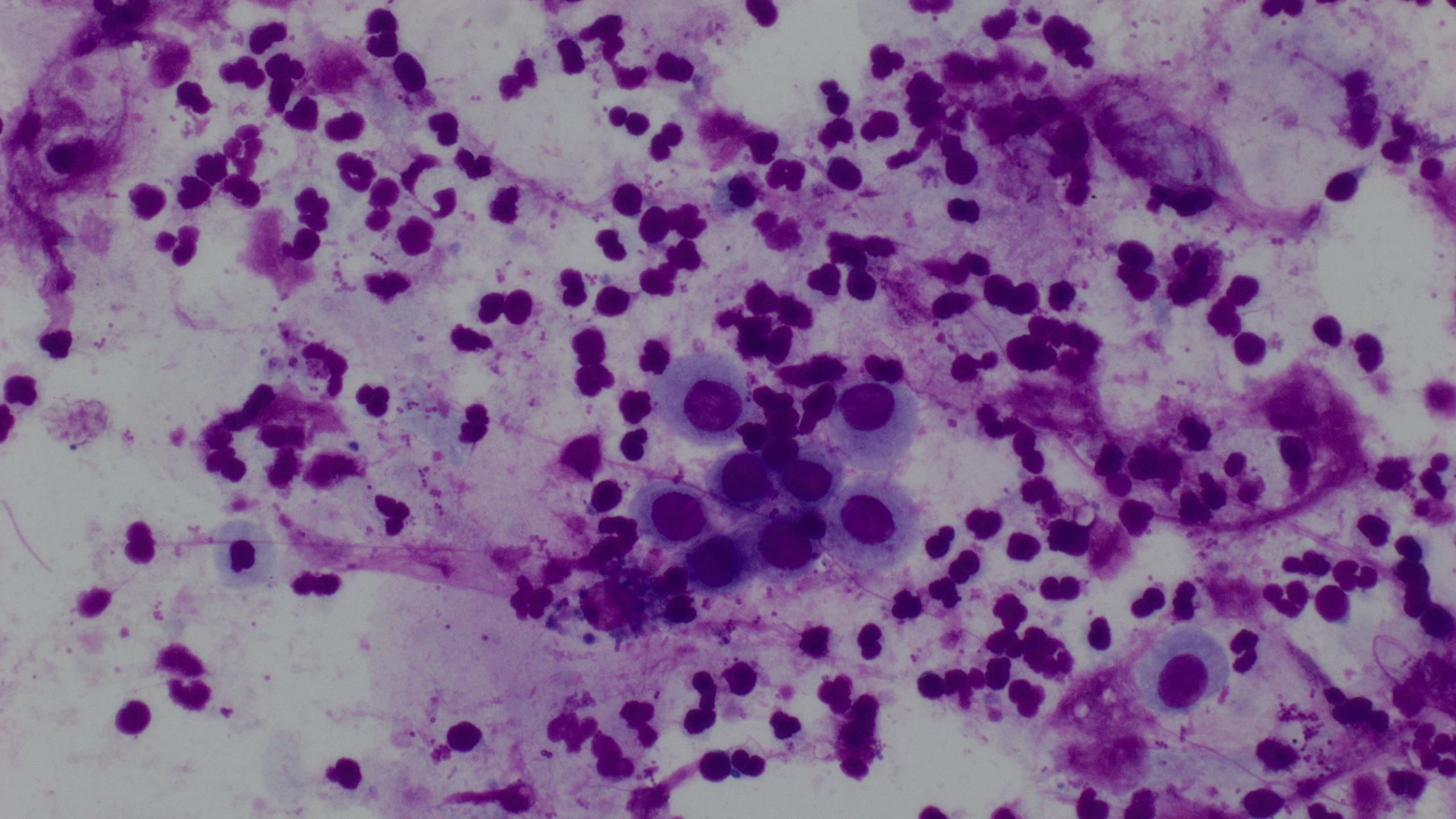
- 47 year old with neck swelling

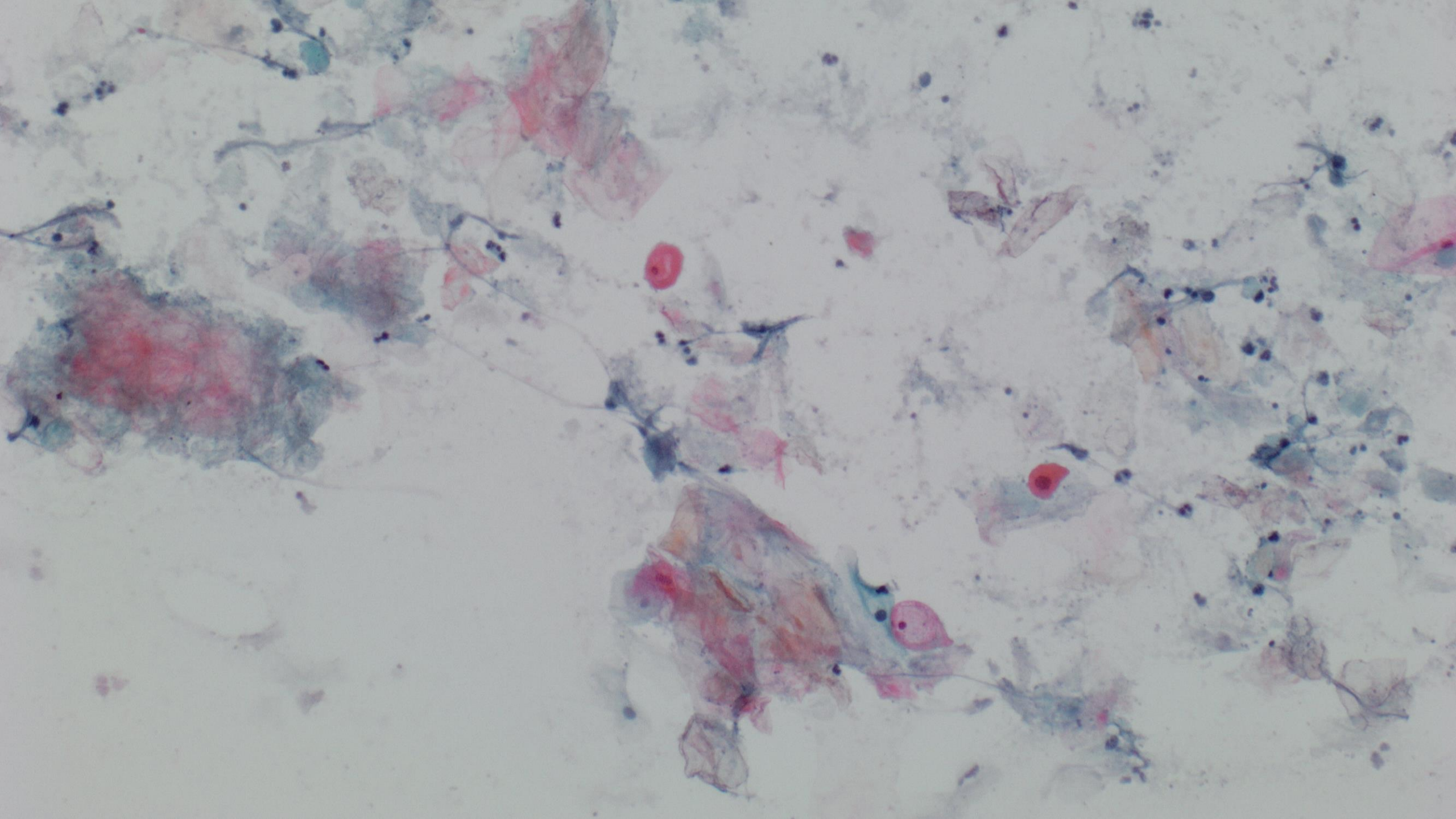


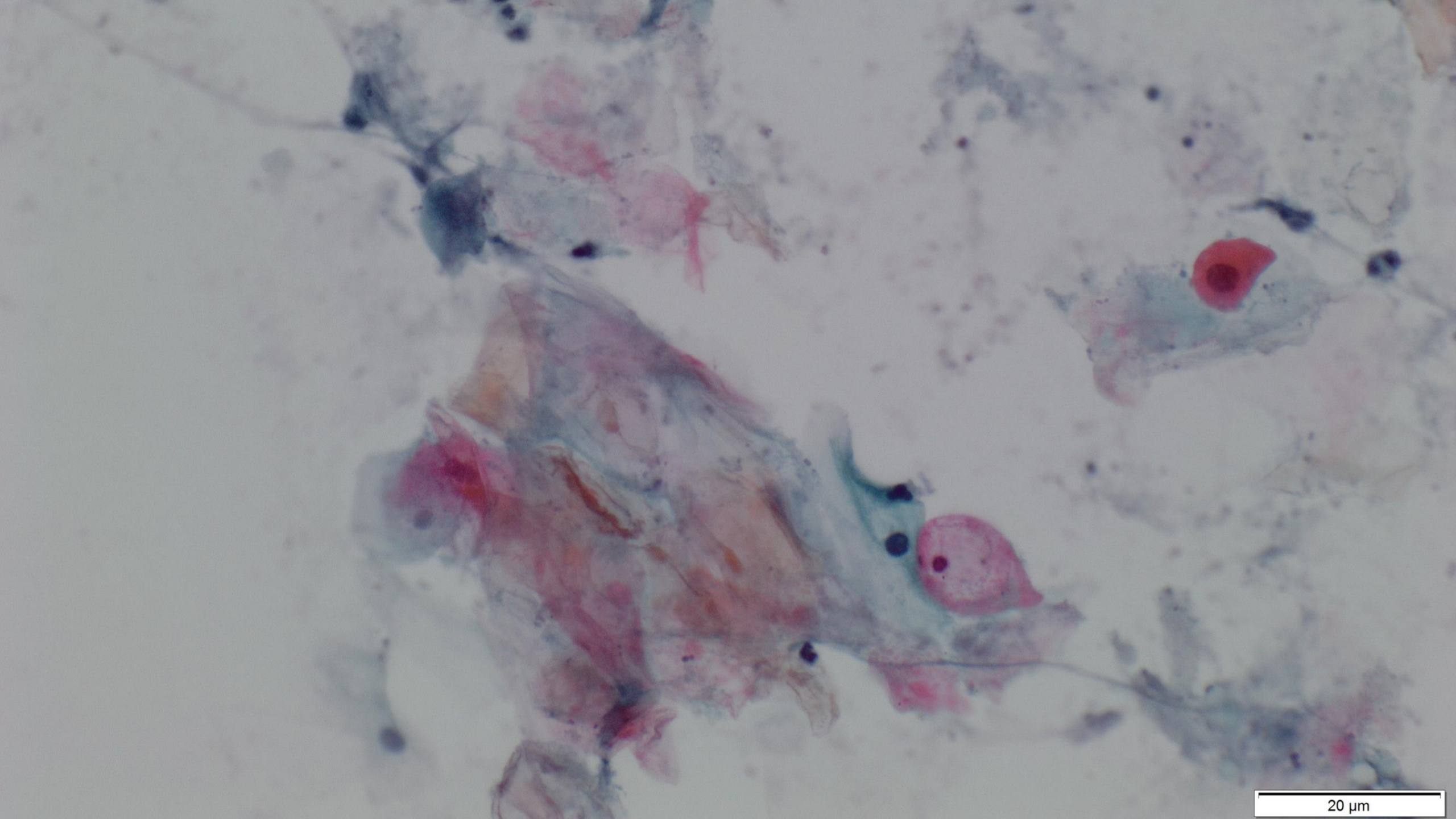




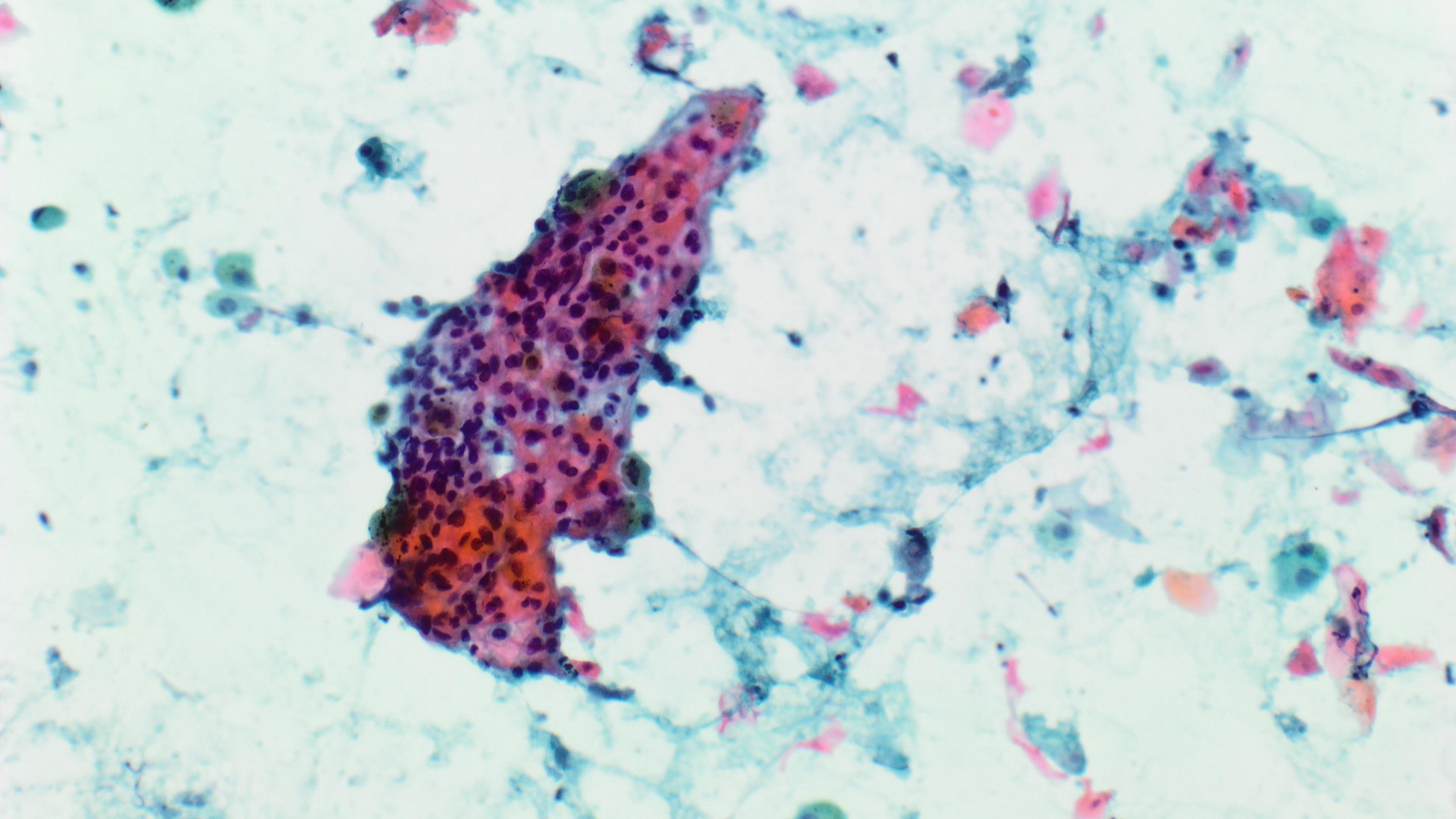








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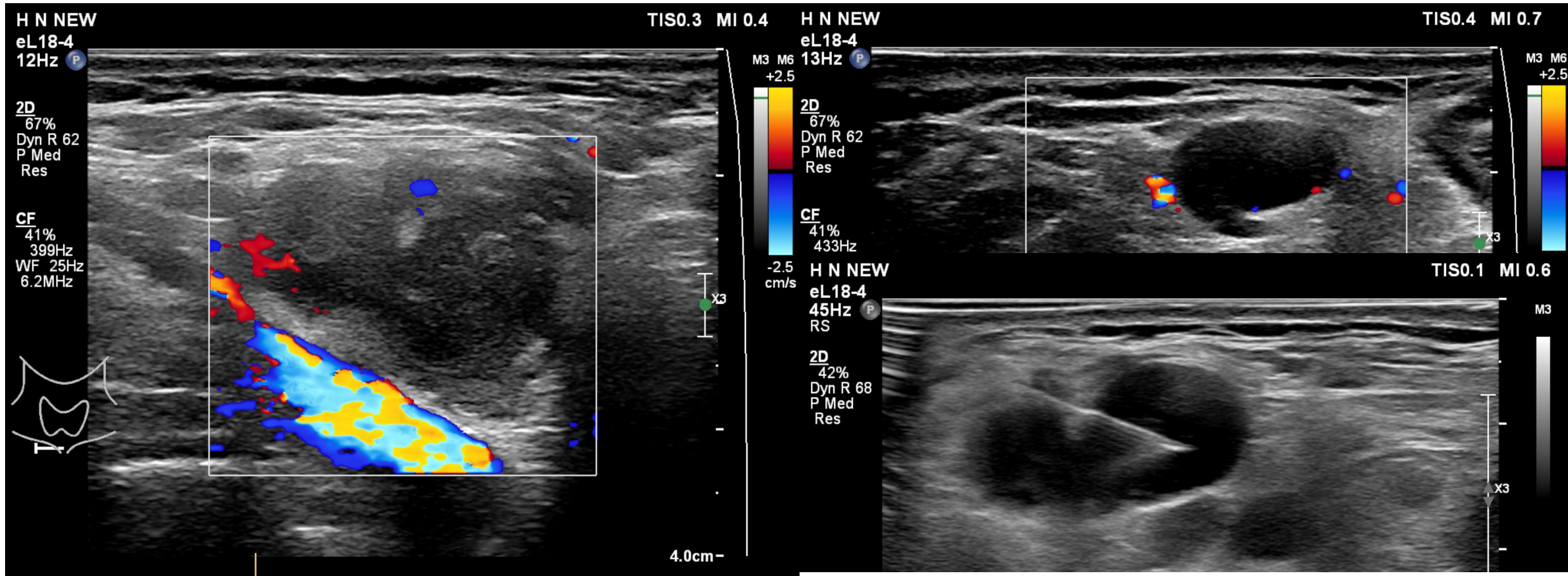


# Cytological findings

- Metastatic squamous cell carcinoma
- Needle washings may be used for preparing a cell block and p16 or HPV –ISH
- Needle washings may be used for DNA genotyping by PCR and provide an easy and more objective test result

# Case 3

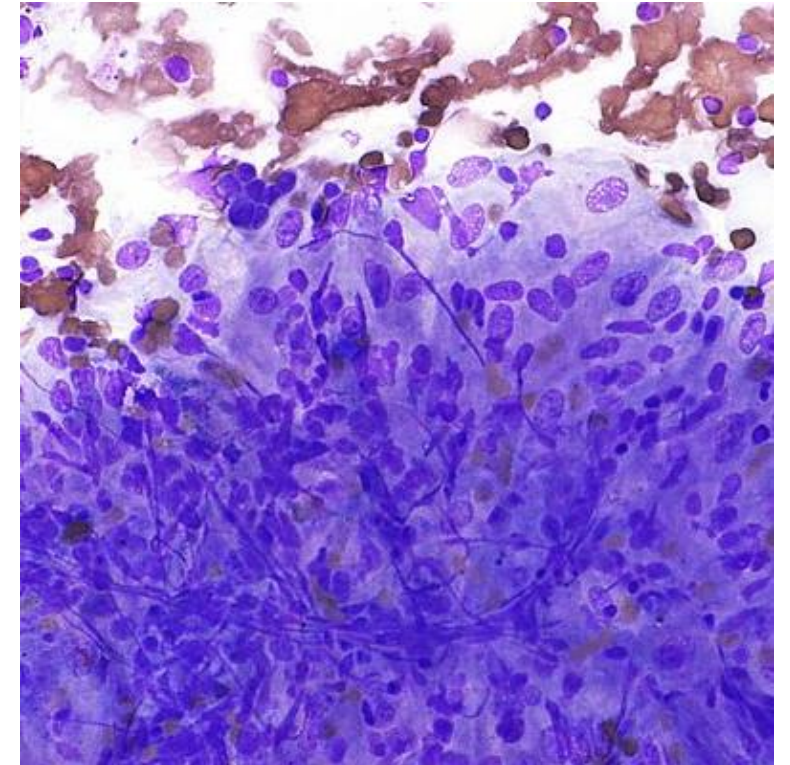
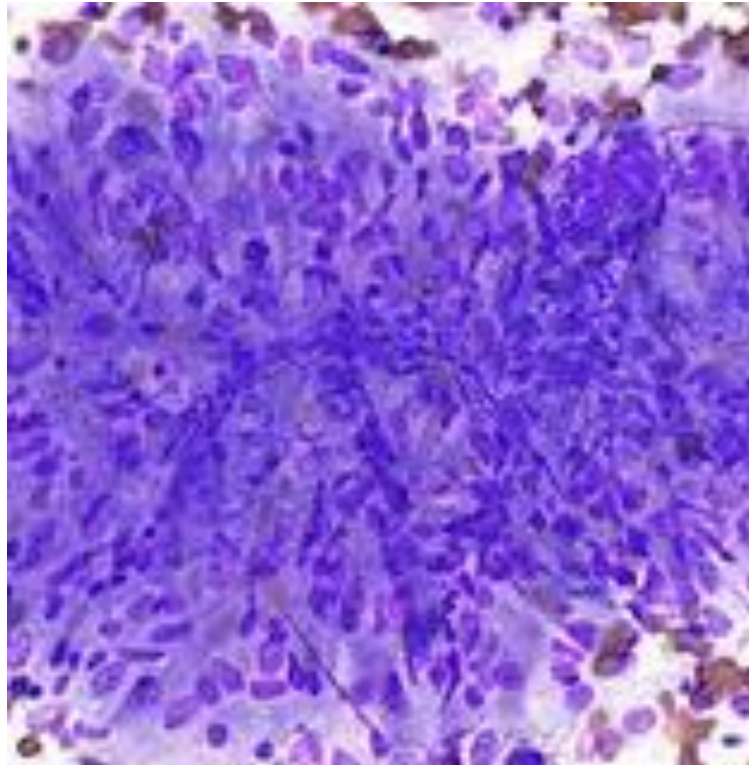
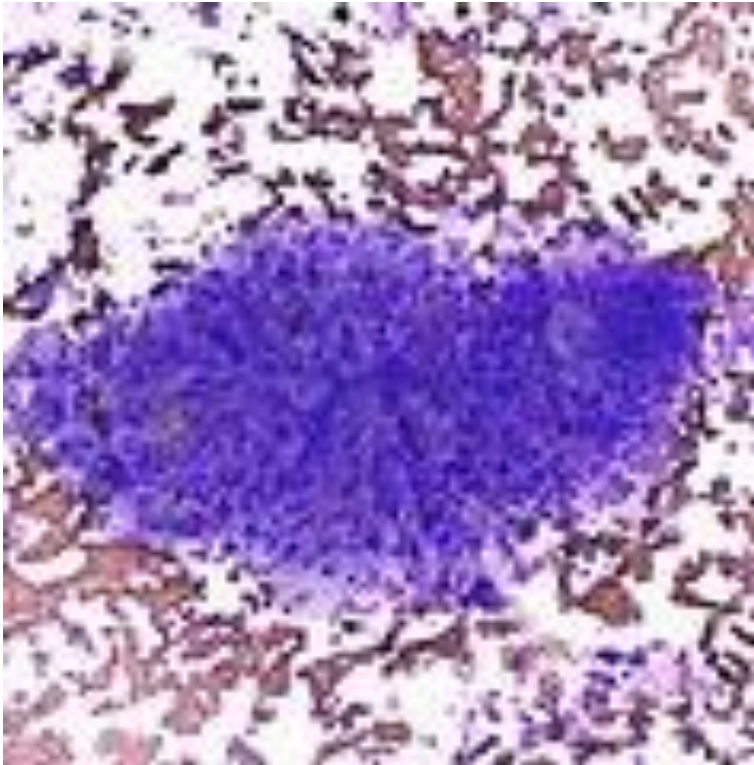
- 30 year old with neck swelling, weight loss and night sweats.





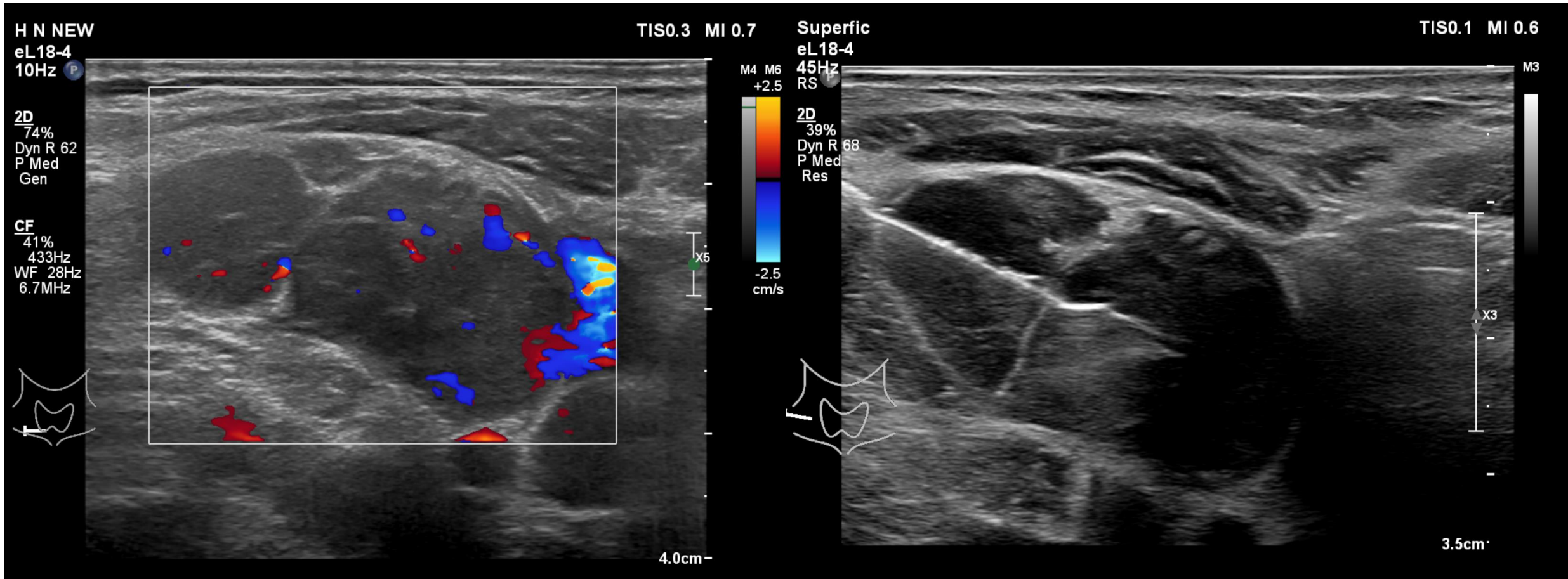
## Granulomatous inflammation

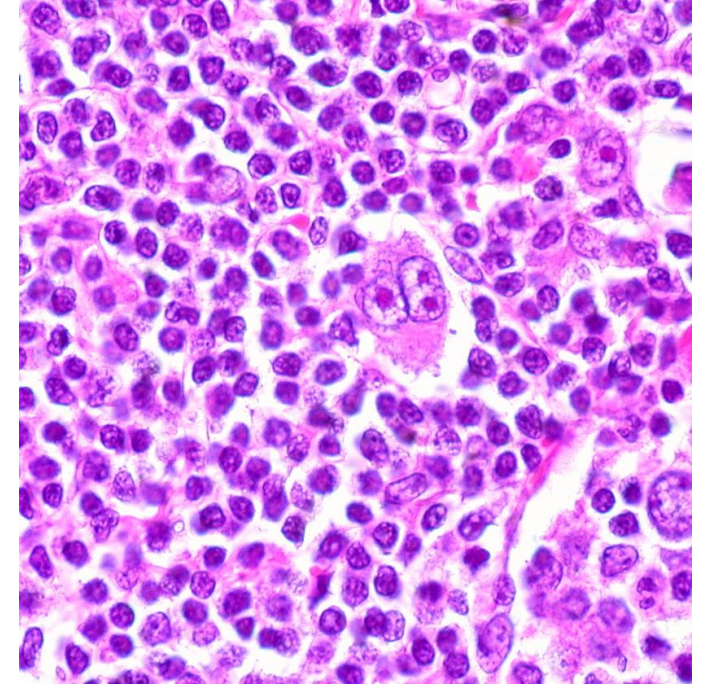
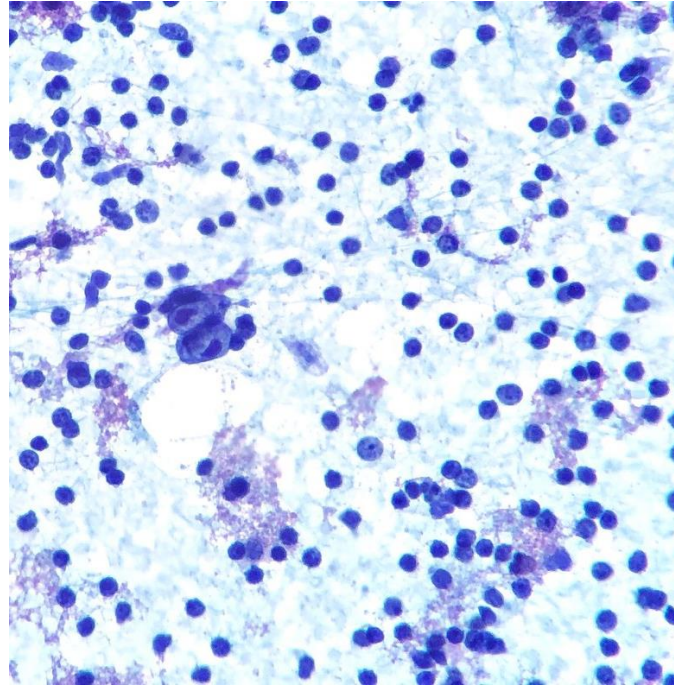
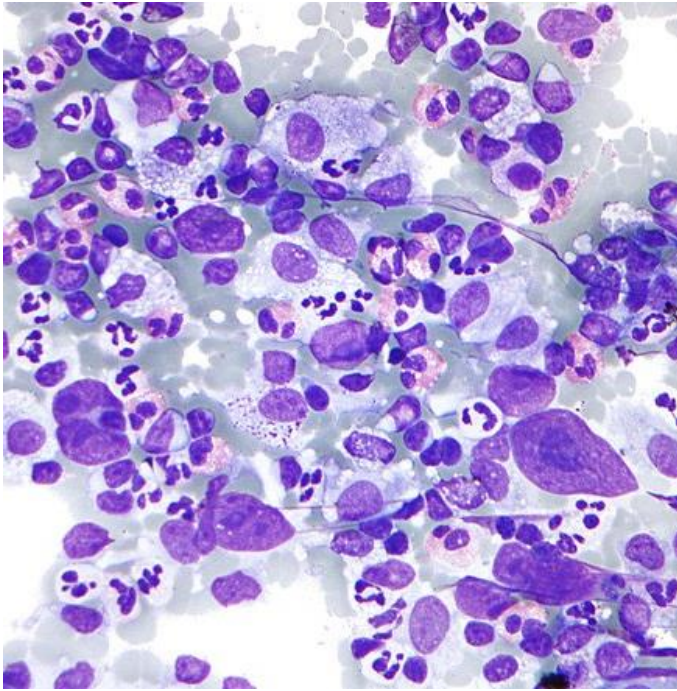
- Needle washings for PCR and microbiological culture and sensitivity
- Exclude other causes such as sarcoid



# Case 4

- 28 year old with neck swelling, weight loss and night sweats.



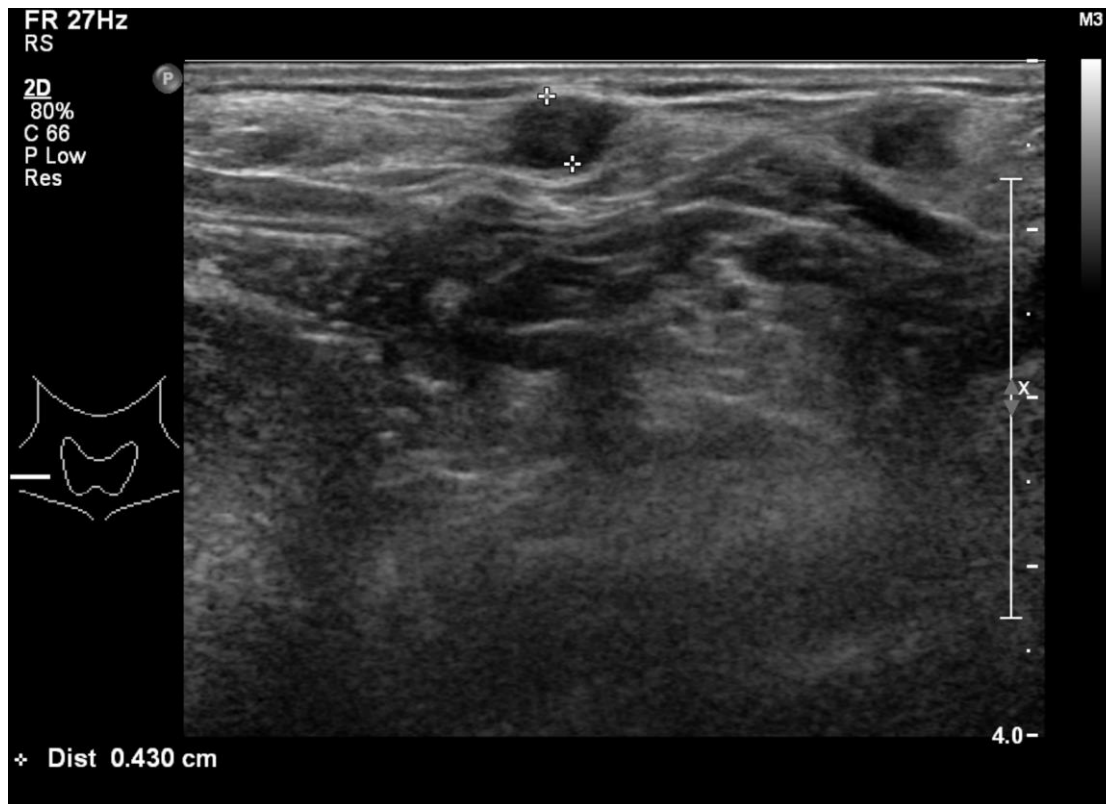


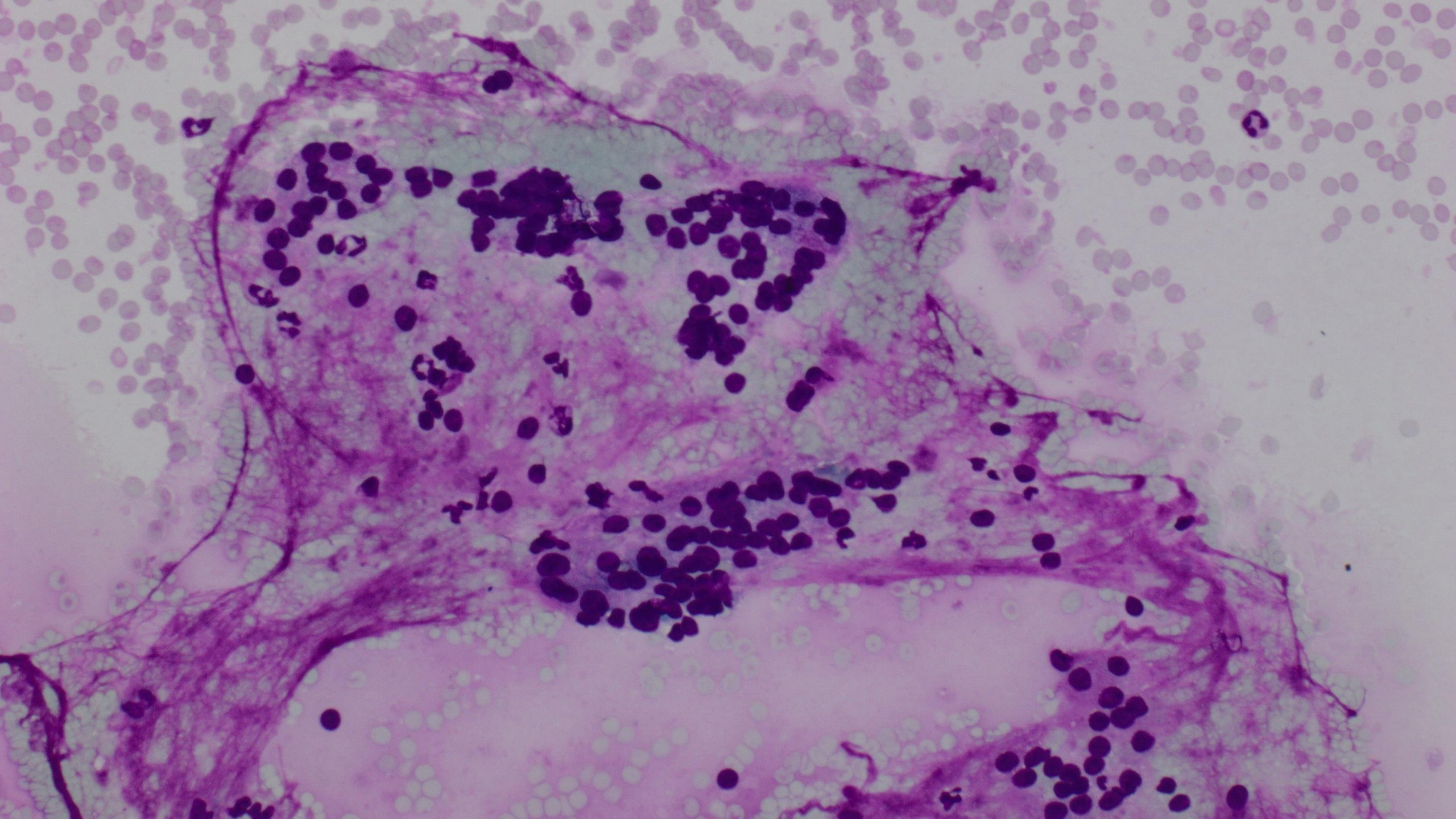
## Hodgkin's lymphoma

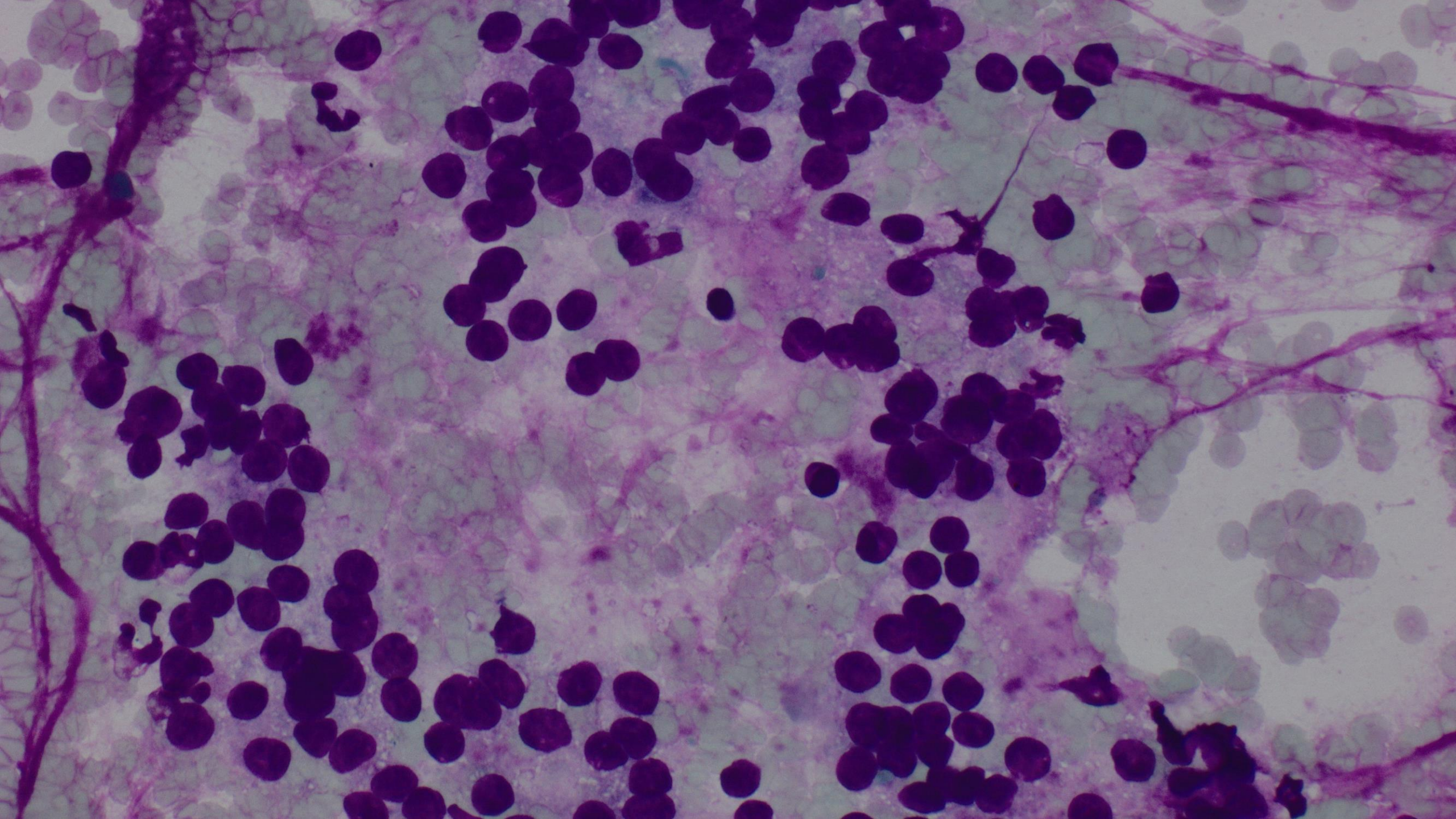
Atypical mononuclear and  
binucleate Reed-Sternberg cells  
present

# Case 5

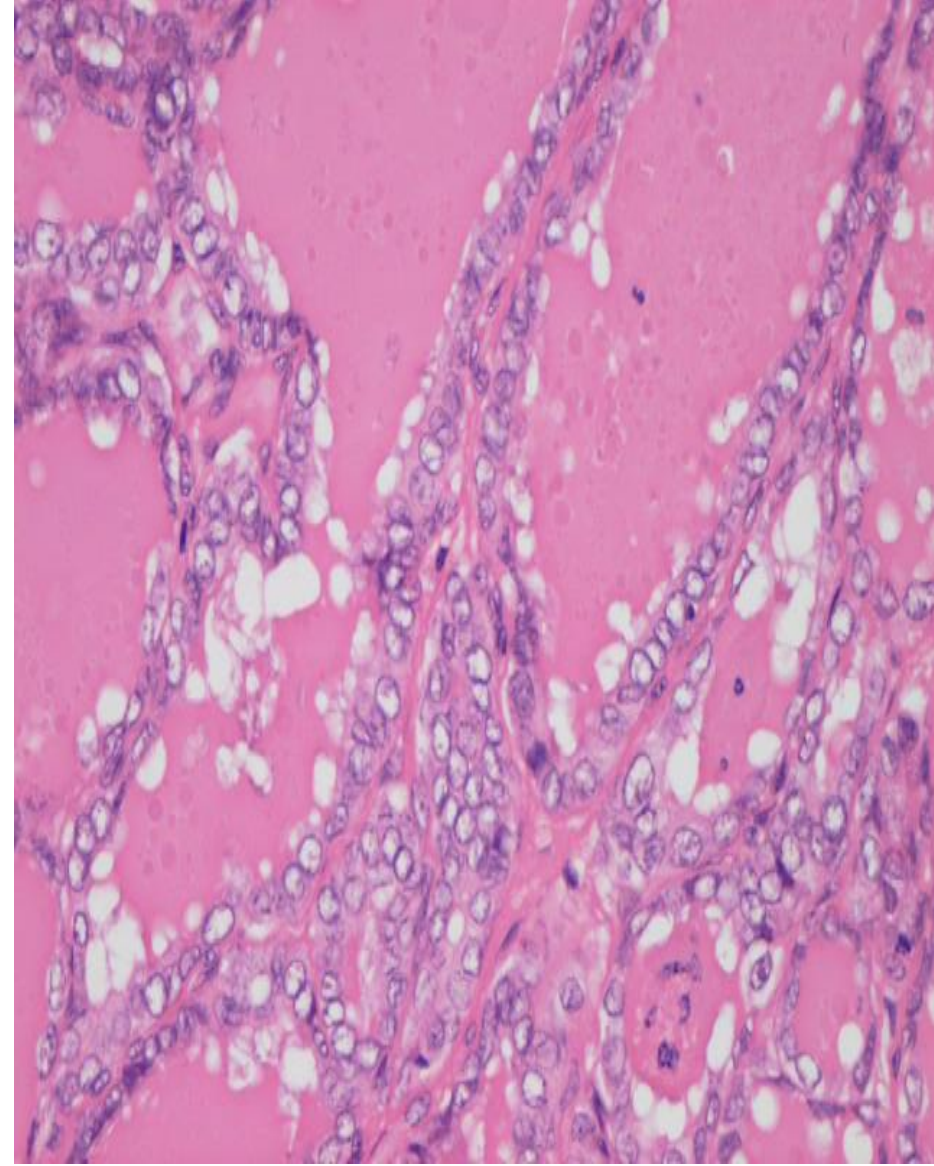
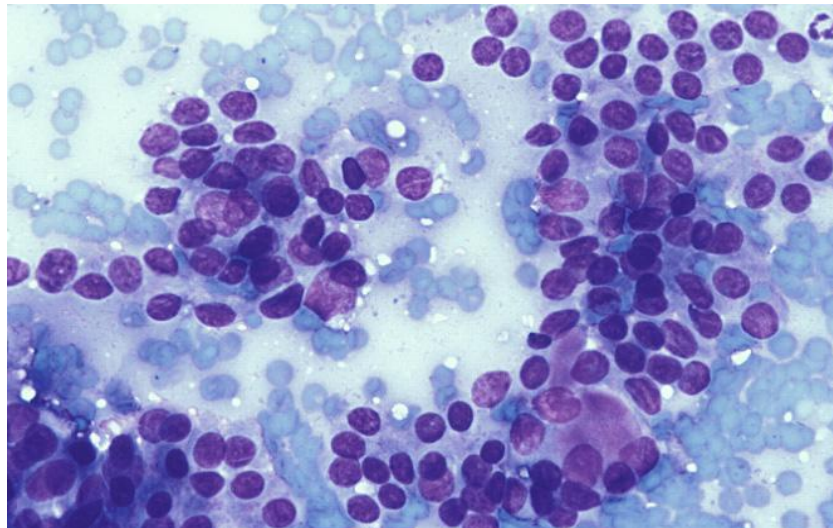
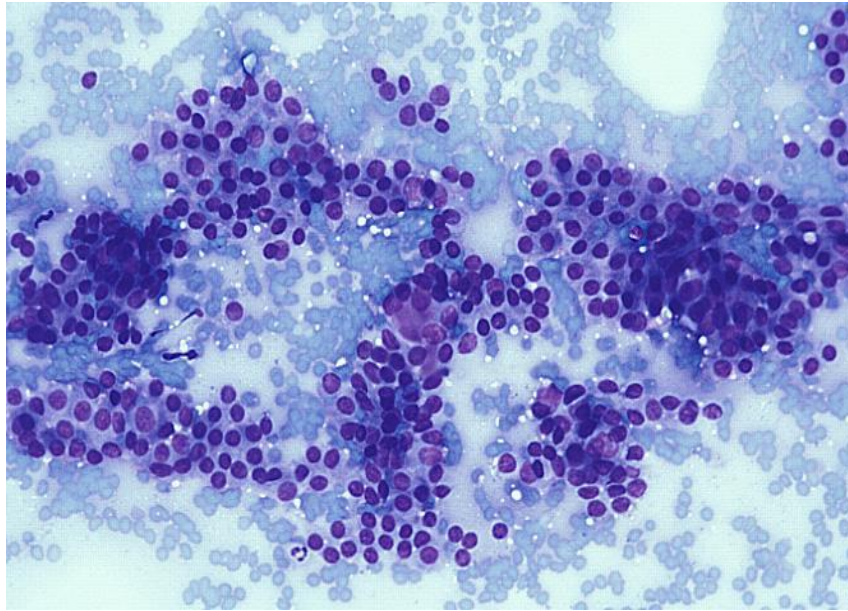
- 41 year old 1 year post total thyroidectomy and neck dissection for thyroid carcinoma.







# Follicular variant of papillary carcinoma, Thy3a nuclear type

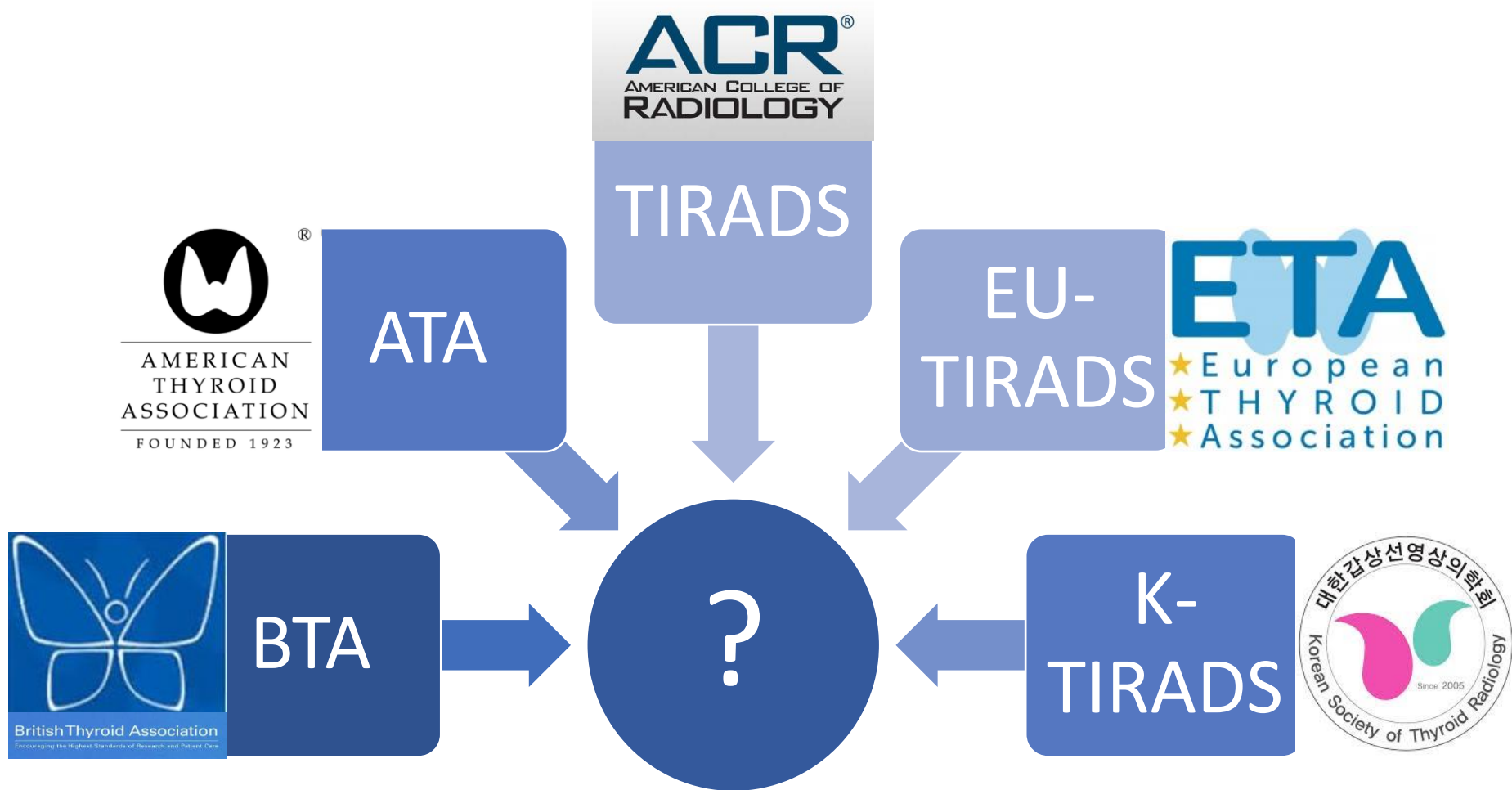


# Notes on radiological assessment of thyroid lesions

- Based on features to provide a risk of malignancy.
- Most features show overlap between benign and malignant lesions, resulting in variable specificity and sensitivity.
- National and international classification systems are used for standardisation and decisions when to FNA.

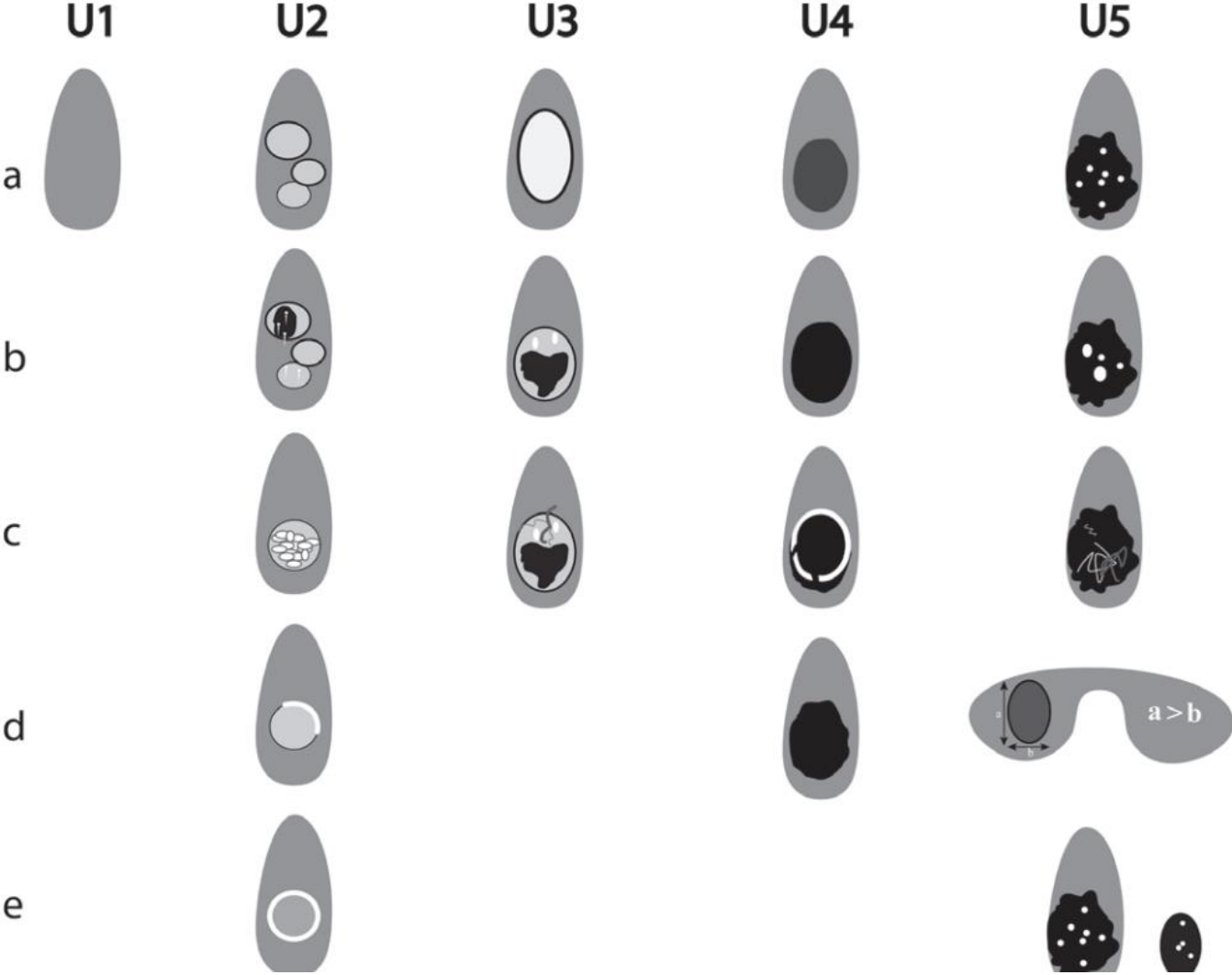


# Nodule risk stratification

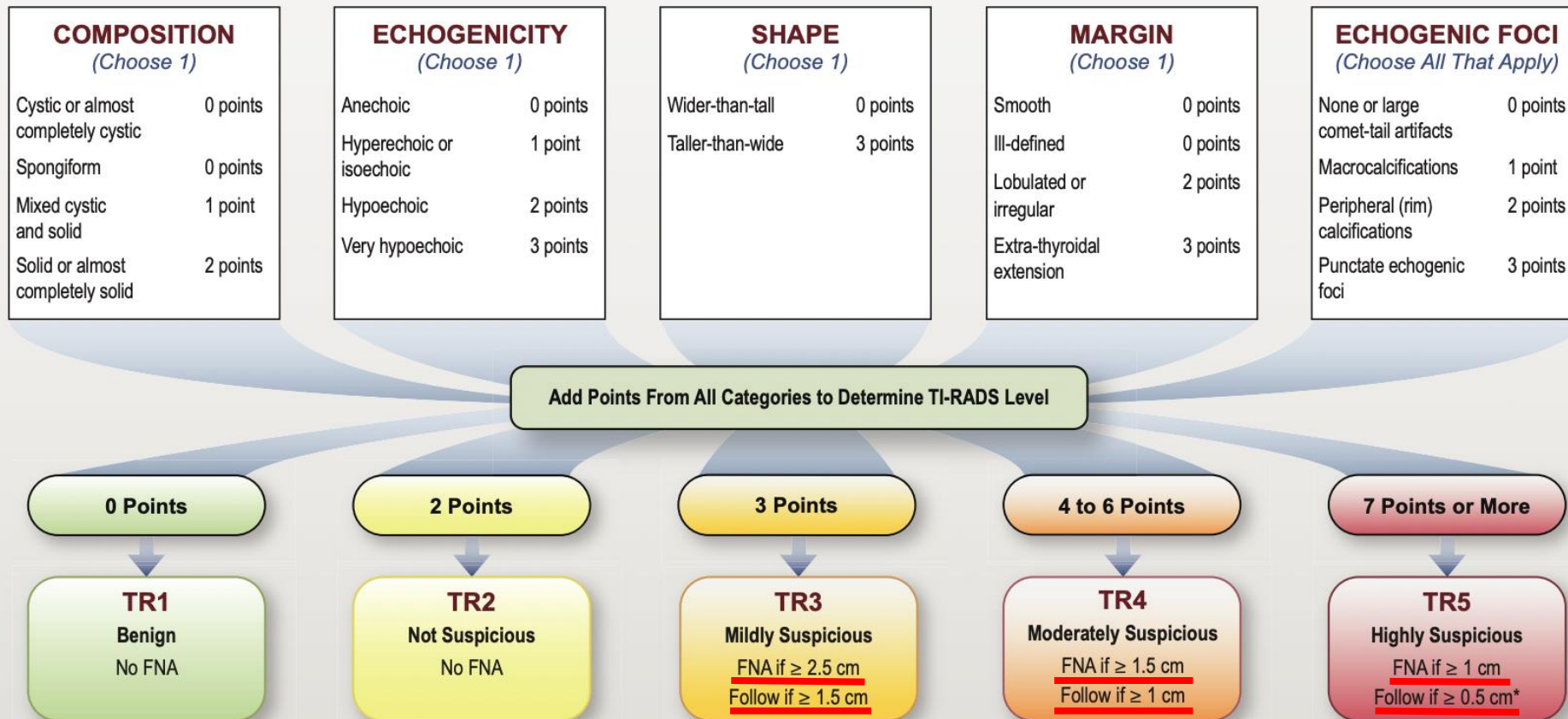


# BTA guidelines

- **U1. Normal**
- **U2. Benign**
- **U3. Indeterminate/Equivocal**
- **U4. Suspicious**
- **U5. Malignant**



# ACR TI-RADS



COMPOSITION	ECHOGENICITY	SHAPE	MARGIN	ECHOGENIC FOCI
<p><i>Spongiform</i>: Composed predominantly (&gt;50%) of small cystic spaces. Do not add further points for other categories.</p> <p><i>Mixed cystic and solid</i>: Assign points for predominant solid component.</p> <p>Assign 2 points if composition cannot be determined because of calcification.</p>	<p><i>Anechoic</i>: Applies to cystic or almost completely cystic nodules.</p> <p><i>Hyperechoic/isoechoic/hypoechoic</i>: Compared to adjacent parenchyma.</p> <p><i>Very hypoechoic</i>: More hypoechoic than strap muscles.</p> <p>Assign 1 point if echogenicity cannot be determined.</p>	<p><i>Taller-than-wide</i>: Should be assessed on a transverse image with measurements parallel to sound beam for height and perpendicular to sound beam for width.</p> <p>This can usually be assessed by visual inspection.</p>	<p><i>Lobulated</i>: Protrusions into adjacent tissue.</p> <p><i>Irregular</i>: Jagged, spiculated, or sharp angles.</p> <p><i>Extrathyroidal extension</i>: Obvious invasion = malignancy.</p> <p>Assign 0 points if margin cannot be determined.</p>	<p><i>Large comet-tail artifacts</i>: V-shaped, &gt;1 mm, in cystic components.</p> <p><i>Macrocalcifications</i>: Cause acoustic shadowing.</p> <p><i>Peripheral</i>: Complete or incomplete along margin.</p> <p><i>Punctate echogenic foci</i>: May have small comet-tail artifacts.</p>

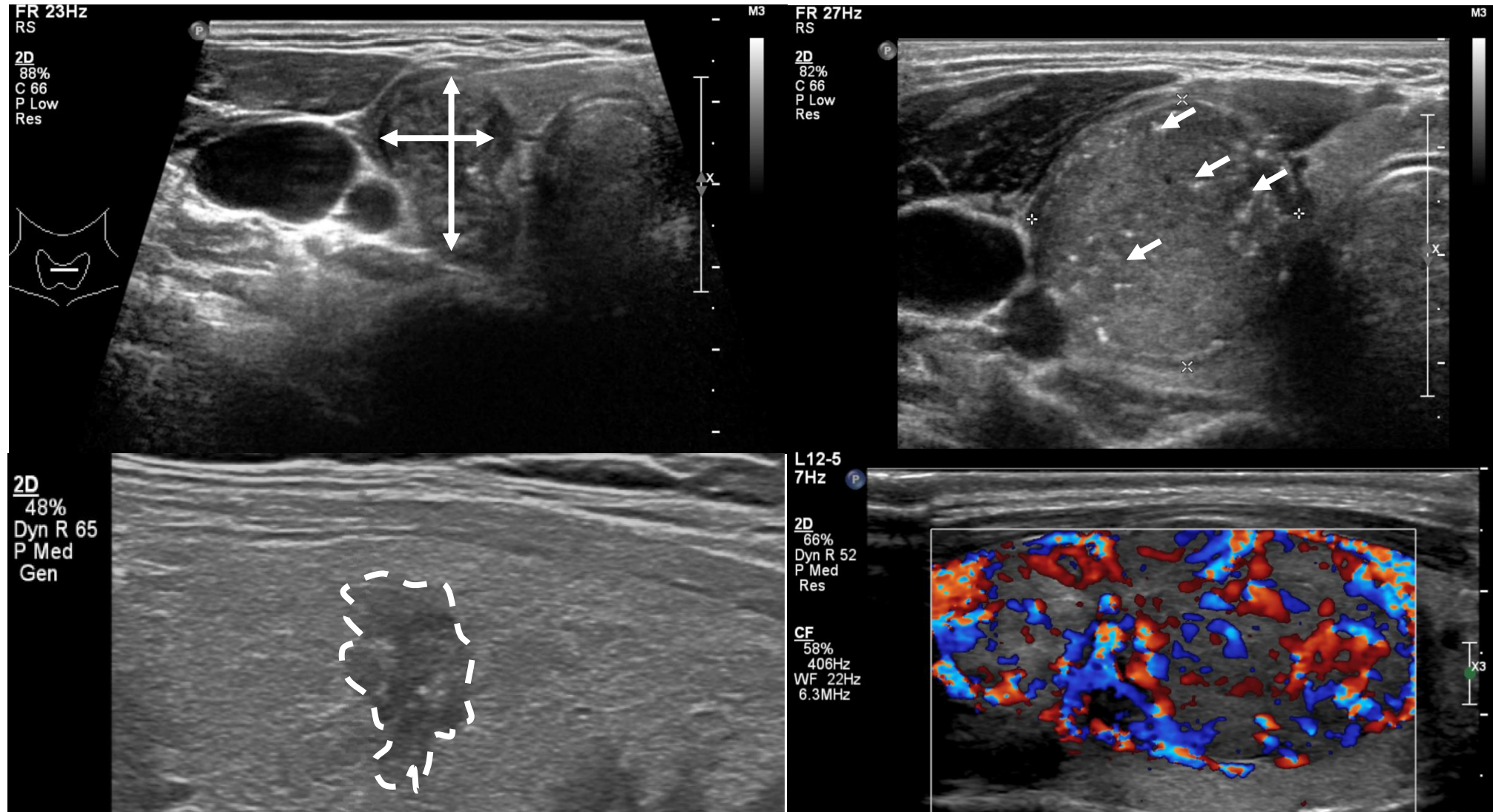
\*Refer to discussion of papillary microcarcinomas for 5-9 mm TR5 nodules.

Feature	Sensitivity (%)	Specificity (%)	Positive likelihood ratio	Probability of malignancy(%)
Taller than wide	26.7	96.6	8.07	47.0
Halo absent	56.4	72.0	2.02	18.1
Heterogeneity	47.5	70.0	1.58	14.8
Hypoechoogenicity	62.7	62.3	1.66	15.4
Solid	72.7	53.2	1.55	14.6
Microcalcifications	39.5	87.8	3.26	26.4
Solitary	53.0	60.2	1.33	12.8
Central vascularization	45.9	78.0	2.09	18.7
Irregular margins	50.5	83.1	2.99	24.7

Remonti LR et al. *Thyroid*. 2015;25(5):538-550.

*No single characteristic sufficiently reliable in isolation to diagnose malignancy*

# US features associated with malignancy



# Comparison

	Studies	Sensitivity	Specificity
BTA	2	100% (74-100) 90% (85-95)	35% (25-45) 63% (60-67)
ATA	13	92 % (87-95%)	50% (37-63%)
TIRADS (ACR)	10	94% (86-98%)	54% (45-62%)
French/EU-TIRADS	7	94% (87-98%)	53% (35-70%)
K-TIRADS	4	91% (74-97%)	38% (10-76%)

# US-guided FNA of thyroid lesions

- Fine needle aspiration
  - Can have non-diagnostic rate of ~20% - significantly improved by rapid onsite assessment (*reduces non-diagnostic rate by 44%*)
  - *Fawcett C et al. Acta Cytol. 2022;66(5):371-378.*
- Core biopsy
  - Selected cases atypical/inconclusive cytology
  - Anaplastic carcinoma
  - Lymphoma

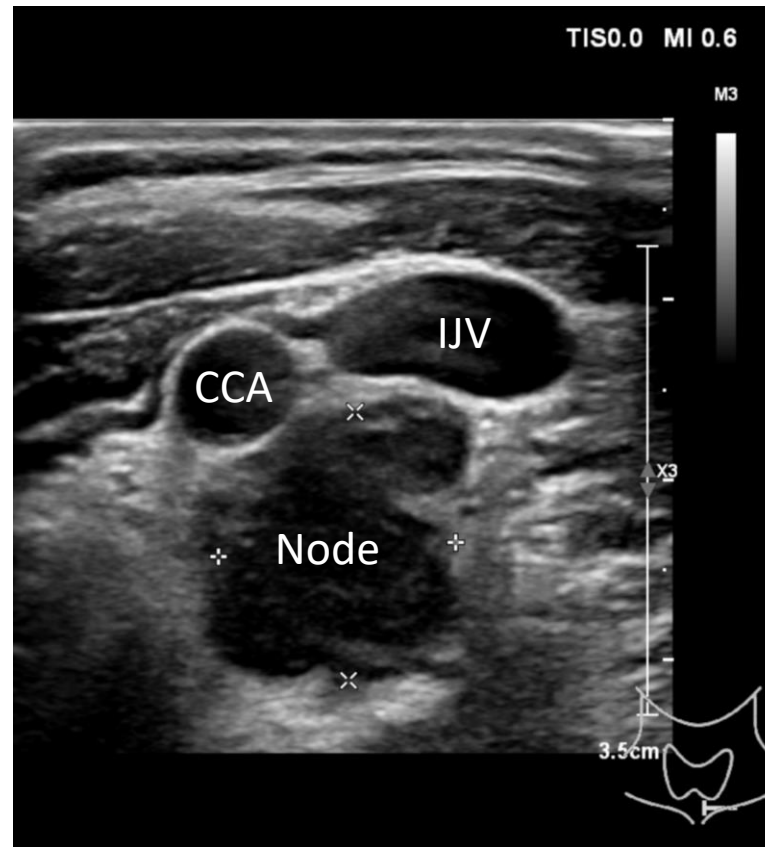
# Pitfalls

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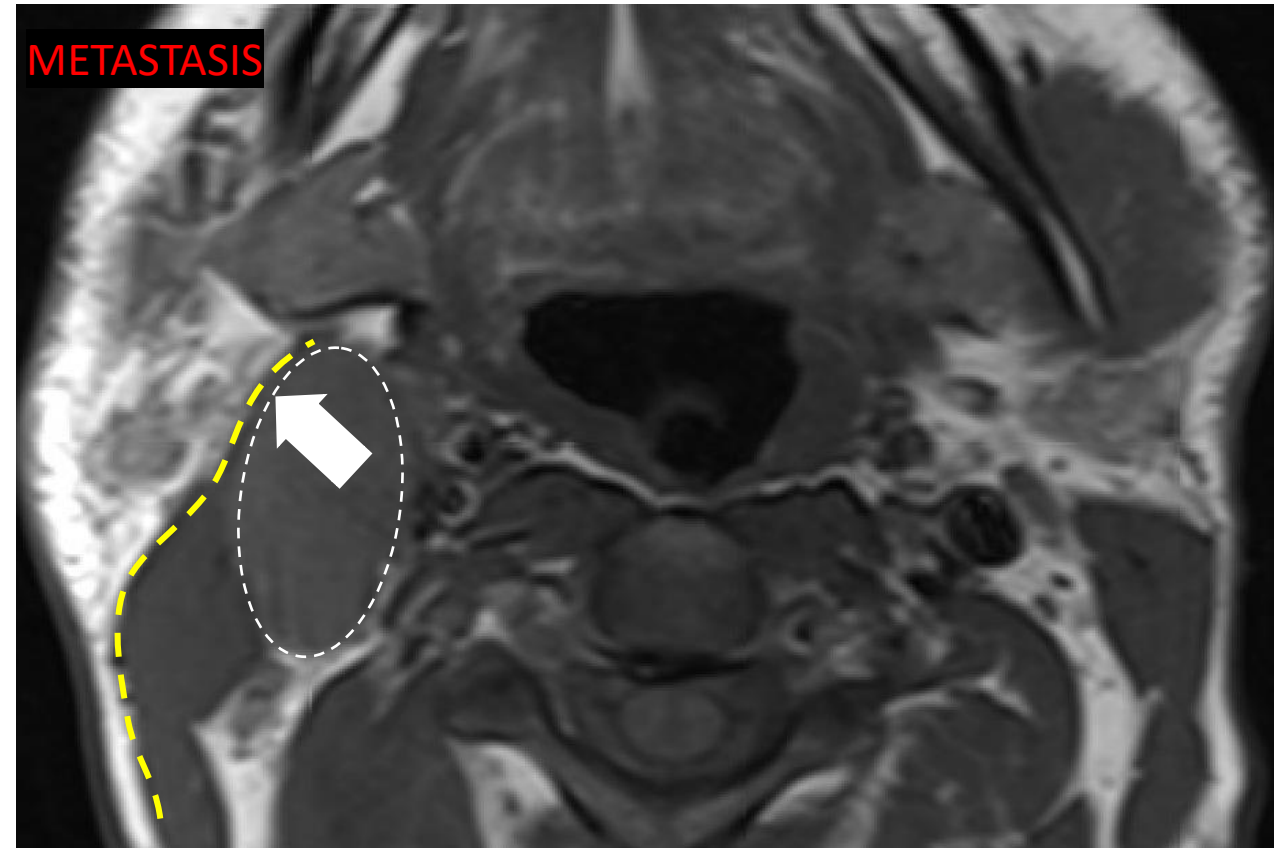
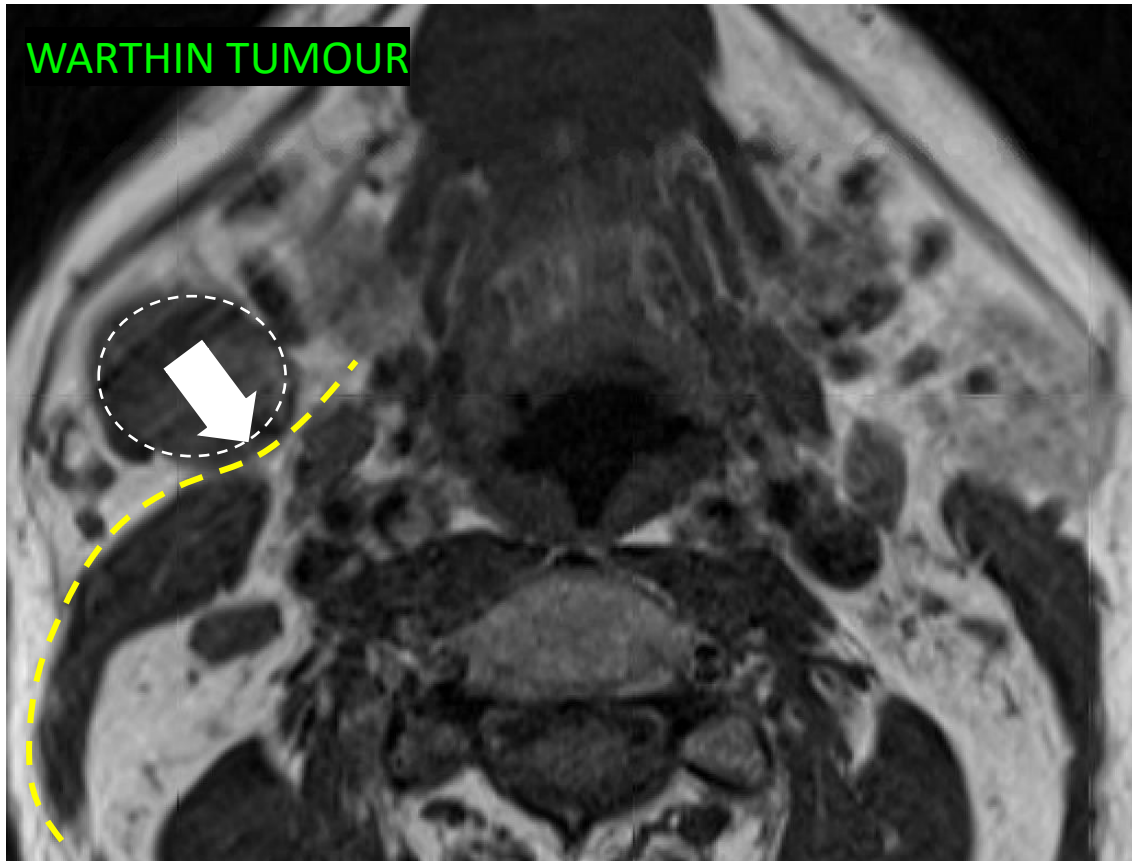
# Location

- Lesions may be located too deep to be accessed

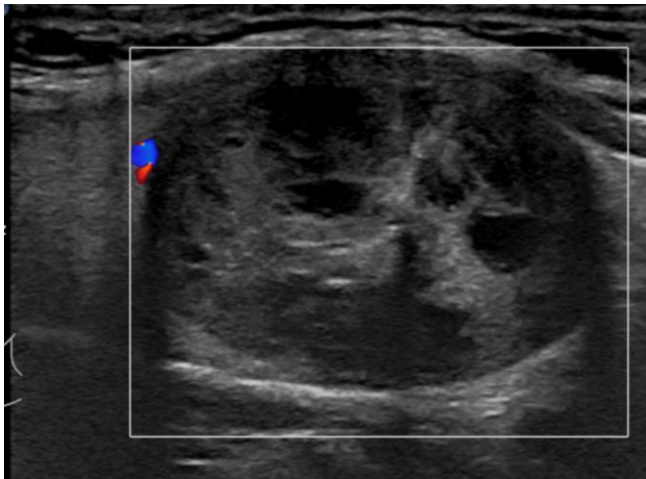


# Location

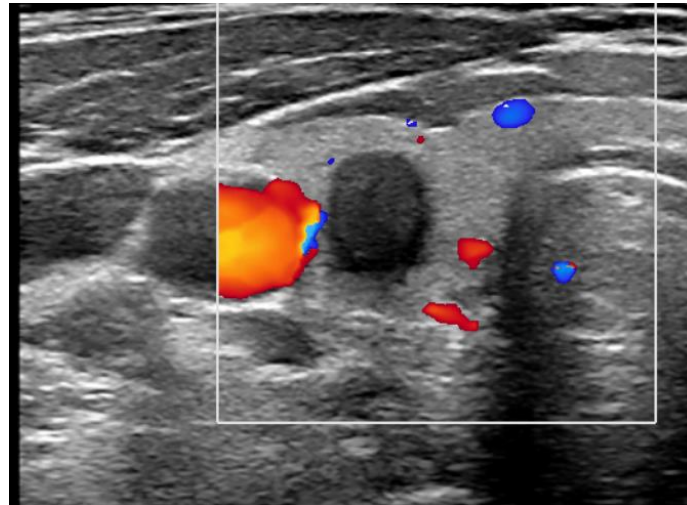
- Pressure from the probe and proximity of structures may confuse accurate localisation



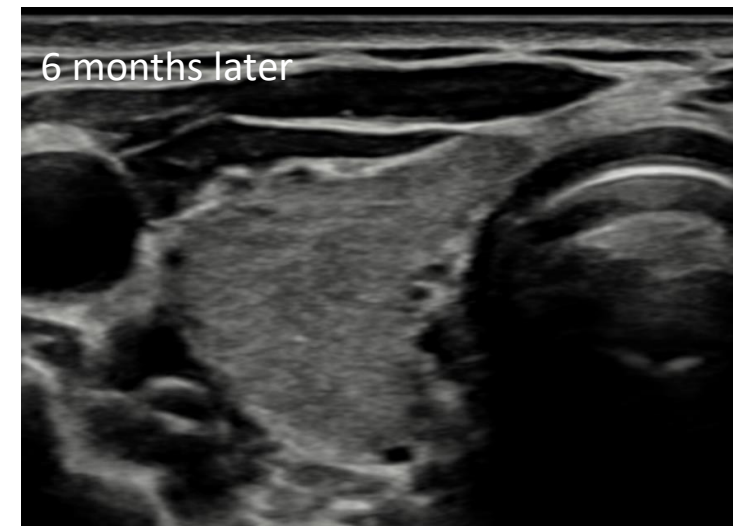
# Mimics of thyroid malignancy



Haemorrhagic cyst

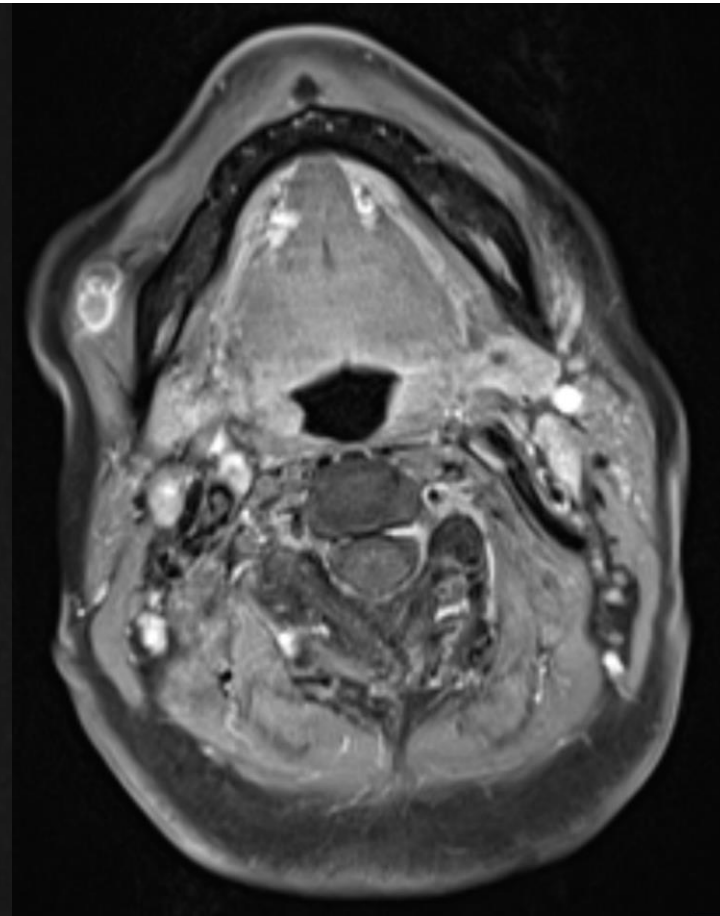
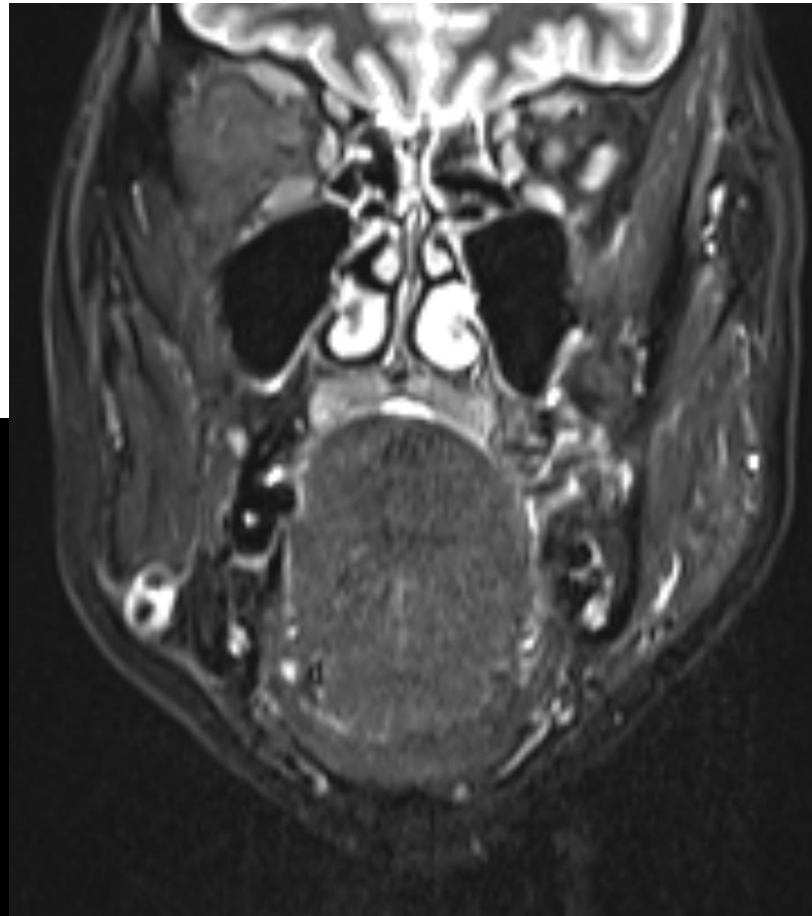
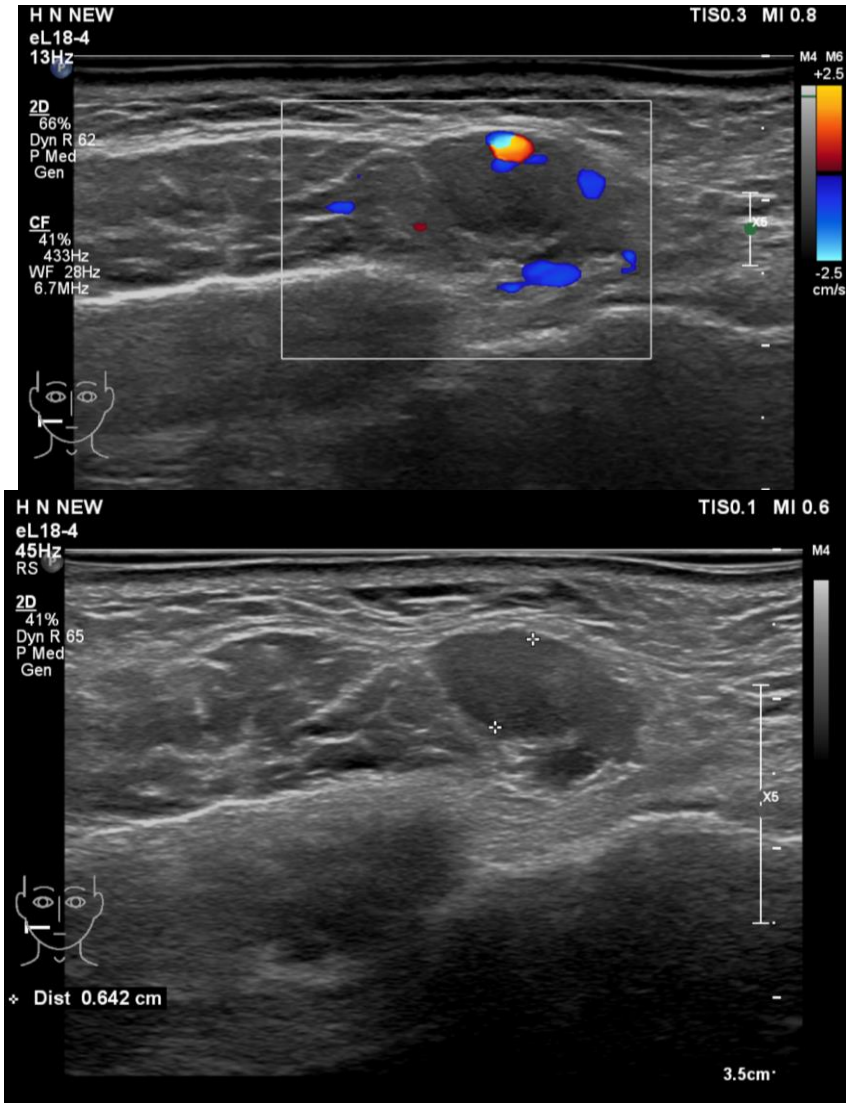


Haemorrhagic cyst



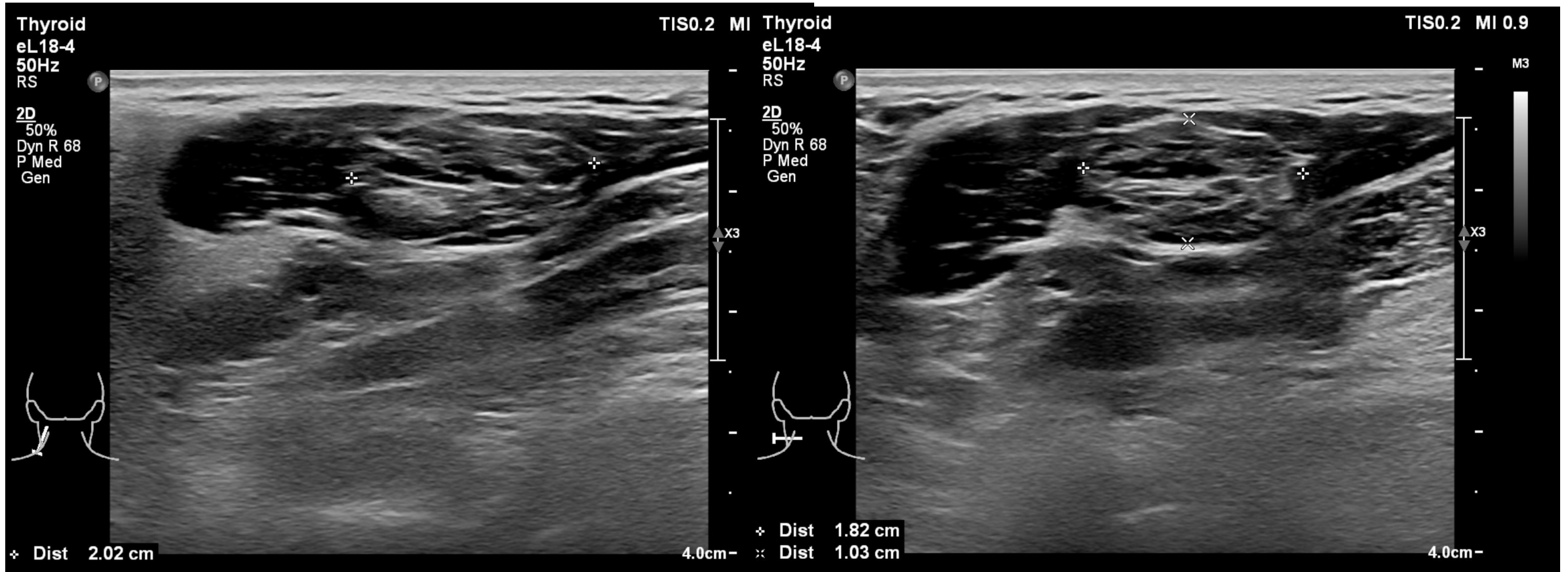
Focal lymphocytic thyroiditis

# Venous malformations



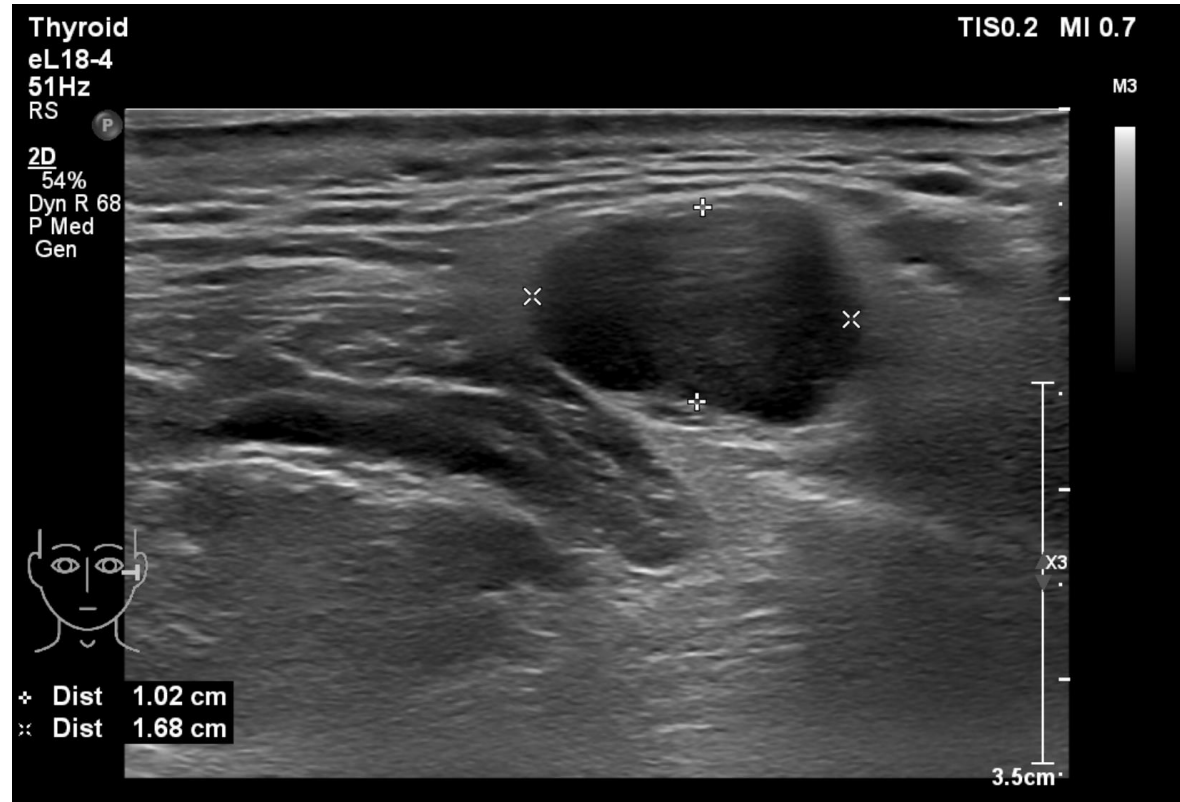
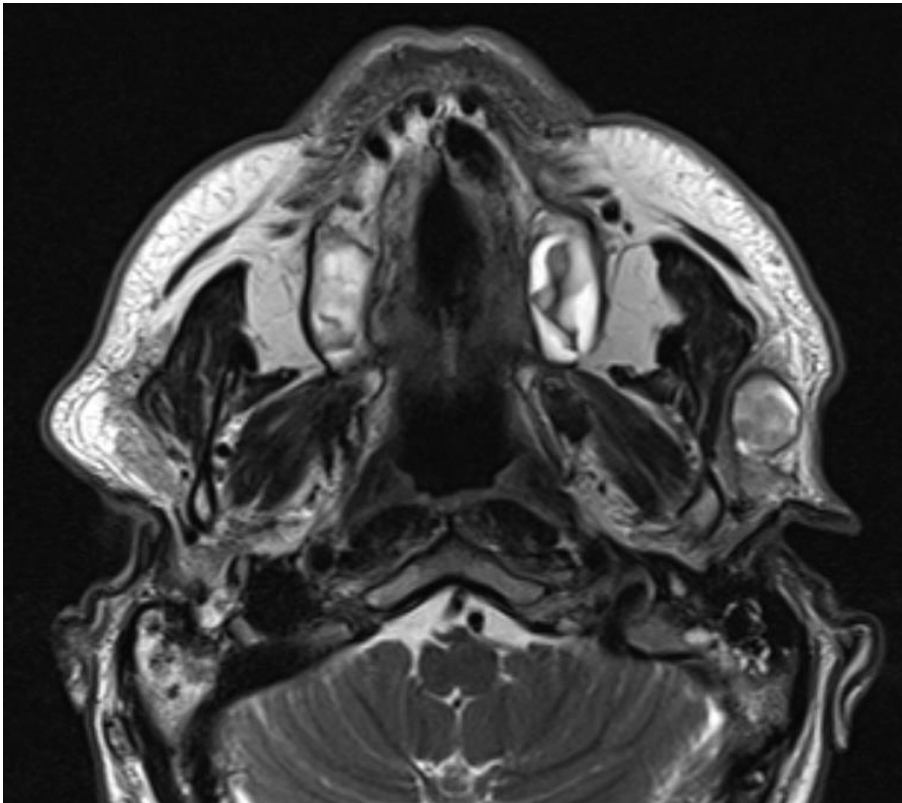
# FNA without US guidance

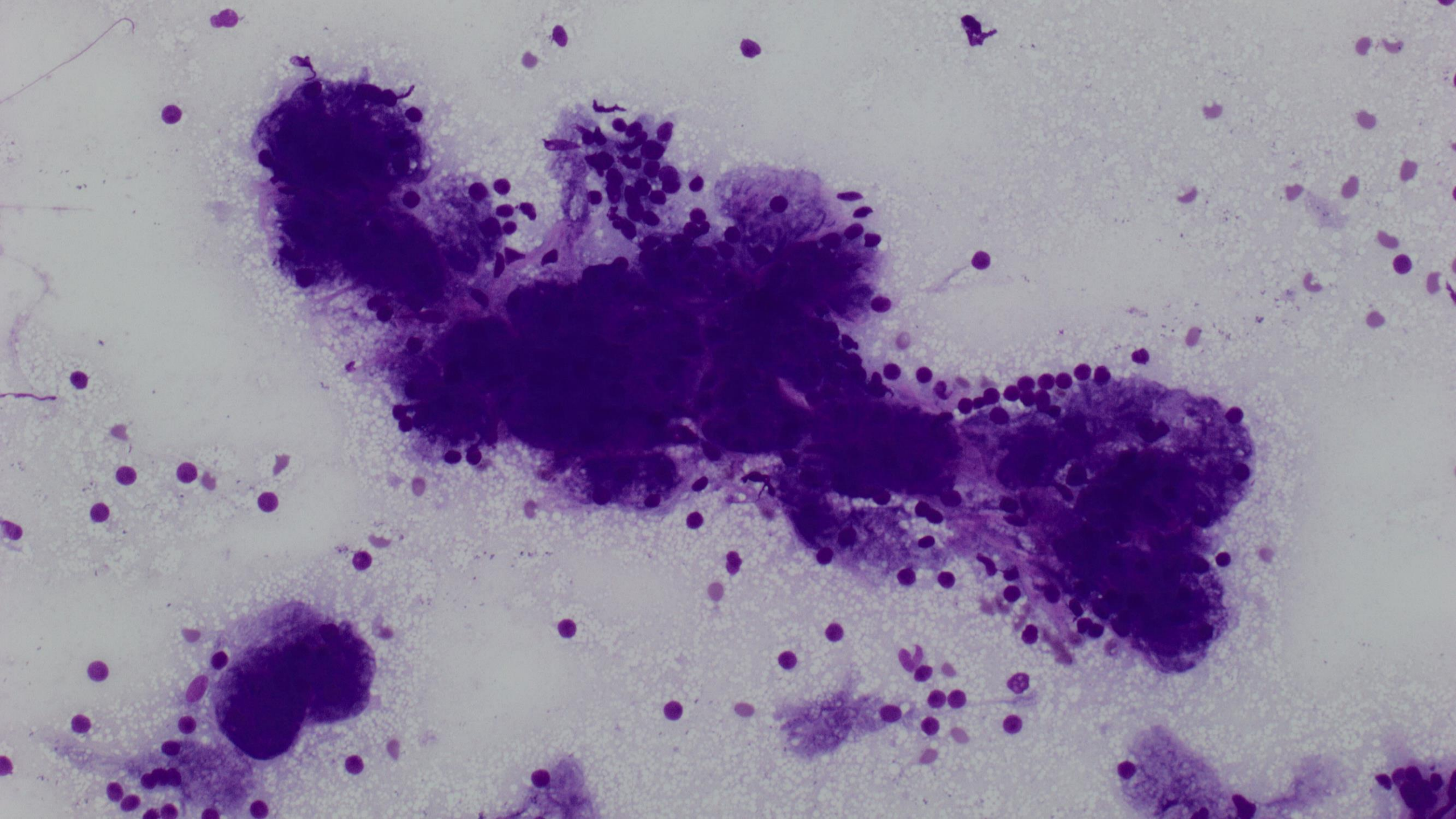
- Some benign lesions with typical US characteristics on US may obviate sampling (e.g. intramuscular lipoma)



# FNA without US guidance

- Not knowing where the needle tip is when sampling can lead to sampling error (myoepithelioma initially diagnosed as spindle cell lipoma).





# Limitations of cytology

- Cytomorphology of well differentiated malignancy may be bland and resemble benign lesions
- Definition of malignancy requires full excision histology (basaloid neoplasms of salivary gland, follicular/oncocytic lesions of thyroid)
- Rare malignancies and variants of common tumours
- Auto-immune diseases eg IgG4 and PD-L1 require core or excision





## Take home messages

- Combination of imaging and cytology = gold standard
  - Better patient experience
  - More rapid diagnosis and treatment
- Awareness of the advantages and limitations of both radiology and cytology helps avoid error
- Collaborative teamwork between clinicians, radiology and pathology enables complementary skills to be deployed optimally

Thank you

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