INSTANT DIGITAL PATHOLOGY FOR RAPID EVALUATION OF THYROID CYTOLOGY: A PILOT STUDY AND MOLECULAR TEST

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BACKGROUND

Confocal Laser Fluorescent Microscopy (CFM), known as instant digital pathology, is an emerging tool for fast imaging from fresh unfixed tissues[1,2]. It requires minimal preparation avoiding material damage or loss. CFM VivaScope-2500 (Mavig, Germany). (**Fig.1**) is used to accelerate intraoperative evaluation of surgical margins. It is a new promising application for cytological samples[3]. No data are still available for its use in thyroid cytology.

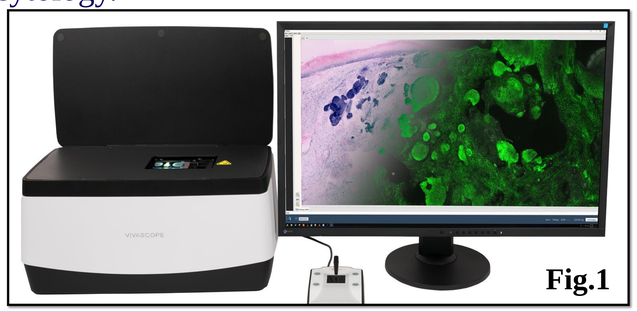

Fig.1

MATERIALS AND METHODS

Samples from patients undergoing fine needle aspiration (FNA) of thyroid nodules with US EU-TIRADS risk ≥ 3 were consecutively collected. 20 patients with cytological indication for surgery were enrolled. (**Table1**)

N° PATIENTS	20	
GENDER	**Male**	6
	Female	14
AGE RANGE	30-82	
US EU-TIRADS	≥ 3	
FNA	**TIR3A**=1	**TIR4**=2
	TIR3B=9	**TIR5**=8
HISTOLOGICAL DIAGNOSIS	**FA**=4	**PTC**=12
	HCC=2	**FV-PTC**=2

Table1. **FA**= *Follicular Adenoma*; **HCC**= *Hürthle Cell Carcinoma*; **PTC**= *Papillary Carcinoma*; **FV-PTC**= *Papillary Carcinoma Follicular Variant.*

The First FNA pass was delivered on foam-like scaffolds (Cytomatrix, UCS Diagnostic, Italy) and freshly observed with VivaScope to obtain the hematoxylin-like digital image.(**Fig.2**)
Samples were fixed and formalin embedded for permanent sections and molecular analysis.

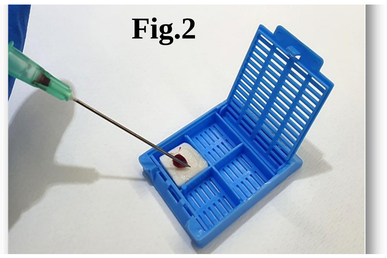

Fig.2

The Second FNA pass was smeared for routine cytology.
Pathologists evaluated in blind VivaScope images, permanent Cytomatrix FFPE, paired routine FNA and final surgical histology.
Molecular analysis for BRAF V600E mutation was performed using a commercial allele-specific quantitative polymerase chain reaction (qPCR) assay (Envitrogen, CA).

RESULTS

CFM allowed satisfactory digital images from all submitted samples. Adequacy was confirmed in all cases. Architectural changes (papillary or microfollicular structures) and morphological details were evaluable from fresh cellular specimens in a new visual modality. (**Fig.3**) Concordance between FCM evaluation and routine FNA diagnosis reached 75% Concordance between VivaScope and final histological diagnosis from surgical specimen was 85%. Molecular analysis identified BRAF V600E mutation in five PTC cases.

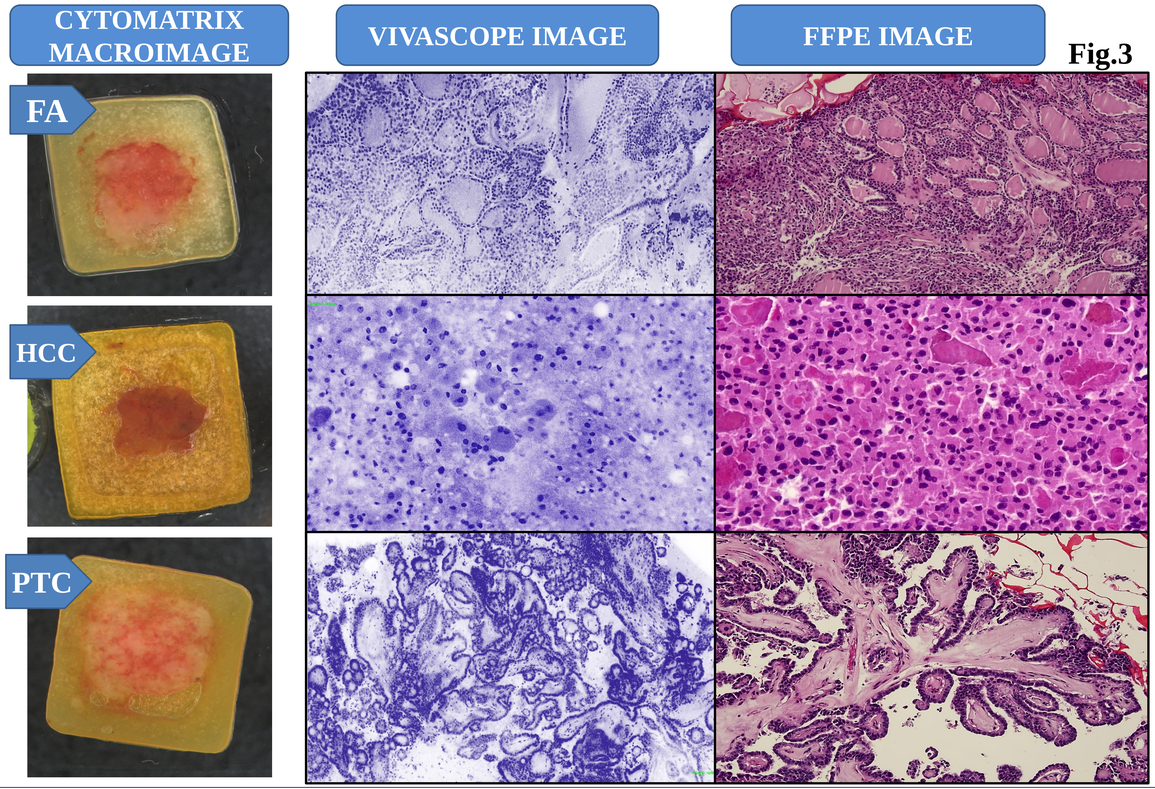

Fig.3

AIMS OF THE STUDY

- To assess the VivaScope performance for rapid adequacy evaluation and, whenever possible, for morphological immediate diagnosis;
- To explore feasibility of molecular analysis on these samples.

DISCUSSION AND CONCLUSION

Confocal Fluorescent Microscopy seems to be a promising tool for enhanced thyroid cytological reporting performance, given its simple application and very rapid microscopic image generation (<5 min/specimen).

The new visual modality needs a learning curve anyway the hematoxylin-like color makes it more easy and user friendly for pathologists.

Instant digital pathology using cell-capturing scaffolds allows fast adequacy assessment of cytological samples and supports morphological evaluation.

Feasibility of molecular analysis on post VivaScope material was demonstrated.

CFMs represent innovative tools for management of patients with thyroid nodule.

REFERENCES

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