Poster Presentation :

2021년도 한국현미경학회

춘계학술대회

Correlated Observation of Human Scalp with Scanning Acoustic Microscope and Light Microscope

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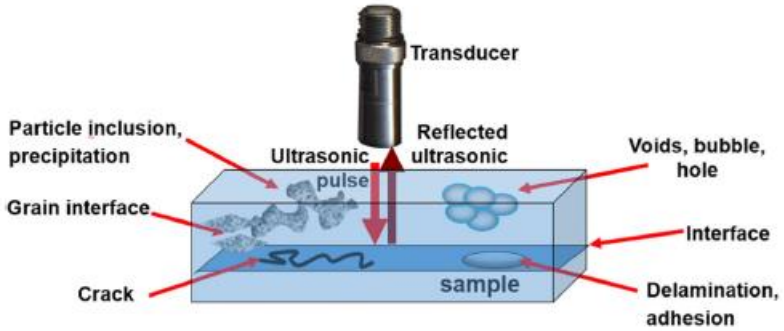
Scanning acoustic microscopy (SAM): one of the useful ultrasonic techniques

- enable non-destructive detecting of physical defects in the field of material science (Scheme 1)
- non-invasive inspection of subsurface structures of biological samples including human skin



Scheme 1 Schematic showing the probing pulse and the reflected echo detected from the internal structure of a sample consisting of a variety of defects and inclusions.

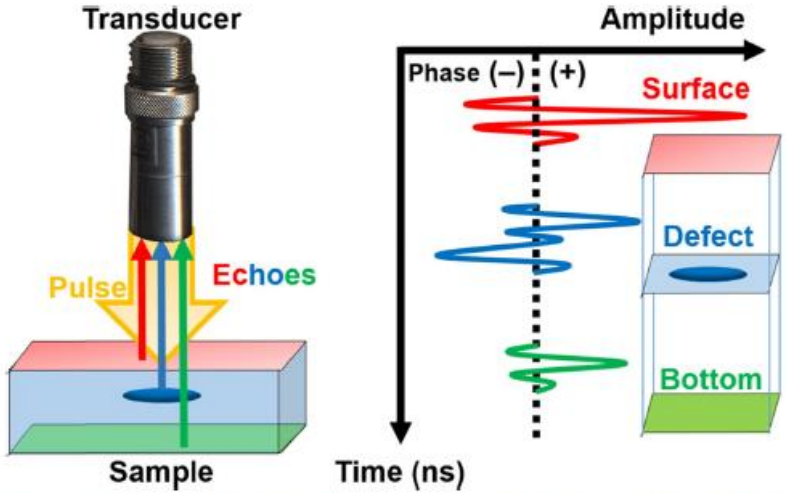


Fig. 1 Schematic showing the incident and reflected ultrasonic pulse (left) and histogram (right) showing the amplitude of the reflected echo (A-scan) after an ultrasonic pulse interacts with a sample

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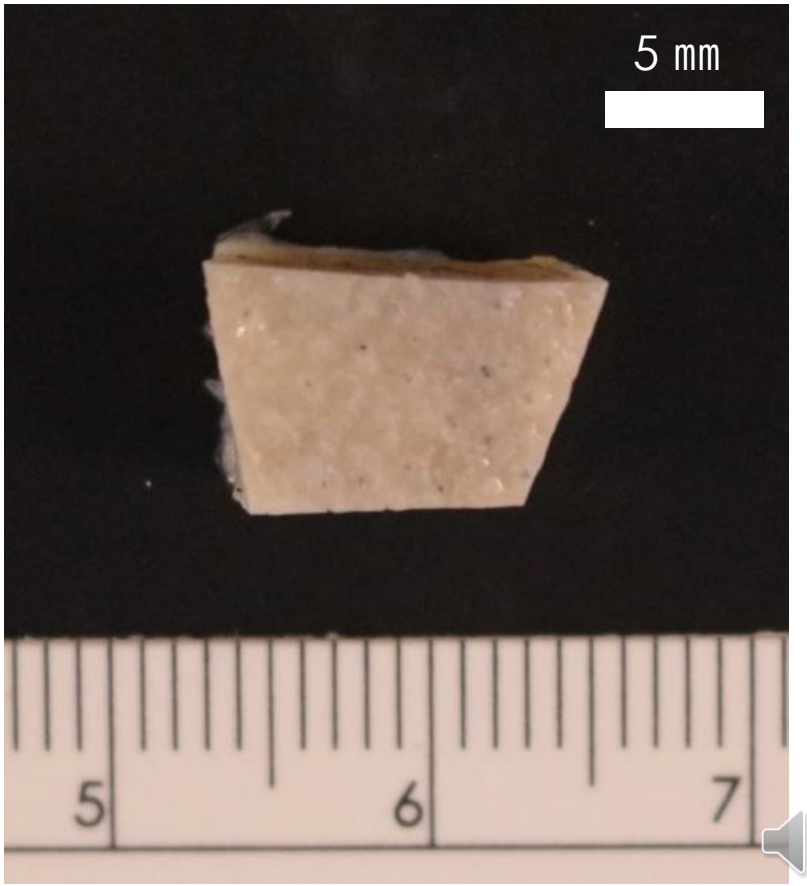
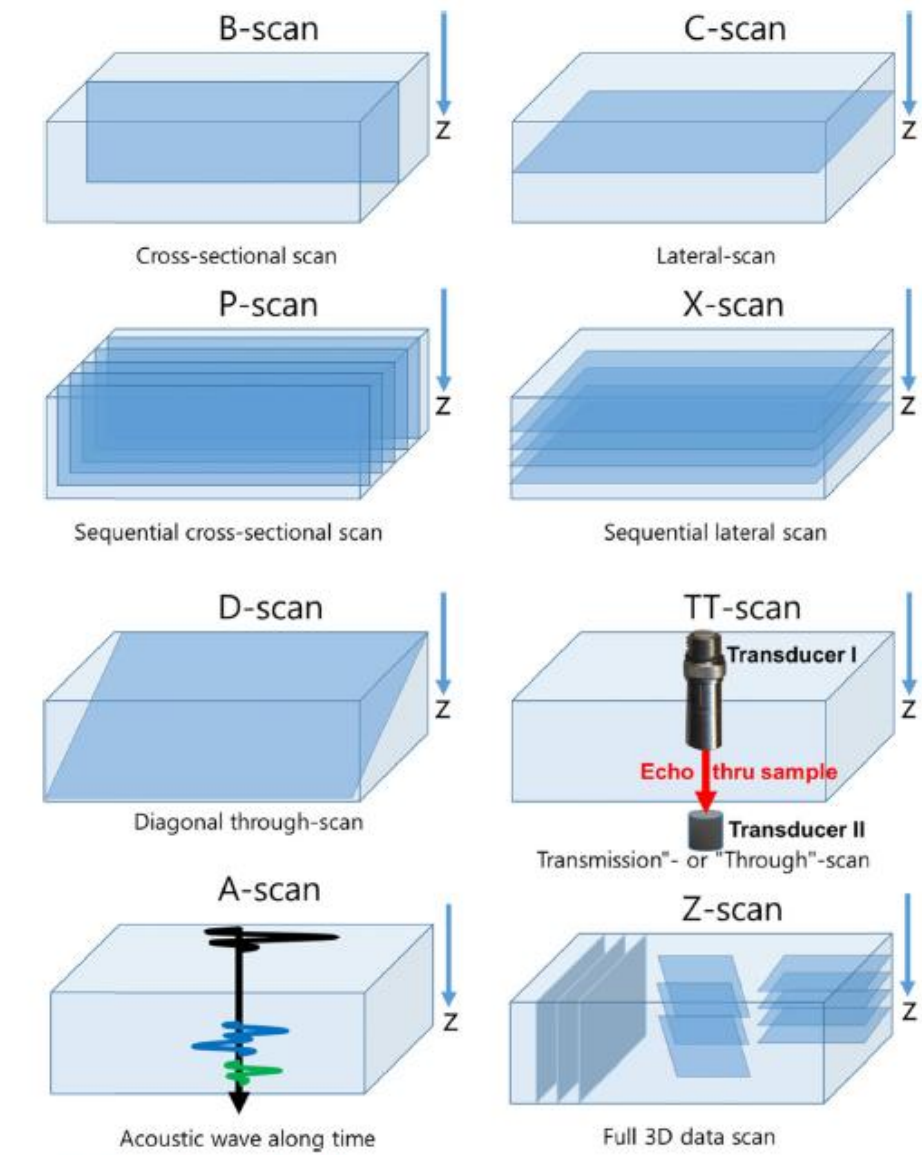
1) To investigate the possible availability of SAM in a non-invasive inspection of subsurface normal structures of human scalp by correlative analysis of images obtained from SAM and histology

2) Human cadaveric scalp was biopsied and fixed in 4% formalin ➔ trimmed by 1cm by 1cm





scanning analytical modes of SAM

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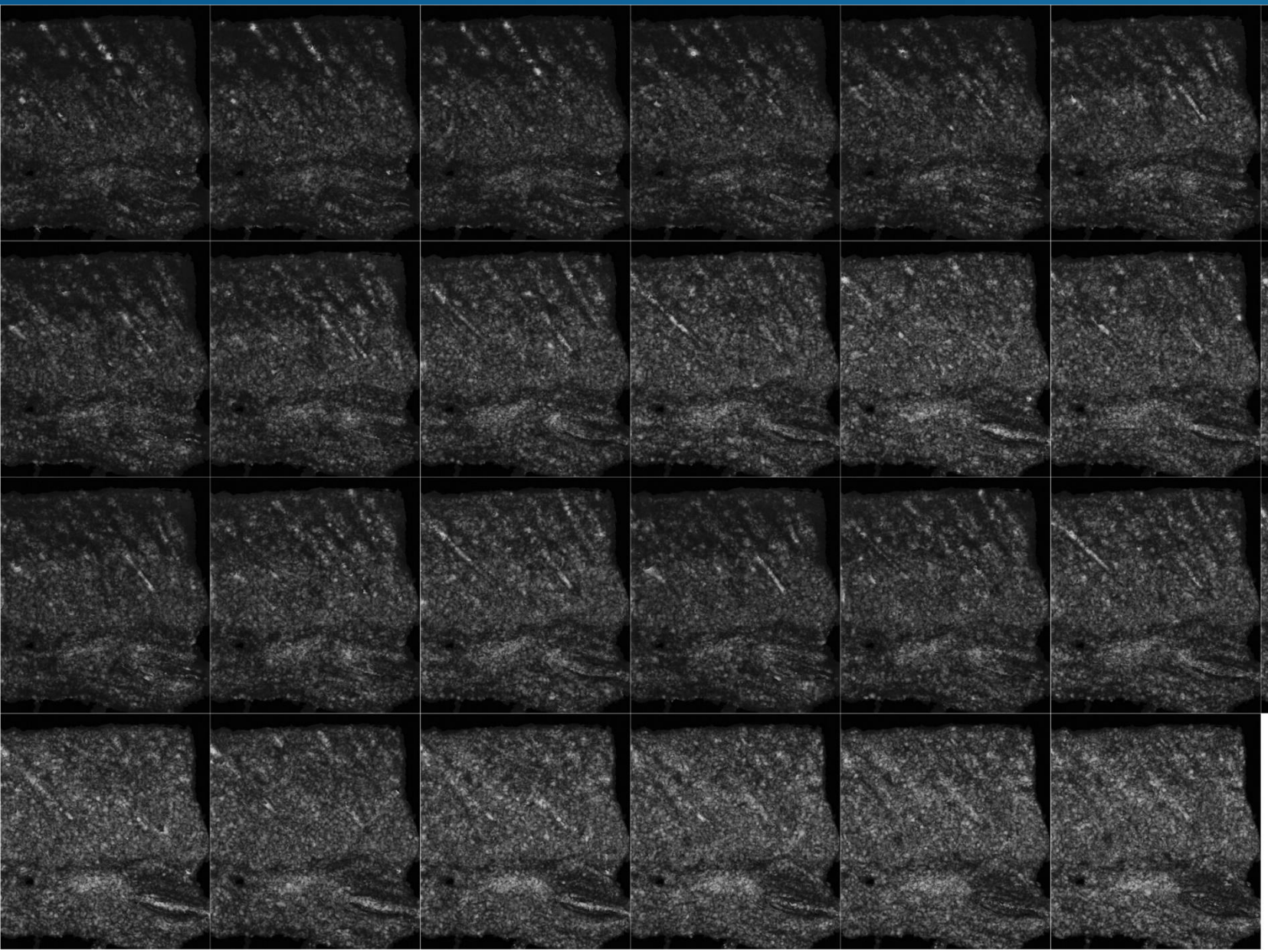
1) The trimmed scalp samples were observed under the SAM (X-scan)

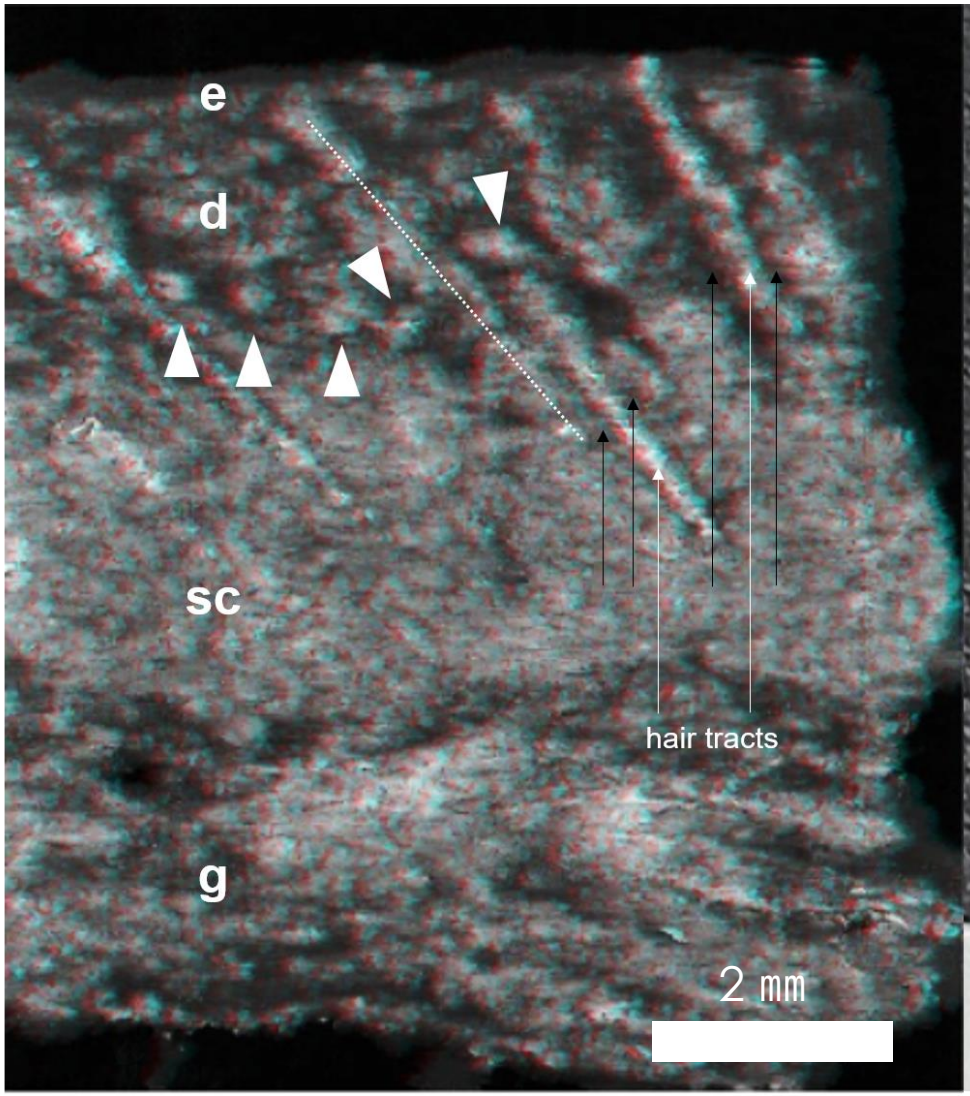
2) The same tissue was paraffin-embedded and processed with Masson's trichrome stain

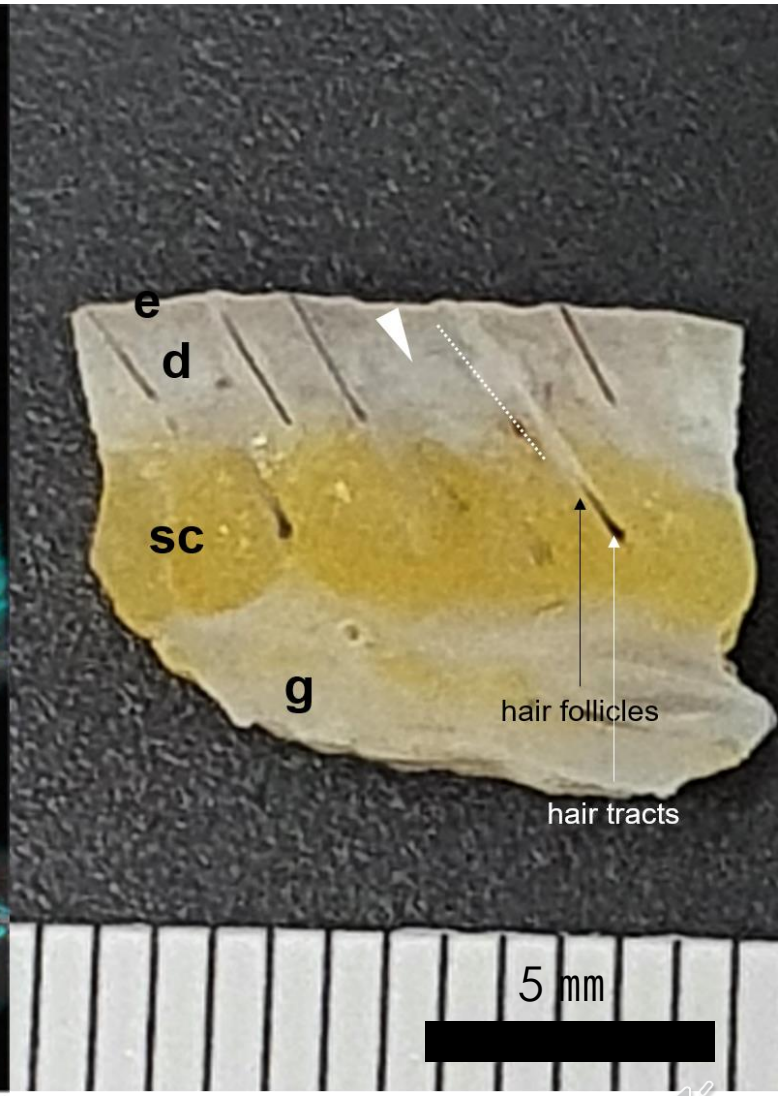
3) The histological slides were imaged with light microscopy to correlate with the images obtained from SAM



1) 8x9 ㎜ 2000 pixel, sectional approach

X-can, From top to bottom





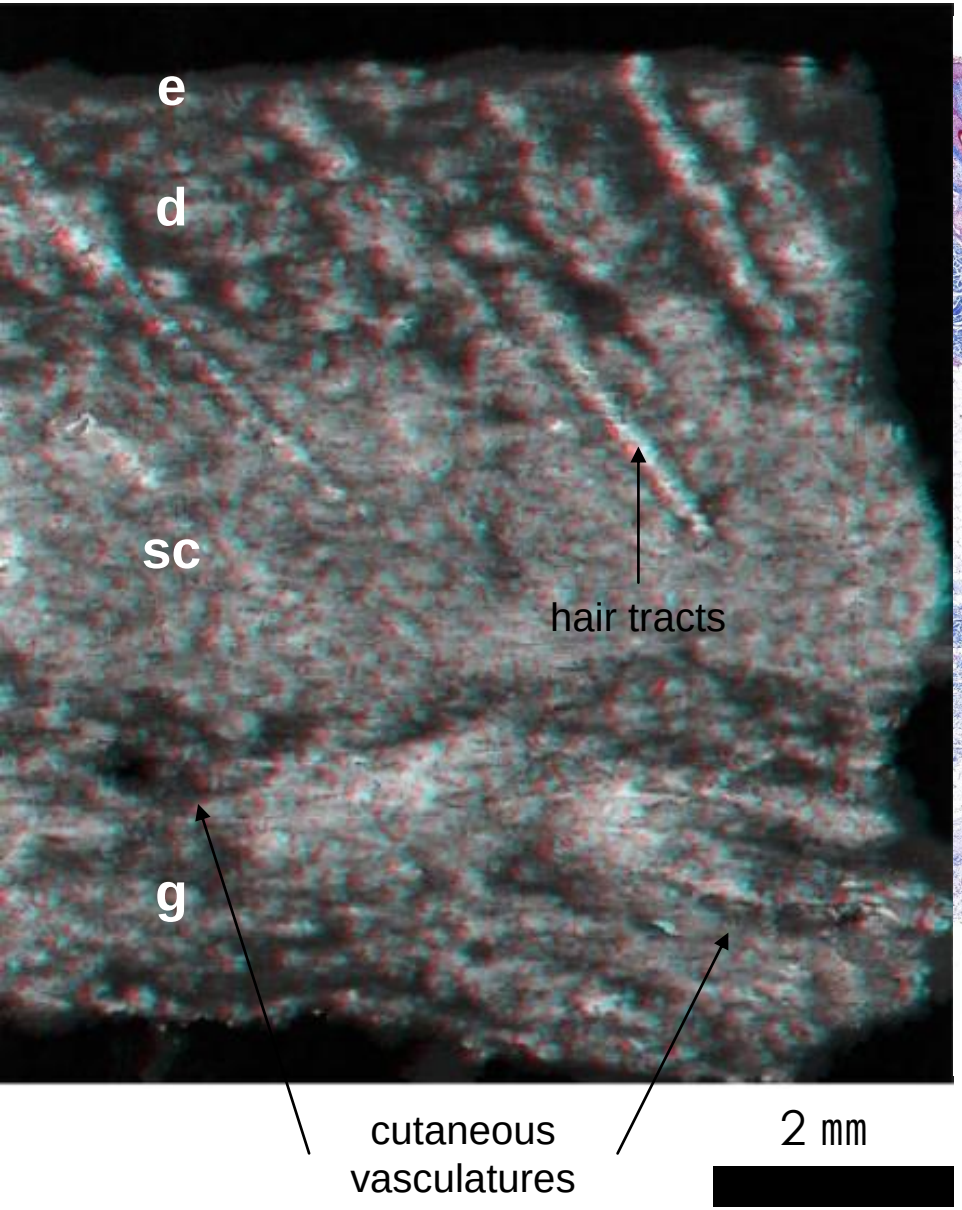
e: epidermis

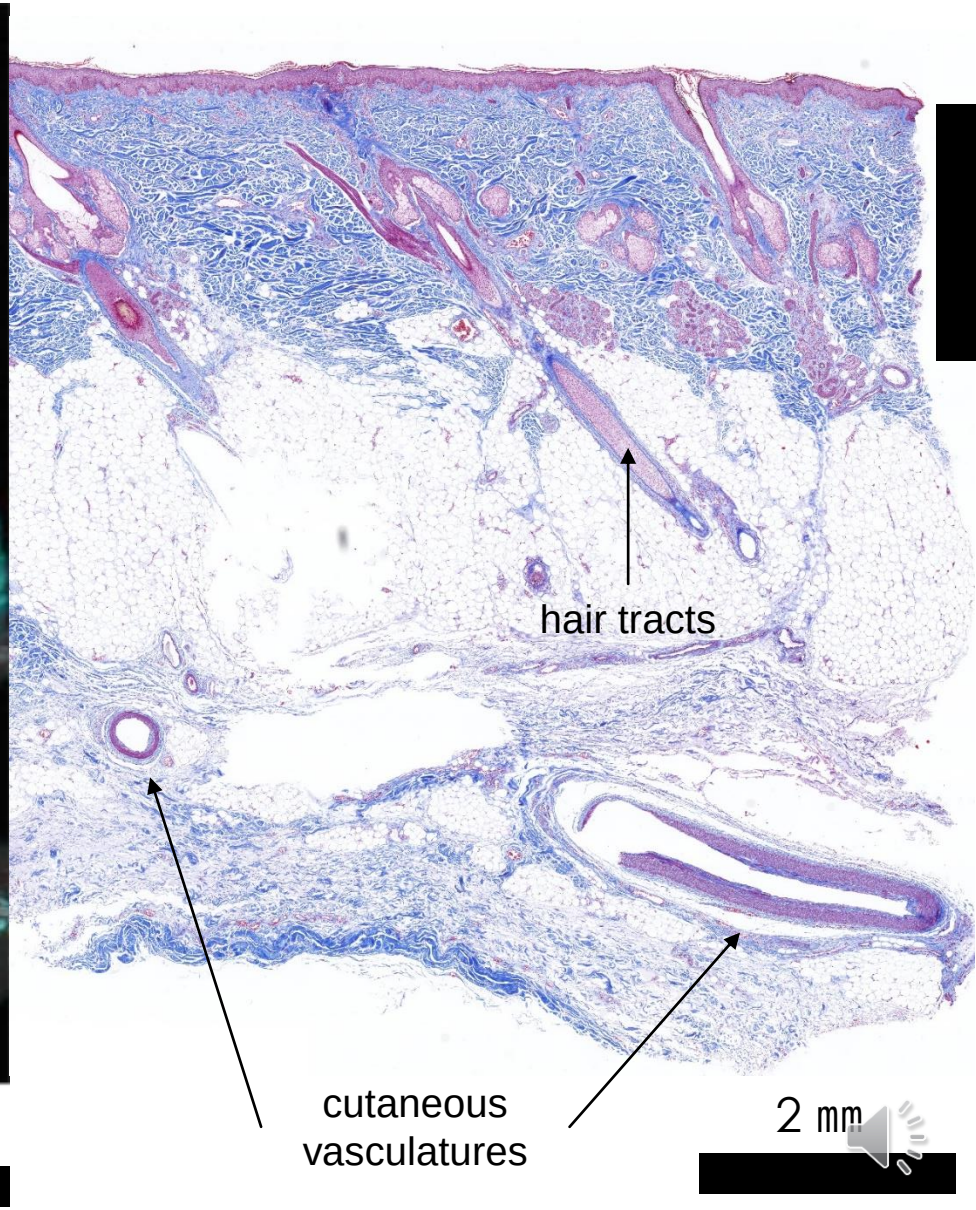
d: dermis

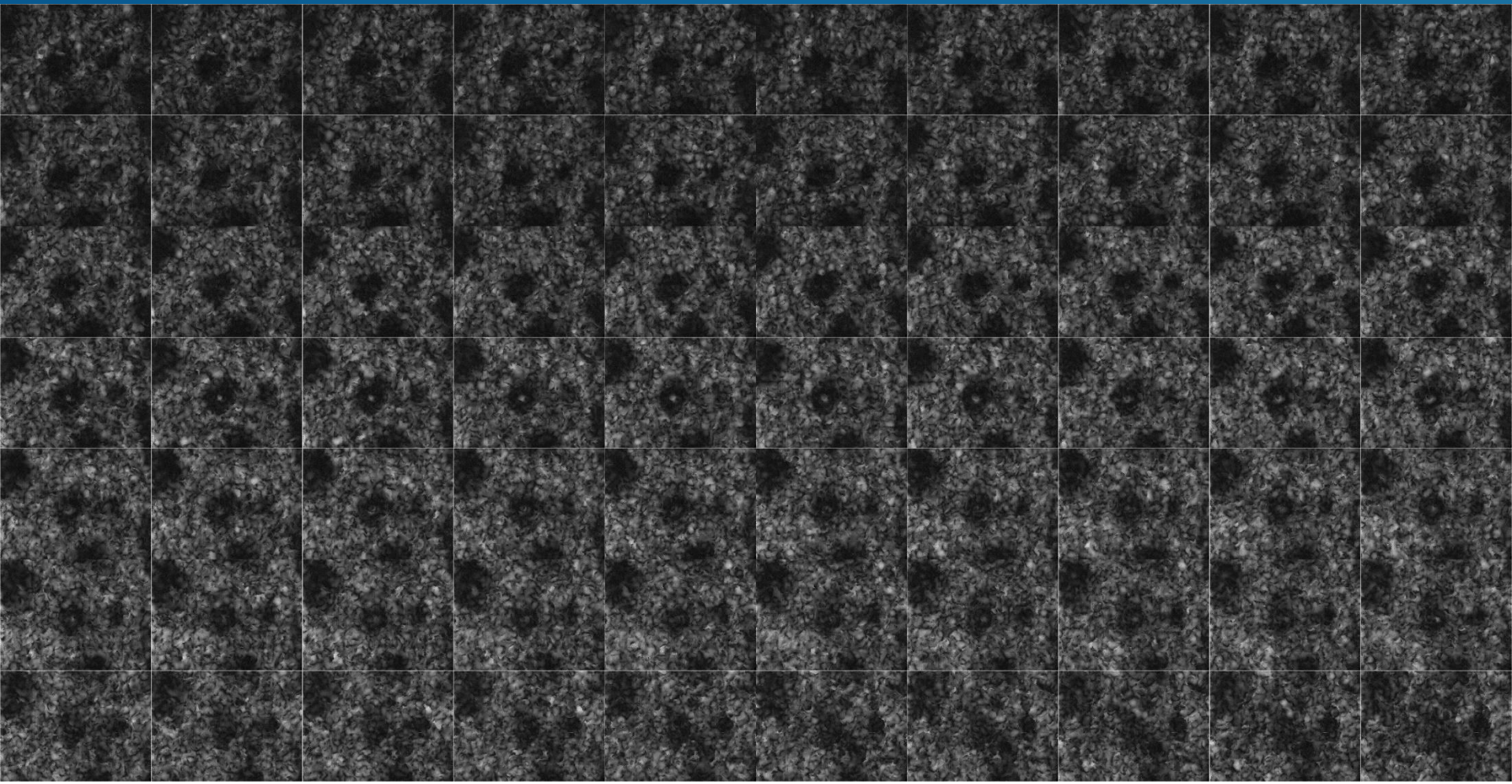
sc: subcu. tissue

g: galea aponeurotica

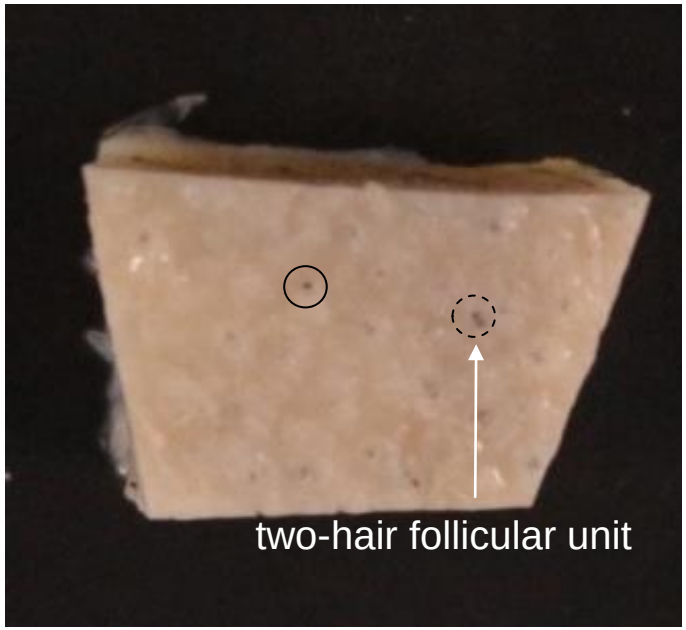
arrowheads: sebaceous glands

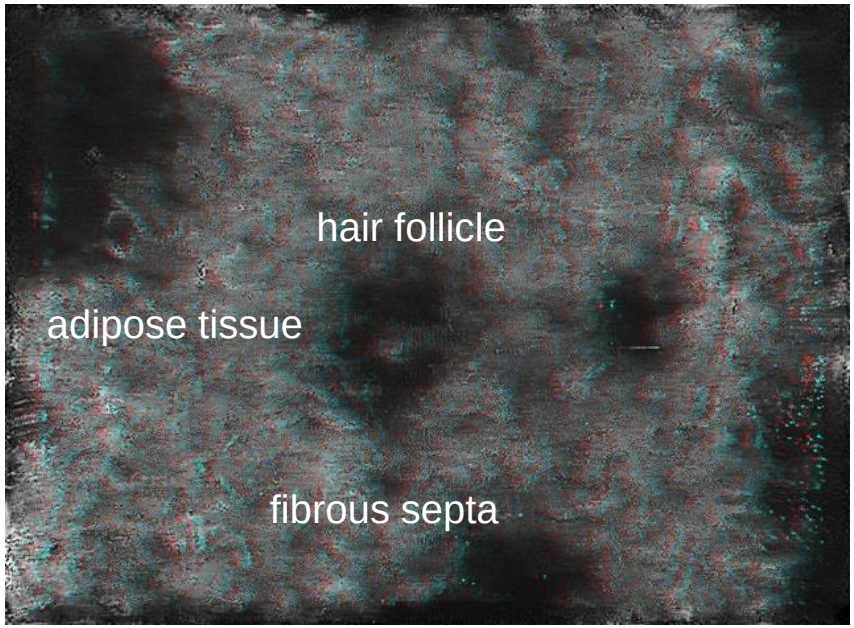

e
d
sc
g
hair tracts
cutaneous vasculatures
2 ㎜

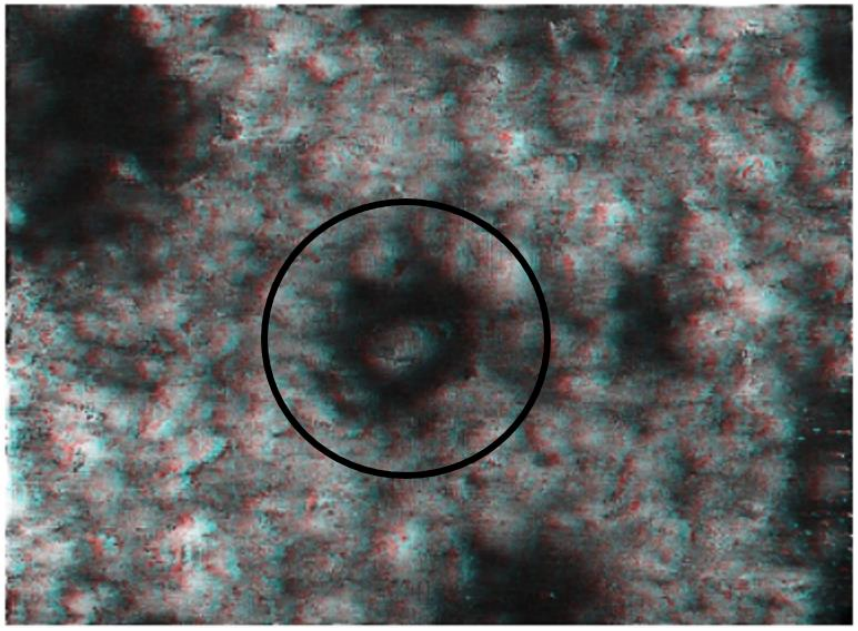

hair tracts
cutaneous vasculatures
2 ㎜

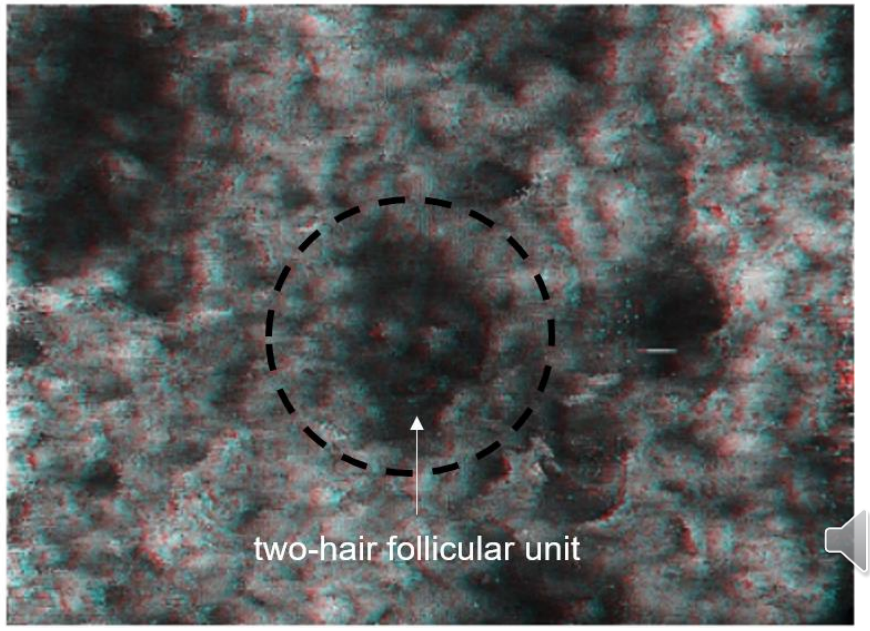


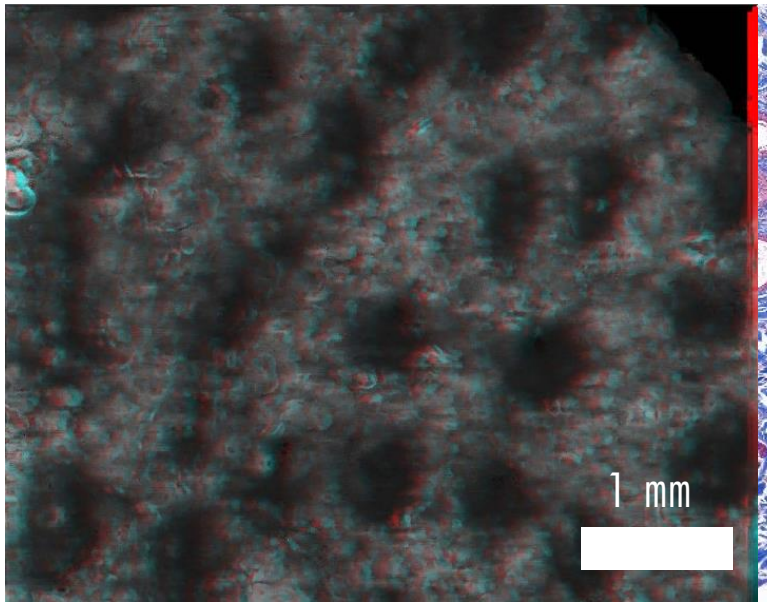
1) X-can, 70 slices, From top to bottom

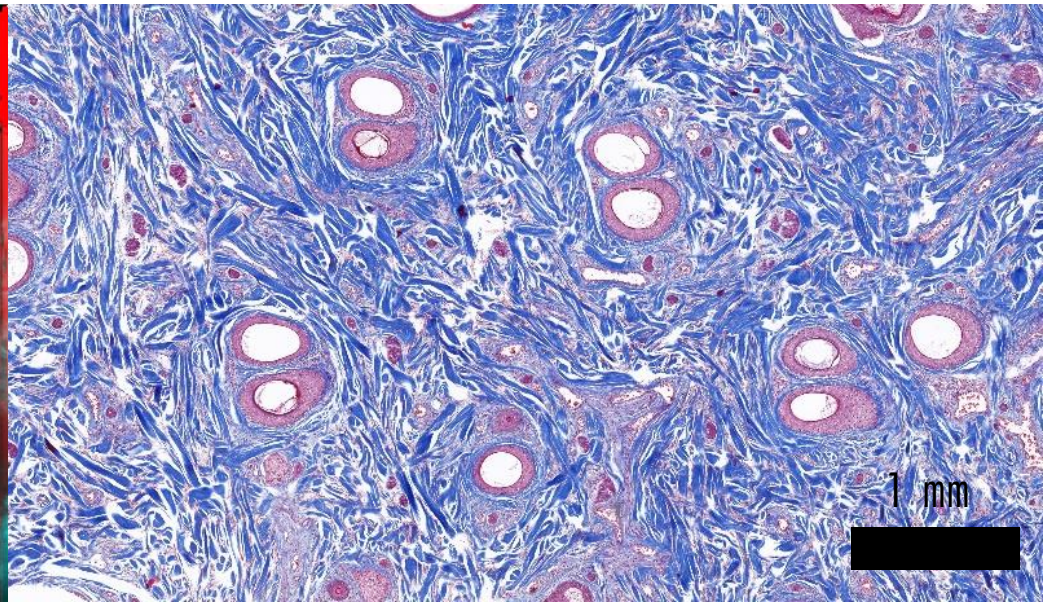

two-hair follicular unit


hair follicle
adipose tissue
fibrous septa




two-hair follicular unit


1 mm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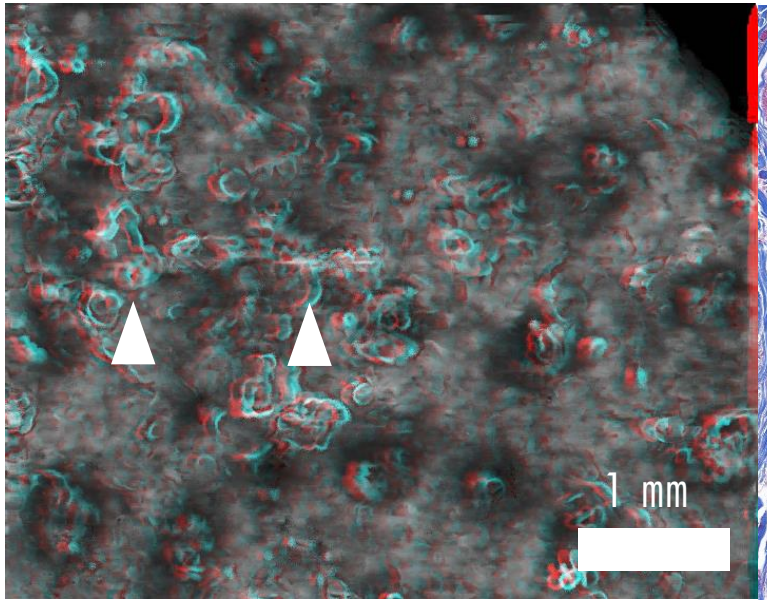
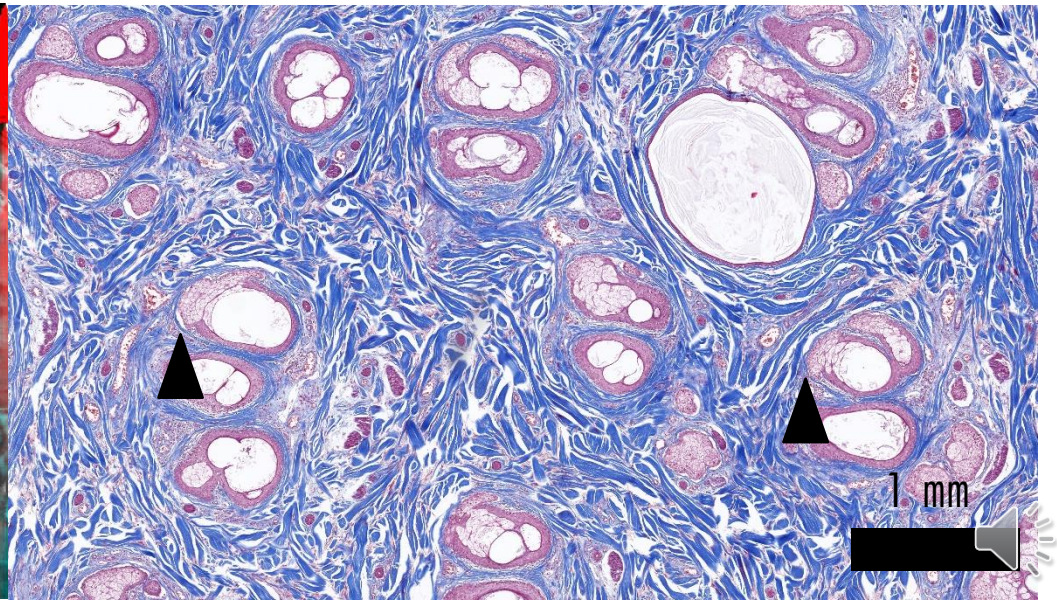

1 mm


1 mm

1) The results indicate that

➔ the SAM could be an effective diagnostic modality assisting investigators interested in a non-invasive morphological analysis of human scalp

➔ the SAM provided well correlated images of subsurface normal structures of human scalp compared with histology such as,

- each layer of skin, epidermis, dermis, subcutaneous fat, galea aponeurotica
- hair structures, hair tracts, hair follicles
- sebaceous glands
- cutaneous vasculatures

2) The currently reported normal characteristics of human scalp under SAM is a mandatory for non-invasive detecting and understanding pathological features of hair disorders including alopecia

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