Mastoid surface area and volume determined by semi-automatic imaging analysis of HR-CT-scanning.
Clinical implications for otosurgery

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1. Introduction

- Normal mastoid – highly pneumatised
- Diseased mastoid – decreased pneumatisation related to chronic OM

- The high area-to-volume ratio facilitates gas-exchange and must be related to pressure regulation

- Thus, not only volume, but area and volume are important factors to evaluate

2. Purpose

- To develop semi-automatic methods for determining the mastoid surface area and volume in normal ears

3. Materials & Methods

- Clinical HR-CT of the temporal bone in DICOM format

- voxel size: 0.625 * 0.625 * 0.625 mm

- Segmentation – binary thresholding

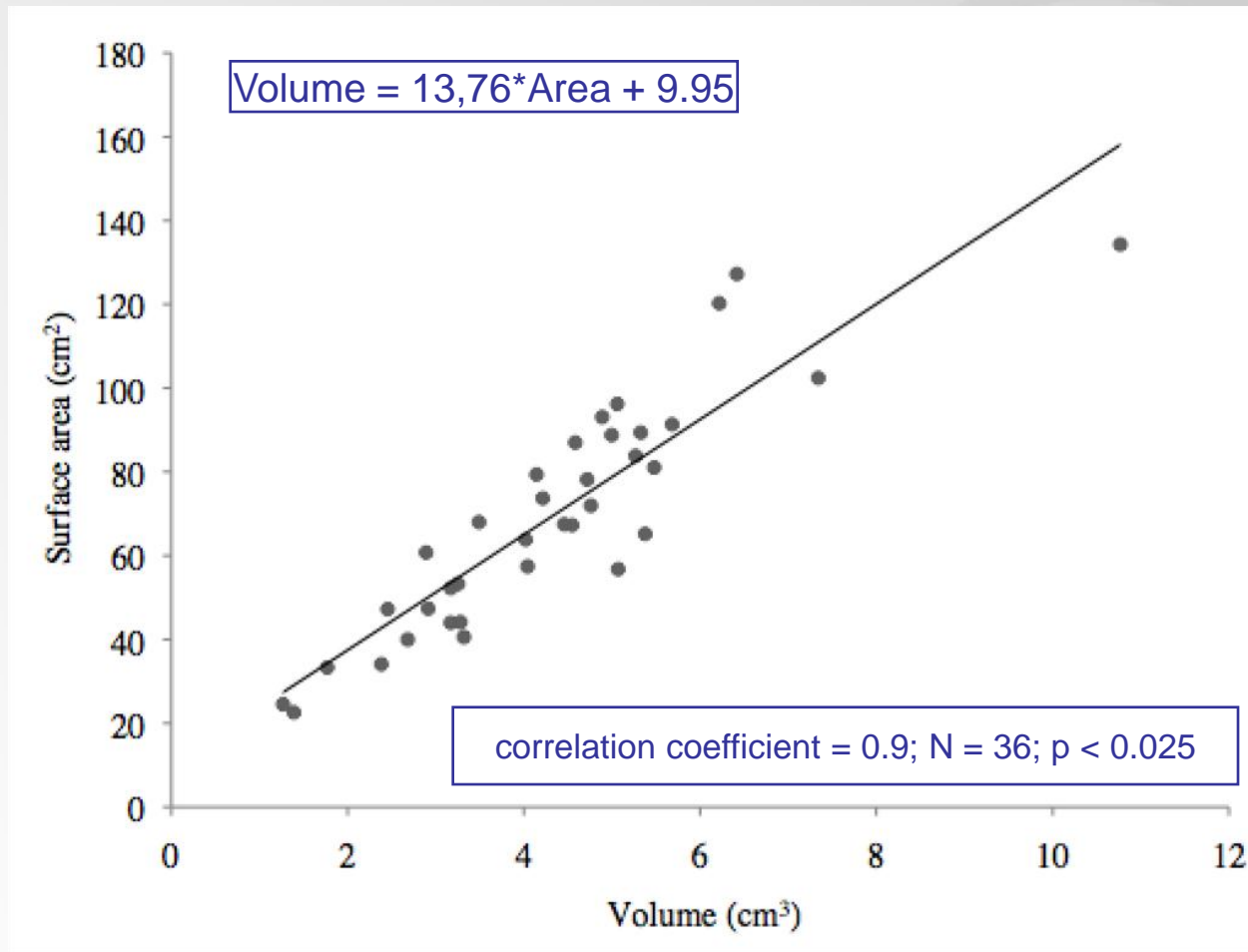- Stereology – point-counting methods

- Cavalieri's principle

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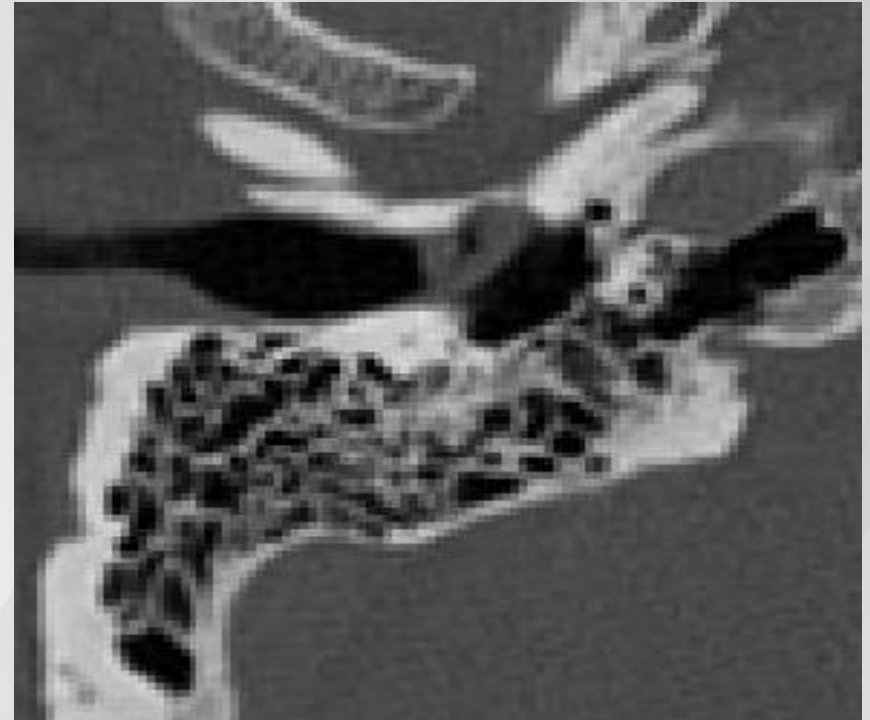
4.1 Results - Basic

- **Volume = 4.3 cm^3**
  Range = 1.3 to 10.8 cm^3

- **Area = 69 cm^2**
  Range 23 to 142 cm^2

- **A/V-ratio = 16.3 cm^{-1}**

- 36 scans in 24 subjects

- 17 right/19 left

- 9 female/15 male

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4.2 Results - Correlation

Volume = 13,76*Area + 9.95

correlation coefficient = 0.9; N = 36; p < 0.025

4.3 Results - Comparison

	Surface Area (cm^2)	Range (cm^2)	Volume (cm^3)	Range (cm^3)	Area/Volume (cm^{-1})
Isono (2000)	N/A	N/A	6	2 - 18	N/A
Park (2000)	167	74,8 - 330	10,43	6,25 - 10,52	16
Luntz (2001)	N/A	N/A	6,61	1,3 - 12,7	N/A
Current study	69	23 - 142	4,43	1,3 - 10,8	16,3

5. Discussion

- The current results agree with previous studies
- The current method is much faster – 10 min's – compared with previous studies

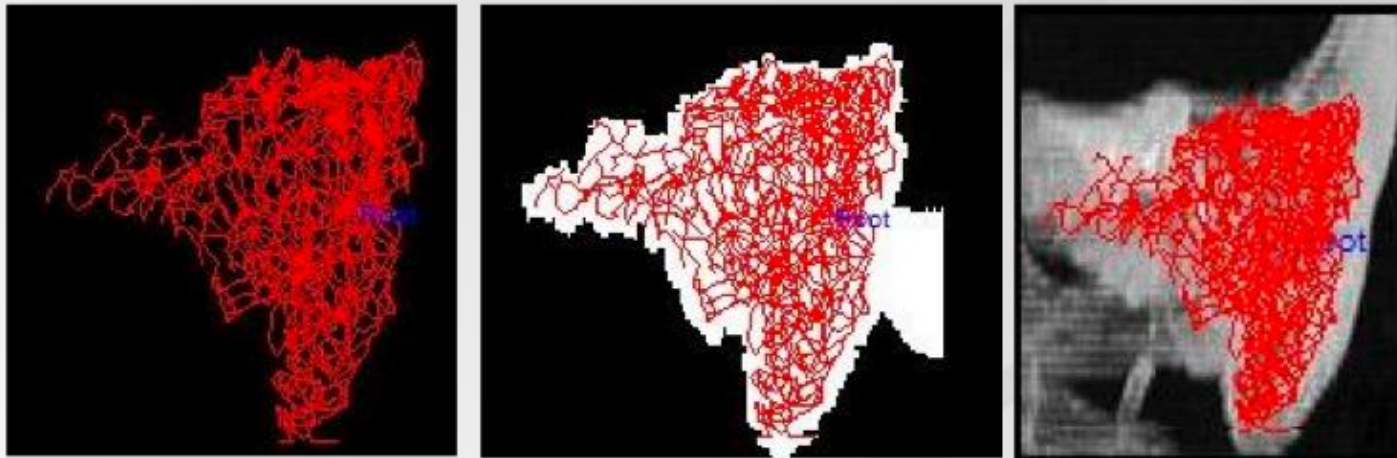- The investigation needs to include cases with chronic OM for further research

6.1 Future – complex structure
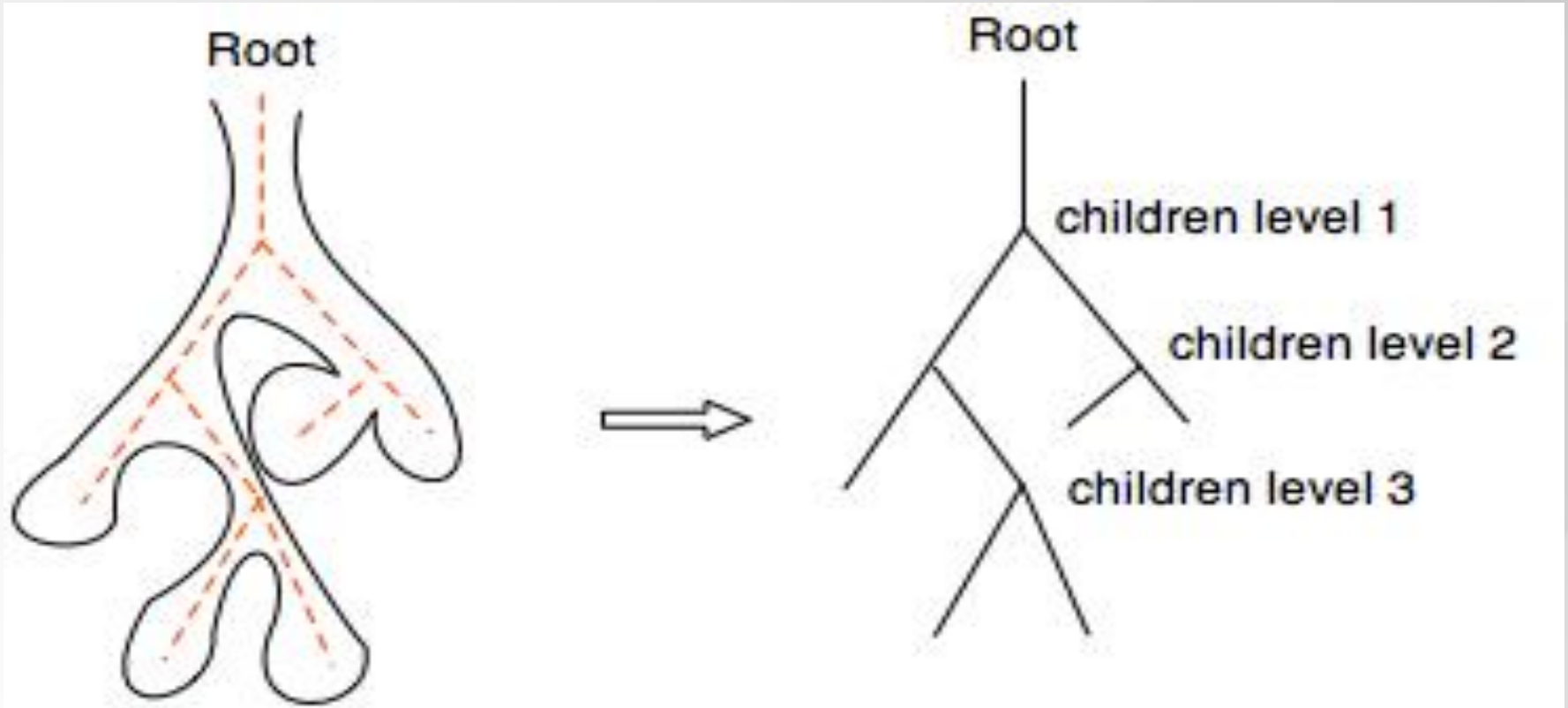
Hypothesis – Mastoid formed by dichotomous divisions

6.2 Future – complex structure

Functional versus anatomical properties of the mastoid:

- Fibrosis, mucosal adhesions may occlude parts to the mastoid cells
- Defining a tree structure of **_connected cells_** will enable to determine the "active" or "functional" part of the mastoid and its properties
- This should improve correlations to clinical measures

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Mastoid tree structure

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