Teeth & Biologial Profile (Age & Sex Estimation)

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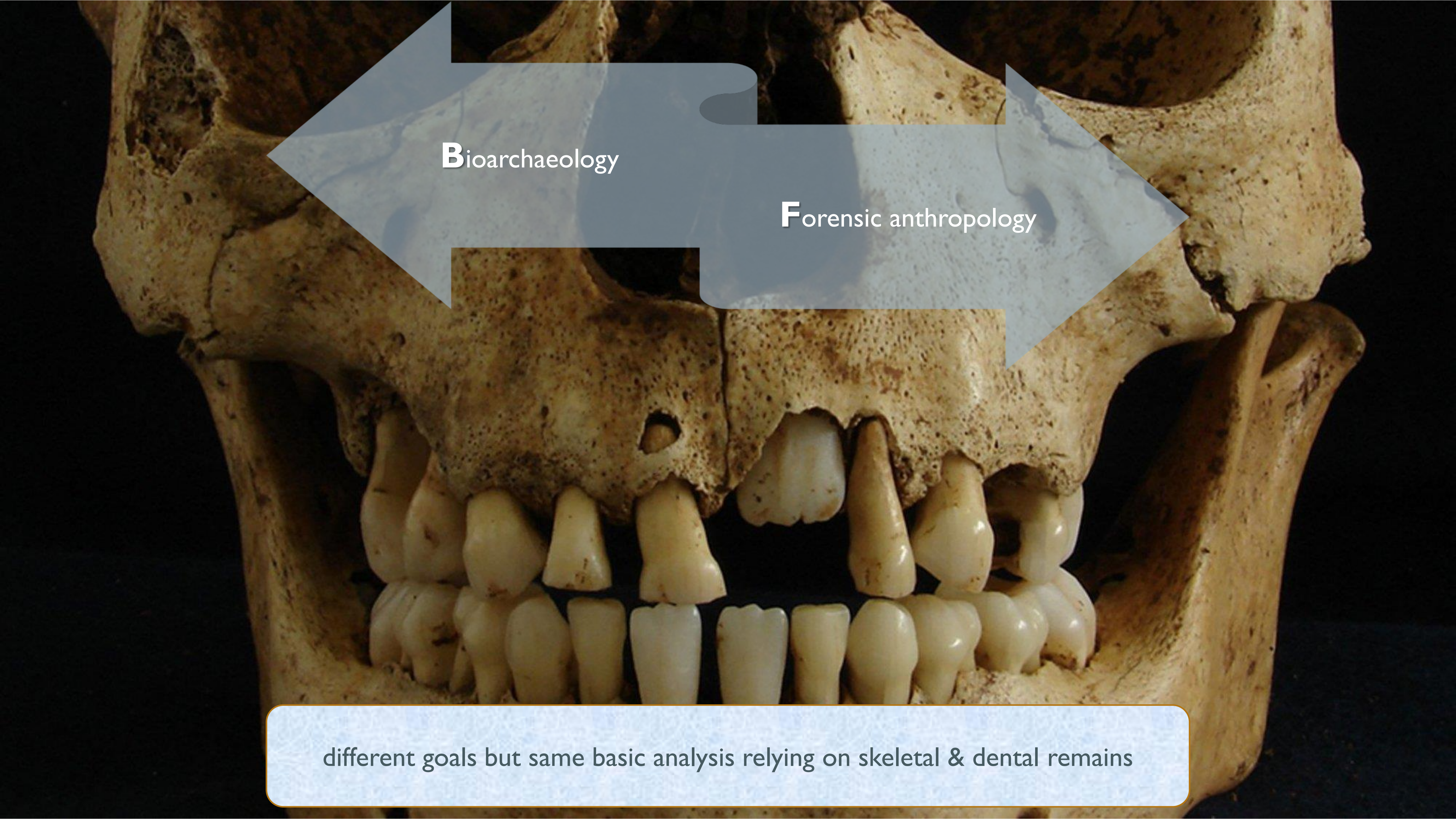

Bioarchaeology
Forensic anthropology
different goals but same basic analysis relying on skeletal & dental remains

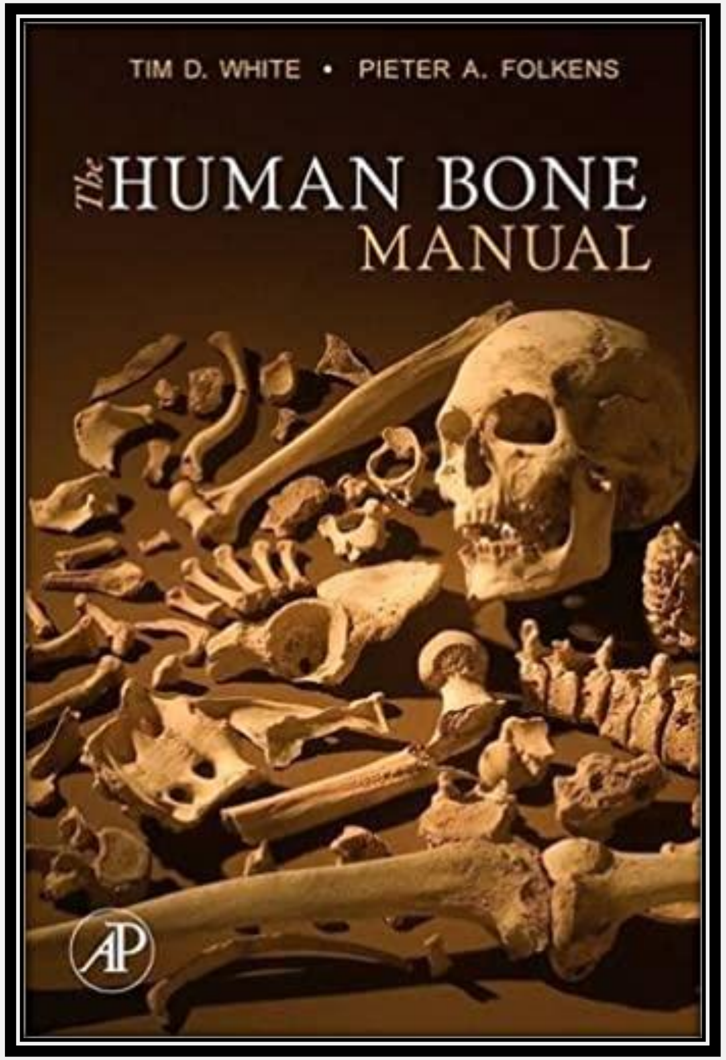
7 QUESTIONS

- Is it bone?
- Is it human?
- Is it modern or archeological?
- How many individuals /minimum number of individuals (MNI)?
- Who is it?
- Is there evidence of trauma before or around the time of death?
- What happened to the remains after death?

Who is it?

construct a biological profile

White & Folkens 2005



sex

age

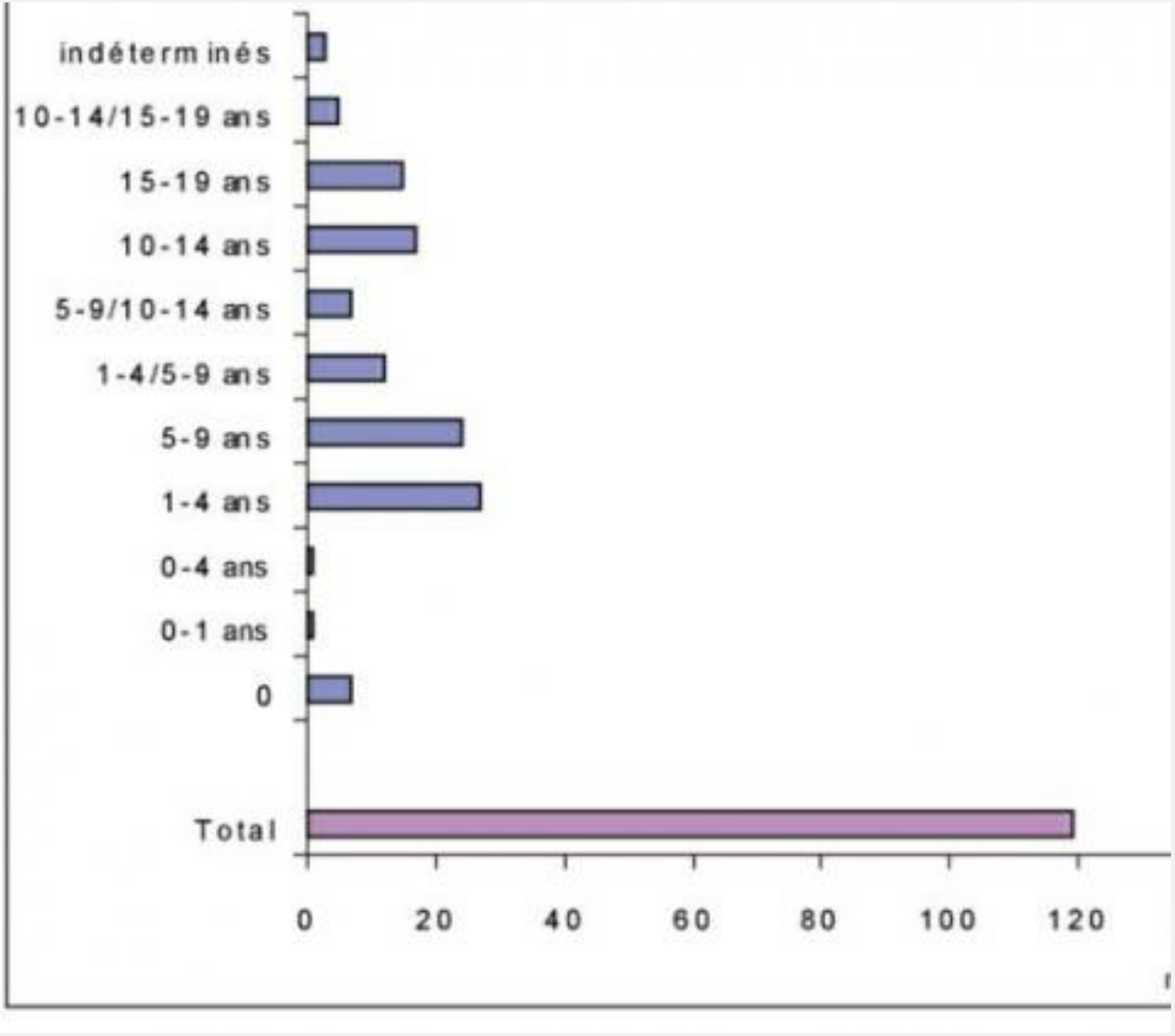
stature

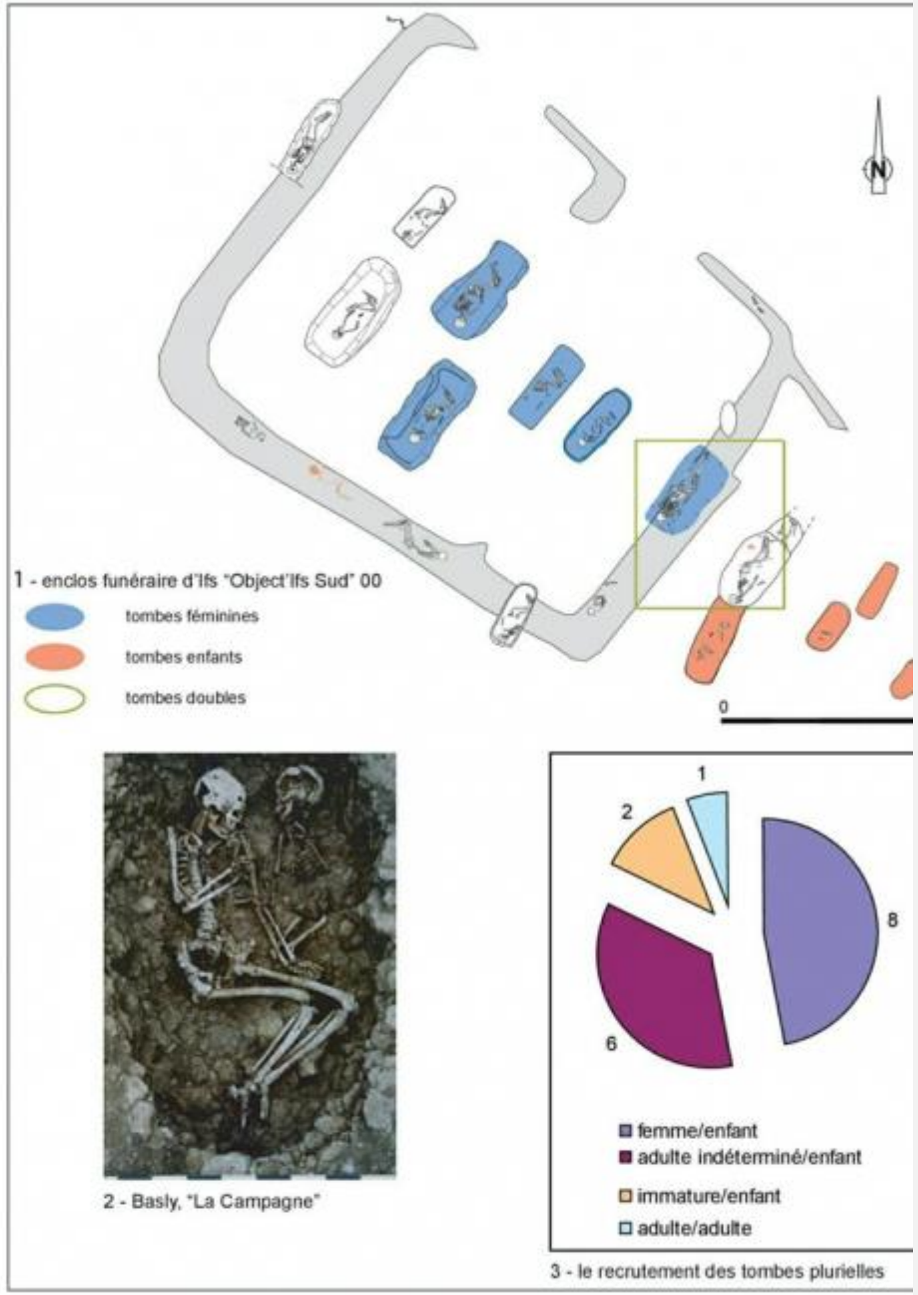
ancestry

variations

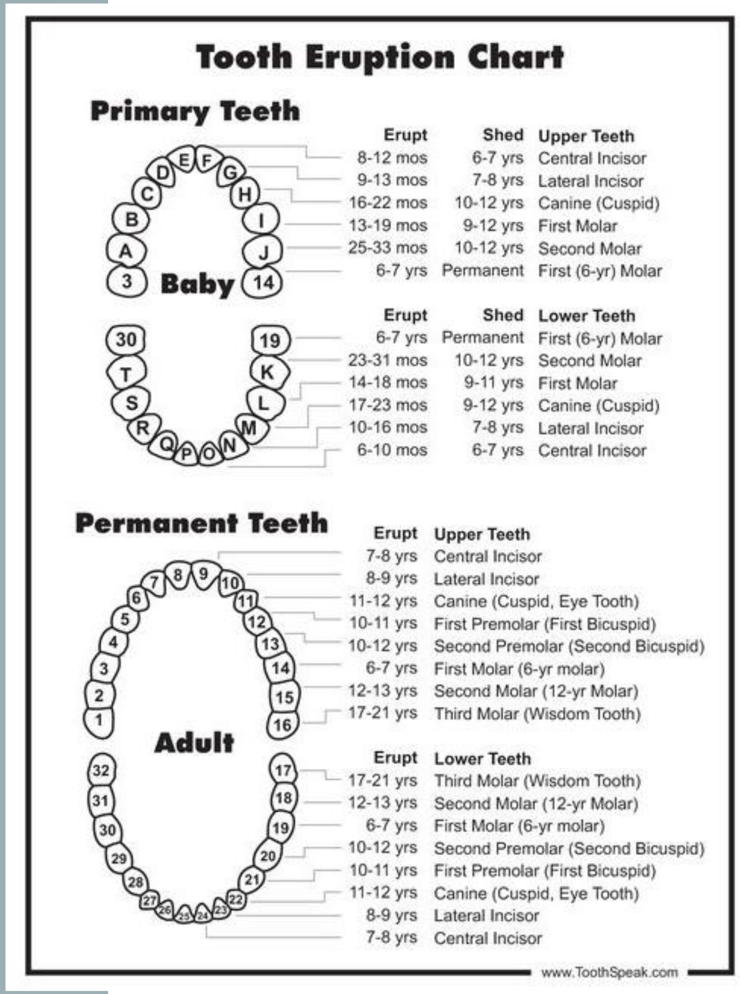
trauma

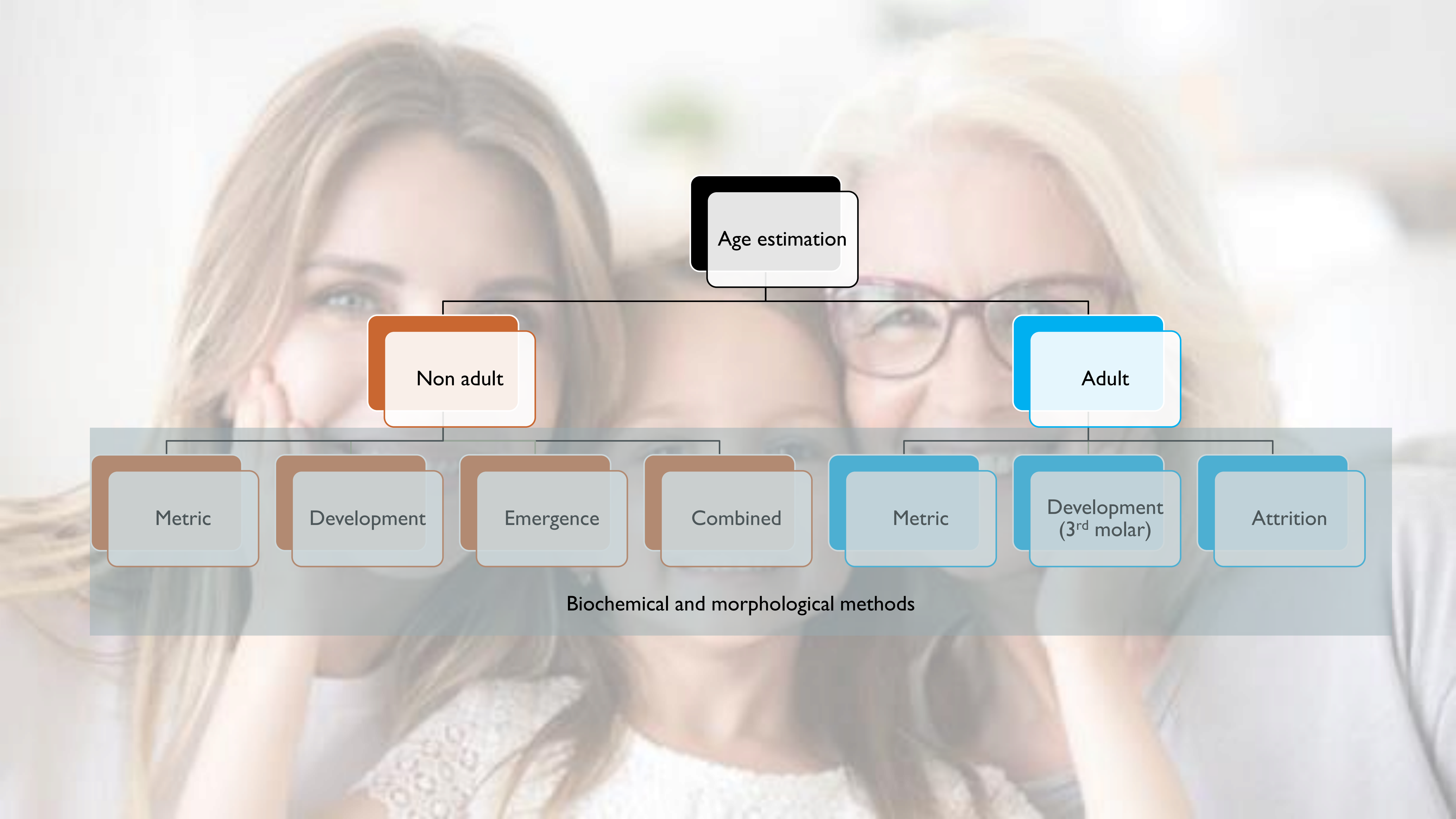
pathology


indéterminés
10-14/15-19 ans
15-19 ans
10-14 ans
5-9/10-14 ans
1-4/5-9 ans
5-9 ans
1-4 ans
0-4 ans
0-1 ans
0
Total
0
20
40
60
80
100
120


N
1 - enclos funéraire d'Ifs "Object'Ifs Sud" 00
tombes féminines
tombes enfants
tombes doubles
0
2 - Basly, "La Campagne"
1
2
8
6
femme/enfant
adulte indéterminé/enfant
immature/enfant
adulte/adulte
3 - le recrutement des tombes plurielles

AGE ESTIMATION





Age estimation
Non adult
Adult
Metric
Development
Emergence
Combined
Metric
Development (3rd molar)
Attrition
Biochemical and morphological methods

AGING BY DENTITION: NON ADULT

1.
Metric
Liversidge et al. 1998

2.
Development
Moorrees et al. 1963

3.
Emergence
Ubelaker 1987

4.
Combined
Alqahtani et al., 2010

AGING BY DENTITION: NON ADULT

1. Metric
Liversidge et al. 1998

2. Development
Moorrees et al. 1963

3. Emergence
Ubelaker 1987

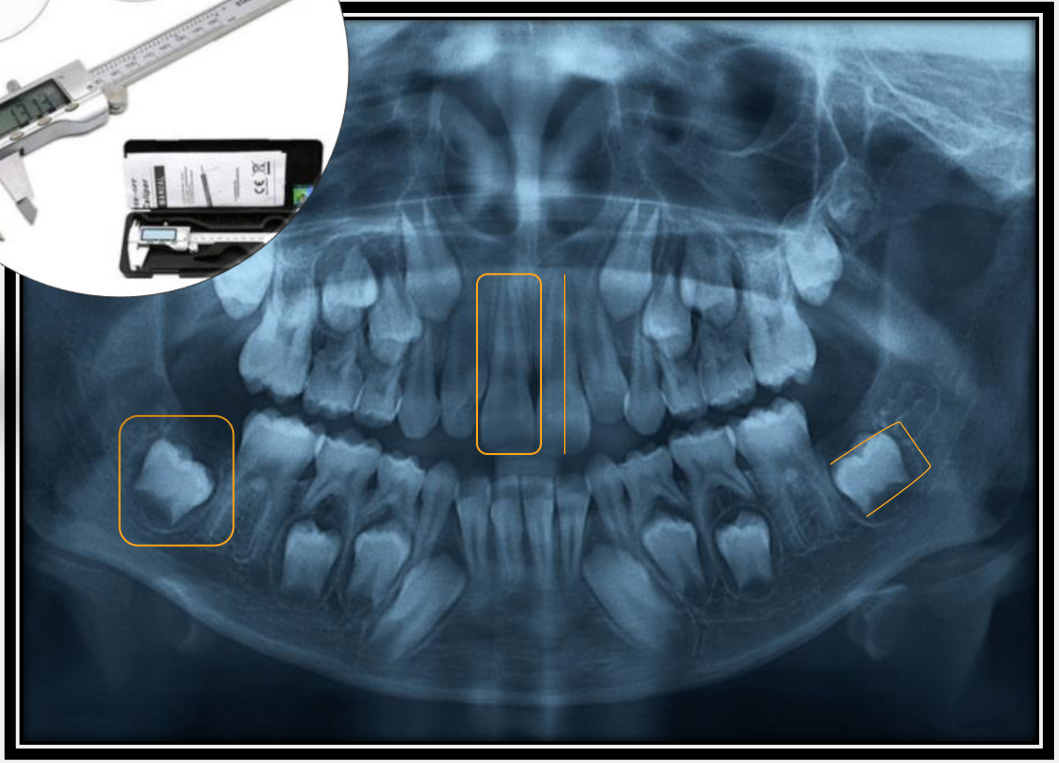
4. Combined
Alqahtani et al., 2010

1. METRIC: Liversidge *et al.* 1998

- Source
- dry tooth measurements
- from children (buried1729-1859)
- excavated from the crypt of Christ Church, London
- males & females combined

Crypt of Christ Church, London

1. METRIC: Liverside *et al.* 1998



- Application

1. Measure the tooth

Tooth length: the distance from the cusps-tips or mid-incisal edge to the development edges of crown or root in the midline

1. METRIC: Liverside *et al.* 1998

- Application

2. Choose the right equation & calculate

Dental Measurements – Deciduous tooth length (mm)	
Tooth	Regression Equation for estimating age (yrs)
i1	Age = - 0.653+ 0.144 x length ± 0.19
i2	Age = - 0.581+ 0.153 x length ± 0.17
c	Age = - 0.648+ 0.209x length ± 0.22
m1	Age = - 0.814+ 0.222 x length ± 0.25
m2	Age = - 0.904+ 0.292 x length ± 0.26

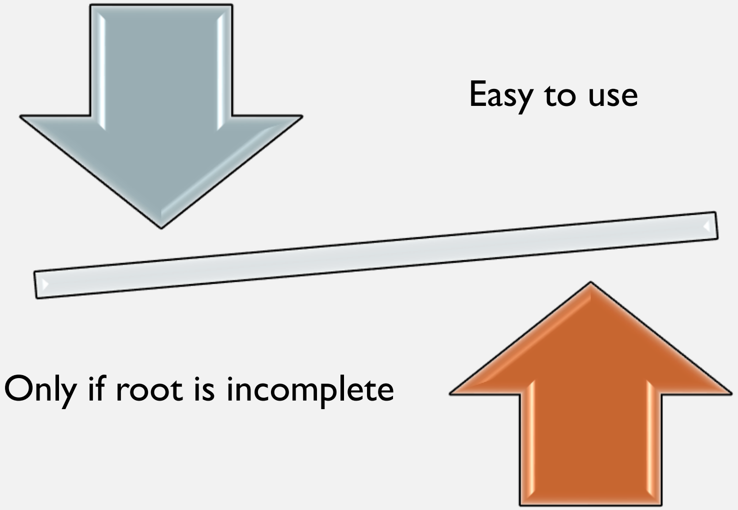
Results from maxillary and mandibular teeth were combined

Dental Measurements – Permanent tooth length (mm)	
Tooth	Regression Equation
I1	Age = 0.237 – 0.018 x length + 0.042 x $(\text{length})^2$ ± 0.21
I^2	Age = -0.137 – 0.538 x length + 0.003 x $(\text{length})^2$ ± 0.14
I_2	Age = 0.921 – 0.281 x length + 0.075 x $(\text{length})^2$ ± 0.12
C	Age = -0.163 – 0.294 x length + 0.028 x $(\text{length})^2$ ± 0.25
M1	Age = -0.942 – 0.441 x length + 0.010 x $(\text{length})^2$ ± 0.25

Measurements from maxillary and mandibular dentition were combined with exception of the lateral incisors

1. METRIC: Liversidge *et al.* 1998

- Advantages vs Disadvantages



i.e., tooth is still growing

AGING BY DENTITION: NON ADULT

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Metric
Liversidge et al. 1998

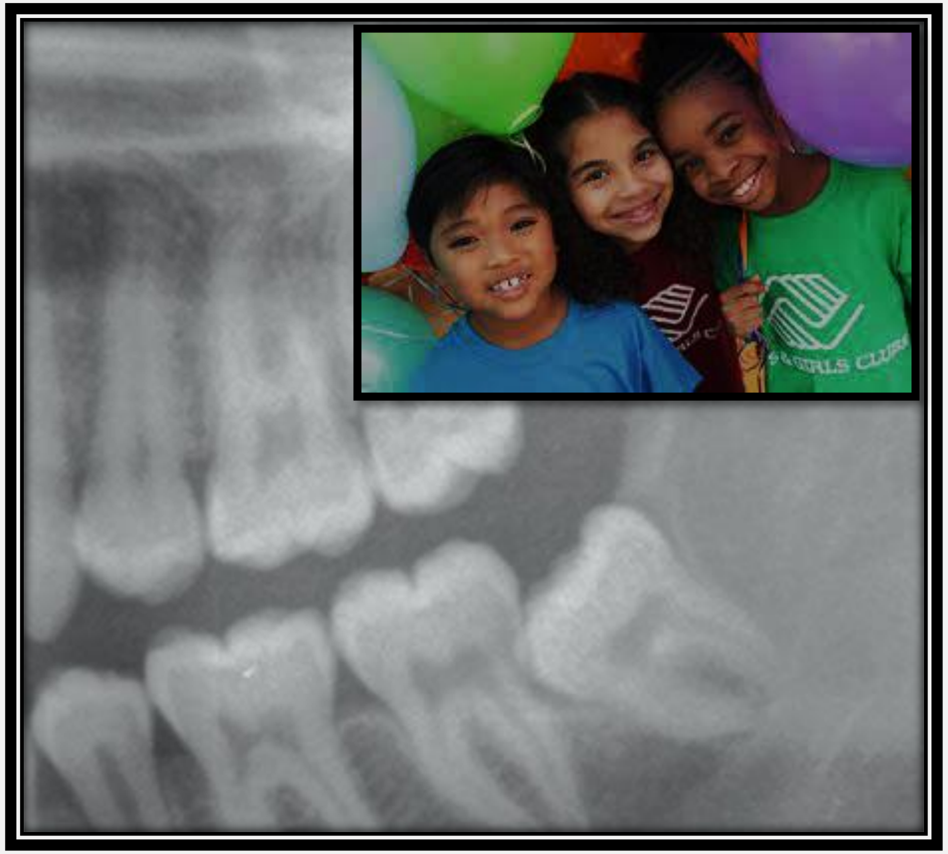
2.
Development
Moorrees et al. 1963

3.
Emergence
Ubelaker 1987

4.
Combined
Alqahtani et al., 2010

2. DEVELOPMENT: Moorrees *et al.* 1963

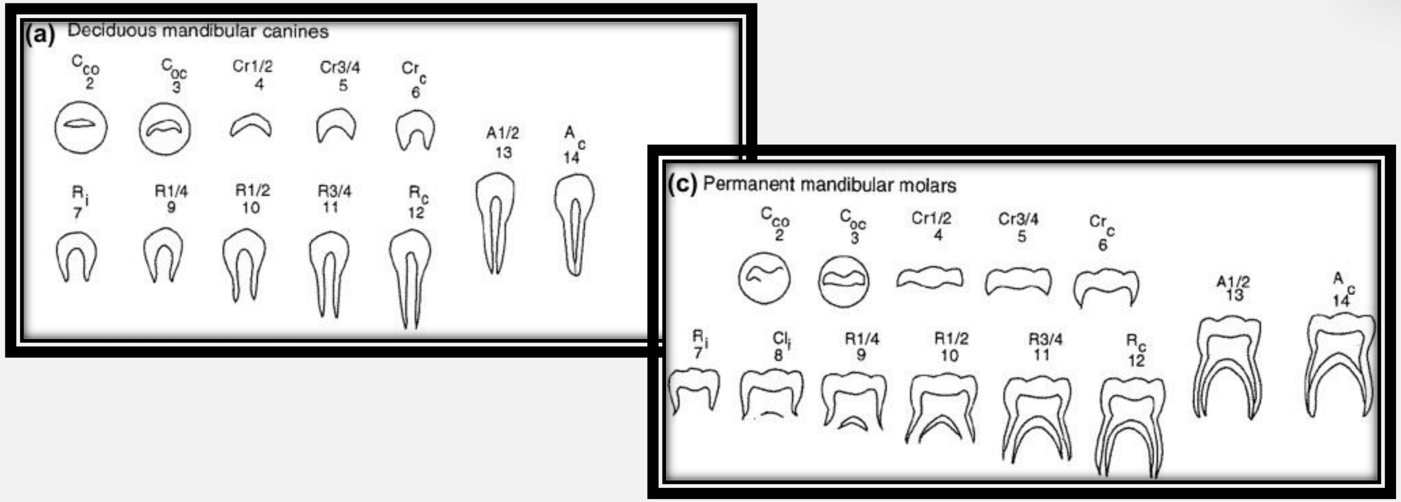
- Source
  - Intraoral radiographs of 134 Boston children (48 males & 51 females)
  - + radiographs from 136 boys & girls from Fels Research Institute program in Yellowsprings, Ohio



2. DEVELOPMENT: Moorrees *et al.* 1963

Application

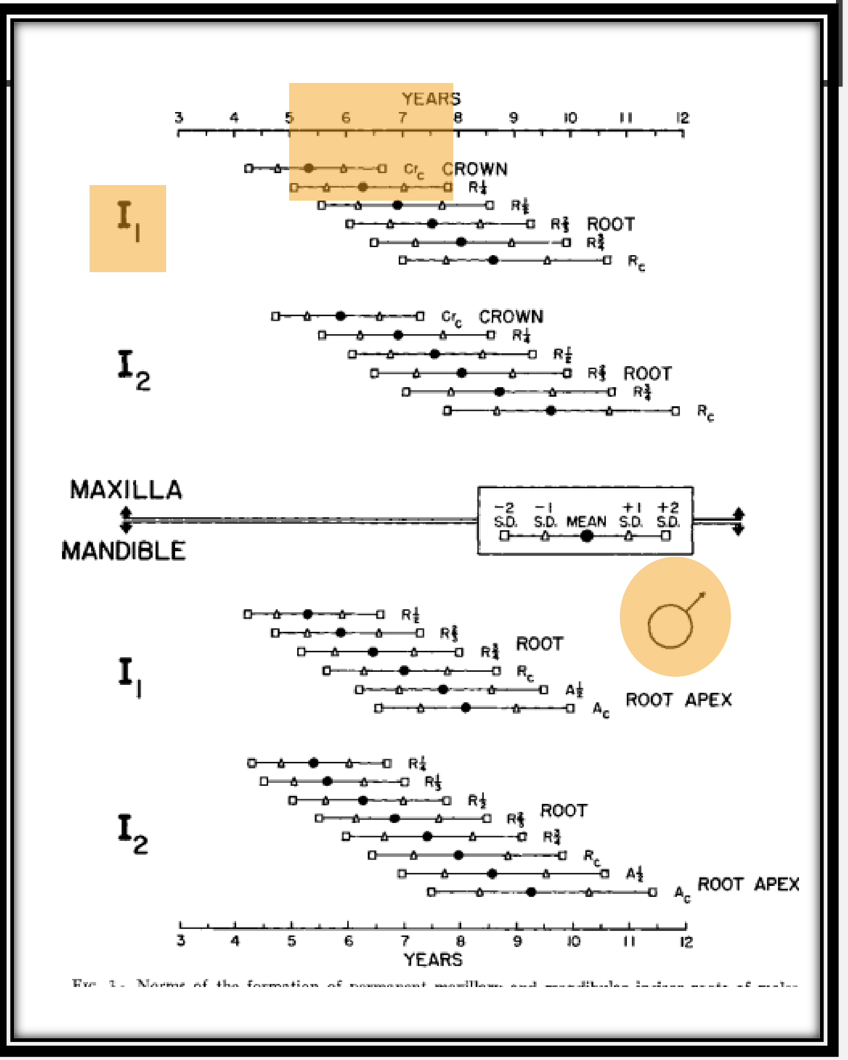
1. Determine the developmental stage of each available tooth (crown & root) by reference to illustrated developmental stages



Definitions of Tooth Formation Stages	
C_i	Initial cusps formation
C_{co}	Coalescence of cusps
C_{oc}	Cusps outline complete
$CR_{1/2}$	Crown half complete
$CR_{3/4}$	Crown three-quarters complete
CR_c	Crown complete
R_i	Initial root formation
Ci_i	Initial cleft formation
$R_{1/4}$	Root length quarter
$R_{1/2}$	Root length half
$R_{3/4}$	Root length three-quarters
R_c	Root length complete
$A_{1/2}$	Apex half closed
A_c	Apex closure complete

Source: Moorrees et al. Age Variation of Formation Stages for Ten Permanent Teeth. *Journal of Dental Research*. 1963;42(6):1490-1502.

2. DEVELOPMENT: Moorrees *et al.* 1963



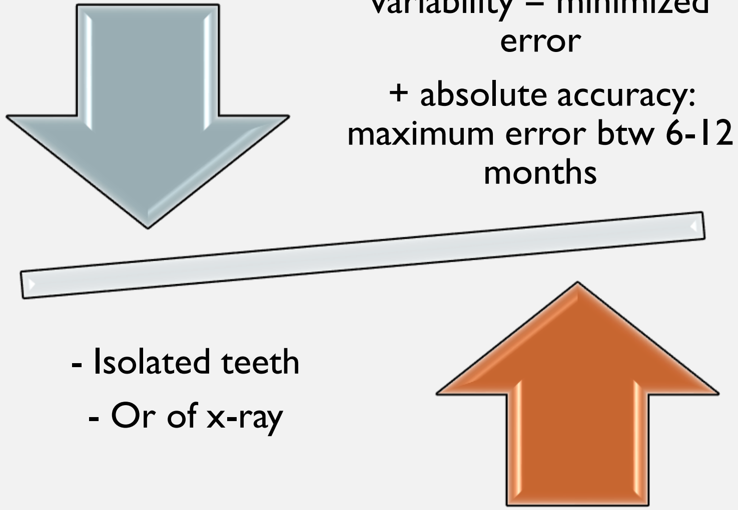
- Application

2. Then, skeletal age is estimated by referencing calculated mean ages for achieving that developmental stage for each tooth

e.g., $I_1 = R_{1/4}$ → 5 to7.9 yrs old (if it's a boy)

2. DEVELOPMENT: Moorrees *et al.* 1963

- Advantages vs Disadvantages

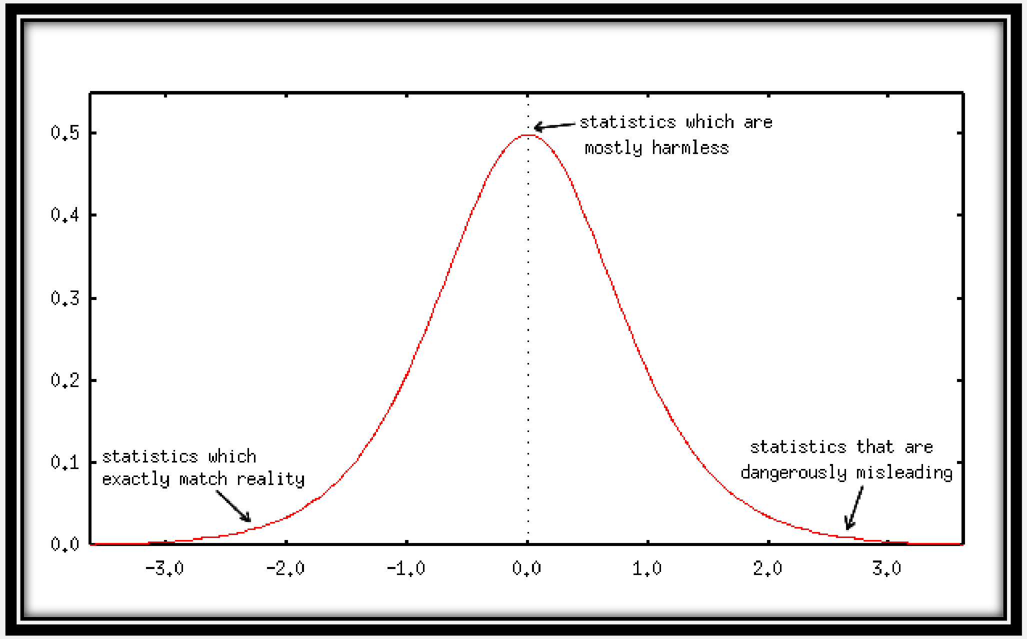


+ interval 95% of the variability = minimized error

+ absolute accuracy: maximum error btw 6-12 months

- Isolated teeth
- Or of x-ray

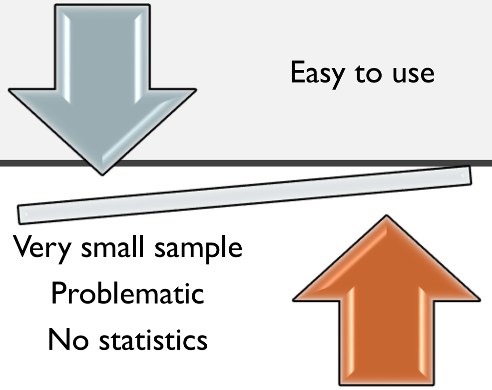
One of the most commonly used European pop



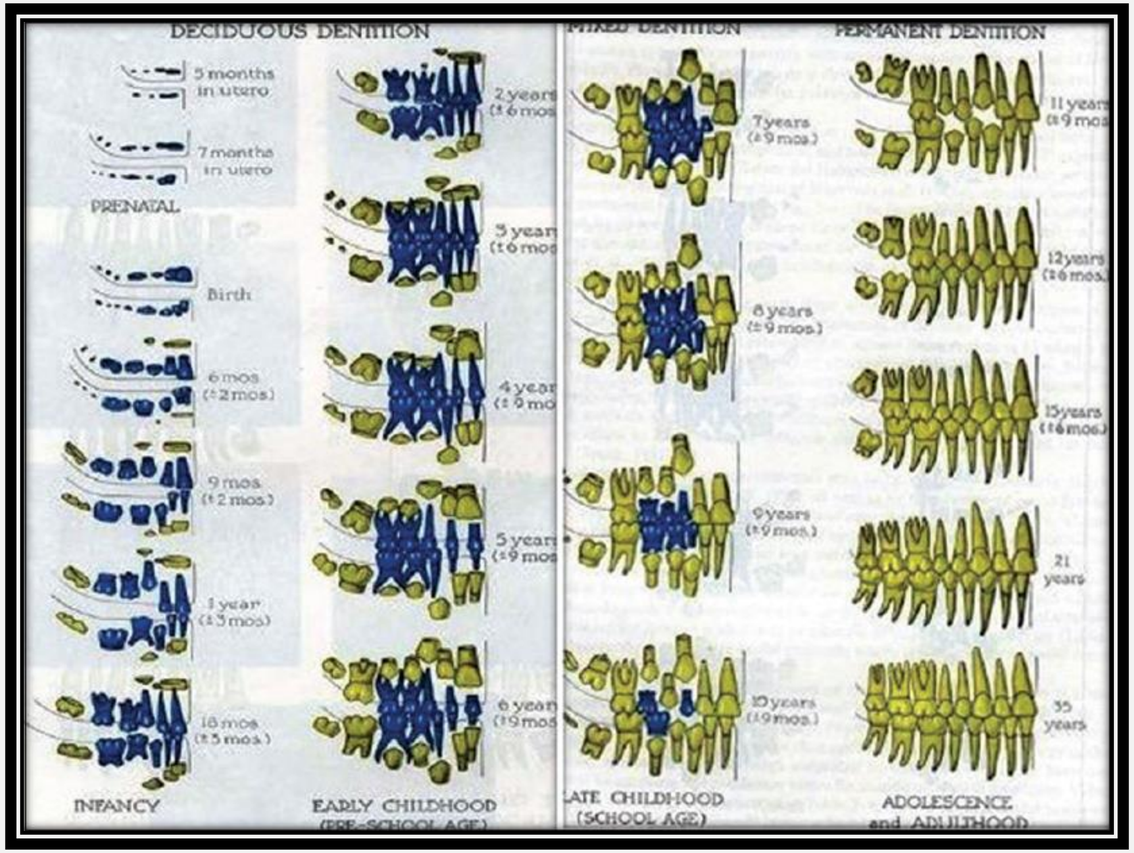
AGING BY DENTITION: NON ADULT

1. Metric Liversidge et al. 1998	2. Development Moorrees et al. 1963
3. Emergence Ubelaker 1987	4. Combined Alqahtani et al., 2010

3. EMERGENCE: Schour & Massler 1941



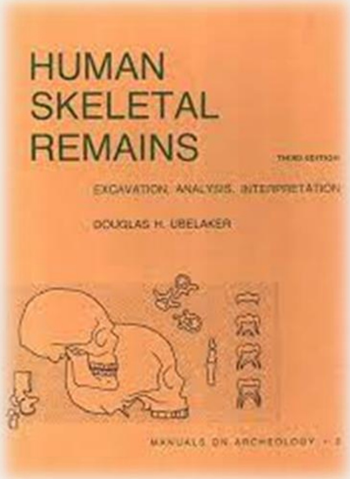
- Among the oldest methods in age estimation
- Native North Americans only
- Using panoramic radiographs
- A chart with a series of 21 drawings
- Age between (5 mths in utero to 35 yrs)



Source: Schour I, Massler M. Development of human dentition. *J Am Dent Assoc* 1941;20:379-427.

3. EMERGENCE: Ubelaker 1987

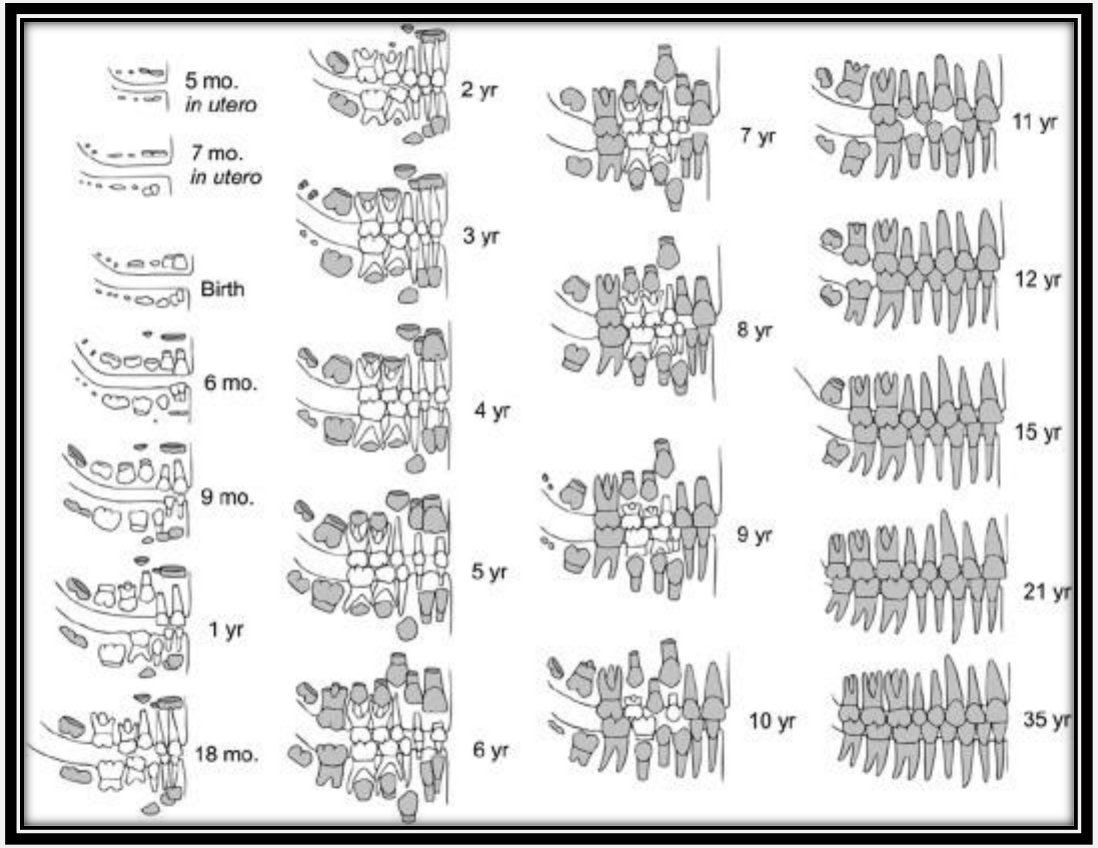
- Source
- Compilation of data from multiple publications 1942-1976



3. EMERGENCE: Ubelaker 1987

- Application

1. Eruptions refers top emergence through the gum, not the alveolar bone



Source: Ubelaker DH. Estimating age at death from immature human skeletons: an overview. J Forensic Sci. 1987 Sep;32(5):1254-63.

3. EMERGENCE: Ubelaker 1987

- Advantages vs Disadvantages

Covered a wide range of variation at each stage of development
Native American Indians pop
Less applicable for European samples

+ estimation errors adapted to each age

+ sexes combined

+ several populations

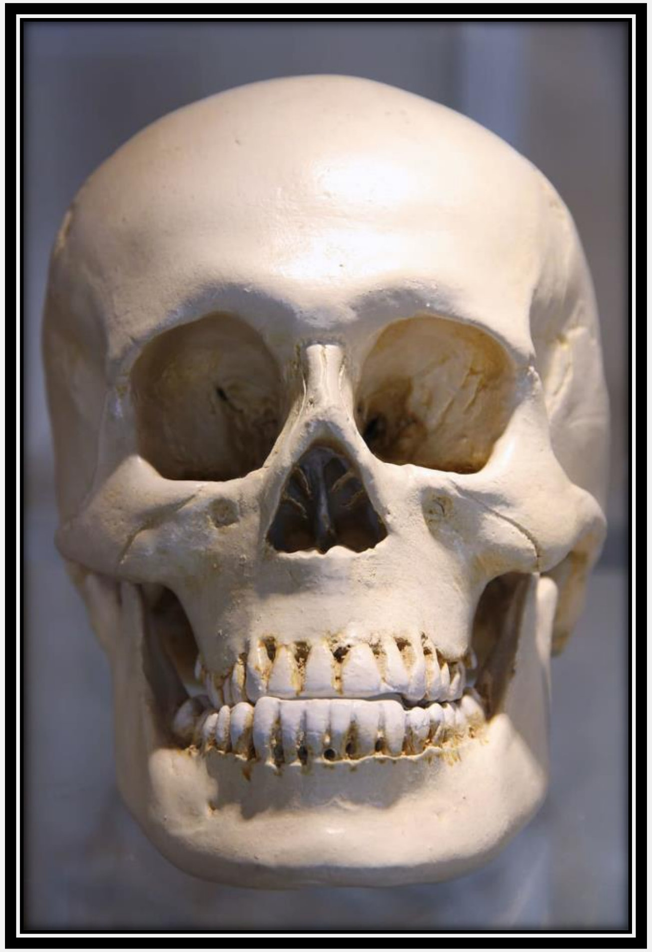
- Visual

AGING BY DENTITION: NON ADULT

1. Metric Liversidge et al. 1998	2. Development Moorrees et al. 1963
3. Emergence Ubelaker 1987	4. Combined Alqahtani et al., 2010

4. COMBINED: Alqahtani *et al*., 2010

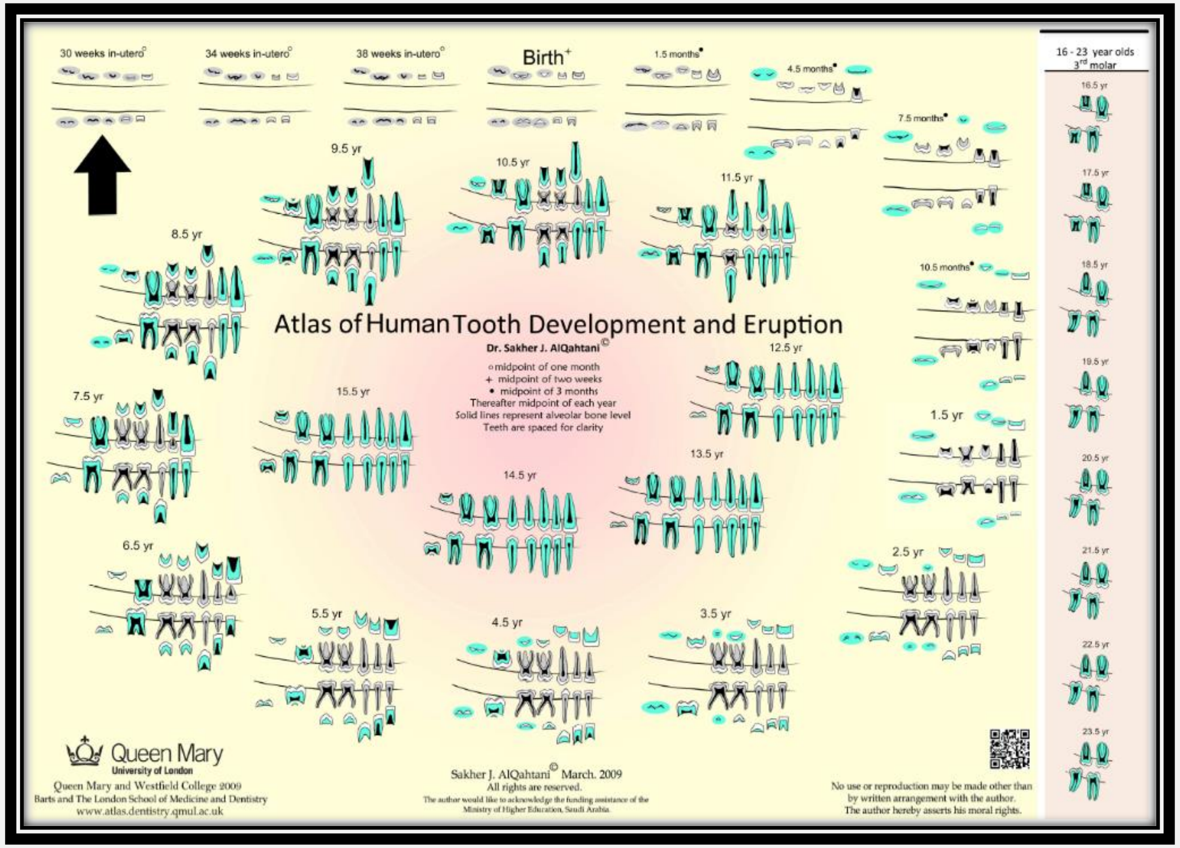
- **Source**
  - Known as 'London Atlas method'
  - Upper incisors & all 8 lower teeth
  - European & Bangladeshi populations



4. COMBINED: Alqahtani *et al.*, 2010

Application

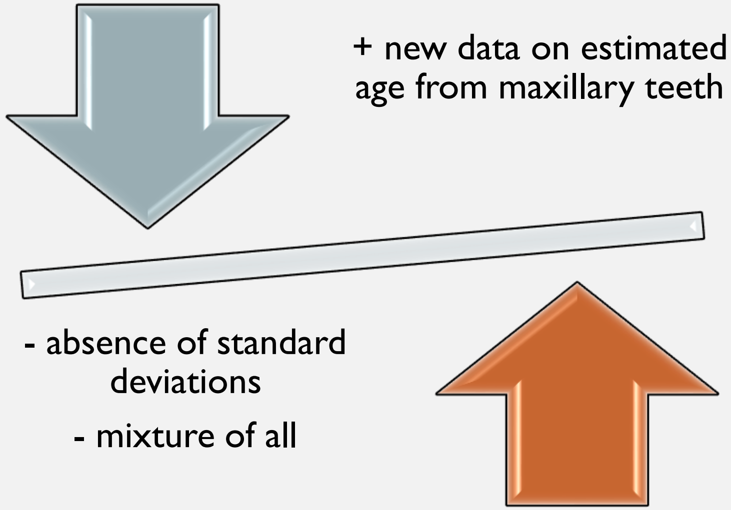
1. Chart divided into different sections based on development → age between (28 weeks in utero to 23 yrs)



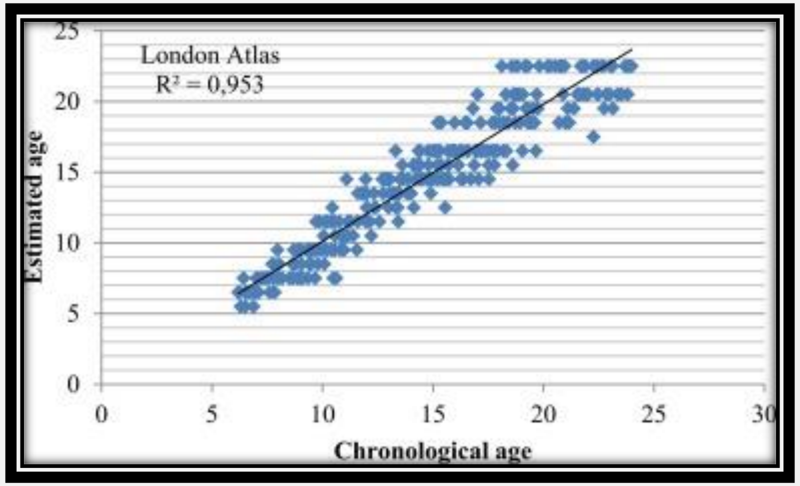
Source: S. J. AlQahtani, M. P. Hector and H. M. Liversidge (2014). 'Accuracy of dental age estimation charts: Schour and Massler, Ubelaker and the London Atlas.' In the American Journal of Physical Anthropology Volume 154, Issue 1, pages 70–78, May 2014

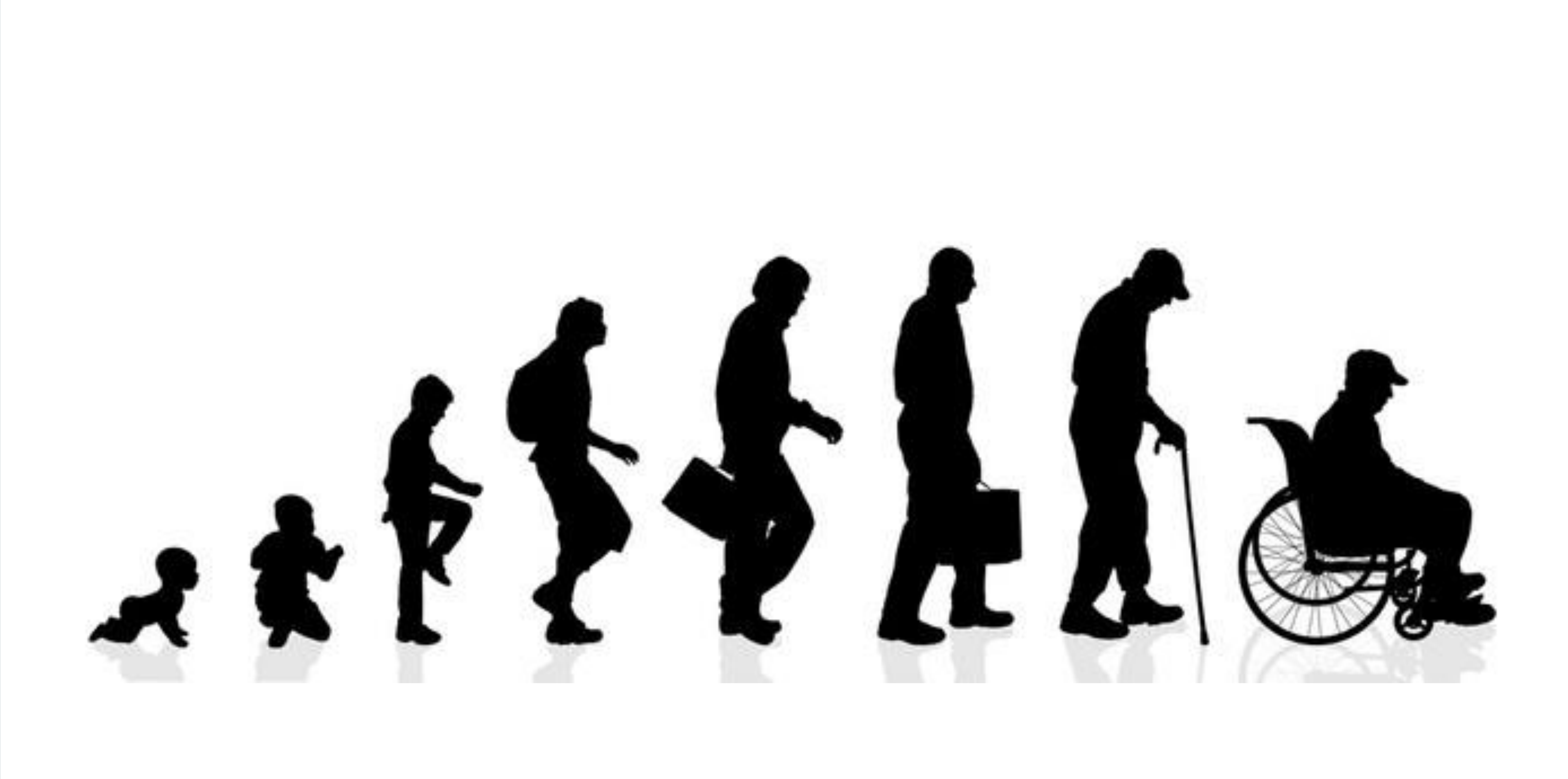
4. COMBINED: Alqahtani *et al.*, 2010

- Advantages vs Disadvantages



Better accuracy compared to emergence methods





AGING BY DENTITION: ADULT

1
Metric
Lamedin et al. 1992

2
Development (3rd molar)
Liversidge & Marsden 2010

3
3
Attrition
Brothwell 1981; Lovejoy 1985
Smith1984

AGING BY DENTITION: ADULT

1
Metric
Lamendin et al. 1992

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Liversidge & Marsden 2010

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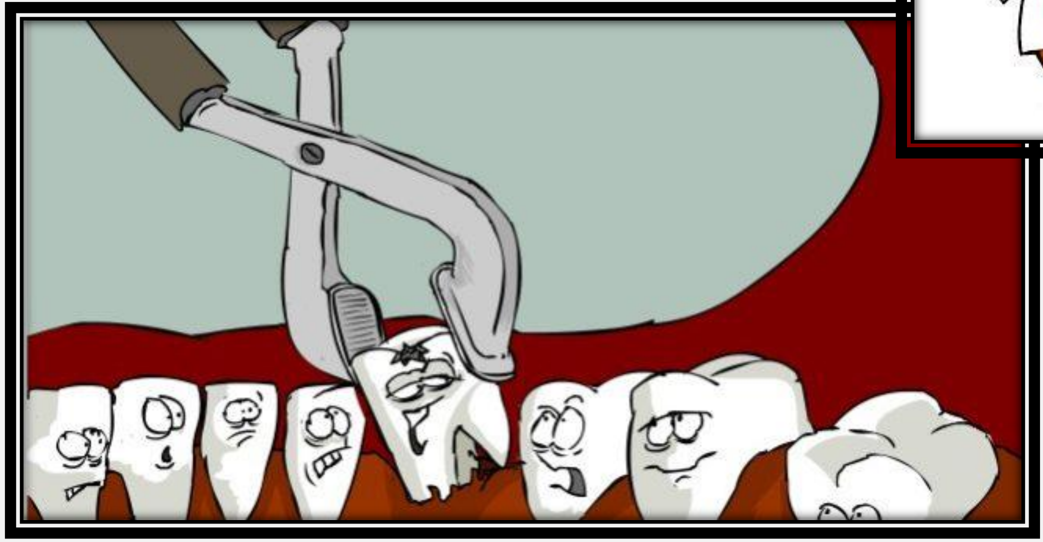
Attrition
Brothwell 1981; Lovejoy 1985
Smith1984

1. METRIC: Lamendin *et al.* 1992

- Source
- 306 teeth extracted from 208 individuals (French)
- aged 22 – 90 yrs
- 135 males & 73 females



1. METRIC: Lamendin *et al.* 1992

- Application

1. Take 2 measures (on the labial surface of the entire tooth)

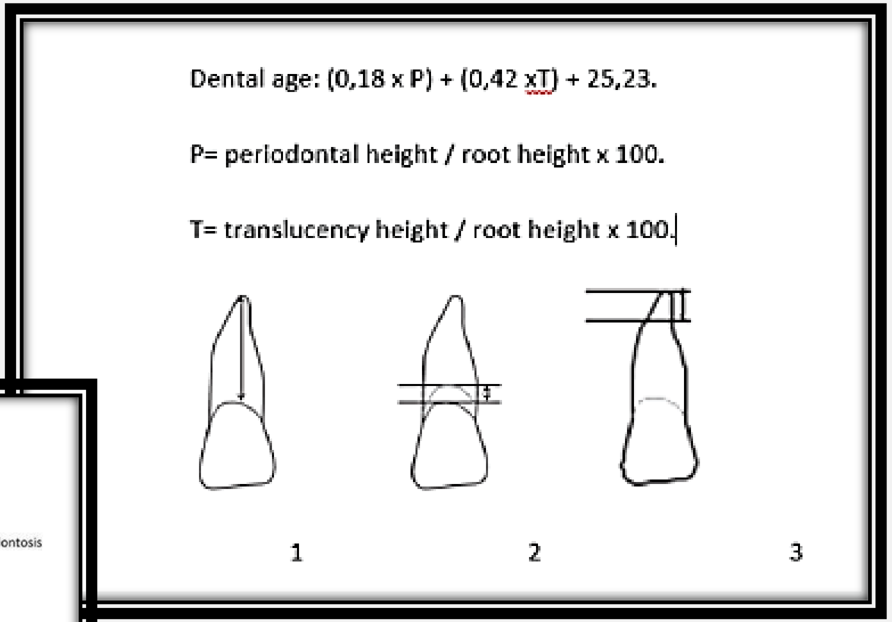
- translucency of the tooth root
- periodontal regression

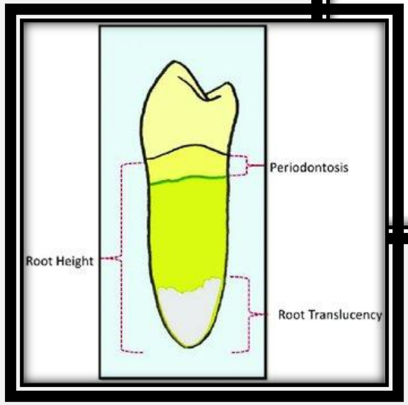
2. Use the formulae :

<u>Age (years) = 0.18 x P + 0.42 x T + 25.53.</u>

P = Periodontosis height x 100/root height

T = Transparency height x 100/root height





1. METRIC: Lamendin *et al.* 1992

- Advantages vs Disadvantages

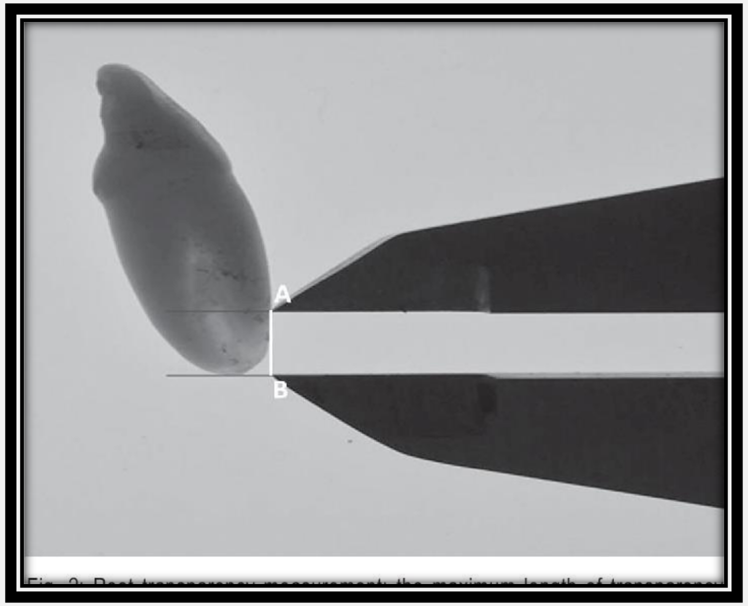
measurements are made without section and do not require special equipment or training

a mean error of

+/- 10 years on the working sample

+/- 8.4 years on a forensic control sample

- One population only



AGING BY DENTITION: ADULT

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Metric
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Development (3rd molar)
Liversidge & Marsden 2010

3

3
Attrition
Brothwell 1981; Lovejoy 1985
Smith1984

2. DEVELOPMENT 3rd molar: Liversidge & Marsden 2010

Objective

Testing :

1. Age estimation methods using Lower 3rd Molar root formation
2. Diagnostic accuracy of 3rd to predict age 18

Br Dent J. 2010 Oct 23;209(8):E13. doi: 10.1038/sj.bdj.2010.976. Epub 2010 Oct 15.

Estimating age and the likelihood of having attained 18 years of age using mandibular third molars

H M Liversidge[1], P H Marsden

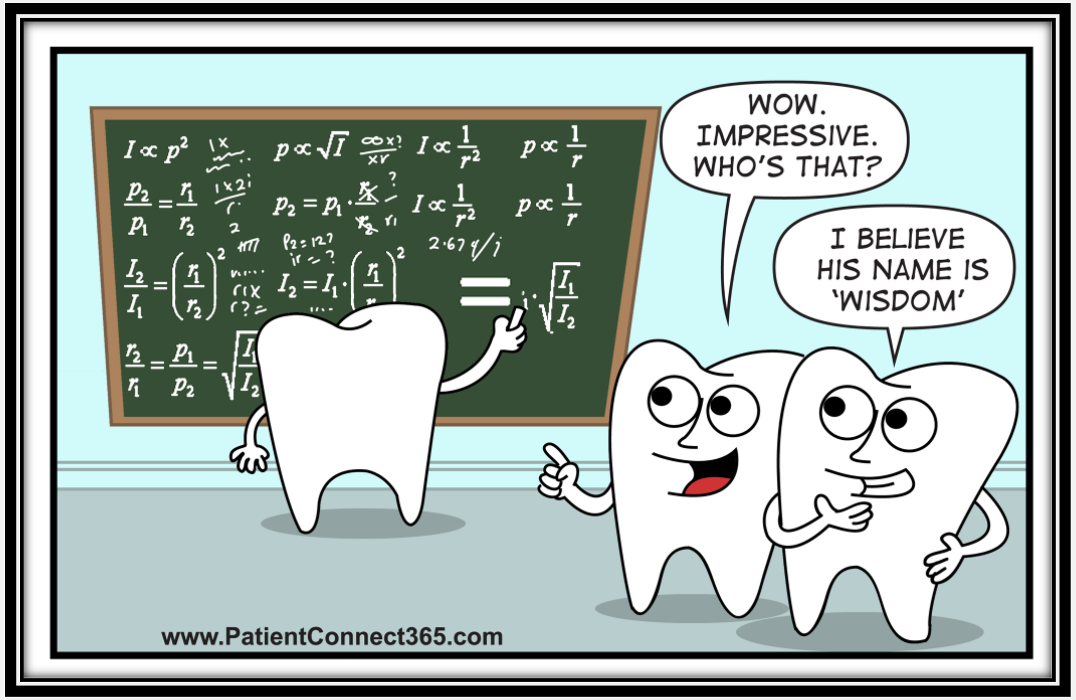
Affiliations + expand

PMID: 20953166 DOI: 10.1038/sj.bdj.2010.976

2. DEVELOPMENT 3rd molar: Liversidge & Marsden 2010

- Design

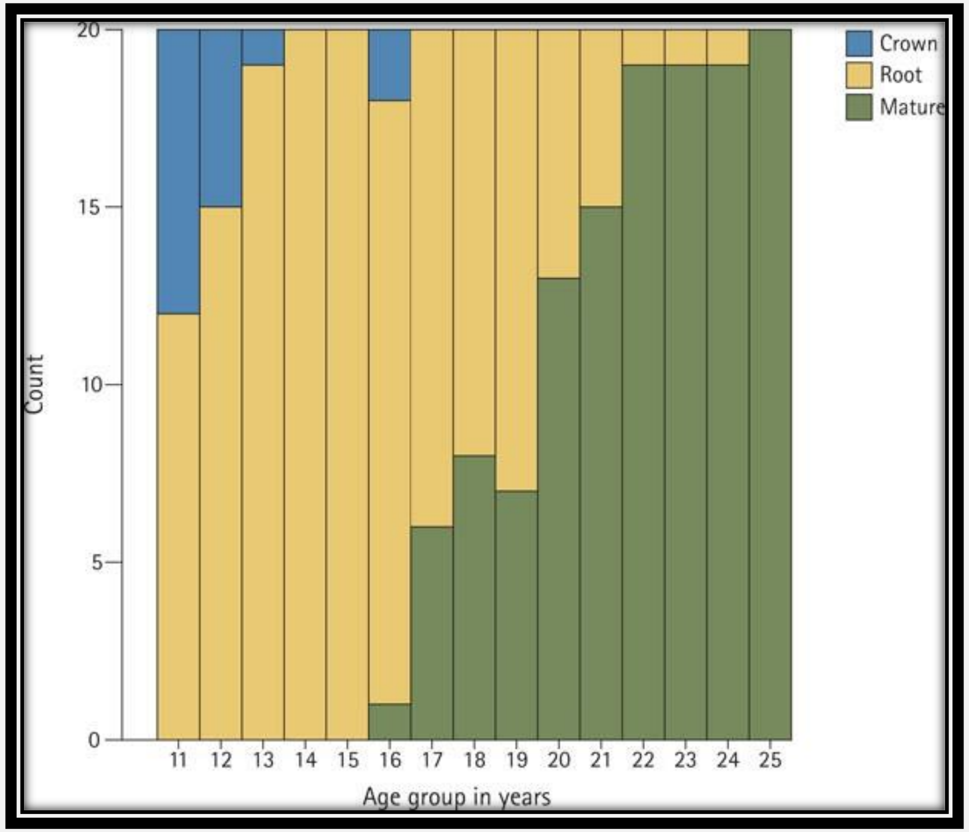
1. Methods tested on 300 dental panoramic radiographs (age 11-25).
2. Diagnostic accuracy assessed on separate reference data (n = 1,663, age 9-25).
3. Root stage was the diagnostic test predicting 18 years of age



2. DEVELOPMENT 3rd molar: Liversidge & Marsden 2010

- Methods

1. Root stage of M3 assessed & age estimated (n = 157) using published methods that use Demirjian or Moorrees root stages.
2. Difference between dental & known ages assessed
3. Diagnostic tests & likelihood ratios calculated for reference data



2. DEVELOPMENT 3rd molar: Liversidge & Marsden 2010

- Main outcome measure

1. Mean difference (bias), standard deviation & absolute mean difference between dental age & known ages
2. Likelihood ratio of age 18, given M3 root stage

2. DEVELOPMENT 3rd molar: Liversidge & Marsden 2010

- Results

Only six of 37 methods estimated age with bias not significant to zero

Mean absolute difference between dental & known age for these methods ranged 1.45-1.97 years

Standard deviation of bias for all methods was around 2 years and 95% confidence interval of estimated age is ± 4 years

2. DEVELOPMENT 3rd molar: Liversidge & Marsden 2010

- Conclusion

Most methods using M3 root formation estimate age with significant bias

If M3 is mature, age 18 is more than likely attained

AGING BY DENTITION: ADULT

1
Metric
Lamedin et al. 1992

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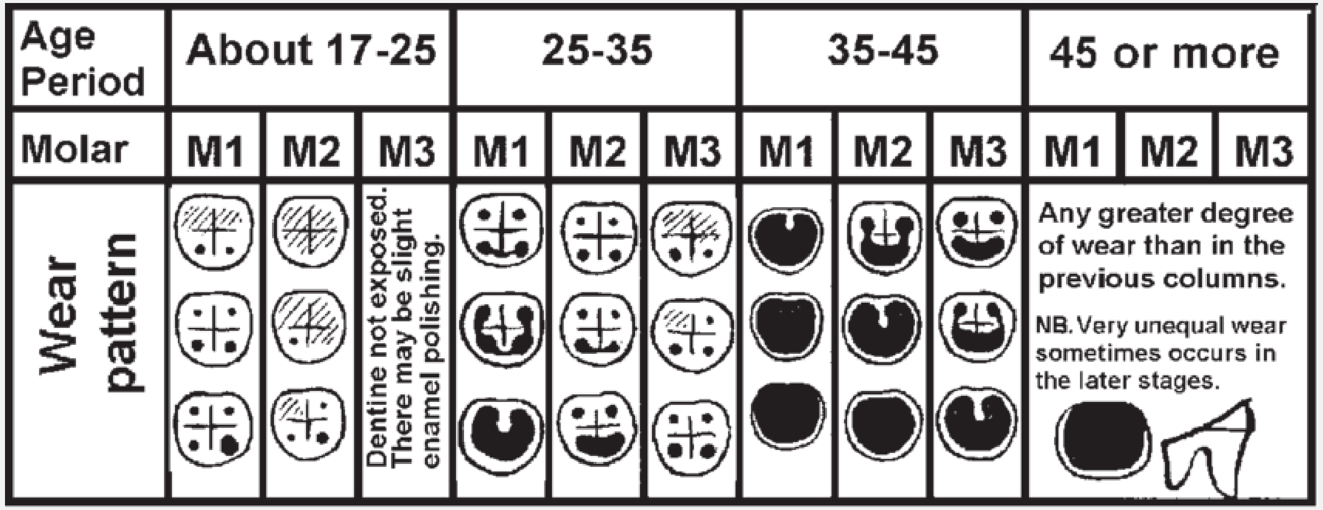
Development (3rd molar)
Liversidge & Marsden 2010

3
Attrition
Brothwell 1981; Lovejoy 1985

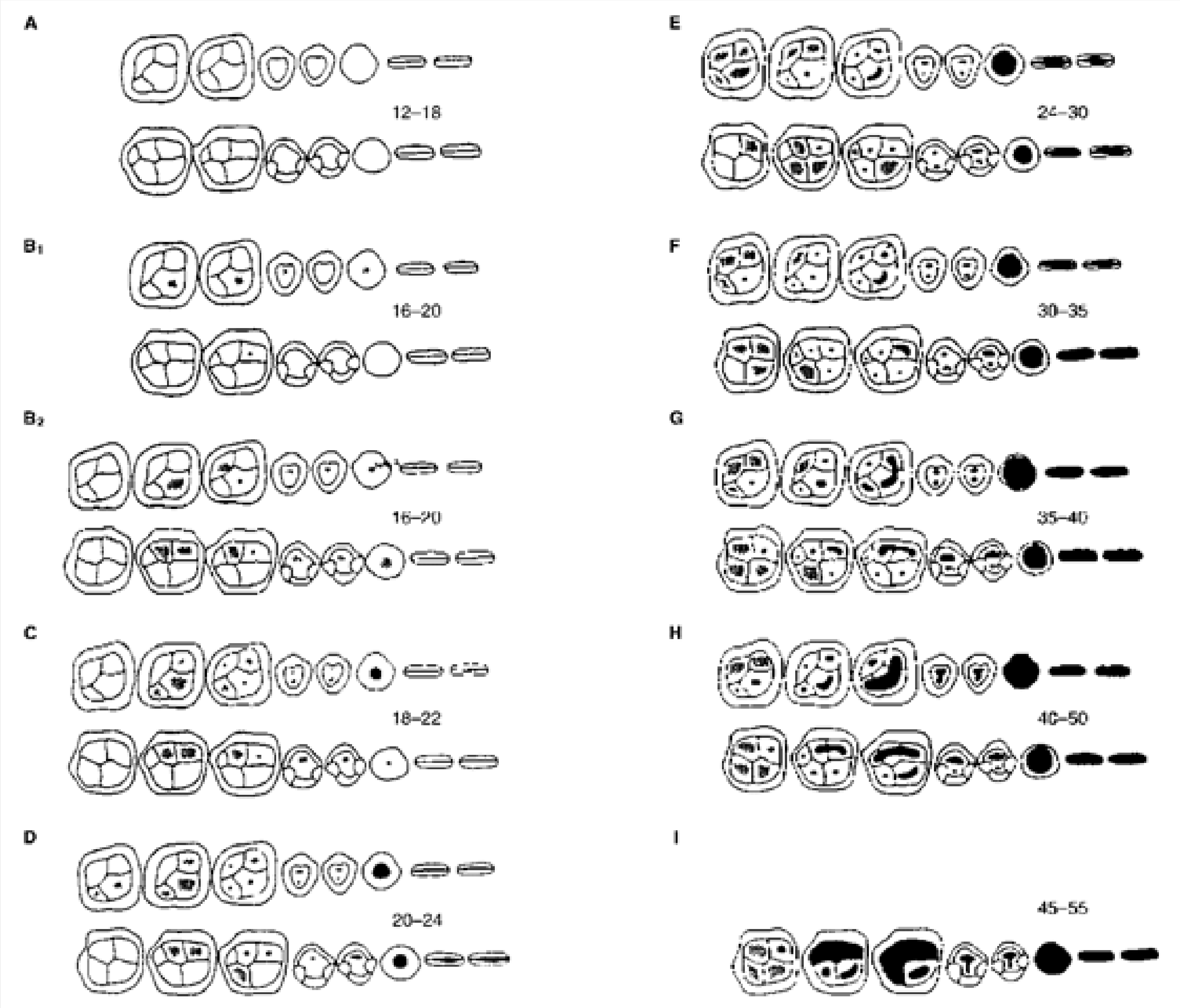
3. DENTAL WEAR

Brothwell 1981



3. DENTAL WEAR

Lovejoy 1985



DENTAL WEAR

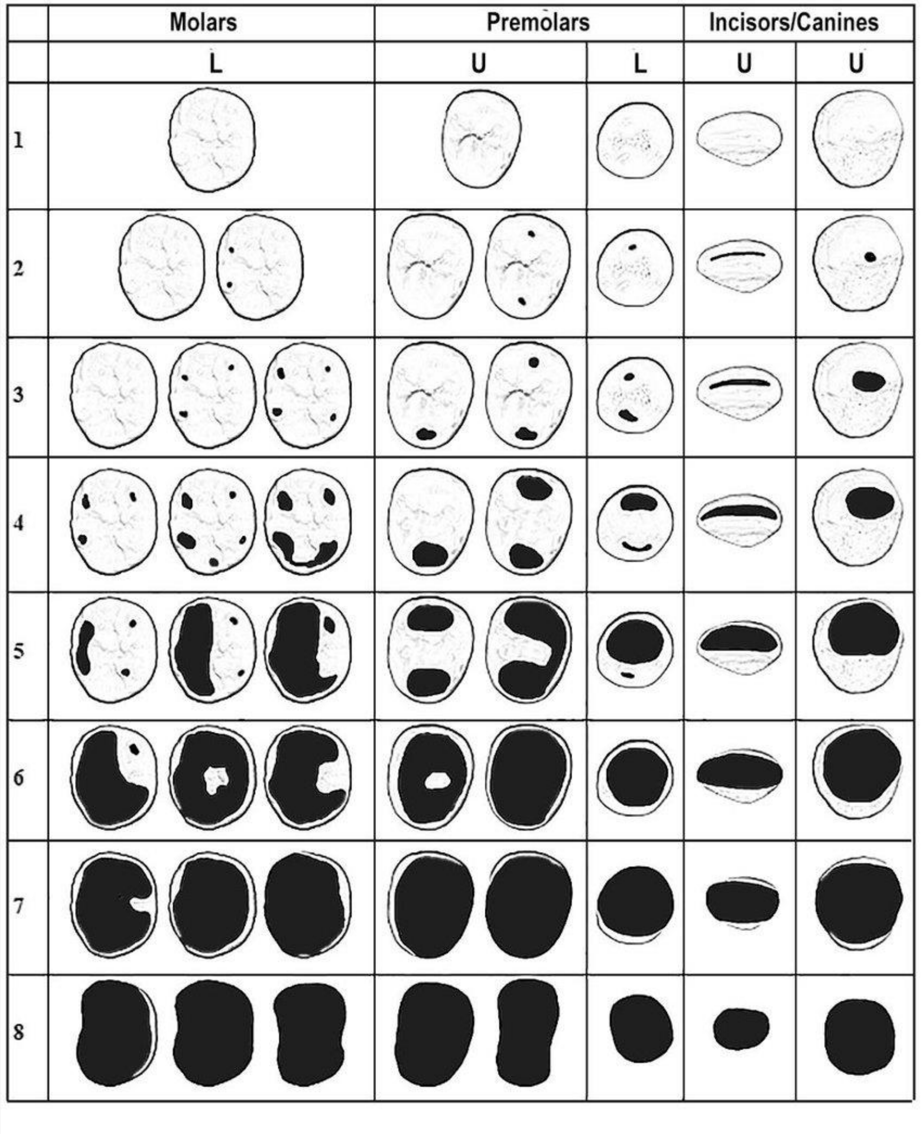
a general term that can be used to describe the surface loss of dental hard tissues

Age estimation

Diet indicator

3. DENTAL WEAR

Smith 1984



AGE ESTIMATION: Biochemical

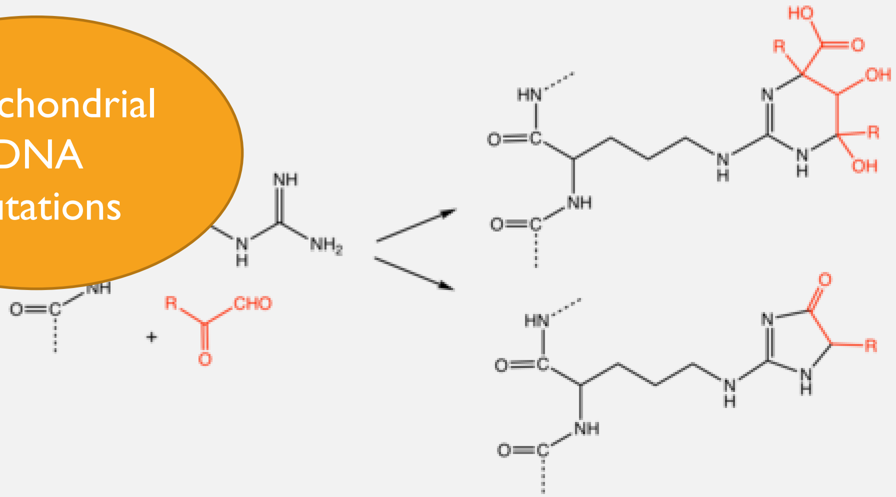
1. Natural aging process, several molecular changes occur most commonly in the long-living proteins & hard tissues like the teeth & bone
2. These molecular changes gradually lead to alterations in several organs & organ systems, which can be quantified & correlated with age

aspartic acid racemization

collagen crosslinks

advanced glycation-end products

mitochondrial DNA mutations



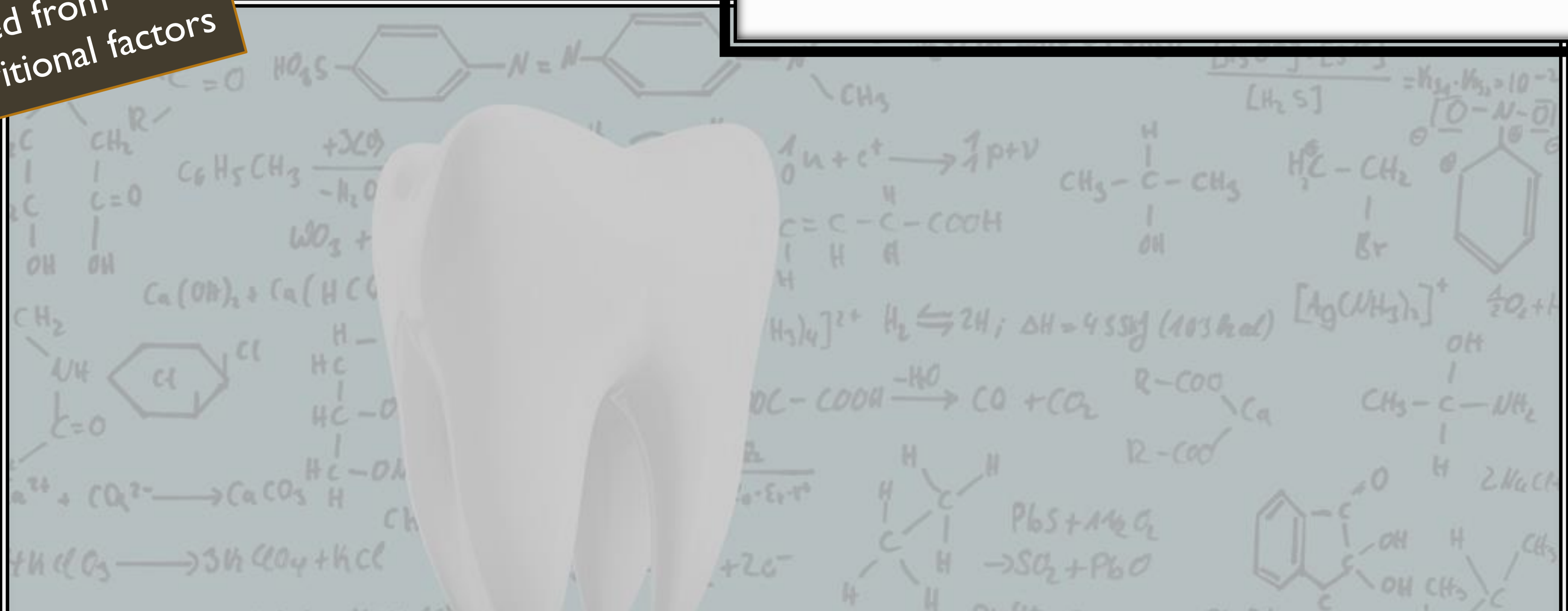
Review | Open Access | Published: 11 January 2022

Biochemical analyses for dental age estimation: a review

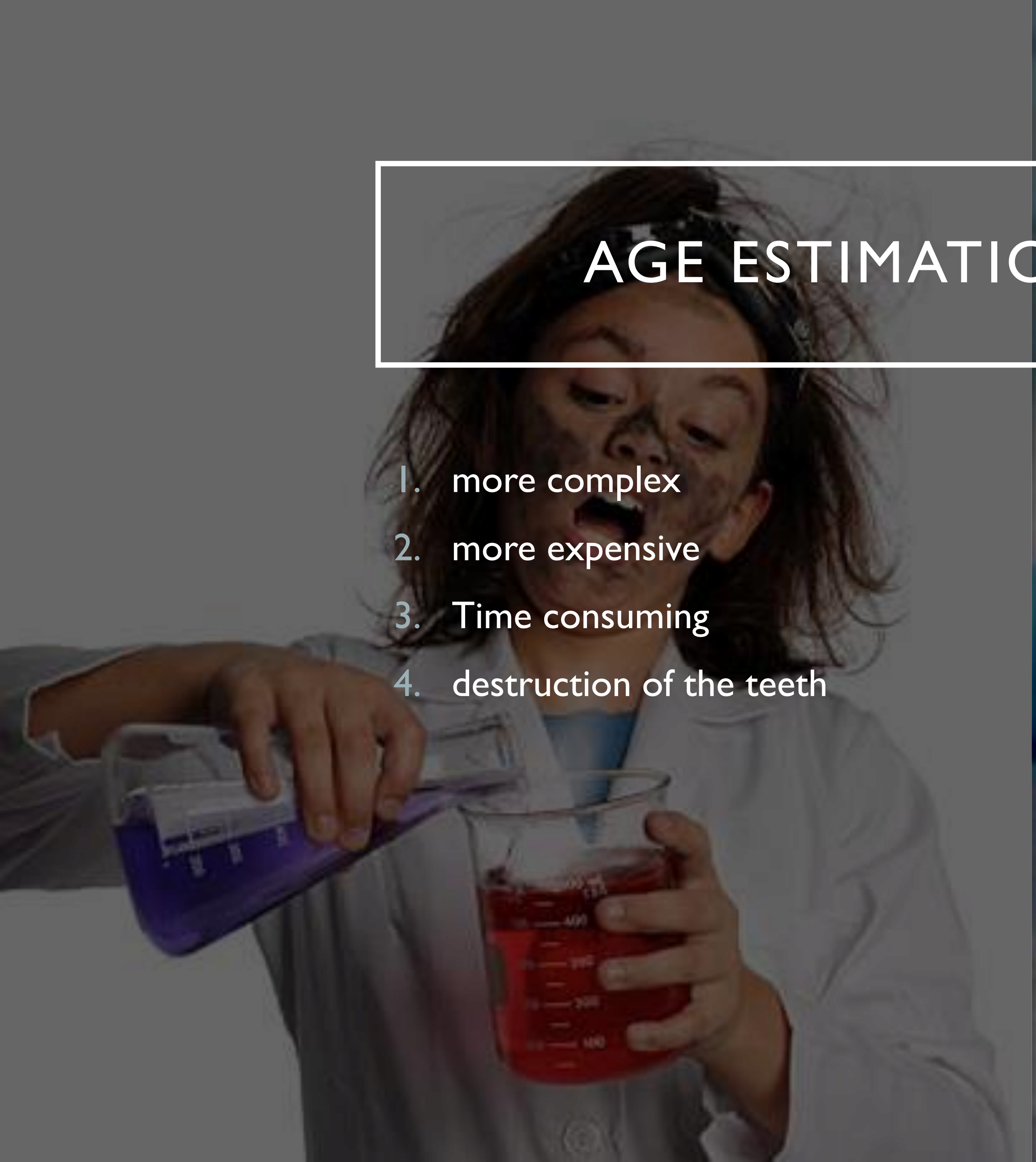
Maitreyi Pillalamarri, Ravikanth Manyam, Swetha Pasupuleti, Smita Birajdar & Satya Tejaswi Akula

Egyptian Journal of Forensic Sciences 12, Article number: 2 (2022) | Cite this article

main advantage:
sample protected from
environmental & nutritional factors



1. racemization of aspartic acid = THE most precise method
2. advanced glycation-end products: valuable (If all the confounding factors are stable)
3. further studies needed to provide more standardized method

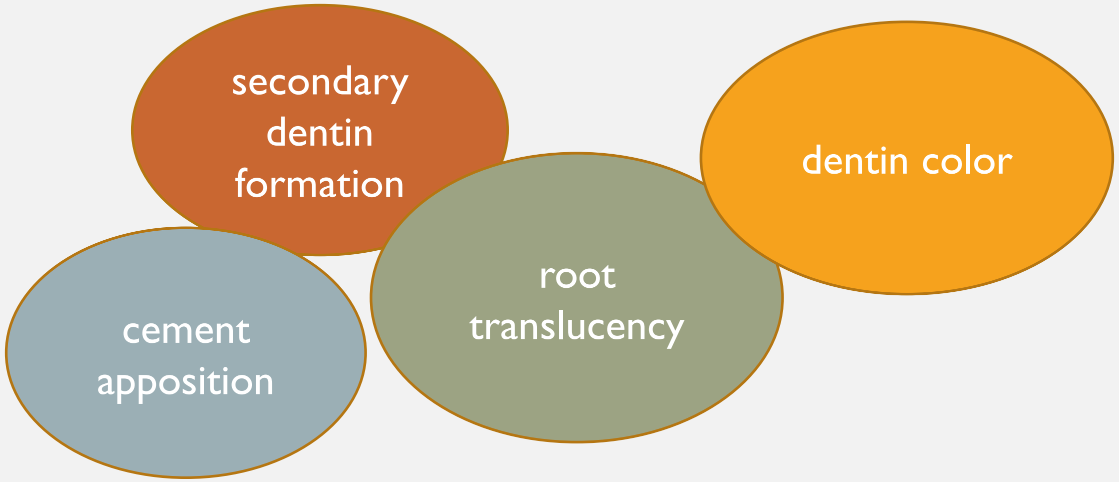


AGE ESTIMATION: Biochemical

1. more complex
2. more expensive
3. Time consuming
4. destruction of the teeth

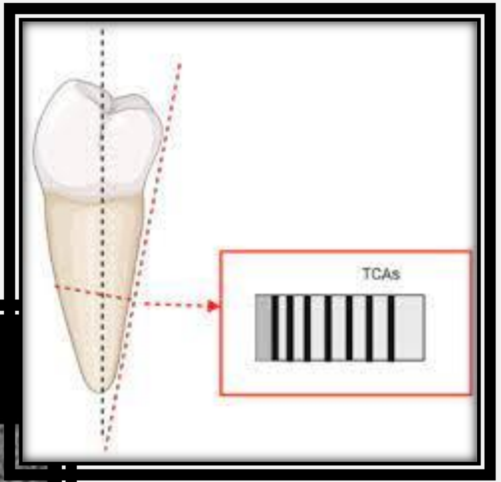
AGE ESTIMATION: Morphological

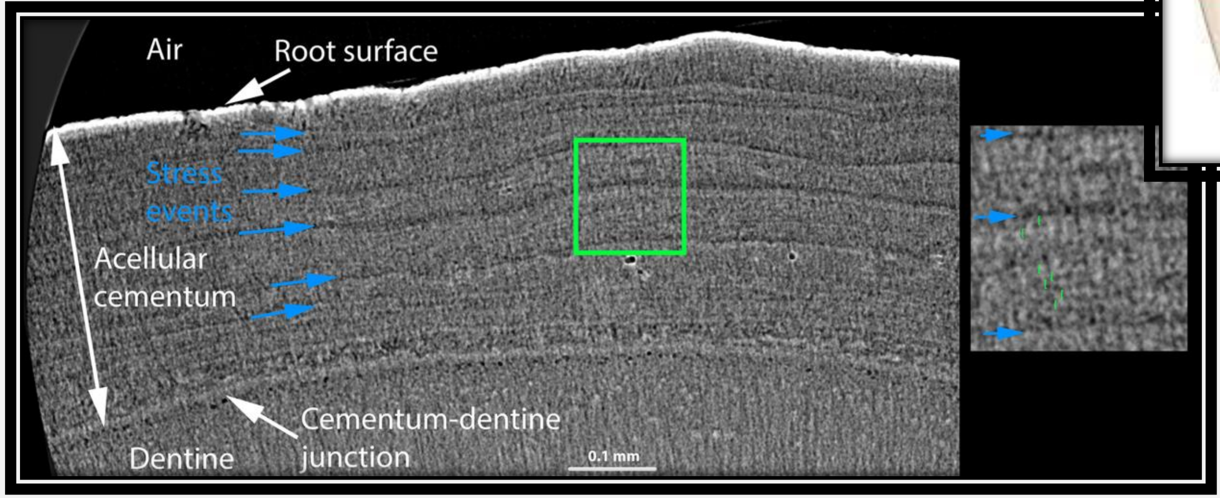
1. based on assessment of teeth (ex-vivo)
2. require extracted teeth for microscopic preparation
3. the most widely used in practical forensic cases

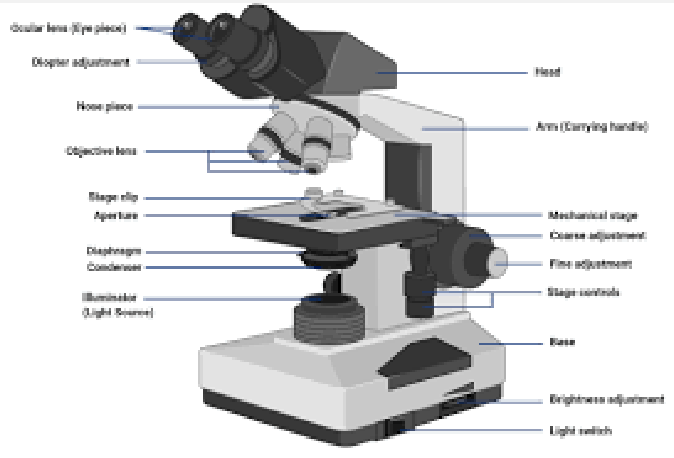


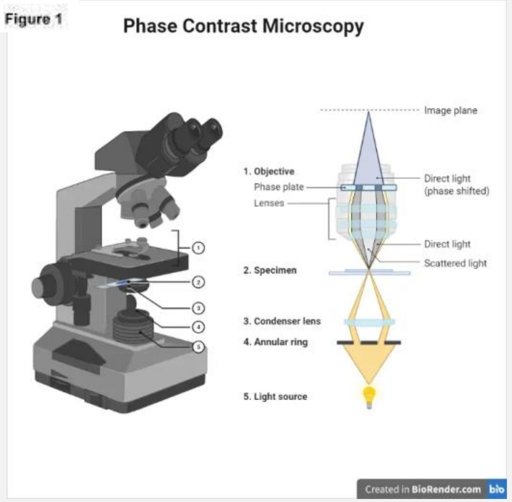
AGE ESTIMATION: Morphological

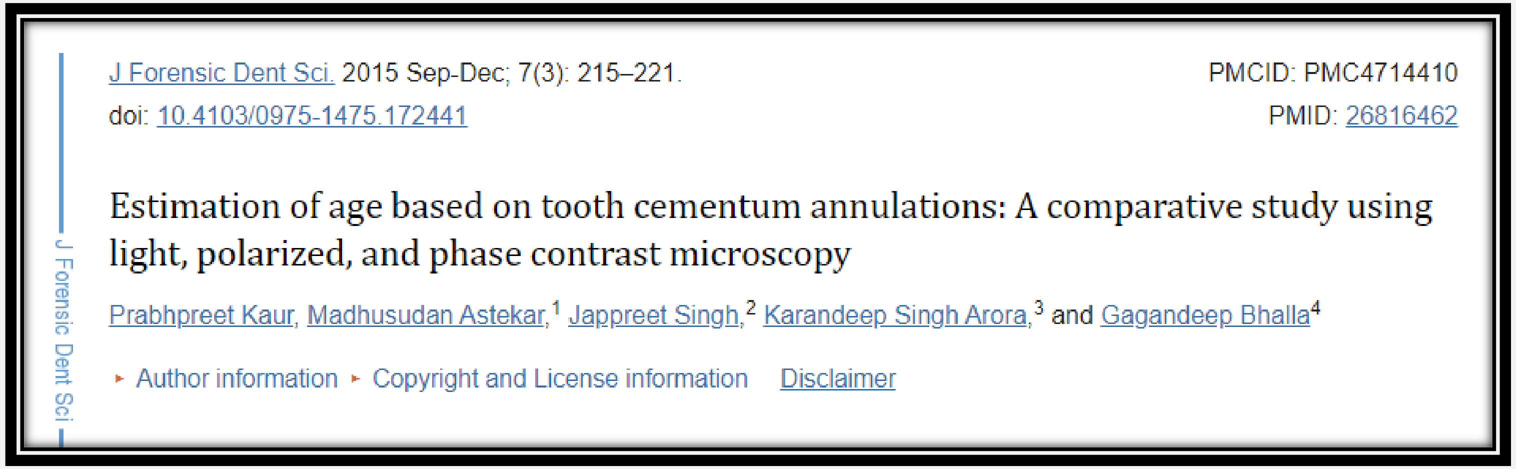
Tooth cementum annulation (TCA): a microscopic method for the determination of an individual's age based on the analysis of incremental lines of cementum










J Forensic Dent Sci. 2015 Sep-Dec; 7(3): 215–221.
doi: 10.4103/0975-1475.172441
PMCID: PMC4714410
PMID: 26816462

Estimation of age based on tooth cementum annulations: A comparative study using light, polarized, and phase contrast microscopy

Prabhpreet Kaur, Madhusudan Astekar,[1] Jappreet Singh,[2] Karandeep Singh Arora,[3] and Gagandeep Bhalla[4]

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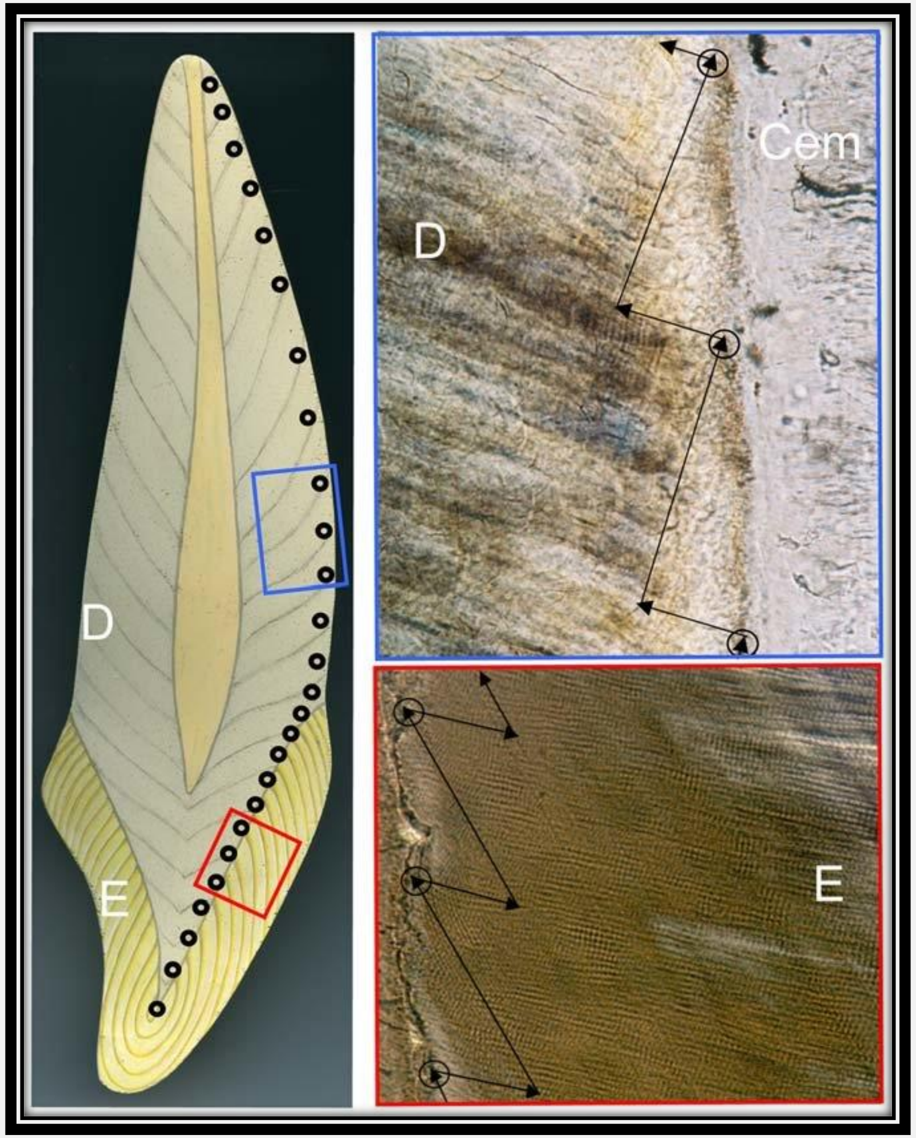
Aim:

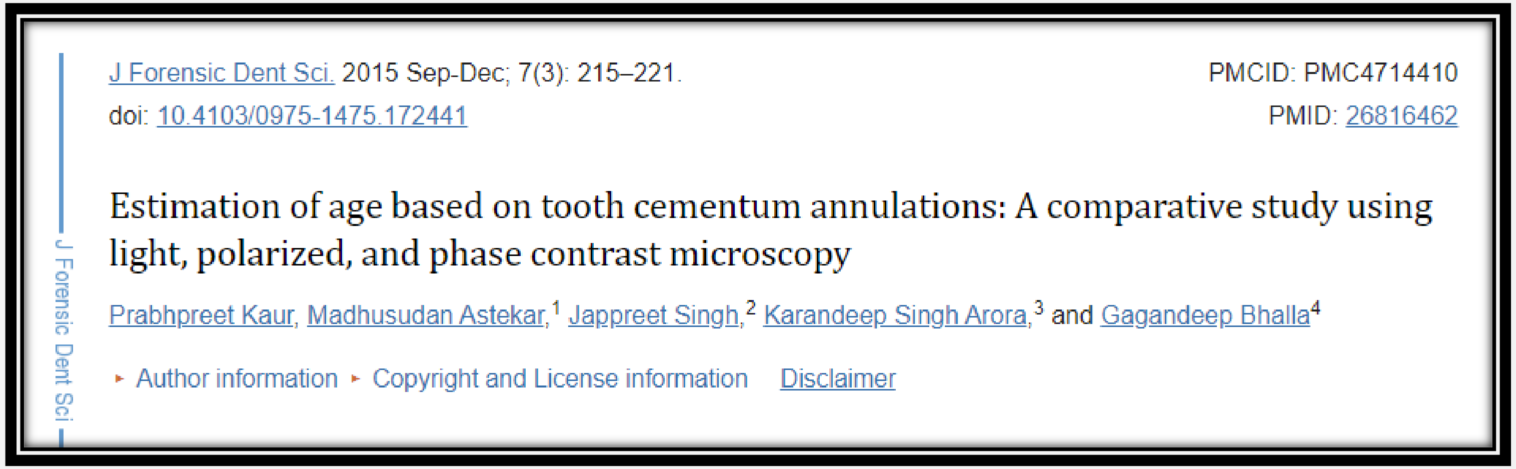
compare ages estimated using incremental lines of cementum as visualized by:

1. brightfield microscopy
2. polarized microscopy
3. phase contrast microscopy

with the actual age of subject and to determine accuracy and feasibility of the method used



Tooth tissues and their growth increments. Incremental markings within the enamel cap (E) and dentine (D) are depicted on the model tooth (left). The red and blue boxes show details of measurements made along the EDJ and CDJ (from one circle up to the next) using examples of micrographs taken at higher power (right) in which fine daily markings 2-3 mm apart can be seen in enamel and dentine. A thin layer of cementum (CEM) covers the root surface that is not shown in the model.



J Forensic Dent Sci. 2015 Sep-Dec; 7(3): 215–221.
doi: 10.4103/0975-1475.172441
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Estimation of age based on tooth cementum annulations: A comparative study using light, polarized, and phase contrast microscopy

Prabhpreet Kaur, Madhusudan Astekar,[1] Jappreet Singh,[2] Karandeep Singh Arora,[3] and Gagandeep Bhalla[4]

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J Forensic Dent Sci

Materials & Methods::

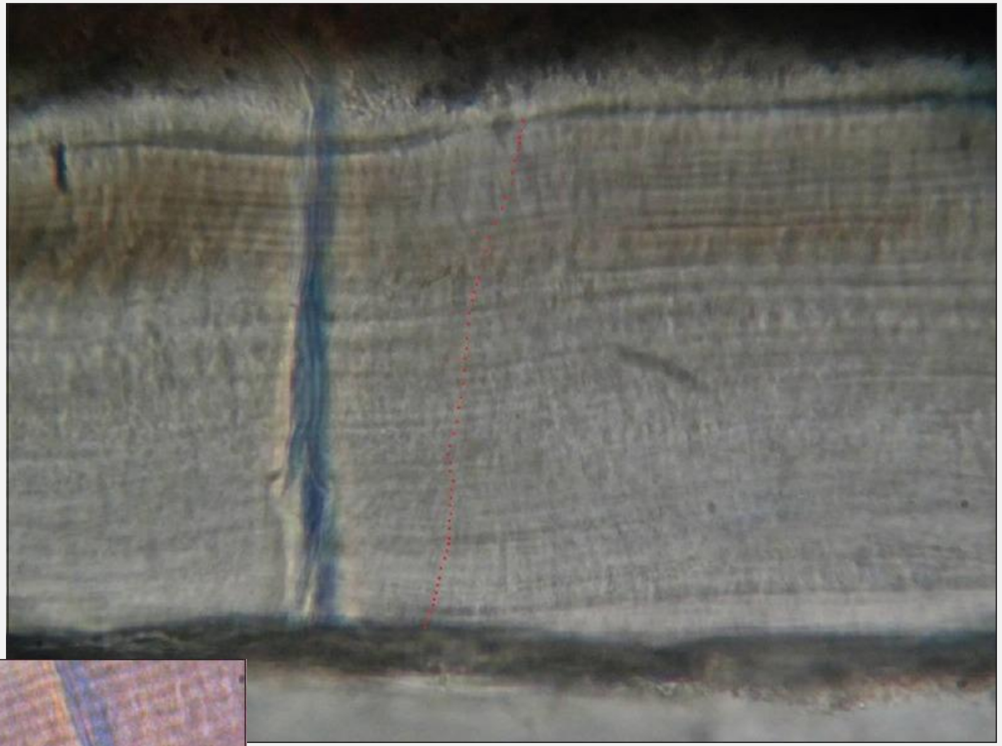
60 permanent teeth

longitudinal ground sections in the mesiodistal plane

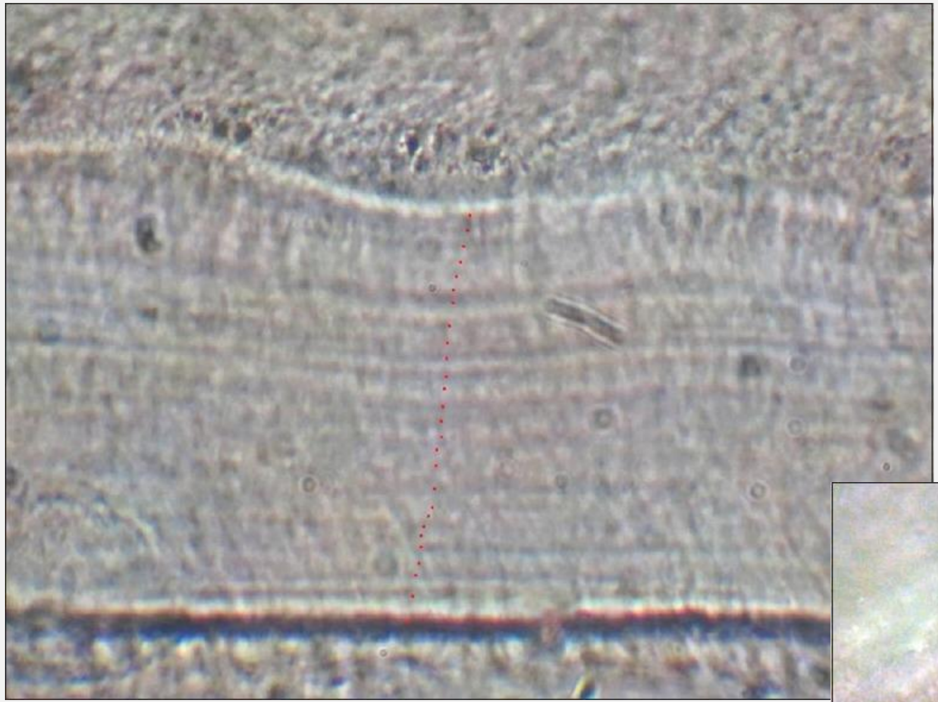
incremental lines counted manually using the 3 different microscopies

age estimated & then compared with the actual age of individual

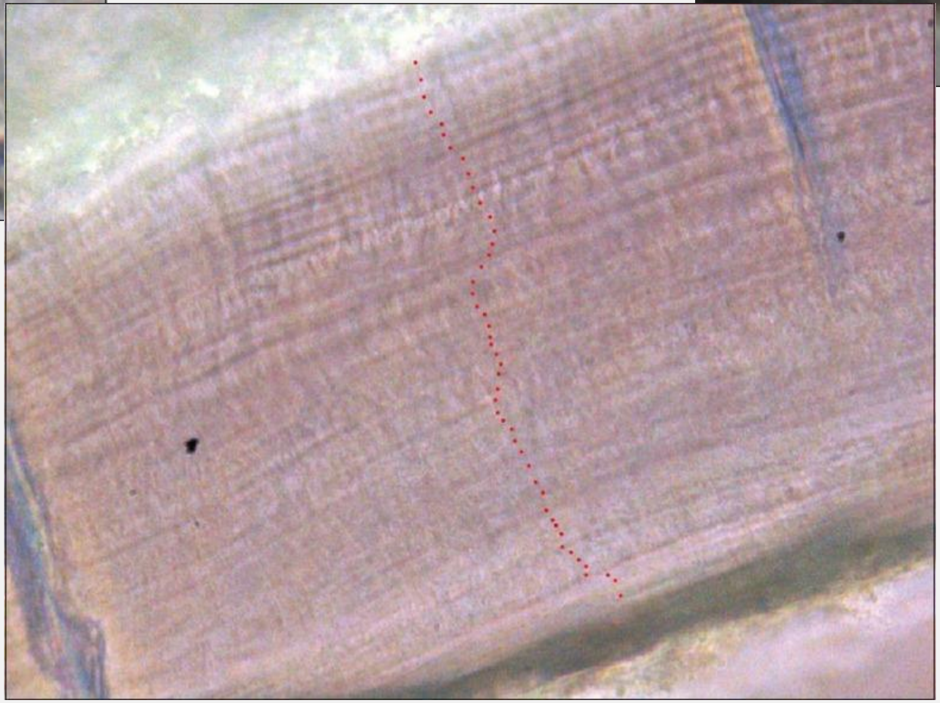
Photomicrograph showing incremental lines of the cementum at 40x magnification



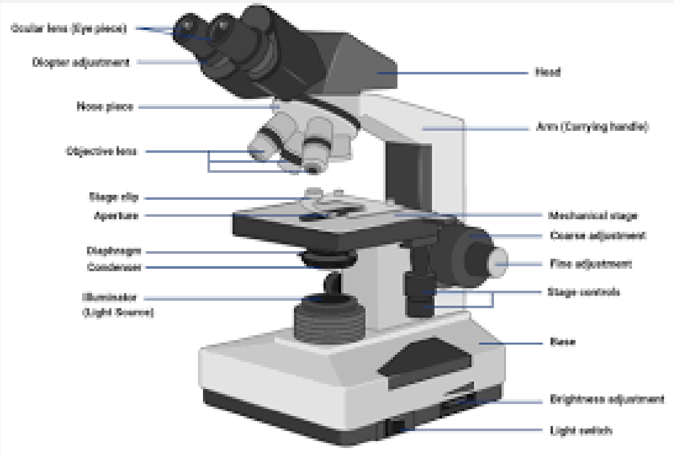
Using a polarizing microscope



Using a light microscope



Using a contrast microscope



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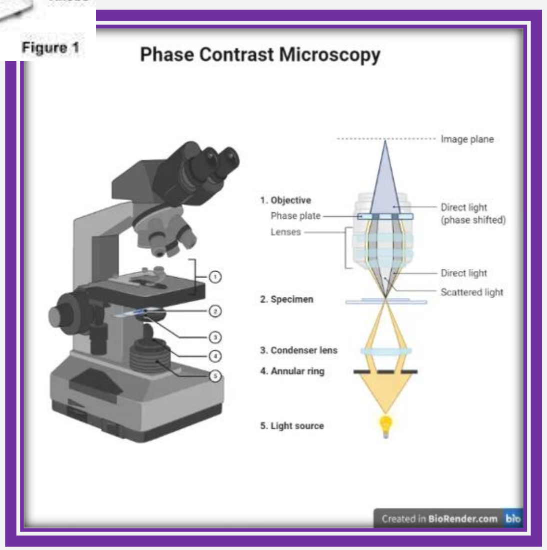


Results:

when used for age estimation 'incremental lines of cementum' most clearly visible:

1 phase contrast microscope

2 polarized microscope

3 light microscope

> Int J Legal Med. 2023 Jan;137(1):123-130. doi: 10.1007/s00414-022-02898-8. Epub 2022 Oct 5.

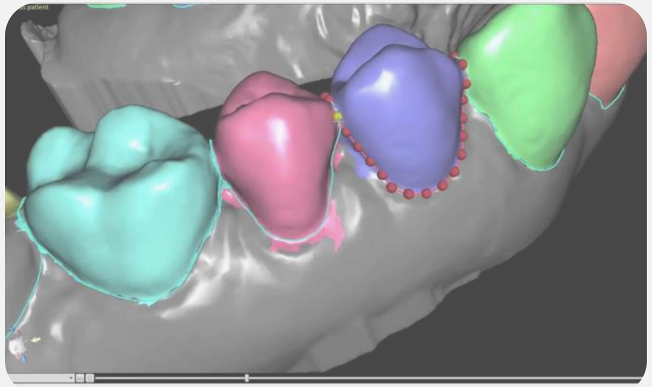
3D segmentation of dental crown for volumetric age estimation with CBCT imaging

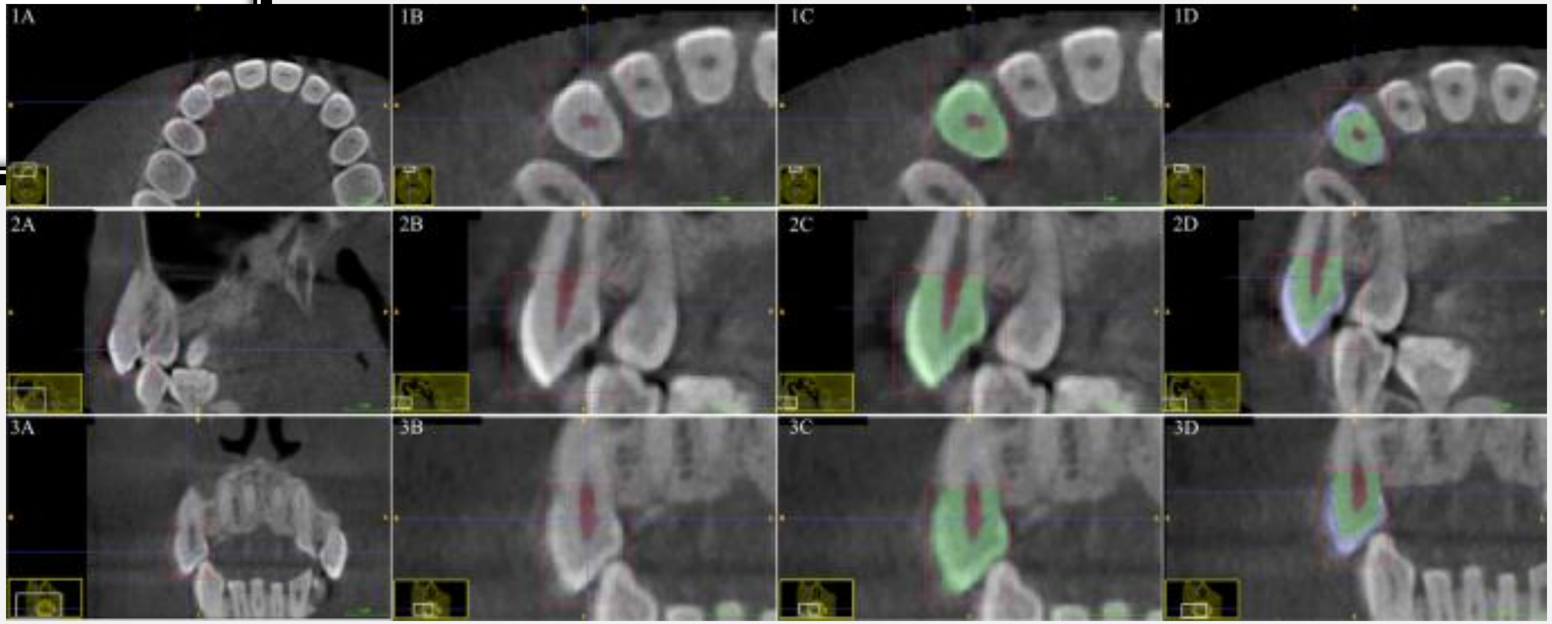
Rizky Merdietio Boedi [1 2], Simon Shepherd [3], Fahmi Oscandar [4], Scheila Mânica [5], Ademir Franco [5 6]

Affiliations + expand

PMID: 36197526 PMCID: PMC9816244 DOI: 10.1007/s00414-022-02898-8

Free PMC article





Segmentation sequence in the ITK-SNAP interface for the maxillary canine.

Segmentation sequence as seen in column 1 (A–D) = axial view, column 2 (A–D) = sagittal view, column 3 (A–D) = coronal view. Row A = initial region of interest placement (red box), row B = pulp chamber volume label (red), row C = whole crown segmentation (green), row D = separation between dentine volume (green) and enamel volume (blue). The yellow window (bottom left) visualizes the current navigation region from the overall CBCT scan section plane with white inset box for the enlarged image. The blue cross represents the target point of interest for CBCT scan navigation

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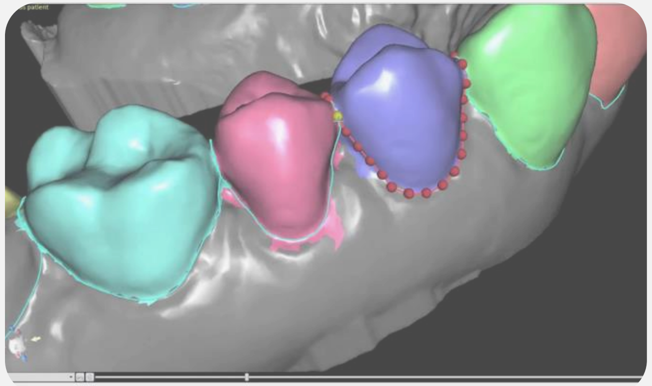

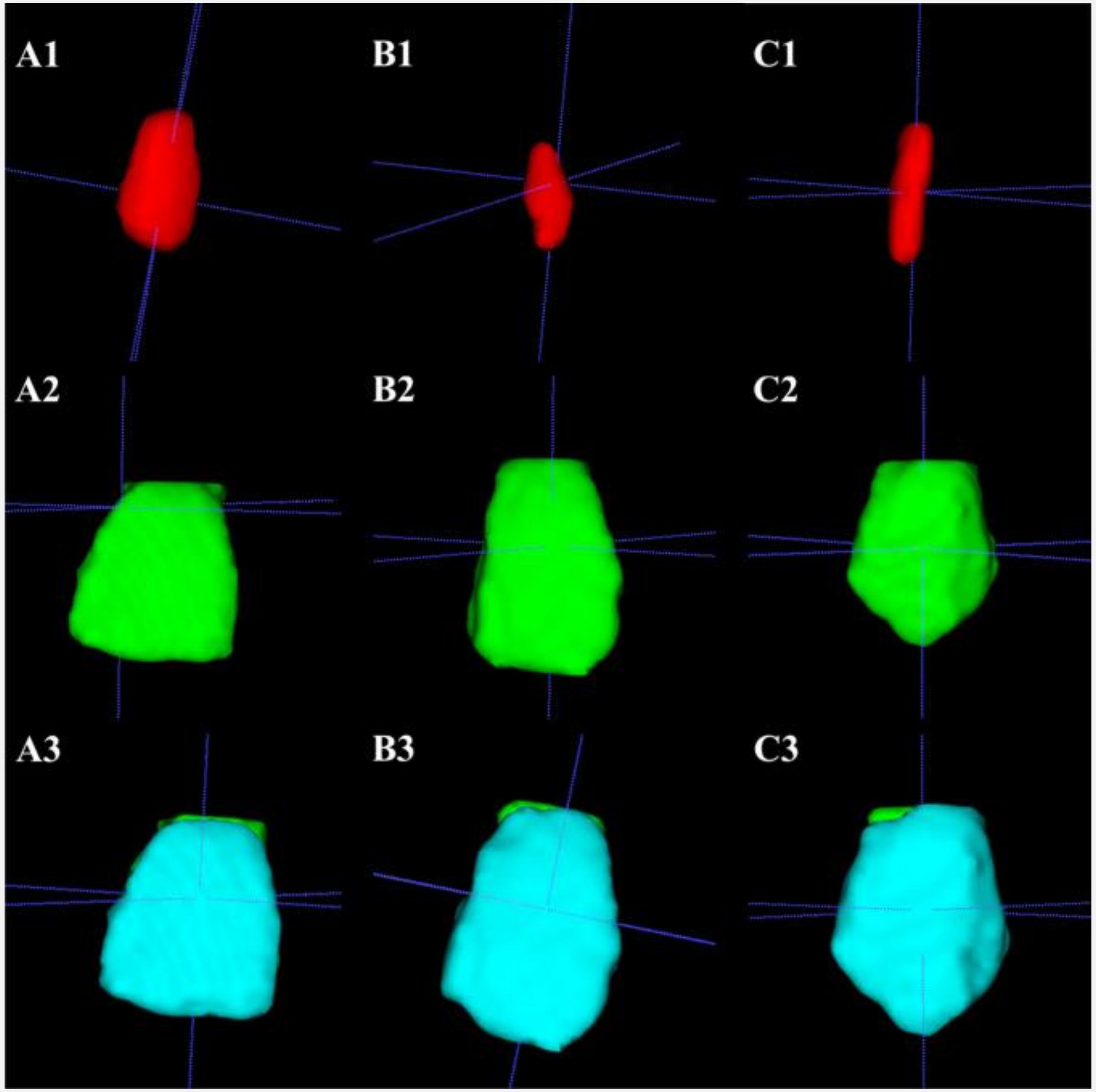

Three-dimensional view of maxillary anterior tooth segmentation sequence
A = central incisor, B = lateral incisor, C = canine, 1 = pulp chamber volume, 2 = whole crown volume before enamel segmentation, 3 = crown volume separation between dentine (green) and enamel (blue) volume

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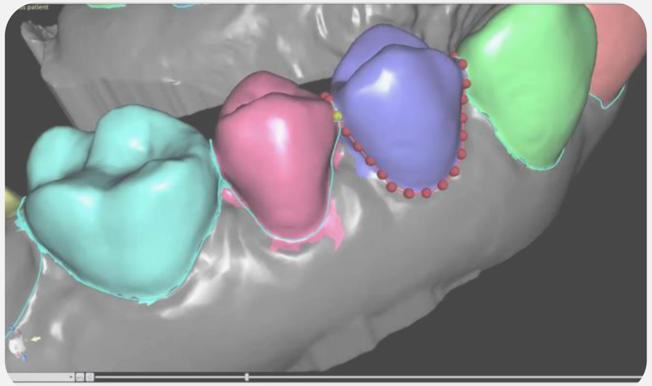

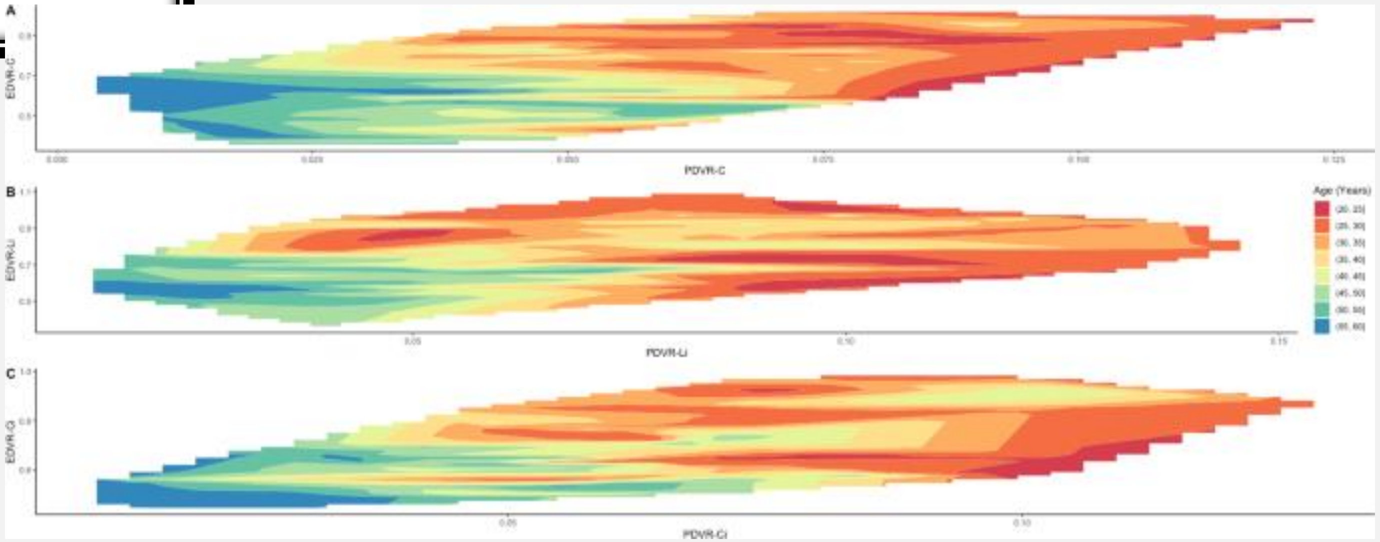

Heatmap graphic depicting a three-way relationship between chronological age, pulp to dentine volume ratio (PDVR) and enamel to dentine volume ratio (EDVR) in canine (A), lateral incisor (B), and central incisor (C).

X-axis: pulp to dentine volume ratio. Y-axis: enamel to dentine volume ratio. Color grid shade on each coordinate in X and Y axis corresponds to age range from red (20–25 years old) to blue (55–60 years old)

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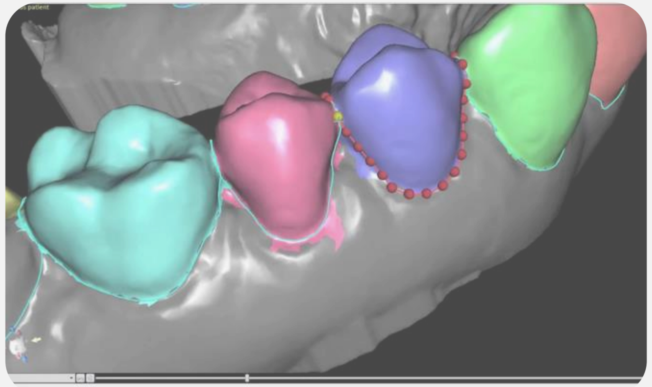
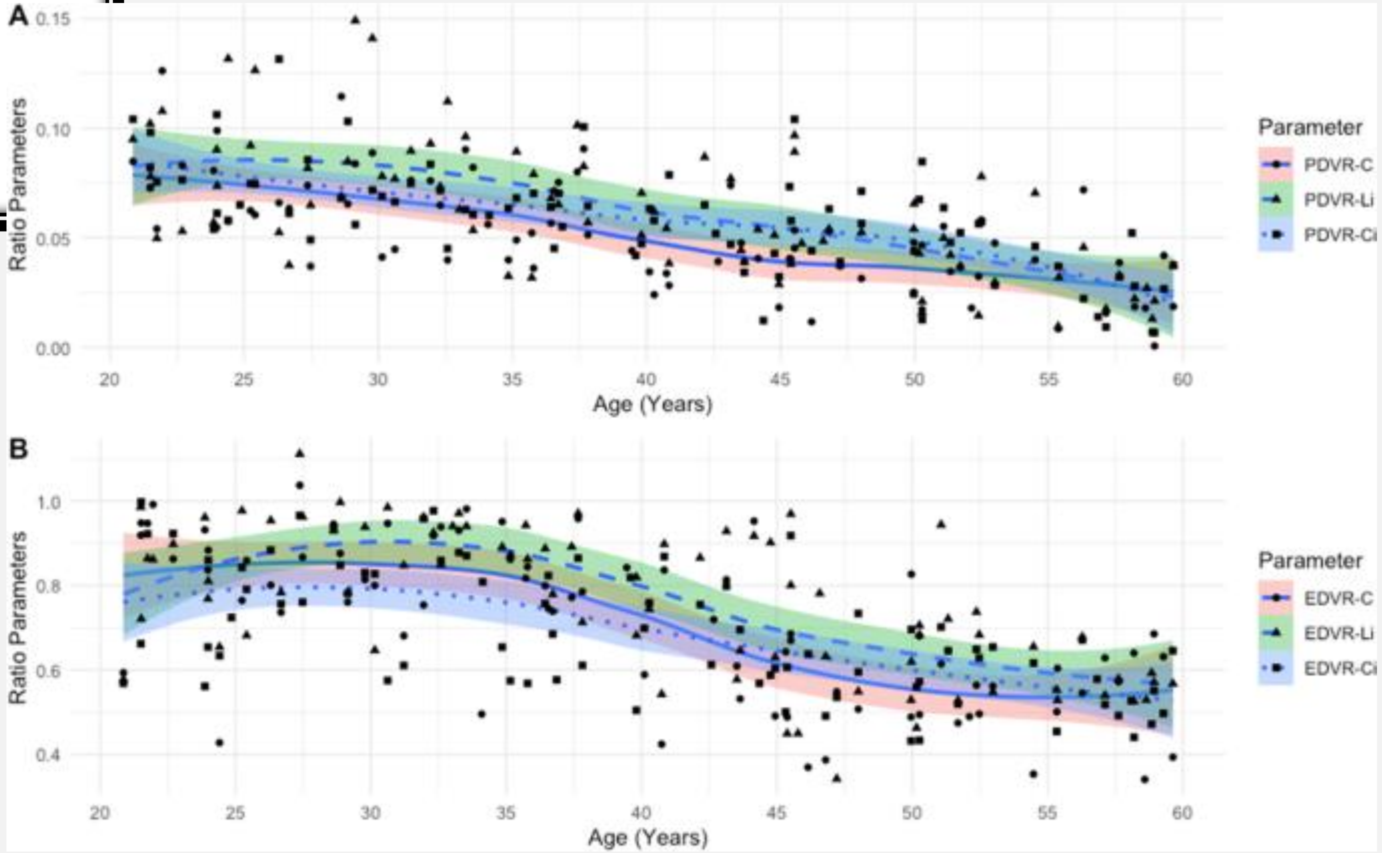


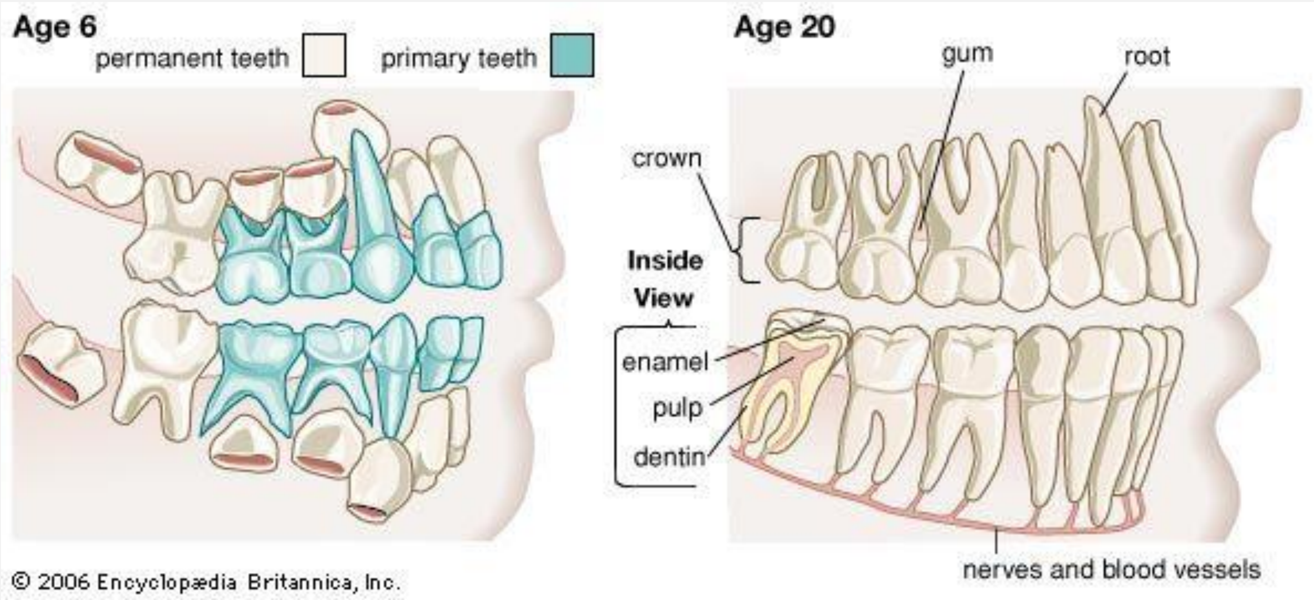


Decreasing ratio parameters (A = pulp to dentine volume ratio, B = enamel to dentine volume ratio) alongside chronological age depicted by the LOWESS line with linear (A) and non-linear (B) variations. C = canine, Li = lateral incisor, Ci = central incisor, PDVR = pulp to dentine volume ratio, EDVR = enamel to dentine volume ratio

CONCLUSIONS: Aging By Dentition

Many dental changes related to age → many methods

- tooth eruption,
- tooth calcification,
- attrition,
- periodontal diseases,
- secondary dentin deposition,
- root translucency,
- cementum apposition,
- root resorption,
- color changes and increase in root roughness



AGING BY DENTITION:
Non Adults Vs Adults

1. highly reliable in nonadults
2. less accurate in adults: age can no longer be estimated by studying development (all permanent teeth have been formed)
3. development ceases into maturation, the degenerative changes play a role in determining the age
4. age estimation errors of ±7–10 years can be acceptable in adults but not in children(because the age interval for adults is much wider)

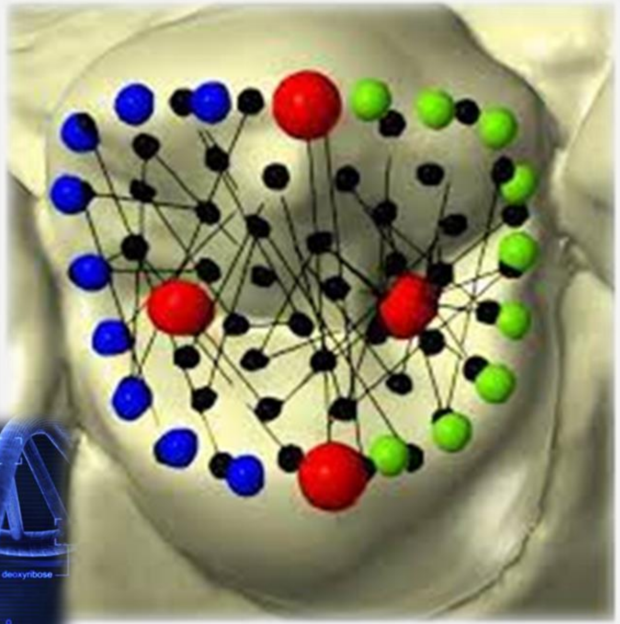
DENTAL SEX ESTIMATION

DENTAL SEX ESTIMATION

Biochemical

Non Metric

Metric



DENTAL SEX ESTIMATION:
1. Metric

- Measurements of dental structure:

1. Directly (measuring the teeth)
2. Indirectly (imaging, radiography, dental casts)

- Non-invasive
- Inexpensive
- Coinvent to perform
- Easily repeatable

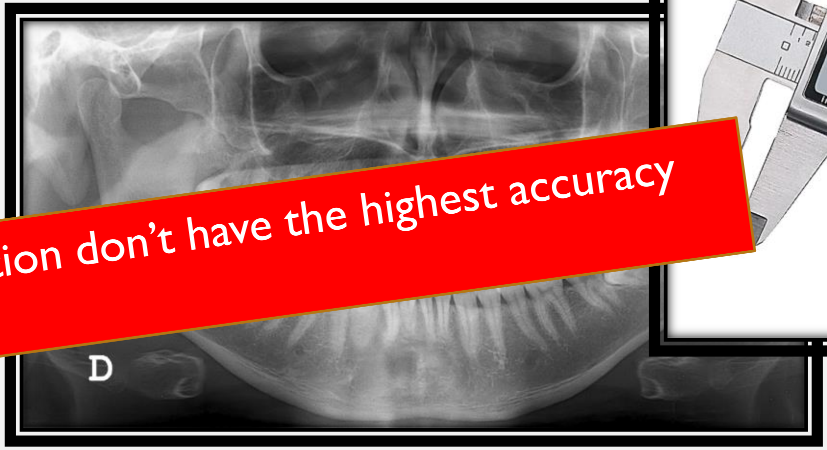
- ✓ Larger teeth in M than in F
- ✓ Canine is the most dimorphic tooth
- ✓ Significanly larger in size in M than in F

DENTAL SEX ESTIMATION:
1. Metric

- Measurements of dental structure:

1. Directly (measuring the teeth)
2. Indirectly (imaging, radiography, dental casts)

- Non-invasive
- perform
- Easily repeatable



Metric dental methods of dental sex estimation don’t have the highest accuracy rates

DENTAL SEX ESTIMATION:
1. Metric

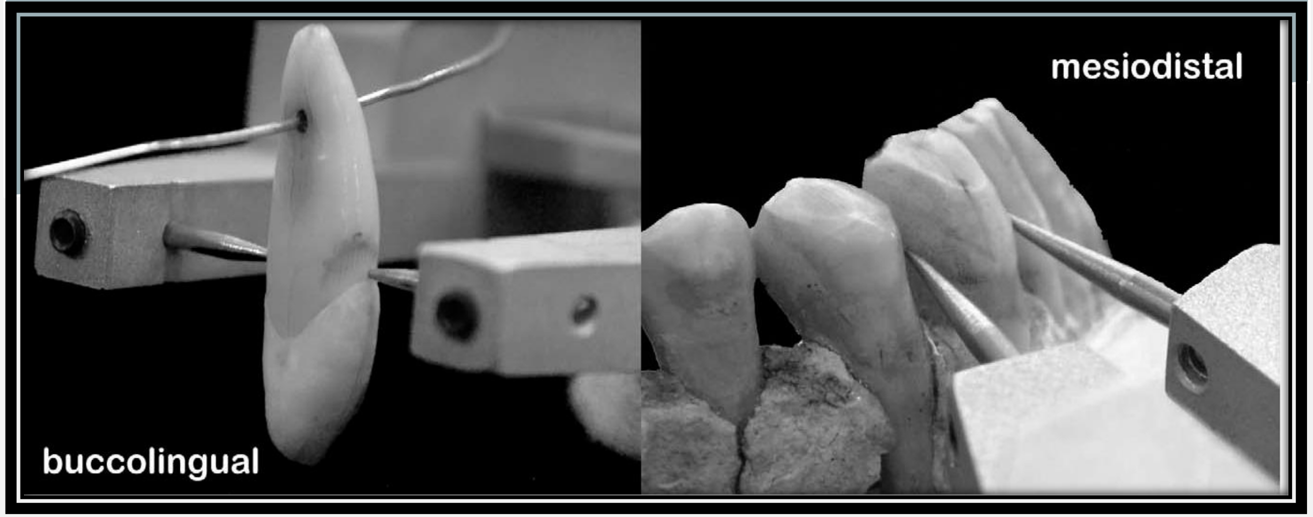
- Odontometric
- Root length
- Incisor index & Mandicular Canine Index

DENTAL SEX ESTIMATION:
I. Metric

Odontometric

- Mesiodistal & buccolingual crown diam + alternative measurements
- Multivariate statistical analysis

Accuracy of sex estimation calculated as a ‰ score



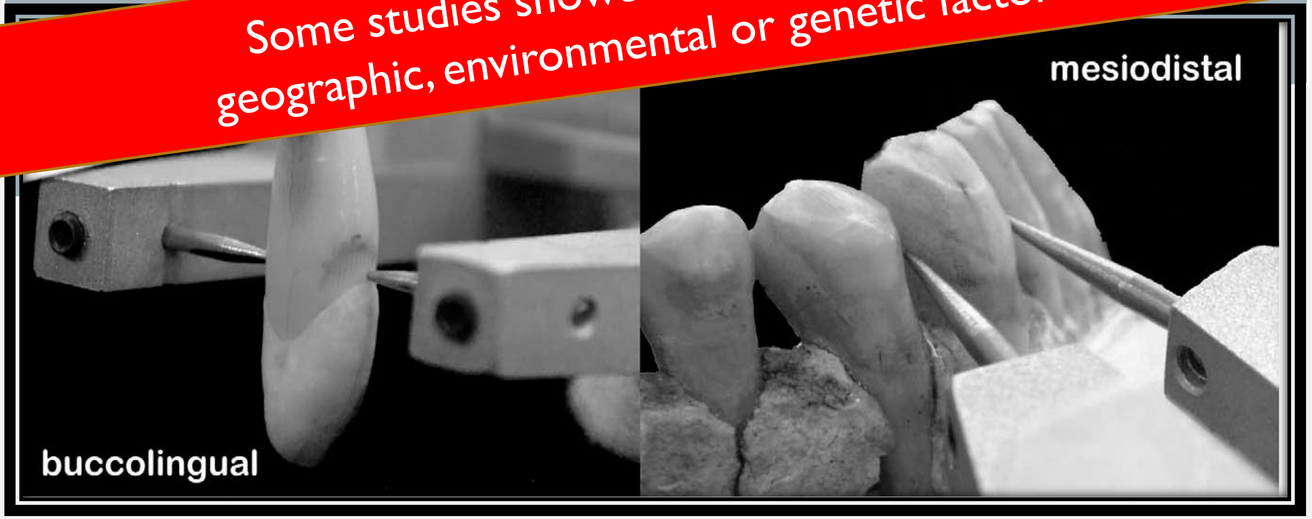
DENTAL SEX ESTIMATION:
1. Metric

Odontometric

- Mesiodistal & buccolingual crown diam + alternative measurements
- Multivariate statistical

Accuracy

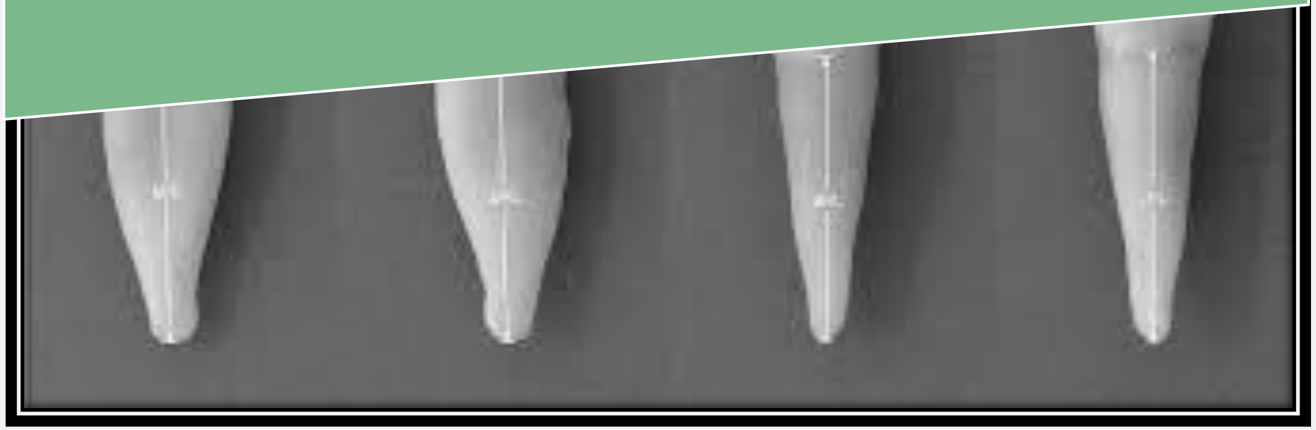
Some studies showed the opposite F≥M;
geographic, environmental or genetic factors



DENTAL SEX ESTIMATION:
1. Metric

Root length

- Zobra et al, 2014; Govindaram et al. 2018
- Higher values in M than in F



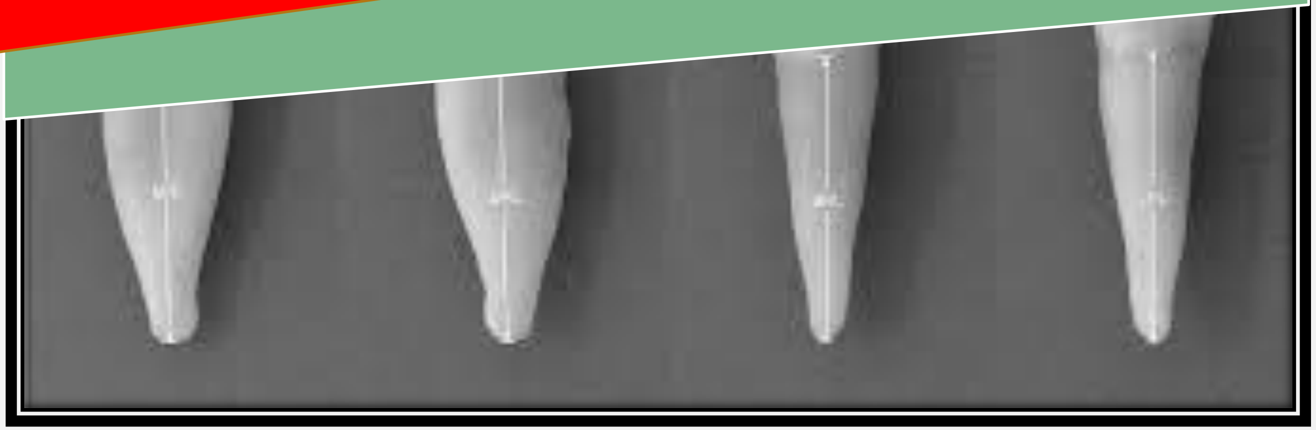
DENTAL SEX ESTIMATION:
1. Metric

Root length

- Zobra et al, 2014; Govindaram et al. 2018

- Higher val

Don’t have the highest accuracy rates



DENTAL SEX ESTIMATION:
1. Metric

Incisor index & Mandicular Canine Index

Incisor index (Ii) = [MDI2/MDI1] x 100

Mandibular Canine index (MCI) = MD crown width/arch width

DENTAL SEX ESTIMATION:
1. Metric

Incisor index & Mandicular Canine Index

Incisor index (Ii) = [MDI2/MDI1

Mandiublar Cani ... width

A lack of homoginity

DENTAL SEX ESTIMATION:
2. Non-metric

- Presence or absence of morphological traits
- More prone to interpreter subjectivity

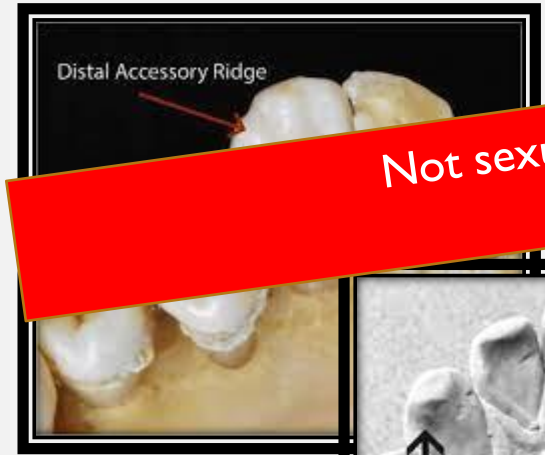
Scott et al. 2015:

✓ The only morphological trait: canine distal accessory ridge

x Might be influenced by ancestry or population variation

DENTAL SEX ESTIMATION:
2. Non-metric

- Presence or absence of morphological traits
- More prone to interpreter subjectivity



Not sexually dimorphic as tooth size variables
Lack of unanimous agreement

Scott et al. 2015:

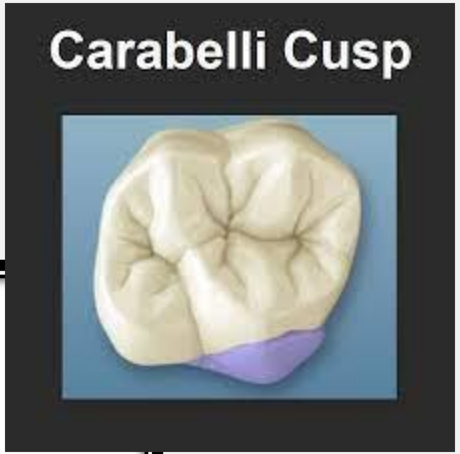
✓ The only morphological trait: canine distal accessory ridge

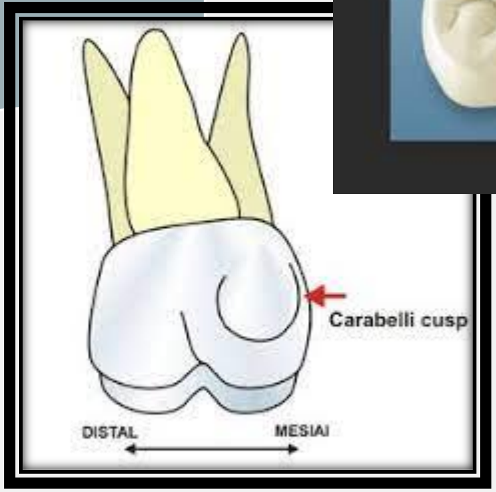
x Might be influenced by ancestry or population variation

SEX ESTIMATION:
2. Non-Metric

Dental morphology & Anamolie

- More valuable in ancestry estimation (Carabelli's cusps)





DENTAL SEX ESTIMATION:
3. Biochemical

- Highly accurate & reliable
- More time
- More costs
- More equipment

Barr Bodies

Amelogenins

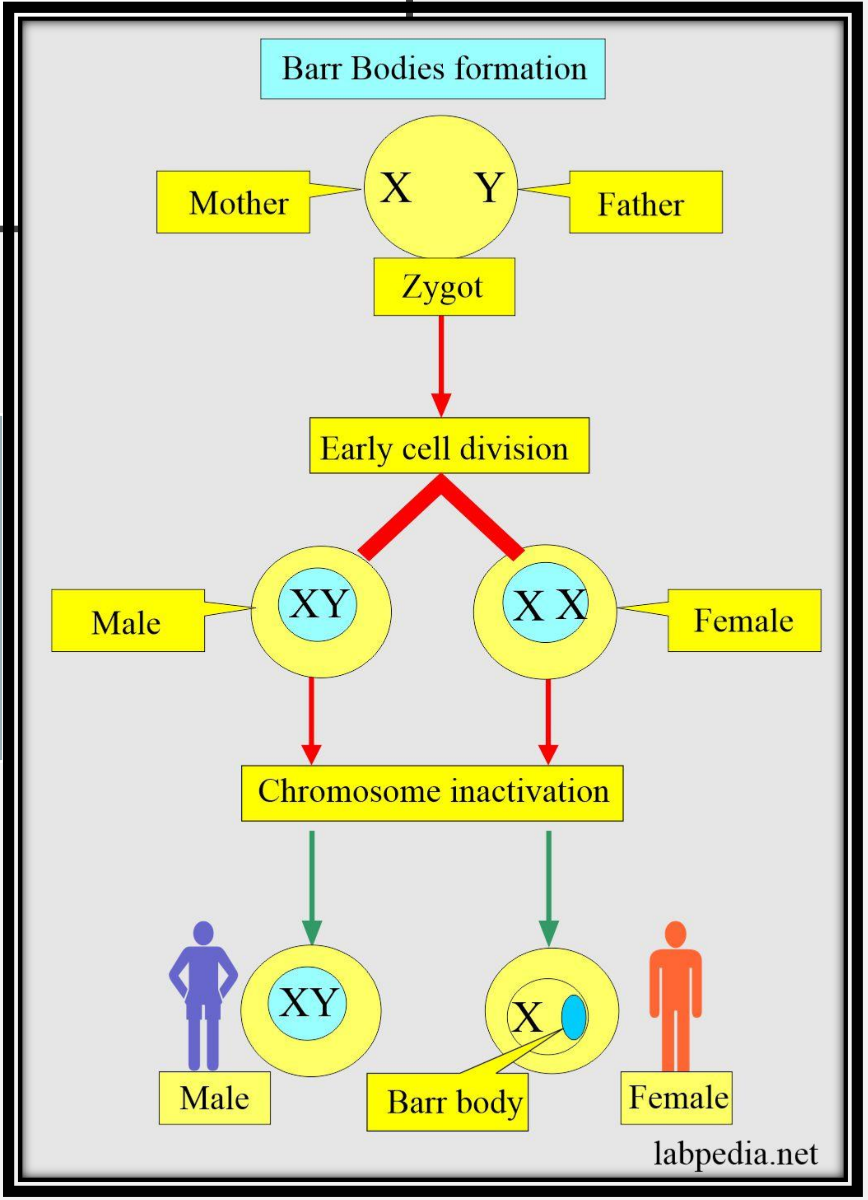
SEX ESTIMATION:
3. Biochemical

Barr Bodies

- Are inactive X chromosomes found in a cell with more than one X chromosome present

1- A typical female has one BB per cell nucleus

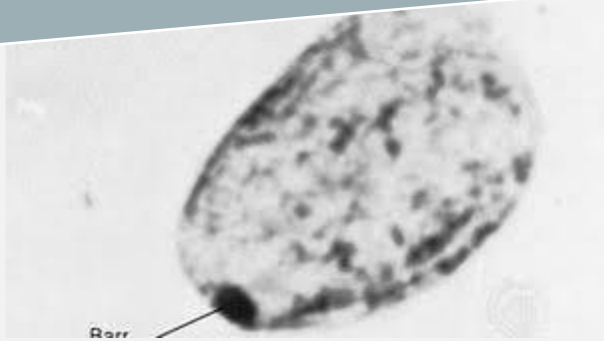
2- A typical male has none



SEX ESTIMATION:
3. Biochemical

Barr Bodies

- Sample taken from intact dental pulps
- Preserved then in formalin
- Samples sectioned into thin slices
- Stained with nuclear dyes
- Viewed under microscope



SEX ESTIMATION:
3. Biochemical

Barr Bodies

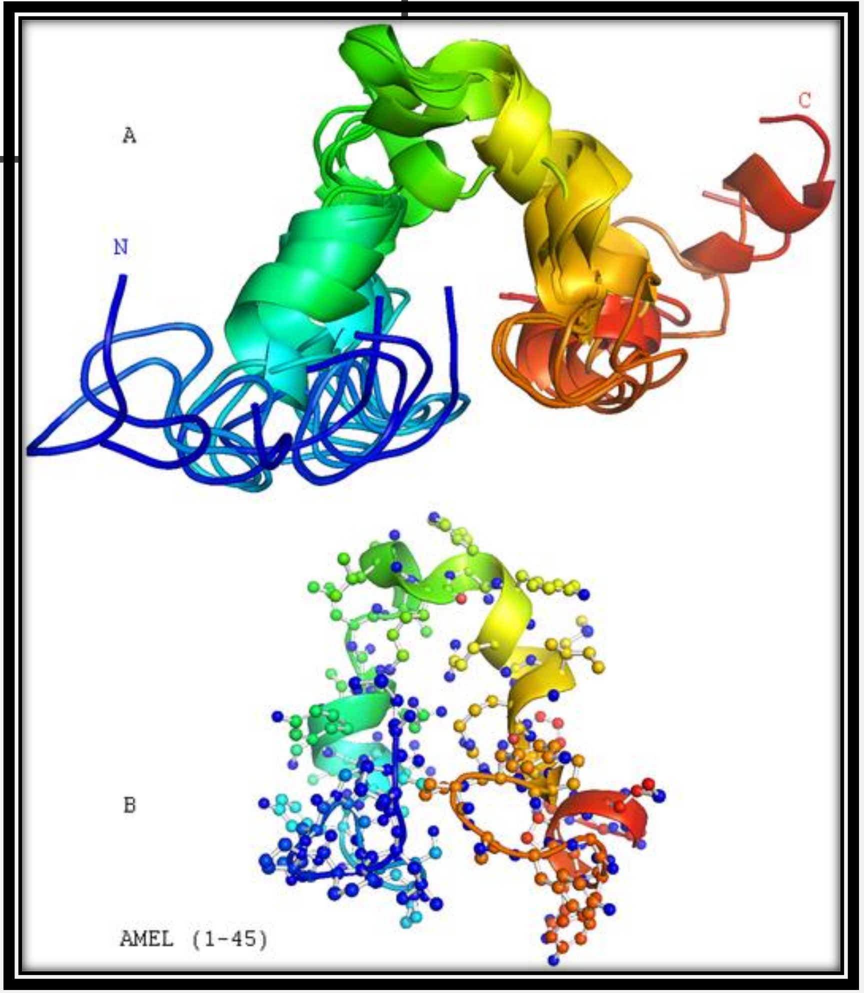
- Sample taken from intact dental pulps
- Preserved then in formalin
- Samples sectioned into thi

Possible up to 7 weeks after death
Limited to specific forensic cases
Not applicable in bioarchaeology

SEX ESTIMATION:
3. Biochemical

Amelogenins

- The principal protein component in the enamel
- Type of extracellular matrix protein
- Involved in the development of tooth enamel
- This gene is found on both the X & Y chromosome
- The size difference btw both → basis for differentiation in M & F



SEX ESTIMATION:
3. Biochemical

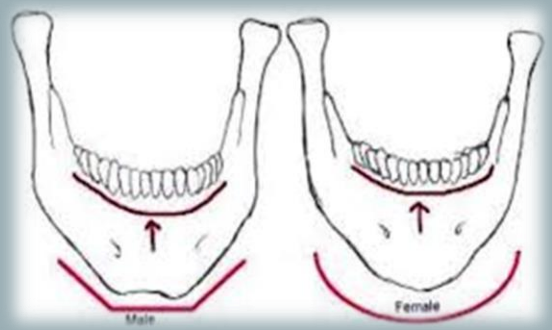
Amelogenins

- A DNA sample is obtained from the tooth enamel
- Sex can be then tested:

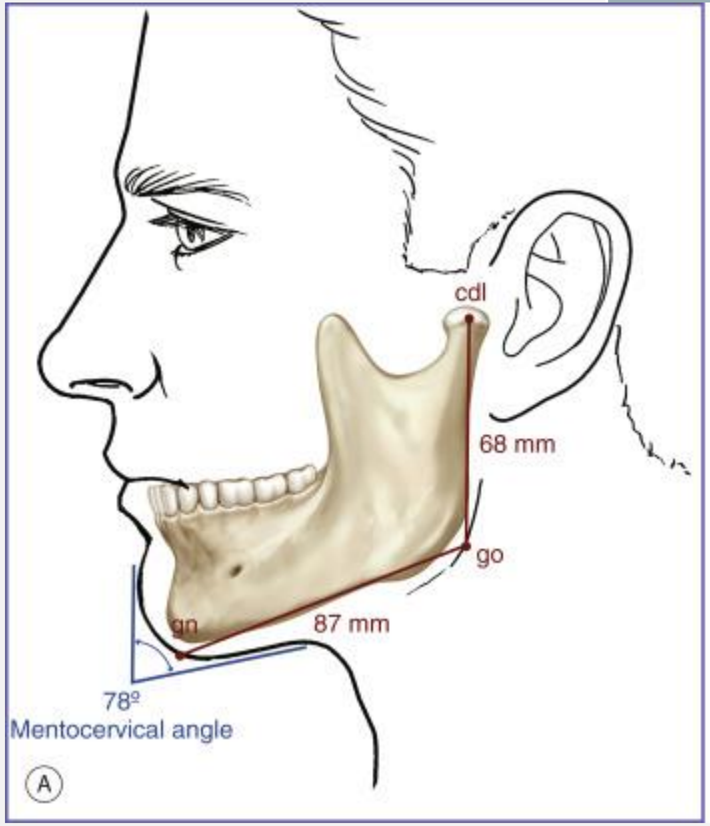
1. Running a known primer against the sample
2. Putting the sample through mass spectrometry

To identify the ratio of X to Y peptides

SEX ESTIMATION:
4. Non-Dental Structure

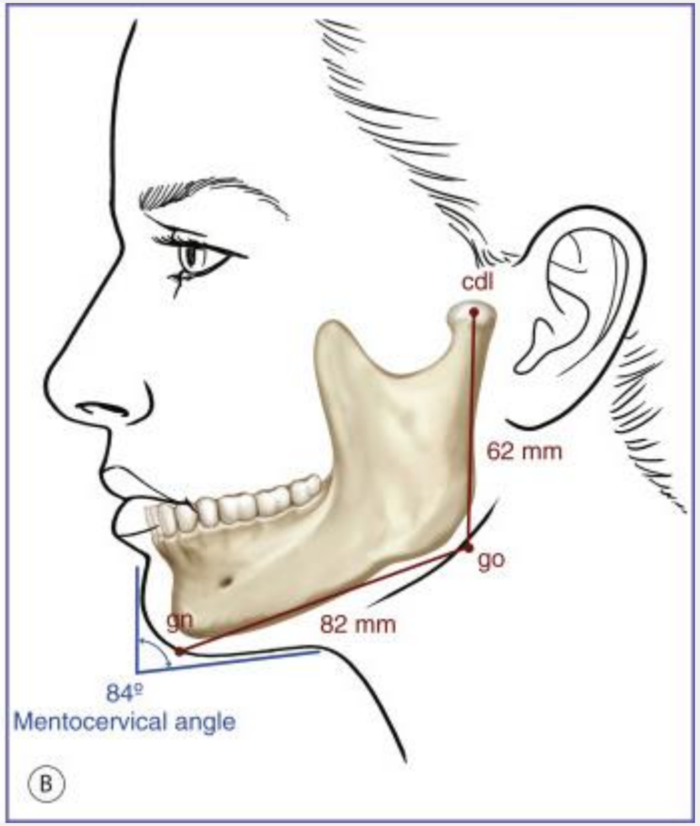


SEX ESTIMATION:
4. Non-Dental Structure



Mandible

Both metric & non-metric



SEX ESTIMATION:
4. Non-Dental Structure

Mandible

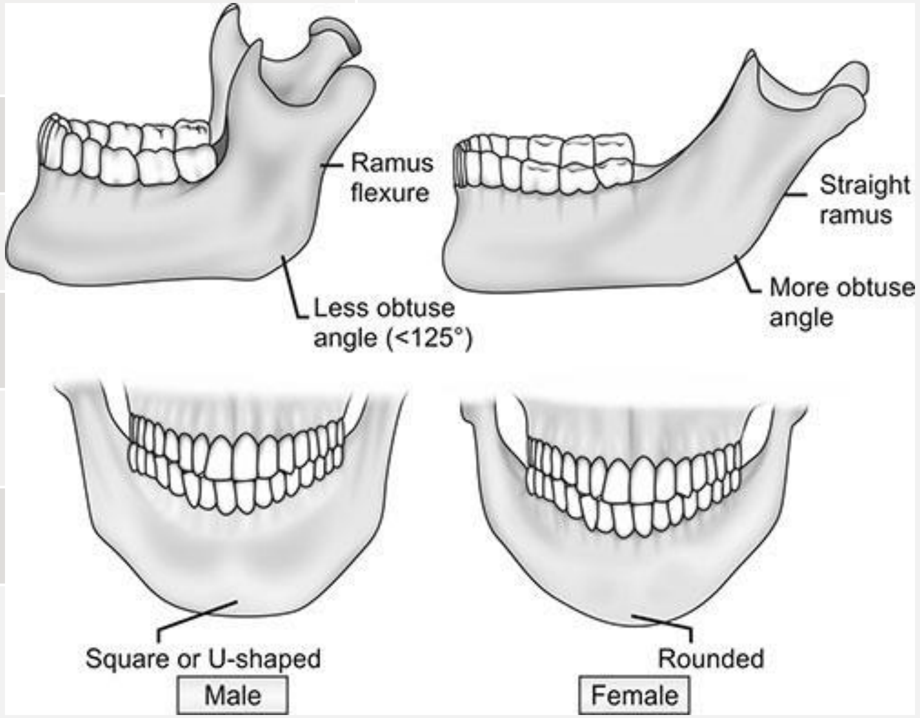
Both metric & non-metric

Use of morphological features is not as strong in consensus than meric analysis

Speificity to population due to genetic & envormnetal factors

SEX ESTIMATION:
4. Non-Dental Structure

M
Larger
More robust
With prominent muscular attachment sites
Gonial flaring/ everted gonial angles
Broad ascending ramus
High symphysis
Small mental eminence / squared chin



HOW TO CHOOSE

Your choice as a specialist (bioarchaeological or forensic context) should be based on:

1. Reliability of the method
2. Context
3. Problematic & aim of the analysis
4. Means (budget, accessibility to machines, timeframe)

And keep your data homogeneous

SEE YOU NEXT FRIDAY