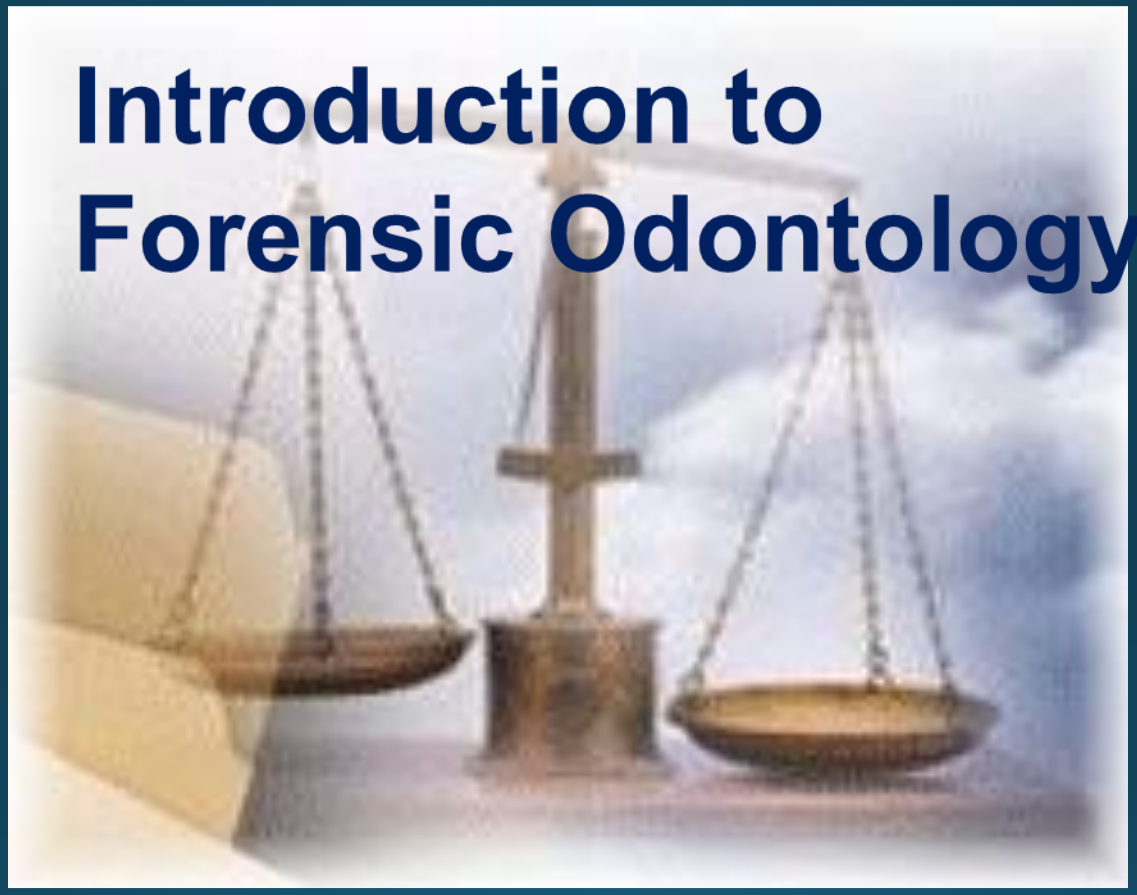


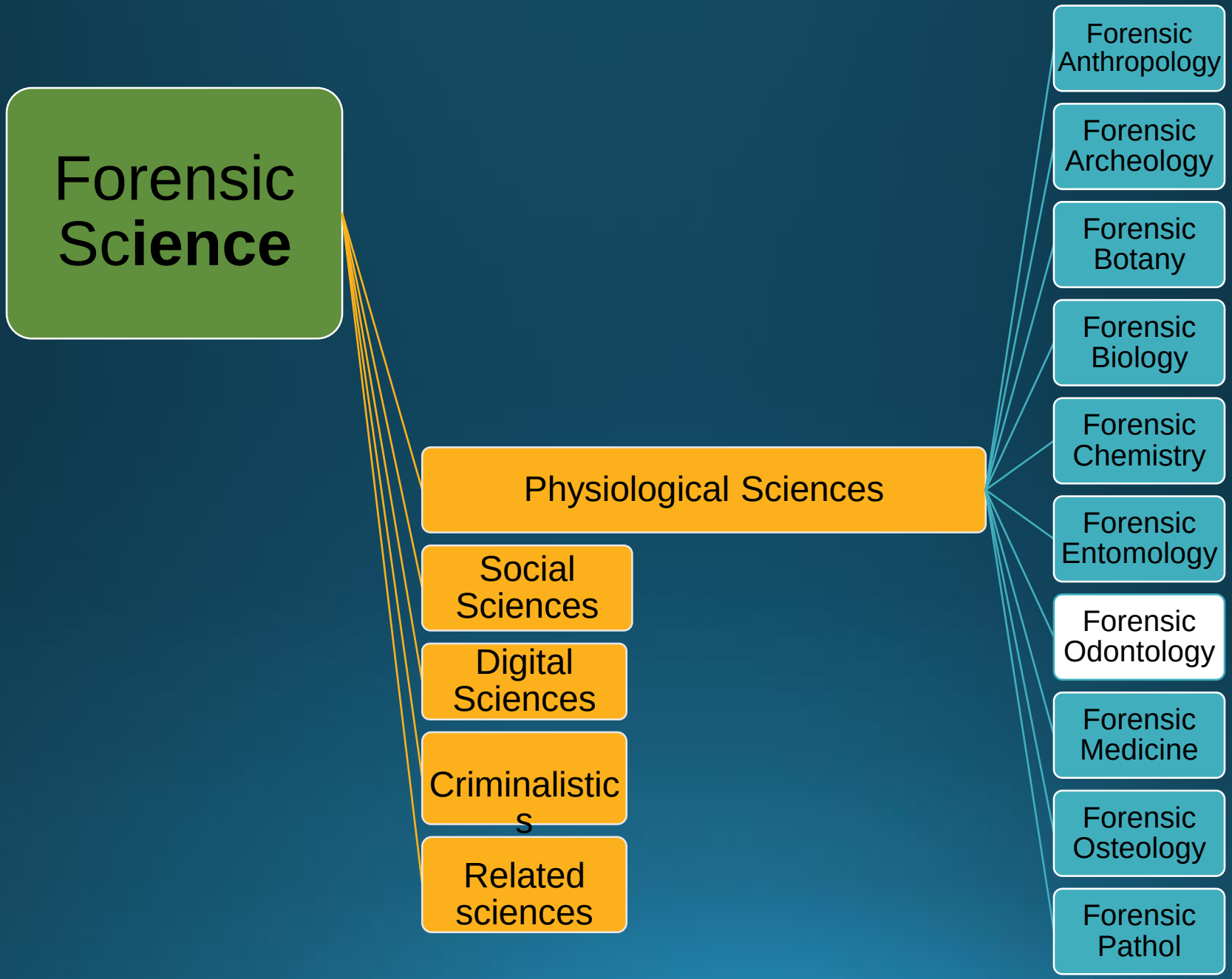
1.What is Forensic Odontology ?

2.Who is a Forensic Odontologist ?

3.Scope of Forensic Odontology ?

Forensic

- Forensic - Latin word *forensis,*
- Forensic = forum.
- It originally applied to the marketplace areas within ancient Rome where many types of businesses and public affairs, such as governmental debates and actions by courts of law, were conducted.
- English vocabulary in 1659,
- The modern meaning limited to the areas of legal and criminal investigations.


Forensic Science
Physiological Sciences
Social Sciences
Digital Sciences
Criminalistics
Related sciences
Forensic Anthropology
Forensic Archeology
Forensic Botany
Forensic Biology
Forensic Chemistry
Forensic Entomology
Forensic Odontology
Forensic Medicine
Forensic Osteology
Forensic Pathol

What is Forensic Odontology

- Forensic Dentistry
- Forensic Odontology
- Forensic Odontostomatology

Development

- A branch of forensic Medicine which propose to apply dental knowledge to the solution of legal and criminal problems – Furuhata & Yamamoto 1967

- Branch of Dentistry which deals with the proper handling and examination of dental evidence and proper evaluation and presentation of dental findings in the interest of the justice – Nielson,1980

Forensic Odontology

- Branch of Dentistry interacting with a court of Law
- Art and Science
- Specialist dentist interpret data and provide expert opinion

What is Forensic Odontology?

Proper handling, examination and evaluation of dental evidence, which will be then presented in the interest of justice

- The application of dental knowledge to questions of law (dictionary meaning)

Forensic Odontologist

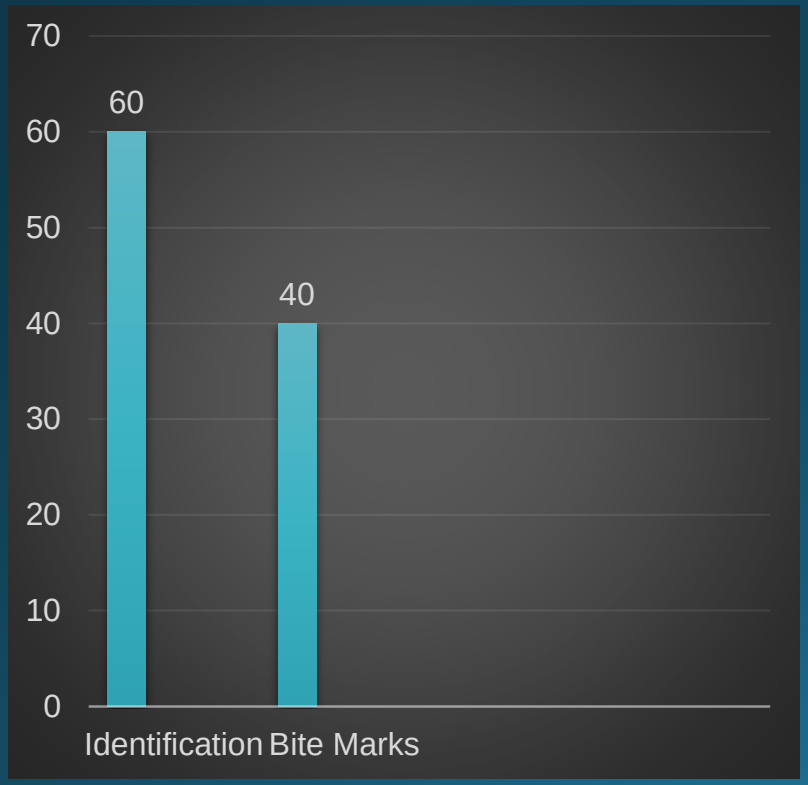
- Basic training - Dentistry
- Specialist training - Forensics

Forensic Odontology Scope & Practice

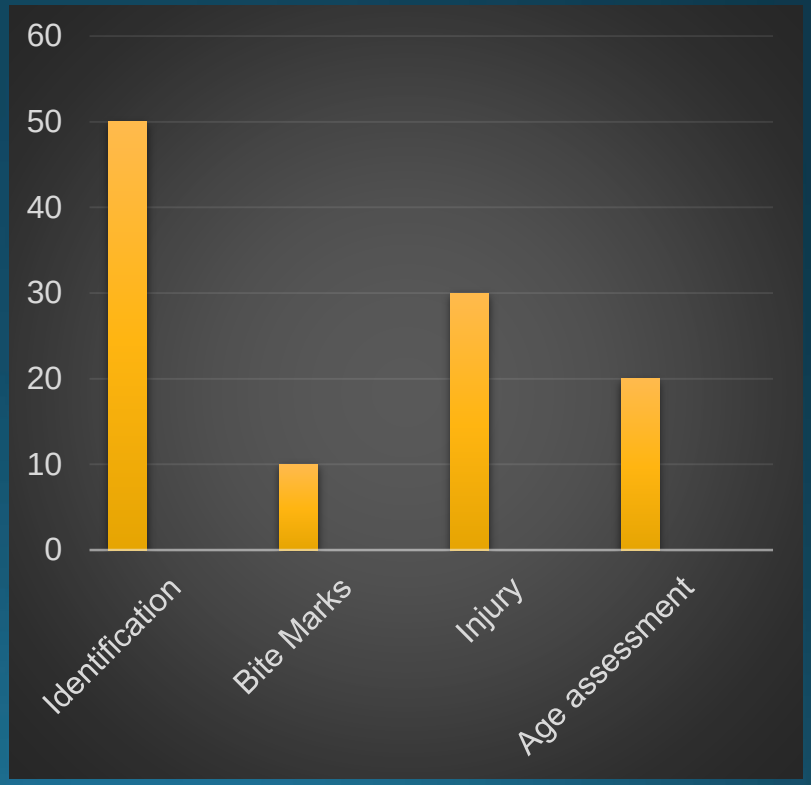
1. Dental Identification
   (Facial superimposition, Facial reconstruction)
2. Bite Mark analysis
3. Dental Age Assessment
4. Trauma analysis
5. Dental Neglect
6. DNA extraction from teeth

Change in Practice FOD

Then

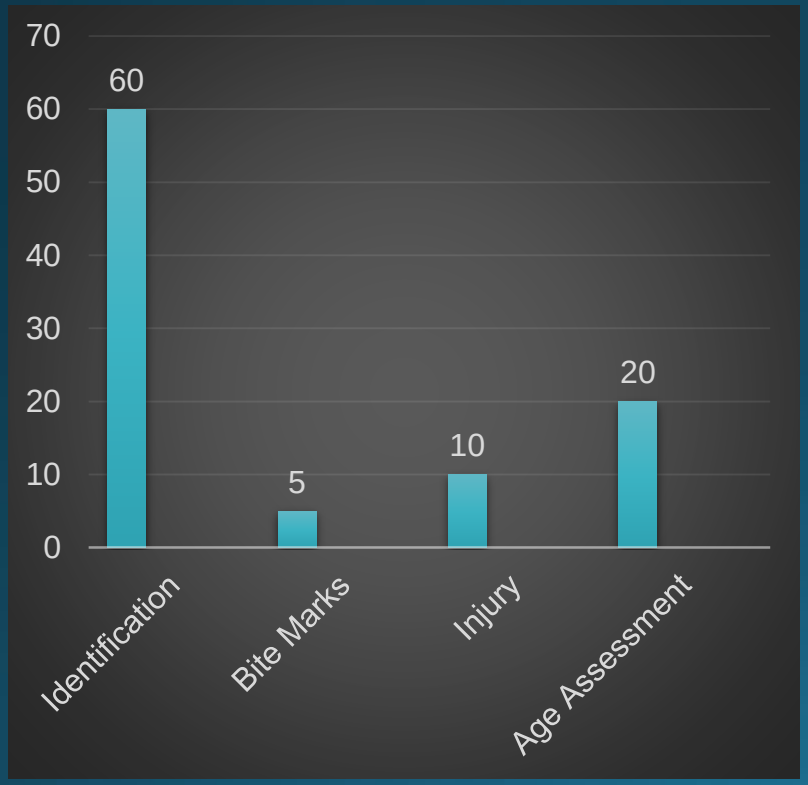


Now

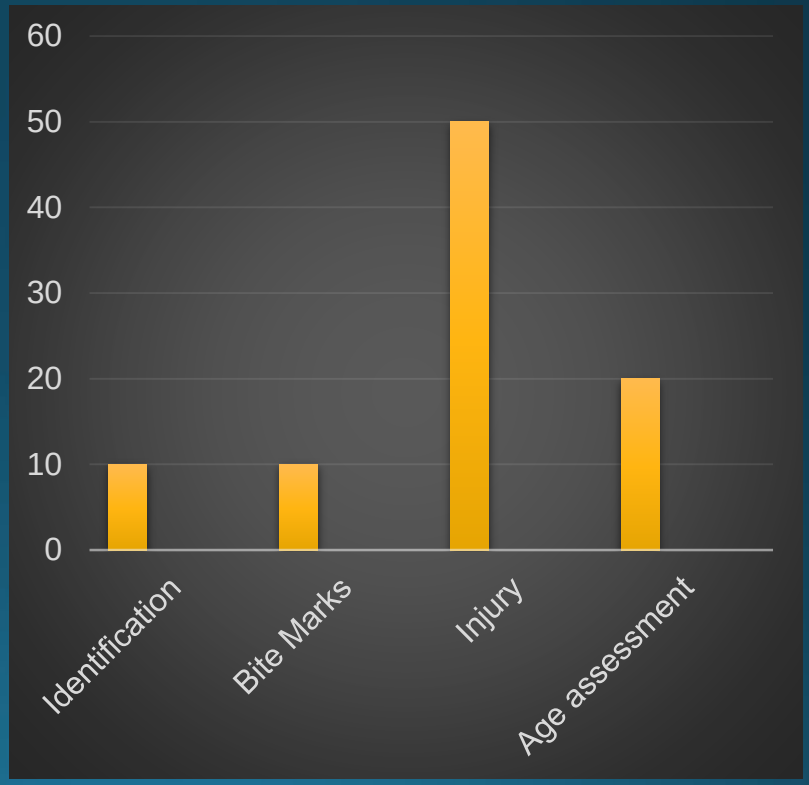


SL vs World

World

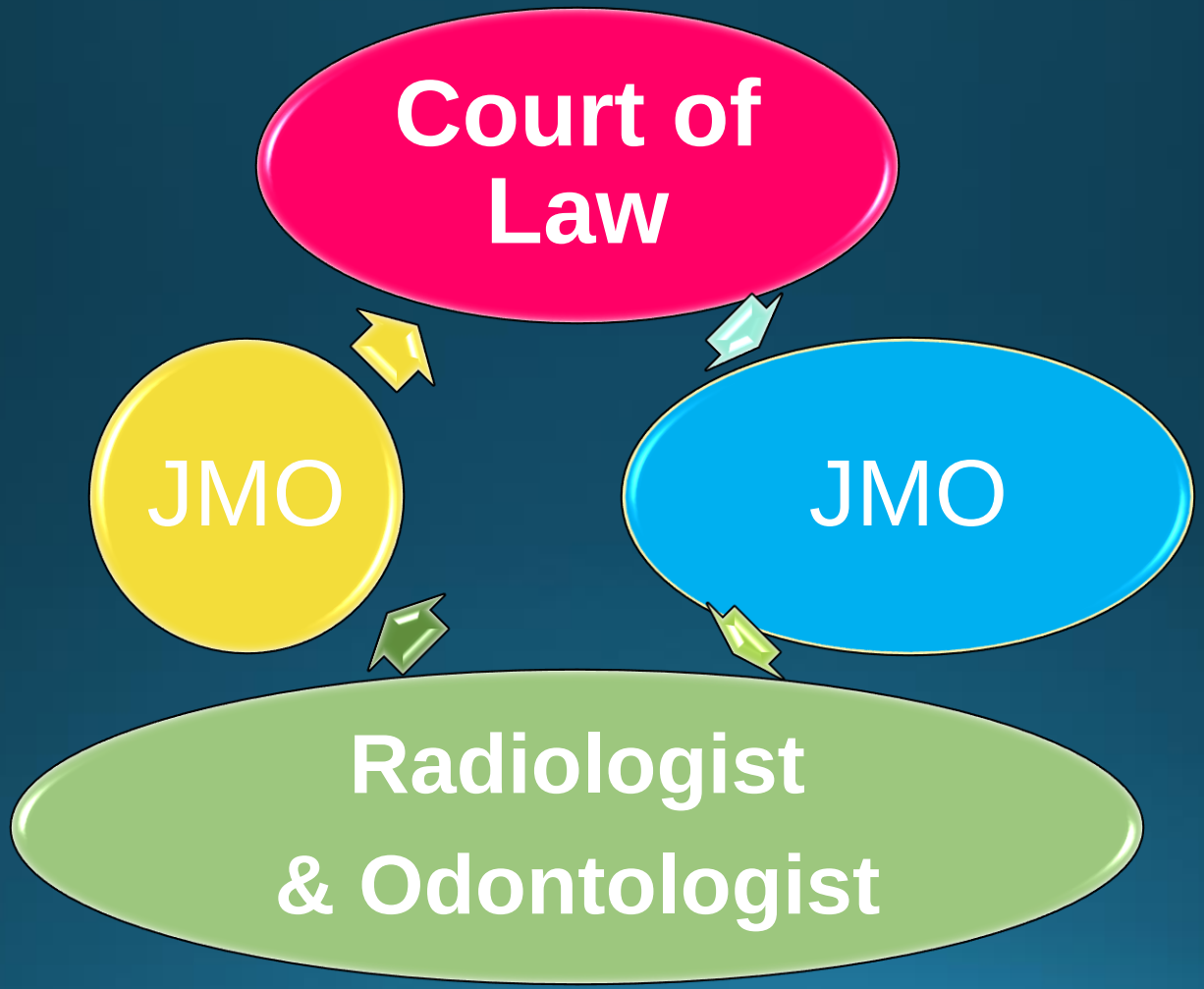


SL

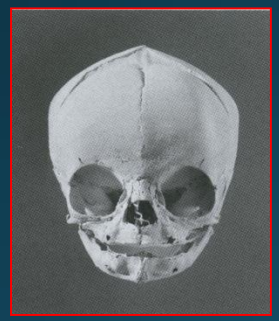


1. Age Estimation

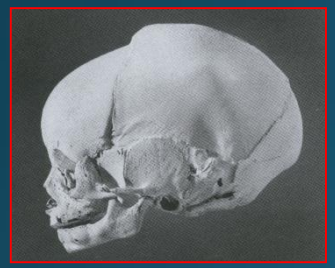
Case of Age Estimation

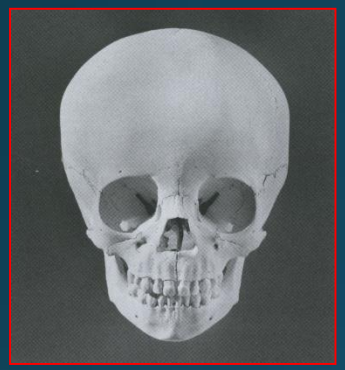


Age estimation

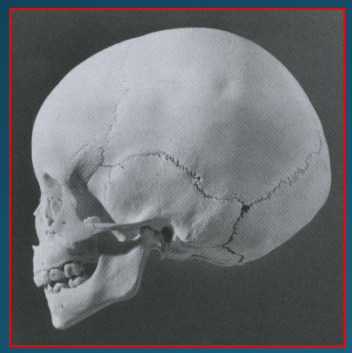


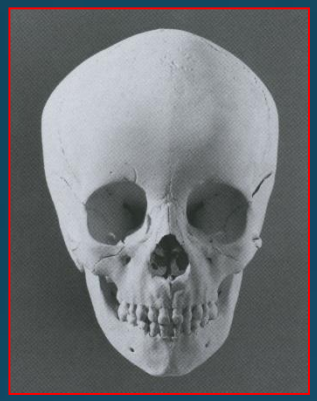
newborn



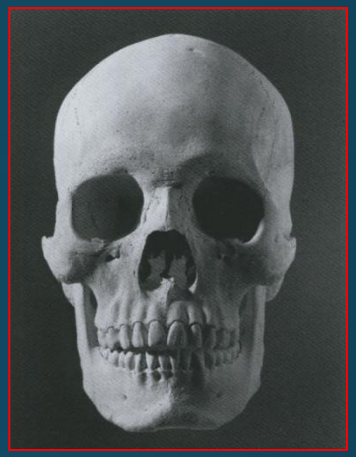


3 years

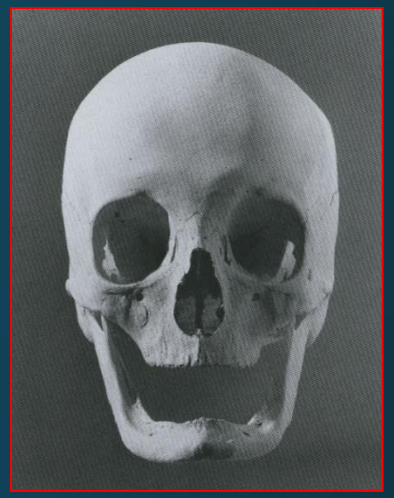




6 years



young adult



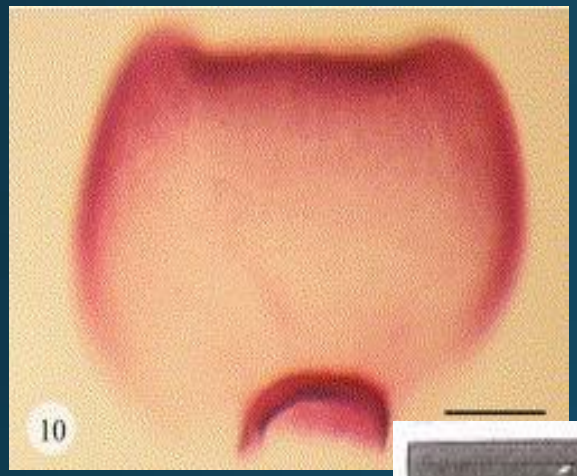
elderly adult

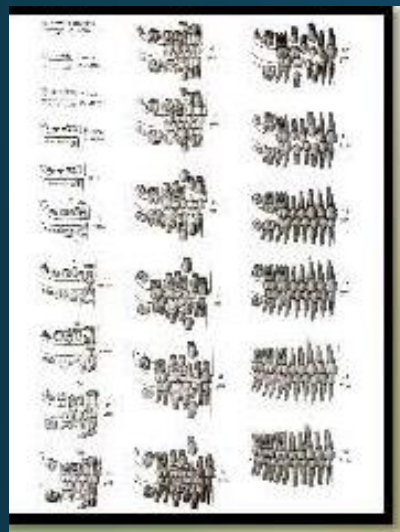
Age Estimation by Teeth

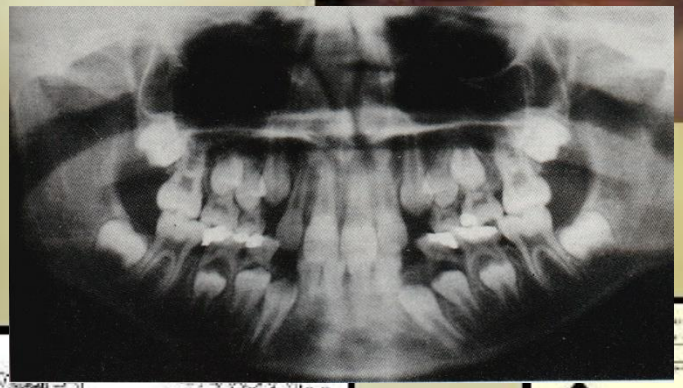
Age estimation:

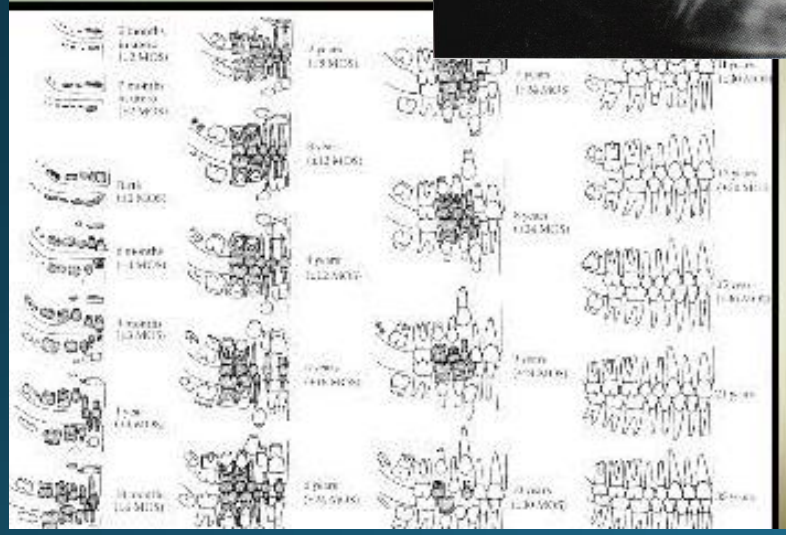
- Determine
  - Infant
  - Child
  - Juvenile or
  - Adult

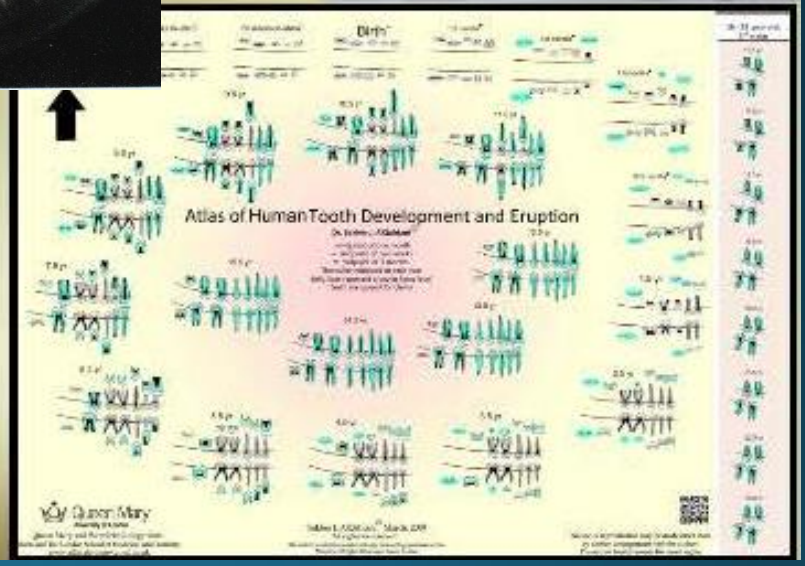
Ageing of an infant



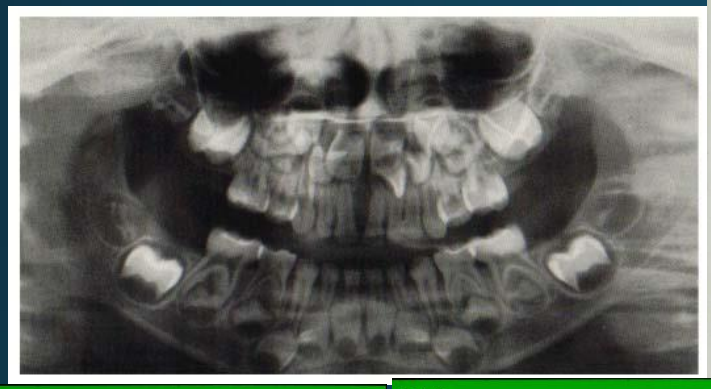







Atlas of Human Tooth Development and Eruption

Demirjian A, Goldstein H, Tanner JM. A new system of dental age assessment. Hum Biol 1973;45:221-27.



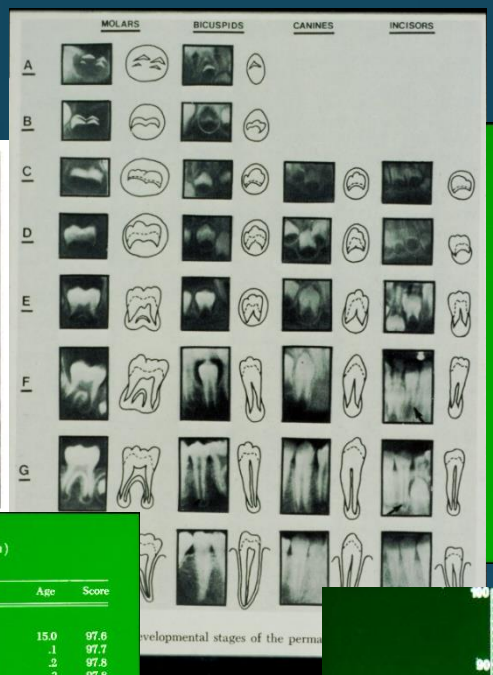


Table 2 (Appendix)

Self-Weighted Scores for Dental Stages 7 Teeth (Mandibular Left Side)

Boys

Tooth	Stage 0	A	B	C	D	E	F	G	H
M_2	0.0	2.1	3.5	5.9	10.1	12.5	13.2	13.6	15.4
M_1				0.0	8.0	9.6	12.3	17.0	19.3
PM_2	0.0	1.7	3.1	5.4	9.7	12.0	12.8	13.2	14.4
PM_1			0.0	3.4	7.0	11.0	12.3	12.7	13.5
C				0.0	3.5	7.9	10.0	11.0	11.9
I_2				0.0	3.2	5.2	7.8	11.7	13.7
I_1					0.0	1.9	4.1	8.2	11.8

Girls

Tooth	Stage 0	A	B	C	D	E	F	G	H
M_2	0.0	2.7	3.9	6.9	11.1	13.5	14.2	14.5	15.6
M_1				0.0	4.5	6.2	9.0	14.0	16.2
PM_2	0.0	1.8	3.4	6.5	10.6	12.7	13.5	13.8	14.6
PM_1			0.0	3.7	7.5	11.8	13.1	13.4	14.1
C				0.0	3.8	7.3	10.3	11.6	12.4
I_2				0.0	3.2	5.6	8.0	12.2	14.2
I_1					0.0	2.4	5.1	9.3	12.9

NB: Stage 0 is no calcification

Table 3

Conversion of Maturity Score to Dental Age (7 Teeth)

Age	Score	Age	Score	Age	Score	Age	Score
Boys							
3.0	12.4	7.0	46.7	11.0	92.0	15.0	97.6
.1	12.9	.1	48.3	.1	92.2	.1	97.7
.2	13.5	.2	50.0	.2	92.5	.2	97.8
.3	14.0	.3	52.0	.3	92.7	.3	97.8
.4	14.5	.4	54.3	.4	92.9	.4	97.9
.5	15.0	.5	56.8	.5	93.1	.5	98.0
.6	15.6	.6	59.6	.6	93.3	.6	98.1
.7	16.2	.7	62.5	.7	93.5	.7	98.2
.8	17.0	.8	66.0	.8	93.7	.8	98.2
.9	17.6	.9	69.0	.9	93.9	.9	98.3
4.0	18.2	8.0	71.6	12.0	94.0	16.0	98.4
.1	18.9	.1	73.5	.1	94.2		
.2	19.7	.2	75.1	.2	94.4		
.3	20.4	.3	76.4	.3	94.5		
.4	21.0	.4	77.7	.4	94.6		
.5	21.7	.5	79.0	.5	94.8		
.6	22.4	.6	80.2	.6	95.0		
.7	23.1	.7	81.2	.7	95.1		
.8	23.8	.8	82.0	.8	95.2		
.9	24.6	.9	82.8	.9	95.4		
5.0	25.4	9.0	83.6	13.0	95.6		
.1	26.2	.1	84.3	.1	95.7		
.2	27.0	.2	85.0	.2	95.8		
.3	27.8	.3	85.6	.3	95.9		
.4	28.6	.4	86.2	.4	96.0		
.5	29.5	.5	86.7	.5	96.1		
.6	30.3	.6	87.2	.6	96.2		
.7	31.1	.7	87.7	.7	96.3		
.8	31.8	.8	88.2	.8	96.4		
.9	32.6	.9	88.6	.9	96.5		
6.0	33.6	10.0	89.0	14.0	96.6		
.1	34.7	.1	89.3	.1	96.7		
.2	35.8	.2	89.7	.2	96.8		
.3	36.9	.3	90.0	.3	96.9		
.4	38.0	.4	90.3	.4	97.0		
.5	39.2	.5	90.6	.5	97.1		
.6	40.6	.6	91.0	.6	97.2		
.7	42.0	.7	91.3	.7	97.3		
.8	43.6	.8	91.6	.8	97.4		
.9	45.1	.9	91.8	.9	97.5		

Table 3

Conversion of Maturity Score to Dental Age (7 Teeth)

Age	Score	Age	Score	Age	Score	Age	Score
Boys							
3.0	12.4	7.0	46.7	11.0	92.0	15.0	97.6
.1	12.9	.1	48.3	.1	92.2	.1	97.7
.2	13.5	.2	50.0	.2	92.5	.2	97.8
.3	14.0	.3	52.0	.3	92.7	.3	97.8
.4	14.5	.4	54.3	.4	92.9	.4	97.9
.5	15.0	.5	56.8	.5	93.1	.5	98.0
.6	15.6	.6	59.6	.6	93.3	.6	98.1
.7	16.2	.7	62.5	.7	93.5	.7	98.2
.8	17.0	.8	66.0	.8	93.7	.8	98.2
.9	17.6	.9	69.0	.9	93.9	.9	98.3
4.0	18.2	8.0	71.6	12.0	94.0	16.0	98.4
.1	18.9	.1	73.5	.1	94.2		
.2	19.7	.2	75.1	.2	94.4		
.3	20.4	.3	76.4	.3	94.5		
.4	21.0	.4	77.7	.4	94.6		
.5	21.7	.5	79.0	.5	94.8		
.6	22.4	.6	80.2	.6	95.0		
.7	23.1	.7	81.2	.7	95.1		
.8	23.8	.8	82.0	.8	95.2		
.9	24.6	.9	82.8	.9	95.4		
5.0	25.4	9.0	83.6	13.0	95.6		
.1	26.2	.1	84.3	.1	95.7		
.2	27.0	.2	85.0	.2	95.8		
.3	27.8	.3	85.6	.3	95.9		
.4	28.6	.4	86.2	.4	96.0		
.5	29.5	.5	86.7	.5	96.1		
.6	30.3	.6	87.2	.6	96.2		
.7	31.1	.7	87.7	.7	96.3		
.8	31.8	.8	88.2	.8	96.4		
.9	32.6	.9	88.6	.9	96.5		
6.0	33.6	10.0	89.0	14.0	96.6		
.1	34.7	.1	89.3	.1	96.7		
.2	35.8	.2	89.7	.2	96.8		
.3	36.9	.3	90.0	.3	96.9		
.4	38.0	.4	90.3	.4	97.0		
.5	39.2	.5	90.6	.5	97.1		
.6	40.6	.6	91.0	.6	97.2		
.7	42.0	.7	91.3	.7	97.3		
.8	43.6	.8	91.6	.8	97.4		
.9	45.1	.9	91.8	.9	97.5		

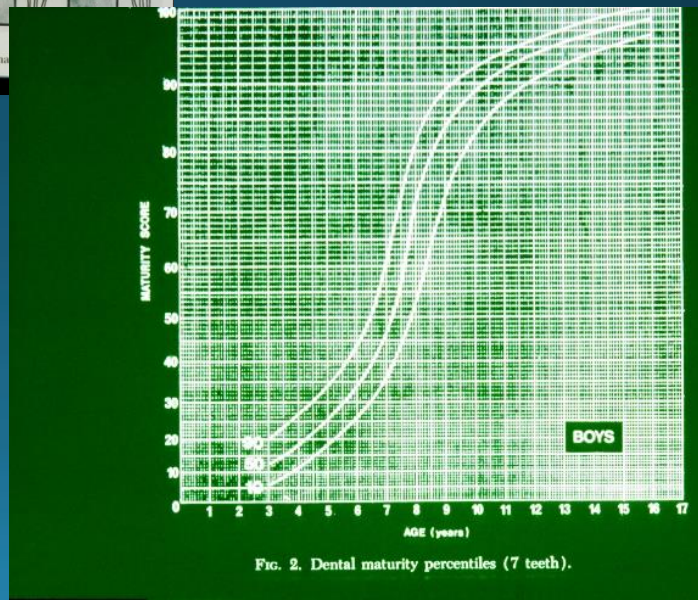
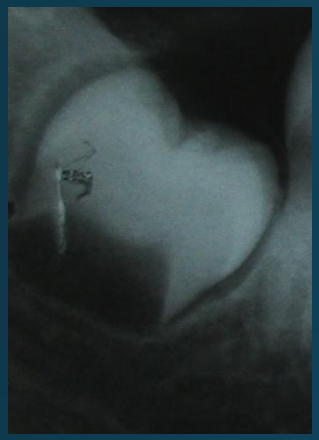
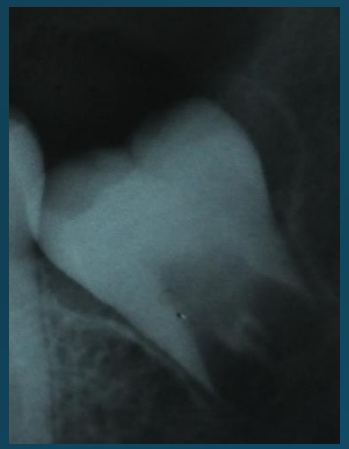
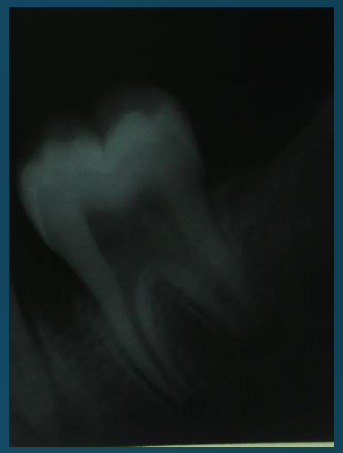


FIG. 2. Dental maturity percentiles (7 teeth).

Adolescence
The wisdom tooth



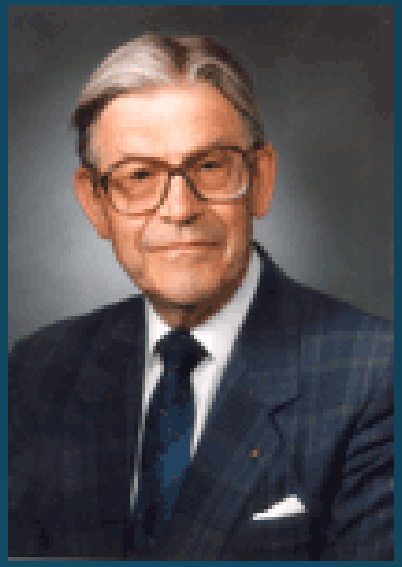

Race	Sex	Statistic	D	E	F	G	H
Whites	Males	mean	16.0	16.6	17.7	18.2	20.2
		S.D.	1.97	2.38	2.28	1.91	2.09
	Females	mean	16.0	16.9	18.0	18.8	20.6
		S.D.	1.55	1.85	1.95	2.27	2.09
Blacks	M+F	mean				19.3	20.4
		S.D.				3.37	3.14

MANDIBLE

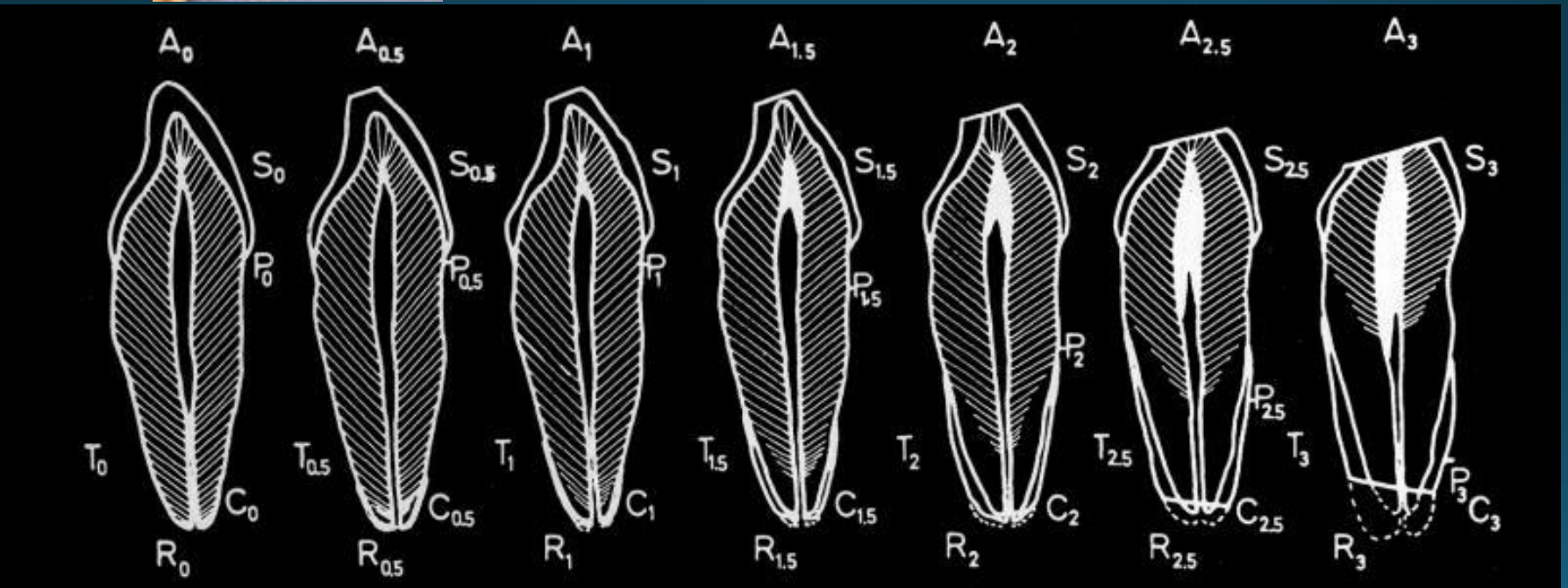
Race	Sex	Statistic	D	E	F	G	H
Whites	Male	mean	15.5	17.3	17.5	18.3	20.5
		S.D.	1.59	2.47	2.14	1.93	1.97
	Females	mean	16.0	16.9	17.7	19.1	20.9
		S.D.	1.64	1.75	1.80	2.18	2.01
Blacks	M+F	mean			17.2	18.5	
		S.D.			3.14	2.68	2.34

08/07/20

Gusthafason & Johanson method

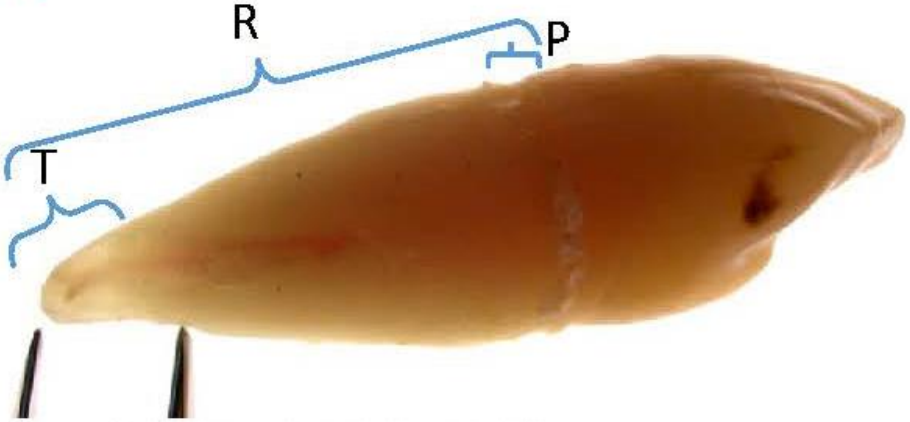


- Tooth attrition
- Cemental apposition
- Root dentine transparency
- Secondary dentine deposition
- Apical root resorption
- Level of the periodontal attachment



Aging adults

Lamendin 1992



Age= (0,18P′) + (0,42T′) + 25,53

P′= (P/R)x100 P = periodontosis height

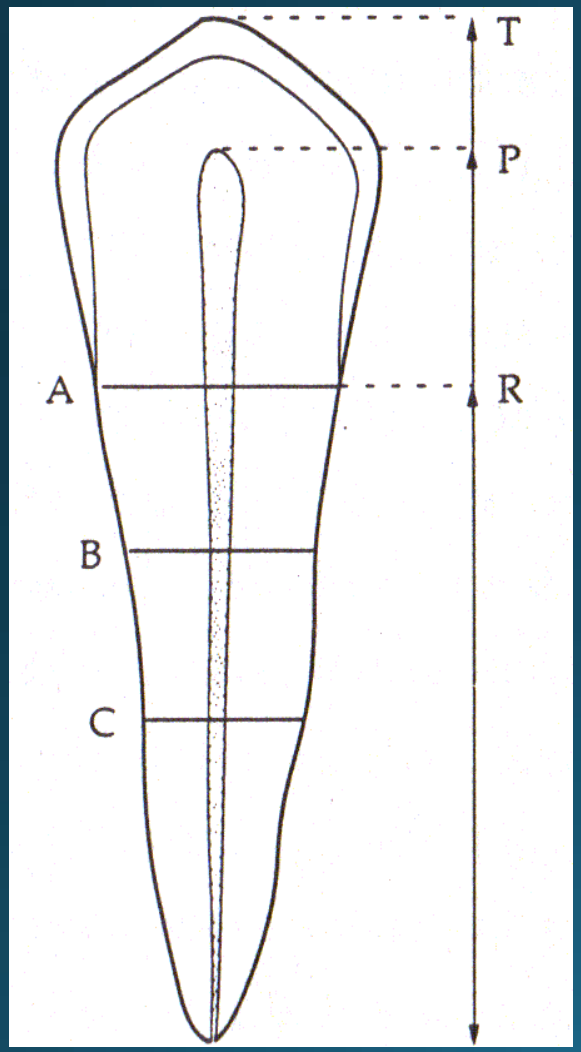
T′= (T/R)x100 T = transparency height

R = root height

ERROR

Age Intervals, Years	25 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	Total
Number of teeth	5 (L) 19 (T)	42 (L) 65 (T)	39 (L) 84 (T)	90 (L) 99 (T)	65 (L) 73 (T)	46 (L) 43 (T)	19 (L) 12 (T)	0 (L) 5 (T)	306 (L) 400 (T)
ME (years) Lamendin's	24.8	15.5	9.9	7.3	6.3	11.6	18.9	—	10

Radiographs (Kvaal et al. 1995)



P=ratio pulp-/root length

T=ratio tooth- root length

A= ratio pulp-/root width

at level A (emamel-cementum junction)

B = ratio pulp-/root width

at level B (between A and C)

C = ration pulp- /root width at level C (mid root)

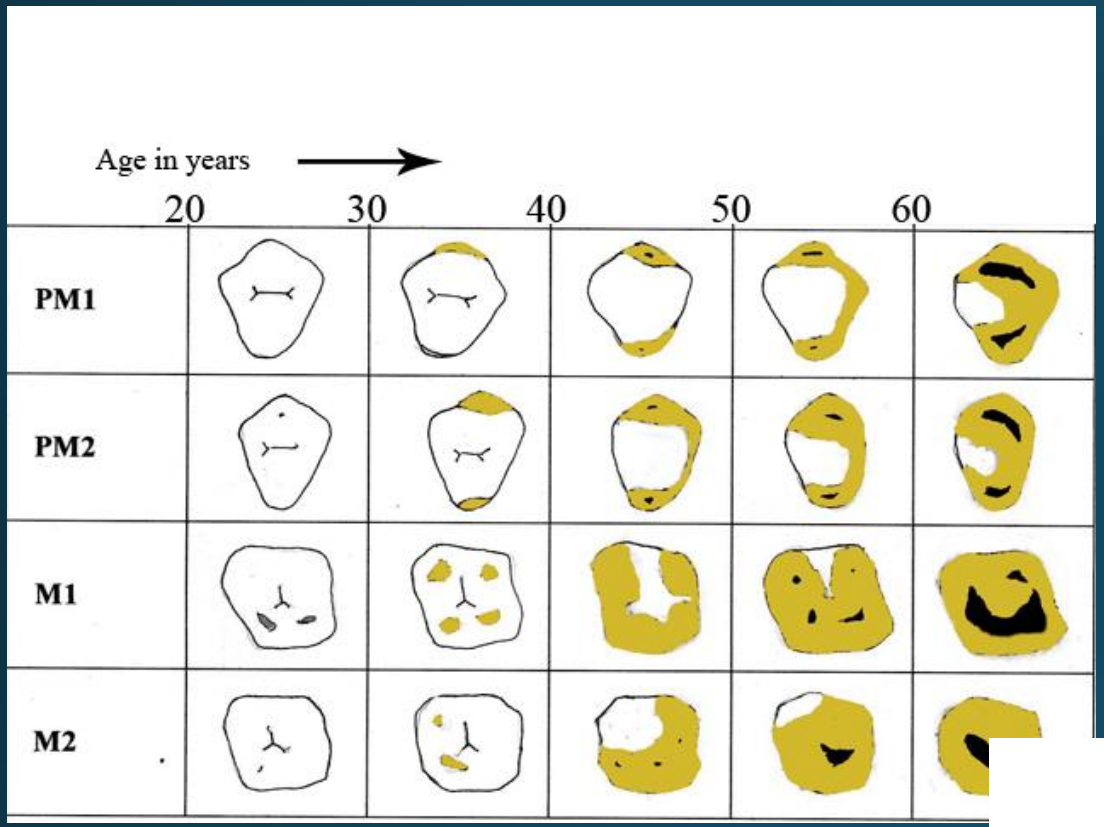
M=mean from (A+B+C+P+ R)

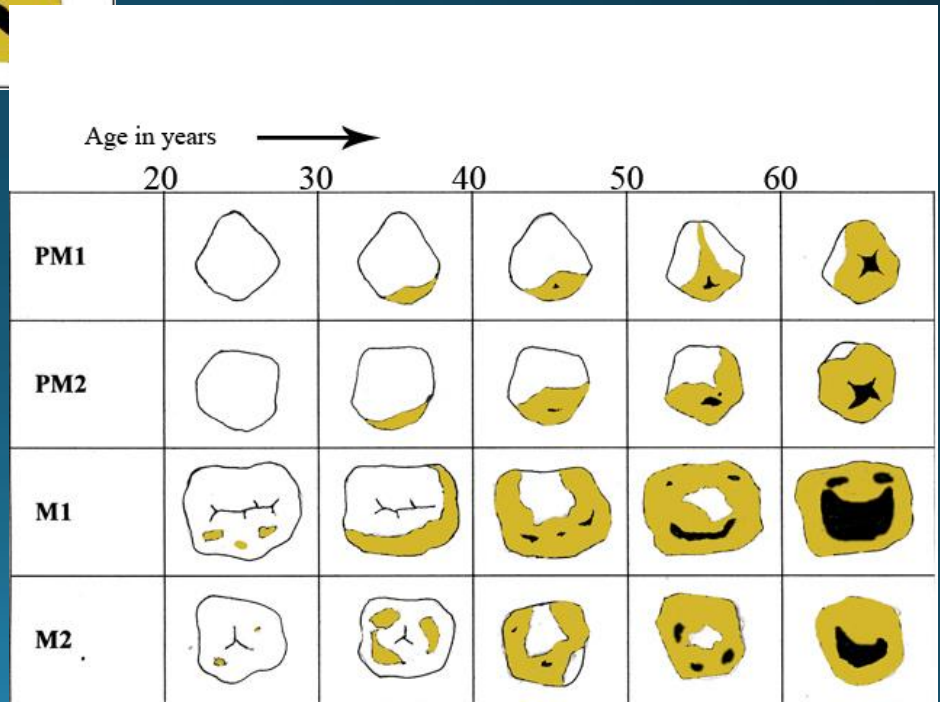
W=mean from (B+C)

C=mean from (P+R)

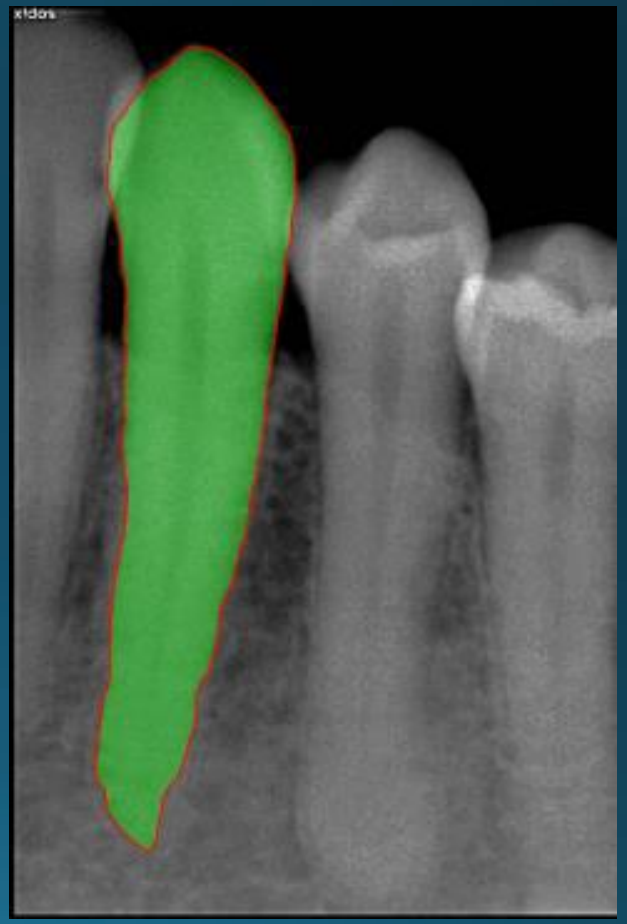
Age = 129.8 - 316.4(M) - 66.8 (W-L)

Dental Attrition





Canine volume

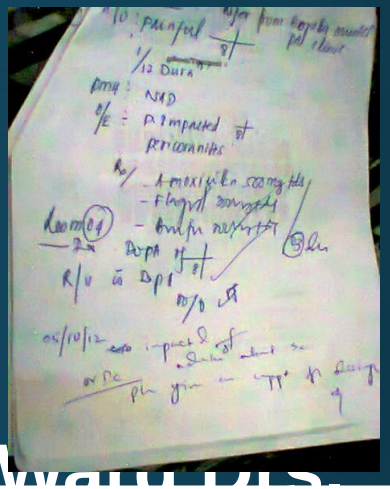


Factors Affecting Dental Development

1. Endocrine disorders ?
2. Nutritional disorders ?
3. Ethnicity ?

2. Trauma

Case Scenario



Incident-Accident/Assault

Hospital Admission /OPD

- Ward D/S
- **Referrals- for clinical management**

JMO
For medico-legal purposes

Court Trial

MLEF

අධිකරණ - වෛද්‍ය පරීක්ෂණ පෝර්මය

MEDICO - LEGAL EXAMINATION FORM

Police Copy

Police (පි.පෝ.) 12/77

No. 14/15

1. Station: ශ්‍රී ලංකා ජාතික මහා රෝහල, කොළඹ.
2. Date: 2015/06/06
3. Name and Address of Examinee:
4. Issued by: [illegible]

Signature and Rank/Reg. No.

5. Hospital: ශ්‍රී ලංකා ජාතික මහා රෝහල, කොළඹ.
6. Ward No. 72
7. B.H.T. No. 016186
8. Produced by
9. Date and Time of Examination
10. Injuries (Initial appropriate cage)

Abrasion ☐ Contusion ☐ Laceration ☐ Stab ☐ Gunshot ☐ Cut ☐ Fracture ☐ Burns ☑ None ☐

Other (Specify)

11. Weapon (Initial appropriate cage)

12. Category of hurt (Initial appropriate cage)

Sharp ☐ Blunt ☐ Other (Specify) burn

Non-Grievous ☑ Grievous ☐ Endangering Life ☐ Fatal in ordinary course of nature ☐

13. Alcohol (Initial appropriate cage)
14. Drugs (Initial appropriate cage)
15. Alcohol/Drugs (Initial appropriate cage)

Breath, Smelling of ☐ Under Influence ☐ Consumed ☐ Under Influence ☐ Negative ☐

16. Remarks

Signature of Medical Officer

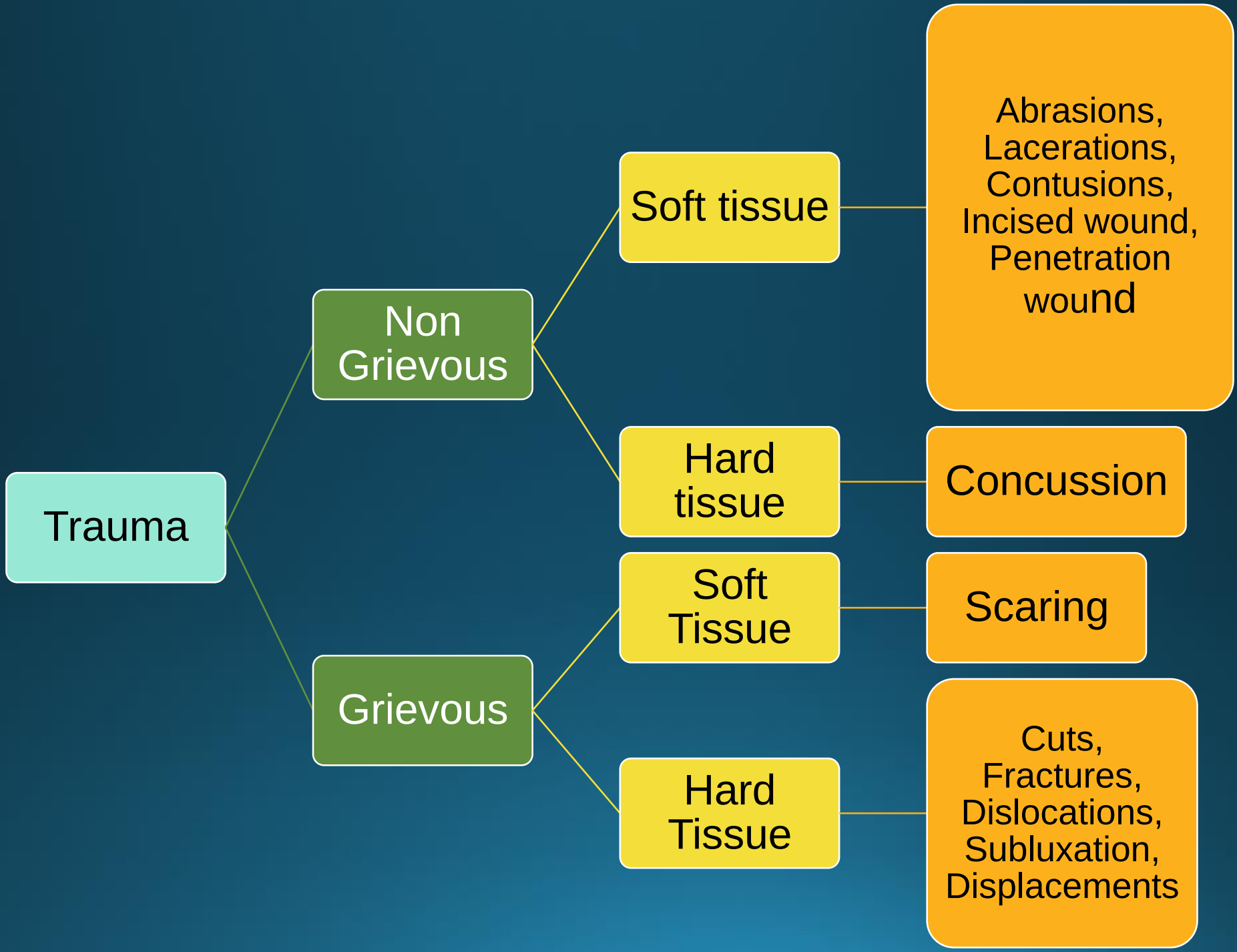
Medico-legal implications

Dental Classification

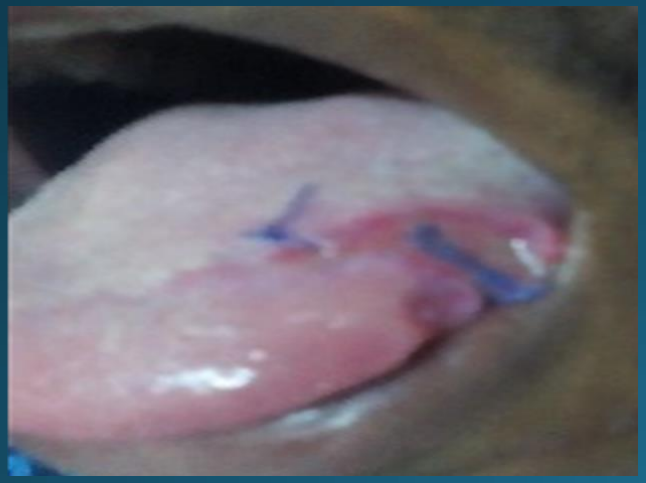
- Soft Tissue
- Hard Tissue Soft Tissue Injuries
  - teeth
  - alveolar bone
  - jaws / nasal bones / zygomatico-orbit complex
- Combination injuries

Legal Classification

- **Grievous**
- **Non grievous**
- **Endangering life**
- **Fatal in the ordinary course of nature**

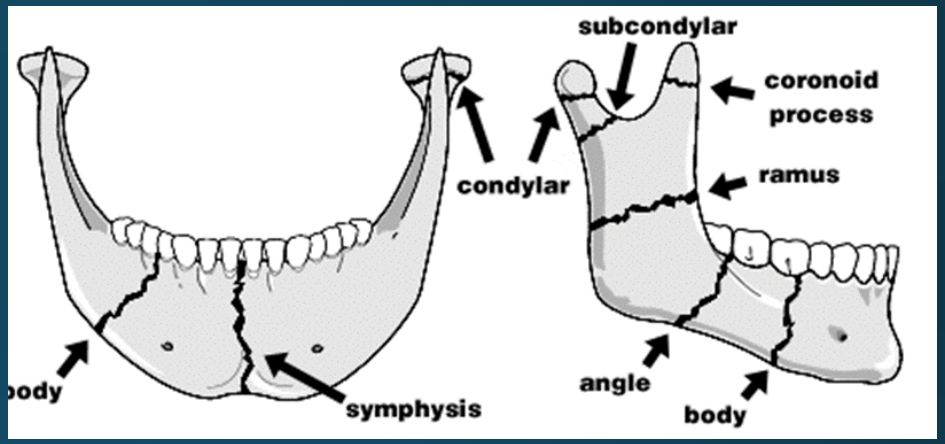

Trauma
Non Grievous
Grievous
Soft tissue
Hard tissue
Soft Tissue
Hard Tissue
Abrasions, Lacerations, Contusions, Incised wound, Penetration wound
Concussion
Scaring
Cuts, Fractures, Dislocations, Subluxation, Displacements

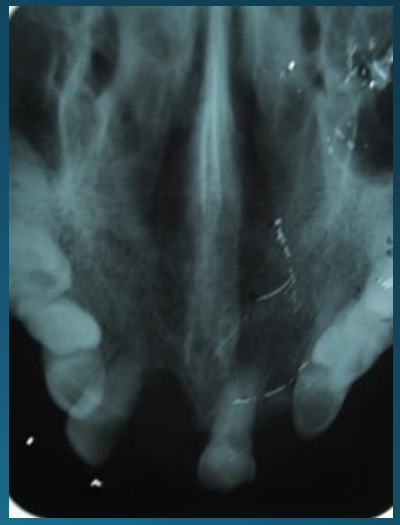
Soft Tissue injuries



Hard Tissue


139
140
141
142
143


subcondylar
coronoid process
ramus
condylar
angle
body
symphysis



Medico-Legal Considerations

Carious teeth?

Proportionality Test !

Recent Fracture

- Enamel - white not stained
- Dentine - yellowish white, sensitive,not stained
- Pulp - pink or red spot tender
- Mobility - ±
- Bleeding from the gum
- Sharp edges
  - **Is the history given by the patient is compatible with the clinical findings**

Periodontal disease

Periodontal disease - Mobility

Periodontal disease + Mobility

Fractured Denture teeth?

Endangering Life

3. Bite Marks

Definition

- ***A mark caused by the teeth either alone or in combination with other mouth parts***

- **Bite Mark / Tooth mark is a patterned injury caused by teeth**

Types

- Human
  - Adult
  - Child
- Animal
  - Domestic
  - Wild

Where do you find bite marks?

- Skin
  - On the victim
    - Sexual homicides
    - Rape
    - Child abuse
  - On the perpetrator
    - Violent attacks
    - Rape
- On in animate objects
  - Cheese
  - Apple
  - Chocolate
  - Butter

Males

Females

Children

- Genitals
- Legs
- Back
- Face

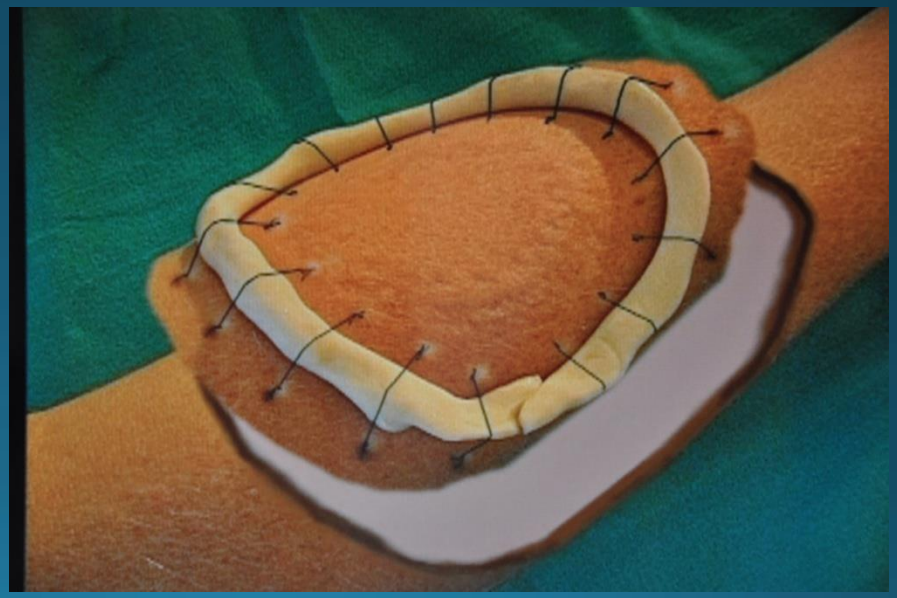
Characteristic features of a human bite mark

- 2 opposing arcades circular or oval shape
- 6 separate marks (indentations, abrasions, bruises, contusions)
- Distance across the arcades 2.5-4.5 cm (<3cm child)
- Reddened areas of petechial haemorrhage

Bite mark examination

1. Recovery of bite mark evidence from the victim
2. Recovery of evidence from the suspect

Bite mark recovery



Conclusion

- Human Bite Mark
- Suggestive of a human bite mark
- Not a Human Bite Mark

Taking Impressions

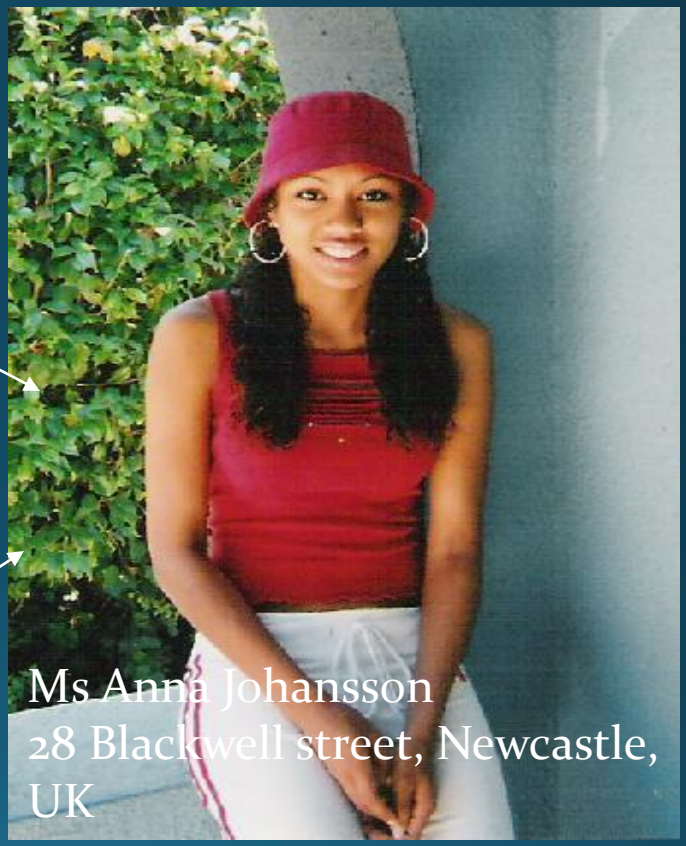
UN upper cast crop litesize edges.jpg

Bite Marks on Inanimate Objects

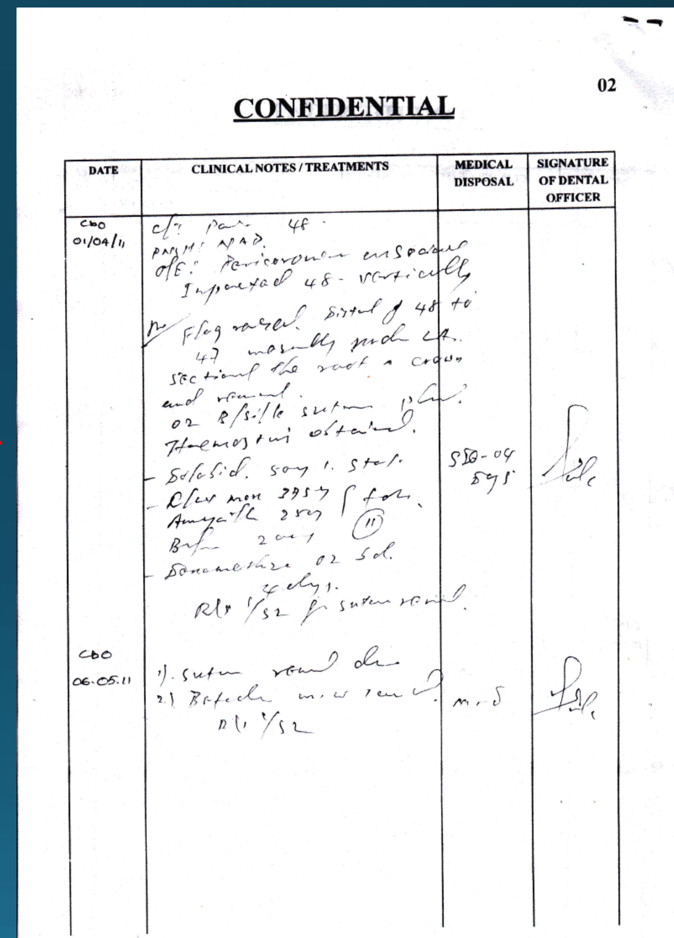
Animal Bites

4. Dental Identification

Dental Identification



Comparative Dental Identification



02

CONFIDENTIAL

DATE	CLINICAL NOTES / TREATMENTS	MEDICAL DISPOSAL	SIGNATURE OF DENTAL OFFICER
CDO 01/04/11	c/o Pain 48. PMH: NAD. O/E: Pericoronitis [illegible] Impacted 48 - vertically. Rx Flap raised. [illegible] 48 [illegible] 47 [illegible] sectioned the root & crown and removed. 02 B/silk sutures placed. Haemostasis obtained. [illegible]	[illegible]	[illegible]
CDO 06.05.11	1). Suture removed [illegible] 2) [illegible] R/V ½/52	[illegible]	[illegible]

Edit | NewPatient | New Member | Family Changes | Delete | Photo | Direct Referral | Open Bal | Labels | Audio | Credit Card | <Back | Forward> | Ok

Patient Details | Workcare/Treatment/Recalls/Appointments | Billing/Referral Details

Oasis No. 000128 File Number

Surname Bloggs
Title Mr
First Name Fred
Second Name Joseph
Prefers Name Fred
WP Salutation Fred

Date of Birth 12/03/1970 Age 39 Gender M

Address Line 1 120 Jackson Street
Address Line 2
Suburb KEW VIC
Postcode 3101

Home Phone 03 9841 0000
Work Phone 03
Mobile Phone 0412 000 999
Main Phone 0412 000 999
Fax Number
Email Address

H/Fund Id
H/Fund Line No.
Medicare 1 M
Medicare 2
Medicare Expiry Date / /
Dva File No
Dva Card Type
Employer

Usual Doctor 0001 salon
Usual Hygienist 0000 All Doctor
Usual Branch 0001 Branch 1

New Patient Date 20/11/2009
Last Visit Date 25/11/2009

Classify Code PRIVATE Private Patient
Contact Code YELLOWPA Yellow Pages
Newsletter Code GENERAL General NewsLetter
Ethnicity Code

Current Balance 0.00
Standby Date
Next Appt Date
Inactive File

Sticky Notes

Date	Details

New | Delete

Restorative Charting

Jackson, Ms Jane

Exit | Toolbar | Diagnosis Sheets | Arch | Print | Tools | Autoclave | Extension | Plan Mode

Existing Condition

18 17 16 15 14 13 12 11 21 22 23 24 25 26 27 28
48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38

Proposed Treatment

18 17 16 15 14 13 12 11 21 22 23 24 25 26 27 28
48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38

#	Date	Chart Description
0001	20/07/2013	Chart

Health Warnings

Incomplete Treatment

#	Date	Description
1	20/07/201	Plan Number 01

T	Item	
	011	Comprehensive oral exa
18	022	Intra periapical/bitewing
31	161	Fissure sealing - per tooth
37	532	Adhesive rest'n-2 surfs -
45	533	Adhes rest'n-3/more surf

Treatment Imaging

Janson, Ms Kelly - DOB 02/01/1975

Exit | InitalChat | Import | Scan | Print | Tools

Image Library

P0001016 (15)

0 | 27-28 | 37-38 | 0 | 0 | 0

start

2 Micr... | 2 Micr... | EXACT... | 2 Micr... | 2 Micr...

15:03

27-28 | 26/01/2006 | 03:25 | 1200x800x16 | 2011KB | James Griffin | RGP | 65KV | 15mA | 0.08s

File Edit Display Options Language Help

Limitations

1. Unavailability of the Antemortem Dental Records
2. Incomplete Dental Records
3. Non recovery of postmortem material

Reconstructive Dental Profiling

Exhumation- Paradise estate
Kuruwita, 2010

Tsunami 2004 -Philippines

Reconstructive Dental Profiling

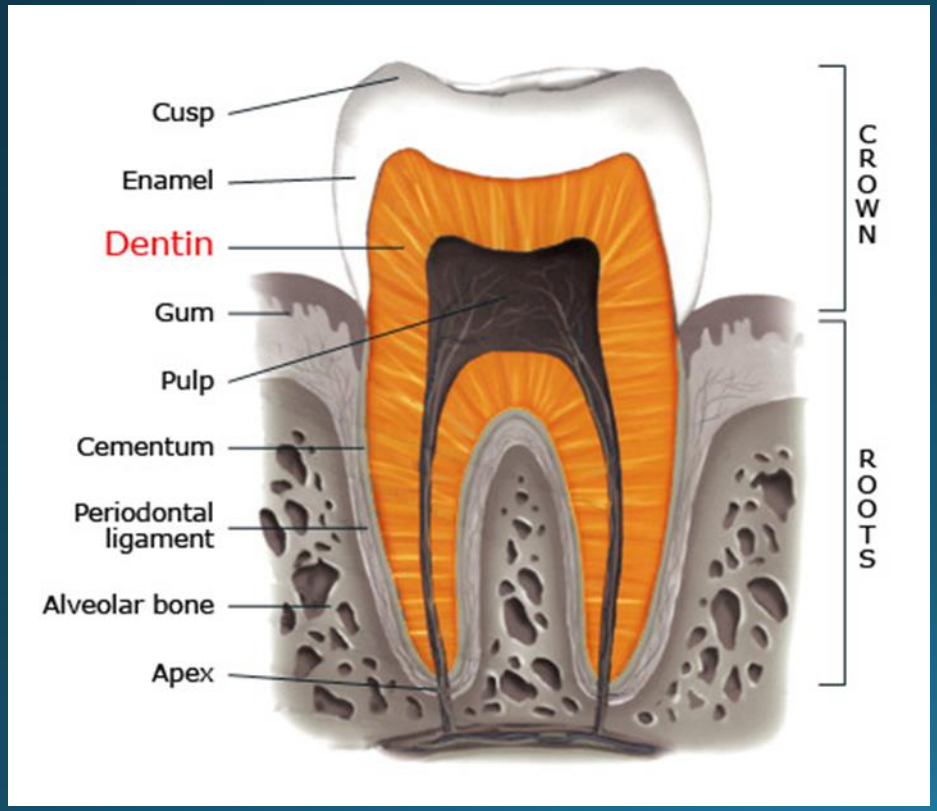
1. Differentiate teeth from Similar objects
2. Species determination
3. Age estimation
4. Gender determination
5. Race determination

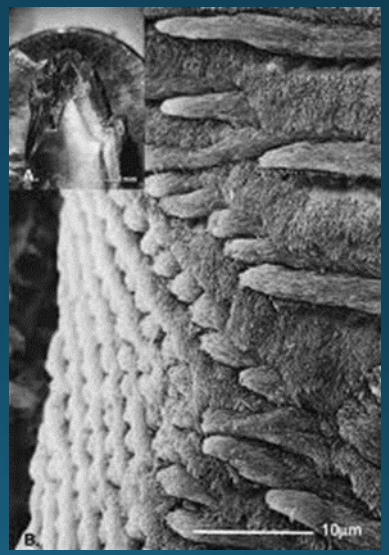
Step-1

- Differentiate teeth from Similar objects

Step - 2

- Species determination

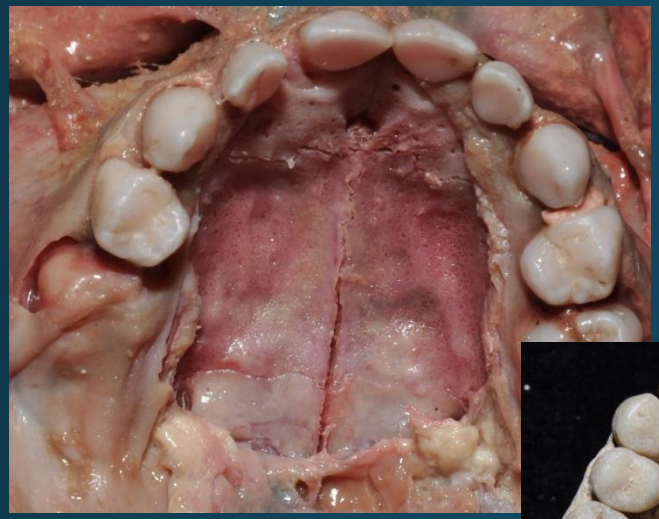




Step - 3

- Age estimation

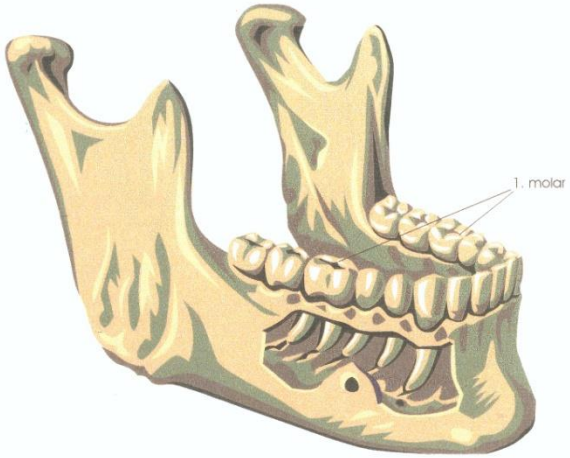
Palatal Sutures

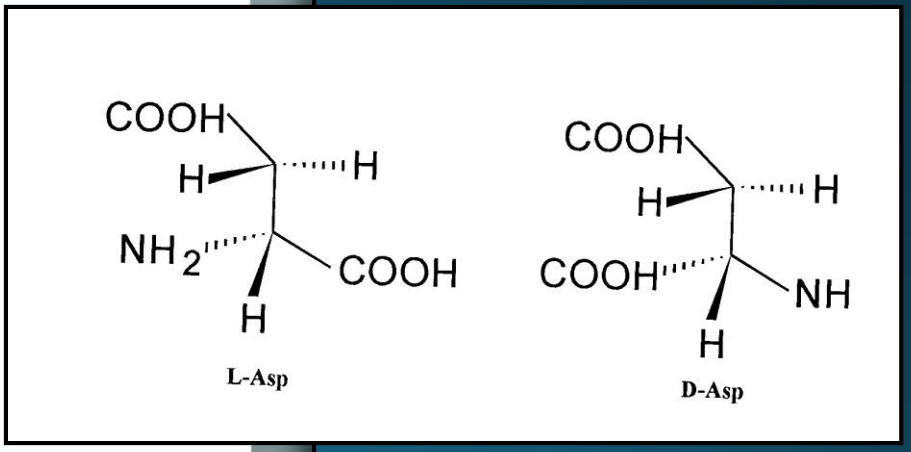


- Incisive 20-25
- PMP 25-30
- TP 35-50
- AMP 50+

Amino acid-racemization

Aldersbestemmelse af lig ved måling af racemiceringsgraden i kollagen fra dentin.





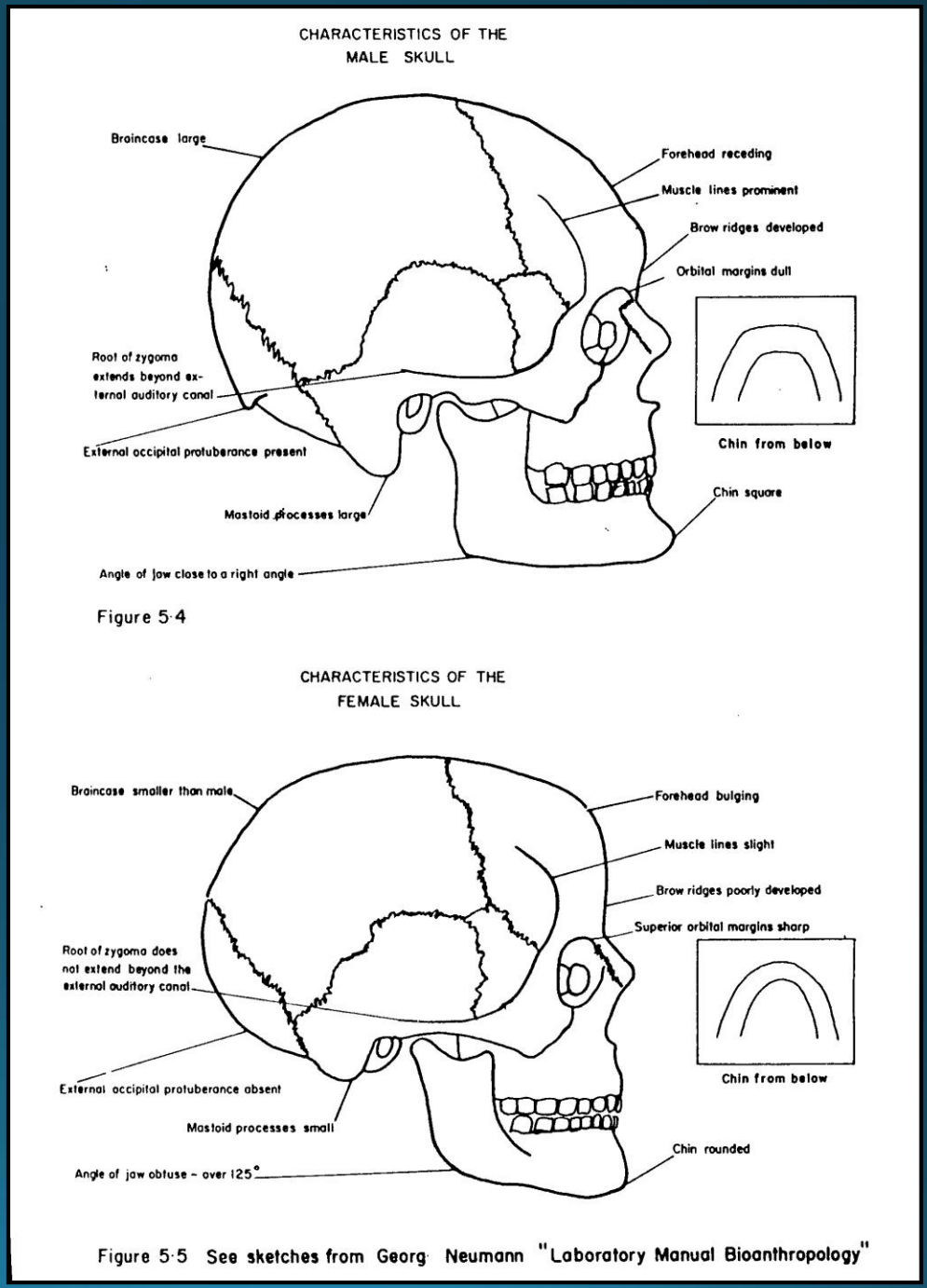
Aspartic acid

Step – 4
Gender determination

Skull-Accuracy 90%

Male characteristics

Female characteristics



Odontometry

- Males have larger teeth than females
- Sex differences are larger in the permanent teeth than in deciduous teeth
- Sex differences are more pronounced in canines

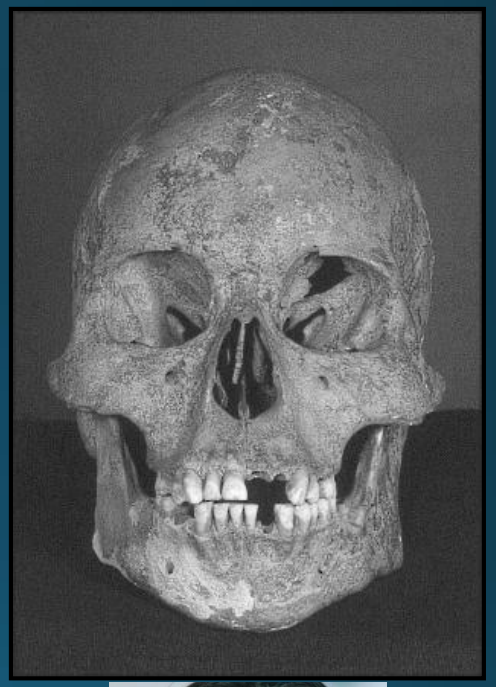
Step - 5

Race determination
Ethnic characteristics

European

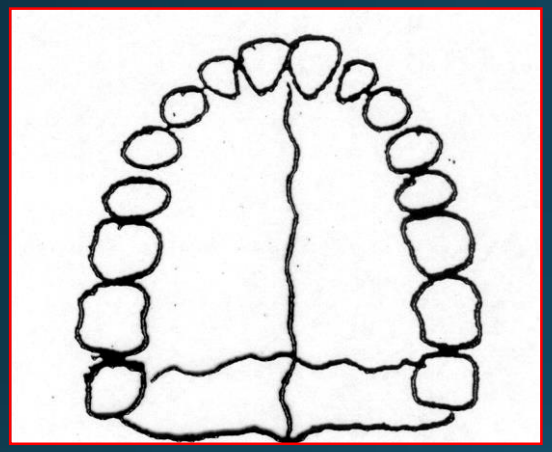
African

Asian



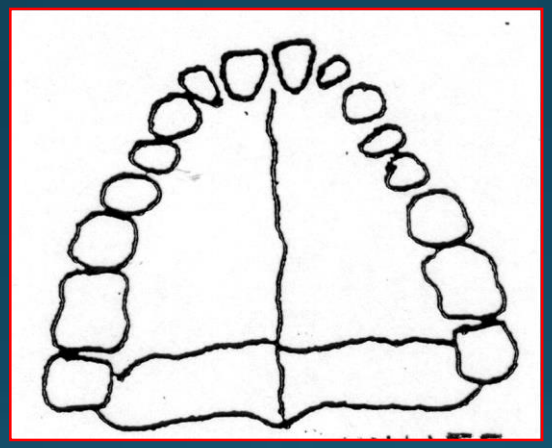
Palatal shape

African



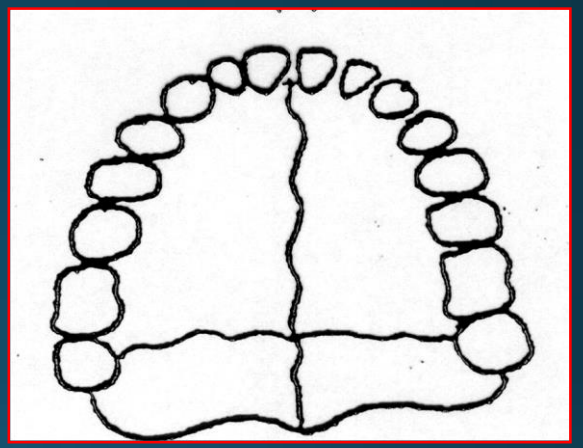
parallel-sided

European



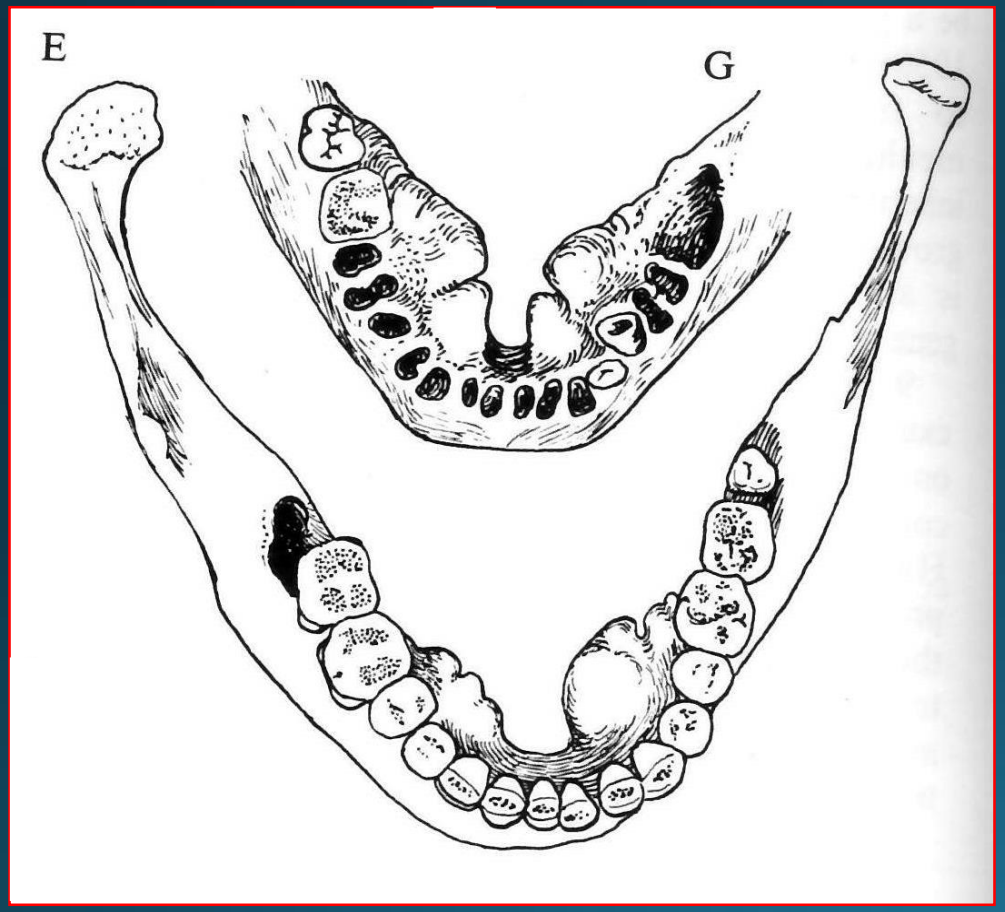
parabolic

Asian

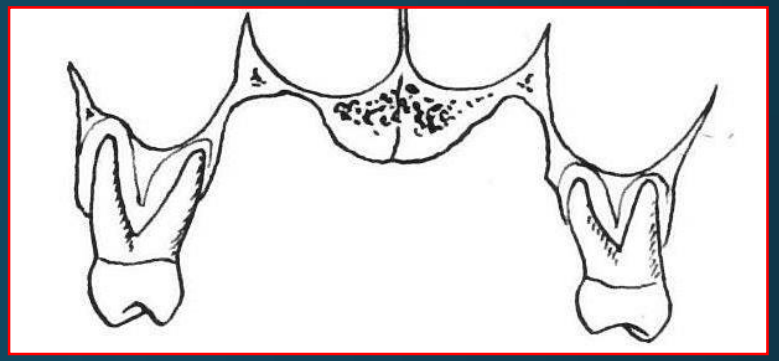


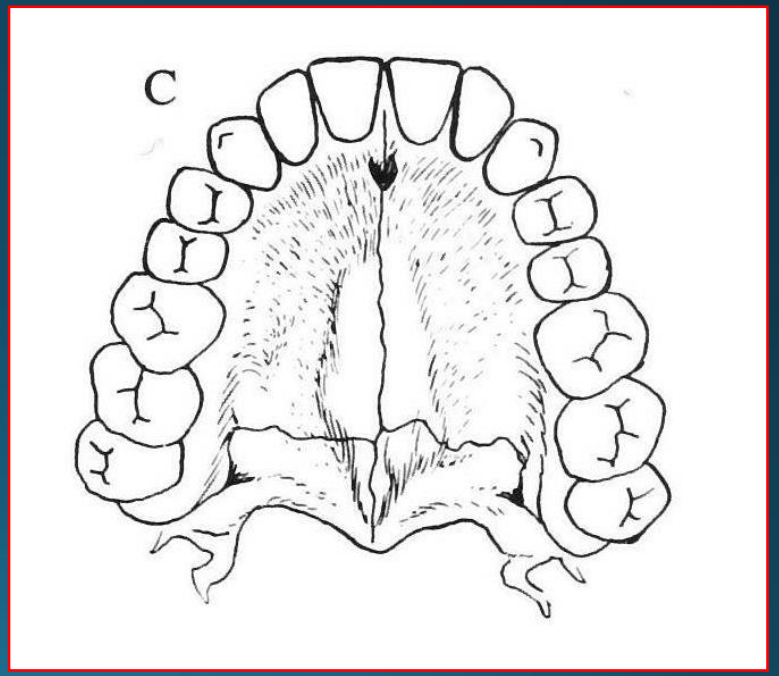
horse shoe shaped

Mandibular tori



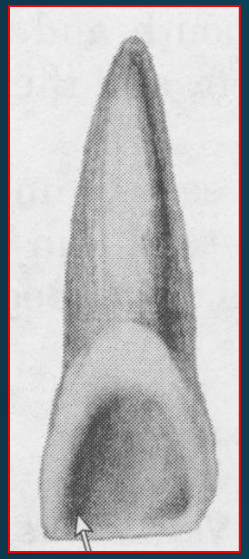
Palatal tori



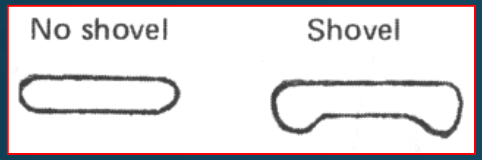


Most frequently seen in Asian populations

SHOVEL-SHAPED INCISORS

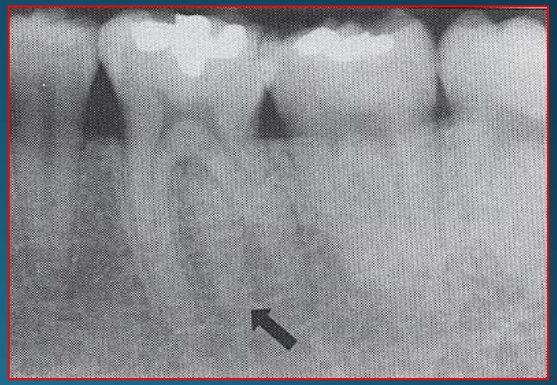


Asian



prominent mesial/distal ridges

mesial/distal ridges



extra roots on mandibular molars

Peculiarities

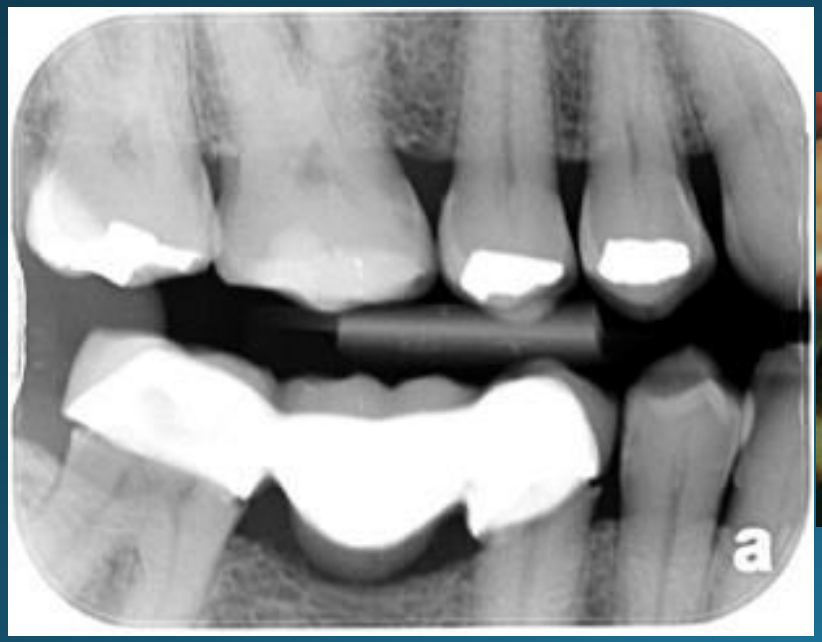
Anatomical

Pathological
Physiological

Treatment

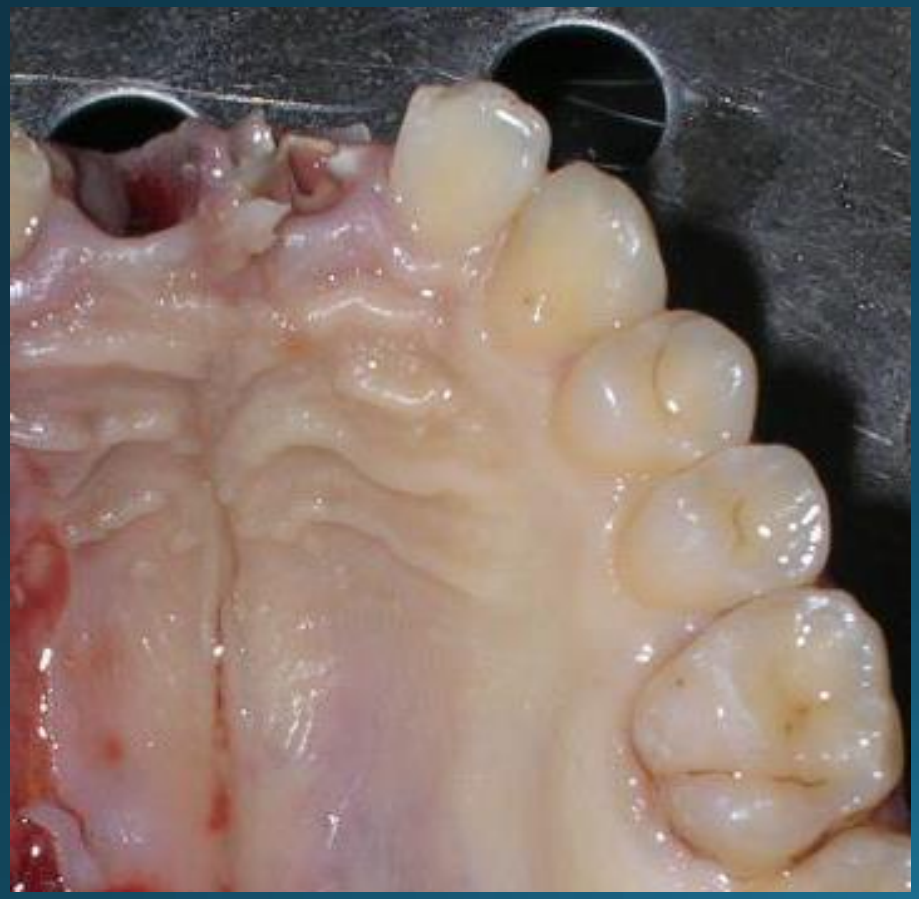
Restorative
Prosthetic
Orthodontic

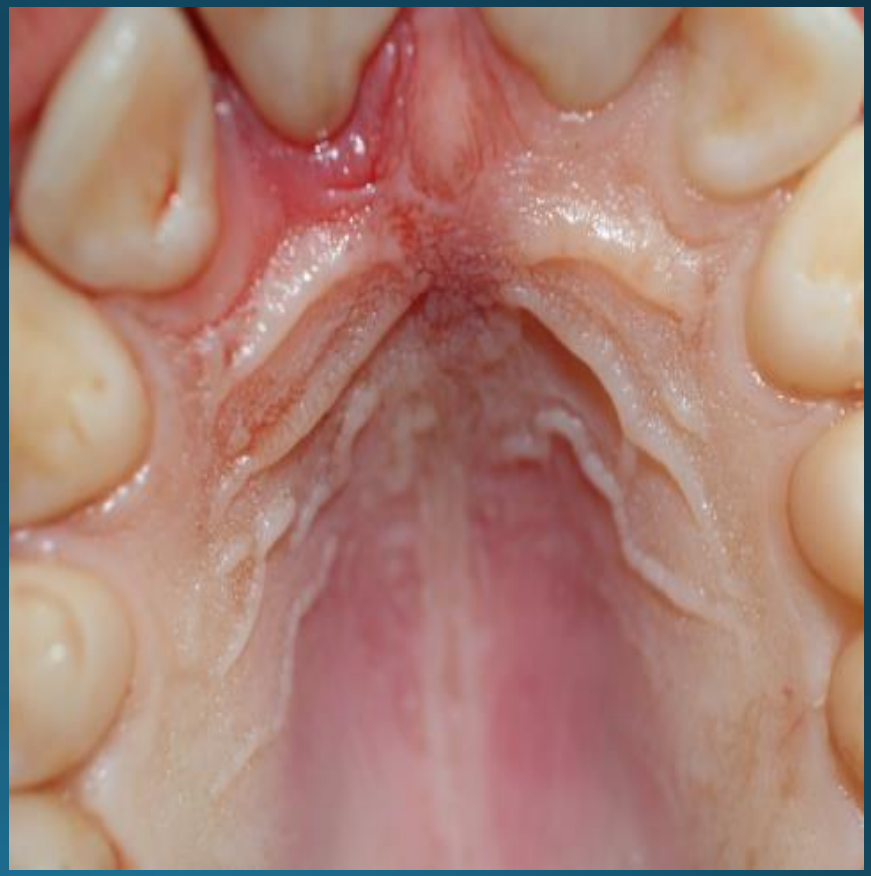
Peculiar Shape


a


SLC/5032/D

Palatal Rugae

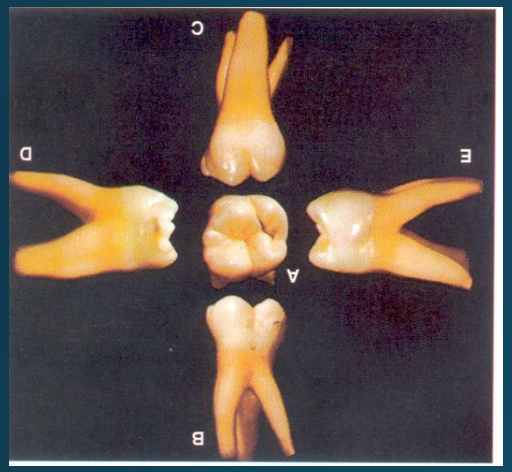




Why teeth so important in Identification?

- The human dentition and dental restorations are extremely resistant to destruction as physical injury and decomposition

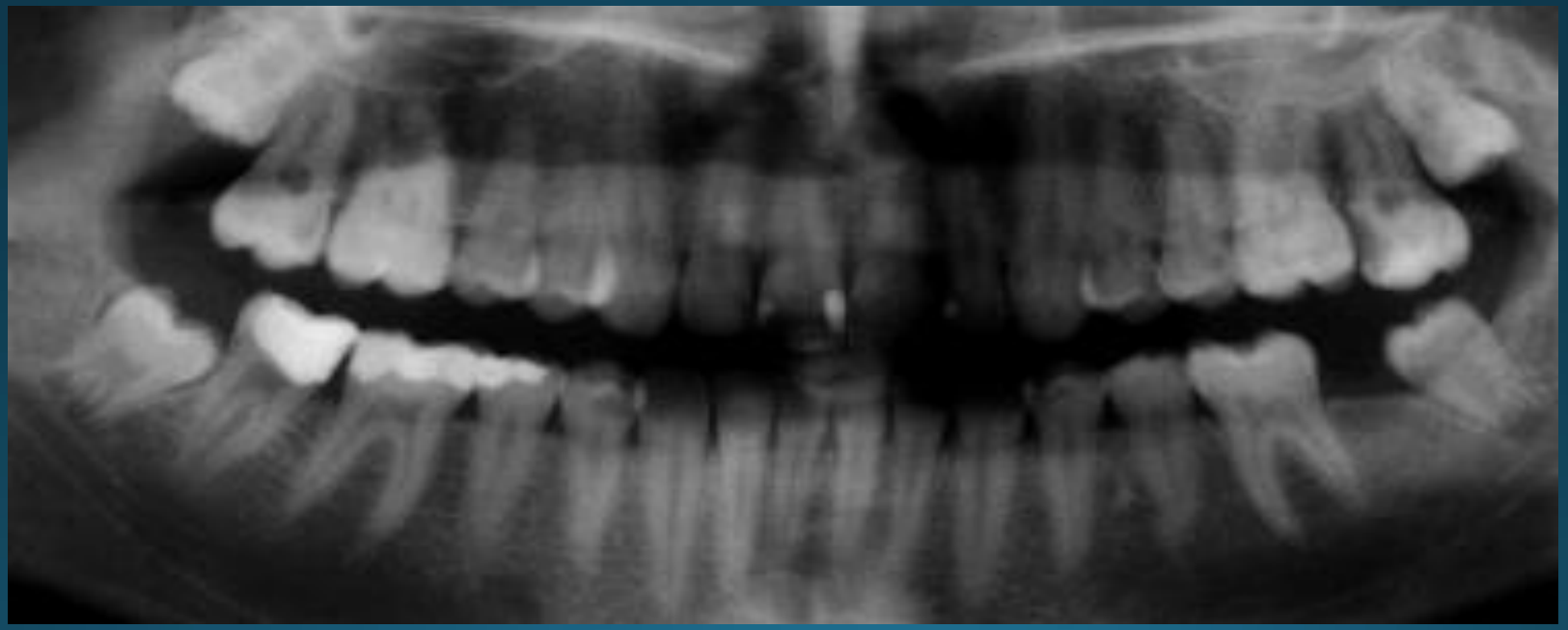
Why dental ID can be conclusive ?



- 5 clinical surfaces
- 32/20 teeth
- 32x5=160/20x5=100 surfaces
- Radiographs

PROBABILITIES

The adult dentition has thirty two teeth with 160 surfaces. The innumerable combinations of missing teeth, carious lesions and restorations form the basis for dental identification

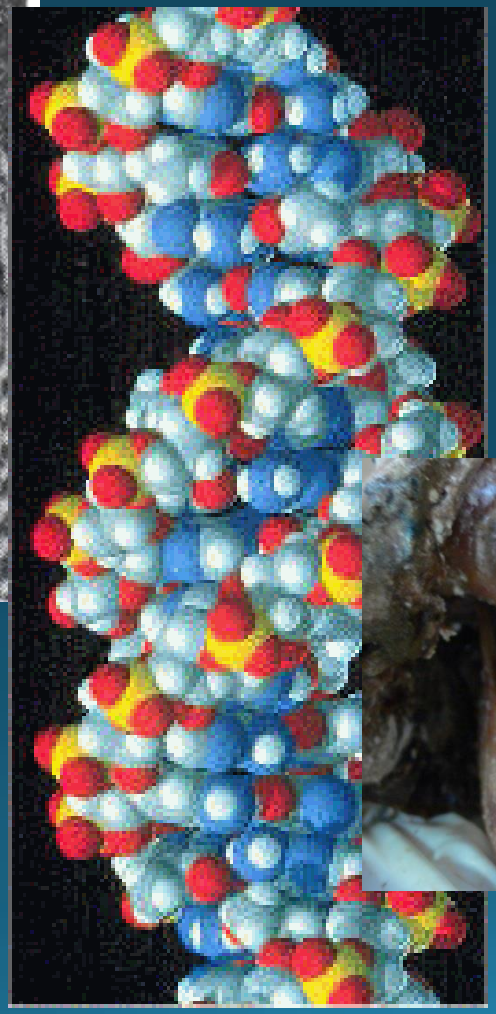


COMBINATIONS 148 SURFACES

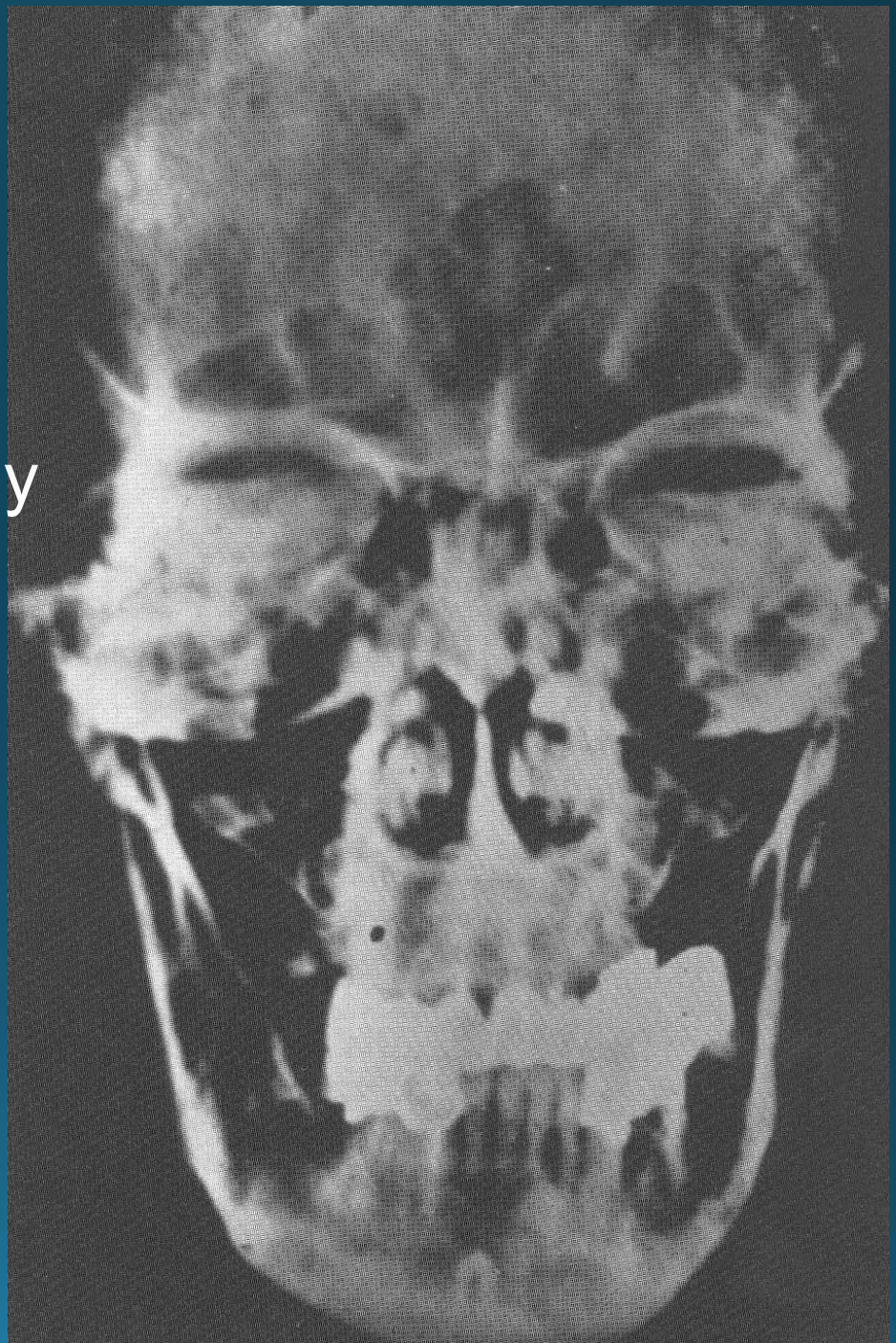
Filled surfaces	Combinations	ces
	1	
1	14	
2	10.	
3	529.	
4	19.190.	
5	552.689.424	143
10	$1,0 \times 10^{15}$	138
20	$2,7 \times 10^{24}$	128
30	$2,1 \times 10^{31}$	118
40	$2,4 \times 10^{36}$	108
50	$8,9 \times 10^{39}$	98

If 20 surfaces have restorations, the possibilities of number of combination are $2,7 \times 10^{24}$

Primary ID Methods.



- Compare the
  - Skull Vs. Photo/X-ray



1. What is Forensic Odontology ?
2. Who is a Forensic Odontologist ?
3. Scope of Forensic Odontology ?