



## Community Dentistry Third class

# FORENSIC ODONTOLOGY

**lecture**

2023---2024

**By Assist. Prof. Adil Ghalib Fadhil  
College of Dentistry  
University of Basrah**



# FORENSIC ODONTOLOGY

Or forensic dentistry :is the proper handling, examination and evaluation of dental evidence, which will be then presented in the interest of justice. It is the identification discipline based upon the recognition of unique features present in each person's dental structures.



---

**It comes into use when identification by the use of skin (ex. fingerprints) is not possible. The teeth and dental restorations are the strongest elements in the human body and survive the destructive influences of fire and exposure to the elements.**

# WHY TEETH?

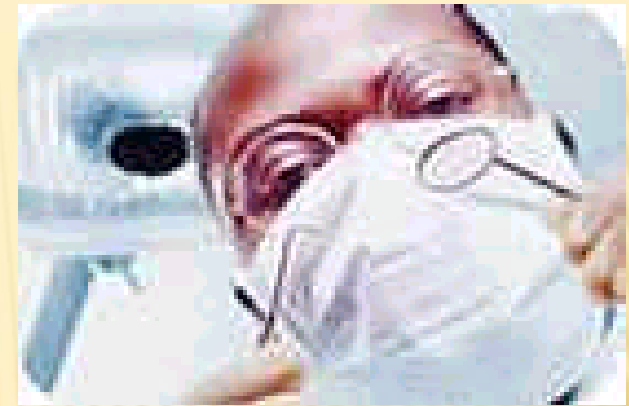


Every human body ages in a similar manner, the teeth also follow a semi-standardized pattern. These quantitative measurements help establish relative age of person.

Each human has an individual set of teeth which can be traced back to established dental records to find missing individuals.

Teeth is made of enamel (hardest tissue of the body) so it can **withstand trauma** (decomposition, heat degradation, water immersion, and desiccation) better than other tissues in body.

Teeth are a **source of DNA**: dental pulp or a crushed tooth can provide nuclear or mitochondrial DNA that to help identify a person.



The THEORY behind forensic dentistry is that **no** two mouths are alike (even identical twins are different), and that teeth, like tools, leave recognizable marks.

# HISTORY

---

- ✘ The earliest known identification from teeth is in 1775 by Dr. Paul Revere. who identified the body of Dr. Joseph Warren  
Paul Revere made a silver bridge for Dr. Joseph Warren.  
The man was killed in the Revolutionary War.  
Body was in mass grave and identified by his silver dental work  
.
- ✘ 1849 – Mass deaths at Vienna Opera House Fire  
Dental evidence is first admitted into court system in US



# FORENSIC ODONTOLOGY

---

is derived from Latin, meaning forum or where legal matters are discussed. Most forensic dentists are board certified and members of professional organizations, although it is possible to work in the field without special qualifications.

- 
- ✘ Forensic dentistry relies on the detailed knowledge of the teeth and jaws possessed by a dentist. This skill incorporates an education in dental anatomy, radiographs and their interpretation, pathology, dental materials, and developmental anomalies.



---

**Forensic identification plays a major role in man-made or natural disaster. Dental identification of humans occurs in a number of different cases:**

- 1. The bodies of victims of violent crimes, fires, and motor vehicle accidents,**
- 2. Persons who have been deceased for some time prior to discovery,**
- 3. Those found in water, can be disfigured to such an extent that identification through conventional methods are difficult.**

# TEETH BASICS

Approximately 32 teeth in adult mouth

Four types of teeth:

Molars

Premolars

Canine

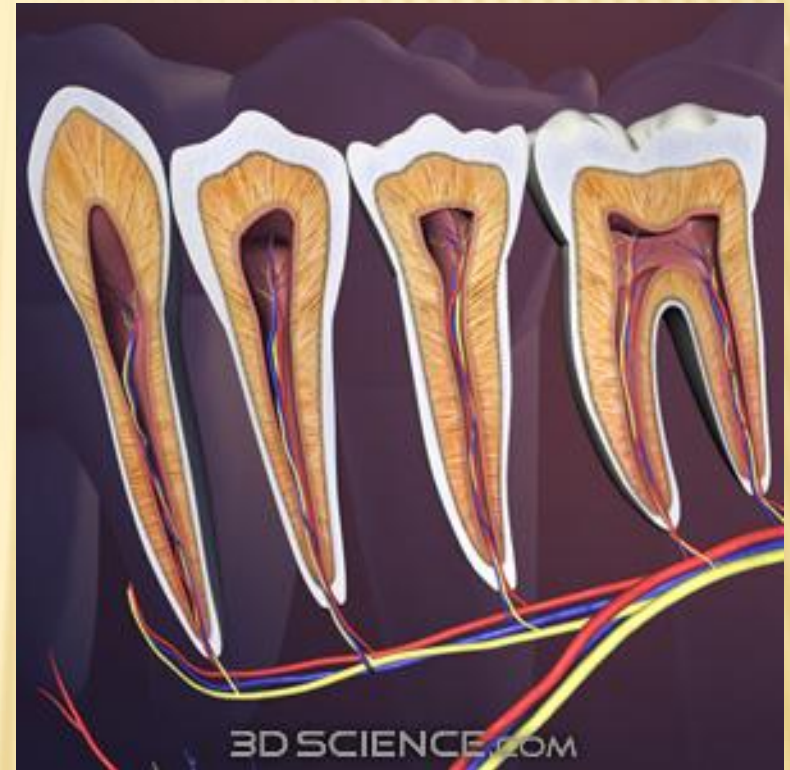
Incisors

Teeth differ in:

Size

Shape

Root type



Types of teeth.  
Left to right: Incisor, Canine, Premolar, molar.

# INDIVIDUAL CHARACTERISTICS

- Size of tooth
- Shape of tooth
- Shape of root
- Placement of tooth
- Quantity of teeth
- Quantity of teeth
- Combinations of dental work done:
  - Crowns
  - Extractions
  - Bridge
  - Fillings
  - Root canals



Various dental work

---

In the case of forensic dentistry, experts (forensic dentists) can use dental records for:

## **I. Identification of found human remains:**

It was done by using dental records. The principle of dental identification is that postmortem dental remains can be compared with antemortem dental records, including

- written notes,
- study casts,
- radiographs,
- photographs etc, to confirm identity.

If there is no ante-mortem dental records, a postmortem dental profile will typically provide information on the victim's

---

## **1-Age:**

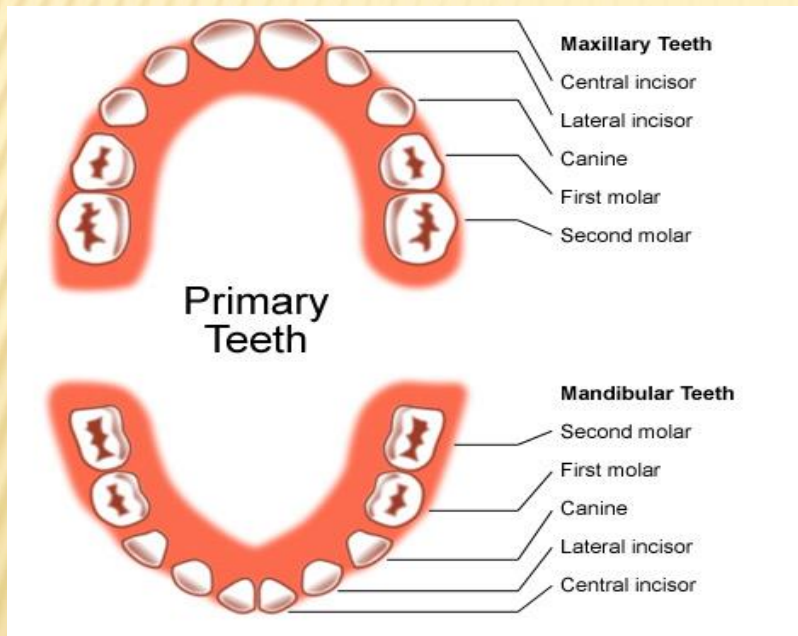
The estimation of age at time of death is often an important step in the identification of human remains. If this age can be accurately estimated, it will significantly narrow the field of possible identities that will have to be compared to the remains in order to establish a positive identification.

- ✘ **In children:** The patterns of tooth eruption, the root length, tooth wear were assessed.
- ✘ **In young adults:** The third molar development.

- 
- ✘ In middle-aged and older adults: Periodontal disease progression, excessive wear, multiple restorations, extractions, bone pathology and complex restorative work were assessed. Recently, dentine composition and cementum deposition were examined in relation to age determination.

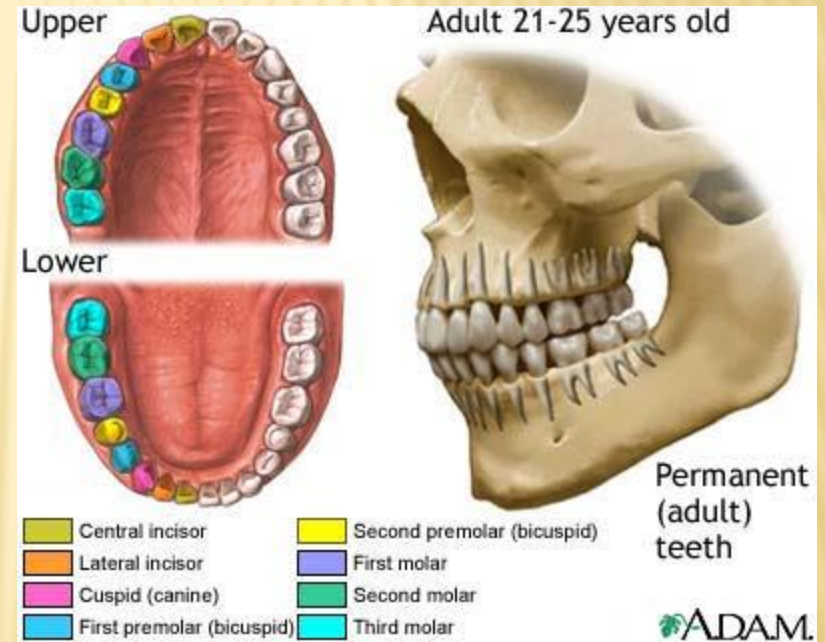
# TEETH THROUGH THE YEARS

## CHILDHOOD



- ✘ Primary teeth sprout from milk buds and are temporary. Once they fall out, permanent teeth as seen on the other side appear.

## ADULTHOOD



- Permanent adult teeth come in when primary teeth fall out; they are permanent because they establish roots inside the gums. Third molar come in around the mid teenage years.

## 2-Race:

can be assessed from skull shape and form. Additional characteristics, such as cusps of Carabelli, shovel-shaped incisors and multi-cusped premolars.

## 3-Gender

can be assessed from

- ✘ Skull shape and form, ( no gender differences regarding teeth morphology).
- ✘ Presence or absence of Y-chromatin in teeth.
- ✘ DNA analysis.

The teeth, in particular canines are larger in males than in females but this method is insufficiently accurate when other objective methods are available.



---

4- **Socio-economic status** :can be assessed through the quality, quantity and presence or absence of dental treatment.

dietary habits and dental or systemic diseases. The presence of erosion can suggest alcohol or an eating disorder while stains can indicate smoking, tetracycline. Unusual wear patterns may result from pipe stems, cigarette holders.

---

## II. Identification the suspect through the

assessment of bite mark injuries in cases of abuse in (child, spousal, elder) and in women during sexual attacks. Bite marks can be found on:

- ✘ the victim (by the attacker),
- ✘ the attacker (suspect) when a victim attempts to defend himself,
- ✘ an object found at the crime scene.

The first published issue based on bite marks , was depend on a piece of cheese found at the crime scene.

# TYPICAL PRESENTATION OF BITEMARK INJURIES

Human bite marks may be found on almost all parts of the human body skin. In defensive circumstances, the arms and hands are often bitten. A representative human bite is described as an elliptical or circular injury that records the specific characteristics of the teeth. Alternatively, it may be composed of two U-shaped arches that are separated at their bases by an open space. The injuries caused by teeth can range from bruises to scrapes and cuts or lacerations.

## BITE MARKS



## EXAMPLE OF BRUISING LEFT FROM BITE MARK.



# TYPICAL PRESENTATION OF BITEMARK INJURIES



---

It is possible to identify specific types of teeth by their class characteristics. For example, **incisors** produce **rectangular** injuries and **canines** produce **triangular** injuries. Other characteristics include fractures, rotations, attritional wear, congenital malformations, etc. When these are recorded in the injury it may be possible to compare them to identify the specific teeth (person) that caused the injury.

# **EVIDENCE COLLECTION FROM THE BITE VICTIM**

---

Dentists should be familiar with the general principles of evidence collection. These are:

## ***1. Documentation***

Make a descriptive record of the injury, including the physical appearance, color, size and orientation of the injury, location on the body, relative contour and elasticity of the site, and types of injuries.

## ***2. Photographs***

Take photographs, both color and black-and-white films. A reference scale (ruler) should be placed in the same plane as the injury and visible in the photographs to enable subsequent measurements.

### **3. *Saliva swab***

---

- a.** Saliva will have been deposited on the skin during biting and this should be collected and analyzed.
- b.** A buccal swab or a sample of whole blood must be collected from the victim at this time to assess the victim's DNA. This will enable analysis of any mixtures that are found in the sample from the bite.

### **4. *Impression***

Fabricate an impression of the bitten surface to record any irregularities produced by the teeth.



# EVIDENCE COLLECTION FROM THE BITE SUSPECT

---

The following evidence are recovered during examination of the bite mark suspect:

## ***1. Clinical examination***

The extra and intra-oral structures are examined and are noted on a dental chart. Special attention is focused on the status of the dental health, occlusion and mandibular articulation, tooth mobility, periodontal pocketing, dental restorations,, fractures, caries, etc., and the function of masticatory muscles.

---

## **2. *Photographs***

**Full facial and profile photographs are produced in addition to frontal and lateral views of the teeth in occlusion.**

## **3. *Impressions***

**It is necessary to produce extremely accurate study casts of the teeth that record all characteristics of the dentition.**

---

#### **4. *Bite sample***

A sample of the suspect's bite is recorded in centric occlusion using a wax.

#### **5. *Salivary sample***

Saliva is also taken for DNA testing.

---

## **Factors that may affect the accuracy of bite mark identification include:**

- 1. Time-dependent changes of the bite mark on living bodies,**
- 2. Effects of where the bite mark was found,**
- 3. Damage on soft tissue,**
- 4. Similarities in dentition among individuals,**
- 5. Poor in techniques, exa. photography, impressions.**

---

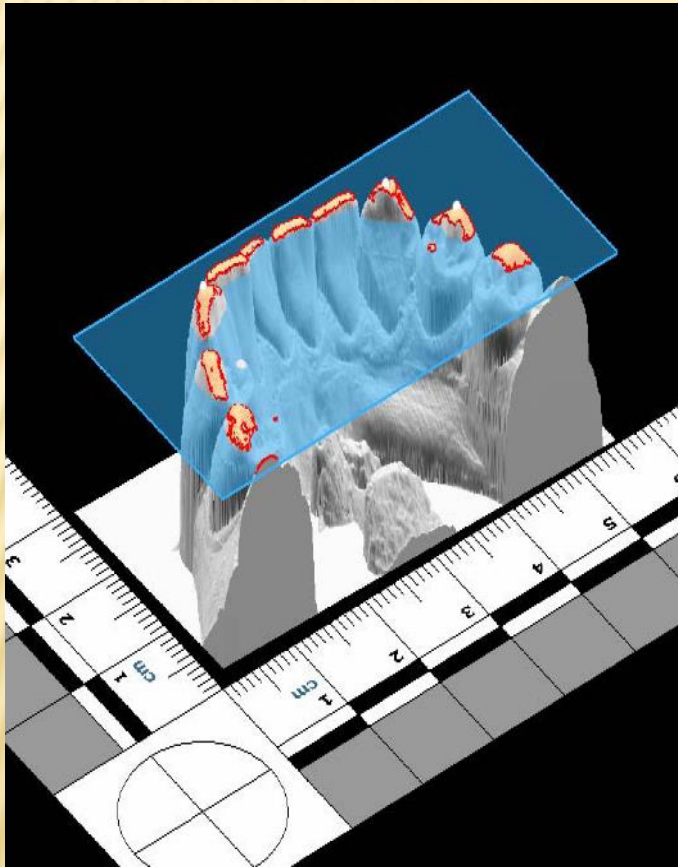
**Also dental profiles of the suspect are subject to change by time, for example**

**1. Loss of teeth.**

**2. Teeth attack by dental caries.**

**So, the suspect's DNA profile obtained from saliva or blood with salivary DNA surrounding the bite mark area proves to be a more reliable form of identification.**

# COMPUTER ODONTOLOGY



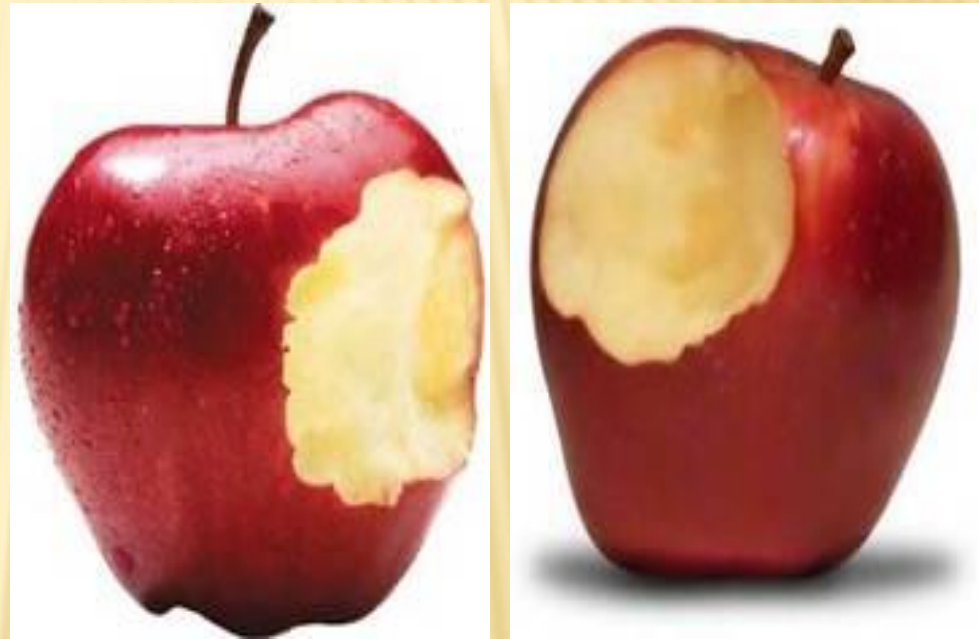
- Automatic dental code matching
  - Bites are run through the computer to find a match
- OdontoSearch
  - Compare a data base of missing peoples, felons, government workers
- Automatic dental identification system
  - A few minutes will produce a list of people who have the same dental code number
- 3D Bite mark analysis
  - 3D scans of dental casts are used to generate overlays using various pressure and deviation.
  - The overlays are compared with the photograph of the bite marks.

# Finally.....

---

Dentist not only improves health by doing treatment in private clinic or preventive program in a community, but also play a major role in **justice achievement.**

- The shape or curvature
- No. of tooth marks
- Horizontal diameter
- Vertical diameter
- Depth of depression
- Distances between two teeth
- Orientation of each tooth
- Other reasonable answers





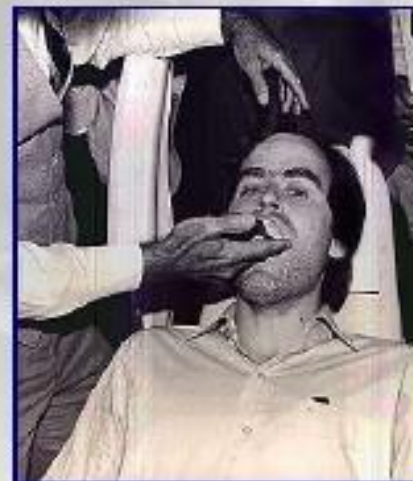
# Forensic dentists are responsible for four main areas of practice:

@Identification of found human remains & Dental profiling.



@Age estimation

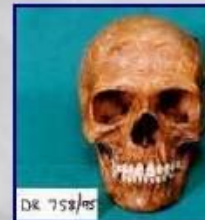
@Assessment of bite mark



@Assessment of cases of abuse

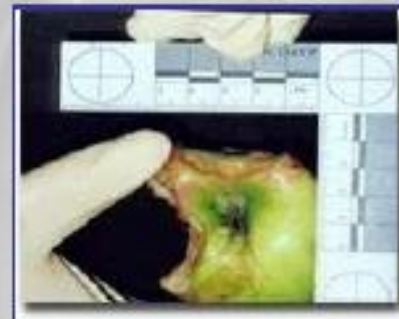
## *Dental profiling*

- @ The forensic dentist can often produce a "picture" of the general features of the individual.
- @ This process is known as post-mortem dental profiling.
- @ Sex and race
- @ skull appearance
- @ Additional characteristics
- @ The age of children
- @ socio-economic
- @ erosion and abrasion
- @ source of DNA

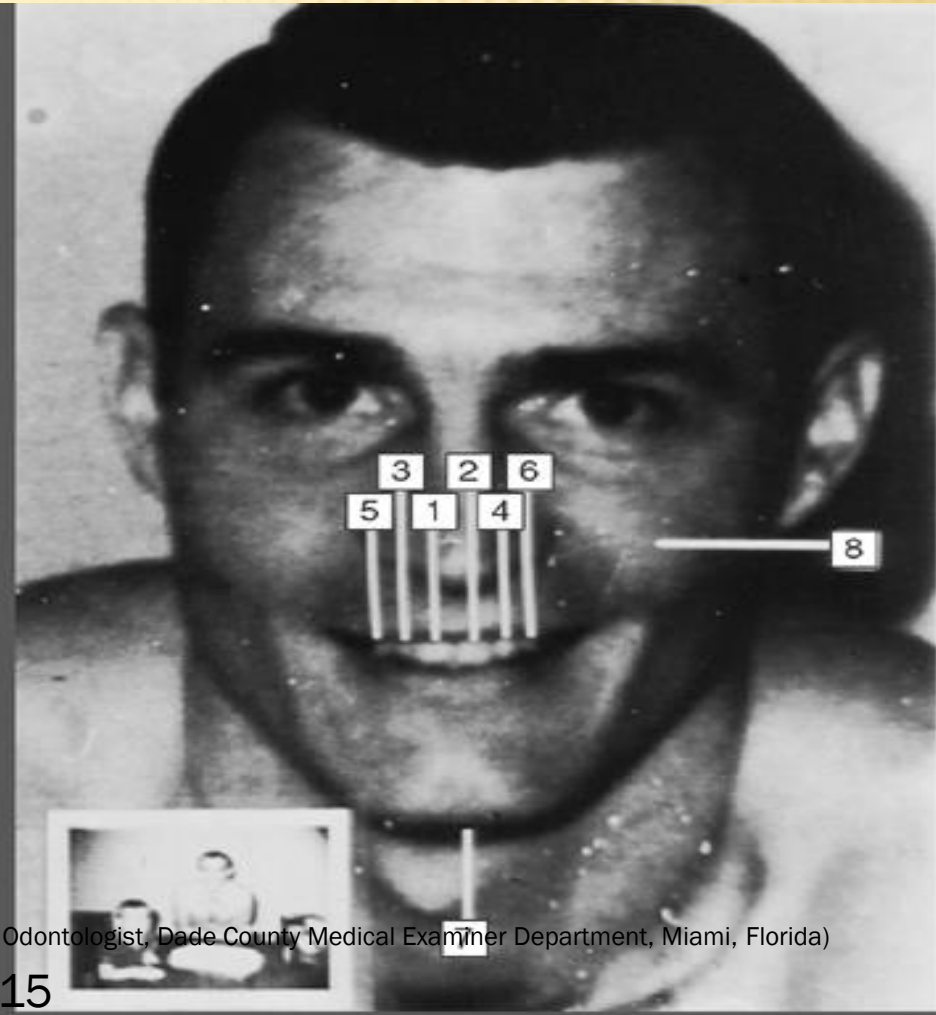
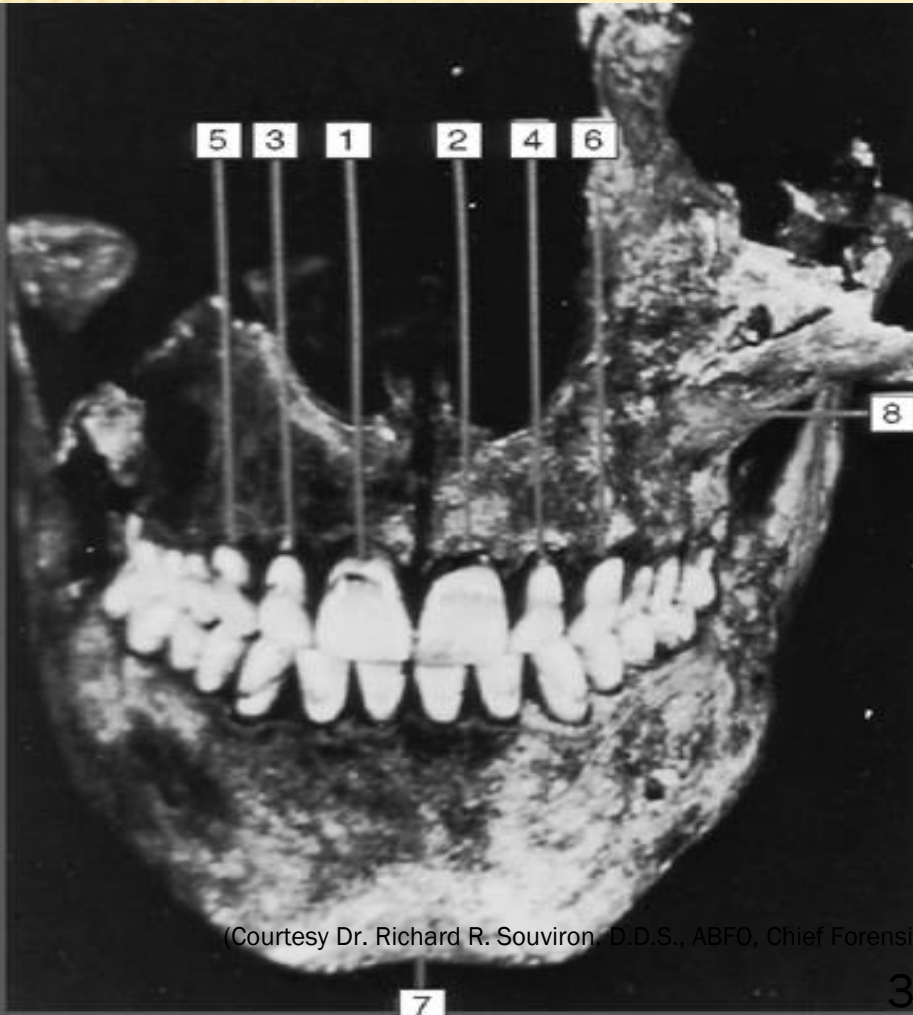


# Bite mark

- What is bite mark?
- Where can you find bite mark?
- any roughly semicircular bruise between 4 and 5 cm diameter should be treated as suspicious.
- Dead or alive
- Special marks



# DENTAL COMPARISON



(Courtesy Dr. Richard R. Souvion, D.D.S., ABFO, Chief Forensic Odontologist, Dade County Medical Examiner Department, Miami, Florida)