

Paleopathology – notes for Human biology course

Paleopathology

- the study of ancient diseases
- the health status of past populations can be investigated by recording the conditions that affected the human beings (skeleton)
- it is useful in understanding the history of diseases, and uses this understanding to predict its course in the future
- paleopathologists are ultimately looking at skeletal material which provides evidence of abnormalities that could be disease related
- cause of death can only be determined in a small percentage of burials
- important information:
 - localization of anomalies
 - size and shape of anomalies

- **Antemortem:** “before death.” Refers to injuries or events that occurred during life. Examples include conditions that alter the natural form of the bone such as healed fractures, infections or nutritional deficiencies.
- **Perimortem:** “around death”. Refers to injuries or events that occurred at or around the time of death. Note: this term does not distinguish between an event that occurred immediately after death from one that occurred at the time of death.
- **Postmortem:** “after death.” Refers to events or influences that occur after the time of death. This includes human, animal, insect, plant or environmental factors that change the condition of human remains.

- **skeletal responses to pathogens:**
 - resorption (break down) or deposition (building)
 - interruption of normal development: malnourishment in childhood causes the disruption of bone growth
 - tooth enamel also reflects childhood stress and malnourishment in an irregular series of lines.
 - arthritis results in an accumulation of bone tissue around an afflicted area
 - various infectious diseases may result in bone loss and pitting or the deformation of the skull and other bone surfaces

Limitations of paleopathological studies:

- the study is restricted to those diseases that affect the skeleton
- unknown history from the patients

- Categories of pathological abnormalities of the skeletal system:
 - Congenital anomalies
 - Traumatic injuries
 - Joint diseases
 - Infectious diseases
 - Metabolic diseases
 - Haematological diseases
 - Nutritional disorders
 - Tumors
 - Dental diseases

Congenital anomalies

- the anomalies or congenital malformations have been described even from the oldest of times
- they are produced by the pathological modifications of the normal development during the intrauterine life
- they may vary from light to severe or even lethal deformations, leading to the decrease of the expectation of life or its quality
- during prehistoric times, the congenital malformations were less frequent identified because most of the affected children died shortly after birth or later because their fragile skeletons could not survive the taphonomic process
- *cleft palate*: the two plates of the skull that form the hard palate (roof of the mouth) are not completely joined
- *premature closure of sutures*: one or more of the fibrous sutures in an infant skull prematurely fuses by turning into bone (ossification), thereby changing the growth pattern of the skull
- *hip dislocation*: abnormal formation of the hip joint in which the acetabulum and femoral head are misaligned; resulted in distinctive skeletal changes that would have severely impacted the lifestyle of an afflicted individual in ancient times
- *polydactyly*: supernumerary fingers or toes; the extra digit is usually a small piece of soft tissue that can be removed; occasionally it contains bone without joints; rarely it may be a complete, functioning digit
- *spina bifida*: the most common congenital malformation localized at the level of the spinal column; the osseous median line is incompletely closed
- *bifid rib*: the anterior end of the rib is bifurcated: sternal end of the rib is cleaved into two

Traumatic condition

- an injury to living tissue that is caused by a force or mechanism extrinsic to the body
- many sources: guns, carnivores, falling, surgery, etc.
- *dislocations*: a dislocation (or luxation), occurs when the articular surfaces of a joint are totally displaced from one another; movement of joint participants out of alignment, often we get new articular surfaces forming, holes associated with bone
- *fractures*: a fracture consists of an incomplete or complete break in the continuity of a bone
- *trephinations and amputations*: *trephination*: partial or complete penetration of the bone cortex by cutting, piercing, drilling, or scraping, such as the excision of pieces of cranial vault bones; *amputation*: amputation of a limb segment
- *weapon wounds, surgery, sharp instruments*: *gun shot*: entrance wound, fairly round hole if enter perpendicular, inter table of entrance would have peeled, less radiating fractures; *sharp force weapon injuries*: the marks were left by a sharp instrument on the bone
- *scalpings*
- *deformations*: *sharp force weapon injuries*: the marks were left by a sharp instrument on the bone
- *pregnancy-related traumas*

Joint diseases

- *arthritis*: inflammation of a joint, probably in most people over 40, most common places to find is in the vertebral column, porosity and lipping on subchondral bone; damage to joint cartilage

Infectious diseases

- microorganisms gain entrance (via blood, lymphatic system)
- necrotic bone: blood supply interrupted
- specific infections: organism known, e.g., tuberculosis, leprosy, syphilis, yaws
- non-specific infections: organism not known, e.g. osteitis, periostitis, osteomyelitis
- **TBC**: microbes (*Mycobacterium tuberculosis*) native to domesticated animals, and began to be transmitted to humans in Neolithic times (about 10,000 B.C.), when people began keeping dairy herds
TBC passed in milk; the most characteristic skeletal lesion is the deformity caused by collapsed spinal vertebrae (Pott's disease)

- **Leprosy:** caused by a parasite: *Mycobacterium leprae*; needs a history of long-term contact with infected individuals
- **Syphilis:** caused by *Treponema pallidum*, which probably evolved in the Old World around 7000 B.C., spreading in areas with warm climates

Metabolic diseases

- **Osteoporosis:** decrease in bone density, tend to break easily, feel lighter, compress with very little force

Haematological diseases

- interruption of the blood supply to bone may result in different manifestations, and may lead to bone death (i.e. necrosis)
- can be caused by diet (iron deficiency): anaemia (porotic hyperostosis)

Nutritional disorders

- skeletal disorders that are directly or indirectly caused by a lack of essential nutrients in the diet
- *Rickets:* vitamin D deficiency; vitamin D deficiency, necessary for calcium absorption, bones unable to ossify properly, often results on bowed legs
- *Scurvy:* vitamin C deficiency
- *Fluorosis:* fluor deficiency (overexposure)

Tumors

- mass, swelling or enlargement or necrosis
- benign or malignant
- tumors in other tissues can cause bone remodelling and resorption

Dental diseases

- **Periodontal diseases:**
 - periodontitis is inflammation of the area around the tooth
 - often caused by calculus that becomes calcified, and often pushes on the soft tissue and causes bone to resorb periodontal ligaments destroyed
 - its antemortem tooth loss often occurs
- **Caries:** decalcification of enamel and dentine, caused by sugars and carbohydrates
- **Enamel hypoplasia:**
 - represents interruptions of amelogenesis, seen in the enamel, systemic events that cause your body to send energy to somewhere else, like trauma
 - lines, pits, grooves on the crown