TEMPORAL BONE PNEUMATISATION

- Pneumatization of temporal bone is divided into 5 compartments:
  1. Middle ear
  2. Mastoid
  3. Perilabyrinthine
  4. Petrous apex
  5. Accessory: This region include Squamous, zygomatic, occipital and styloid cells.

- Penumatization of temporal bone follows definite cell tracts. These tracts include:
  1. Posterosuperior cell tract
  2. Posteromedial cell tract
  3. Subarcuate cell tract
  4. Perilabyrinthine cell tract
  5. Peritubal cell tract

These tracts communicate with each other.

POSTEROSUPERIOR AND POSTEROMEDIAL CELL TRACT:

- These tracts extend medially through the antrum to pneumatize the medial pyramid. The posterosuperior tract lies above the level of Internal acoustic meatus.

SUBARCUATE TRACT

- This tract arises more medially from the mastoid antrum, extending anteromedially passing below the ARC of superior semicircular canal (So SUBARCUATE). This tract often participates in the formation of posterosuperior tract and may pneumatize the petrous apex.

PERILABYRINTHINE CELL TRACT

- This tract pneumatizes the labyrinthine area. It divides into supralabyrinthine and infra labyrinthine tracts.

PERITUBAL CELL TRACT

- This tract pneumatizes the tubal and peritubal area.

FUNCTIONS OF TEMPORAL BONE AIR CELLS

1. Sound reception
2. Resonance
3. Insulation
4. Supplementary air reservoir
5. Sound dissipation
6. Lightening the weight of skull
7. Protection against injury
PNEUMATIZATION OF MASTOID REGION IS OF THREE TYPES

1. Sclerotic mastoid – Absent pneumatization. Dense bone in non pneumatized area.
2. Diploic mastoid – Partial pneumatization. The non pneumatized area is filled with bone marrow.
3. Pneumatic mastoid – Complete pneumatization

- The process of pneumatization begin between **22-24 weeks** of fetal life, and continues till the child reach the age of **8 yrs**. The development of air cavities begin with the formation of bony cavities. This process is dependent on the normal periosteal activity. This cavity is known to contain primitive bone marrow. This bone marrow gets transformed into loose mesenchymal connective tissue. This cavity gets invaded by mucosa from the middle ear cavity.
- Temporal bone pneumatization is symmetrical in **75%** of normal individuals. Any asymmetrical pneumatization indicates middle ear disease.

THEORIES OF PNEUMATISATION

1. Theory of Active Endodermal epithelization
2. Mesodermal theory of potential space formation in bone marrow
3. Theory of mastoid plate retraction
4. Hypothesis of Whitmaack
5. Bateman theory
6. Diamant theory
7. Redui Theory
8. Tumarkin theory
9. Thorburn

THEORY OF ACTIVE ENDODERMAL EPITHELISATION

- Resorption of diploic bone on active invasion by epithelial cells originating from primitive tympanum.
- Epithelial invasion gives rise to mastoid air cells and air cells in relation to labyrinth.
- Vital process of pneumatisation begins in most cases before birth though **mastoid eminence** becomes prominent after birth only.

MESODERMAL THEORY OF POTENTIAL SPACE FORMATION IN BONE MARROW

- Mesodermal theory of potential space formation in bone marrow with aeration through breakdown of walls partly.

THEORY OF MASTOID PLATE RETRACTION

- This theory sees the growth of mastoid as a response to its muscle bearing duties resulting in a separation of the inner and outer plates due to pull of Muscles.
- In the potential space thus formed air enters simply as a result of atmospheric communication via eustachian tube.
- Blockage of this middle ear communication before completion of pneumatisation will result in variations or loss of pneumatization.
HYPOTHESIS OF WHITTMACK

- Mucous membrane influences the development of mastoid air cell system and normal mucosa results in a well developed mastoid air cell system.
- During birth meconium or vernix caseosa may enter the middle ear and produce a pathological type of mucosa and infantile otitis may accomplish same effect.
- This pathological mucosa will lead to inhibition or retraction of the process of pneumatization of air cells.
- The pathological types of mucosa govern development of chronic suppurative otitis media.

BATEMAN THEORY

- Stated that COM is a result of infection in acellular mastoid.

DIAMANT THEORY

- Stated that degree of pneumatization is determined by hereditary factors.

REDUI THEORY

- Necrotizing otitis media in infants can arrest pneumatization by destroying the mucosa and replacing it with connective tissue and eventually a sclerotic bone.

TUMARKIN THEORY

- Eustachian tube obstruction with resultant intratympanic vaccum leads to arrest in pneumatization.
- This occurs in young children as a result of infection and enlargement of adenoids.

THORBURN THEORY

- It’s not the persistent eustachian tubal obstruction which is the common feature of chronic middle ear disease. Although intramastoid negative pressure is probably the limiting factor in pneumatization.
- Intramastoid negative pressure can develop by persistent obstruction of ventilation between the mesotympanum and epitympanoantral segment without persistent eustachian tubal obstruction.