# RESULTS

The electron microscopic examination of the normal middle ear mucosa showed that it is formed of only one layer of flat to cuboidal epithelium resting on a very clear basal lamina. Collagenic fibres in the form of bundles were seem passing in different directions parallel to the basal lamina, oblique or even anchored to the basal lamina. The lining cells are even adhered together through tight junctions and have irregular flat nuclei which showed mostly euchromatin than heustachian tubeerochromatin and the cytoplasm was rich in smooth endoplasmic reustachian tubeiculum (Fig. 1).

The cells with high magnification showed no cilia or microvilli (Fig. 2). The lamina propria which contained normal blood capillaries rested on intact basal lamina; as well, the endothelial cells lining the proprial vessels revealed an electron dense cytoplasm. The blood vessels also exhibited short microvilli on the inner surface of endothelial cells (Fig. 3). Moreover, the nuclei of the endothelial vascular cells had an irregular contour. Numerous collagenic fibriles were seen sourrounding the proprial vessels (Fig. 4). The endothelial cells of blood capillaries had a ruffled appearance due to many microvilli (Fig. 4).

Fibroblosts are seen within the lamina propria, each is characterized by irregular cellular processes. The cytoplasm is rich in rough endoplasmic reticulum and mitochondria. The nucleus has electron dense heustachian tubeero- chromatin, the later is rare interiorly. The nucleulus is found peripherally mostly adhering to the nuclear membrane. The most striking picture of fibroblasts is its relation with bundles of collagenic fibres passing in different directions and appearing to be derived from these cell which is the mother of these fibres (Fig. 5).

Different connective tissue cells are also seen as lymphocytes, large, intermediate and small lymphocytes as well as polymorphonuclear cells. The lymphocytes are also rich in rough endoplasmic reticulum and contain many mitochandria. The cells revealed secondary lysosotitis media with effusions and many vacuoles (Fig. 6).

Connective tissue macrophages with irregular, electron dense nucleus, vacuoles in the cytoplasm and secondary lysosomes were also encountered (Fig. 7).

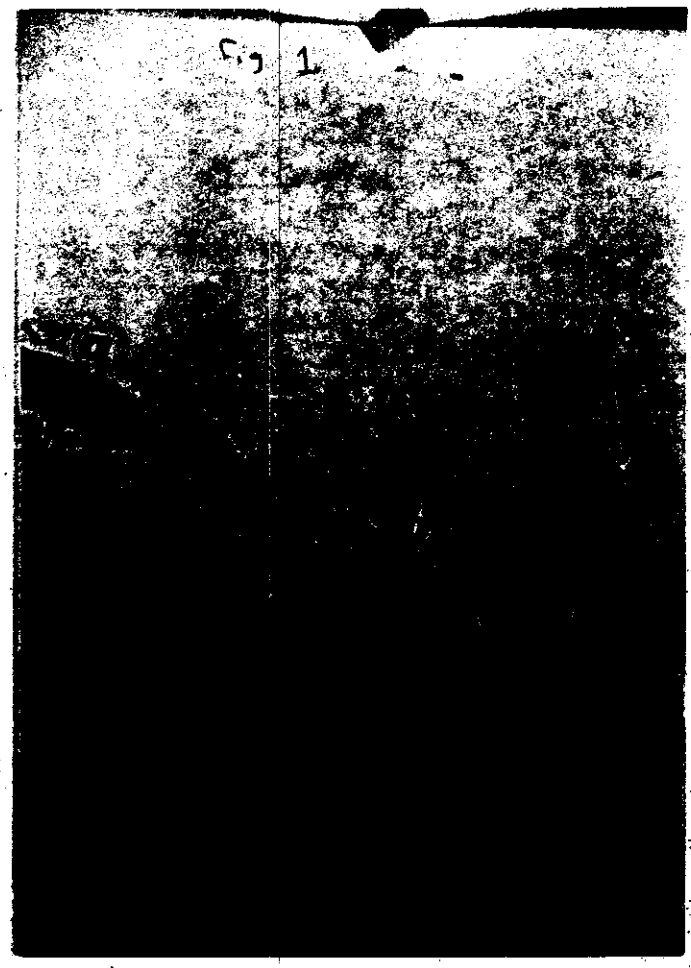

**Fig. (1):** Electron micrograph of the control middle ear mucosa revealing flat, cuboidal cells (a,b and c) resting on basal lamina (bm). Collagen fibrils (F) are also seen. (2.7 x 1000).


**Fig.(2):** Higher magnification of figure (1) no cilia or microvilli of the lining epithelium Normal capillaries are seen resting on intact basal lamina (arrows)
(5 x 1000).

**Fig. (3):** Electron micrograph of the control middle ear mucosa showing electron dense cytoplasm in the endothelial cells lining the proprial blood vessels (D) which rest on intact basal lamina (bm), microvilli (m) (40 x 1000).


**Fig. (4):** Electron micrograph of control middle ear mucosa. The proprial blood vessels showed short endothelial microvilli (V) giving a ruffled appearance. The nuclei of the endothelial vascular cells have an irregular contours (c). Numerous collagen fibrils are seen sonrrounding the proprial blood vessels (F) (6 x 1000).


**Fig. (5):** Electron micrograph of the control middle ear mucosa showing fibroblsts having cellular processes (p). The nucleus has electrnodense peripheral heterochromatin. The nucleulus (n) is found peripherally. The collagen fibrils (F) appear to be derived from the fibroblasts (10 x 1000).


**Fig. (6):** Electron micrograph of the control middle ear mucosa. The lamina propria shows large (L), intermediate (im) and small (S) lymphocytes polymorph nuclear cells (P) are also seen (5 x 1000).

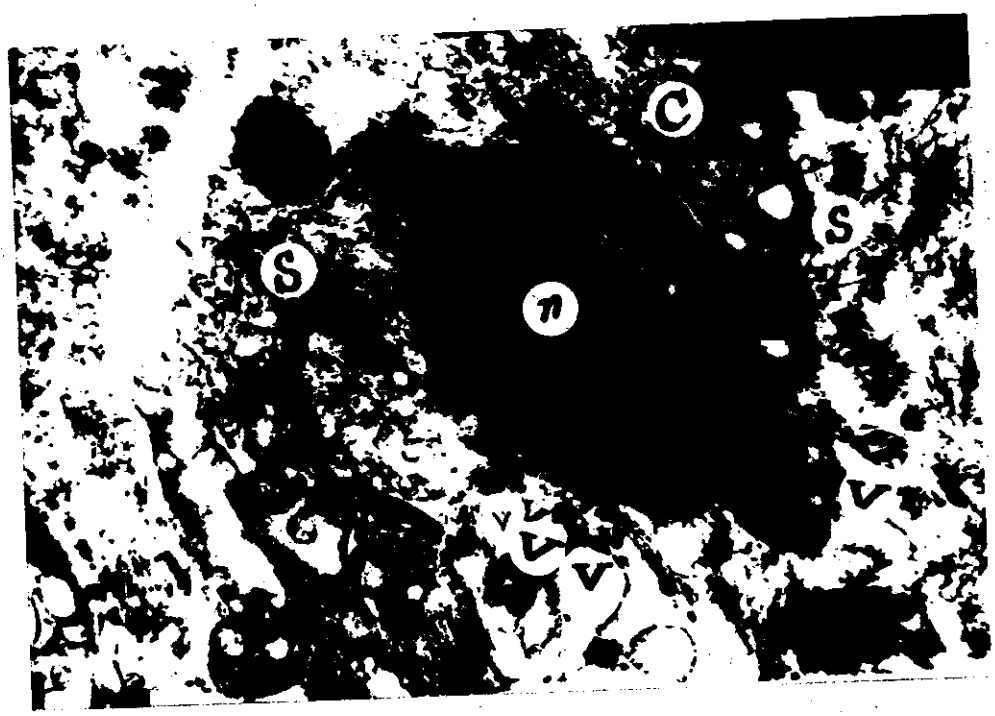


**Fig. (7):** Electron micrograph of control middle ear mucosa showing macrophages having an irregular dense nucleus (n), vacules (v) in the cytoplasm (c) and secondary lysosomes (s) (5 x 1000).

## Operated ears :

**After 2 days of platelet activating factor injection :**

On dissection of the temporal bone and thinning of its tympanic bulla to obtain a specimen of the middle ear mucosa, there was found a marked thickening and congestion of the mucosa. The tympanic bulla was found filled with fluid of light reddish colour Fig. (8).

Electron microscopic study of the specimens 2 days after platelet activating factor injection, revealed a degree of inflammation in all operated ears. In addition to the encountered epithelial changes, the lamina propria showed oedema, haemorrhage, congested blood vessels and infilteration with macrophages, polymorphenucelar cells and plasma cells. The electron microscopic examination of the middle ear mucosa in group II revealed tall columner cells (Fig.9). In soome sections, the cells carried distinct cilia and microvilli. The cells could be differentiated into light, intermediate and dark cells. The nuclei of the former cells were irregular in their contours and have mostly peripheral thin heterochromatin rims (Fig. 9). By higher magnification, the cells revealed cytoplasmic fine granular matrix of electron dense and electron lucent forms as well as destructed cristae of mitochondria. The mitochondria were still intact while another mitochondria was still showing its cristae. The intercellular junctional complexes were still intact (Fig. 10).

In otitis media with effusion regions of the epithelium, invading polymorphonuclear cells with their specific cytoplasmic electron dense granules and lobulated nucleus could be seen in between the lining cells of middle ear. The cells lining the tympanic cavity had friable microvilli and few cilia which were liable to destruction. As well under the epithelium are present many polymorphnuclear cells (Fig. 11 and 12).

In Other regions, multilayered epithelium could be recorded, so 2 layers of epithelial cells were easily seen. The superificial cells had microvilli and were rich in dilated smoth endoplasmic reticulum while the nuclei were euchromatic and only the heterochromatin was representd by thin peripheral zone electron dense region. Though the extra layer cells revealed no cilia, the one layer cells had very distinct cilia and numerous microvilli. The nuclei of the basal cell layer were also more euchromatic, with only peripheral thin zone of heustachian tubeerochromatin. The nuclei of all types of cells showed an irregular contour. Related to the basal lamina of the epithelium are present many macrophages with indentated nucleus. The latter cells press on the basal lamina toward the bases of epithelial cells (Fig. 13).

The superficial cells of multilayered epithelium revealed a striking picture of dilated smooth endoplasmic reticulum

having different profiles. The superificial epithelial cells had less organelles and invaded in between by many macrophages and polymorphonuclear cells (Fig. 14). On the other hand, the deeper cells of the epithelium revealed lesser dilated endoplasmic reticulum.

In general the mitochondria of all epithelial and invading polymorphnuclear cells in between the epithelial cells revealed many broken mitochondria which formed vaculated bodies after the destruction of their crista (Fig. 14, 15, 16). Cell exfoliation and desquamation were common to occur here and there at vast areas of mucosa.

In the lamina propria, areas of oedema appeard in the form of widely dispersed connective tissue constituents. Other locations showed haemorrhagic spots which was reflected by ozing of red blood cells and expanding the loose connective tissue in which the blood constituents were trapped.

Also the subepithelial propria revealed congested blood vessels. The blood vessels had compleustachian tubeely bloked lumen with red blood cells. The endothelial lining cells exhibited intended nuclei of mostly peripheral heterochromatin in a thin zone. The nucleolus was adherent to the heterochromatin related to the nuclear membrane as well the cytoplasm of these endothelial cells had dilated tubules of smooth endoplasmic reticulum.

On the other hand not all the blood vessels were congested but some showed no luminal blood so their endothelial cells revealed no dilated smooth endoplasmic reticulum, but their mitochondria had an electron dense entities (Fig. 17). The inner membrane of the endothelial cells has short and thick processes or microvilli giving ruffling appearance, wholly the blood vessels were related to distinct collagenic fibrils with higher magnification of these walls of these blood vessels, fenestrae were revealed (Fig. 18).

As regards the infilterating cells of the propria of the middle ear mucosa, very numerous polymorphonuclear cells were seen. the polymorphonuclear cells showed different stages of changes. Sotitis media with effusion polymorphonuclear leucocytes show karyorrhexis, few primary granules of large size and slight electron dense entity and numerous secondary electronodense granules of spherical or elongated figures. Also large light vacuoles were present through the cytoplasm as remanants of digested matters especially mitochondria or destructed parts of nuclear lobuls. Adjacent to this, polymorphonuclear leucocytes are present remanants of destructed ones and oozed blood cells in the stroma of the propria (Fig. 19).

Moreover, the propria revealed few number of plasma cells and large lymphocytes. The latter had its specific nucleus

with peripherally arranged heterochromatin but with week floctuating nuclear membrane. The mitochrondria of their cytoplasm lost their cristae and their matrix were granular. Other mitochondria revealed, higher non granular matrix. The rough endoplasmic reticulum lost its cisternal regular arrangement and become dilated and contained granular constituents (Fig. 20) but lost their ribosomes.

**After 2 days of eustachian tube obstruction :**

Of the 10 left ears with eustachian tube obstruction, one animal showed postoperative wound infection and the left temporal bone of this animal was excluded. The electron microscopic changes seen in the mucoperiosteum following eustachian tube obstruction were nearly similar to those seen after platelet activating factor injection. The mucosa of the remaining animals showed marked oedema. The vessels were dilated and congested, with hemorrhagic spots or extravasated (RBCs) and fluid accumulated in the lumina propria accompanied by disruption of collagen bundles (Figs. 21, 22, 23). However, the epithelium remained flat and no inflammatory cellular infilteration was seen. Signs of fibrosis could not be detected


**Fig. (8):** Showing normal temporal bone ® and another temporal bone (L) 2 days after platelet activating factor injection. The reddish colour of the mucosa is seen (arrow).

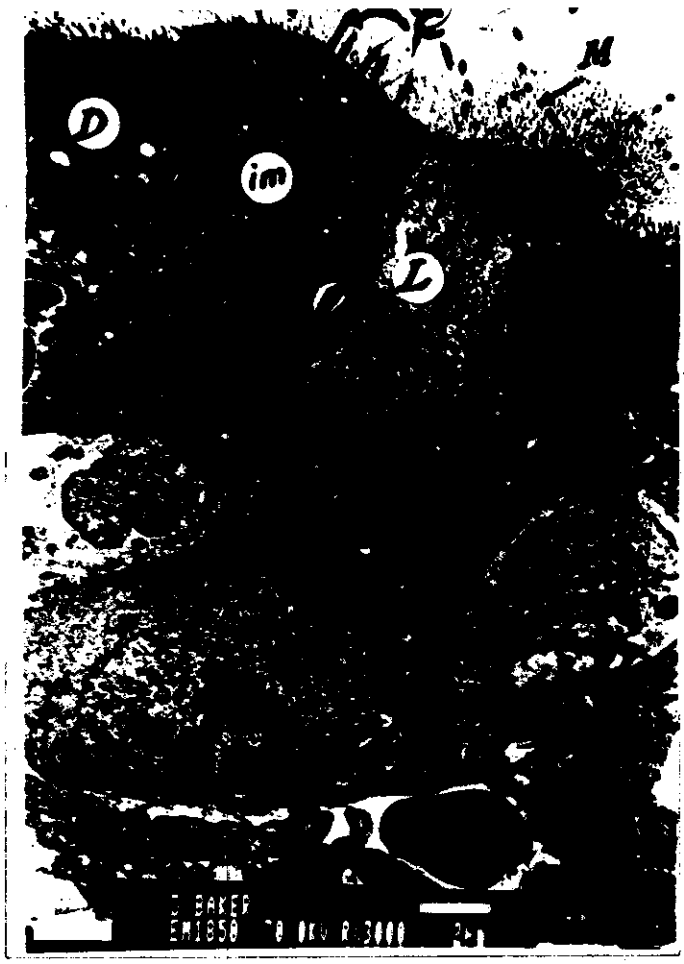


**Fig. (9):** Electron micrograph of middle ear mucosa 2 days after platelet activating factor injection. showing tall columner cells with cilia (C) and microvilli (M). Light (L) intermediate (im) Dark cells (D) are seen (3 x 1000).


**Fig. (10):** Electron micrograph of middle ear mucosa 2 days after platelet activating factor injection Showing intact microvilli (v), destructed cristae of mitochondria (M), fine granular matrix of electron dense (D) and electron lucent (L) forms. Intact intercellular junctional complexes (J) (25 x 1000).


**Fig. (11):** Electron micrograph of middle ear mucosa 2 days after platelet activating factor injection Showing PML with electron dense granules (D) and lobulated nucleus (arrow) and PNL (P) subepithelially (7.5 x 1000).


**Fig. (12):** Electron micrograph of middle ear mucosa 2 days after platelet activating factor injection. Showing many polymorphnuclear cells (P) can be seen in the subepithelial layer (4 x 1000).


**Fig. (13):** Electron micrograph of middle ear mucosa 2 days after platelet activating factor injection. The superficial epithelial cells have numerous microvilli (v) then normal distinct cilia (a) are seen. Marcophages (M) with indented nucleus (nuc). Secondary lysosomes (c) are also seen (5 x 1000).


**Fig.(14):** Electron micrograph of middle ear mucosa 2 days after platelet activating factor injection. Showing migrating macrophages (m) and polymorphonuclear cells (PNL) in between the epithelium lining (El) (arrows) the latter lost many of their organelles. (5 x 1000).


**Fig. (15):** Electron micrograph of middle ear mucosa 2 days after platelet activating factor injection. Showing lesser dilated endoplasmic reticulum of epithelial cells (SER). PML (P) with sotitis media with effusion of their dense granules are dessolved leaving large vacules (v). Sotitis media with effusion destructed mitochondria (M) are also seen (5 x 1000).

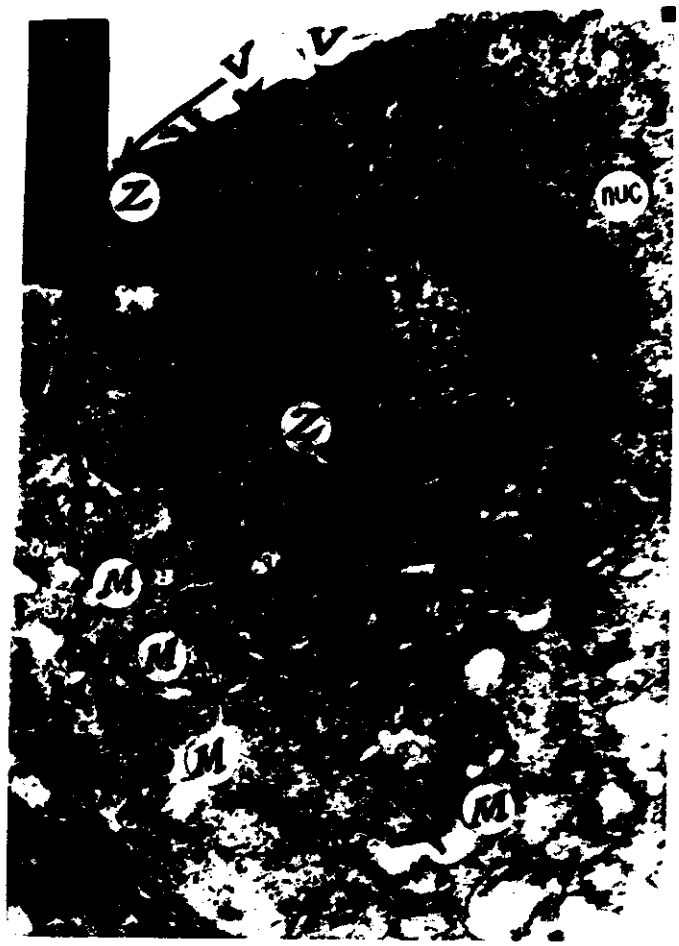


**Figure (16):** Electron micrograph of middle ear mucosa 2 days after platelet activating factor injection. Showing destructed mitochonria (M), short microvilli of epithelial cells (V). Irregularly distended endonplasmic reticulum (arrow), large peripheral nucleus (nuc) with thin electron dense peripheral zone (z) (6.7 x 1000).


**Fig. (17):** Electron micrograph of middle ear mucosa 2 days after platelet activating factor injection. Showing short and long processes (p) of the inner membrane of the endothelial cells of blood vessels giving a ruffling appearance. Collagenic fibres (c) are seen related to the blood vessels (10 x 1000).

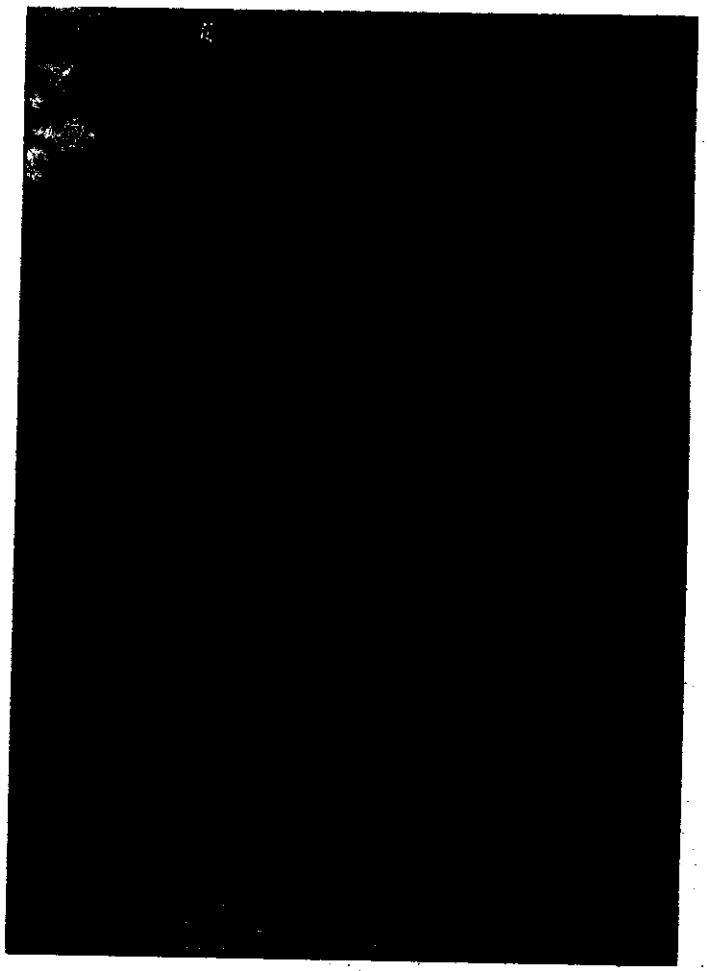

**Fig. (18):** Electron micrograph of middle ear mucosa 2 days after platelet activating factor injection. Showing fenestrae of the blood vessels (arrows) (x 40 K).


**Fig. (19):** Electron micrograph of middle ear mucosa 2 days after platelet activating factor injection. Smooth endoplasmic reticulum (s), ethausted azuroophil granules and many specific granules (s) having electron density of (PNL) and another destructed one (D), and oozed blood (b) also lymphocytes showing stage of karyorrhexis (k) (7.5 x 1000).


**Fig. (20):** Electron micrograph of middle ear mucosa 2 days after platelet activating factor injection. Showing large lymphocytes with its nucleus (n), nuclear membrane (mem). Mitochondria revealed lighter non granular matrix and lost their cristae (x) (12 x 1000).

**Fig. (21) :** Electron micrograph of middle ear mucosa 2 days after Eustachian tube obstruction. Showing focal areas of oedema appearing in the form of widely dispersed connective tissue constituents (arrows) (7.5 x 1000).

**Fig. (22):** Electron micrograph of middle ear mucosa 2 daysof Eustachian tube obstruction. Showing haemorrhagic spots (arrows) (7.5 x 1000).


**Fig. (23):** Electron micrograph of middle ear mucosa 2 days Eustachian tube obstruction. The lumen of blood vessels is filled with red blood cells; congestion (c). The endothelial lining cells had indented nuclei (n) and smooth endoplasmic reticulum are seen (en) (7.5 x 1000).

**After 14 days :**

On dissection of the temperal bone the mucosa of the middle ear was not thickened as was observed in group 2 and no effusion was seen in the animals of these group.

By electron microscope, the cells in many sections showed extensive microvilli and cilia. Many of the cilia were broken down, as also the cells were revealed in the form of light and dark cells, but mostly their cytoplasm contained widely distended endoplasmic reticulum and electron dense nuclei peripherally, but electron lucent centrally. Also the nuclei were having an irregular contour or with indented entities. In between the epithelial cells still migrating polymorphonuclear leucocytes with primary and secondary lysosomes and areas of vaculated cytoplasm. Their nuclei had the characterstic thick peripheral heterochromatin and central euchromatin. Deeply in the epithelium monocytes could be encountered with bean shaped nucleus having thin peripheral heterochromatin (Fig. 24).

In otitis media with effusion focal areas of some epithelial cells revealed many normal mitochondria with intact cristae but only few had destructive cristae. These cells had normal spherical nucleus mainly euchromatic having small nucleolus adherent to the inner nuclear membrane and scanty heterochromatin which also stuck to the inner nuclear

membrane. The nucleolus revealed slight side indentation. In these cells the smooth endoplasmic reticulum had narrow branching tubules (Fig. 25).

The cell exfoliation and desquamation were less common than after perfusion but did not finished absolutely.

Through the still affected epithelium the cells revealed intercellular irregular spaces cytoplasmic expansions and cytoplasmic tonofibrils and more disturbed mitochondria. As well these areas suffered of stratification of the epithelium and superficial cells were liable to destruction leaving empty spaces (Fig. 26). The irregular spaces between the epithelial cells are due to weakness of contact between the adjacent cells. the boundary cells exhibited short microvilli through these intercellular spaces. Also an electron dense granules were scarcely present either in the intercellular spaces and even inside the cytoplasm of the affected epithelial cells (Fig. 27).

On higher magnification of one of the epithelial cells, the normal constituents of the cytoplasm appeared more or less normal including normal nucleus with normal distributed heterochromatin and eurochromatin, normal nucleolus and intact nuclear membrane. The cytoplasmic ribosotitis media with effusions were evenly distributed (Fig. 28).

On the other hand, the still affected cells from inflammatory changes exhibited widely dilated cisternae of endoplasmic reticulum and destructed mitochondria as also granular debris of cytoplasm and intracytoplasmic destructed filaments (Fig. 29). Adjacent affected epithelial cells showed balloned mitochondria with destructed mitochondrial cristae and disturbed, lobulated intended nucleus of migakaryocytes (Fig. 30). The cell junctional complexuses beustachian tubeween the epithelial cells showed a disturbed configuration whose spaces were more widened and had a granular extra-cytoplasmic matrix (Fig. 31).

Most of the intervening PNL between the epithelial cells showed intracytoplasmic abnormal destructed granular constituents and more vacuolations, the large electron dense azurophil granules representing secondary lysosomes, even partially dissolved nuclear lobes were common (Fig. 32, 33). As well the intercellular spaces between the infilterating PNL and epithelial cells revealed granular materials and so the adjacent epithelial cells were still revealing abnormal destructed mitochondria.

Respecting the subepithelial proprial connective tissue, it contained in sotitis media with effusion regions scanty oedema, and remanants of destructed connective tissue cells. Also in between the oedematous fluids were still appearing

disturbed PNL, small lymphocytes with pyknotic nucleus (Fig. 34). Fibroblastic with vaculated or dilated cisternae of their endoplasmic reticulum was also encountered in relation to bundles of collagenic bundles and disturbed small lymphocytes in the lamina propria.

The proprial collagenic fibrils were passing in different directions and appeared to be more extensive (fibrosis) than in control.

As well, these extensive collagenic fibrils (fibrosis) were also investing many of active polymorphonuclear cells , the latter cells revealed long processes or pseudopodia and there cytoplasm showed many digesting secondary lysosomes and few electron lucent primary lysosomes.

Active fibroblasts with intact mitochondria and newly formed polymerized tropocollagen molecules, to form new collagenic fibres were also common in the propria.

In few regions of the propria, modified fibroblasts in their way to change to osteogenic cells could be detected. These cells showed peripheral heterochromatin on the inner nuclear membrane and the whole presented osteogenic cells. Their cytoplasm revealed active rough endoplasmic reticulum with more or less few mitochondrium (Fig. 35).

**2 weeks after eustachian tube obstruction :**

The electron microscopic changes seen 14 days after eustachian tube obstruction were more remarkable than those seen following platelet activating factor injection. A remarkable finding was increased activity of the periosteum on the luminal side of the middle ear. Stratification and hyperplasia of the epithelium were clearly seen. Fibrosis causing a more dense stroma was also detected in this group as active fibroblasts with distended cisternae and intact mitochondria similar to those seen 2 weeks after platelet activating factor injection were observed. The infilteration with macrophages, plasma cells, PMNL seen in cases of platelet activating factor injection were not clearly seen in this group and whenever seen, these were not to the same extent described in platelet activating factor injection. However, in 2 animals, the mucoperiosteal lining showed dense inflammatory cellular infilteration with plasma cells, lymphocytes and macrophages (Figs 36, 37, 38 & 39) with collagenic and elastic fibres.


**Fig. (24):** Electron micrograph of the middle ear mucosa after 14 days of platelet activating factor injection showing extensive microvilli (v) and cilia (c), distended endoplasmic reticulum (ed). The nuclei have an irregular contour (arrow). PML (P) and monocytes (M) are also seen (4 x 1000).


**Fig. (25):** Electron micrograph of the middle ear mucosa after 14 days of platelet activating factor injection showing normal mitochondria (M) and destructed cristae (D). The nucleus revealed slight indentation (in) with their endoplasmic reticulum having narrow braching tubules (arrows) (4 x 1000).


**Fig. (26):** Electron micrograph of the middle ear mucosa after 14 days of platelet activating factor injection showing interecellular epithelial spaces (s) and cytoplasmic expansion (ex), cytoplasmic tonofibrils and disturbed mitochondria (M). Empty spaces (em) in place of the destructed epithelial cells are seen (5 x 1000).


**Fig. (27):** Electron micrograph of the middle ear mucosa after 14 days of platelet activating factor injection showing intercellular spaces (s). Electron dense granules (G) are seen in this place and in the cytoplasm (7.5 x 1000).


**Fig. (28):** Electron micrograph of the middle ear mucosa after 14 days of platelet activating factor injection. Showing normal nucleus (n), normal nucleolus (nuc) and intact nuclear membrane (arrows). The cytoplasmic ribosomes (D) are evently distributed. Cytoplasmic filaments are seen (F) (25 x 1000).


**Fig. (29):** Electron micrograph of the middle ear mucosa after 14 days of platelet activating factor injection. Showing destructed mitochondria of epithelial cells (M), widely dilated cisternae of endoplasmic reticulum (en) and granular debris (deb). Intracytoplasmic destructed filaments (F) are also seen (10 x 1000).


**Fig. (30):** Electron micrograph of the middle ear mucosa after 14 days of platelet activating factor injection. Showing balloned mitochondria (M) with destructed mitochondrial cristae and disturbed, lobulated indented nucleus (nuc) of megakaryocyte (20 x 1000).


**Fig. (31):** Electron micrograph of the middle ear mucosa after 14 days of platelet activating factor injection. Showing disturbed configuration of the cell junctional complexes between epithelial cells (arrows). Granular extra-cytoplasmic matrix (G) is also seen (25 x 1000).


**Fig. (32):** Electron micrograph of the middle ear mucosa after 14 days of platelet activating factor injection. The polymorphs show intracytoplasmic abnormal destructed granular constituents (c) with more vacuolation (v). Azurophil granules representing secondary lysosomes are seen are large and electron dense (arrow) (20 x 1000).


**Fig. (33):** Electron micrograph of the middle ear mucosa after 14 days of platelet activating factor injection. Showing granular materials (M) in the intercellular spaces between epithelial cells and PML (10 x 1000).


**Fig. (34):** Electron micrograph of the middle ear mucosa after 14 days of platelet activating factor injection. Showing some regions of scanty oedema (D) with remenant of destructed connective tissue (R.). Disturbed PML (arrow) and small lymphocytes with pyknotic nucleus (L) are also revealed (5 x 1000).


**Fig. (35):** Electron micrograph of the middle ear mucosa after 14 days of platelet activating factor injection. Showing modified fibroblasts in their way to form osteogenic cells (A, b and C) (7.5 x 1000).


**Fig. (36):** Electron micrograph of the middle ear mucosa after 14 days of Eustachian tube obstruction. Showing fibroblasts with distended cisternae of their endoplasmic reticulum (F) in relation to collagenic bundles (C). Small lymphocytes are seen in the propria (L) (10 x 1000).


**Fig. (37):** Electron micrograph of the middle ear mucosa after 14 days of Eustachian tube obstruction, showing proprial collagenic fibres in different directions (F) as fibrosis (20 x 1000).


**Fig. (38):** Electron micrograph of the middle ear mucosa after 14 days of Eustachian tube obstruction, showing extensive collagenic fibres (F). Fibrosis and active PMNL (L) with long processes or pseudopods (P) (15 x 1000).

**Fig. (39):** Electron micrograph of the middle ear mucosa after 14 days of Eustachian tube obstruction. Showing active fibroblasts with intact mitochondria (arrows). Newly formed tropocollagen molecules and elastic fibres (e) were also seen (7.5x 1000).

**Table (1):** Showing the severity of (Hyperemia, edema, haemorrhage, stratification, fibrosis and osteoneogenesis) in different groups (the control group and groups injected by PAF).

| Changes / Group | Hyperemia | Edema | Hemorrhage | Stratifecation | Fibrosis | Osteoneogenesis |
|---|---|---|---|---|---|---|
| Group I Control ears | – | – | – | – | – | – |
| Group II Rt ears injected by PAF for 2 days | +++ | +++ | +++ | +++ | – | – |
| Group III Rt ears injected by PAF for 14 days | + | + | + | ++ | + | + |

* PAF = Platelet - activating factor.
* +++ = Severe.
* ++ = Moderate
* + = Mild.
* – = No. change.
* Rt = Right
* Group I = Control ears
* Group II = Right ears injected by PAF and sacrificed after 2 days
* Group III = Right ears injected by PAF and sacrificed after 14 days.

**Table (2):** Showing the distribution of inflammatory cells among various groups (The control group and groups injected by PAF).

| | Polymorph--nuclear leukocytes | Lymphocytes | Macrophages | Plasma cells | Mast cells |
|---|---|---|---|---|---|
| Group I Control ears | 2 | 1 | 1 | 1 | 1 |
| Group II Rt ears injected by PAF for 2 days | 10 | 3 | 10 | 2 | 1 |
| Group III Rt ears injected by PAF for 14 days | 5 | 5 | 3 | 1 | 1 |

* PAF = Platelet - activating factor.
* Group I = Control ears
* Group II = Right ears injected by PAF and sacrificed after 2 days
* Group III = Right ears injected by PAF and sacrificed after 14 days.
* Rt = Right
* The average number of cells recorded above is dependent on readings per many fields for every specimen as a differential cell count.

**Table (3):** Showing the severity of (Hyperemia, edema, haemorrhage, stratification, fibrosis and osteoneogenesis) in different groups (the control group and groups of Eustachian obstruction).

| Changes / Group | Hyperemia | Edema | Hemorrhage | Stratifecation | Fibrosis | Osteoneogenesis |
|---|---|---|---|---|---|---|
| Group I Control ears | – | – | – | – | – | – |
| Group II Lt ears with E.T obstruction for 2 days | +++ | +++ | +++ | +++ | – | – |
| Group III Lt ears with E.T obstruction for 14 days | + | + | – | +++ | ++ | ++ |

* +++ = Severe.
* ++ = Moderate
* + = Mild.
* – = No. change.
* E.T. = Eustachian tube.
* Group I = Control ears
* Group II = Left ears with Eustrachian tube obstruction sacrificed after 2 days
* Group III = Left ears with Eustachian tube obstruction sacrificed after 14 days.
* Lt = Left

**Table (4):** Showing the distribution of inflammatory cells among various groups (The control group and groups of Eustachian obstruction).

| | Polymorph--nuclear leukocytes | Lymphocytes | Macrophages | Plasma cells | Mast cells |
|---|---|---|---|---|---|
| Group I Control ears | 2 | 1 | 1 | 1 | 1 |
| Group II Lt ears with E.T obstruction for 2 days | 7 | 2 | 8 | 2 | 1 |
| Group III Lt ears with E.T obstruction for 14 days | 4 | 3 | 2 | 1 | 1 |

* Group I = Control ears
* Group II = Left ears with Eustachian tube obstruction sacrificed after 2 days
* Group III = Left ears with Eustachian tube obstruction sacrificed after 14 days.
* Lt = Left.
* The average number of cells recorded above is dependent on readings per many fields for every specimen as a differential cell count.