ROUND WINDOW MEMBRANE FISTULA REPAIR: 2

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SUMMARY

There was a deficiency in animal model which showed the results of repairment of the RWM rupture. For this reason we planned to make an investigation in guinea pigs. We created a standard core perforation in the round window membrane of 15 healthy albino guinea pigs. Experimentally produced perforation of the RWM were repaired with fascia in left ears and with fibrin glue (Tissell) in right ears. The results of the RWM perforation healing process were followed in both groups. Our comperative histopathologic results which were encountered in light microscope are presented.

Key Words: Round window, fistula repair

INTRODUCTION

Many otological diseases may involve the round window membrane or niche. Besides, round window is prone to trauma in the course of surgical procedures which are widely performed in otologic practice. The clinical consequencies such as otologic and vestibular findings have been widely described in the literature. Also there are a lot of papers about spontaneous healing of the experimentally induced round window membrane lesions (1, 2). Spontaneous or surgically created perforations of many round windows have been grafted in humans with fascia, free adipose tissue, perichondrium or gelfoam and healing procedures have been investigated (3-5). There are limited numbers of experimental grafting in animals and mostly electrophysiological measurements are performed in the course of healing process.

Reports dealing with histopathological changes in an animal model are very rare. We had performed such an experimental animal model in which surgically created perforation of the round window membrane which was grafted with gelfoam compared to spontaneous healing (6). In this report fascia grafts are compared to grafts of fibrin glue. Histopathologic results of healing procedures which were investigated in light microscope are presented.

MATERIALS AND METHODS

15 healthy albino quinea pigs obtained from Istanbul University Center for Experimental Research and Application (DETAM) were used. They were the same species with animals used in our first investigation. The animals were each anesthetized by means of an intraperitoneal injection of sodium pentobarbital calculated at 25 mg/kg of body weight and ether inhalation anesthesia. The same method which was widely explained in our first report has been used (6). Animals were divided into 5 groups and each group consisted of 3 animals. After surgical procedure the animals were sacrified at 1 day, 5 days, 9 days, 13 days and 17 days by intracardiac formaline injection. Following sacrification, bullae were removed and middle ear was explored under operating microscope. Stapes was removed and the cochlea perfused via the apex and oval window and then temporal bones were embedded in 10 % formaldehid for 24 hours. Following decalcification in 5 % trichlor acetic acid (TCA) for 3 days they were washed with saline solution and cleared in low degree alcohol and embedded in paraffin. Sections of 5-7 micron were stained with

hematoxylen-eosin and evaluated under light microscope.

RESULTS

In histopathological examination of the round window membrane erythrocyte accumulation was observed at the scala timpani site. It was mentioned in our first report that this condition was due to the trauma turing the preparation of temporal bones for histologic sections.

In the first group, examination of the left ear at early period revealed erythrocyte accumulation in the middle ear, congestion of the RWM, neutrophil leucocyte accumulation at the scala timpani site of the membrane (Fig. 1). Examination of the right ear revealed erythrocyte accumulation at the scala timpani site of the membrane, homogenous eosinophilic fibrin, scant erythrocytes and inflammatory cells in the middle ear (Figs 2, 3). In animals who were sacrified at 5 days, fusiform thickening of membrane, fascia graft at the middle ear site which was adhered to membrane, erythorcyte accumulation and eosinophilic granular material at the scala timpani site were observed in the left ear (Fig 4). In the right ear relatively normal membrane with minimal thickening and congestion, extravasated erythrocytes at one site were observed (Figs. 5, 6).

The histopathologic sections of the third, fourth and fifth groups were similiar. It was observed that the fistulae were healed in all ears. In the ears which were grafted with fascia, fusiform thickening of the membrane with adherent fascia on the middle ear site and serum accumulation at th scala timpani site were observed (9 th day Fig 7, 13 th day Fig 8). The fusiform thickening of the membrane was more prominent on the 17 th day (Figs. 9, 10). In the right ear grafted with fibrin glue, minimal thickening and congestion of the membrane and also extravasated erythroscytes were observed (Figs 11, 12).

In four animals which were grafted with fascia there were inflammatory reaction in the middle ears, whereas this condition was observed only in one of the animals grafted with fibrin glue.

DISCUSSION

Many round window fistulas have been grafted in humans. But as Paparella et al mentioned, experimental grafting in animals are rare (7). In an experimental study, histopathologic results of grafting round window membrane in cats with gelfoam which were compared to grafts of collagen-adipose tissue were reported (8). We had reported the histopathologic results of grafting RWM in guinea pigs with gelfoam compared to spontaneous healing (6). In this report we present the histopathological results of grafting RWM with fascia compared to graft of fibrin glue. Gelfoam application seems to be advantageous as it leads to thickening of the whole membrane, thus creating a strong barrier against the flow from middle ear into the internal ear or viceversa by decreasing permeability of the membrane. On the other hand, it has also disadvantages, namely more inflammatory reaction in the early post operative period, accumulation of edematous fluid in the internal ear which would lead to a decrease in the elasticity of the membrane (6). Fascia grafts cause uniform and consistent thickening of round window membrane due to fibroblastic proliferation. Inflammatory reaction and edema are less prominent in first and second groups of fascia graft compared to gelfoam grafts. In other groups the manifest histopathological view is the fusiform thickening of membrane and extravasated erythrocytes. In ears grafted with fibrin glue, limited thickening of the membrane is observed. In the other groups the histopathological appearance of RWM is relatively normal other than minimal edema and reaction. In this group inflammatory infiltration and reaction at the scala timpani site of membrane is relatively neglicable. This histopathological findings stres that fibrin glue as grafting material is the best choice among present grafting materials, although we need more electrophysiological studies that support our findings.

Fig 1: x 100 HE. Appearance of the RWM and erythrocyte accumulation.

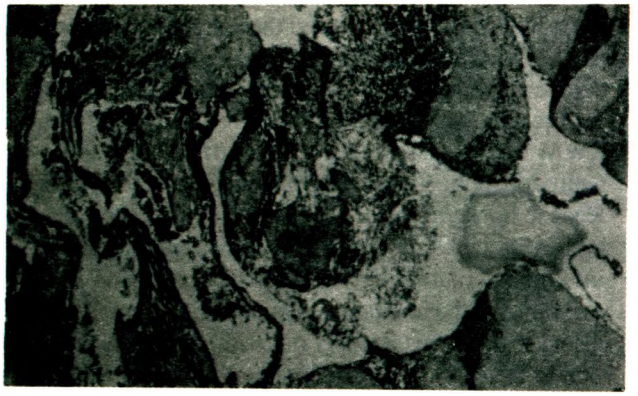

Fig 2: x 40 HE. Erytrocythe accumulation and homogenous eosinophilic fibrin in the middle ear.

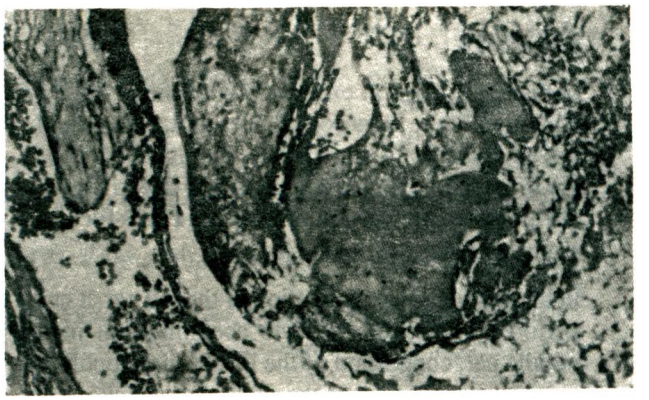

Fig 3: x 100 HE. RWM and eosinophilic fibrin.

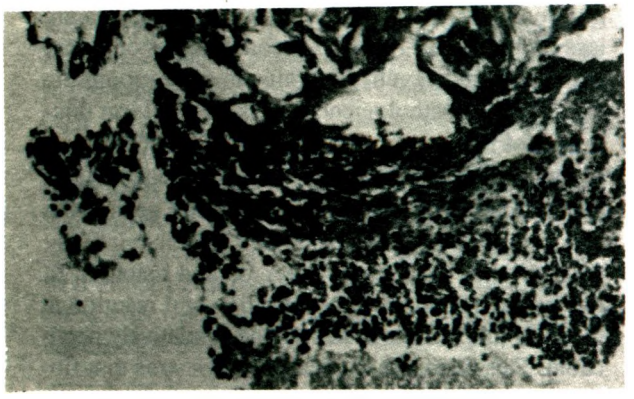

Fig 4: x 200 HE. Fascia graft, RWM and erythorcyte accumulation.

Fig 5: x 40 HE. Appearance of the RWM in the right ear at 5 days.

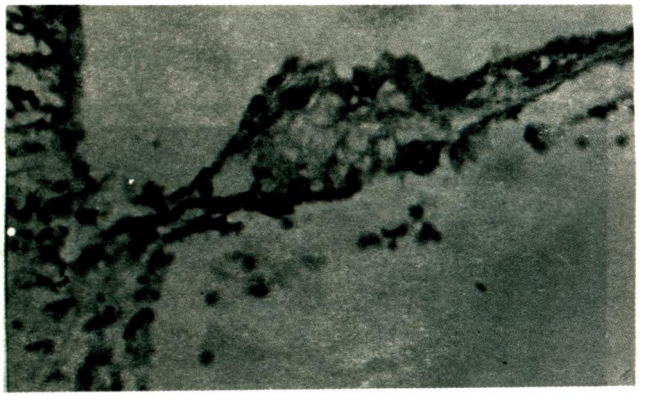

Fig 6: x 200 HE. Minimal thickening and congestion of the RWM.

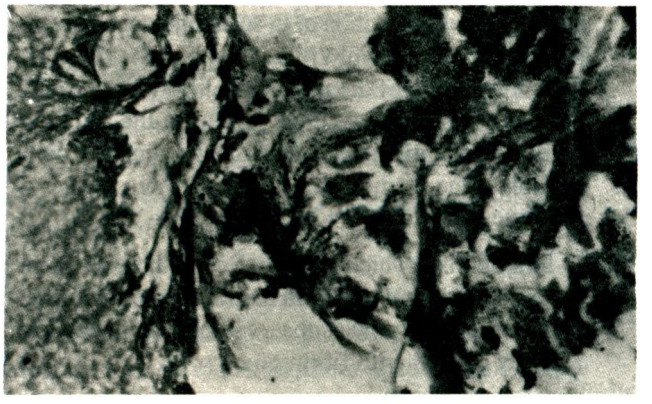

Fig 7: x 100 HE. Fusiform thickening of the RWM and fascia graft at the healing site.

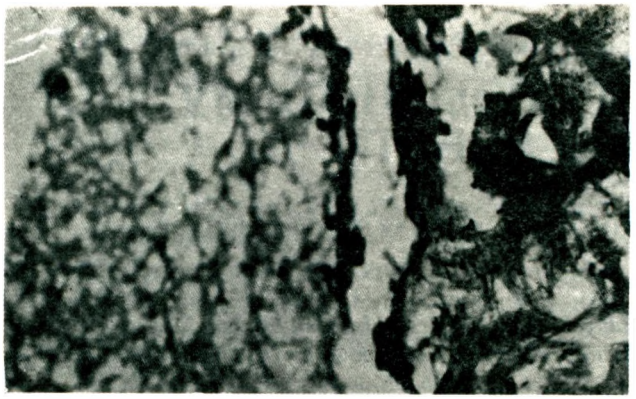

Fig 8: x 400 HE. Note the fusiform thickening consisting of fibroblast proliferation.

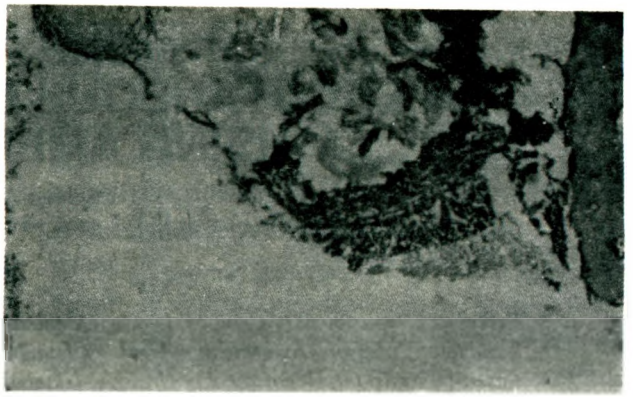

Fig 9: x 100 HE. The fusiform thickening more prominent at 17 days.

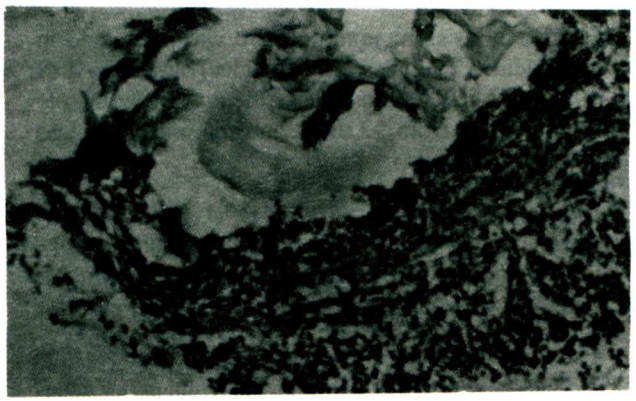

Fig 10: x 200 HE. The same appearance of ficture 9 with higher magnification.

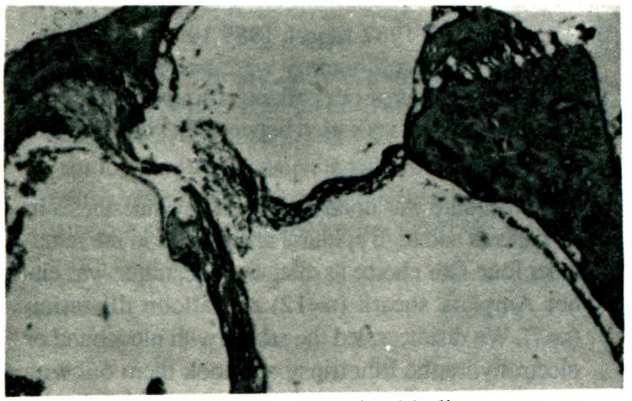

Fig 11: x 100 HE. Regenerated epithelium was observed on the right ear at 17 days

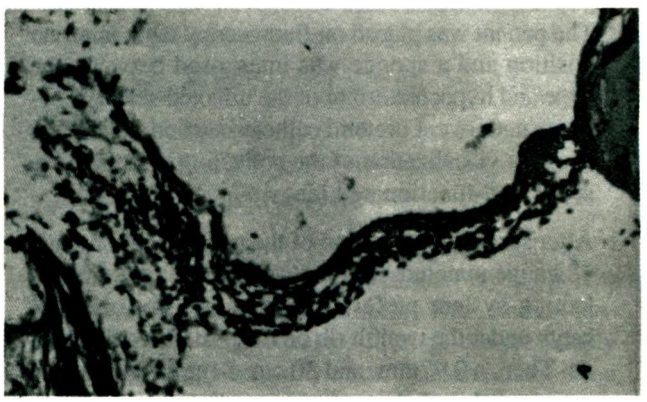

Fig 12: x 200 HE. Minimal thickening and congestion of the membrane at the healing region.

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