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Closure of tympanic membrane perforations using repeated trichloracetic acid

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Abstract

Our aim in this study is to show the efficacy of trichloracetic acid cauterization in the tympanic membrane perforations. Between January 2002 and January 2012 central perforations in 160 ears of 142 cases were tried to be closed by repeated trichloracetic acid cauterization in one week interval followed by the placement of a piece of cigarette paper to the perforation site. In 98 of 137 ears (71.5 %) that followed-up for a desired period of time, perforation was closed after an average of 4.2 applications. No statistical relation was found between the success of treatment, and the age of patient, the site of perforation and previous history of otorrhea. It was shown that the width of perforation is an important factor in the success of treatment.

Keywords: Trichloracetic acid, perforation, tympanic membrane

Introduction

The closure of perforations in tympanic membrane (TM) repairs the loss in the vibrating area of TM and prevents the direct touch of sound to the round window. Closure of a tympanic membrane perforation not only improves hearing, but also eliminates the risk of recurrent infection of the middle ear via the external auditory canal.

The use of trichloracetic acid (TCA) in TM perforations goes back to approximately a hundred years. The cauterization of the edges of perforation with TCA followed by the closure of perforation with a support and the repetition of this procedure at regular intervals have been frequently used [1-3].

Our aim in this study is to bring up the activity of this method and the factors that affect the success of treatment.

Materials-Method

Between January 2002 and January 2008, central perforations in 160 ears of 142 cases were tried to close by trichloracetic acid cauterization.

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The treatment of 8 of 160 ears (5.6 %), to which trichloracetic acid cauterization was applied, was called off due to discharge (Fig1). The treatment for the two of these cases started again six months later, after ceasing the discharge. Owing to recurrent infection, it was impossible to obtain a dry ear from the other six cases for a long time. These cases who were suggested tympanoplasty, weren't included in this study.

It was the fact that enough cauterization could not be applied to 17 ears of 13 cases because they gave up receiving complete treatment. These cases were also excluded from this study.

After external otitis was treated, cauterization application was continued to the two cases whose ears developed external otitis during the TCA application.

Between 1 and 10 applications were carried out on the 137 ears of 123 cases included in this study.

The ages of the cases, 55 of whom were males and 68 of whom were females changed between 13 and 48 (average 25.5).

In 82 ears (59.8 %) 25 percent or less and in 55 ears (40.1 %) more than 25 percent of the tympanic membrane was perforated.

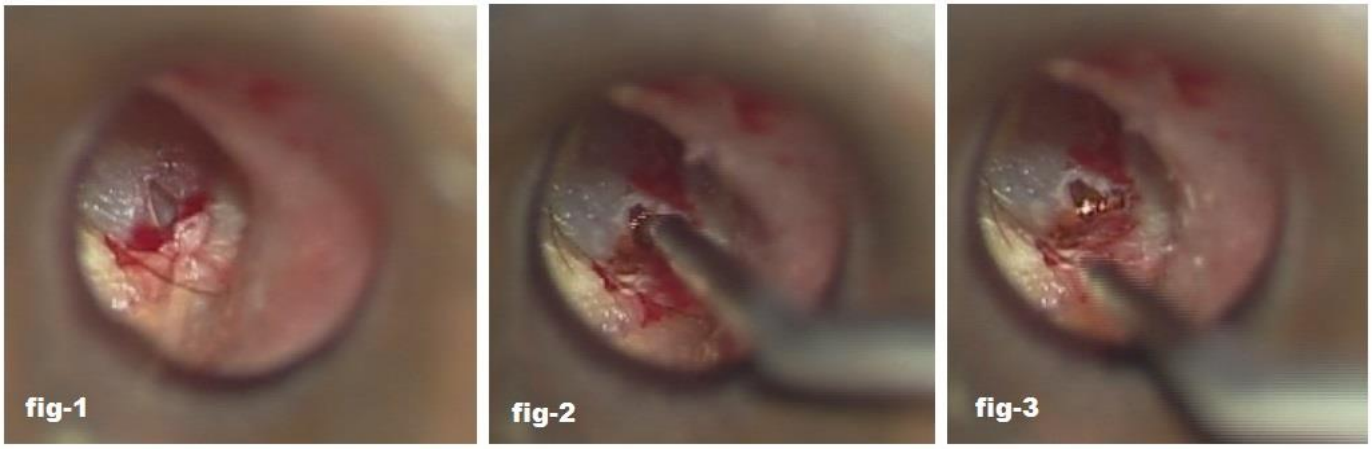

Figure 1-3. The edges of the membrane with TCA desepithelialization

In 19 ears (13.8 %) the perforation was limited just in the anterior quadrant and in 66 ears (48.1 %) it was limited in the posterior quadrant. In 52 cases (37.9 %) both the anterior and posterior quadrants were involved.

This procedure has not been applied to the ears that have discharge in the last six months. Fifty two (37.9 %) of the ears had discharge at least once in a period between 6 months and 20 years.

Before the first TCA application, the perforation was closed with a piece of cigarette paper and an audiologic examination was carried out. Afterwards it was compared with audiologic evaluation, which was made without using a piece of cigarette paper. With this method, it was possible to determine the benefit that a case could get provided the procedure would be a success. By this procedure, tympanoplasty was suggested for the cases whose loss of hearing ever increased. This procedure was not applied to the perforations to which 50 or more percent of TM was attached, to marginal perforations, to the ears which has cholesteatoma or tympanosclerosis, and to the cases whose external ear canal was too narrow and tortuous to prevent the edges of perforation to cauterize.

In the most of the cases the procedure was carried out without using anaesthesia. By means of an operation microscope, saturated TCA cauterization was performed on the edges of perforation followed by closure of a piece of cigarette paper covered with a thin layer of antibiotic cream on the perforation. The solution of saturated TCA was achieved using a little saline but it was enough to dissolve the TCA crystals.

The procedure was repeated in one week interval and meanwhile antibiotic ear drops were used in order to get continuous moisture of the paper placed to the perforation site.

The cases whose perforations were possible to close, were followed for 4-47 months. When the number of the cases was sufficient, chi square test was done.

Results

In 98 ears out of 137 (71.5 %), after 1-10 applications (average 4.2) the perforation was closed. In order to close the perforation, the other 39 ears were suggested myringoplasty. Eight of the 98 cases (8.1 %) whose perforation was closed, developed reperforation in 6-22 months followed by the closure of the perforation. In four of eight ears 1-4 months later, after ceasing of the discharge the perforation closed spontaneously. Only one case preferred myringoplasty instead of re-TCA cauterization treatment. In the other three cases reperforations were closed after the second, fourth and seventh TCA cauterization.

While the perforation of 52 cases out of 72 (72.2 %) below average age was closed, of 46 cases out of 65 (70.7 %) above average age was closed by TCA treatment, too. There was no considerably statistical difference between the two groups ($p>0.05$).

In 12 of 19 ears (63.2 %) that the perforation was limited in anterior quadrant of the membrane and 52 of 66 ears (78.7 %) that the perforation was limited in posterior quadrant, the perforation was closed with TCA cauterization. And there was no statistically significant difference between the two groups ($p>0.05$).

Success was achieved in 33 of 52 ears (63.4 %) that had discharge in their history of otorrhea and the same success was possible for 65 of 85 ears (76.4 %) that had no discharge. No statistically significant difference was found between these groups ($p>0.05$).

In 72 (86%) of 82 ears that the perforation was 25 percent or less and 26 (47%) of 55 ears that the perforations was more than 25 percent, perforation is closed. The difference is statistically significant between the two groups ($p<0,05$).

The mean hearing gain was 20.9 dB in the ears whose perforations were closed.

Discussion

The pars tensa of the tympanic membrane is made up of five distinct layers [4]. These layers from outer to inner surface are:

1- Stratified squamous epithelium
2- Dermis
3- Radiate fibrous layer
4- Circular fibrous layer
5- Mucous layer

After the spontaneous healing of large perforations, the dense fibrous layer cannot be frequently renewed. On the other hand, a perforation closure induced by acid cauterizations often results in a tympanic membrane possessing all five layers.

In the permanent perforations, the exterior squamous epithel perforation goes forward along its edge toward the interior mucous layer. The destruction of this epithelium that causes a barrier to the closure of perforation explains the logic of acid cauterization [1]. The paper patch placed on the perforation, it serves as a support for the regenerated epithelium.

Derlacki [1] informed that when the closure of the membrane with a flat cotton patch was carried out followed by the cauterization of the perforation edge with TCA with the repetition of this procedure, in 10 days- 3 weeks interval, the perforation was possible to close in 75.6 %. With a similar technique Write [2] reported 87.6 % success in 65 ears.

The average number of treatment that is 14.6 carried out by Derlacki [1]. Regarding the closure of perforation and in the study of Write [2] period of treatment that extended to a couple of years may explain the proportion of success achieved in these studies is higher than that of (70.7 %) achieved in our studies.

When it is impossible for the perforation to close or to get smaller after 6 or 7 treatment, we always suggest myringoplasty to most of our cases instead of insisting on TCA cauterization treatment.

In our study the reperforation rate was 8.1 %. This figure was found 9.1 % by Derlacki [1].

Derlacki [1] pointed out, the size of the perforation and the age of the case had no effect on success. In our studies although the age of the cases had no statistically significant effect on success, it was found that in large perforation the chance of success decreased significantly.

In the report of long term results of tympanic membrane repair, Halık and Smyth [5] emphasised the low success and high reperforation rates in the anterior perforation.

In our studies, the success rate of the anterior quadrant perforations were worse than the posterior ones, but the difference was not statistically significant ($p>0.05$).

In 98 ears, the perforation of which was closed, the mean hearing gain obtained as 20.9 dB was compatible with that of 16.3 dB in the literature [1,6].

Even though we have not received the result of late period in our studies, in suitable central perforations TCA cauterization by placing a paper support in one week interval was effective both in terms of the repair of the perforation and in reconstruction of hearing. At the same time it was realised that age of the case, quadrant of the perforation and the history of otorrhea did not affect the success of the treatment. But the chance of the closure of small perforations was higher in comparison with large perforations.

References

1. Derlacki EL. Repair of central perforations of tympanic membrane. Arch. Otolaryngol. 1953;58:405-20.
2. Wright WK. Repair of chronic central perforations of the tympanic membrane: by repeated acid cautery; by skin grafting. Laryngoscope 1956;66:1464-87.
3. Adams LA. Closure of tympanic membrane perforations by trichloracetic acid cauterization; report of cases. AMA Arch Otolaryngol 1952;55(1):38-42
4. Glasscock ME, Shambaugh GE, Johnson GD. Closure of tympanic membrane perforation.In: Glasscock ME, Shambaugh GE, Johnson GD, eds. Surgery of The Ear. W.B. Saunders Company. Philadelpia 1990;334-49.
5. Halık JJ, Smyth GD. Longterm results of tympanic membrane repair. Otolaryngol. Head Neck Surg. 1988;98:162-69.
6. Santhi T, Rajan KV. Indian J Otolaryngol Head Neck Surg. 2012;64(4): 389–92