Evaluation of Spontaneous Healing of Traumatic Tympanic Membrane Perforation

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Abstract

Traumatic tympanic membrane (TM) perforation has long been a challenge to the otologist, the objective of this study was to evaluate the prevalence of spontaneous healing of traumatic TM perforation and the factors influenced this healing process. This was a hospital based prospective study performed in the Department of ear, nose and throat (ENT), Al-Fallujah Teaching Hospital, Al-Anbar, Iraq, from August 2011 to April 2013, during this period 60 patients diagnosed having traumatic perforation of TM (62TM) due to bilateral affection in two patients. All those patients treated conservatively with systemic antibiotics, avoidance of let water in the ear and follow up for three months. The most common cause of perforation was slap injuries (29%), perforation by solid objects (25.8%), explosion (16.1%), falling from height (12.9%), road traffic accident (9.7%), syringing (4.8%) and swimming (1.6%). The healing rate of perforated TM after three months of follows up was 82.3% (51 of 62 TM). There was no statistically significance difference between patients with, or without spontaneous healing of TM regarding the gender of the patient, laterality and causes of the injury (p>0.05). There was statistically significant difference between patients with, or without spontaneous healing of TM regarding age of the patient, severity of deafness, size of perforation (p <0.05). From this study we concluded that the chances of spontaneous healing of traumatic TM perforation were very high, so that, early surgical intervention of traumatic TM perforation is not indicated.

Keywords: Traumatic; Tympanic membrane; Perforation; Spontaneous healing

Introduction

The tympanic membrane (TM) is an important component of sound conduction as its vibratory characteristic is necessary for sound transmission in human beings [1]. Traumatic perforations of TM are not uncommon injuries. Rupture of the TM may be caused by changes in the air pressure (blow on the ear, blast injury, Eustachian tube inflation, nitrous oxide anesthesia and hyperbaric oxygen treatment), by fluids (syringing, caloric tests and in diving) or by solid objects (instrumentation attempts at foreign body removal, match sticks, hair clips and sparks of hot metal) [2]. Traumatic perforations often occur in healthy members of the community: generally the prognosis is excellent. Most of traumatic tympanic membrane perforations usually spontaneously heal and returns to normal membrane function. However, small perforations are more likely to close spontaneously than large ones [2]. The two main factors leading to failure of the perforations to heal are loss of tissue and secondary infection [3]. Surgical intervention for perforation should be undertaken in the rare cases when these conditions persist greater than six months [3].

The aim of the study was to evaluate the prevalence of spontaneous healing of traumatic TM perforation and the factors influenced this healing process.

Materials and Methods

This was a hospital based prospective study performed in the Department of ear, nose and throat (ENT), Al-Fallujah Teaching Hospital from August 2011 to April 2013. This study was approved by ethics committee of the hospital and informed consent had been taken from each patient, during this period 65 patients diagnosed having TM traumatic perforation for different reasons. Patients who were included in the study were who presented within two weeks of the injuries, and had no history of external or middle ear diseases. Five patients were lost during follow up so the remaining patients were 60 patients. Assessment of the patients had been done by taking history included: age, gender of the patient, duration, cause of injury. Each patient underwent ear, nose, throat and general examinations including tuning fork tests (Rinne and Weber tests), more details recorded regarding TM perforation regarding the site, size and draw of the affected TM was done. The site classified as anterosuperior, anteroinferior, posterosuperior, posteroinferior and central (if involved more than one quadrant. The size of the TM perforations were divided into three categories: small; if the size was less than 30% of the total size of TM, moderate; if the size 30-50% of TM and large if the size more than 50%. Pure tone audiometry (PTA) was performed to all the patients involved in the study at frequencies 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz and 8000 Hz respectively in an acoustically treated sound proof room. Air and bone conduction threshold were determined. The mean hearing loss was calculated through the pure tone average taken at 500 Hz, 1000 Hz and 2000 Hz.

The treatment policies build up upon conservative management of the perforation. All the patients were treated with oral antibiotics for ten days, avoidance of let water in the ear and follow up scheduled at every two weeks visit for up to three months. During each follow up visit, the TM was re-evaluated and PTA was repeated. Those patients who showed no chance for healing spontaneously or conservatively after three months, they were referred for surgical repair of the perforation.

Results

The total number of the patients with traumatic TM perforations was 60 patients, they ranged from seven year to above 60 years old, and the mean age with standard deviation was 22 years ± 2.2 years.

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Received January 02, 2014; Accepted January 15, 2014; Published January 25, 2014


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They were 38 patients' males and 22 patients were females with male to female ratio of 1.7:1 as shown in table 1.

Traumatic TM perforations happened in 39 patients on the left side, 19 patients on the right side and two patients with bilateral TM perforations, so that the total perforations were 62 in the studied patients.

The majority of the perforations were small in size which constituted 44 (71%), moderate sized perforation happened in 13 (21%) and large perforations in 5 (8%).

The aetiology of traumatic TM perforation showed in Table 2, in order of frequency, the commonest cause was slap injuries (29%), perforation by solid objects (25.8%), explosion (16.1%), fall from height (12.9%), road traffic accident (9.7%), syringing (4.85%) and due to swimming (1.6%).

The healing rate of perforated TM after three months of follows up was 82.3% (51 of 62 TM). There was no statistically significance difference between patients with, or without spontaneous healing of TM regarding the gender of the patient, laterality and causes of the injury (p>0.05). There was statistically significant difference between patients with, or without spontaneous healing of TM regarding age of the patient, severity of deafness, size of perforation (p <0.05) as shown in Table 3.

Discussion

Traumatic perforations often occur in the healthy members of the community; and generally the prognosis is excellent [2,4]. The two main factors that predispose to failure of the perforation to heal are loss of tissue and secondary infection [5]. A great number of these perforations heal spontaneously, especially those caused by acute trauma, while others remain open and have to be closed surgically. Controversies are still excited regarding the best way to handling such trauma, while others remain open and have to be closed surgically.BH

The healing rate of perforated TM after three months of follows up was 82.3% (51 of 62 TM). There was no statistically significance difference between patients with, or without spontaneous healing of TM regarding the gender of the patient, laterality and causes of the injury (p>0.05). There was statistically significant difference between patients with, or without spontaneous healing of TM regarding age of the patient, severity of deafness, size of perforation (p <0.05) as shown in Table 3.

Table 1: Age and Sex Distribution.

<table>
<thead>
<tr>
<th>Character</th>
<th>Healed TM (no.51)</th>
<th>Non healed TM (no.11)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>10</td>
<td>1</td>
<td>P&lt;0.05</td>
</tr>
<tr>
<td>21-40</td>
<td>32</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>&gt;40</td>
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<td>6</td>
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<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>31</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>18</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Hearing loss</td>
<td></td>
<td></td>
<td>P&lt;0.05</td>
</tr>
<tr>
<td>Mild (20-30decibel)</td>
<td>37</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Moderate (31-50decibel)</td>
<td>14</td>
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<td></td>
</tr>
<tr>
<td>Side</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>34</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>17</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Size</td>
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<td></td>
<td>P&lt;0.05</td>
</tr>
<tr>
<td>Small</td>
<td>39</td>
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<td></td>
</tr>
<tr>
<td>Moderate</td>
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</tr>
<tr>
<td>Large</td>
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<td>2</td>
<td></td>
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<tr>
<td>Causes</td>
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<tr>
<td>Changes in air pressure</td>
<td>36</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Changed in fluid pressure</td>
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<td>0</td>
<td></td>
</tr>
<tr>
<td>Solid objects</td>
<td>11</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Shows the prevalence of spontaneous healing of tympanic membrane and related demographic factors.

The perforations that do not heal spontaneously after 3–6 months can be considered for surgical repair.

Previous studies investigating spontaneous repair of traumatic TM perforation have reported prevalence ranging from 48-94% [6-16]. The variability in these studies may be attributed to differences in the age of the patient, patient population, place of the study (clinic versus institution), causes of perforation and the duration of follow up. The prevalence of spontaneous repair noted in the present study is within the range reported in the literatures.

This study showed that the effect of the age on spontaneous healing of TM rupture was statistically significant (p<0.05) which is consistent with previous study [14]. Wound healing is faster in young people, although, it is normal in elderly [17]. The rate of healing was reported to be faster in young people because of higher protein turnover in such individuals.

Perforation of the tympanic membrane causes a conductive hearing loss that can range from negligible to 50 dB [18]. The results also showed that large sized perforations resulted in significant non healing perforation (p<0.05). This agrees with other studies [12,14]. TM plays a major role in physiology of hearing, it has an augmentation power (14-16 dB) [19] to the sound waves when they reach the oval window, so when the perforation is larger; the conductive type of deafness is greater. Our study showed that the healing of fresh TM rupture was affected by severity of deafness (p<0.05).

In this study, the percentage of spontaneous healing of traumatic TM perforation was not significant regarding laterality (left versus right) or gender. Furthermore, we found that spontaneous healing was not significantly affected by cause of trauma. Early assessments of the patient at the time of injury with close follow up can be helpful in prevention of ear infection, avoidance of complications which might occur with such injuries.

Conclusion

From this study we concluded that the chances of spontaneous healing of traumatic TM perforation were very high, so that, early surgical intervention of traumatic TM perforation is not indicated.
Acknowledgment

I want to express my thanks to the medical and paramedical staff in Al-Fallujah Teaching Hospital who support this work successfully.

References