The Value of Computed Tomography Scanning in Assessment of Aditus ad Antrum Patency and Choice of Treatment Line in Revision Myringoplasty

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Abstract

Objectives: The present study was designed to detect the value of CT imaging in assessment of aditus ad antrum patency and to correlate the radiological findings with operative findings.

Patients and Methods: This study was conducted on 40 patients with failed myringoplasty. All patients underwent full history taking, complete clinical otorhinolaryngological examination and preoperative laboratory investigations. The patients were selected with the following criteria: Previous myringoplasty without mastoidectomy, dry safe perforation in pars tensa, intact ossicular chain, good Eustachian tube (E.T) function and no cartilage graft in the previous operation. CT scanning with 2mm slice thickness and 2mm intervals was done preoperatively for all patients for assessment of the tympanomastoid pneumatization and condition of aditus. All patients underwent cortical mastoidectomy operation with underlay myringoplasty with tragal cartilage perichondrium graft. Patients were examined with the use of an operating microscope and otoscope weekly for two months till the ear was completely healed.

Results: The study included 40 patients, 23 males and 17 females with mean age of 29.3 years. CT scanning detected 29 cases (72.5%) with blocked aditus ad antrum and 11 cases (27.5%) with opened aditus ad antrum and these results coincided with the operative finding with CT accuracy of 100%. Only one case presented by failed myringoplasty out of 40 patients from the group of opened aditus ad antrum.

Conclusion: The CT scanning is very effective and accurate tool in evaluation of aditus ad antrum blockage and this blockage play a role in failure of myringoplasty. It is recommended that CT scanning should be done for every patient with simple myringoplasty before operation to decrease time consuming, avoid complications of cortical mastoidectomy and decrease the rate of failure of operation, as it gives accurate idea about the choice of the correct line of treatment, if the patient necessitate cortical mastoidectomy operation or not.

Key Words: CT – Aditus ad antrum – Revision myringoplasty.

Introduction

FAILED tympanoplastic reconstruction still remains problematic. A number of causes have been recognized, including infection, poor wound healing, Eustachian tube dysfunction, retained aural disease and poor surgical technique [1]. Beside that, other studies consider re-operation, material used for the graft, technique of the graft position and size of tympanic perforation predictive factors [2]. The lack of an aerating mastoidectomy at the time of initial tympanoplasty may be a significant source of failure in patients with chronic-noncholesteatomatous suppurative otitis media. This is particularly true for patients with CT evidence of aditus ad antral block, epitympanic or mastoid diseases. Patients who have an aerated mastoid/middle ear space have improved results from tympano mastoidectomy, in part because of the increased volume and pressure buffer created by the open mastoid cavity [1]. The presence of a pneumatized mastoid greatly increases the volume of the middle ear/mastoid system, which, in accordance with Boyle’s Law, can moderate pressure changes in middle ear cleft [3]. Mastoidectomy was not necessary for successful repair of simple tympanic membrane perforations. However, adding mastoidectomy to tympanoplasty improved the clinical course in patients who received it by reducing the number of patients requiring future procedures and reducing disease progression. These outcomes suggest that even in the absence of active evidence of infection, mastoidectomy may improve the underlying disease process. Combining mastoidectomy with tympanoplasty during repair of simple perforations in patients with no active evidence of infection remains an appropriate option and may be valuable in reducing progression of
disease and the need for future surgery. However when considering the addition of a mastoidectomy to a tympanoplasty, the performing surgeon should consider not only the potential added benefit but also potential risks and costs to the patient [4]. A major advance in imaging of the ear structures has occurred with the development of the high resolution thin section CT. The bony portions of the temporal bone are depicted with approximately the same resolutions with polytomography, but CT has added a whole new dimension for evaluation of the ear by allowing visualization of the soft tissue components within and adjacent to the temporal bone [5]. CT scan added a new dimension to the study of middle ear disease; middle ear masses and associated complications were visualized for the first time [6]. High resolution CT is very effective in evaluation of aditus blockage and residual tissue of the tympanomastoid region [7].

The present study was designed to detect the value of CT imaging in assessment of aditus ad antrum patency and to correlate the radiological findings with operative findings.

Patients and Methods

This study was conducted since January 2007 till May 2009 at Otorhinolaryngology Department, Benha University Hospital. The study included 40 patients with failed myringoplasty; 23 males and 17 females with mean age of 29.3; range: 20 to 43 years. All patients had previous history of myringoplasty without mastoidectomy.

All patients were subjected to the following:

A- Pre-operative assessment:

All patients underwent full history taking, complete otorhinolaryngological examination, including microscopic and otoscopic examination of the ear with audiological evaluation included, pure tone audiometry and tympanometry; for detection of Eustachian tube function, where a positive pressure (+300 dapa) is introduced into the external auditory canal in both normal and abnormal ears. The (E.T) spontaneously opened and there will be a residual pressure. The patient is asked to swallow several times. The residual pressure reach zero after two swallow, this means that (E.T) function is good. Failure to equalize the pressure indicate that (E.T) function is abnormal (Shanks and Shelton) [8]. Routine chest X-ray and preoperative laboratory investigations were done.

Axial CT scanning with 2mm slice thickness and 2mm intervals was done preoperatively for all patients for assessment of the tympanomastoid pneumatization and condition of aditus ad antrum, whether closed or opened. All the patients in the study were selected with the following criteria: previous myringoplasty without mastoidectomy, dry safe perforation in pars tensa (any size and shape), intact ossicular chain, good Eustachian tube function and no cartilage graft in the previous operation.

B- Operative technique:

After obtaining fully-informed written consent 40 patients assigned for cortical mastoidectomy (canal wall up technique) with underlay myringoplasty with tragal cartilage pericordium graft. All surgeries were conducted under general inhalational anesthesia with orally situated cuffed endotracheal tube through post auricular approach. Trimming of the edge of the perforation with dissection of the posterior meatal wall and elevation burr the bone above and behind the external auditory meatus was gradually excavated to open the antrum, then saline was evacuated in the antrum and its passage through the aditus to middle ear was noticed and the result was recorded. If aditus closed or opened. If aditus was blocked, the bony posterior metal wall was thinned until short process of the incus was identified, then by curved needle; the soft tissue in the region of aditus ad antrum was removed and dissected until saline pass to the middle ear. Tragal cartilage pericordium graft was introduced under the drum and the tympano-meatal flap was repositioned with closure of post auricular incision.

C- Follow-up:

Patients were examined with the use of both an operating microscope and otoscope weekly for two months till the ear was completely healed.

Results

The study included 40 patients with failed myringoplasty; 23 males (57.5%) and 17 females (42.5%) with mean age of 29.3; range: 20 to 43 years.

CT scanning detected 11 cases (27.5%) with opened aditus ad antrum (Figs. 1,2) and 29 cases (72.5%) with blocked aditus ad antrum (Figs. 3-6) (Table 1).

Surgically there were 29 cases (72.5%) with blocked aditus ad antrum and 11 cases (27.5%) with opened one, the same like CT findings. The accuracy of CT scanning in evaluation of aditus ad antrum patency was 100% by comparison with the surgical results (Table 2). Only one case presented by failed myringoplasty out of 40 patients from the group of opened aditus ad antrum due to post operative infection.
Table (1): CT findings of the studied cases.

<table>
<thead>
<tr>
<th>Aditus</th>
<th>Number</th>
<th>Closed aditus</th>
<th>Open aditus</th>
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<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
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<tr>
<td></td>
<td>40</td>
<td>29 72.5</td>
<td>11</td>
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Table (2): Correlation between CT results and surgical results.

<table>
<thead>
<tr>
<th>CT results:</th>
<th>Surgical results</th>
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<tbody>
<tr>
<td>Closed aditus</td>
<td>Open aditus</td>
</tr>
<tr>
<td>CT results:</td>
<td>Closed aditus</td>
</tr>
<tr>
<td></td>
<td>Open aditus</td>
</tr>
<tr>
<td>Total number</td>
<td>29</td>
</tr>
</tbody>
</table>

Fig. (1): Axial CT scan showing opened right aditus ad antrum [(A) Aditus, (O) ossicles & (N) antrum].

Fig. (2): Axial CT scan showing opened left aditus ad antrum [(A) Aditus, (O) ossicles & (N) antrum].

Fig. (3): Axial CT scan showing closed right aditus ad antrum [(A) Aditus, (O) ossicles & (N) antrum].

Fig. (4): Axial CT scan showing closed left aditus ad antrum [(A) Aditus, (O) ossicles & (N) antrum].

Fig. (5): Axial CT scan showing closed left aditus ad antrum [(A) Aditus, (O) ossicles & (N) antrum].

Fig. (6): Axial CT scan showing closed left aditus ad antrum [(A) Aditus, (O) ossicles & (N) antrum].
Discussion

Myringoplasty with good Eustachian tube function, dry safe ear with small central perforation without postoperative infection and with good surgical technique may be failed, why? The impression of dry safe ear correlates with the normal mastoid air cell system or not. Mastoidectomy has long been identified as an effective method of treatment of chronic ear infection [9]. Well-trained, experienced otologists currently remain divided as regard the importance of mastoidectomy in the treatment of chronic noncholesteatomatous suppurative otitis media [10]. The use of mastoidectomy to treat chronic drainage or suppuration from otitis media remains an issue of debate. Some authors have thought that mastoidectomy is justified in cases of chronic suppurative otitis media which have been refractory to maximal antibiotic therapy [11]. Other authors have argued that closure of tympanic membrane perforations and elimination of chronic drainage can be achieved effectively when performing tympanoplasty with or without mastoidectomy. It has been suggested further that Mastoidectomy is not only unnecessary when treating chronic non-cholesteatomatous supportive otitis media but also it increases patient risks and costs with little or no significant clinical outcome advantage [12]. Throughout the ear surgery in cases of myringoplasty with cortical mastoidectomy, in our hospital, we found that the mastoid air cell system was normal in all cases. However, we found soft tissue blocked the aditus in some cases rendering saline difficult to pass from antrum to middle ear while in other cases the aditus ad antrum was patent. Mastoidectomy is time consuming, with potential complications and with no added benefit for the patient if the aditus ad antrum is already patent. CT scanning is capable of evaluation of patency of aditus ad antrum.

So the purpose in this study was to detect the value of high resolution CT imaging in assessment of patency of aditus ad antrum and its accuracy regarding to the operative findings.

Our results showed that the accuracy of CT in assessment of aditus ad antrum was 100% and these coincide with results of Gorur et al., [7] who reported that CT is very effective in evaluation of aditus blockage and residual tissue of the tympanomastoid region. Our results reported that 72.5% of cases in this study were with blocked aditus ad antrum, which means that there is a role of mastoid in failure of myringoplasty and all cases in this group showed success rate of 100% after combined mastoidectomy with tympanoplasty, these results coincide with that reported by Benjamin et al., [4] who reported that combining mastoidectomy with tympanoplasty during repair of simple perforations in patients with no evidence of infection remain an appropriate option and may be valuable in reducing progression of disease and the need for future surgery.

Conclusion:

CT scanning is very effective and accurate tool in evaluation of aditus ad antrum blockage and this blockage play a role in failure of myringoplasty. It is recommended that CT scanning should be done for every patient with simple myringoplasty before operation to decrease time consuming, avoid complications of cortical mastoidectomy and decrease the rate of failure of operation, as it gives accurate idea about the choice of the correct line of treatment, if the patient necessitate cortical mastoidectomy operation or not.

References

