

Evaluation of Auriculocephalic Angle following Canal Wall up and Canal Wall down Mastoidectomy Procedures

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Abstract

Background: Mastoidectomy is a common procedure in otolaryngology. It has numerous complications. Aesthetic issues following this surgery are not widely discussed.

Purpose: To evaluate auriculocephalic angle and helix to mastoid distance between patients who underwent canal wall up and canal wall down mastoidectomy procedures.

Methods: In this cross sectional study, sixty patients who underwent canal wall down or canal wall up mastoidectomy, observed for auriculocephalic angle and helix to mastoid distance of both ears before and after surgery. We analyzed data with paired t-test and independent t-test. All tests were conducted at the 0.05 level of significance.

Results: Patients, who underwent canal wall down mastoidectomy, had a significant reduction in auriculocephalic angle and helix to mastoid distance. In canal wall up group, these parameters increased, although the observed differences were not statistically significant.

Conclusion: Mastoidectomy can alter the aesthetical parameters of the auricle and may also lead to functional disorders due to these changes.

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INTRODUCTION

Canal wall up (CWU) and canal wall down (CWD) mastoidectomy procedures have their own indication, benefits and pitfalls. In CWD, the posterior wall of external auditory canal is removed and a common cavity containing mastoid and ear canal is remained. The ear canal is significantly wider and it is easier to get access to middle ear and mastoid (1, 2).

A significant disadvantage of CWD procedure is the need for frequent cavity care and the pitfall of CWU procedure is limited access and the probability of remaining disease and need for revision surgery (3, 4).

An aesthetically normal auricle has a width to length ratio of 1/2. The normal length of auricle is equal to the length of the nose, from nasion to sub nasal. The upper surface of the auricle is in the same level with the eyebrow and its lower limit has the same level with the nasal ala. One of the aesthetical characteristics of the auricle is auriculocephalic angle (ACA)

which normally is 20 to 30 degrees. The helix to mastoid distance (HMD) is normally 15 to 25 mm (5, 6).

CWD and CWU mastoidectomy are usually performed via post-auricular incisions. They may alter the natural distances and angles of the auricle. The aim of this study is to measure and compare these distances and angles between the patients who underwent CWU or CWD procedure.

PATIENTS and METHODS

This cross-sectional study performed in Loghman Hakim hospital during a 12 month period between September 2014 and 2015.

The patients, who underwent mastoidectomy due to surgical indications, entered the study. They were evaluated pre-operatively regarding auricular anomalies. The ones with history of previous ear surgery in either ears, the patients with congenital or acquired anomalies of the auricle(s) and the ones who developed surgical

complications such as hematoma, infection and abscess formation in surgery site, excluded from this study.

Sixty patients met the inclusion criteria and entered the study, from which 29 underwent CWD and 31 underwent CWU procedure. The distance between the most prominent point of the helix and mastoid and auriculocephalic angle measure in both ears before surgery and 6 month post-operatively.

The data was analyzed after proof of normality using SPSS v 18 for Windows. Paired t-test and independent t-test were used with meaningful level of 5%.

The study performed after agreement of ethics committee of Shahid Beheshti University of Medical Sciences. Informed consent obtained from all patients.

RESULTS

In a one-year period between September 2014 and 2015, sixty patients who underwent mastoidectomy were evaluated. The patients aged between 19 and 72 years and mean age was 44.4 ± 12.1 years. Thirty-one patients (51.7%) underwent CWU mastoidectomy and 29 (48.3%) had CWD procedure.

In CWD group, 16 patients (55.2%) were female and 13 (44.8%) were male. There were 16 (51.6%) females and 15 (48.4%) male in CWU group.

In CWD group, in 8 patients (27.6%), ACA increased post-operatively while this angle decreased in 21 cases (72.4%). Mean post-operative ACA in CWD group was 24.5 ± 9.6 degrees in surgery side and 27.6 ± 7.6 degrees in healthy side. This difference was statistically significant.

In CWU group, in 18 patients (58.1%), ACA increased post-operatively while this angle decreased in 12 cases (38.7%) and in one patient (3.2%) it remained unchanged. In this group, this angle was 24.8 ± 9.5 degrees in operation side and 23.0 ± 8.2 degrees in healthy side. This means that despite CWD patients, in CWU group the ACA was actually increased although the observed difference was not statistically significant ($p = 0.237$).

Mean helix-mastoid distance (HMD) was 15.2 ± 4.5 mm in operated side and 17.4 ± 5.1 mm in healthy side in CWD group. This difference was statistically significant ($p < 0.05$).

In CWU group, mean HMD was 15.3 ± 3.5 mm in operated ear and 14.3 ± 4.3 mm in healthy ear. This difference was not significant ($p = 0.179$).

There was a statistically significant difference between two surgical procedures regarding ACA and HMD ($p < 0.05$). Patients who underwent CWD mastoidectomy had smaller ACA and HMD post-operatively. There was no difference in measured HMD and ACA between males and female in CWU or CWD groups.

DISCUSSION

Surgery of the middle ear and mastoid is a relatively common procedure in otolaryngology (7). There are many complications related to the diseases and surgeries of this region but the aesthetical issues are not discussed very well (5).

The shape and position of the auricle may be important for localization of the sound (8). Prominent ears are a sign of good fortune in some areas of the Asia while it is considered unpleasant in most cultures (9).

Some authors have proposed that forward position of the auricle may lead to better perception of the sounds that come from anteriorly oriented sources (10). This means that reduction in ACA may have some effects on auditory functions.

The desirable ACA is 20-30 degrees. Ideally, this angle should remain unchanged after mastoid surgery. Alternation of this angle may be aesthetically unpleasant especially in female patients (5).

Driessen JP et al. have proposed that the definition of protruded auricles is different between males and females. They found that males have greater ACA than female (11). In our study, we found no significant difference between two genders.

CWD mastoidectomy, by removing the posterior canal one and building up a large

common cavity, may lead to internal rotation of the posterior aspect of anteriorly junction and leads to reduction in ACA (3, 4).

In our study, in patients who underwent CWD procedure, ACA increased in 27.6% and decreased in 72.4% of cases. The difference in ACA between two sides was significant. We can propose that CWD mastoidectomy leads to an overall reduction in ACA. This finding is similar to previous findings (3, 4).

In CWU group, the post-operative difference between ACA of two ears was not significant. However, the data showed a slight increase in this angle after surgery. We assume that these changes may be due to iatrogenic injuries of posterior auricular muscle hence this theory needs approval by further studies.

Normal HMD is mentioned to be between 15-25 mm. Although in our patients this distance remained in this normal range, the difference between two sides – that means asymmetry – was significant in CWD group.

CONCLUSION

Mastoidectomy can alter the aesthetical parameters of the auricle and may also lead to functional disorders due to these changes.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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