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Comparative Study between Ear Lobe Push Down Versus Ear Lobe Transposition in Microtia Reconstruction

Ahmed Elshahat, Hany Saad, Niveen Fathy Al Mahmoudy
Plastic, Burn and Maxillofacial Surgery Department, Faculty of Medicine, Ain Shams University, Cairo, Egypt
Corresponding author: Niveen Fathy Al mahmoudy, **Mobile:** 0201002414347, **email:** neveenoos@hotmail.com

ABSTRACT

Background: In microtia, there is a remnant of the malpositioned lobe and deformed auricle. To achieve an aesthetically appealing consistent ear; there must be a balanced 3-dimensional structural support, and there must be an adjustment of the skin to the framework. **Aim:** To compare extension of the cartilaginous framework downwards to be inserted in a pocket created inside the ear lobe (ear lobe push down) versus ear lobe transposition in cases presented with microtia.

Patients and methods: Twenty cases presented with unilateral microtia, underwent ear reconstruction with cartilaginous framework, randomized into two groups; in (group A) the carved 3D cartilaginous framework was introduced based on auricular foot print, with its lower end inserted in a pocket dissected inside ear lobe, while in (group B) the carved 3D framework was introduced as well based on auricular foot print, with no interference with the ear lobe, with assessment of the results objectively and subjectively.

Results: The movement of the lobe in the second stage in (group A) ranged from 0 to 45 degree if needed, whereas in (group B) it ranged from 135 to 180 degrees, with higher patient satisfaction in group A.

Conclusion: Ear lobe push down technique, by extension of the cartilaginous framework downwards to be adapted in a pocket dissected in ear lobe, is a feasible modification (step) in microtia reconstruction with appealing aesthetic outcomes.

Keywords: Microtia, ear reconstruction, ear lobe transposition.

INTRODUCTION

Microtia is a congenital disease with more occurrence in the right ear with more prevalence in males. Microtia has got variable degrees of severity, varying from malformed rudimentary vestiges to complete absence of the ear[(1)]. Reconstruction of microtia, in spite of the many techniques and modifications mentioned in literature, yet it is still challenging for optimizing results and final outcome by providing good ear projection and symmetrical presentation on both sides of the face[(2)].

The main malformations in microtia are the deranged cartilage remnants and the distorted mal-positioned ear lobe. Two major techniques were proposed for the malformed malpositioned lobe. First, transforming Z plasty technique, by **Nagata[(3)]**, that was done in first stage of ear reconstruction, but with a drawback of putting the posterior flap at risk of necrosis. Second, introduced by **Firmin and Marchac [(4)]** by transposing the lobe in second stage ear reconstruction without subcutaneous flap as **Nagata[(3)]**; ending up with easier dissection of tissues and better modulation of the cartilaginous framework.

Transposition of the ear lobe faced difficulty to inset in the right position as angle of rotation in some cases was more than 180 degrees, also, rapping of lobe skin over the lower part of the cartilage framework was difficult[(5)]. This study introduces a modification in ear lobe management, where the cartilaginous framework extended downward to be inserted in a pocket created inside the ear lobe area; this extension gives the lobe a support by making the cartilaginous frame continued as one unit. The aim of our study is to compare extension of the cartilaginous framework downwards to be inserted in a pocket created inside the ear lobe (ear lobe push down) versus ear lobe transposition in cases presented with microtia.

PATIENTS AND METHODS

This prospective study, was conducted in Plastic, Burns and Maxillofacial Department, Faculty of Medicine, Ain Shams University from June 2021 till September 2023. This study was for twenty cases presented with unilateral microtia with inclusion criteria; age ranging from 6-15 years, cooperative, and fitting patients for surgery. And exclusion criteria; hemifacial deformity, syndromic form of microtia, patients with facial nerve palsy and patients who refused surgery. All patients were operated upon by the senior author (Professor Elshahat). Prior to surgery a full general and local examination, with full relevant history and full laboratory investigations was done for all patients. Prior to surgery determination of the external morphology of the prospected auricle, based on measurements of the contralateral auricle (auricular foot print), was done, and a 3D printed model subunit was made[5,6], as a template for the affected ear to be reconstructed, so as to facilitate and enhance the carving of the harvested costal cartilage frame work. All patients were photographed (anteroposterior, lateral and posterior views) preoperatively, in between stages and at the end of second stage at 3-6 months. Patients were randomized into two equal groups, each of 10 patients; group (A) the odd numbers and group (B) the even numbers.

During the first stage: In group A, a pocket posterior auricular area was dissected according to auricular foot print, then the carved 3D cartilaginous framework was introduced and inserted in the pocket, with insertion of the lower end of the framework into a skin pocket, which was designed in ear lobe pocket, then a drain was inserted under the frame work and closure was performed with tension free sutures (Figure 1).

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Fig (1): a. Male patient with unilateral microtia, dissection of ear lobe pocket b. Insertion of cartilaginous framework.

In group B, the same as group A was done but with no interference or pocket creation in the ear lobe, the ear lobe was addressed in the second stage.

In both groups, following the first stage, postoperative antibiotics in the form of third generation cephalosporins, analgesics, and anti-inflammatory drugs were prescribed to the patients for 7-10 days. Drains were removed on the 5th day postoperatively with less than 1 cc drain. Sutures were removed on the 7th -10th day.

Follow up of the patients continued, once every two weeks for the first 2 months and then once every month until the second stage, which was usually 3-6 months following the first stage.

In group A;

Pushing the ear lobe down in the first stage by introducing the lower most part of the framework inside it may correct its position from the start or at least decreased the need for position adjustment (Figure 2).

Fig (2): Minimal correction of ear lobe position was needed in group A.

Separation of the upper 2/3 of the auricle from the head with creation of auriculo-cephalic angle and coverage of the post auricular sulcus with a split thickness skin graft harvested from the thigh were done, while the lobe was hanging freely from the first stage (Figure 3).

Fig (3): a. Male patient with unilateral microtia underwent reconstruction by 3D cartilaginous framework, b. Separation of upper 2/3 of auricle and creation auriculo-cephalic angle.

In group B, separation of the entire auricle from the head with creation of auriculo-cephalic angle and coverage of the postauricular sulcus with a skin graft with major movement of ear lobe for correction of position were done (Figure 4)

Fig (4): The pivot point of the lobule is 1 cm above its lower limit to maintain its vascularity. The angle of rotation of the ear lobe needed in second stage reconstruction in group B was more than 135-180 degree.

Patient satisfaction is the main goal and reflection of the success of any reconstruction technique. All patients were satisfied with the reconstructed auricle as a whole and ear fitting with face and measured by patient satisfaction score (five-point scale: 1-5: 1: very dissatisfied and 5: very satisfied).

Postoperative care and medications following the second stage, was the same as following the first stage.

Ethical approval: **The procedures in this study were performed in compliance with relevant laws and institutional guidelines in accordance to Helsinki ethical guidelines and have been approved by the Ethical Committee of Faculty of Medicine of Ain Shams University. An informed consent from the parents or guardians of the patients was signed, after full explanation of the surgical procedure and likely comorbidities if any.**

Statistical analysis: The collected data concerning the degree of lobe transposition were statistically analysed using SPSS version 25, where Mann Whittney U test was applied to compare data of both groups, which were presented as mean, standard deviation (SD), median, and interquartile range (IQR). P value of 0.05 or less was considered significant.

RESULTS

20 patients with unilateral microtia were included in the study. Patients were randomized into two groups, group A; 10 patients (odd number),7 males and 3 females.

The patients were operated upon using 3D costochondral cartilage framework after creation of an ear lobe pocket to adapt the framework. Lobe transposition may be done in selected cases in the second stage because many cases already have normal position and vector of their ear lobe. The movement of ear lobe ranged from 0 to 45 degree if needed. Both surgical stages for group (A) passed smoothly with no complications of seroma, disruption, infection, extrusion of cartilage or necrosis of skin (Figures 5, 6).

Fig (5): a. Right side ear microtia in male patient, b. Ear reconstruction by 3D costochondral cartilage framework with insertion of the frame in ear lobe pocket, c. Separation of the framework with minor transposition of ear lobe less than 20 degree.

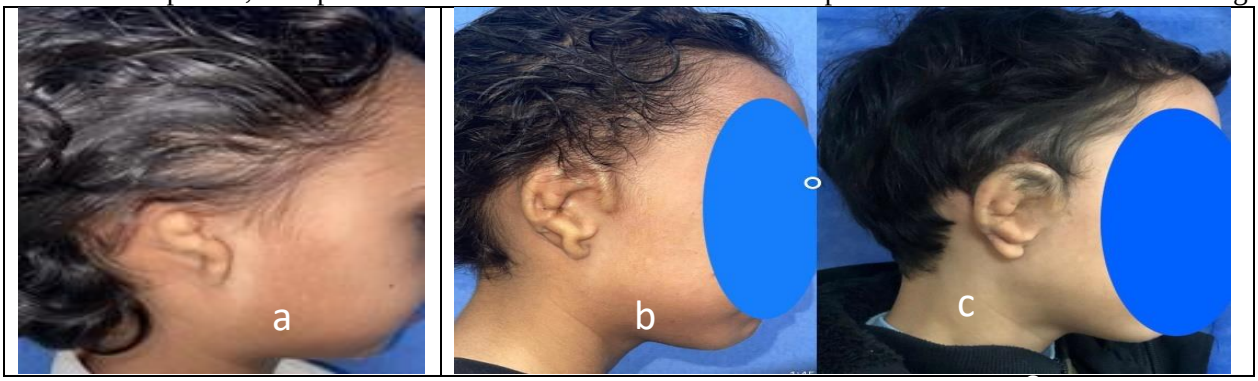

Fig (6): a. Right sided microtia in male patient, b. Reconstruction by 3D costochondral cartilage framework and insertion of the frame in a pocket dissected in ear lobe, c. Separation of the framework with minor transposition of ear lobe less than 45 degree.

While in **group B** (even numbers), there were 8 males and 2 females. The patients underwent 3D costochondral cartilage framework reconstruction and introduction in auricular footprint with no pocket dissection in the ear lobe, however creation of an ear lobe was done in the second stage by lobe transposition.

The movement of the lobe in the second stage in group B ranged from 135 to 180 degree.

Also, in **group B**, both stages passed uneventfully with no major complications of seroma, disruption, infection, extrusion of cartilage or necrosis of skin, except for two cases with minor disruptions, where one was managed with secondary sutures and the other with dressing with topical antibiotic cream (Figures 7-9)

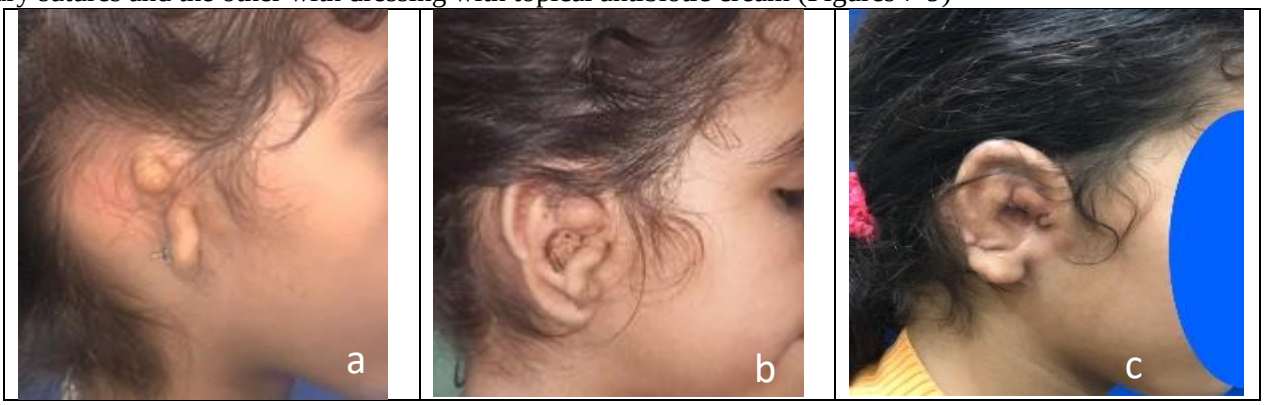

Fig (7): a. Right sided microtia in female patient, b. Reconstruction by 3D costochondral cartilage framework in auricular footprint without pocket dissection of ear lobe in first stage, c. Separation of the framework with major transposition of ear lobe of 160 degree.

Fig (8): a. Left sided microtia in female patient, underwent reconstruction by 3D costochondral cartilage framework in auricular footprint without pocket dissection of ear lobe in first stage, b. Separation of the framework with major transposition of ear lobe of 170 degree.

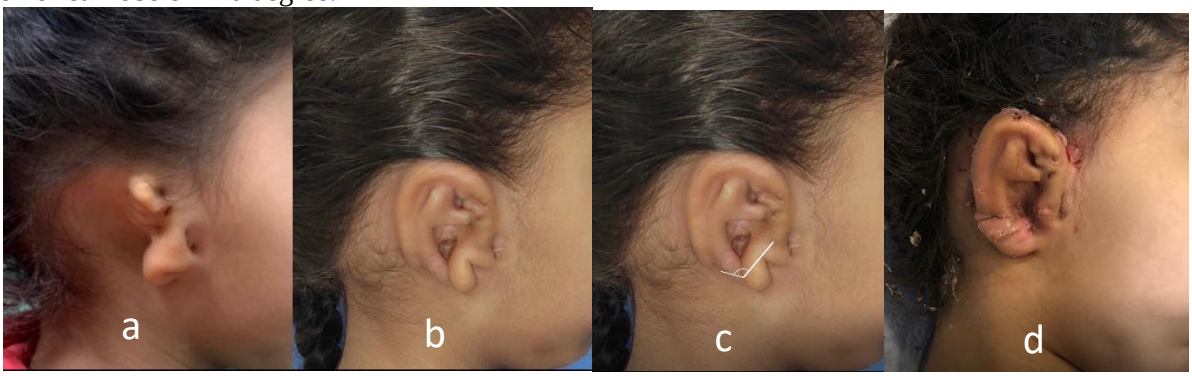

Fig (9): a. Right sided microtia in female patient, b. Reconstruction by 3D costochondral cartilage framework in auricular footprint without pocket dissection of ear lobe in first stage, c. Angle of ear lobe transposition is more than 135-degree, d. Separation of the framework with major transposition of ear lobe.

Evaluation of the patient satisfaction showed that in Group A; 7 patients were very satisfied, and 3 patients were satisfied, with no dissatisfied patients. In Group B; four patients were very satisfied and six patients were satisfied, with also no dissatisfied patients. With overall higher degree of satisfaction in group A.

The degrees of lobe transposition in both groups are shown in table 1.

Table (1): Degree of lobe transposition in both groups A and B

Number of cases	1	2	3	4	5	6	7	8	9	10
Degree of lobe transposition in group A (in degrees)	45	0	0	25	20	0	25	40	35	45
Degree of lobe transposition in group B (in degrees)	180	180	160	135	150	170	180	170	140	170

The median of the degrees of lobe transposition for group A was 25, and for group B the median was 170 (Table 2). These results show statistically highly significant difference between both groups, with better values in group A.

Table (2): Mean (SD) and median (IQR) of the degrees of lobe transposition for group A and B

Group A N=10	Mean (SD)	23.50 (18.27)	P-value <0.001*
	Median (IQR)	25.00 (0-40)	
Group B N=10	Mean (SD)	163.50 (16)	
	Median (IQR)	170.00 (150-170)	

SD: Standard deviation, IQR: Interquartile range,
*: Significant.

DISCUSSION

A successful ear reconstruction is one that should go unnoticed. Even the most minor deformity of the ear can be a considerable source of psychological stress for some patients [(7)].

In microtia, there is a remnant of the malpositioned lobe and deformed auricle. According to **Firmin**, certain goals must be achieved to grant the patients an aesthetically appealing consistent ear; there must be a balanced 3-dimensional structural support, and there must be an adjustment of the skin to the framework [(8)]. The auricular lobe has a significant role in the ear and facial aesthetics, although interventions appear to be simple, yet its impact on the individual is very high[9].

Several authors and techniques addressed the management of the ear lobe in cases of microtia. **Nagata and some other authors** [(3,10,11)], in his technique, created Z plasty skin flaps in first stage ear reconstruction, where the lobe is split into an anterior and a posterior skin flap. The anteriorly based tragal flap is used to cover the external surface of the tragus, while the posterior flap remains attached to the mastoid. After introducing the cartilaginous framework into the subcutaneous pocket in his technique, this may jeopardize the vascularity of the posterior flap and may endanger its blood supply ending up with skin necrosis.

Whereas **Firmin and Marchac** [(4)] in their technique, management of the lobe was in the second stage ear reconstruction, where if it is broad and optimal positioned; Z plasty and transposition of the lobe was done, and if narrow or not perfectly positioned lobe, a transfixing incision was done.

The senior author (A. Elshahat) in this study, started the application of the push down technique for the cartilaginous framework in a previous study, in cases of Tanzer type IIB constricted ears[(12)], where he applied the extended cartilaginous framework downwards to be inserted in a pocket fashioned inside the lobe area and with high satisfaction scores of the patients[(13)], which was a motivation to apply the same technique in cases of microtia in this study.

In this study, a p7erfect position of the lobe was gained by the effect of the push down of the cartilaginous framework. In some cases, minimal rotation (<45 degrees) was done, and even in some other cases there was no need for lobe transposition.

Considering the vascularity and aesthetic outcome, the technique in this study gave more reliable results as separation in the second stage to the upper 2/3 only, offered better vascular supply to the cartilaginous framework, as well as better sulcus definition as the lower part of the lobe is hanging freely with a more natural and appealing outcome than reconstructed lobes in other studies.

For each technique, there are still merits, such that in group B, although there is a need for second stage with greater degree of lobular transposition, yet this lobe may be a benefactor in cases of cartilage exposure if it occurred, which is not the case in group A where there will be a scanty of lobular tissues to cover exposed cartilage if occurred as a complication or morbidity.

Moreover, considering the satisfaction of the patients with the final outcome, and how the results of this survey showed a high satisfaction rate of more than 80% of patients, adds to the subjective assessment of the study and its reliability.

The limitation of this study is the limited number of cases.

CONCLUSION

Ear lobe push down by extension of the cartilaginous framework downwards to be adapted in a pocket dissected in ear lobe, is a feasible modification (step) in microtia reconstruction with appealing aesthetic outcomes.

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