

MODIFIED MUSTARDÉ TECHNIQUE FOR CORRECTION OF PROTRUDING EAR (BAT EAR) IN CHILDREN

By

Abd El-Rahman Salah Beltagy El-Beltagy¹, El-Sayed Hassan Mohamed
Abdallah¹, Ibrahim Ahmed Ismail Gamaan¹, Abd El-Rahman Safwat
Yossef El-Kady²

¹Department of Pediatric Surgery, Faculty of Medicine, Al-Azhar University

²Department of General Surgery, Faculty of Medicine, Al-Azhar University

Corresponding author: Abd El-Rahman Salah Beltagy El-Beltagy,

Mobile: 01099606331; **E-mail:** abdelrahmansalah887@gmail.com

ABSTRACT

Background: The auricle constitutes an important part of the face which is a focus of attention and personal interaction. A malformed auricle especially in young school age may result in some kind of psychosocial disturbance. Congenital abnormalities of the auricle have been estimated to occur in 5% of the population.

Objective: to demonstrate and evaluate the results of modified mustarde technique used for correction of prominent ear deformity in pediatric.

Patients and Methods: The present study included the results of operations in 30 ears concerning 16 patients because there were 14 bilateral and 2 unilateral patients with prominent ear deformities, at age between 4-14 years of sexes, (11 males and 5 females). The patients were admitted to Al-azhar University hospitals in Cairo.

Results: Our results were discussed in view of one technique, modified mustarde technique for all cases. The aesthetic results were evaluated, during the first 6 months postoperatively, by inspection and continuous measurements of auriculo-mastoid distance. For that purpose, photographs and measurements data taken in the pre- and post-operative periods was compared. In addition, the opinions of the patients and their care givers were taken into consideration.

Conclusion: The use of modified mustarde technique not only hides the suture material but also provides a primary otoplasty technique that supports the repair with plication and scoring which gives the opportunity for the new shape to remain consistent in the postoperative period, a natural-looking antihelical fold, no sharp edges was formed and Long-lasting permanent results were aimed We believe that the modified mustarde technique was simple, safe and easy applicable method for protruding ear correction with excellent results.

Keywords: Laser- assisted cartilage remodeling.

INTRODUCTION

The auricle is a defining feature of the face. Its shape and size is influenced by age, sex and ethnic origin (*Schneider and Douglas, 2018*).

Prominent ear is the most common congenital auricular deformity and typically occurs bilaterally. Approximately 5% of the population

suffers from some degree of ear prominence (*Mazeed et al., 2019*).

The most common causes of protrusion of the external ear are underdeveloped flat antihelix or an overdeveloped deep concha. In reality, most patients have a combination deformity of posterior cartilage excess and an undefined antihelix (*Koul and Patil, 2011*).

The protruding ear can be managed through a multitude of approaches, both surgical and nonsurgical. Molding techniques are frequently successful in infants with protruding or deformed ears. Another management option is the Laser-assisted cartilage remodeling (LACR) which is based on the temperature-dependent characteristics of cartilage (*Byrd et al., 2010*).

More than 170 techniques have been described for correction of prominent ears varying between incisions, excision, scoring and suturing techniques indicating that there is no single widely accepted procedure that has been adopted by most surgeons (*Ali et al., 2017*).

In this study we will use a Modified Mustardé technique otoplasty to create a new antihelix that based on incision-scoring techniques combined with plication and sutures to get a smooth well defined antihelix with permanent result.

Aim of the work:

It is a prospective non comparative study for Evaluation of the efficacy and Outcome of Modified Mustardé technique for correction of protruding ear in pediatric.

PATIENTS AND METHODS

This study is a prospective non-comparative study and included the results of operations in 30 ears concerning 16 patients because there were 14 bilateral and 2 unilateral prominent ears, at age between 4-14 years of both sexes (11 males and 5 females) with prominent ear deformity. The patients were admitted to Al-Azhar University hospitals (Al-Hussein And Sayed Galal University hospitals) and all of them underwent otoplasty using modified mustarde technique.

The results were evaluated during a period of 1–6 months postoperatively; through inspection and auricle-mastoid distance measurements In addition, the opinions of the patients and their care givers which were taken into consideration and photographs compared in the pre and postoperative period. The patient must be fit for surgery.

Surgical management:

1. General anesthesia with oral endotracheal intubation.

2. Sterilization and draping.

Both ears and per auricular regions were cleansed using alcohol 70% then povidone iodine solution after application of eye ointment and small piece of gauze in both external meatal openings then draping.

3. Marking the skin ellipse by sterilized marker pen.

Marking the target skin ellipse by marker pen depending on subtraction the desired helical mastoid distance by millimeter from current helical mastoid distance. (for ex, the desired helical

mastoid distance equal 20 mm and the current helical mastoid distance equal 33 so 33mm minus 20mm equal 13mm so the elliptical skin maximum width equal 13 mm) starting from the opposite end of the helical rim.

4. Hydro dissection:

A solution 1/400000 adrenaline in normal saline was injected subcutaneous through the whole posterior marking and also anteriorly along the site of future antihelix to help bloodless hydro dissection.

5. Skin excision and flap elevation.

Elliptical skin excision with sharp tips should be done along the previous marking until we exposed the perichondrium, then The auricular cartilage was divided along the lateral edge of excised skin leaving 2mm cartilage from the skin edge extending from helical rim to tail to achieve a near total separation of the helix, (Fig. 1). Dissection of cartilage from anterior skin was performed using the scissors and dissectors to freeing the cartilage preparing it for plication, (Fig. 2).



Fig. (1): Incision in the cartilage extending from helical rim to tail



Fig.(2): Dissection of cartilage from anterior skin

6. Cartilage scoring:

Anterior superficial longitudinal scoring was performed using number 15 scalpel for weakens the cartilage for easy folding.

7. Artificial anti helix formation:

plication of the free part of the cartilage upon its self to form artificial anti helix using non absorbable monofilament polypropylene suture 4\0 with circle needle through special manner, suture start from the posterior surface to

make the knot posterior inside the plicated cartilage to avoid stich sinus, (Fig. 3).

Three sutures using non absorbable monofilament polypropylene suture 4\0 with circle needle were enough. Assessment of the shape of artificial anti helix must be done after first suture to ensure the symmetry of the shape and degree of prominence and helical mastoid distance between both ears.



Fig. (3): Plication of the cartilage upon its self-using non absorbable monofilament polypropylene suture 4\0

8. Last step (skin closure and ear dressing).

Skin closure is done by subcuticular skin suturing using 5/0 polypropylene suture and steri strip. We use malleable stent synthesized from folly's catheter size 12 or 14f according to ear size and

metallic wire, (**Fig. 4**) that help for catheter remodeling to take the shape of helical groove and its length according the length of the helix we put it in the helix to preserve the helical groove, leads to less postoperative edema and help cartilage reshaping, (**Fig.5**).



Fig. (4): Malleable stent synthesized from folly's catheter size 12 or 14f and metallic wire.



Fig. (5): After fixation of malleable stent by steri strep.

Follow-up:

All patients were bandaged for 48 hours after surgery, change the dressing and removal of stent then re bandaged for one week. Removal of retro auricular skin sutures were at 8 day post-operatively. The light bandage continued for another 10 days only at night time. The results were evaluated in a period 1 – 6 months postoperatively; through inspection and auricle-mastoid distance measurements In

addition, the opinions of the patients and their care givers which were taken into consideration and photographs compared in the pre and postoperative periods.

Statistical Analysis

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data were presented as mean, standard deviations and ranges. Also qualitative variables were presented

as number and percentages. The comparison between two paired groups with quantitative data with parametric distribution was done by using **Paired t-test**. The comparison between more than two independent groups with quantitative data with parametric distribution was done by using **One Way ANOVA**. **Spearman correlation coefficients** were used to

assess the correlation between two quantitative parameters in the same group. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following: P-value > 0.05: Non significant (NS). P-value < 0.05: Significant (S). P-value < 0.01: Highly significant (HS).

RESULTS

This study included 30 ears concerning 16 patients, (14 patients of bilateral and 2 patients of unilateral) prominent ears and

all of them underwent otoplasty using modified mustarde technique. **Table 1).**

Table (1): Demographic data of the studied group

Demographic data		Total no. = 16(percentage)
Age (years)	Range	4 – 14
	Mean ± SD	7.91 ± 3.44
Sex	Males	11 (68.8%)
	Females	5 (31.2%)

The age of the studied group was ranged from 4 years to 14 years with mean 7.91years, and 68.8% of the patients were

males (11patients) and 31.2% were females (5patient).

Table (2): Data about studied patients

Affected side	Bilateral	14 (87.5%)
	Right sided	1 (6.2%)
	Left sided	1 (6.2%)
Family history	Negative	5 (31.2%)
	Positive	11 (68.8%)
The motivation for surgery	Bullying from the peers	16 (100.0%)
Antihelix	Completely absent	10 (62.5%)
	Absent upper third only	6 (37.5%)

Fourteen patient, (87.5%) were bilateral, 1 patient (6.2%) was right sided and 1 patient, (6.2%) was left sided. 11 patients, (68.8%) has positive family history and 5 patients, (31.2%) has negative family history. By history the motivation for surgery for all patients was

Bullying from the peers. The deformity of the ears that causing it looking prominent in this study is absent anti helix that may be completely or partially absent, 10 patients, (62.6%) were completely absent and 6 patients, (37.5%) only absent upper third of the antihelix. **Table 2).**

Table (3): Statistic data about operative time and postoperative complication for each ear

Operative time for each ear (min)	Mean \pm SD	30.43 \pm 5.29
	Range	23 – 40m
Post-operative complication	Non	28 (93.3%)
	Still prominent ear (asymmetry)	1 (3.3%)
	Hematoma	1 (3.3%)

The range of operative time was 23-40 min with mean 30.43 min for each ear. No complication was detected in 28 ears, (93.3%).

Table (4): Postoperative impression and patient or care givers satisfaction

Post-operative impression	Excellent (85-100%)	11 (68.8%)
	Very good (75-84%)	2 (12.5%)
	Good (60-74%)	3 (18.8%)
	Bad (< 60%)	0 (0.0)
Patient and/or care giver percentage of satisfaction (%)	Mean \pm SD	92.81 \pm 10.73
	Range	70% – 100%

Eleven patient (68.8%) were excellent 2 Patients, (12.5%) were very good and 3 patients, (18.8%) were good Post-operative impression,. Patient and/or care

giver percentage of satisfaction ranging from 70-100% with mean 92.81%. **Table 4).**

**Fig. (5):** Pre and post-operative photos of female patient 5.8years old with bilateral bat ears ,Photos taken from the front, rear, and of each ear from the side



Fig. (6): Pre and post-operative photos of male patient 4years old with left bat ear, Photos taken from the front, rear, and LT ear from the side



Fig. (7): Pre and post-operative photos of male patient 5years old with bilateral bat ears, Photos taken from the front showing post-operative asymmetry due to still prominent right ear



Fig. (8): Pre and post-operative photos of female patient 4years old with bilateral bat ears, Photos taken from the front and lateral side of left ear showing minimal resolved hematoma

DISCUSSION

Prominent ear deformity leads to considerable social and emotional impact rather than an aesthetic problem. Surgical management of protruding ears has evolved over time to include countless innovative techniques (Yamada, 2018).

The cartilage-sparing techniques have shown unacceptable high recurrence rates compared with the non-cartilage sparing

techniques, (Smittenberg *et al.*, 2018) due to the tension applied on the sutures. In spite of multiple trials to cover it like using post auricular fascial (Taş, 2018) or adipodermal fat flaps (Cihandide *et al.*, 2016), suture extrusion is still being one of its drawbacks. Beside the great risk of recurrence and less durability of repair after cartilage sparing technique, chronic postoperative pain related to the

embedded sutures is additional problem also noted.

The operative time was 23-40 min with mean 30.43 min for each ear which is good in comparison with *Ahmed et al. (2018)* who used nearly similar technique with his mean operative time was 90 minutes (ranged from 85 to 120 minutes).

No complication was detected in (28 ears), 93.3% of patients, while 2 complication was happened in (2 ears) 6.6% of patients, Still prominent ear occurs in (1 ear), 3.3% that was satisfied for the patient who refused further surgical intervention while minimal resolved hematoma occurs in (1 ear), 3.3% of patients that not need evacuation, just hot fomentation, haemoclar (pentosane polysulphate) cream, prophylactic antibiotic and follow up was done for 10 days until resolved with no further complication, which is good result in comparison with 20% complication rate in cartilage sparing technique, 6% from them need reoperation while 21% in non-cartilage sparing techniques, 7% from them need reoperation (*Smittenberg et al., 2018*).

There was a highly significant inverse relationship between postoperative H-M Distance and post-operative impression with P-value < 0.01 (11 patient) 68.8% were excellent Post-operative impression While (2 patients) 12.5% were very good, and (3 patients) 18.8% were good Post-operative impression. In comparison with *Valente et al. (2010)* who used nearly similar technique and achieved very good results in 50 patients (83%), good results in nine patients (15%), and acceptable results in one patient (1.7%).

The advantage of the modified mustarde' technique over the other suture techniques (cartilage sparing otoplasty) was that no recurrence rate as in comparison with (10.3%) recurrence rate with mustarde' technique *Olivier et al. (2009)* due to incision, scoring and plication of cartilage and using of non-absorbable mono filament suture. In addition to the knot of the permanent sutures in this technique placed inside the plicated cartilage that decreases the incidence of suture extrusion in comparison with Suture extrusion occurred in 17 patients (8.5%) using cartilage sparing mustarde' suture technique In seven of them, suture was removed in the dressing clinic without needing anesthesia. Six patients needed removal under local anesthetic, and four patients required general anesthesia (*Mazeed and Bulstrode, 2019*).

The advantage of the modified mustarde' technique over the other cartilage excision techniques was that smooth antihelix no sharp cartilaginous ridge at site of the new antihelix (*Schneider and Douglas, 2018*).

CONCLUSION

The use of modified mustarde' technique not only hides the suture material but also provides a primary otoplasty technique that supports the repair with plication and scoring which gives the opportunity for the new shape to remain consistent in the postoperative period, a natural-looking antihelical fold, no sharp edges was formed and Long-lasting permanent results were aimed, We believe that the modified mustarde' technique was simple, safe and easy

applicable method for protruding ear correction with excellent results.

REFERENCES

1. **Ahmed M, Hani A, Emad I. (2018):** "Helix free otoplasty for correction of prominent ear." *Asian J Surg.* 2018; 22: 30541-4.
2. **Ali K, Meaike JD, Maricevich RS et al., (2017):** The protruding Ear: cosmetic and reconstruction. *Semin Plast Surg.* 2017; 31: 152-60.
3. **Byrd HS, Langevin CJ, Ghidoni LA. (2010):** Ear molding in newborn infants with auricular deformities. *Plast Reconstr Surg.* 2010; 126(04): 1191–200.
4. **Cihandide E, Kayiran O, Aydin EE, et al., (2016):** A new approach for the correction of prominent ear deformity: the distally based perichondrio-adipo-dermal flap technique. *Journal of Craniofacial Surgery.* 2016; 27(4):892-7.
5. **Koul AR and Patil RK. (2011):** An effective technique of helical cartilage scoring for correction of prominent ear deformity, *Indian J Plast Surg.* 2011; 44(3): 505-8.
6. **Mazeed AS and Bulstrode NW. (2019):** Refinements in Otoplasty Surgery: Experience of 200 Consecutive Cases Using Cartilage-Sparing Technique. *Plast Reconstr Surg.* 2019; 144(1):72-80.
7. **Olivier B, Mohammad H, Christian A, et al., (2009):** Retrospective study of the long-term results of otoplasty using a modified Mustardé (cartilage-sparing) technique. *J Otolaryngol Head Neck Surg.* 2009; 38(3):340-7.
8. **Schneider AL and Douglas MS. (2018):** "Cosmetic otoplasty." *Facial Plastic Surgery Clinics.* 2018; 26(1): 19-29.
9. **Smittenberg MN, Marsman M, Veeger NJ, et al., (2018):** Comparison of cartilage-scoring and cartilage-sparing otoplasty: a retrospective analysis of complications and aesthetic outcome of 1060 ears. *Plastic and Reconstructive Surgery.* 2018; 141(4):500-6.
10. **Taş S. (2018):** "Prominent ear correction: a comprehensive review of fascial flaps in otoplasty." *Aesthetic surgery journal.* 2018; 38 (7): 695-704.
11. **Valente AS. (2010):** Separating the helix from the antihelix: a new concept in prominent ear correction. *Aesthetic surgery journal.* 2010; 30(2):139-53.
12. **Yamada A. (2018):** Commentary for Modified Island Technique for Prominent Ears. *Aesthetic Plastic Surgery.* 2018; 42 (1): 165-6.

دراسة تقنيه معدلة لتقنية مستاردي لتصحيح الأذن البارزة (الأذن الخفاشية) في الأطفال

عبدالرحمن صلاح بلتاجي البلتاجي*، السيد حسن محمد عبد الله*، إبراهيم احمد

إسماعيل جمعان*، عبد الرحمن صفوت يوسف القاضي**

قسمي الجراحة العامة** وجراحة الاطفال*، كلية الطب، جامعة الأزهر

خلفية البحث: تتبوأ الأذن الخارجية أهمية قصوى بالنسبة لكل انسان ، حيث تعطى الأذن الخارجية جمال طبيعي للوجه يزداد بما تحمله من حلى و مجوهرات. ان تشوهات الأذن الخارجية تجبر بعض المرضى على استخدام تسريحة خاصة للشعر لإخفائها لذا فإن عمليات اصلاح و تجميل تشوهات الأذن الخارجية تمثل أهمية لكلى الجنسين. ويشكل صيوان الأذن جزء هام من الوجه ، قد يثير الانتباه والتأثير الشخصي في حالة التشوه الخلقى خاصة عند صغار السن، فقد يسبب لهم أنواعا من الاضطراب النفسي. و جدير بالذكر أن نسبة حدوث التشوهات الخلقية في صيوان الأذن تصل الى 5% من التعداد السكانى فى العالم.

الهدف من البحث: دراسة تقنيه معدله لتقنية العالم مستاردي لتصحيح الأذن البارزة (الأذن الخفاشية) في الأطفال.

المرضى وطرق البحث: تمت الدراسة فى هذا البحث على ثلاثون اذن في ستة عشر مريضاً لوجود اربعة عشر طفل يعاني من الاذن البارزة علي الجانبين وطفلان يعانون من الاذن البارزة علي جانب واحد منهم احد عشرة ولد وخمسة بنات يعانون من تشوهات بروز الأذن الخارجية الوراثية في مستشفيات جامعة الأزهر بالقاهرة (مستشفى سيد جلال ومستشفى الحسين الجامعي) ومناسبون لإجراء جراحة تعديل وتجميل للأذن الخفاشية فى الفترة من يونيو 2019 إلى اكتوبر 2020. واشتملت طرق البحث قبل العملية علي أخذ التاريخ المرضى للحالة و الفحص الإكلينيكي الشامل قياس نسبة البروز للأذن أبحاث الدم التصوير الفوتوغرافي وتم اجراء عمليات التجميل والاصلاح للأذن الخارجية طبقا للتشوهات الموجودة بنفس الطريقة و تم الفحص الإكلينيكي المتكرر والتصوير الفوتوغرافي من بعد العملية وحتى فتره تتراوح من شهر الي ستة أشهر متتالية.

نتائج البحث: لقد أسفرت النتائج عن عدم وجود أي مضاعفات مستديمة بعد اجراء الجراحات التجميلية لجميع المرضى غير ان مريض واحد حدث له تجمع دموي بسيط في الاذن اليسرى وتم شفاؤه بدون اي تدخل جراحي وأخر استمرت اذنه اليمنى بارزه الي حد بسيط كما أسفرت النتائج عن تحسن شكل صيوان الأذن بعد شهر الى ستة أشهر عن طريق الفحص الإكلينيكي المتكرر لصيوان الأذن وشعور المرضى وذويهم بالسعادة بتجميل صيوان الأذن بعد الجراحة وأيضاً باستخدام المقاييس الجمالية المتعارف عليها.

الاستنتاج: تعتبر جراحة تعديل وتجميل صيوان الأذن بالتقنية المعدلة لتقنية العالم موسناردى تقنيه بسيطه وسهله التطبيق ولا ينتج عنها مضاعفات مستديمة وتؤدي الي شكل جمالي وتزيل العبء النفسي عن الاطفال وتسبب لهم ولذويهم السعادة البالغة.

الكلمات الدالة: معدلة لتقنية موسناردى – الأذن الخفاشية – طى الغضروف وتحصينه