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Mustardé Versus Incisionless Otoplasty for Protruding Ear

Mohamed Hassan Abdel-Aal, Mohammad Reda Ahmad, Mansour Mohamed Morsy, Mohamed Elsayed Mohamed Abdel-Wahed*

Department of General Surgery – Faculty of Medicine, Zagazig University

* Corresponding author: Mohamed el sayed Abdel wahed, Mobile: (+20) 01116373887, E-mail: Mohamed.abdelwahed.1989@gmail.com

ABSTRACT

Background: Prominent ear is one of the most common facial deformities affecting children. The aesthetic and psychosocial concerns surrounding an ear deformity serve as a catalyst for parents to seek correction, thereby propagating the strong desire for otoplasty at an early age.

Objective: is to assess the role of **Mustardé** technique and incisionless otoplasty technique regarding aesthetic outcome in surgical treatment of protruding ear, complications and postoperative care.

Subjects and methods: 24 patients (18 males and 6 females) suffering from prominent ear deformity (4 unilateral and 20 bilateral) were included in the present study. The reconstructive procedures were done for 44 ears divided by the procedure done into 2 groups. Group A: **Mustardé** procedure (21 ears, 8 patients with bilateral prominent ear and 2 patients with unilateral prominent ear); and group B: Incision-less procedure (23 ears, 9 patients with bilateral prominent ear and 2 patients with unilateral prominent ear). An approval of the study was obtained from Zagazig University academic and ethical committee and an informed written consent was obtained from each patient for acceptance of the operation.

Results: The mean values of the duration of operation in Mustardé procedure (group A) was significantly longer than that of Incision-less procedure ($P < 0.001$). The follow up period (months) revealed non-significant difference between both groups ($P > 0.05$). Mustardé procedure (group A) has a significant high percentage of reduction in auriculo-cephalic distance ($P < 0.01$), when compared with that of incision-less procedure, the percentage of reduction of the auriculo-temporal distance, and auriculo-mastoid distance of Mustardé procedure (group A) had a non-significant high values when compared with those of incision-less procedure ($P > 0.05$).

Conclusion: Both Mustarde and the incision-less suture techniques provide satisfactory results; however, the incisionless suture technique appears to be easier with less surgical time.

Keywords: Mustarde, Incisionless otoplasty, Protruding ear

INTRODUCTION

The protruding ear, also known as prominent ear, is one of the most common facial deformities affecting children. The aesthetic and psychosocial concerns surrounding an ear deformity serve as a catalyst for parents to seek correction, thereby propagating the strong desire for otoplasty at an early age **(1).**

It is the most common congenital auricular deformity and typically occurs bilaterally. Approximately 5% of the population suffers from some degree of ear prominence, presenting as a cosmetic concern rather than a physiological deficit **(2).**

Assessment of prominent ear depends on multiple factors such as ear size, position, rotation, contour, projection and several other factors **(3).**

Protruding ear usually manifests at an early age. However, the appropriate time for corrective surgery should balance auricular growth, cartilage pliability, psychological burden secondary to the auricular deformity, and patient maturity level. In the golden window between ages 4 and 6, these elements align, thereby allowing optimal execution of reconstructive techniques to improve the cosmesis of the ear **(4).**

There are many procedures in the literature that attempt to describe a unique surgical approach to treat prominent ear. First attempts were done by **Diefennbach** **(5)** followed by several attempts reaching nowadays **(6).**

Mustardé technique is considered as one of the most popular techniques in repairing protruding ear using sutures only **(7).** He described a well-known suture technique to create an anti-helical fold by an open approach. The procedure, which needs a skin incision, may lead to complications such as bleeding, keloid formation, and a visible scar because of poor wound healing. The procedure may also require a prolonged ear dressing. Because of these disadvantages, an incision-less otoplasty technique with permanent subcutaneous sutures was developed **by Fritsch** **(8)** **and** **(9).**

Although many researches evaluated the efficacy and aesthetic outcome of the several techniques of prominent ear surgical management, no global agreement on the optimal technique for surgical correction **(10).**

No universal agreement about regimen of special care should be taken in postoperative stage to ensure the newly shape ear **(11).** Therefore, this work was designed to compare aesthetic outcome of the cases done by **Mustardé** technique and Incisionless Otoplasty technique.

Aim of the work is to assess the role of **Mustardé** technique and incisionless otoplasty technique regarding aesthetic outcome in surgical treatment of protruding ear, complications and postoperative care.

SUBJECTS AND METHODS

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This study was conducted in the Department of General Surgery, Faculty of Medicine, Zagazig University within the period from June 2018 to March 2019.

A total of 24 patients (18 males and 6 females) presented by prominent ear deformity (4 unilateral and 20 bilateral). The reconstructive procedures were done for 44 ears divided by the procedure done into 2 groups. Group A: **Mustardé** procedure (21 ears, 8 patients with bilateral prominent ear and 2 patients with unilateral prominent ear); and **group B**: Incision-less procedure (23 ears, 9 patients with bilateral prominent ear and 2 patients with unilateral prominent ear). There were 3 patients with bilateral prominent ear were operated by **Mustardé** procedure for right ear and Incision-less procedure for the left ear.

Ethical approval and written informed consent:

An approval of the study was obtained from Zagazig University academic and ethical committee and an informed written consent was obtained from each patient for acceptance of the operation.

In group A, patients' age ranged from 4 years to 26 years (11.05 ± 6.19). Twelve ears were males (57.14%) and 9 ears were females (42.86%). The operated ear was right in 12 ears (57.14%) and left in 9 ears (42.86%). Two ears for 1 patient were operated with regional anesthesia (9.53%) and 19 cases (19 ears, 7 bilateral patients, 2 unilateral patients and there were 3 bilateral patients were operated by **Mustardé** procedure for right ear) were operated with general anesthesia (90.47%) **(Table 1).**

In group B, patients' age ranged from 4.5 years to 21 years (12.04 ± 6.28). Twenty-one ears were males (91.30%) and 2 ears were females (8.70%). The operated ear was right in 9 ears (39.13%) and left in 14 ears (60.87%).Two ears for 1 patient were operated with regional anesthesia (8.70%) and 21 ears (8 bilateral patients, 2 unilateral patients and there were 3 bilateral patients were operated by Incision-less procedure for the left ear) were operated with general anesthesia (91.30%) **(Table 1).**

Table 1: Comparison between the two procedures as regard sex, side and type of anesthesia used

Items		Group A Mustardé (n=21)		Group B Incision-less (N23)	
		No	%	No	%
Sex	Male	12	57.14	21	91.3
	Female	9	42.86	2	8.7
Side	Right	12	57.14	9	39.13
	Left	9	42.86	14	60.87
Anesthesia	General	19	90.47	21	91.3
	Regional	2	9.53	2	8.7

Operative:

Anesthesia: General Anesthesia in 22 cases and Regional nerve block in 2 cases.

Position: Supine decubitus with donut pillow under head.

Group (A) Mustardé technique: The ear was folded back to produce an antihelix and the summit of the fold marked in methylene blue. The positions for the mattress sutures were also marked on the skin (7 mm from the summit line). Through and-through punctures of the full thickness of the ear at the skin, markings were made with a hypodermic needle charged with methylene blue - To indicate on the cartilage the sitting of the mattress sutures-.A small quantity of saline with adrenaline (1: 200000) injected under the anterior auricular skin to raise it off the cartilage and facilitate insertion of the sutures into the cartilage and perichondrium **(Photo 1).**

Photo (1): Injection of saline adrenaline

After the insertion of a traction suture through the margin of the helix to hold the ear forward an ellipse of skin, about 3 to 4 cm. ×1 cm was removed from behind the ear on the medial or conchal side of the proposed antihelix. The skin and soft tissues on both sides of the excised area were elevated off the perichondrium by blunt dissection to expose the dye marks**. (Photo 2)**

A

B

Photo 2 A): Excision of skin B): Exposure of posterior aspect of ear cartilage and exposure of dye markings

Mattress sutures of 3/0 or 4/0 polyproline on a half-curved needle were inserted including the full thickness of the cartilage and the perichondrium on both sides, they were temporarily tightened and the ear inspected to confirm that the new antihelical fold was satisfactory. **(Photos 3)**. The sutures were then tied at a tension, which produced a pleasing folding of the antihelix.

Photos 3: Placement of **Mustardé** suture in posterior aspect of ear cartilage

The skin wound was closed by a continuous intradermal suture 5/0 vicryl. **(Photo 4)**

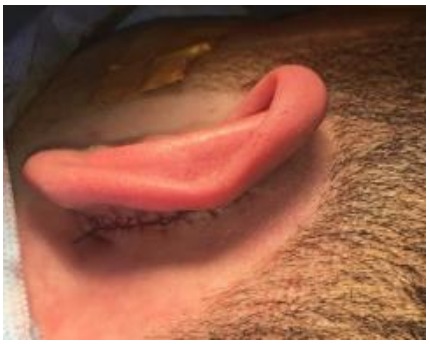

Photo 4: Closure of skin

Photography: Standardized color digital photography of the cases using single camera, fixed distance and fixed views (anterior, posterior, lateral and basal). The contours of the ear were carefully but firmly packed with gentle dressing. **(Photo 5)**

Photo 5: Dressing after finishing the operation

Group (B) Incisionless otoplasty technique: A surgical pen was used to determine the suture locations in front and at the rear of the auricle. The points where the sutures penetrate the cartilage was symmetrically above and below the desired new anti-helical curve. (**Photo 6**)

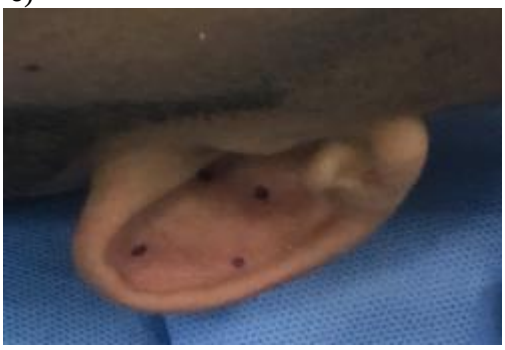

Photo 6: Preoperative markings for incisionless otoplasty technique

The median point of the two needle holes was intended to be the peak point of the new anti-helical curve. 21-gauge needle was used (in cases with hard cartilage) for scoring by creating a new curve to its pin, to weaken the cartilage. The new shape of the pin helped to break the cartilage also longitudinally and horizontally. **(Photo 7)**

Photo 7: Blind anterior scoring using 21-gauge needle

The needle entered the skin from the most superior part of the desired antihelical fold. The sharp edge of the needle was towards the cartilage. The needle entered the skin with a 90˚ angle from the posterior surface of the auricle and penetrated the full thickness cartilage to exit from the skin in front of the auricle.

The needle reentered from the exact exit hole and it raised upwards in front of the cartilage subperichondrially. The needle exited symmetrically above the hole to the new antihelical curve. The needle reentered from the exact exit hole to penetrate the full thickness cartilage towards the posterior. The needle exited from the posterior surface of the auricle. The needle reentered the skin, at the posterior of the cartilage subperichondrially, leading downward to the original first entry hole to exit. **(Photo 8)**

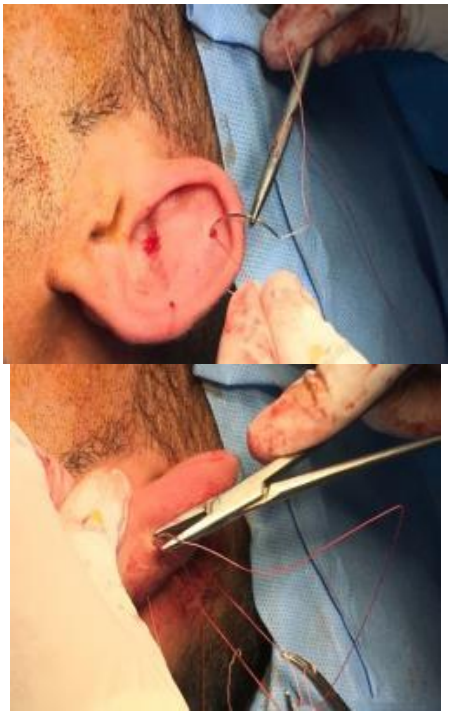

Photo 8: Placement of sutures in incision-less otoplasty technique

The sutures were knotted and tightened to create the new anti-helical fold. **(Photo 9)**

Photo 9: Knotting and tightening of sutures to create the new anti-helical fold

Photography: Standardized color digital photography of the cases using single camera, fixed distance and fixed views (anterior, posterior, lateral and basal).

Postoperative;

On postoperative day1, the surgical dressing was replaced by an elastic bandage for auricular protection; this was maintained for 21 days and was used only at night for the last 15 days.

Antibiotic therapy was maintained for 7 days, and analgesics and non-steroidal anti-inflammatory drugs was prescribed as required. Outpatient postoperative follow-up consultations were held postoperative day 1, one week, 21, 45 days, 3, and 6 months after the procedure with standardized color digital photography of the cases using single camera, fixed distance and fixed views (anterior, posterior, lateral and basal) at each visit .

Assessment

1- Preoperative, intraoperative and postoperative measurement of: The conchal bowl depth measurement**,** auriculo cephalic angle measurement, concho scaphal angle measurement, auriculo temporal distance measurement, auriculo cephalic distance measurement, auriculo mastoid distance, rate of recurrence and complications and subjective patient or parents' satisfaction.

Statistical analysis

Statistical analysis Data were analyzed by Statistical Package of Social Science (SPSS), software version 22.0 (SPSS Inc., 2013). Continuous data was expressed as Mean ± SD, while the nominal data were presented by the frequency and percentage.

The unpaired-samples t-test (independent t-test): compares the means between the two groups of patients (Mustardé operated group "Group A" and incision-less operated group "Group B" regarding age (years), operation time (minutes), Follow up period (months). Moreover, the independent t-test was used also to compare the operation results as regards, conchal-bowl depth (Cm), auriculo- cephalic angle (°), concho-scaphal angle (°), auriculo-temporal distance (mm), auriculo-cephalic distance (mm) and auriculo-mastoid distance (mm).

The paired – sample t-test compares the means between preoperative and postoperative conchal-bowel depth (Cm), auriculo-cephalic angle (°), concho-scaphal angle (°), auriculo-temporal distance (mm), auriculo-cephalic distance (mm) and auriculo-mastoid distance (mm) in the two patients groups (group A and Group B).

In all testes used P value < 0.05 considered significant.

RESULTS

There was non-significant deference between the two groups as regard the age as it was 11.05 ± 6.19 years in group A and 12.04 ± 6.28 years in group B (tt = 0.529, P > 0.05).

The mean values of the duration of operation in **Mustardé** procedure (group A, 35.95 ± 5.62 minutes per ear) was significantly longer than that of Incision-less procedure (group B, 13.35 ± 2.50 per ear) (P < 0.001). Regarding the follow up period (months) there was no significant difference between both groups (**Mustardé**: 4.62 ± 1.28 & Incision-less: 5.17 ± 1.03), P > 0.05) **(Table 2).**

Table 2: Illustrate the difference between the two groups as regard; age (yeas), duration of operation (minutes) and the follow up period (months).

Items	Group A Mustarde (n=21)	Group B Incision-less N= (23)	Unpaired tt	P value
Age (years)	11.05 ± 6.19	12.04 ± 6.28	0.529	0.600
Duration of operation (min)	35.95 ± 5.62	13.35 ± 2.50	17.51	0.000
Follow up period (months).	4.62 ± 1.28	5.17 ± 1.03	1.588	0.120

Our results regarding conchal-bowl depth (Cm), auriculo- cephalic angle (°) concho-scaphal angle (°) revealed that in group A (**Mustarde** procedure), the mean value of measured conchal-bowl depth was significantly reduced from 1.82 ± 0.08 to 1.37± 0.006 (tt = 27.36, P < 0.001) with percentage of reduction 24.46± 3.16.

In addition, the mean value of auriculo- cephalic angle was significantly reduced from 67.38 ± 9.43 to 29.52± 3.12 (tt = 24.19, P< 0.001) with percentage of reduction 55.87 ± 3.75.

In the same way, the mean value of concho-scaphal angle was also significantly reduced from 109.52±8.93 to 85.23 ± 4.32 (tt = 20.08, P < 0.001), with percentage of reduction reach 21.96 ± 3.24 **(Table 3).**

Table 3:

Table 3: The pre- and postoperative conchal-bowl depth (Cm), auriculo-cephalic angle and concho-scaphal angle of Mustarde operation (group A).

Mustardé procedure Group A (N=21)		range	Mean ± SD	Paired tt	P value	% of change
Conchal-bowl depth (Cm)	Pre	1.7-2	1.82 ± 0.08	27.36	0.000	4.46± 3.16
	Post	1.5-1.3	1.37± 0.006			
Auriculo-cephalic angle(°)	Pre	55-85	67.38 ± 9.43	24.19	0.000	5.87 ± 3.75
	Post	25-35	29.52± 3.12			
Concho-scaphal angle (°)	Pre	100-125	109.52±8.93	20.08	0.000	1.96 ± 3.24
	Post	80-90	85.23 ± 4.32			

Our results regarding conchal-bowl depth (Cm) auriculo- cephalic angle (°) concho-scaphal angle (°) revealed that in group B (Incision-less procedure), the mean value of measured conchal-bowl depth was significantly reduced from 1.84 ± 0.13 to 1.45± 0.08 (tt = 17.14, P < 0.001) with percentage of reduction 21.18 ± 4.94. In addition, the mean value of auriculo- cephalic angle was significantly reduced from 65.56 ± 8.70 to 33.04 ± 2.49 (tt = 19.65, P< 0.001) with percentage of reduction 48.93 ± 7.14. In the same way, the mean value of concho-scaphal angle was also significantly reduced from 107.17 ± 7.20 to 88.04 ± 2.49 (tt = 14.91, P < 0.001), with percentage of reduction reach 17.58 ± 4.58 **(Table 4).**

Table 4: The pre- and postoperative Conchal-bowl depth (Cm), auriculo-cephalic angle and concho-scaphal angle of incision-less operation (group B).

Incision-less procedure Group B (N=23)		range	Mean ± SD	Paired tt	P value	% of change
Conchal-bowl depth (Cm)	Pre	.6-2	1.84± 0.13	17.14	0.000	21.18±4.94
	Post	.3-1.6	1.45 ±. 0.08			
Auriculo- cephalic angle(°)	Pre	5-80	65.65 ± 8.70	19.65	0.000	48.93± 7.14
	Post	0-35	33.04± 2.49			
Concho-scaphal angle (°)	Pre	5-120	107.17± 7.20	14.91	0.000	17.58 ± 4.58
	Post	5-90	88.04 ± 2.49			

(Table 5) represent the comparison between the results of the two groups (**Mustarde** and incision-less procedures), as regard percentage of reduction in conchal-bowl depth, auriculo- cephalic angle and concho-scaphal angle

Table 5: Comparison between the results of Mustarde and incision-less, as regard the percentage of reduction in conchal-bowl depth, auriculo- cephalic angle and concho-scaphal angle.

Items	Group A Mustardé (n=21)	Group B Incision-less (N= 23)	Unpaired tt	P value
Conchal-bowl depth	4.46± 3.16	21.18±4.94	2.59	0.012
Auriculo- cephalic angle	5.87 ± 3.75	48.93± 7.14	3.98	0.002
Concho-scaphal angle	1.96 ± 3.24	17.58 ± 4.58	3.63	0.007

Table (6) shows the results regarding auriculo-temporal distance (mm), auriculo-cephalic distance (mm) and auriculo-mastoid distance (mm) of group A (**Mustardé** procedure). The mean value of measured auriculo-temporal distance was significantly decreased from 25.9 ± 5.18 to 14.62 ±1.59 (tt = 12.01, P < 0.001) with percentage of reduction 42.17 ± 8.89. Also, the mean value of auriculo-cephalic distance was significantly decreased from 28.90 ± 2.58 to 18.38 ± 0.97 (tt = 19.91, P< 0.001) with percentage of reduction 36.01 ± 5.40. In addition, the mean value of auriculo-mastoid distance was also significantly decreased from 27.90 ± 4.63 to 20.14± 1.09 (tt = 9.68, P < 0.001), with percentage of reduction reached 26.51 ± 8.55 (Table 6 and Figure 6).

Table 6: **The pre- and postoperative auriculo-temporal distance (mm) , auriculo-cephalic distance (mm) and auriculo-mastoid distance (mm) of Mustarde procedure (group A).**

Mustardé procedure Group A (N=21)		range	Mean ± SD	Paired tt	P value	% of change
Auriculo-Temporal Distance (mm)	Pre	17-40	25.9 ± 5.18	12.01	0.000	42.17 ± 8.89
	Post	13-18	14.62 ±1.59			
Auriculo- Cephalic Distance (mm)	Pre	23-32	28.90 ± 2.58	19.91	0.000	36.01± 5.40
	Post	17-20	18.38 ± 0.97			
Auriculo-Mastoid Distance (mm)	Pre	20-36	27.90 ±4.63	9.68	0.000	26.51± 8.55
	Post	18-22	20.14 ± 1.19			

Table 7 shows the results regarding auriculo-temporal distance (mm), auriculo-cephalic distance (mm) and auriculo-mastoid distance (mm) of group B (Incision-less procedure). The mean value of measured auriculo-temporal distance was significantly decreased from 25.08 ± 5.30 to 14.17 ± 1.40 (tt = 12.34, P < 0.001) with percentage of reduction 41.67 ± 10.04. In addition, the mean value of auriculo-cephalic distance was significantly decreased from 26.00 ± 3.49 to 18.17 ± 1.37 (tt = 12.93, P< 0.001) with percentage of reduction 29.19 ± 8.62. In addition, the mean value of auriculo-mastoid distance was also significantly decreased from 27.73 ± 4.89 to 20.21± 1.28 (tt = 8.10, P < 0.001), with percentage of reduction reached 25.50 ± 10.21 (Table 7 and Figure 7).

Table 7: **The pre- and postoperative auriculo-temporal distance (mm), auriculo-cephalic distance (mm) and auriculo-mastoid distance (mm) of incision-less procedure (group B).**

Incision-less procedure Group B (N=23)		range	Mean ± SD	Paired tt	P value	% of change
Auriculo-Temporal Distance (mm)	Pre	16-33	25.08 ± 5.30	12.34	0.000	41.67 ± 10.04
	Post	12-16	14.17 ± 1.40			
Auriculo- Cephalic Distance (mm)	Pre	19-34	26.00 ± 3.49	12.93	0.000	29.19 ± 8.62
	Post	16-20	18.17 ± 1.37			
Auriculo-Mastoid Distance (mm)	Pre	23-38	27.73 ± 4.89	8.10	0.000	25.50 ± 10.21
	Post	18-22	20.21 ± 1.28			

Table 8 represent the comparison between the results of two groups (**Mustardé** and incision-less procedures), as regard percentage of reduction in auriculo-temporal distance, auriculo-cephalic distance and auriculo-mastoid distance,

Table 8: A Comparison between the results of Mustarde and incision-less procedures, as regard auriculo-temporal distance (mm), auriculo-cephalic distance (mm) and auriculo-mastoid distance (mm).

Items	Group A Mustardé procedure (n=21)	Group B Incision-less procedure N= (23)	Unpaired tt	P value
Auriculo-Temporal Distance (mm)	42.17 ± 8.89	41.67 ± 10.04	0.177	0.861
Auriculo- Cephalic Distance (mm)	36.01± 5.40	29.19 ± 8.62	3.109	0.003
Auriculo-Mastoid Distance (mm)	26.51± 8.55	25.50 ± 10.21	0.351	0.727

Figure 1 shows the incidence of postoperative complications occurred in **Mustardé** procedure (Group A) and incision-less procedure (Group B). After **Mustardé** operation seventeen patients (17 ears) passed without any complications (80.96%), three cases (3 ears) had over correction (14.28%), one patient (1 ear) got hematoma (4.67%) but no patient (ear) represented with recurrence or asymmetry (0.00%). Regarding incision-less procedure (Group B); twenty patients (20 ears) had passed without any complications (83.33%), two patients (2 ears) got recurrence (8.33%), another two patients (2 ears) had asymmetry (8.33%), but no recorded cases (ears) of overcorrection or hematoma (0.00%).

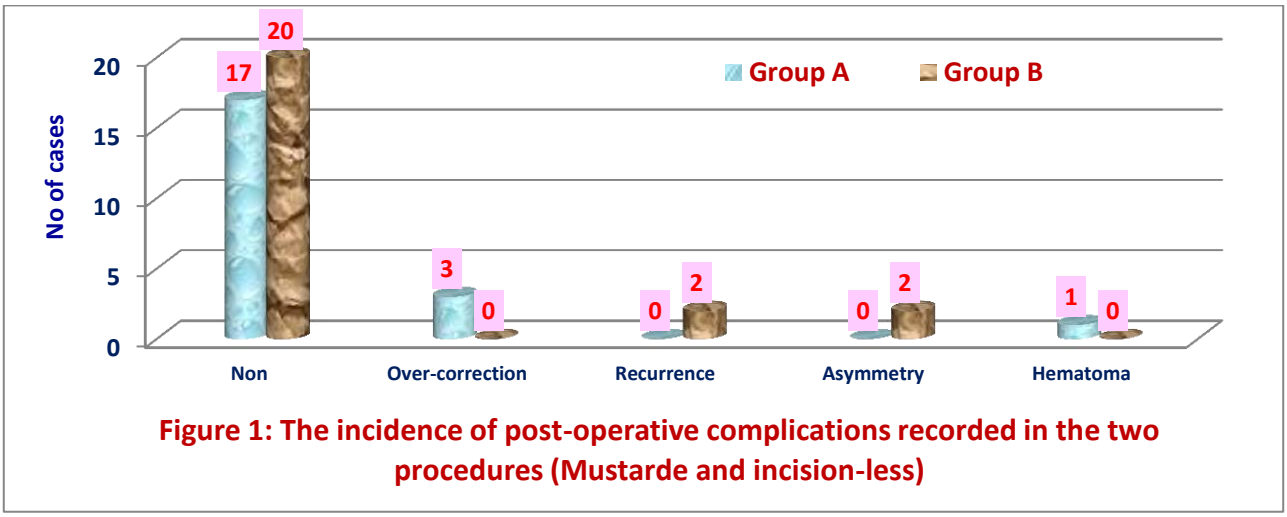

Figure 1: The incidence of post-operative complications recorded in the two procedures (Mustarde and incision-less)

Figure 2 is presenting patients' or parents' degree of satisfaction regarding the results of the procedure done {**Mustardé** procedure (Group A) and incision-less procedure (Group B)}. Seventeen patients (17 ears) of group A (80.96%) and nineteen patients (19 ears) of group B (82.61%) described the results as being excellent. Two patients (2 ears) of group A (9.52%) and one (1 ear) of group B (4.35%) identify the results as very good. The results described as good by two cases (2 ears) of group A (9.52%) and two cases (2 ears) of group B (8.69%). Bad result was the comment of one case (1 ear) in group B (4.35%) only. Finally, no one express his/her opinion as poor in both groups (0.00%).

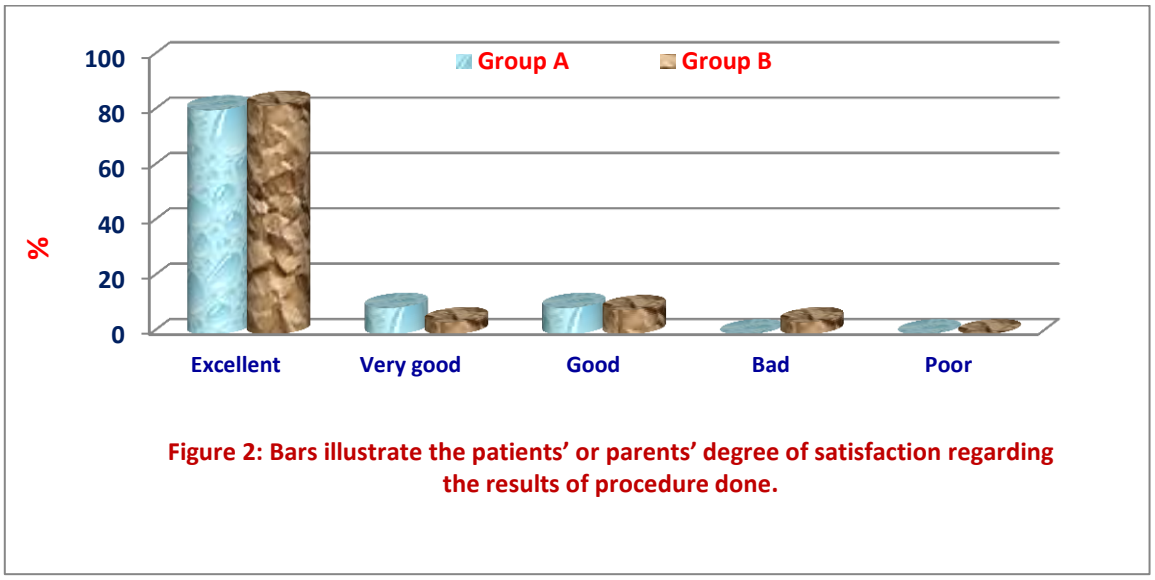

Figure 2: Bars illustrate the patients' or parents' degree of satisfaction regarding the results of procedure done.

CASE 1

Male patient, 8 years old with bilateral prominent ear was operated by incision-less otoplasty technique; preoperative (A, B) and postoperative (C, D).

CASE 2

Male patient, 26 years old presented with bilateral prominent ear, was operated with incisionless otoplasty technique; preoperative (A, B) and postoperative (C, D).

CASE 3

Female patient, 5.5 years old presented with bilateral prominent ear operated by **Mustardé** technique ; preoperative (A, B,C) and postoperative (D, E,F)

CASE 4

Male patient, 4.5 years old presented with bilateral prominent ear operated by **Mustardé** technique; preoperative (A, B) and postoperative (C, D).

CASE 5

Male patient, 21 years presented with bilateral prominent ear operated by **Mustardé** technique for the right ear and incisionless technique for the left ear. preoperative (A, B) and postoperative (C, D).

DISCUSSION

Otoplasty is one of the most common plastic surgeries performed in children. Even in the hands of the more-experienced surgeon, delicate discussion, preoperative planning, and intraoperative decision-making, all play a role in the outcome of the surgeries. It is important to take into account the expectations of the patient, and the causes of the unsatisfactory results from the patients and parents' opinion. With this in mind, otoplasty for the prominent ear can offer the patient and the family some significant aesthetic and psychological relief [(6)].

The modern techniques of this surgery can be divided into three categories according to the cartilage procedure: scraping (scoring), incision (plus or minus cartilage excision), and shaping with posterior sutures [(12)]. Because of the numerous problems leading to a protruding ear, no appropriate single procedure had been described for correcting all deformities [(13)].

Scraping techniques can lead to irregularities subsequent hematoma, infection, and even to cartilage destruction [(12)].

In this current study, we had been excluded very big concha and huge auricle, so incision and excision of the cartilage had not indicated in our patients.

Posterior suturing techniques have the advantage in that degloving of the anterior skin and exposure of the anterior cartilage is not required. Thus, the risk of anterior skin necrosis or anterior hematoma is negated. The disadvantage is the reliance on sutures to hold the ear [(14)].

The most widely used method for otoplasty is that of Mustardé**.** In this technique, the author described mattress sutures to create a new anti-helical fold without cutting or excising the cartilage. **Fritsch** [(8)] developed a technique based on the principal that there is no need for an incision to settle the sutures. **He** placed the sutures percutaneously after scoring the cartilage. [(9)].

we used in group A the traditional Mustardé technique, the patient age ranged from four years old to forty six years old, the age was younger than the study published by **Rosique** [(12)] and slightly older than the series of cases done by **Shabana *et al.*** [(15)], and the age group was similar to the case series of **Braun *et al.*** [(16)].

In the present study, the duration of operation in Mustardé procedure (group A, 35.95 ± 5.62 minutes per ear) was significantly longer than that of Incision-less procedure (group B, 13.35 ± 2.50 per ear) ($P < 0.001$), while in **Haytoglu *et al.*** [(9)] the mean operation time for Incision-less procedure was 15.7 ± 4.9 min.

The follow up period in current study in average was 6 months while in **Shabana *et al.*** [(15)] was 3 years, and **Strychowsky *et al.*** [(17)] was 3.7 years and **Haytoglu *et al.*** [(9)] was 14 month , while in **Rosique** [(12)] and **Haytoglu *et al.*** [(13)] series of cases the period of follow up was 6 months which is same period of our study and from our opinion this follow up period is not long enough to assess the delayed results of procedure.

In this study, patients' or parents' degree of satisfaction regarding the results of the procedure done. While in study published by **Haytoglu *et al.*** [(13)], the rate of satisfaction by patients or their parents was 91.9±8.3 at post-operative 6 months.

Also in the study published by **Haytoglu *et al.*** [(9)], patient satisfaction was 93.9 % of all patients while in other study by **Foda** [(18)]**,** who compared the values recorded on both ears at 6 month post operatively, 28 patients of his cases (71.8%) showed excellent results, 9 cases (23.1%) showed good results and 2 cases of his series were poor.

Shabana *et al.* [(15)] reported asymmetry between both sides was found in 1 cases, of total 18 patient in Mustardé group while 1 case of recurrence in Mustardé group, while in study published by **Haytoglu *et al.*** [(13)] the recurrence rate was reported to be between 0 and 12% in the literature. In our study, two of 44 (4.1 %) ears showed recurrence.

According to **Haytoglu *et al.*** [(13)]**,** in the literature, the complication rates after otoplasty were between 0 and 47%. Recurrence occurred at 1.0 to 5.8 years from surgery.

According to **Haytoglu *et al.*** [(9)] in **Mustardé**[(7)] recurrence rate was recorded to be about 7%.

According to **Haytoglu *et al.*** [(9)] infection after otoplasty had been reported to be between 0 and 15.5 %. In recent studies, bleeding was reported to be up to

7.9 % and keloid formation was reported to be up to 6.2 %.

According to **Mehta and Gantous** [19], revision rates were similar (10.5% vs 12.9%). In **Shabana *et al.*** [15] study, recurrence was reported in incision less technique in 1 case of 20 patients while asymmetry was reported in 2 cases of 20 patients.

In this study we agreed with **Shabana *et al.*** [15] who reported that, the incisionless suture technique appears to be easier with less surgical time and no hospital stay as all patients were discharged at the same day of the operation.

Our net results in this study is that both Mustardé and the incision-less suture techniques provide satisfactory results, however, the incisionless suture technique appears to be easier with minimal complications. **Shabana *et al.*** [15] had reported the same results.

CONCLUSION

The incisionless suture technique appears to be easier with less surgical time and no hospital stay as all patients were discharged at the same day of the operation.

Both **Mustarde** and the incision-less suture techniques provide satisfactory results; however, the incisionless suture technique appears to be easier with minimal complications.

Limitations of the study

There were some limitations in this study such as relatively small number of patients, relative short period of the study and poor compliance of some patients. Improvement of this study can occur by increasing number of patients, elongating the period of this study and follow up, multicentric studies and better patient's education.

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