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Three Points Suturing to Avoid Recurrence in Ear Setback: Prospective Study

SHERIEN METWALLY SALAMA, M.D.; IBRAHIM KAMEL, M.D. and AHMED GADALLAH, M.Sc.

The Department of Plastic, Burn and Maxillofacial Surgery, Faculty of Medicine, Ain Shams University

Abstract

Background: Auricular deformities, specifically prominent ears, are frequent. Although the physiologic consequences are negligible, the aesthetic and psychological effects on the patient can be substantial. Otoplasty, or correction of prominent ears, is one of most performed surgeries in plastic surgery both in children and adults. Until nowadays, there have been more than 150 techniques described, but all with certain percentage of recurrence which varies from just a few up to 24.4%.

Objective: In this study, we will evaluate the efficacy of new suture technique for otoplasty in the form of weakening of the cartilage by parallel partial cartilage incisions along the length of the antithetical fold associated with permanent sutures (three points suturing of the antihelix to mastoid fascia with or without concha reduction accordingly) to decrease the incidence of recurrence and to leave the ear with an "unoperated" soft, natural contours with high patient satisfaction and good aesthetic results.

Patients, Methods, and Results: In this prospective study, patients will be followed up objectively and subjectively over 6 months as regard effectiveness, longevity, complications, recurrence, satisfaction rate with the final aesthetic results Patients in concern in this study; all patients had bilateral prominent ears, age varied between 6 and 40 years with no history of previous repair.

Conclusion: Using three-point fixation as the main technique in otoplasty improves aesthetic outcomes in adults. This technique decreased the incidence of recurrence, corrected the protrusion and maintains it and improves the symmetry.

Key Words: *Otoplasty – Suture technique – Recurrence.*

Ethical Committee: The Ethical Committee of the College of Medicine at Ain Shams University had approved the study. Code: R00006379.

Disclosure: No conflict of interest.

Correspondence to: Dr. Ahmed Gadallah,
E-Mail: ahmed.gadallah93@gmail.com

Introduction

Although there are no functional impairments linked to ear prominence, it is a quite common cosmetic defect that has a significant psychological impact, particularly in younger individuals.

It is caused by one or more of the following characteristics: (1) Macrotia, or widespread ear overgrowth; (2) Effacement or inadequate antithetical fold; (3) Conchal hypertrophy or anomalies in conchal morphology; and 4) malformation of the underlying skeletal structure **[1]**.

Determining the degree of ear prominence requires a three-dimensional study of ear projection. The most often utilized criteria for ear projection are the helix-to-mastoid distance throughout the whole auricular rim and the auriculocephalic angle **[2]**.

An auriculocephalic angle of less than 25 degrees is often formed when the auricle protrudes from the mastoid process by no more than 2cm. The normal distances in the upper, middle, and lower third of the ear are 10 to 12mm, 16 to 18mm, and 20 to 22mm, respectively, between the helix and mastoid. The helix-to-mastoid distance is typically within 3mm when comparing the two ears **[3]**.

Restoring the antithetical fold and restoring the natural size and location of the concha are the two main goals of the prominent ear repair. A reasonable method based on auricular development and school matriculation age determines the best time for surgical repair. Correction may be done around 6 or 7 years old as the ear is completely matured by then **[4]**.

The surgical repair of protruding ears, known as otoplasty, often involves a mix of suture, scoring, and incision procedures. In the past century, more than 150 methods for treating the primary causes of large ears have been reported **[5]**.

Converse [2] and Pitanguy [3] described full thickness cartilage incisions. In Mustardé's [4,5] otoplasty, the prominent ear is reshaped and repositioned using just sutures. The methods used by Stenstrom [6] and Chongchet [7] are based on the theory that cartilage warps away from a damaged surface, as stated by Gibson and Davis [8] in 1958. An anterior approach was taken by both writers. In 1969, Spira [9] introduced a synthesis of Mustardé's and Stenstrom's methods. Farrior [10] described his method of combining suturing and cartilage sculpturing in 1970.

Recurrence has been a common issue to everybody, regardless of the approach (posterior or posterior) or the method utilized to generate the antihelix [11].

Our study's goal is to assess the effectiveness of a novel suture method for treating ear setbacks in patients who have underdeveloped antihelixes and/or enlarged conchals. Three contouring suture fixations using non-absorbable suture material are included in the novel suture method, which runs from the antihelix to the mastoid fascia.

- The first contouring suture at the top of the antihelix, at the superior crus.
- Second, at the tragus level at the center of the antihelix.
- The antihelix's bottom third contouring suture.

The objectives of such a method are to leave the ear looking "unoperated," with gentle, organic curves, and to prevent recurrence. Each part of the setback should seem in a proper place in relation to the rest of the ear for it to be harmonious.

Aim of work:

This study aims to address a frequently asked subject and propose an otoplasty approach without recurrence. Is it Possible for an Otoplasty to Have No Recurrence?

Patients and Methods

This technique was utilized when inadequate antihelix development, with or without some degree of conchal expansion, was the cause of the protrusion of the ear. As a result, the process will be customized for the abnormal anatomy. Step-by-step instructions for surgical operations are provided, along with illustrations and pictures taken throughout the process.

Type of study: Prospective non-control study according to CONSORT statement.

Study settings: The study will be done at faculty of medicine, Ain Shams University.

Study population:

Inclusion criteria: 20 consecutive cases, a logical strategy based on auricular development and the age of school matriculation determines the best time for surgical repair. As the ear is almost fully formed by the time a child is 6 or 7 years old. Participants in the research ranged in age from 6 to 40, had protruding ear deformities from underdeveloped antihelix with or without conchal enlargement, were willing, suitable for surgery, and had stable personalities.

Exclusion criteria: Patients <6ys and >40 years, (as with increasing age, auricular cartilage becomes less malleable and more calcified, proving to be harder to manipulate in reconstructive procedures).

Prominent ear owing to distortion of the underlying skeletal structure as mastoid hypertrophy, individuals who had undergone previous surgical ear repair, non-cooperative patients, and patients with psychiatric illnesses.

Sample method: Convenience sampling.

Sample size: Sample size of (20) cases including 4 children will be included in the study. Size calculation was made using OpenEpi, Version 3, open-source calculator.

A sample size of 20 patients is sufficient to achieve study objectives based on a hypothized % frequency of 87.1%, margin of error +/-10 and confidence level 95.0%

Ethical considerations: An informed consent was obtained from all patients who agreed to participate in the study after explanation according to the local ethical committee regulation. Absolute confidentiality for names and addresses of patients were given a particular care.

Methodology:

1- *Complete history taking:*

Personal history includes patient's age, sex, and history of medical importance.

2- *Preoperative evaluation:*

An analysis of the symmetry, size, form, and projection of the ears is part of a preoperative evaluation. Every article's physical inspection is recorded. This method was used in cases of ear protrusion brought on by inadequate antihelix development, either with or without conchal growth in tandem.

To provide critical and precise analyses that show pertinent anatomic information, serve as a reference for preoperative surgical planning, and enable correct preoperative and postoperative comparisons, standardization of photography method with extraordinary attention to patient privacy must be performed regularly.

The patient should be seated with his head in the Frankfurt horizontal plane, which places the orbitale and tragion in the same plane, while being examined from the front, side, and back perspectives. The orbitale is the lowest point on the orbit's lower edge, while the tragion is the point on the tragus' upper margin where the tangents drawn to the cartilage's anterior and superior margins intersect.

We measured helix-to-mastoid distance (HMD) using Standard anthropometric instrument (geometrical set square (with its base touching the mastoid area along the entirety of the auricular rim as an objective parameter for ear protrusion at three points (a) Superaurale (b) Tragal level and (c) At the bottom on antihelix.

The vertical limb of the set square thus measures the perpendicular distance between the posterior helical border at those three points and the mastoid area. Fig. (4).

At that time, the patient and parents were informed about the abnormalities that already existed, the surgical course, realistic results, and potential problems.

Prominent ear deformities were classified by diagnostic checkpoints. Class I (simple prominent ear) includes prominent ear that developed with the absence of the antihelix without conchal hypertrophy. Class II (mixed-type prominent ear) is defined as having not only a flat antihelix, but also conchal excess. Class III (conchal-type prominent ear) has an enlarged conchal bowl with a well-developed antihelix (24). Most of our patients had grade I prominent ears.

Goals of surgery:

The attainment of a natural, symmetric, and aesthetically pleasing auricle is the main objective of otoplasty.

The specific surgical goals of otoplasty to be considered are:

1- Proper protrusion of the top third of the ear; the opposite is not true; protrusion of the middle or lower third of the ear is acceptable provided the upper third is fully repaired.

2- Both ears' helixes should be visible from the front perspective, extending past the antihelixes at least to the middle ear.

3- There should be a continuous, smooth line along the helix.

4- No discernible reduction or distortion of the postauricular sulcus should occur.

5- The ear should not be positioned too near to the skull, particularly in boys. The posterior measurement should be 10 to 12mm in the upper third and 16 to 18mm in the middle third, from the outside border of the helix to the skin of the mesotidal area (HMD).

6- Always, the two ears' positions that is, the separations between their lateral borders and the head should coincide by no more than 3mm.

7- In our study (apart from the six previously stated elements, our objective is no recurrence with natural appearance).

3- *Operative technique:*

Every patient had general anesthesia throughout their procedures, and they were all given perioperative antibiotic prophylaxis and a local anesthetic substance containing 1/1000 adrenaline for hydro dissection and hemostasis.

The patients were dressed and covered to preserve exposure to both ears. To access the underlying cartilage, the skin incision is made centered over the depth of the postauricular groove.

In particular, the incision was made far enough superiorly to expose enough cartilage. In the supraperichondrial plane, wide undermining occurs nearly all the way to the helical rim. Press on the ear to see where the antithetical fold should be positioned. By measuring the three locations of fixation with 25-gauge needles into the anterior auricular skin at the planned site of antihelix development and pulling the needle out the posterior side, the region of the anticipated neoantihelix is marked. After marking the cartilage with methylene blue, the needles are removed.

The three 2-0 non-absorbable prolene sutures (3/0 in children) are positioned through the cartilage and anterior perichondrium, avoiding the anterior skin, at the top, midpoint, and bottom of the neoantihelix. These sutures are put before any are firmly knotted.

After achieving the correct antithetical fold, each suture is affixed to the mastoid fascia permanently, starting from the superior and working down to the inferior, allowing the tension to secure the desired fold to be adjusted step-by-step. Typically, the knots are made "blindly" as the fold develops from the front side. The identical markings and procedures are used on the other ear. Fig. (4).

Before sealing the skin incisions, the patient should be inspected from the front, side, and back. The helical rim should notably be a straight line in the posterior view; abnormal contouring, overcorrection, and obliteration of the native sulcus are undesirable outcomes. And must be fixed before skin closure. Wet cotton is applied to the newly formed ear folds, and sterile Vaseline gauze pads are placed over the ears and secured with an Ace bandage. For an entire day, this dressing remains in place. The entire operation for both ears last for about 90mins to 2 hours.

The entire dress is taken off at the postoperative visit the following morning. After that, the patient is told to wear a tennis sweat band every night for two weeks and then every night for a month.

No certain complications had been reported in our technique except hematoma collection which occurred in 2 patients only.

Statistical analysis:

Quantitative (numerical) variables will be described as mean ± SD, ordinal as median (inter-quartile range) and qualitative (categorical) data as numbers and percentage. Student's *t*-test, Mann-Whitney U-test and Chi-square test or Fisher's exact test will be used for comparisons as appropriate.

Statistical package:

Statistical analysis will be performed using computer software statistical package for the social science (SPSS) version 21.

A six-month follow-up period was involved. Patients were seen three, six, and one month after surgery.

Examination was done objectively by measuring the helix-mastoid distance (HMD) at the three places specified during the pre-operative examination, and subjectively by using the patient satisfaction score.

Patients will give the ratings as responses will use a five-point Likert-type scale ranging from 1 (very unsatisfied) to 5 (very satisfied) **[6,11]**.

Fig. (1): 30 years old male with bilateral protruded ear (pre-operative photos).

Fig. (2): 30 years old male underwent bilateral otoplasty, follow-up at day 30.

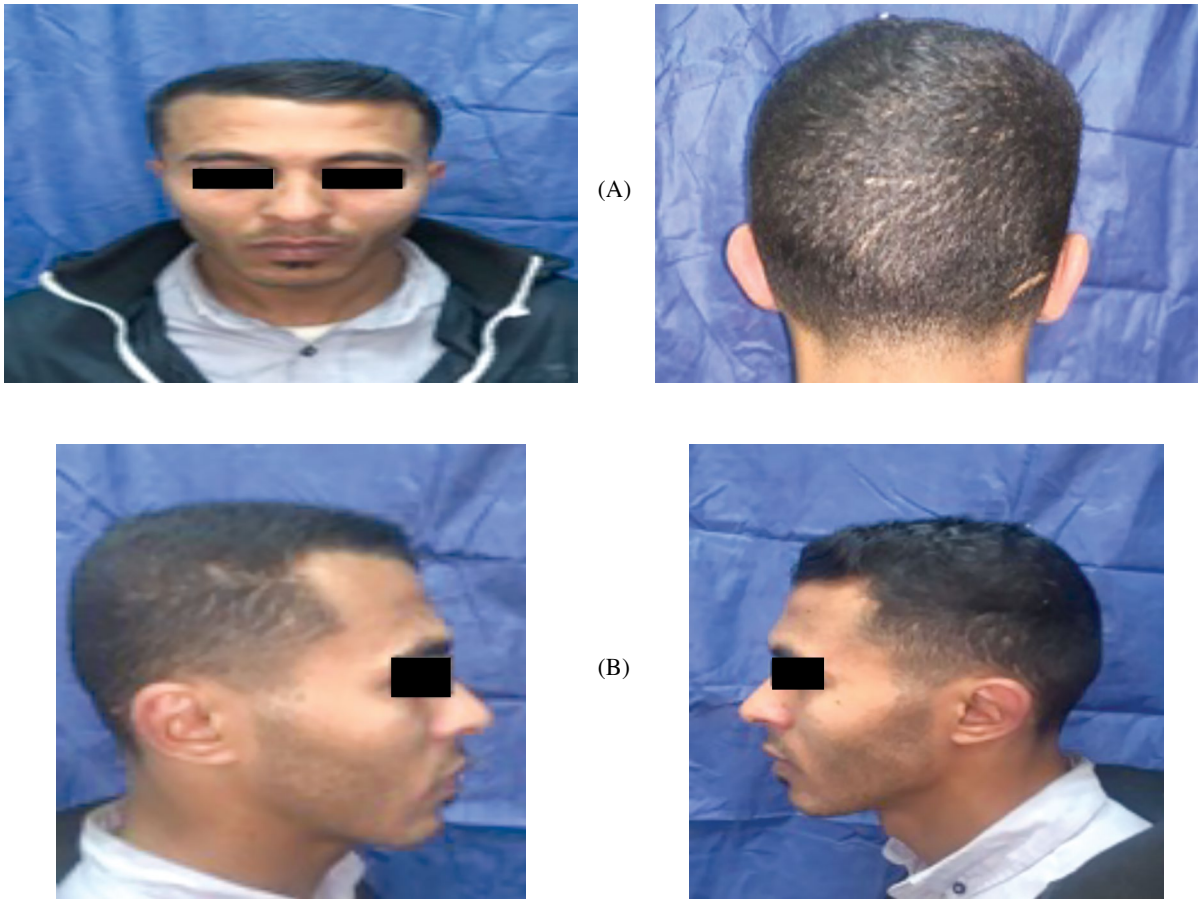

Fig. (3): Follow-up after 6 months (A: Anterior and posterior / B: Lateral views).

Fig. (4): Intra-operative three-point fixation.

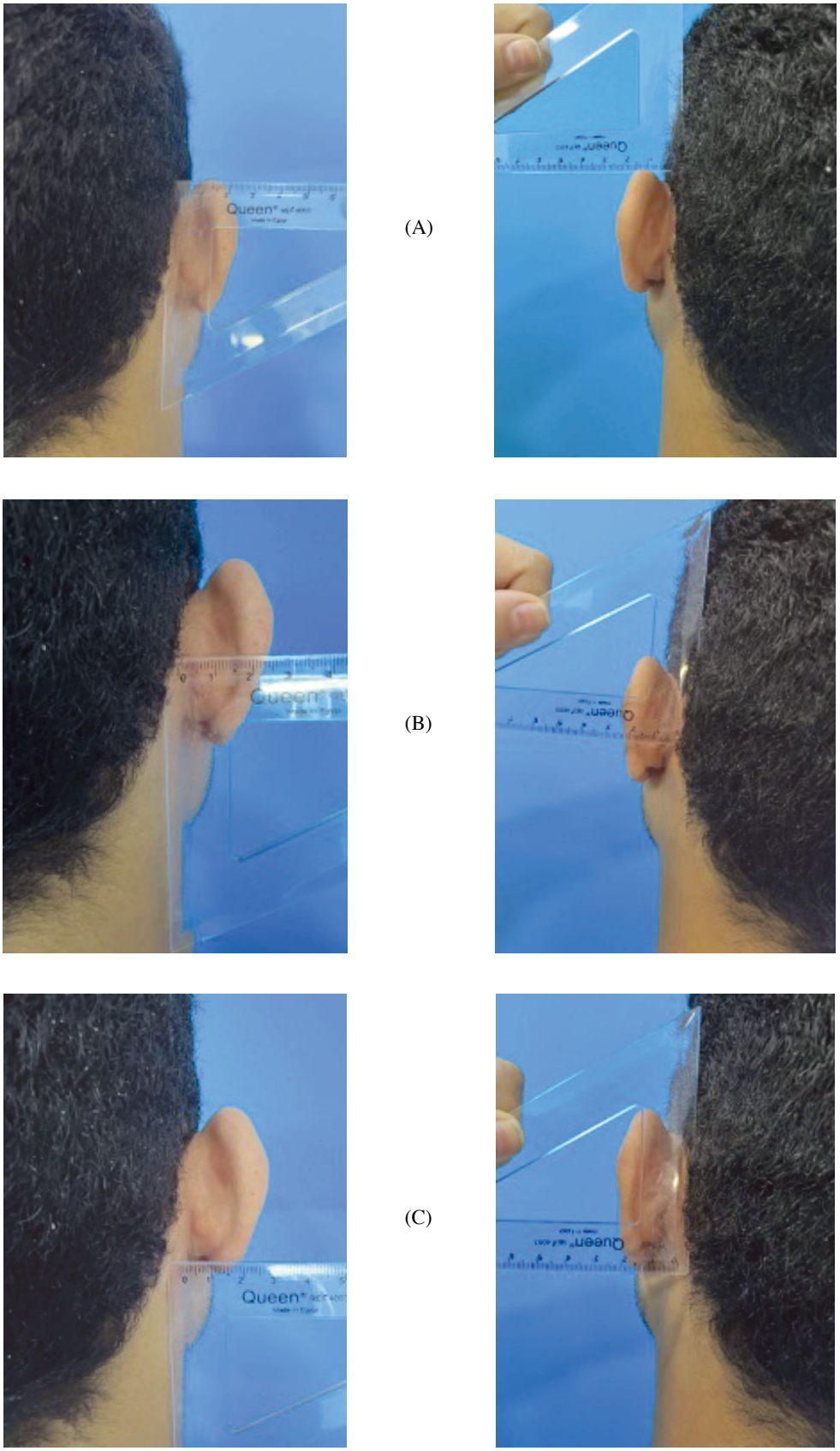

Fig. (5): Measuring ear protrusion. Protrusion at (A) Superaurale and (B) Tragal levels, (C) At the bottom of antihelix, measured with a geometrical set square. The arrows show the protrusion of ear from mastoid bone pre-operative.

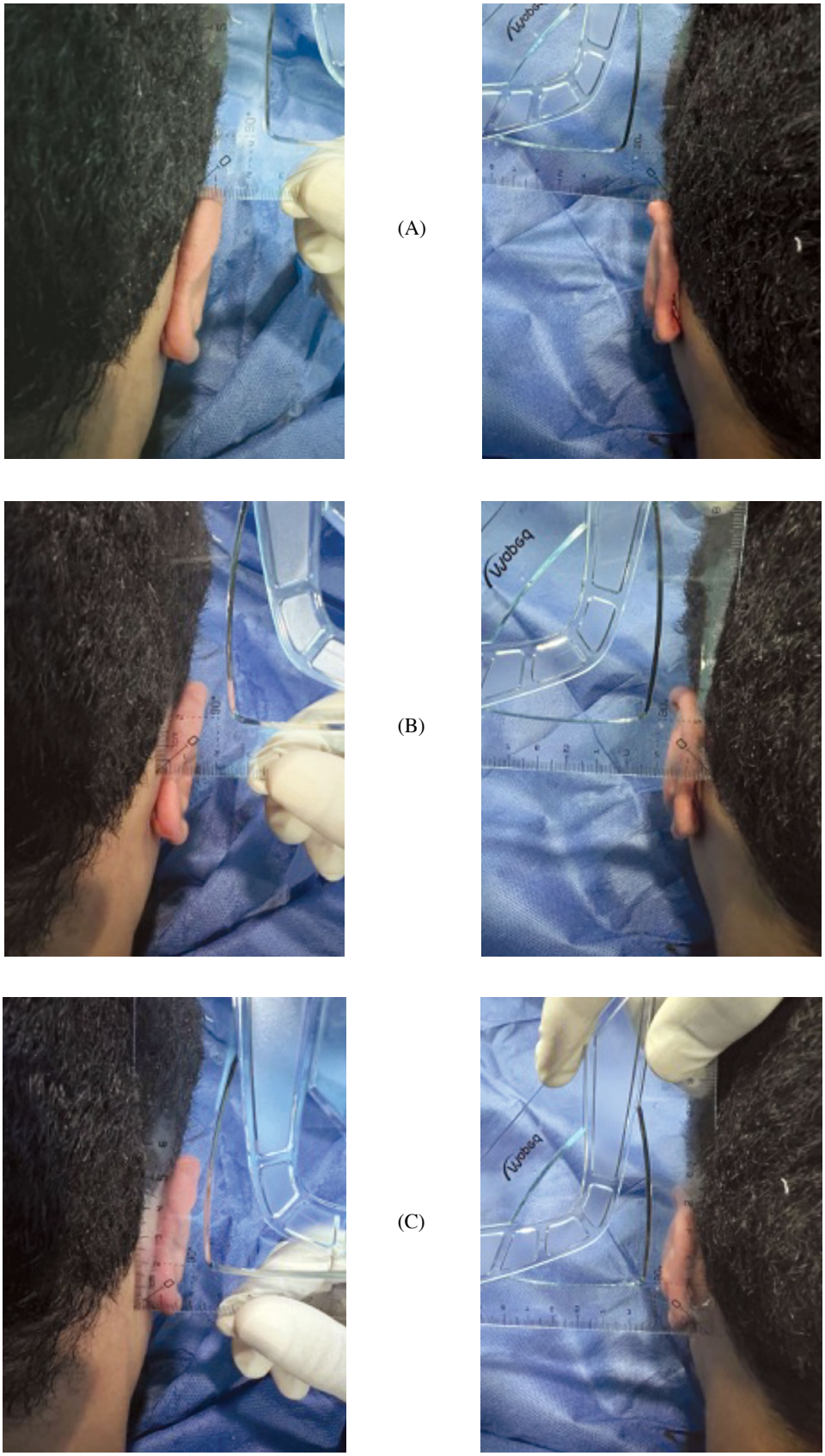

Fig. (6): Post-operative follows-up at zero-day, Protrusion at (A) Superaurale and (B) Tragal levels, (C) At the bottom of antihelix, measured with a geometrical set square.

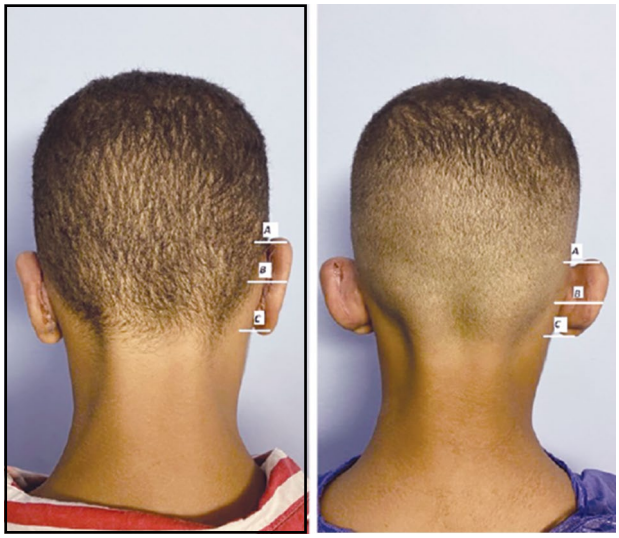

Fig. (7): Pre-operative and post operative follow-up at day 30, Protrusion at (A) Superaurale and (B) Tragal levels, (C) At the bottom of antihelix.

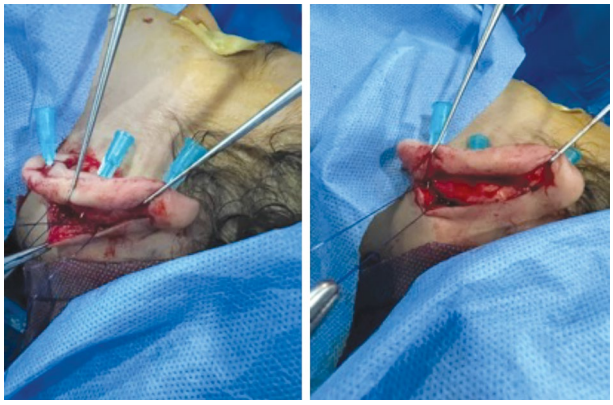

Fig. (8): Fixation to Mastoid fascia (concho – Mastoid sutures).

Results

Table (1): Outcome of questionnaire assessing the post-operative patient's satisfaction.

	Satisfaction score Right ear	Satisfaction score Left ear
Ear in general:		
Median (IQR)	4 (3-5)	4 (3-5)
Range	2-5	3-5
Unsatisfied	4 (20.0%)	3 (15 %)
Satisfied	16 (80.0%)	17(85 %)
Ear fitting with face:		
Median (IQR)	4 (3-5)	4 (3-5)
Range	3-5	2-5
Unsatisfied	2 (10%)	4 (20.0%)
Satisfied	18 (90%)	16 (80.0%)

Table (2): The distance from mastoid bone to superaurala, tragus and bottom of antihelix pre and post-operative.

Distance (range) in cm	Pre-operative	Post-operative	*p*-value
Mastoid to superaurala Mean ± SD	2-3 3.875±0.425	0.5-1 3.395±0.421	≈0.043
Mastoid to tragus Mean ± SD	3-4 4.5375±0.488	1-1.5 3.52±0.55	≈0.02
Mastoid to antihelix Mean ± SD	2-3 3.675±0.425	0.5-1 3.105±0.321	≈0.034

Discussion

Compared to cartilage scoring, suture-based procedures are preferred in otoplasty because they reduce the risk of cartilage necrosis and injury to the perichondrium **[9]**.

Nonetheless, there are still reports of significant recurrence rates from suture extrusion or infection resulting from the outlined techniques. Conchoscaphal sutures have historically been utilized by surgeons to treat effacement of the antithetical fold **[10]**.

Although Stenstrom's method has a recurrence rate of 8 to 9.9%, Mustardé's approach has a comparatively high incidence of recurrence **[14,15]**. Conversely, Scharer et al. **[20]** discovered a higher than 10% prevalence of chronic or recurrent ear protrusion in a 15-year retrospective analysis of individuals who had the Farrior procedure.

McDowell **[12]** put forward the objectives of a successful otoplasty in 1968. These objectives remain valid, and we have included the requirement that the antihelix have a recurrence-free, natural-looking appearance.

By combining these methods, we have created a straightforward, repeatable suture-based otoplasty procedure that involves three contouring suture fixations along the antihelix to the mastoid fascia using non-absorbable suture material. This allows us to recreate neo antihelix that closely resembles the natural appearance while preventing recurrence. We think that by properly fixing the auricle to the deep cuff of the mastoid fascia with permanent sutures, the high frequency of recurrence may be prevented. This will help to address the issue, "No Recurrence in Otoplasty: Is That Possible?".

The most often utilized criteria for ear projection are the helix-to-mastoid distance throughout the whole auricular rim and the auriculocephalic angle. Since anomalies in these two characteristics are the main causes of the projecting ear, special attention needs to be paid to analyzing the shape of the antihelix and conchal bowl **[12-16]**.

During the follow-up periods of our investigation, we evaluated the result using (HMD) as an objective metric. In every distance we tested, the difference between pre- and post-operative was statistically significant, indicating the effectiveness of our method.

Regarding contentment with the surgical results in this research, the majority of subjects expressed satisfaction with their ears, with 85% expressing happiness with their left ear and 80% with their right. However, 90% of the subjects reported being satisfied with their right ear fitting, and 8% with their left ear.

This approach produced a form and contour that was both beautiful and organic. Only a few small issues (antihelix contour abnormalities) that had nothing to do with the approach occurred.

Every single instance had a smooth recovery, quick elimination of postoperative oedema, and excellent, unimpaired innervation and vascularization. There were no incidences of recurrence. Hemostasis, infections, mental health issues, hypertrophic scars, or keloid forms were absent.

Ten percent of patients had mild to severe postoperative pain or discomfort managed with non-steroidal and anti-inflammatory medications over one to three days. The ears were not Mal positioned after surgery.

Conclusion:

Re-protrusion of the ear is believed to be the most common outcome following otoplasty. Three-point fixation, when performed using our method, frequently reduces the rate of recurrence. Every patient expressed great satisfaction with the outcome, and no more operations were required. Even a novice surgeon may easily replicate the method presented in this study. We think that (No Otoplasty Recurrence: Is Possible). We recommend increasing the sample size in further studies to achieve a wider scope of patient satisfaction.

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