Percutaneous Adjustable Closed Otoplasty for Prominent Ear Deformity

Orhan Ozturan, MD, Remzi Dogan, MD, Sabri Baki Eren, MD, Fadlullah Aksoy, MD, and Bayram Veyseller, MD

Objective: The aim of this study is to follow longitudinally the prominent ears treated by percutaneous adjustable closed otoplasty (PACO) and evaluate this procedure in terms of technical efficiency, recurrence, complications, and patient satisfaction.

Materials and Methods: Percutaneous adjustable closed otoplasty was used to treat 28 ears in 15 patients presenting with prominent ear deformities. To determine the success of each operation, distances between the helical rim and scalp were measured at 4 levels preoperatively, at the end of the surgery and again postoperatively at the first week and the first, third, and sixth months. Patient satisfaction was evaluated using a visual analog scale and Glasgow Benefit Inventories.

Results: Favorable outcomes were observed in scales and health-related quality-of-life surveys of patient satisfaction. Mean operating time was a mere 19.4 ± 5.7 minutes. Complication rates were low. Auriculocephalic distances increased by 7.3%, 11%, 15.3%, and 20%, respectively, compared with the preoperative measurements during the follow-up.

Conclusions: Percutaneous adjustable closed otoplasty is an efficient surgical procedure with positive outcome, low recurrence, and high patient satisfaction. In prominent ear deformities with soft cartilage, PACO should be the preferred surgical choice because of its advantages of shorter time in surgery, lack of need for prolonged postoperative compressive dressing, and allowing patients to view the results immediately after surgery. In contrast to the previously described techniques, auriculocephalic distances are adjustable while tightening the mattress sutures. Besides, it is a reversible technique, if the surgeon not satisfied with the result of the surgery can either redo the procedure or revert to CST. Percutaneous adjustable closed otoplasty does not cause serious complications, contour deformities, hematoma, or incision scars. For ear deformities presenting with stiff helical cartilage and conchal hyperthrophy, surgical indications can be extended by scoring and conchal resection, respectively.

Key Words: Prominent ear deformity, otoplasty, incisionless, surgery, satisfaction

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Prominent ear deformities with an otosomal transition pattern are seen in 5% of whites,[1] with male and female subjects equally affected.[2,3] Prominent ear is primarily caused by absence of antihelical curve and/or by conchal hypertrophy.[4] To surgically correct prominent ear, more than 200 techniques have been suggested.[5] The existence of so many approaches highlights the fact that no single technique can correct every case and that novel techniques and modifications will continue to be developed.[6] There are 3 main groups of surgical techniques are used to correct prominent ear: cartilage-cutting techniques (CCT), cartilage-sparing techniques (CST), and incisionless techniques. By proper preoperative analysis of different anatomic deformities, an appropriate surgical approach is tailored according to the patient's pathological condition.

Although prominent ear does not functionally affect hearing, it may cause psychological stress, emotional trauma, and behavioral disorders, particularly in children.[7] The widely accepted view is that an ear deformity operation should ideally be performed on a child between 3 and 6 years old.[8] The purpose is to correct the malformation before the process of socialization to prevent a child from being humiliated by peers. In addition, otoplasty on the young is facilitated because the ear cartilage, which stiffens with age, is more easily shaped. Cartilage-sparing techniques can be safely used at this age, reducing the need for CCT.[9]

Cartilage-cutting techniques are often preferred in the presence of stiff and thick cartilage. Cartilage-cutting techniques break the elastic resistance of the auricular cartilage to form an antihelical curve. Incisions are made from the front and/or rear aspect of the antihelical cartilage. Incision, excision, scoring, and abrasion render the cartilage easier to turn into a tubular form with the aid of sutures; however, CCT involve the risk of a visible contour and sharp deformities.[10]

In CST, cartilage resistance is reduced by means of partial incisions or scorings. These techniques are also advantageous in that they provide maximum protection of cartilage support, minimize scar risk and contour disorders, and allow easy suturing of cartilage.[7] With CST, permanent changes in cartilage structure are avoided, and reversibility is ensured.[7,11] Suturing in CST is suitable for those with cartilage that has less stiffness;[10] however, with stiff cartilage, sufficient healing and expected outcome may not be achieved using such techniques. Mustarde,[11] a pioneer of CST, described multiple horizontal mattress sutures used to form an antihelical curve. The biggest objection to suture techniques is that the suture may slice through tissue like a wire slicing through a block of cheese. This cheese-cutting effect can erode the cartilage and result in recurrence. The memory and elastic structure of cartilage may within 1 year cause an up to 40% return of the ear to its preoperative condition.[12]

Scoring in CST weakens the cartilage, but it does not involve incisions through the full layer of the tissue.[10] After Gibson and Davis[13] demonstrated that cartilage can be curved to the reverse of where scoring is made, Stenstrom[14] and Chongchet[15] applied this

FIGURE 1. Operation is started with measurements of the auriculocephalic distances at 4 levels.

FIGURE 2. To determine the suture traction sites, a surgical pen is used to draw 3 interrupted lines on the scapha parallel to the antihelix.

FIGURE 3. First, starting at the lower end of the skin mark, a 3-0 braided white polyester suture is passed from the rear of the auricle to the scapha.

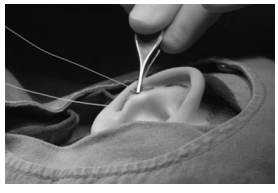

FIGURE 4. First, starting at the lower end of the skin mark, a 3-0 braided white polyester suture is passed from the rear of the auricle to the scapha.

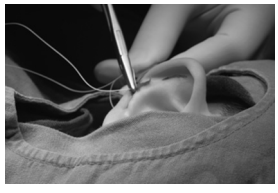

FIGURE 5. Second, the needle reinserted into the exit point passes between the anterior perichondrium and the skin and leaves from the upper end of the skin mark of that traction site on the anterior side.

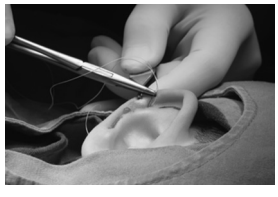

FIGURE 6. Third, the suture is reinserted from that point and exits the rear side of the auricle.

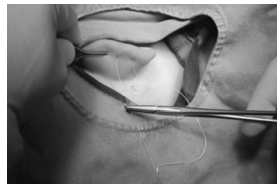

FIGURE 7. The 2 ends (arms) of the suture are left hanging behind the ear.

FIGURE 8. Then, the upper and lower sutures have been placed in like manner. Traction lines are drawn on the postauricular skin starting from the suture exits to the postauricular sulcus.

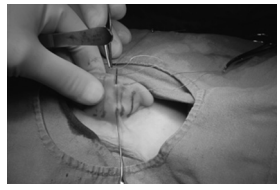

FIGURE 9. Starting with the middle suture site, an unthreaded suture carrier is inserted at the postauricular sulcus and follow the traction line on the rear of the auricle to emerge at the exit point of the suture.

FIGURE 10. The suture carrier is then threaded with lower arm of the middle suture for delivery to the postauricular sulcus site.

FIGURE 11. Then, the suture carrier is then threaded with upper arm of the middle suture.

FIGURE 12. The upper arm of the middle suture is delivered to the postauricular sulcus site.

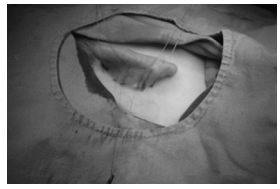

FIGURE 13. The middle suture is delivered with both arms to the traction site in the postauricular sulcus.

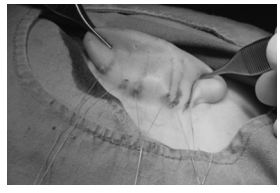

FIGURE 14. The upper and lower pexy sutures are likewise carried to their counterpart traction sites on the postauricular sulcus.

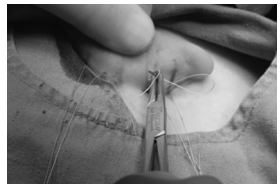

FIGURE 15. A free (unthreaded) needle is threaded with the lower arm of the middle suture, reinserted into its lower exit point.

FIGURE 16. The free needle is scraped over the mastoid bone to firmly anchor the suture to the mastoid periosteum and join the other arm of the suture.

FIGURE 17. The suture is leaving the upper exit point while grabbing the mastoid periosteum firmly to join the other arm of the suture.

FIGURE 18. The other 2 pexy sutures have been similarly placed, completing a horizontal mattress style course.

FIGURE 19. The middle knot is tied and tightened consecutively controlling for adequate distance.

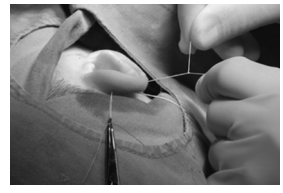

FIGURE 20. The middle, upper and lower knots are tied and tightened consecutively controlling for adequate distance.

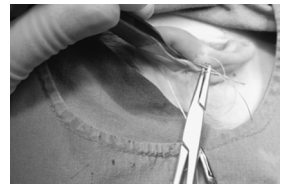

FIGURE 21. Both ends of each suture coming from its knot are threaded onto a free needle, reinserted into the knot orifice.

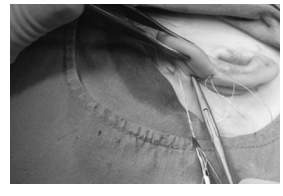

FIGURE 22. This suture is carried subcutaneously underneath the mastoid skin.

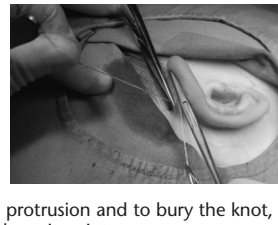

FIGURE 23. To avoid protrusion and to bury the knot, excess suture is lightly pulled and cut off at the exit point.

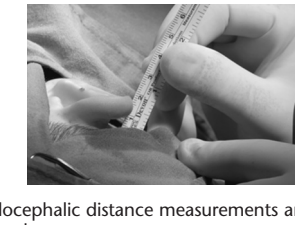

FIGURE 24. Auriculocephalic distance measurements are made at 4 above-mentioned levels.

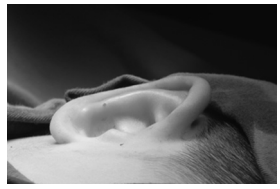

FIGURE 25. Postoperative anterior view when the operation is terminated.

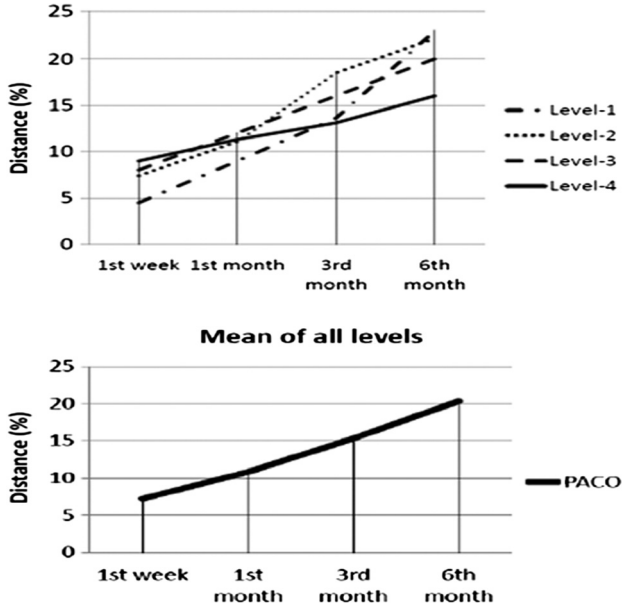

FIGURE 26. Mean longitudinal changes of auriculocephalic distance in percentage compared with the preoperative values in PACO at different and all levels.

practice to otoplasty. However, the scoring technique is inefficient by itself and, depending on the structure of cartilage, can, like CCT, also cause a sharp edge, contour disorder, and/or recurrence.[16]

In addition to cartilage-cutting and cartilage-sparing techniques, Furnas[17] suggested using a concha-mastoid mattress suture to minimize deep conchal bowl projection. If the conchal bowl is deep, concomitant with absence of the antihelix, conchal resection can be applied together with cartilage-cutting or cartilage-sparing techniques.[10] If the only deformity is conchal hypertrophy, then elliptical cartilage excision is made across the conchal edge. In such case, a concha-mastoid suture may or may not be applied.

FIGURE 27. Preoperative and postoperative pictures of a child operated using the PACO technique.

FIGURE 28. Preoperative and postoperative pictures of an teenager operated using the PACO technique.

The success of CST in preventing contour deformities paved the way for the development of otoplasty techniques without incision.[10] Incisionless otoplasty techniques developed by Fritsch use percutaneous permanent subcutaneous horizontal sutures.[18] To shape an antihelical curve, the anterior surface is first scored subcutaneously with a no. 21 needle. Three appropriately placed percutaneous Mustarde sutures then form the antihelical curve. To ensure that each suture is buried under the skin, the needle must reenter the skin from the same exact point it leaves. In the incisionless otoplasty technique introduced by Fritsch to treat a deep conchal bowl, by means of endoscopy, a Furnas suture is placed via the postauricular skin between the mastoid and the conchal bowl. Peled[19] applied another incisionless otoplasty technique by scoring anterior cartilage. He operated on 20 ears of 11 patients and encountered no recurrence at the end of 6 to 30 months of follow-up.

In both CCT and CST, the difficulty of adjusting distance from the helix to scalp, high recurrence risk, long operation time, prolonged postoperative compressive ear dressing, and potential for complications inspired the senior author to develop PACO, an incisionless technique. The aim of this study is to follow the prominent ears longitudinally treated by PACO and assess this procedure as to efficiency, recurrence, complications, and patient satisfaction.

MATERIALS AND METHODS

This study was conducted following local ethic committee approval. Fifteen patients (28 ears) complaining of prominent ear deformity were enrolled in the study. Revision cases, the mentally and physically retarded, and the handicapped patients were excluded from the study. The patients and their parents were informed regarding operative treatment and their consent was given.

FIGURE 29. Preoperative and postoperative pictures of a young adult operated using the PACO technique.

Participating patients were first subjected to a complete ear-nose-throat examination. For the evaluation of auricular prominence, 4 levels of measurements are made parallel to the Frankfort line: level 1 (the most superior point on the auricle), level 2 (the point of insertion of the helix crus to the scalp), level 3 (the most superior point of the tragus), and level 4 (the level of the antitragus).[6] These measurements were repeated at the end of the operation, postoperatively at the first week, in the first, third, and sixth months. All ears were operated upon by the first surgeon (O. O.).

The PACO Procedure

Percutaneous adjustable closed otoplasty was used in 28 ears of 15 patients using the following procedure. After endothracheal intubation anesthesia and surgical preparation, auriculocephalic distances at 4 levels are measured and recorded (Fig. 1). To determine the suture traction sites, a surgical pen is used to draw 3 interrupted lines on the scapha parallel to the antihelix (Fig. 2). The suturing process begins with the middle traction site. First, starting at the lower end of the skin mark, a 3-0 braided white polyester suture is passed from the rear of the auricle to the front, that is, to the scapha (Figs. 3,4). Second, the needle is reinserted into the exit point, passes between the anterior perichondrium and the skin and leaves from the upper end of the skin mark of that traction site on the anterior side (Fig. 5). Third, the suture is reinserted from that point and exits the rear side of the auricle (Fig. 6). When these steps are completed, the 2 ends (arms) of the suture are left hanging behind the ear (Fig. 7). The upper and lower sutures are then placed in like manner (Fig. 8).

After all the sutures have been placed, traction lines are drawn on the postauricular skin starting from the suture exits to the postauricular sulcus (Fig. 8). Sutures are carried under the postauricular skin by a simple, specially designed suture carrier. This surgical device has a slightly curved 1-mm diameter needle with a hole at the sharp end for threading the suture and is attached to a handle for easy manipulation. Starting with the middle suture site, an unthreaded suture carrier is inserted at the postauricular sulcus and follow the traction line on the rear of the auricle to emerge at the exit point of the suture (Fig. 9). The suture carrier is then threaded with lower arm of the middle suture for delivery to the postauricular sulcus site (Fig. 10), after which, the upper arm is treated similarly (Figs. 11–13). Next, the upper and lower pexy sutures are likewise carried to their counterpart traction sites on the postauricular sulcus (Fig. 14). A free (unthreaded) needle is threaded with the lower arm of the middle suture, reinserted into its lower exit point (Fig. 15), and is scraped over the mastoid bone to firmly anchor the suture to the mastoid periosteum (Fig. 16). Now, it is ready to come out from the upper exit point to join the upper arm of the suture (Fig. 17). When the other 2 pexy sutures have been similarly placed, this horizontal mattress style course is complete (Fig. 18). Finally, the middle, upper, and lower knots are tied and tightened consecutively, controlling for adequate distance (Figs. 19,20). Meanwhile, simultaneous use of a ruler ensures millimetric adjustment of distance between the auricula and scalp. Both ends of each suture coming from its knot are threaded onto a free needle, reinserted into the knot orifice (Fig. 21), and carried subcutaneously underneath the mastoid skin (Fig. 22). To avoid protrusion and to bury the knot, excess suture is lightly pulled and cut off at the exit point (Fig. 23). After measuring the 4 above-mentioned auriculocephalic distances (Fig. 24), the operation is terminated (Fig. 25).

Distances between the helical rim and the scalp of each patient were measured at levels 1 to 4 preoperatively, at the end of the operation and postoperatively at the first week, and first, third, and sixth months. Patients' photographs were taken preoperatively and 6th months postoperatively from 5 different positions: anterior, posterior, right and left profiles, and right and left oblique.

The degree of patient satisfaction was assessed by a visual analog scale and Glasgow Benefit Inventory. Degree of patient satisfaction was evaluated with a 0–100 visual analog scale both before the operation and 3 months after the operation. Patients unable to respond to patient satisfaction tests were evaluated based on the responses of their parents. Surveys were handed to the patients and their families during postoperative examinations at least 3 months after operation.

As a health-related patient satisfaction assessment, the Glasgow Benefit Inventory was applied to those aged 14 years and older, and the Glasgow Children's Benefit Inventory was applied for those under the age of 14. The Glasgow Benefit Inventory consists of 18 questions to identify health-related quality of life in different aspects using a 5-level Likert-type scale. The points comprise the Glasgow Benefit Inventory score. Scores range from −100 (reverse effect), 0 (no effect), to +100 (maximum positive effect). After completion of the survey, total score and subscores (overall score, social support score, and physical health score) were calculated.[20,21]

The Glasgow Children's Benefit Inventory is an analog form derived from the Glasgow Benefit Inventory. It consists of 24 questions answered by the parents using a Likert-type scale from 1 to 5, after which, total score and subscores (emotional, physical health, learning, and vividness) were calculated.[22,23] Scores range from −100 (reverse effect), 0 (no effect), to +100 (maximum positive effect).

Statistical Analysis

SPSS (Statistical Package for Social Sciences) for Windows 17.0 program was used for statistical analyses. *T* tests were used to compare qualitative data, apart from the complementary statistical methods (mean and SD).

RESULTS

Fifteen patients with 28 ears (mean age, 12.4 ± 8.8) were enrolled in this study. Auriculocephalic distances of the ears were measured at 4 levels at 6 specific times. Auriculocephalic distances in patients in the first week and in the first, third, and sixth months postoperative follow-up were found to have returned to their preoperative positions by 7.3%, 11%, 15.3%, and 20%, respectively (Fig. 26).

Six months after the operation, interaural difference in auriculocephalic distance for levels 1 to 4 were measured 2.4, 2.4, 2.1, and 1.3 mm, respectively. Hematoma, perichondritis, or contour deformity did not occur in any patients. Suture extrusion encountered in 5 ears (17.8%) was relieved with minor intervention. Visual analog scale increased from 15 preoperatively to 92 three months after the surgery. Mean operation time was only 19.4 ± 5.7 minutes.

In patients older than 13 years, the total score of the Glasgow Benefit Inventory was 36.4 with subscores as follows: general subscale score was 48.7, social support score was 16.5, and physical health score was 3.3. Apart from their physical health scores, after the operation, patients' health-related quality of life showed a statistically significant increase. In patients younger than 14 years, the total score of the Glasgow Children's Benefit Inventory was 41.2 with subscores as follows: emotional score was 41.9, physical health score was 30.9, learning score was 44.4, and vividness score was 34.6. Apart from their physical health score, after the operation, patients' health-related quality of life showed a statistically significant increase.

Figures 27 to 29 are preoperative and postoperative pictures of representative cases (a child, a teenager, and a young adult). The postoperative views of these cases were taken more than 1 year after the surgical intervention.

DISCUSSION

Many techniques are used in otoplasty, resulting in a great deal of discussion about their efficiency. Such techniques can be divided into 3 groups: cartilage-cutting, cartilage-sparing, and incisionless. Currently, CSTs are the most widely used surgical treatments for prominent ear deformity. Similar successful results by longitudinal case studies would indicate the efficiency of incisionless techniques for recommendation as a method of choice for prominent ear deformity. Percutaneous adjustable closed otoplasty is a novel incisionless technique. Our study aimed to demonstrate the efficiency of PACO itself.

For ears with stiff cartilage, CCT are used, which may result in sharp edges, thereby causing aesthetic problems. Cartilage-sparing techniques were developed to prevent not only sharp edges but also possible contour disorders, which might occur in CCT. In CST, contour disorder may occur much less often because cartilage is not incised through the full layer. However, in cases of stiff cartilage, sufficient correction might not always be achieved.

Mustarde[11] first described multiple, horizontal mattress sutures for forming an antihelical curve. Shaping the auricle with suturing techniques is easier than with CCT. In CST, permanent changes in cartilage structure are avoided, and reversibility is ensured.[10,14] Cartilage-sparing techniques also ensure maximum protection in cartilage support and minimize scar possibility and contour disorders; however, potential of return to a preoperative ear deformity is high because of the memory of the cartilage as well as suture slippage.[24]

Encouraged by the success of CST, Fritsch[18] developed an otoplasty technique requiring no incisions. Percutaneous adjustable closed otoplasty is a further refinement, a novel incisionless otoplasty technique with suture application. Because PACO does not involve cutting the cartilage, it poses no risk of contour disorder, sharp edge, or scars. It has low recurrence potential. Percutaneous adjustable closed otoplasty does not require the scoring of cartilage but only uses antihelix-forming percutaneous sutures. It is effective with soft tissue cartilage but not in prominent ear deformities because of conchal hypertrophy per se.

In this study, PACO was used only for ears with soft cartilage. The auricle is repositioned medially to the postauricular sulcus, with the application of three 3-0 white braided permanent polyester sutures. Horizontal mattress sutures pull the scapha to the mastoid periosteum subcutaneously so that an antihelical curve is formed percutaneously, with no cutaneous incision. In this technique, knots can be adequately tightened while simultaneously controlling millimetric adjustment of the distance from the auricle to the scalp with a ruler. In bilateral cases, auriculocephalic distances achieved in the first and the most prominent ear are duplicated for the second. Suture knots are buried under the skin to avoid extrusion because of their hardness. Percutaneous adjustable closed otoplasty is a reversible technique if the surgeon not satisfied with the result of the surgery can either redo the procedure or revert to CST. Compressive dressing is not needed after PACO, only a simple closing dressing, which is applied for several hours, that is, during the recovery from the anesthesia.

In the literature, postoperative infection observed after otoplasty was found to be between 0% and 15%.[25–27] Because no incision is made in PACO, intact skin is thought to be a main protector against surgical infections. If pain and/or high fever occur after a classical otoplasty, dressings are removed on the first day after the operation for observation to help in the early diagnosis of the existence of hematoma and/or infection and the taking of any necessary precautions. In PACO, however, hematoma does not occur because of the nature of this surgical technique so that a light dressing to the patient's ear only on the day of operation is sufficient.

Another frequent complication of otoplasty is suture extrusion. Suture extrusion is caused by infections or by incorrectly placed sutures, which put excessive tension on the cartilage. In the literature, the rate of suture extrusion varies from 0% to 22.2%.[25–28] In our study, this rate for PACO was 17.8%.

Patient dissatisfaction is the most frequently encountered complication after otoplastic surgery.[29] Satisfaction levels with otoplasty are slightly higher in patients (96%) than in surgeons (92%), who are more analytical about the results than are patients and their families.[29,30] The preoperative and postoperative visual analog scales showed a significant difference of patient satisfaction ($P < 0.0001$).

In our study, to indicate health-related patient satisfaction objectively, we used the Glasgow Benefit Inventory and the Glasgow Children's Benefit Inventory. Both scales consist of questions prepared for retrospective purposes to determine health-related quality of life of the patient, especially after plastic reconstructive and/or otolaryngology surgeries.[20–23] These instruments were chosen as being the tests most sensitive to identify cases affecting health-related quality of life.[20–23] In this study, for those 14 years and older the Glasgow Benefit Inventory score was 36.4, indicating that these patients perceived benefit from the surgery. Using the same inventory, the total score was 37.5 in the study of Schwentner et al.[31] and 30.6 in the study of Braun et al.[32] These are compatible with our rates.

The total score for the Glasgow Children's Benefit Inventory was 41.2. In the literature, Braun et al.[32] conducted this survey with their otoplasty patients and found a rate of 24.1. All scores and subscores increased significantly in our young patients, whereas among the older group, physical health scores changed insignificantly. This situation causes concerns that with increasing age, aesthetic operations do not sufficiently influence parameters having an impact on their physical health.

In otoplastic surgery, the postoperative difference of auriculocephalic distances at the measured levels of the 2 ears should be within 3 mm.[5] In PACO, although such adjustment is ensured by adequate tightening of mattress sutures; in other techniques, such adjustment is primarily based on surgical skill and experience. The average auriculocephalic distance in the ears of our patients was found to be less than 3 mm when they were measured 6 months after the operation.

The major objection to suture techniques is based on the cheese-cutting effect of the cartilage that can cause recurrence of prominent ear deformity by either cartilage being cut or by detachment. To avoid such complications in PACO, 2 refinements were instituted before the initiation of this study. First, monofilament polypropylene sutures used formerly were replaced by braided sutures. Besides the cheese-cutting effect, monofilament polypropylene sutures, when exposed to warm water (eg, during showers) elongate under the skin and cause partial return of deformity. Second, sutures are scrupulously placed over both the cartilage and the perichondrium on the anterior side. This double layer of tissue protects against unwanted damage to the auricle and eventual return of deformity. Because of these 2 measures in PACO, any cheese-cutting effect and misplacement of sutures are no longer encountered.

In light-skinned people, white braided and permanent sutures are not noticed from the anterior, thus making PACO a technique reliable not only in terms of recurrence but also in increased patient satisfaction. The regrettable development of recurrence in an ear after surgical correction depends on various factors such as postoperative trauma, insufficient cartilage weakening, and suture insufficiency or weakness especially for stiff or thick cartilage. The loss in such postoperative correction and retroposition derives particularly from relying exclusively on skin excision.[28] Among all otoplasty techniques, recurrence rates are generally between 4% and 8%.[5]

In this study, only 1 auricle (3.6%) returned to near the preoperative status by the end of the sixth month after PACO. This case was revised surgically using the same surgical technique.

All our cases were successfully followed longitudinally for up to 6 months after the surgery. Up to the time of submitting of this study, there was no case presented with any kind of problem because of the surgery. Postoperative views of the representative cases shown in Figures 27 to 29 are the patients who have been operated using the PACO technique even longer than a year after surgery.

The only limitation in this study was that PACO was performed in ears with soft cartilage. Although this might have affected results, the conclusion of this study is that when operating on ears of suitable cartilage, PACO achieves pleasing results with much less time in the operating room, less disturbance to the patient, and few postoperative complications. Despite all the above-mentioned merits, PACO has several shortcomings. First, it may not be an effective treatment for the ears with thick and sturdy cartilage. In such cases, CST should be used. Second, PACO is not indicated if the prominent ear deformity is due exclusively to conchal hypertrophy. Next, PACO requires a specially designed suture carrier. Finally, suture slippage is a general failing point of all types of incisionless otoplasty techniques, even for the Mustarde-type sutures applied in conventional otoplastic surgeries. In addition, white colored polyester sutures may be difficult to obtain in some parts of the world.

CONCLUSIONS

Percutaneous adjustable closed otoplasty is a technically noncomplex ear pexy procedure using a 3-0 nonabsorbable braided suture. It has been demonstrated that PACO has favorable rates of efficiency, low recurrence and complications rates, and high patient satisfaction. Advantages of PACO are that auriculocephalic distances are adjustable in contrast to the previously described techniques; it is much less time-taking operation, prolonged postoperative compressive dressings are not required, and the patient can view the result immediately after surgery. Besides, it is a reversible technique, if the surgeon not satisfied with the result of the surgery can either redo the procedure or revert to CST. In addition, PACO does not cause contour deformities, hematoma, or incision scars. Percutaneous adjustable closed otoplasty is certainly a preferred surgical technique in prominent ear deformities that have soft cartilage. However, for ears with thicker cartilage, surgical indication can be extended by anterior scoring, and conchal resection can also be included for ears presenting additionally with conchal hypertrophy.

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