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Anterior versus Posterior Scoring of Cartilage in Otoplasty: A Retrospective Patient-related Outcome Measurement Study

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Background: Various surgical techniques are applied to correct prominent ears. However, there are limited data on the effect of otoplasty on patient-related outcome measures, such as cold ears and cold intolerance. This retrospective cohort study describes the occurrence of cold intolerance in 98 patients, with a total of 196 ears in a single center during 6 years (2011–2017).

Methods: In this study, 3 groups were identified: group I, anterior scoring of the cartilage (ie, Chong Chet); group II, posterior scoring of the cartilage and suture reposition of the cartilage; and group III, posterior approach without scoring (ie, Furnas and Mustardé). Parents of patients filled in a questionnaire with 40 questions to criticize the effect of surgery.

Results: Symptoms of cold intolerance and pain were reported in 44.4% (n = 16) in the anterior scoring group, 48.1% (n = 26) in the posterior scoring group, and 62.5% (n = 5) in the posterior approach group without scoring of the cartilage ($P = 0.68$). The satisfaction rate was significantly lower in the posterior group without scoring (Likert scale of 17.44 ± 22.01 anterior scoring, 16.02 ± 18.13 posterior scoring, and 11.13 ± 25.87 posterior approach without scoring; $P = 0.02$).

Conclusions: This study underscores the fact that a great part of patients after otoplasty report symptoms of cold intolerance; however, these most often resolve and did not differ between different groups. Patients should be informed about this sequela. Furthermore, overall satisfaction rate was significantly lower in the posterior group without scoring. *(Plast Reconstr Surg Glob Open 2020;8:e2900; doi: 10.1097/GOX.0000000000002900; Published online 9 June 2020.)*

INTRODUCTION

Protruding ears encompass underdevelopment of the antihelical fold, hypertrophy of the concha, or both.[1] Approximately 5% of the White population is affected.[2] In Dutch national guidelines, a threshold of 21 mm from mastoid bone to helix is used for the diagnosis. A less commonly used definition is an angle of >90° between concha and scaphoid.[3] Heredity is one of the main causes of prominent ears because it is an autosomal dominant trait. Consequences are not of functional or physiologic nature: most patients report a diminished quality of life due to low self-esteem or bullying.[4]

Otoplasty is common, and different techniques have been used. In general, there are 3 subtechniques (ie, cartilage sparing versus anterior or posterior scoring of the cartilage), with each technique having advantages and disadvantages.[5]

Complications of surgical reconstruction can be classified as early (ie, 30 days postoperatively) or late (ie, later than 30 days postoperatively). Early complications can encompass bleeding, hematoma, infection (eg, chondritis), pain, and necrosis. The average rate of early complications is 0%–8.4%.[6] Late complications include unesthetic or painful scarring (ie, keloid, hypertrophic scarring), recurrence, suture problems (eg, abscess and spitting sutures), and patient dissatisfaction. The average rate of late complications is 0%–47.3%.[6]

Although we often encounter postoperative cold ears and cold intolerance after otoplasty in our outpatient clinic, there is a paucity of information about this in the

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literature. We are consequently unable to inform our patient of this possible sequela of the otoplasty surgery. We hypothesized that anterior scoring of the cartilage has an higher rate of these symptoms because more damage to the innervation is done than in posterior scoring of the cartilage. A secondary objective is to assess both revision surgery rates and complication rates in our subgroup.

METHODS

Cartilage suture techniques are conducted most in prominauris.[1] It is effective in patients with a mild to moderate deformity of the antihelix.[7] These techniques require less manipulation of the cartilage, which results in a low risk of postoperative hematoma. In Mustardé, a posterior mattress suture to approximate concha and scapha to create antihelical fold is used.[8] In Schaverien, the skin is partly resected posterior of the ear and the skin/subcutis/perichondrium is dissected to the posterior sulcus.[9] Subsequently, a postauricular fascia flap is created to cover the sutures used to create an antihelical fold after the cartilage is scored on the posterior surface. In Furnas, soft tissue including the posterior auricular muscle and ligament are resected and approximated by mattress sutures through both the cartilage of the concha and the perichondrium. It is then secured to the periosteum of the mastoid bone.[10] Our "posterior approach without scoring" includes a combination of the method described by Schaverien et al[9] and Furnas.[11] A more invasive surgical technique is cutting of the cartilage (eg, scoring of the cartilage and wedge excisions). These techniques are indicated in patients with more rigid cartilage (mostly older patients). In Chong Chet, the characteristic of cartilage to warp it dorsally by injuring it ventrally. An incision is made between the antihelix and the helix to score the anterior surface of the cartilage to form an antihelix.[12] Skin excisions were performed in Chong Chet, Furnas, and Schaverien.

This retrospective cohort study reviewed 98 patients who received surgical correction of prominent ears between 2011 and 2017 in a single-center hospital (Meander Medical Centre in Amersfoort, The Netherlands). A total of 224 patients were examined and confirmed eligible. All these patients received questionnaires twice (response rate, 45.1%). Three patients were excluded due to >30% missing data in their response. All patients were operated on both sides. Follow-up was conducted 7 days postoperatively and 6–8 weeks after surgery. Patients were requested to come back for follow-up if their ears deformed again after time. Because hypersensitivity is a late complication, questionnaires were sent a minimal of 2 years postsurgery.

After institutional review board approval, data were collected through a questionnaire. Written informed consent was obtained from all subjects before the study. Inclusion criteria used were the following: patients who have undergone otoplasty for prominent ears by 3 procedures (ie, anterior scoring, posterior scoring, or posterior approach without scoring between 2011 and 2017). Exclusion criteria used were the following: >30% missing data in the questionnaire, patients with previous traumatic surgery/events to the ear, patients using analgesics for other conditions than prominauris, patients who underwent otoplasty for indications other than prominent ears, and patients who underwent correcting of prominent ears other than anterior scoring, posterior scoring, or posterior approach without scoring. Complications, demographic data, and surgery techniques were obtained through the hospital database. Statistical Package for the Social Sciences program version 22 (IBM SPSS 25; IBM, Chicago, Ill.) was used for analyzing demographic and clinical data.

Patients were divided into 3 groups. Group I included patients who underwent anterior scoring of the cartilage (Chong Chet). Group II included patients who had their ears corrected via posterior scoring. Group III encompassed patients who received a posterior approach without scoring of the cartilage (Furnas and Mustardé).

All data are de-identified and anonymous. Patient characteristics are either categorized as continuous, dichotomous, or categorical data. Numerical variables are presented as mean ± SD; other data are reported as median (25–75th percentile). Categorical variables are presented as the number of cases and percentage of total (%). Late complications are defined as complications occurring >30 days postoperatively. Potential confounders are age and sex of patients between different subgroups. A Kruskal-Wallis test was used to compare outcomes between different techniques of surgery. The threshold for statistical significance was set to a P value of <0.05.

A statistical comparison was made between patients who underwent anterior scoring of the cartilage, posterior scoring of the cartilage, and a posterior approach without scoring. The choice of technique depended on severity of the anomaly, hardness of the cartilage, personal surgical preference, and potential risk of hypersensitivity (ie, surgeons tend to perform otoplasty as minimal invasive as possible). In general, concha hypertrophy was corrected via Chong Chet. In the absence of an antihelix, the degree of deviation of the ears results in either posterior technique (ie, posterior approach without scoring for small deviations and posterior scoring of the cartilage for significant deviations). Primary outcome variables encompass symptoms of cold ears or cold intolerance. Secondary outcome variables include Likert scale [ie, scale with range from –50 (maximal unsatisfactory after surgery) to +50 (maximal satisfactory after surgery), with 0 meaning no positive or negative effect of surgery], revision surgery, and complication rates in all subgroups. The STROBE (Strenghtening the Reporting of Observational Studies in Epidemiology) checklist was adhered to in the reporting of this article.

RESULTS

In this study, 51 patients were women and 47 were men. The mean age was 11 years (range, 5–19). Of those 98 patients, 36 patients (36.7%) underwent anterior scoring of the cartilage [19 men; 17 women; mean age, 10 (range, 5–17)] and 54 patients (55.1%) underwent posterior scoring of the cartilage with suture reposition of cartilage [23 men; 31 women; mean age, 11 (range,

5–18)]. The other 8 patients had a suture technique of the antihelix only (Mustardé) in 2 patients (2%) and suture of concha to mastoid (Furnas technique) in 6 patients (6.1%) [5 men; 3 women; mean age, 14 (range, 11–19)]. All operations were performed under general anesthesia with the additional use of intraoperative lidocaine with adrenaline. In general, no opioids were needed in either techniques. Postoperatively, paracetamol (*acetaminophen*) was prescribed.

Because this hospital is not a residency teaching hospital, all otoplasty surgeries were performed by a plastic surgeon (a total of 6 plastic surgeons). Postoperatively, compression gauzes were applied and secured with a crepe bandage. The first postoperative check was 7 days after hospital dismissal.

Complications were reported in 5.6% (n = 2) of the anterior scoring group, 1.9% (n = 1) of the posterior scoring group and 0% of the posterior approach group without scoring. Complications encompassed diminished esthetics due to superficial stitches (2%) and pain due to infection (1%). The patient with infection of the ear presented with high fever (39.2°C/102.5°F), redness of the skin, and no abscess. Vital parameters were within normal range. Outcome after revision surgery in the posterior scoring group was good [ie, no necrosis, no anatomical deformity (eg, cauliflower ear), and no pain]. Postoperatively, a combination of amoxicillin and clavulanic acid was prescribed for 7 days. Complications did not differ between groups ($P = 0.53$). Symptoms of cold intolerance and pain were reported in 44.4% (n = 16) in the anterior scoring group, 48.1% (n = 26) in the posterior scoring group, and 62.5% (n = 5) in the posterior approach group without scoring of the cartilage ($P = 0.68$). Of the patients who reported symptoms, 23 reported pain (n = 9 anterior scoring, n = 11 posterior scoring, and n = 3 posterior approach), 10 reported both pain and numbness (n = 2 anterior scoring, n = 8 posterior scoring), 1 reported numbness alone (n = 1 posterior scoring), and 13 reported symptoms but did not further specified this (n = 5 anterior scoring, n = 6 posterior scoring, and n = 2 posterior approach). The total duration of symptoms took <6 months in 8.2% of all patients (n = 8), 6–12 months in 12.2% (n = 12), 12–24 months in 9.2% (n = 9), and >24 months in 18.4% (n = 18). In total, 3.1% (n = 3, of which n = 2 anterior scoring group and n = 1 posterior scoring group) did have symptoms of cold intolerance but did not respond to this question (Table 1). In general, one should explain to patients that symptoms of cold intolerance can take >24 months to disappear. The satisfaction rate (Fig. 1) was significantly lower in the posterior group without scoring (Likert scale of 17.44 ± 22.01 anterior scoring, 16.02 ± 18.13 posterior scoring, and 11.13 ± 25.87 posterior approach without scoring; $P = 0.02$).

A secondary outcome was satisfaction rate of all patients combined and divided into different seasons (Fig. 2). There were no significant difference in satisfaction rate between the time of surgery in different seasons ($P = 0.07$). The incidence of cold intolerance between seasons did not differ ($P = 0.08$). Neither did the total duration of symptoms ($P = 0.39$).

DISCUSSION

This study demonstrates that cold intolerance is an overlooked sequela often encountered after protruding ear surgery. More than 25% of patients complain of cold intolerance lasting for >12 months, and patients should be informed accordingly. Although cold intolerance complications are present for a long time, patients can be informed that discomfort will disappear with time.

Over 200 different techniques have been described in the surgical correction of correcting ears.[6] However, no specific technique has been identified as superior. In our study, complication rates in different techniques are according to rates noted in previously conducted research.[6] Our complication rates are slightly lower due to a low number of included patients. No rates of cold intolerance nor numbness have been described earlier. Moreover, patient factors such as aberrant courses of nerves may influence such numbers.

Although each surgeon has his own preferences in correcting ears, there is a trend over the course of years in performing less invasive surgical techniques. It has been hypothesized that less invasive type of surgery will result in minimal damage to nerves and therefore result in less pain, numbness, and cold intolerance. Furthermore, it has been hypothesized that anterior scoring of the cartilage, with an approach from dorsal (Chong Chet), could result in higher rates of complications (eg, cold intolerance and numbness in the ear) due to extensive dissection on both sides of the ear and location of the nerves.[13]

Table 1. Occurrence and Duration of Symptoms Divided into Surgical Technique Groups

Period of Symptoms	Group I Anterior Scoring (Chong Chet) (n = 36), n (%)	Group II Posterior Scoring (n = 54), n (%)	Group III Posterior Approach (Furnas, Mustardé) (n = 8), n (%)	Total (n = 98), n (%)
No symptoms at all	18 (50.0)	27 (50.0)	3 (37.5)	48 (49.0)
Presence of symptoms, mo	16 (44.4)	26 (48.1)	5 (62.5)	47 (48.0)
<6	0 (0)*	6 (11.1)†	2 (25.0)	8 (8.2)
6–12	4 (11.1)	7 (13.0)	1 (12.5)	12 (12.2)
12–24	4 (11.1)	4 (7.4)	1 (12.5)	9 (9.2)
>24	8 (22.2)	9 (16.7)	1 (12.5)	18 (18.4)
Missing	2 (5.6)	1 (1.9)	0 (0.0)	3 (3.1)

Due to rounding, percentages presented in this table may not add up precisely to the total.
*Diminished esthetics due to superficial sutures (n = 2).
†Pain due to infection (n = 1).

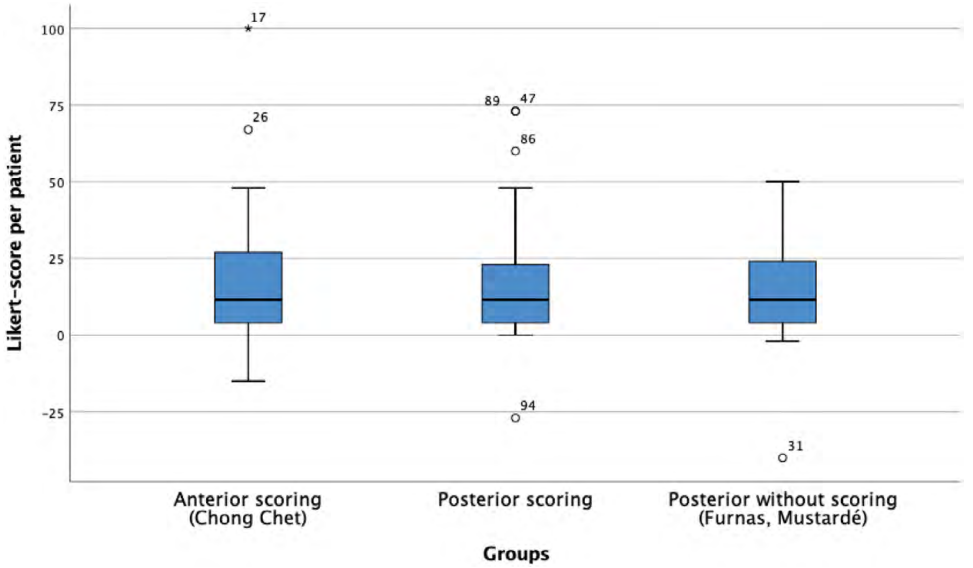

Fig. 1. Boxplot of Likert score distribution per patient divided into different surgical technique groups.

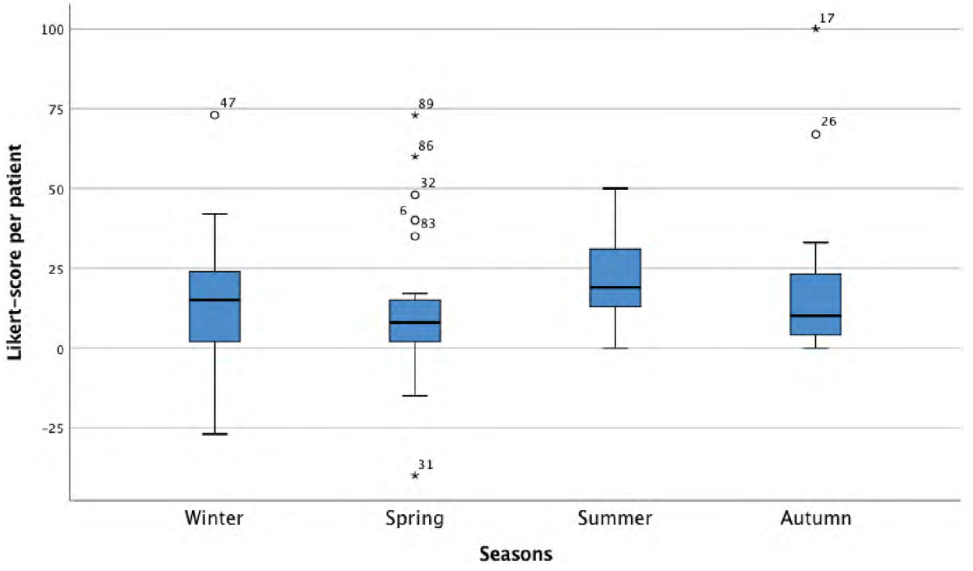

Fig. 2. Boxplot of Likert score distribution per patient divided into different seasons.

Although numbers are very small, the satisfaction rate is significantly lower in the posterior group without scoring (Mustardé and Furnas techniques). However, this study shows that there is no difference in complications such as cold intolerance or pain. Cold intolerance and numbness may also occur due to technical deficiency from misplacing sutures.[14] However, we feel that patients will have more complaints about pain from a misplaced suture, than cold intolerance.

Our small study revealed that patient satisfaction was less in the posterior group without scoring. However, numbers are too small to make any recommendations about surgical technique. Anatomical abnormality, surgical experience, and operator preference should also be considered in making a decision for a specific surgical technique. It should be noted that anterior scoring techniques such as Chong Chet can leave visible irregularities that are difficult to correct. The big advantage of the posterior approach is that with retrusion of cartilage, no permanent damage is performed to the cartilage.

Nevertheless, this study has some limitations. In our 10-year follow-up, only 101 patients replied to the questionnaire (response rate, 45.1%). Especially, the posterior subgroup without scoring did not encompass a great number of patients (n = 8). Further research need to be conducted to either confirm or dismiss our conclusion with a larger study population. Moreover, a 6-, 12-, and 24-month follow-up should be executed to assess either technique and their rate of late complications (ie, complications after 30 days postoperatively). Patients did not also have a physical examination, and this study was based on subjective measures given by the patient from a questionnaire.

However, in an age where patient-related outcome measures are becoming increasingly important, physicians should know that it is important for patients to be aware of possible side effects and the duration of these sequelae. Because only a few exclusion criteria were used and 6 different plastic surgeons performed surgery, this study has a high external validity. Higher external validity could be obtained in a multicenter study with a greater number of patients.

CONCLUSIONS

This study demonstrates that cold intolerance is common after protruding ear surgery and patients should be informed accordingly. However, this will recover with time.

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