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Pediatric Otoplasty: An Evaluation of the Surgical Technique, Results, Patient Satisfaction, and Influence of a Medical Fee

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ABSTRACT

Objective: In our center (UZ Brussel), a small modification of the "Converse and Wood-Smith technique" is used to correct prominent ears in children. We present our results and complication rate. We also investigated the influence of a temporarily introduced medical fee on the number of operations and satisfaction of the patients/parents.

Methods: Out of all children that were operated (otoplasty) on between January 2005 and December 2016, we included all minors with a minimum follow-up period of 6 months. Data about complications were collected retrospectively from their medical files. Data about satisfaction of the patient/parent and surgeon were prospectively collected by questionnaire. Patients were excluded from the study if they were previously operated elsewhere, if the questionnaire was incomplete, if their auricle could not be classified as a grade I dysplasia (Weerda) or as a class V dysplasia (Tanzer's classification), and if the protrusion was secondary to any genetic disease, trauma, or infection.

Results: The parent's/patient's satisfaction differed significantly from the surgeons' satisfaction, with the patient/parent being more satisfied than the surgeon. In 9 out of 105 ears (8.6%), revision surgery under general anesthesia was needed to resolve a complication such as recurrence of protrusion. The introduction of a medical fee did not have a significant influence on the mean number of surgeries performed each year and did not alter patient's/parent's satisfaction.

Conclusion: The results of our modified Converse and Wood-Smith technique were satisfying for correction of prominent ears. The introduction of a medical fee did not seem to have an influence on satisfaction.

Keywords: Complications, medical fee, otoplasty, outer ear, pediatric

Introduction

A prominent ear is the most common congenital auricular deformity. The reported prevalence of prominent ears is approximately 5%, and both sexes are affected equally. It is inheritable in an autosomal dominant way but is expressed with variable penetrance. A positive family history is reported in up to 59% of the patients.[1-5] The ear is an eye-catching part of the body, and auricular prominence often leads to bullying and ridicule. Children may suffer significantly from social distress and might therefore benefit from surgery.

For many years, a modification of the "Converse and Wood-Smith" technique has been used in our department to correct prominent ears in children. In this study, we present the modified Converse and Wood-Smith technique (mCWS), the subjective results, and the rate of complications.

For a few years, an additional medical fee has been demanded for this particular surgery because of unfavorable cost variances due to changes in healthcare financing. This allowed us to investigate the influence of a medical fee on patient satisfaction.

Methods

Surgical Technique

Prominent ears can display 1 or more deformities such as a hypoplastic antihelix, a high concha, and a protruding lobule. In our department, the cartilage-cutting mCWS technique is

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used to correct these deformities. It is based on the Converse and Wood-Smith technique[6] supplemented with the Furnas technique[7] to rotate and fix the concha to the mastoid and includes a Siegert lobuloplasty[8] if necessary.

All operations were performed by a senior surgeon (2 in total) or a senior surgeon together with a registrar.

Otoplasty was performed under general anesthesia. The ear was disinfected with a chlorhexidine-based solution. Sterile surgical drapes were placed in such a way that comparison between both ears during surgery was possible.

A fusiform area (±1 cm width) was marked on the posterior surface of the auricle near the postauricular sulcus. The surgical area was injected with 2% lidocaine with 1:80 000 epinephrine. Each cartridge contained 36 mg of lidocaine hydrochloride. The maximum injected dosage of lidocaine hydrochloride was 3–5 mg/kg. The skin of the marked area was incised with a number 24 blade and removed. The skin overlying the posterior surface of the auricle was undermined by blunt dissection. The concha was detached from the mastoid by sharp dissection of the posterior auricular muscle.

The borders of the neo-antihelix were determined by applying gentle pressure to the helix. As indicated in Figure 1, 3 needles were inserted to mark the conchal line. Another 3 needles were used to mark the posterior border of the neo-antihelix and the superior crus of the antihelix (scaphal line). Two needles were inserted to mark the anterior border of the superior crus (fossa line).

The position of the needles was marked at the posterior surface with methylene blue. Partial-thickness cartilage incisions were made along these markings with a number 15 blade. A fourth partial-thickness cartilage incision was made superiorly of the markings, parallel to the helical rim. This fourth incision ran between the scaphal-line incision and fossa-line incision but did not connect them. In cases where a small strip of conchal cartilage had to be removed, the conchal-line incision needed to be a full-thickness cartilage cut.

Four to 6 non-absorbable polyester polyfilament mattress sutures were placed to tube the antihelix. They were placed between the conchal incision and the scaphal incision and more superiorly between the scaphal incision and the fossa incision. The position of the incisions and sutures is illustrated in Figure 2.

Main Points

- Patients and surgeons are in general highly satisfied with the results of the modified Converse and Wood-Smith technique.
- Patients and their parents are more satisfied with the results than the surgeon. The surgeon is probably more critical.
- Minor complications were rather frequent and easily solved without sequels. In 8.6% of the ears, revision surgery under general anesthesia was required.
- A medical fee does not seem to have an influence on patient satisfaction or on the mean number of surgeries per year.

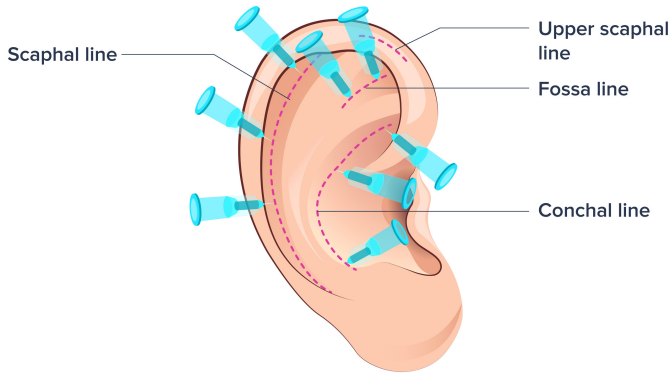

Figure 1. Needles marking the scaphal, conchal, and fossa lines.

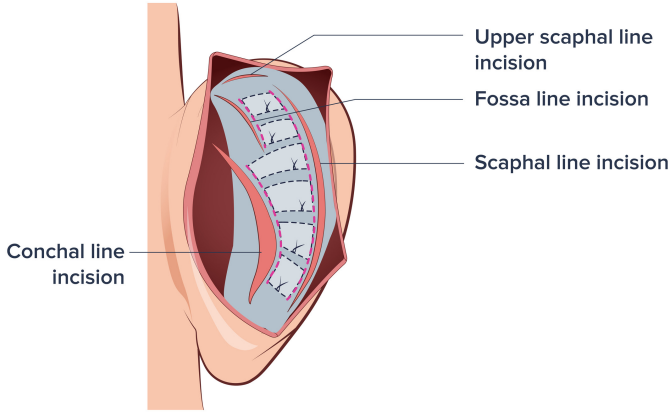

Figure 2. Cartilage incisions and mattress sutures. A small strip of conchal cartilage can be removed.

A small strip of conchal cartilage could be removed to correct a prominent concha. This cartilage incision was also sutured with non-absorbable polyester polyfilament.

The lobule was rotated by placement of a mattress suture with polydioxanone monofilament thread, reaching from the lobular soft tissue to the conchal cartilage. This suture was tightened till the desired setback was reached.

The concha was set back with placement of 3 mattress sutures (non-absorbable) from the cavum concha, concha cymba, and triangular fossa to the mastoid. In this Furnas technique, the mattress sutures were placed in such a way that the auricle was pulled posteriorly and an external auditory canal obstruction prevented.[7]

The auricle was measured; the helix-to-mastoid distance should be less than 20 mm at each point. Skin closure was performed with polyamide monofilament sutures.

The auricle was covered with an antiseptic paraffin dressing, gauze, and cotton pads, and a pressure bandage was applied. One day after surgery, the bandage was replaced by a less tightened bandage. This bandage stayed in place till the sutures were removed 1 week later. After suture removal, a sports headband was worn at night for 3 weeks.

Data Collection

The study was approved by the Medical Ethics Committee of UZ Brussel (B.U.N.143201630447, 25/01/2017). An

informed consent form was signed by all (parents) of our study participants.

Out of 187 children (201 operations) that were operated on between January 2005 and December 2016, we included all minors with a minimum follow-up period of 6 months. Data were collected retrospectively from the patients' medical files. Data about patient and surgeon satisfaction were prospectively collected by questionnaire. Patients were excluded from the study if the case involved revision surgery and had been previously operated on in another hospital, if the questionnaire was incomplete, if the auricle could not be classified as a grade I dysplasia according to Weerda or as a class V dysplasia of the Tanzer's classification (Tanzer, in Weerda, 1977),[9] or if the protrusion was secondary to any genetic disease, trauma, or infection.

For statistical analysis, IBM Statistical Package of Social Sciences version 28 (IBM Corp., Armonk, NY, USA) was used. For each analysis, a *P*-value of ≤.05 was considered significant.

Patient/Parent Satisfaction and Surgeon Satisfaction

The patients/parents were asked to indicate their satisfaction with the postoperative result on a visual analog scale (VAS). Zero indicated "extremely dissatisfied with the result" and 10 indicated "extremely satisfied with the result." Indicating a number with 1 decimal was allowed. Two otologic surgeons of our department were asked to do the same, based on digital photographs taken at follow-up consultations. Patients were excluded if photographs were not of eligible quality or if not all required views (frontal, lateral, and posterior views) were available for adequate rating.

The parents were also asked to write down their comments on the postoperative result to explain their satisfaction or dissatisfaction. They could indicate what aspects they were dissatisfied about, for example visible scar formation and asymmetry.

Complications

All patients' files were checked for the occurrence of complications. If a complication was described in the patient's file, the severity of the complication was rated using the Clavien and Dindo classification[10] as displayed in Table 1. If multiple complications with different grades were present in 1 ear, we choose the highest grade to represent this ear.

Payment Arrangement

A few years ago, a governmental decree was introduced that lowered the financing related to otoplasty. This caused an imbalance between income and expenses related to this surgery in our department, leading to a net loss when performing otoplasty. This became the motivation to introducing a payment arrangement in 2012 for a few years in which a medical fee of 500 euros was requested before surgery. This fee was not reimbursed by the health insurance system. The total number of operations performed before and after introduction of the payment arrangement was calculated. We compared the median patient/parent satisfaction before and after the introduction of the payment arrangement.

Results

In a 12-year period between 2005 and 2016, a total of 201 otoplasty procedures were performed on 187 children using the mCWS technique. One hundred eighty-seven operations (93%) were performed as primary surgery and 14 operations (7%) as revision surgery.

Of all operations performed between 2005 and 2016, 124 operations took place before the introduction of the payment arrangement in 2012, and 77 operations took place after the introduction of the payment arrangement.

Out of 187 patients, 118 parents/patients could be contacted by phone and were sent a questionnaire and the other 69 could never be contacted by any means. The questionnaire was answered by the parent together with their child. Sixty-one letters were returned to our department (response rate of 51.7%). Seven children were excluded from our study because the parents did not complete the questionnaire correctly (n = 2), of suspicion of syndromic malformation (n = 3), or they were a revision-surgery case (n = 2).

Data from 54 children (representing 105 ears that were operated on) were eligible for inclusion.

Our study population consisted of 21 boys (38.9%) and 33 girls (61.1%). The mean age at the time of the surgery was 7.2 ± 1.70 years, ranging from 5 to 13 years old. The majority of our study population had surgery when the patients were 6 years old (29.6%) or 7 years old (25.9%). Fifty-one patients had bilateral otoplasty and 3 patients had unilateral otoplasty.

Table 1. Classification of Complications According to the Clavien and Dindo Scale (10)

Grade	Definition
I	Any deviation from the normal postoperative course without the need for pharmacological treatment (other than the allowed therapeutic regimen) or surgical, endoscopic, and radiological interventions
II	Requiring pharmacological treatment with drugs beyond those allowed for grade I complications
III	Requiring surgical, endoscopic, and radiological interventions A - Not under general anesthesia B – Under general anesthesia
IV	Life-threatening complication requiring critical care management; central nervous system complications A – Single-organ dysfunction B – Multiple-organ dysfunction
V	Death of patient

The vast majority of the ears that were operated on showed preoperatively a hypoplastic antihelix in 98.1% (n = 103 ears). A high concha and a protruding lobule were also frequently encountered and were present in 76.2% (n = 80 ears) and in 31.4% (n = 33 ears), respectively. The most prevalent combinations of deformations were hypoplasia of the antihelix together with a hypertrophic concha (51.4%; n = 54 ears) followed by the triad of a hypoplastic antihelix, hypertrophic concha, and protruding lobule (20%; n = 21 ears).

Conchal bowl setback according to Furnas[7] was performed for 95 ears (90.5%) and lobuloplasty according to Siegert[8] for 39 ears (37.1%).

Satisfaction

The mean patient/parent satisfaction with the postoperative result (VAS) was 8.5 ± 1.84 (n = 54; median = 9; range= 2-10).

The mean satisfaction of the surgeons was based on photographs. Only 36 photographs were eligible for evaluation. Of these 36 cases, the mean patient/parent satisfaction was 8.7 ± 1.6 (median = 9; range= 2-10). The mean surgeon satisfaction was 8.3 ± 0.53 (median = 8.5; range= 7.3-9.5).

The boxplot in Figure 3 shows a difference in distribution between both groups.

The mean rank of patient/parent satisfaction was significantly higher than the mean rank of surgeon satisfaction (Wilcoxon signed-rank test, $P = .039$).

The patients/parents were asked to comment on the aspects of the postoperative result. Most frequently, comments were about the protrusion of the ears, asymmetry, and scar formation.

Complications

All ears (n = 105) were evaluated during follow-up consultations for the presence of minor or major complications. Complications were reported in 27 ears (25.7%) relating to 19 patients.

Table 2. Frequencies of Early Complications

Early Complications	N = Number of Ears (% Out of 105 Ears)
Infection	4 ears (3.8%)
Wound dehiscence	4 ears (3.8%)
Bleeding	4 ears (3.8%)
Insufficient correction	3 ears (2.9%)
Allergic reaction	2 ears (1.9%)
Hematoma	2 ears (1.9%)
Distortion of postauricular sulcus	0 ears (0%)
Presence of sharp ridges	0 ears (0%)
Necrosis of tissue	0 ears (0%)

In Tables 2 and 3, we summarized the frequencies of early and late complications. Sometimes more than 1 complication was encountered in 1 ear.

The most frequently encountered early complications were local wound infection, wound dehiscence, and postoperative bleeding. The most frequently encountered late complications were recurrence of protrusion, hypertrophic scarring, sensation disturbances, and suture extrusion.

In Table 4, we summarized the severity of the complications that were present.

A grade I complication was encountered in 9 ears. These complications included mild recurrence or insufficient correction of protrusion, in which case the parents and child opted to wait and watch the evolution; mild sensation disturbances without need for further treatment; the presence of hypertrophic scar tissue, which did not bother the patient; and postoperative bleeding which was stopped by compression bandaging. The outcome in the case of the bleeding was good; the situation of the other children remained unchanged.

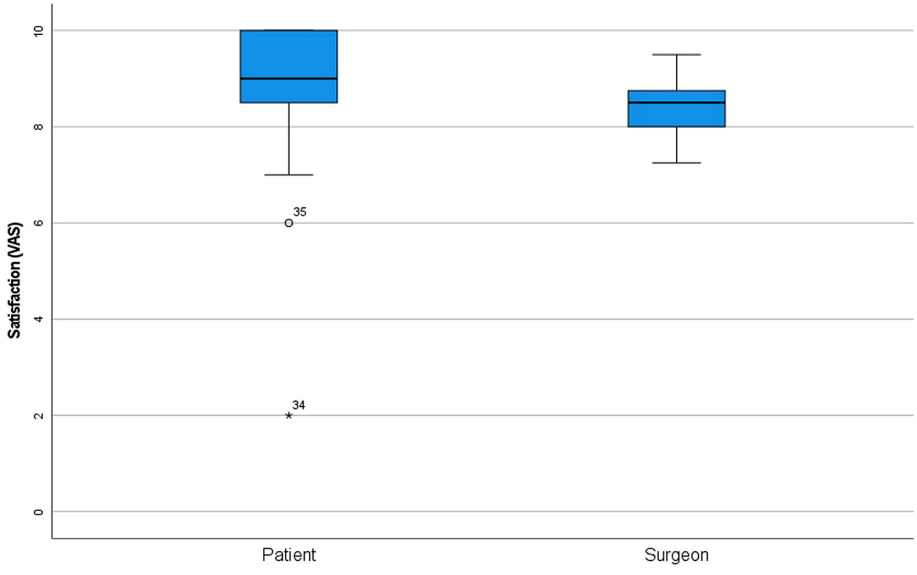

Figure 3. Boxplot of the reported satisfaction with the postoperative result, as rated on a visual analog scale.

Table 3. Frequencies of Late Complications

Late Complications	N = Number of Ears (% Out of 105 Ears)
Recurrence of protrusion	11 ears (10.5%)
Hypertrophic scar tissue/ keloid	4 ears (3.8%)
Sensation disturbances	4 ears (3.8%)
Suture extrusion	4 ears (3.8%)
Granulation tissue	2 ears (1.9%)
Aesthetical complications	0 ears (0%)

Grade II complications were present in 5 ears and included a hematoma which drained spontaneously, needing only compression bandaging and preventive antibiotic treatment; an allergic reaction to the bandages, which needed local corticoid application; wound dehiscence and local wound infection (no perichondritis), which was treated with oral antibiotics and local wound care. The outcome in all cases was good.

Grade III complications were present in 13 ears, including suture extrusion, which needed removal under local anesthesia; recurrence of protrusion or insufficient correction with the parents' and patient's desire for revision surgery; a hematoma which needed surgical drainage and antibiotic treatment; infected tissue, which was surgically excised; scar formation, which was surgically corrected; and formation of granulation tissue, which was treated with excision shaving and systemic antibiotic treatment.

In 9 out of 105 ears (8.6%), revision surgery under a general anesthetic was needed to resolve the complication.

Outcomes were satisfying except for 1 child, for whom the granulation tissue recurred and only healed after further medical treatment, and 1 other child, for whom the revision surgery of recurrence in protrusion was not completely satisfying but was no longer disturbing for the patient.

Payment Arrangement

Of all children included in our study (n = 54), 33 were operated upon before the introduction of an extra fee, and 21 were operated upon after the introduction of this payment arrangement.

The mean patient/parent satisfaction before the payment arrangement was 8.5 ± 1.80 (median = 9; range = 3-10) and after the payment arrangement was 8.4 ± 1.97 (median = 9; range = 2-10). No significant difference was found in the mean rank of patient/parent satisfaction before and after the payment arrangement (Mann–Whitney *U*-test, $P = .834$).

The mean number of operations per year before the payment arrangement was 17.7 ± 4.46 and the mean number of operations per year after the payment arrangement was 15.4 ± 4.04. These numbers are displayed in Figure 4. The mean ranks of both groups were not significantly different from each other (Mann–Whitney *U*-test, $P = .414$).

Discussion

In the literature, many treatment options can be found for protruding ears. Otoplasty techniques can be broadly classified into 3 categories.

First, there are the surgical techniques, in which a skin incision is made to reach the cartilage. These techniques can be either cartilage cutting, using cartilage incisions or scoring, or cartilage sparing, like the suturing technique.[11] Often a combination of both is used.

Second, a non-surgical technique involves splinting of the ear. This technique is useful in neonates when cartilage is still moldable because of circulating maternal estrogen. At 6 weeks of age, the estrogen levels are at baseline, and this non-surgical technique becomes less usable.[12]

Lastly, minimally invasive techniques, which are gaining more popularity lately, entail percutaneous mattress sutures. Studies show this method is efficacious for correction of a hypoplastic

Table 4. Classification of Complicated Ear According to the Clavien and Dindo Scale

Grade	Definition	N= Number of Ears (% Out of 105 Ears)
I	Any deviation from the normal postoperative course without the need for pharmacological treatment (other than the allowed therapeutic regimen) or surgical, endoscopic, and radiological interventions	9 (8.6%)
II	Requiring pharmacological treatment with drugs beyond those allowed for grade I complications	5 (4.8%)
III	Requiring surgical, endoscopic, and radiological interventions A – Not under general anesthesia B – Under general anesthesia	13 (12.4%) 4 9
IV	Life-threatening complication requiring critical care management; central nervous system complications A – Single-organ dysfunction B – Multiple-organ dysfunction	0 (0%)
V	Death of patient	0 (0%)

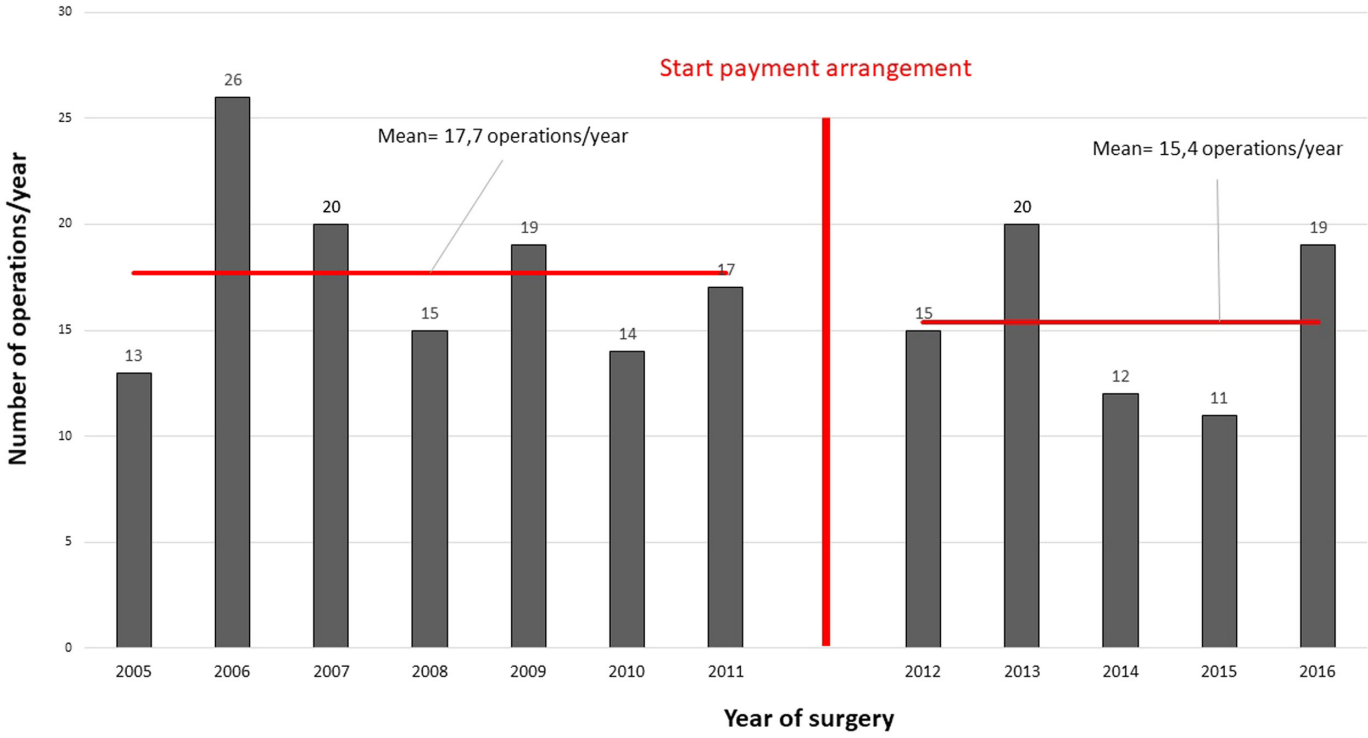

Figure 4. Number of operations per year performed before and after the introduction of the payment arrangement.

antihelix. This technique is less invasive, seems equally effective in longevity, and has a low complication rate.[13,14]

To the best of our knowledge, this is the first study to report the mCWS technique, a combination of suturing and cartilage cutting. We aimed to evaluate the subjective results, complications, and the effects of the payment arrangement.

Patient/Parent Satisfaction (vs. Surgeon Satisfaction)

As recommended by Voutilainen et al.[15] we used a VAS to measure patient/parent and surgeon satisfaction. In Figure 3, a boxplot displays patient/parent and surgeon satisfaction, in which the results are generally skewed toward the higher scores. Our results were difficult to compare with those of the literature because most authors used a Likert-scale questionnaire or ranked VAS scores. Many authors simply described patient satisfaction and did not present numeric data.

Toplu et al[16] found a VAS score of 70 after performing a cartilage-cutting technique (37 patients) and a VAS score of 90 after performing a suturing method (68 patients). This corresponds to a score of 7 and 9, respectively, on a scale from 0 to 10. Our result of 8.5 ± 1.84 lies in between. Considering our mCWS technique belongs rather to the cartilage-cutting techniques, we scored slightly better for our mean patient satisfaction, but conclusions are difficult because of the small study population.

We strongly recommend the use of a continuous VAS in any future studies concerning otoplasty. This scale is more precise; it makes patient satisfaction comparable between techniques and avoids the use of arbitrary defined classes regarding satisfaction.

We found a significant difference in the mean rank between patient/parent satisfaction and surgeon satisfaction, indicating surgeons are more critical about the result. This result is supported by Kompatscher et al, McDowell, Robinson et al, and Hyckel et al.[17-20] but other authors, such as Richards et al[21] and Prakash,[22] found no significant difference. We noticed that the primary concern of a parent/patient is the correction of protrusion, and dissatisfaction is mostly caused by residual or recurrence of protrusion. Many patients/parents are not aware of the specific and (often) multiple deformations present in prominent ears and are satisfied when their ears are no longer protruding. A surgeon, however, will try to correct each aspect of the prominent ears and has a trained eye to detect all small abnormalities after surgery, which can explain the significant lower scores.

Another theory could be that a surgeon has a more critical attitude toward his or her own work.

Complications

When reviewing the patient's medical record, in 27 out of 105 ears (25.7%), corresponding to 19 patients, complications were present. Sometimes multiple complications were present in 1 ear.

These numbers are higher than those reported in the literature by Smittenberg et al[11] (21%) or by Hendrickx et al[23] (27 patients out of 200, or 13.5%). Our rates were smaller than those reported by Limandjaja et al.[24] who reported a complication rate as high as 47%, and those of Kompatscher[17] (asymmetry in 80% and protrusion in of upper pole in 57%).

It appears that our complication rate lies in between the ranges reported in the literature. However, we should note that we considered almost each deviation from desired outcome and postoperative course as being a complication. In addition, we suspect the presence of selection bias because

patients/parents were more likely to participate in our study when a problem occurred during the postoperative follow-up period. Patients with no problems appeared less motivated to respond. These factors could have augmented our complication rates.

Except for Fraser et al.[25] we did not find any article using the Clavien and Dindo Classification or subdividing the complications into well-defined classes following otoplasty. We recommend the Clavien and Dindo Classification as a practical tool to subdivide complications following otoplasty and to make more objective communication possible between different authors.

Payment Arrangement

Our study shows that the introduction of the payment arrangement did not have an influence on the mean number of surgeries performed each year and did not affect patient/parent satisfaction significantly. This suggests that our study population did not set higher expectations for the results because of the higher cost nor were they paradoxically more satisfied because they felt they had paid for quality.

According to Pantouvakis et al[26], customer's (or patient's) overall satisfaction is composed of interaction, physical, and corporate quality, together with convenience and cost. However, cost is not a strong factor. Furthermore, in state-owned hospitals, cost has a rather symbolic meaning, since it does not represent the actual service cost.

No relevant publications about the relationship between cost and satisfaction were found in the specific domain of otoplasty. With our report, we hope to open up the debate about the financial aspect of otoplasty and arouse other authors' interest to report their findings concerning this topic.

Limitations

One possible shortcoming in our study was that surgeries were performed by 2 different senior surgeons, which can create some variations in the surgical result and patient satisfaction, although they used the same technique. It has been shown that next to surgical outcome, patient's confidence in a care provider and communications also play a major role in patient (and parent) satisfaction.[27] Second, the surgical procedure is always slightly adapted to meet specific needs and to the situation and is therefore never fully identical between patients. Third, our study population was rather small. Out of the total population of 187 patients, only 54 children were eligible for inclusion, which corresponds to 28.9%. Our results could have been biased because dissatisfied parents and patients appeared to be more motivated to participate in our study compared to satisfied parents and patients. Lastly, the 2 surgeons themselves evaluated and scored the postoperative results (VAS), which could have biased the scores.

Conclusion

The mCWS technique is a cartilage-cutting technique preferred by our surgeons because it can be used in more severe deformities and in rigid cartilage, provides more permanent correction, and creates natural-looking ears. Good satisfaction scores are achieved, and complication rates lie within the range reported in the literature.

We can further conclude that a medical fee can be introduced in case of negative-balance variances without significantly influencing the satisfaction or expectations of the patient.

Further research is, however, warranted to investigate and confirm this statement.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of UZ Brussel (Approval No: 143201630447, Date: 25/01/2017).

Informed Consent: Written informed consent was obtained from all (parents) of our study participants.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – G.F., F.I., S.T.; Design – S.T.; Supervision – G.F., F.I.; Materials – S.T.; Data Collection and/or Processing – S.T.; Analysis and/or Interpretation – S.T.; Literature Review – S.T.; Writing – S.T.; Critical Review – G.F., F.I.

Declaration of Interests: The authors have no conflict of interest to declare.

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