Otoplasty is an old and common surgical procedure for prominent ears,1 and numerous techniques have been developed over the years. The most frequent causes of prominent ears include conchal valgus, conchal excess, and a lack of antihelical fold.2 Otoplasty methods can be classified into the following 2 categories: (1) those that score the cartilage and (2) those that use a posterior absorbable or nonabsorbable suture to bend the cartilage.3-5 Techniques can be combined,6 and a concha-mastoid suture can be added to correct the protrusion of the concha, as described by Furnas.7 In his Atlas of Plastic and Aesthetic Surgery,8 G. Jost describes a technique using cartilage splitting and cartilage scoring with a number 15 scalpel blade. This technique, unevaluated to date in the literature, has been performed at Hopital R. Ballanger, Aulnay-sous-Bois, France, for more than 10 years. The objectives of this study were to highlight the technical details of the otoplasty procedure involving cartilage splitting without stitches and to evaluate its complications and outcomes.

**Methods**

**Surgical Technique**

The procedure is performed using general anesthesia. A solution of 50% saline serum and 50% lidocaine (1%) with epinephrine (1:10 000) is injected along the posterior portion of the pinna, subcutaneously and deep to the mastoid periosseum. The skin is incised 2 to 4 mm from the postauricular sulcus, with a small sole-shaped excision. Subperichondrial posterior dissection is performed up to 1 or 2 mm from the edge...
of the helix. The posterior auricular muscle is cut, and the pre-mastoid tissue is resected. The helix and antihelix sulcus are marked with hypodermic needles 1 mm anterior to the sulcus. The cartilage is incised following this landmark on its posterior face, preserving the anterior skin. Subperichondrial anterior dissection of the antihelix is performed through this incision to expose the anterior face of the antihelix. The external edge of the concha is marked with hypodermic needles, and the cartilage is cut at its posterior face, preserving the anterior skin. Subcutaneous dissection on the anterior side of the concha in a subperichondrial plane is performed over approximately 1 cm. A crescent-shaped segment of cartilage is resected (Figure 1). The helix is then completely dissected from the antihelix and the concha. At the proximal origin of the antihelix anterior branch, blunt scissors are led beneath the skin under the cymba and under the root of the helix. The scissors are controlled using skin palpation, and the cartilaginous bridges are cut. The same procedure is performed at the inferior pole of the concha at the tragus-antitragus junction.

A grid of nontransfixing incisions is made with a No. 15 scalpel blade on the exposed anterior side of the antihelix, weakening and folding the antihelix (Figure 2). Meticulous hemostasis is performed with bipolar forceps. A posterior drain is placed. The concha is bound to the mastoid periosteum with absorbable suture (PDS 4.0; Ethicon, Johnson & Johnson Company) to fill the dead space. The skin is closed with an intradermal absorbable 4.0 running suture (Figure 3). Bolster dressings of petroleum gauze conforming to the antihelix reliefs and the concha are bound with U-shaped transfixing stitches to pre-
vent hematoma (Figure 4). A loose head dressing is placed. After surgery, antibiotic prophylaxis (cefuroxime) is given for 5 days, for the duration of the bolster. Drains are removed at day 1, and the bolster is removed at day 4 or 5. Technical highlights are summarized in the Video footage.

Patients
In this retrospective study, we included all patients who underwent a unilateral or bilateral otoplasty in our service by one of us (P.L.) with the same surgical technique between January 2004 and September 2010. Exclusion criteria included otoplasties requiring a cartilaginous graft, otoplasties performed with other techniques, patients with less than 1 year of follow-up data, and patients without preoperative and postoperative photographs. Oral informed consent was obtained from the study participants.

Data Analysis
We reviewed 67 otoplasty files from January 2004 to September 2010. Nine files were excluded. We included 58 patients and recorded their age at the time of the intervention and any postoperative complications. The complications were categorized as early complications (before postoperative day 15) or late complications (postoperative day 15 or later) and as major complications (requiring reoperation or postoperative antibiotics) or minor complications (requiring conservative treatment).

Three external lay observers and 3 plastic surgeons who were not involved in the operation reviewed the preoperative and postoperative photographs. They scored the global morphologic result of the intervention on a visual analog scale ranging from 1 (very poor) to 10 (excellent). These scores were then categorized as unsatisfactory results (score range, 1-5), sat-
isfactory results (score range, 6-7), or very satisfactory results (score range, 8-10).

Results

Our review included 58 patients. There were 28 women and 30 men, with a mean age of 16 years (age range, 7-49 years).

Complications

The only early complication was a small hematoma that was punctured during consultation, without any aftermath. The late complications (postoperative day 15 or later) included one case of external earache 2 months after the procedure, one case of inflammatory reaction due to absorbable suture, one case of delayed healing of the posterior incision (requiring a dressing >15 days), one case of painful unilateral syndrome at 3 months but ending at 1 year after surgery, and one case of a compression wound on the anterior antihelical skin (requiring a dressing for 7 days). Altogether, 6 patients (10%) had a complication. We observed no major complications (extended necrosis or chondritis). No surgical revisions or recurrences were reported. The results are summarized in the Table.

In this series, 3 patients had undergone a previous otoplasty in a different institution to correct prominent ears. In 2 patients, the recurrence was bilateral (with keloid scars in one case) after Stenström otoplasty.8,9 In the third patient, the recurrence was unilateral after anterior blind rasping and Mustarde otoplasty.10 These 3 patients have no recurrence at 1 year after performance of the surgical technique described herein. The keloid scars were excised during the procedure and have not recurred.

Outcomes

No global morphologic result score of less than 4 was reported by the 3 plastic surgeons or by the 3 lay observers. The mean scores were 7.68 among the plastic surgeons, 8.24 among the lay observers, and 8.84 among the patients. The evaluations are summarized in Figure 5.

Discussion

Most otoplasty studies focus on techniques based on a posterior cartilage suture, occasionally associated with anterior cartilage scoring. The postoperative result is generally good, and patient satisfaction is usually high.11,12 However, complications occur, and the recurrence rate is high, around 10%.11,13 In our series, we evaluated a technique that requires neither stitches nor blind cartilage scoring, which has not been assessed to date in the literature.

Perioperative setting of cartilage suture may be difficult and uncertain. Complications with this technique usually include extrusion of stitches or breaking, which can lead to recurrence in up to 24% of cases.10,14 With the Jost technique, no stitches are used to maintain the shape of the antihelical fold; therefore, stitch-related complications (eg, palpation, extrusion, breaking) are avoided. The only stitches used are an absorbable suture to fill the dead space behind the concha and skin suture.

With Stenström otoplasty, the cartilage is scored by a rasp or microneedles that are blindly slipped through the posterior incision or by the use of an incision on the upper edge of the antihelix.12 Control of the intensity and the scoring area is not possible, and the anterior skin can be injured, with both leading to skin necrosis. In the Jost technique, the cartilage is scored on an area that is completely exposed; therefore, one can easily set the depth and extent of the grid, depending on the need for correction. In this way, we avoid a lack of scoring, which may lead to recurrence, as well as excess that may imply an overly marked antihelical fold, which would not appear natural. Moreover, the rasping with the Stenström technique is performed precisely on the desired antihelical fold. Morphologic outcomes can be disappointing if the rasping is

Table. Study Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. (%)</th>
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<tbody>
<tr>
<td>Age, mean (range), y</td>
<td>16 (7-49)</td>
</tr>
<tr>
<td>Complications, No. (%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6 (10)</td>
</tr>
<tr>
<td>Early</td>
<td></td>
</tr>
<tr>
<td>Hematoma</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Late</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Painful unilateral syndrome</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Delayed healing</td>
<td>1 (2)</td>
</tr>
<tr>
<td>External earache</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Inflammatory reaction to absorbable suture</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Compression wound</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Revision or recurrence, No. (%)</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 5. Outcome Evaluation

Thirty-six plastic surgeons (62%), 40 lay observers (69%), and 54 patients (93%) were very satisfied with the cosmetic result. Twenty plastic surgeons (34%), 18 lay observers (32%), and 2 patients (3%) were satisfied with the cosmetic result. Two plastic surgeons and 2 patients were dissatisfied with the cosmetic result.
too extensive, leading to antihelical sharp edges. In the Jost technique, there is no direct incision in the antihelical fold, preventing these complications.

The position chosen for the chondrotomies is not where the cartilage will be folded; the aim is to split helix-antihelix and antihelix-concha junctions. The anterior fibroelastic arch of the antihelix is broken with the anterior striation grid as a result of striations. Cartilage splitting and cartilage scoring allow spontaneous and natural placement of the antihelix fold.

The anterior faces of the antihelix and concha are dissected under the perichondrium, preserving the vascularization of the anterior skin during scoring. Ultimately, exhaustive hemostasis can be obtained because all undermined areas are accessible. Moreover, the final bolster dressing fixed in the sulcus helps prevent hematoma on elevated areas. However, the dressing must not be too tight to prevent any skin necrosis.

Six of our patients (10%) had postoperative complications. This is consistent with the literature. However, our criteria may have been overinclusive because any postoperative need for nursing care was considered a complication. In fact, all of the complications were minor postoperative events, with no bearing on the morphologic outcome.

We observed no chondritis or skin necrosis, although the skin elevation was extensive. However, a superficial compression wound occurred on a limited area (<3-mm diameter), most likely due to a tight dressing. The only infection was a Corynebacterium external otitis, occurring 2 months after the procedure, and may have been caused by a small wound on the external auditory canal. No keloid scars have occurred, probably because the skin resection is moderate and the suture is tension free.

Two cases of persistent swelling at postoperative month 3 were reported. Although we did not classify these as complications, it is important to point them out because they may be linked to the technique and the inflammatory reaction caused by extensive dissection. In all cases, swelling had disappeared after 4 months.

Regarding the other complications (delayed wound healing, a persistent painful syndrome, and a cutaneous reaction...
to absorbable suture, none were specific to the Jost procedure. These complications may occur with any surgical procedure.

The Jost technique can also be used for secondary otoplasty after failed procedures. Because the surgical steps are different from those of the Mustarde and Stenström techniques, the Jost procedure can be performed regardless of the initial operation. Therefore, this technique is a helpful lifeboat in case of recurrence for surgeons who usually perform another procedure.

The duration of the Jost technique is longer than others, requiring approximately 80 minutes compared with 45 minutes for the anterior scoring techniques and 60 minutes for the posterior sutures. Moreover, the Jost technique may seem more complicated than the other procedures because it combines extensive skin undermining and transfixing cartilage splitting. However, the learning curve is rapid, and a junior surgeon can operate autonomously after approximately 3 procedures.

Because extensive skin elevation is performed, one may fear skin necrosis or hematoma and an infection, but none occurred in this series. The patients were young nonsmokers, ensuring optimal skin vascularization, and the ear is a well-vascularized area. Moreover, meticulous hemostasis and the use of a bolster dressing help avoid those complications. The drain usually collects less than 3 mL of blood, and our team is debating whether to use one at all.

Antibiotic prophylaxis for the duration of the dressing can be justified because of the use of transfixing stitches on the bolster toward the skin and the cartilage. To our knowledge, no scientific evidence exists on the use of antibiotics after otoplasties; therefore, this practice may vary among operating teams.

Ultimately, the level of patient satisfaction is high. The surgeons are also satisfied with the global morphologic result, which is described as very natural, without a vertical antihelix or an unpleasing acute angle (Figure 6). The rare cases that are less satisfactory involve asymmetry, a “telephone ear” deformity, or an uncorrected lobule protrusion. These findings are consistent with other series. Therefore, the Jost technique results in a natural shape, without any hypercorrection or recurrence, and is positively perceived by the patient and the surgical team.

In conclusion, the Jost technique of cartilage splitting without stitches leads to excellent outcomes. The ear spontaneously assumes a natural shape after the cartilage scoring. We observed no instances of recurrence and few complications, all of which were minor. This procedure requires no use of non-absorbable sutures to bend the cartilage, avoiding many complications. The learning curve is rapid. Jost otoplasty is safe, reliable, and reproducible, with long-lasting outcomes. The Jost technique can also be useful for secondary otoplasty after failed Stenström or Mustarde procedures.

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REFERENCES