INTRODUCTION

A typical auricular pseudocyst is an asymptomatic cystic swelling at the anterior auricle; it is common in the Chinese population and rarer in Western countries.1 It is a noninherited disease of young adults, with the mean age of presentation ranging from 30 to 40 years and a male predominance.2 The lesions are typically located in the scaphoid fossa, triangular fossa of the antihelix, and cymba concha.3 The pathogenesis of this disease remains unknown. The presence of a potential space originating during embryogenesis of the auricular cartilage or repeated minor injuries leading to cartilaginous degeneration caused by the release of chondrocyte lysosomal enzymes are among many theories explaining the formation of auricular pseudocysts.4–6

Various treatments for this condition have been reported. Simple incision with drainage or aspiration of the cystic fluid with a pressure dressing usually leads to recurrence with reaccumulation of the cystic fluid.6 Incisional drainage followed by chemical obliteration with intralesional instillation of corticosteroid is commonly used, but with undesirable side effects such as discoloration and atrophy.7 Chemical obliteration performed with trichloroacetic acid, bleomycin, minocycline, fibrin glue, or sodium tetradeyl sulfate has also been reported, although with variable results.7–10 By contrast, deroofing with resection of the anterior cartilaginous leaflet of the pseudocyst, followed by a button bolster or plastic sheet compressive dressing, gives better results.11–14

However, the lack of pliability and availability of the above-mentioned compressive dressing materials can limit their use. As the auricular three-dimensional morphology varies among individuals, an auricular pseudocyst may develop on uneven surfaces or in locations such as the cymba concha, especially at the reflection near the junction of the base of the helix and the crus of the antihelix (Fig. 1). A stiff button bolster will often
fail to compress this irregularly surfaced area completely and uniformly after deroofing, which may lead to recurrence. In addition, if the affected area is too extensive and involves multiple concavities, it may be difficult to find a button of adequate size and shape for use. Another commonly used material is a plastic sheet, which may be more malleable than a button, but which may not be as readily obtainable. To resolve this problem, we developed a novel method we call the sandwich method using a cotton ball and two rubber tourniquet sheets transfixed in a through-and-through manner. The operations were mostly performed under local infiltration anesthesia, unless the patient could not comply. The patients were placed in a supine position, and the skin of the auricle was sterilized with alcohol and iodine. Then, 1% lidocaine and 1:100,000 epinephrine were injected subcutaneously at the lesion site for local anesthesia to block the auriculotemporal, great auricular, and lesser occipital nerves. An adequate incision was made along the margin of the pseudocyst, and the serous fluid inside the pseudocyst was aspirated completely (Fig. 2a). Then, the anterior skin on the pseudocyst was separated from the underlying cartilage and perichondrium, exposing the superficial surface of the pseudocyst entirely. We excised the entire anterior aspect of the pseudocyst, including the cartilaginous leaflet and perichondrium (Fig. 2b). Then, the posterior cartilage wall of the cyst was curetted to remove any granulation tissue debris (Fig. 2c), and the overlying flap of skin was repositioned with 5-0 nylon. Next, we shaped a condensed cotton ball into an appropriate size and shape to match the location and contours of lesion. The cotton ball was soaked in aqueous povidone-iodine and used to hold and compress the deroofed area (Fig. 3a,b). Two sterilized rubber tourniquet sheets, fashioned to 1.5 times the size of the lesion, were placed with one in front of the cotton ball and the other behind the auricle (Fig. 3c). Then, we transfixed these two sheets from back to front with two vertical mattress sutures using 2-0 silk on a straight needle and tied them posteriorly (Fig. 3d–f). These two sheets brought the cotton ball into contact with the affected area completely and with equal pressure. The anterior skin flap firmly adhered to the auricular cartilage without forming dead space, preventing the formation of a hematoma or recurrence of the pseudocyst. Typically, the operation was completed in half an hour. Postoperative oral antibiotics and analgesics were prescribed for 1 week. We kept

**Surgical Procedure**

The patients underwent deroofing with excision of the anterior cartilaginous leaflet of the pseudocyst, including the perichondrium, followed by a sandwich compression suture using cotton ball packing and two layers of rubber tourniquet sheets transfixed in a through-and-through manner. The operations were mostly performed under local infiltration anesthesia, unless the patient could not comply. The patients were placed in a supine position, and the skin of the auricle was sterilized with alcohol and iodine. Then, 1% lidocaine and 1:100,000 epinephrine were injected subcutaneously at the lesion site for local anesthesia to block the auriculotemporal, great auricular, and lesser occipital nerves. An adequate incision was made along the margin of the pseudocyst, and the serous fluid inside the pseudocyst was aspirated completely (Fig. 2a). Then, the anterior skin on the pseudocyst was separated from the underlying cartilage and perichondrium, exposing the superficial surface of the pseudocyst entirely. We excised the entire anterior aspect of the pseudocyst, including the cartilaginous leaflet and perichondrium (Fig. 2b). Then, the posterior cartilage wall of the cyst was curetted to remove any granulation tissue debris (Fig. 2c), and the overlying flap of skin was repositioned with 5-0 nylon. Next, we shaped a condensed cotton ball into an appropriate size and shape to match the location and contours of lesion. The cotton ball was soaked in aqueous povidone-iodine and used to hold and compress the deroofed area (Fig. 3a,b). Two sterilized rubber tourniquet sheets, fashioned to 1.5 times the size of the lesion, were placed with one in front of the cotton ball and the other behind the auricle (Fig. 3c). Then, we transfixed these two sheets from back to front with two vertical mattress sutures using 2-0 silk on a straight needle and tied them posteriorly (Fig. 3d–f). These two sheets brought the cotton ball into contact with the affected area completely and with equal pressure. The anterior skin flap firmly adhered to the auricular cartilage without forming dead space, preventing the formation of a hematoma or recurrence of the pseudocyst. Typically, the operation was completed in half an hour. Postoperative oral antibiotics and analgesics were prescribed for 1 week. We kept

**MATERIALS AND METHODS**

**Study Participants**

We collected clinical data on 100 patients with a diagnosis of pseudocyst of the auricle seen from July 2004 to May 2016,
the cotton ball in place for 3 days after surgery and removed the stitches 1 week later.

RESULTS

This study enrolled 100 patients who underwent surgical deroofing of the anterior pseudocyst cartilage followed by sandwich compression using a cotton ball and rubber tourniquet sheets (Table I). There were 84 males (84.0%) and 16 females (16.0%), with an average age of 37.7 years (range 7–78 years). All of the patients had unilateral lesions with right-side lesions (53.0%) slightly more common than left-side ones. The predominant site of the lesions was the cymba concha (60.0%), whereas the triangular fossa was the least common site (14.0%). Eight patients (8.0%) had experienced ear trauma within the previous 3 months, whereas the other cases had no specific etiology. Before the operation, 35 patients (35.0%) had responded poorly to simple needle aspiration leading to recurrence. All of the patients were followed for at least 1 year postoperatively, and 98 of the 100 patients recovered smoothly without recurrence or complications. Two patients (2.0%) had recurrences with the reaccumulation of fluid 5 months and 3 years postoperatively. Both patients recovered without recurrence after surgical revision. One patient experienced wound dehiscence 14 days postoperatively. No cartilage infection or perichondritis with auricular deformity was noted postoperatively. The diagnosis of auricular pseudocyst was confirmed histopathologically. The pathology showed a subperichondrial or intercartilaginous cystic space filled with serous fluid, with lymphocytes scattered over the cyst wall (Fig. 4).

DISCUSSION

In this article, we share our experience of treating 100 patients with auricular pseudocysts using a modified surgical technique involving a new sandwich compression method. A 98% success rate was achieved with this

**TABLE I.** Characteristics of 100 Patients With an Auricular Pseudocyst

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex ratio, male:female (%)</td>
<td>84:16 (84.0%;16.0%)</td>
</tr>
<tr>
<td>Age, yr, mean ± SD (range)</td>
<td>37.7 ± 10.1 (7–78)</td>
</tr>
<tr>
<td>Location, n (%)</td>
<td>5 (5.0%)</td>
</tr>
<tr>
<td>Scaphoid fossa</td>
<td>14 (14.0%)</td>
</tr>
<tr>
<td>Triangular fossa</td>
<td>60 (60.0%)</td>
</tr>
<tr>
<td>Cymba concha</td>
<td>21 (21.0%)</td>
</tr>
<tr>
<td>Multiple</td>
<td>53:47 (53.0%;47.0%)</td>
</tr>
<tr>
<td>Side, right:left, n (%)</td>
<td>38 (38.0%)</td>
</tr>
<tr>
<td>Previous treatment failure by incision and drainage, n (%)</td>
<td>8 (8.0%)</td>
</tr>
<tr>
<td>Trauma history, n (%)</td>
<td>3 (3.0%)</td>
</tr>
<tr>
<td>Complication, n (%)</td>
<td>2 (2.0%)</td>
</tr>
<tr>
<td>Recurrence, n (%)</td>
<td></td>
</tr>
</tbody>
</table>

*One patient with hematoma and two patients with wound infection. SD = standard deviation.
To our knowledge, this is the largest series of deroofing surgery using a sandwich compression method in the English literature.

Pseudocysts of the auricles are commonly seen in dermatology and ear, nose, and throat practices. Engel first described the lesion in 1966 as an auricular cystic swelling without a true epithelial lining within the intracartilaginous space. An auricular pseudocyst presents as a benign asymptomatic cystic lesion on the scaphoid, triangular fossa, or concha. Most are located in the scaphoid area and triangular fossa, although our series and some other reports found predominance at the concha. Demographically, most of our patients were young males, which is consistent with previous studies. This phenomenon might be explained by a proposed mechanism in which androgens modify the inflammatory response induced by chronic trauma in susceptible individuals, which leads to cartilage destruction and pseudocyst formation.

Various surgical methods have been proposed for the treatment of auricular pseudocysts. The method of incision and drainage was the earliest and easiest, but involves a very high recurrence rate, with recurrence occurring within 2.3 days postoperatively. Compression after incision or aspiration decreased the recurrence rate. Although many chemical obliteration methods have been used after making a conservative incision, deroofing surgery is now considered the standard treatment for auricular pseudocysts (Table II).

Surgical deroofing with excision of the anterior segment of the auricular pseudocyst was first described in 1984 by Choi et al., with no recurrence and cosmetically good results in 90% of their 31 patients. All of the patients were operated on under local anesthesia. A contour dressing was used for compression. Lim et al. modified the technique by using buttons instead, and also reported good cosmetic outcomes without recurrence.

### TABLE II

<table>
<thead>
<tr>
<th>Reference</th>
<th>Methods</th>
<th>Case No./Sex ratio (M:F)/Age, yr</th>
<th>Ethnicity</th>
<th>Previous Treatment</th>
<th>Recurrence, %/Follow-up Period</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choi et al., 1984</td>
<td>Deroofing with contour dressing</td>
<td>31/NA/NA</td>
<td>Chinese</td>
<td>NA</td>
<td>0%/NA</td>
<td>One patient with perichondritis and resolved with a resultant cauliflower ear</td>
</tr>
<tr>
<td>Lim et al., 2002</td>
<td>Deroofing with buttoning</td>
<td>41/36/5:38.9</td>
<td>Thirty-one Chinese (75.6%), four Malays (9.8%), four Indians (9.8%), and two others (4.9%)</td>
<td>Nine patients had prior aspiration of the cyst; there was reaccumulation of the cyst within 2.3 days</td>
<td>0%/NA</td>
<td>1/41 (2.4%) (initial perichondritis with a resultant cauliflower deformity)</td>
</tr>
<tr>
<td>Kanotra and Lateef, 2009</td>
<td>Deroofing with buttoning</td>
<td>20/20/0:32.6</td>
<td>Indian</td>
<td>Five patients received incision and drainage with buttoning</td>
<td>0%/1 month</td>
<td>0%</td>
</tr>
<tr>
<td>Wang et al., 2013</td>
<td>Deroofing with iodine gauze</td>
<td>14/6:8/43.8</td>
<td>Taiwanese</td>
<td>Ten patients underwent aspiration follow by intralesional steroid injections</td>
<td>0%/6 to 30 months (average 14 months)</td>
<td>One patient with perichondrial reaction</td>
</tr>
<tr>
<td>Shan et al., 2014</td>
<td>Deroofing with plastic sheet</td>
<td>87/80:7/52 (median)</td>
<td>Chinese</td>
<td>Some of the patients received conservative treatment elsewhere, such as repeated needle aspiration or plaster fixation with pressure</td>
<td>0%/51.9 months (average)</td>
<td>One patient with perichondrial reacation; four patients with incisional site scarring</td>
</tr>
</tbody>
</table>

NA = not available, M = male, F = female.
after successful treatment.\(^6\) Recently, Shan et al. reported that using a plastic sheet was also effective for compression after surgical deroofing, with no recurrence and an acceptable cosmetic appearance.\(^{14}\) On comparing the treatment modalities, surgical deroofing with compression using various materials for the treatment of auricular pseudocysts appears to be the most reliable method, with low recurrence rates and good esthetic outcomes.

However, there are some disadvantages to using a button or plastic sheet as the compression material. As we know, the auricle cartilage framework is three dimensional. The helix and antihelix constitute the main concavities of the auricle. The degree of depressions varies among subites, such as the concha cavum or triangular fossa, with the overall surface of the auricle being variable, uneven, and irregular. A button bolster is not always suitable for use after deroofing because it cannot conform to the affected auricular surface evenly. In addition, multiple or extensive lesions cannot be compressed completely using the available commercial buttons. In our experience, these conditions will lead to the recurrence of auricular pseudocysts following button compression.

A cotton ball can be fashioned to any size and contour of the deroofed area. Furthermore, although plastic sheets provide better shaping and adhesion than button bolsters, they are not readily available in most hospitals. Considering the pliability and availability of possible compression bolster materials, we chose materials that were both readily available in the hospital and easily malleable to fit the irregular contour of the auricle: 1) a cotton ball soaked in aqueous povidone-iodine to serve as the bolster on the anterior auricular skin and 2) two rubber sheets fashioned from the tourniquets used as the bolster on the anterior auricular skin and 2) two cotton ball soaked in aqueous povidone-iodine to serve as a cushion to counteract the stiffness of an overlying button or plastic sheet as the compression material. As we know, the auricle cartilage framework is three dimensional. The helix and antihelix constitute the main concavities of the auricle. The degree of depressions varies among subites, such as the concha cavum or triangular fossa, with the overall surface of the auricle being variable, uneven, and irregular. A button bolster is not always suitable for use after deroofing because it cannot conform to the affected auricular surface evenly. In addition, multiple or extensive lesions cannot be compressed completely using the available commercial buttons. In our experience, these conditions will lead to the recurrence of auricular pseudocysts following button compression.

This modified sandwich method using a cotton ball and rubber tourniquet sheets has several advantages. First, the plasticity makes it convenient for the surgeon to shape the cotton ball to the size and contour of the lesion, especially over uneven concave regions like the concha cavum or triangular fossa, allowing the cotton ball bolster to compress the affected area completely to prevent recurrence. Second, the soft cotton ball acts like a cushion to counteract the stiffness of an overlying button or plastic sheet and helps to decrease the patient’s discomfort. Third, the cotton balls and tourniquet sheets are readily available. Fourth, rubber tourniquet sheets can apply equal pressure on the auricular cartilage without causing necrosis, which results from excessive localized pressure.

The sandwich compression method requires some precautions. First, the materials of the cotton ball and tourniquet could cause contact dermatitis in patients who are allergic to iodine or rubber. Second, iodine may cause temporary staining of the skin. Last, the transcartilaginous compression suture may cause temporary postoperative pain and adequate oral analgesic is necessary.

**CONCLUSION**

Pseudocysts of auricles are common, but conservative management gives unsatisfactory results with high recurrence rates. Our novel modified surgical method—deroofing followed by sandwich compression using rubber tourniquet sheets and an iodine-soaked cotton ball—is a promising, reliable alternative treatment. This method has the advantages of using clinically available materials for compression, being simple to perform, offering more comfort, and having an extremely low recurrence rate.

**Acknowledgments**

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**BIBLIOGRAPHY**