Benign paroxysmal positional vertigo (BPPV) is an extremely common peripheral vestibular disorder. The origins of this pathology from free-floating particles in the posterior semicircular canal are well documented. Standard treatment is physical therapy utilizing particle-repositioning maneuvers. Physical therapeutic maneuvers successfully manage greater than 90% of patients with one or two attempts. Patients who have failed particle-repositioning maneuvers and still have clear and persistent BPPV symptoms remain a clinical challenge. For a select group of patients, posterior semicircular canal (PSCC) occlusion is a therapeutic alternative. This procedure involves the obliteration of the PSCC, and thus, prevents the canal from being motion sensitive. Success rates for this procedure for the symptoms of vertigo are reported near 100% in several studies.

**Diagnosis and Indications**

BPPV manifests with a classic set of signs and symptoms. The classic symptoms are positional vertigo with the absence of hearing changes. Physical examination reveals the following:

1. Clockwise nystagmus with the left ear down during Dix-Hallpike maneuver
2. Counterclockwise nystagmus with the right ear down during Dix-Hallpike maneuver
3. Latency of 2 to 10 seconds
4. Fatigability
5. Vertigo
6. Reversal with sitting

It is essential that rotary nystagmus is observed during the Dix-Hallpike maneuver, confirming that the pathology is indeed from the PSCC.

Standard treatment with one or two Epley maneuvers successfully treats patients in the low 90% range. Of the remaining patients, only a small subset will have symptoms troubling enough to warrant surgical intervention.

The two indications for PSCC occlusion after at least two particle-repositioning maneuvers have failed are as follows:

1. Continuous symptoms for greater than 3 months
2. Recurrent symptomatic BPPV for 12 months or greater

**Contraindications**

1. Only hearing or significantly better hearing ear
2. Active otomastoiditis

**Preoperative Evaluation**

The history should focus on confirming the diagnosis of BPPV as well as ruling out bilateral disease. Approximately 15% of patients may have bilateral BPPV. Treatment should focus on the most symptomatic side first unless it is the significantly better hearing ear.

Physical exam should include a complete neuro-otologic exam with audiometry, electronystagmography (ENG) to confirm PSCC involvement, and magnetic resonance imaging (MRI) to rule out central pathology, and some clinicians request a variety of otologic-related metabolic labs. A complete workup is essential before proceeding to the operative suite.
**SURGICAL GOALS**

The success of the surgery depends on two critical factors. The first is that the membranous labyrinth of the PSCC is not violated. Once the posterior semicircular canal is opened, no suctioning can be done in the proximity of the canal. The second critical factor is that the canal is packed tightly to avoid the possibility of a perilymph leak.

Special instruments are listed in Table 26-1.

**ANESTHESIA**

General endotracheal anesthesia is used.

**OPERATIVE TECHNIQUE**

After anesthesia induction and patient positioning, the postauricular incision is injected with 1% lidocaine with 1:100,000 epinephrine. The patient is prepped and draped as if for a tympanomastoidectomy. A No. 15 Bard-Parker blade is used to incise 0.5 cm posterior to the postauricular crease while palpating the mastoid tip to avoid excessive inferior dissection. The No. 15 blade is used to cut until the temporalis muscle superiorly and mastoid perios tome inferiorly is encountered. Blunt finger dissection is used over the top of the temporalis muscle to increase exposure. A No. 15 blade is used to incise the deep temporalis fascia, or true fascia, until muscle fibers are revealed beneath. Using a Brown-Adson and iris scissors, a 1.5-cm-square area of fascia is harvested. Two sets of fascia are trimmed into two different sizes in advance that are appropriately sized for packing the PSCC. A standard T incision is made in the mastoid perios teum, and it is elevated. Preparation of the fibrinogen glue should commence in anticipation of its use. A simple mastoidectomy is performed exposing the horizontal semicircular canal (HSCC) and PSCC. Thinning of the tegmen and development of the digastric ridge are unnecessary. Donaldson’s line, which is a line drawn through the HSCC extending posteriorly, is identified (Fig. 26-1). This line bisects the PSCC in the middle of the area to be exposed.

The posterior half of the PSCC is identified and outlined with a diamond bur. A 1- or 2-mm diamond bur is then used to create a 5-mm bony island in the

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**Table 26-1** SPECIAL INSTRUMENTS AND OTHER EQUIPMENT NEEDED FOR THE PROCEDURE

<table>
<thead>
<tr>
<th>Item</th>
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<tbody>
<tr>
<td>Fibrinogen glue (Tisseel, NHS Company, Hackensack, NJ)</td>
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<tr>
<td>Facial nerve monitor not routinely used</td>
</tr>
<tr>
<td>Mastoidectomy burs of choice</td>
</tr>
<tr>
<td>1- or 2-mm diamond bur</td>
</tr>
<tr>
<td>90-degree hook</td>
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<tr>
<td>Neurosurgical cottonoids</td>
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**FIGURE 26-1** Donaldson’s line along the plane of the horizontal semicircular canal (HSCC). D, Donaldson’s line; E, epitympanum; EAC, external auditory canal; PCW, posterior canal wall; PSCC, posterior semicircular canal; SS, sigmoid sinus.

**FIGURE 26-2** Creation of a 5-mm bony island.
middle of the exposed PSCC by blue-lining the canal around the bony island. It is critical that the membranous labyrinth be kept intact (Fig. 26–2). Set the suction aside and switch to neurosurgical cottonoids for blotting. Gently remove the bony island with a 90-degree hook while not violating the membranous labyrinth (Fig. 26–3). Often, the membranous labyrinth partially collapses with wicking. Select the appropriate-sized temporalis fascia piece and mix with one to two drops of fibrinogen glue. It will begin to get sticky and malleable, and then is ready for packing. Now pack the exposed ends of the PSCC with temporalis fascia atraumatically (Fig. 26–4). The intervening PSCC between the packed ends should be drilled away (Fig. 26–5). The remaining pieces of temporalis fascia are draped over the exposed packed ends of the PSCC. Several drops of fibrinogen glue are placed on the draped temporalis fascia. The soft tissues are closed and dressing applied per surgeon preference.

### TIPS AND PITFALLS

It is critical that once the PSCC is opened, or even blue-lined, all suctioning cease in this area. This is the single most important factor in avoiding a dead ear. The PSCC can be packed with a variety of materials with temporalis fascia and/or muscle as the most common choices. Some authors have had good success with bone dust, and moderate success with bone wax. The majority of surgeons advocate the use of fibrinogen glue to aid with a watertight closure. The preparation of the fibrinogen glue should begin in advance of its need by 20 minutes. Packing the canal tightly is of utmost importance.

### COMPLICATIONS

All patient should be counseled on the following possible complications:

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**FIGURE 26–3** (A,B) Removal of bony island while preserving the membranous labyrinth.

**FIGURE 26–4** Plugging the posterior semicircular canal (PSCC) with temporalis fascia and fibrinogen glue.

**FIGURE 26–5** Removal of the intervening PSCC remnant.
1. Two percent risk of complete hearing loss
2. Chance of persistent or worse symptoms
3. All patients have dysequilibrium for 6 to 8 weeks postoperatively, and a hospital stay of 2 to 4 days until they get accustomed to the dysequilibrium.

**Postoperative Care**

Some physicians perform this procedure as outpatient surgery, whereas others do it as an inpatient procedure that entails an average of a 3-day hospital stay. Patient recovery is much faster with the addition of vestibular rehabilitation. Vestibular suppressants slow recovery by delaying compensation. Patients are given the following instructions and cautions:

1. No strenuous activity for 3 weeks.
2. They may have hearing loss for 3 to 4 weeks.
3. Dysequilibrium lasts for 6 to 8 weeks.
4. Motion sensitivity lasts for 2 to 3 weeks.

**REFERENCES**