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Unilateral posterior canal-plugging surgery for intractable bilateral posterior canal-type benign paroxysmal positional vertigo

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ABSTRACT

Objective: To investigate the effectiveness of unilateral posterior semicircular canal (PSCC)-plugging surgery for patients with intractable bilateral PSCC-type benign paroxysmal positional vertigo (P-BPPV).
Methods: From July 2011 to December 2015, we diagnosed 136 patients with P-BPPV. Of these, 3 patients had bilateral P-BPPV, and in 2 of the 3, the condition had been refractory to conservative treatment for more than 1 year. We planned a staged PSCC-plugging surgery for these 2 patients; initially one side was treated, and the contralateral side was treated 6 months later.
Results: After the first surgery, both patients experienced improvement in symptoms of vertigo and nystagmus on the operated side and no change on the non-operated side. Patients underwent the Epley maneuver for the non-operated side. In one case, the non-operated side was cured. In the other case, although the P-BPPV was not completely resolved, the patient was satisfied with the result of unilateral surgery because he was now able to turn in bed to the operated side without vertigo. Before surgery, he had experienced vertigo when turning even slightly in bed.
Conclusion: We propose that even unilateral PSCC-plugging surgery is effective for some patients with intractable bilateral P-BPPV.

1. Introduction

Benign paroxysmal positional vertigo (BPPV) is a common disease causing positional (i.e., static) and/or positioning (i.e., dynamic) vertigo. The pathophysiology involves canalolithiasis, which is free-floating debris in the semicircular canal (SCC) [1]. The disease is generally self-limiting, and the duration of symptoms can be shortened by the performance of a canalith-repositioning procedure (CRP), such as the Epley maneuver [2]. However, the symptoms are intractable in some patients [3,4]. Bilateral posterior SCC (PSCC)-type BPPV (P-BPPV), which is characterized by free-floating debris in both the right and left PSCCs, is relatively rare [5]. In the supine position, patients with unilateral BPPV can turn in bed to the healthy side without vertigo, but those with bilateral P-BPPV feel vertigo with even slight head movement. Because there are few

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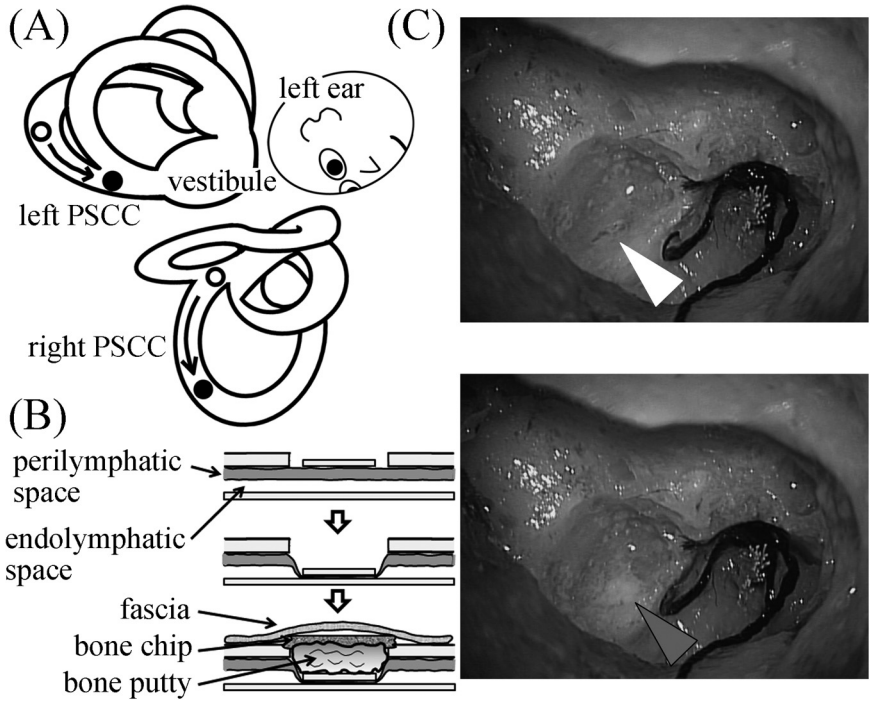

Fig. 1. Bilateral P-BPPV and method of PSCC-plugging surgery. (A) The movement of debris in the right and left PSCCs during the Epley maneuver for left P-BPPV. Debris in the left PSCC moves into the vestibule; simultaneously, debris in the right PSCC moves to the PSCC duct. (B) Plugging surgery. Cross sections of plugged SCC. Exposed compact bone of the SCC is carefully drilled with a diamond burr to expose the blue line of the canal. A small bony island is created (top figure), then pushed into the perilymphatic space (middle figure). Because the endolymphatic duct runs along the outermost region of the perilymphatic duct, the endolymphatic duct is located just under the bony island and the endolymphatic duct is blocked by pushing the bony island into the perilymphatic space. The area over the bony island is packed and sealed with bone putty, bone chips, and temporal muscle fascia (bottom figure), and the packed and sealed area is covered with fibrin glue. (C) Photographs of Patient A during PSCC-plugging surgery. White triangle (top photo) shows the bony island pushed into the perilymphatic space; the gray triangle (bottom photo) shows the area packed and sealed with bone putty.

movements that stimulate neither PSCC, the daily activities of these patients are quite limited. When a patient with bilateral P-BPPV is treated with a CRP on one side, the debris in the other side will move toward the PSCC even if it stays in the vestibule [6]. Therefore, there is no CRP that can move the debris in both the right and left PSCCs to the respective vestibules simultaneously (Fig. 1A). Bilateral PSCC-plugging surgeries must therefore be performed to cure patients with intractable bilateral P-BPPV [7].

We do not perform bilateral PSCC-plugging surgery simultaneously. Because PSCC-plugging surgery is associated with a risk of severe sensorineural hearing loss, clinicians must first confirm that it has not occurred on the operated side before the contralateral-side surgery is undertaken. We therefore plan bilateral PSCC-plugging surgery as a staged procedure separated by a 6-month interval. We herein present 2 cases of intractable bilateral P-BPPV in patients who were satisfied with their outcomes after unilateral PSCC-plugging surgery only.

2. Materials and methods

From July 2011 to December 2015, 136 patients with P-BPPV presented to our department and were examined. Of these, 3 patients had bilateral P-BPPV, and in 2 of the 3, the condition had been refractory to conservative treatment for more than 1 year. The first, Patient A, was an 81-year-old woman. The second, Patient B, was a 74-year-old man. Both patients demonstrated vertical-torsional nystagmus during the Dix–Hallpike maneuver on both the right and left sides, and neither demonstrated neurological abnormalities other than positional and positioning nystagmus. This study was approved by the ethics committee of Osaka University Hospital (No. 10091), registered in the University Hospital Medical Information Network (UMIN) (study ID: UMIN000020047), and performed in accordance with the Declaration of Helsinki. Written informed consent was obtained from all patients before examination.

2.1. Surgical procedure

After creation of a retroauricular incision, transcortical mastoidectomy was performed with a cutting burr to expose the compact bone of the PSCC. The PSCC was carefully drilled with a diamond burr until the blue line of the canal was exposed. A small bony island was created and pushed into the perilymphatic space, and the area was packed and sealed with bone putty, bone chips, and temporal muscle fascia (Fig. 1B,C). The packed and sealed area was covered with fibrin glue, and the wound was closed with skin suture [8].

2.2. Recording and 3-dimensional analysis of positional nystagmus

Positional nystagmus was recorded with an infrared charge-coupled device camera (RealEyes^{TM}; Micromedical Technologies, Chatham, IL, USA) and saved to a computer hard disk

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