Canalith Repositioning for Benign Paroxysmal Positional Vertigo

Timothy C. Hain, MD
Northwestern University, Chicago, IL
T-hain@northwestern.edu

Benign Paroxysmal Positional Vertigo (a.k.a.)
BPPV
BPV (Benign Positional Vertigo)
Positional Vertigo
(Not BPV of childhood)

Case SH
- 61 y/o wm slipped and fell, hitting back of head
- LOC for 20 min
- In ER, unable to sit up
- Halpike maneuver -- positive

Diagnosis: Dix-Hallpike Maneuver

BPPV nystagmus
- Latency (0-20sec)
- Burst (< 60 sec)
- Upbeating/ Torsion vector
- Reversal on sitting
- Fatigue with repetition

Prevalence of BPPV is high
- 20% of all vertigo
- 2% population yearly
- 50% of vertigo in older persons.
- Linear increase with age!
- 85% of all positional vertigo

**BPPV Mechanism**

Canalithiasis (loose rocks)


**BPPV timing: Latency, burst, reversal, fatigue**

**Mechanism of Latency and fatigue**

- Hydrodynamic advantage is less in ampulla
- Margination -- fatigue


**BPPV Variants**

Ewald’s first law: eye movements occur in the plane of the canal being stimulated. Three canals → three vectors.

- Posterior canal
- Lateral canal
- Anterior canal

**Vector of nystagmus tells you the variant of BPPV (and the treatment)**

- PC - Upbeating and Torsion
- AC - Downbeating and Torsion
- LC - Horizontal

**PC - BPPV Treatment**

- Controlled studies of PC BPPV treatment, show that it works well – 80% response.
- Goal of therapy is to remove debris from semicircular canal.
PC BPPV Maneuvers
Many ways to do the same thing
Many specialties

- Brandt-Daroff (1980) - two neurologists
- Epley (CRP), 1980 -- ENT
- Semont (Liberatory), 1988 -- PT
- Gans (2006) - Ph.D. (Audiology)
- Foster (2012) -- ENT

Brandt-Daroff -- avoid this maneuver

- Brandt-Daroff exercises
  - 3 cycles of exercise 3 times per day.
  - Stop exercises symptom-free with routine and exercises for 2 consecutive days
  - Outcome: 23% success rate within 1 week
  - MUCH WORSE than more current treatments

PC – BPPV Treatment -- CRP

- Canalith Repositioning Procedure
  Illustrated for treatment of right PC.
  - Single Treatment
  - Force of gravity redistributes otoconia
  - Outcome: In RCT, 79 ± 16% average short term success rate of single treatment session.


PC – BPPV Treatment -- Epley (CRP)

- Canalith Repositioning Procedure – CRP


PC – BPPV Treatment -- Semont

- Semont Maneuver also referred to as Liberatory Maneuver. Illustrated for treatment of right PC.
  - Single treatment approach
  - Similar geometry to Epley
  - Outcome: In RCT, 82 ± 6% average short term success rate of single treatment session (slightly better than CRP)

CRP vs Semont Maneuver

- Practically, efficacy is the same for CRP and Semont Maneuver.
- A comparison of the position of the head during the CRP and Semont Maneuver illustrates that the maneuvers are nearly the same.
- In US, we tend to use Epley – takes less space, safer, less threatening.

Gans Repositioning Maneuver (GRM)

- “Hybrid” of Semont and CRP
  - Start with position 1 of Semont (i.e. provoking)
  - Roll around long axis of body to nose down
  - Upright
- Comments:
  - Same head r.e. gravity positions as Semont and all but the “useless” position of the CRP.
  - Less head movement on neck (as head remains same on neck).
  - Leaves out “useless” position of CRP.

Foster Maneuver


PC – BPPV Self Treatment

- Self-Canalith Repositioning Procedure illustrated for treatment of right PC.
  - Self treatment
    - Head is extended over edge of pillow.
    - 3 cycles of exercise 3 times per day.
    - Stop exercises symptom-free with routine and exercises for 2 consecutive days
- Outcome: In RCT, 93 ± 4% cured within 1 week.
PC – BPPV Self Treatment

- Foster Maneuver illustrated for treatment of right PC.
  - Self treatment
  - Compared home-Epley with home-Foster
  - Outcome: 27% after 2 maneuvers (first attempt).
  - Repeat variable # times until no longer dizzy.
  - Eventually similar results to home-Epley
  - “Patients prefer the less effective exercise”

Complications of Procedures
PC BPPV

- Canal Conversion
- Canal Jam
- Nausea and Vomiting
- Recurrence

Canal conversion. The “Oh My God” reaction to second cycle of CRP.

- During treatment of PC – BPPV, debris moves from posterior canal to lateral canal (mainly), or anterior canal (rarely).
- Second CRP results in a dramatically different nystagmus
- Treat with maneuvers we will demonstrate later in talk

Complications of Procedures -- Emesis

- Nausea and vomiting.
  - Always identify a good sized wastebasket
- High risk patients may be administered antiemetic
  - Ondansetron HCL (Zofran) – if they have to drive home
  - We prefer 8 mg of liquid but 8mg pills are cheap (30 cents)
  - Meclizine (Antivert, Bonine) – if they don’t have to drive home
  - Promethazine (Phenergan) – also can’t drive home

BPPV often Recurs

- Of patients treated successfully
  - 25% redevelop BPPV within 1 year
  - 44% redevelop BPPV within 2 years

Where do the rocks go?

- They just dissolve? (Parker et al., 1968)
- The dark cells?
  - Lim suggested that otoconia are reabsorbed by the "dark cells" of the labyrinth (Lim, 1973, 1984), which are found adjacent to the utricle and the cristae

Where do the Rocks go?

They stick back onto the utricle? (Otsuka, 2010)

Otsuka K and others. Model experiments of otoconia stability after canalith repositioning procedure of BPPV. Acta Oto-Laryngologica, 2010, early Online, 1-6

Case: LATERAL CANAL BPPV

- Patient seen in office, has mild PC BPPV
- Sent home with home-Epley instructions
- Calls to say that he is now “much worse”
- Before, just got dizzy lying down on left.
- Now he is dizzy to both sides, and doesn’t feel too good standing up either.

Direction Changing Positional Nystagmus (DCPN) is seen in lateral canal BPPV

Lateral Canal (5%)
- Horizontal DCPN

Mechanism of lateral canal BPPV:

- Debris deposited in lateral canal
- Can be on either side of loop or stuck to cupula

Supine roll test
Lateral canal BPPV: Canalithiasis

- Can be on either side of loop
- Sign: direction changing positional nystagmus (DCPN)


Lateral canal BPPV: Cupulolithiasis


HC – BPPV Treatment

- Determine side involved
- Treat with Log-roll rolling from bad to good side
- Switch to other side if no better

HC – BPPV Treatment

- There are no controlled studies of most HC treatments, but uncontrolled studies report about 80% response.
- Log Roll - 270° rotation around longitudinal axis at 90° increments in the recumbent position. Illustrated for canalithiasis right HC.
  - Performed by clinician or self treatment.
  - 3 cycles of exercise. If self treatment, 3 times per day.
  - If self treatment, stop exercises when symptom-free with routine and exercises for 2 consecutive days
  - Outcome: 71% cured within 1 treatment (Nuti, et. al., 1998).

Complications of Log Roll

- Nausea and vomiting – lateral canal BPPV seems to cause more nausea – stronger, longer nystagmus
- Doesn’t work –
  - You may be treating the wrong side. Switch to other side.
  - You may be treating the wrong disease

Gufoni Maneuver - geotrophic

- Logroll is inefficient. No need to go to "bad side", if debris is already halfway there.
- "Gufoni" maneuver: 80% response rate.
- Side-lying to “good” side (less intense).
- Turn head down after 30 seconds.

Casani et al. Audiol Neurotol 2011;16:175-184
Gufoni Maneuver -- ageotropic

- Mirror geotropic Gufoni maneuver for geo
- Side-lying to "bad" ear (less intense for geo).
- Turn head 45 deg up after 30 seconds

Kim et al (2012) reported 62% response, compared to 34% for Sham maneuver.

Case: ANTERIOR CANAL BPPV

- Patient seen in office, gets dizzy lying on back (any position)
- Dix-Hallpike shows downbeating nystagmus --- not much torsion

Diagnosis of Anterior Canal BPPV

- Downbeating or mixed down/torsional nystagmus
- Provoked by head-hanging
- If no previous BPPV, DD includes DBN in general.

Vector for Anterior Canal BPPV

- PC and AC BPPV both due to excitation
- Excitation of canals on one side causes same direction torsion. PC/AC opposite
- PC should twist towards down ear.
- AC should twist towards up ear
AC – BPPV Treatment
There are no controlled studies

- We use Deep Dix Hallpike, Kim, or Yacovino maneuvers
- Logic – wait long enough for debris to sediment past the top of AC. Don’t put head too far forward at end.

Deep Dix Hallpike

AC – BPPV Treatment
Kim maneuver

- Treatment for AC BPPV as proposed by Kim and associates (2005). Prospective unblinded study – 96.7% success

In position ‘b’, the head is turned 45 degrees towards the symptomatic side for 2 minutes.

In position ‘c’ debris goes around the bend of AC.

Problems – 1. position ‘d’ might encourage debris to fall back. 2. What if wrong ear?

AC – BPPV Treatment
Yacovino maneuver

- Treatment for AC BPPV as proposed by Yacovino, Hain, Gualtieri (2009). Improved variant of Deep Dix Hallpike

In position ‘2’, debris falls to apex of AC. Variant that we use is to turn head 45 deg to L and R (i.e. treat both AC)

In position ‘3’ debris goes around the bend of AC.

AC – BPPV Treatment
Head down maneuver

In step ‘2’, debris falls to apex of AC. Turn head 45 deg to L and R (to treat both AC)

In step ‘4’ debris goes around the bend of AC. Could end up in PC. If it does, proves AC was cause

Step 5 – into vestibule.

WHAT IF EXERCISES FAIL?

- Get an MRI
- If normal you can do any or all of following
  - Nothing (6 months ~ 80% response to time)
  - Avoidance of provoking positions
  - Medication
  - Daily Exercise ……….

What can happen if you don’t get an MRI

- Dizzy 75 year old man
  - Frenzel exam showed downbeating nystagmus
  - Treated with PT for many sessions for AC BPPV, then discharged
  - 2 years later, returned

Dizzy 75 year old man
Frenzel exam showed downbeating nystagmus
Treated with PT for many sessions for AC BPPV, then discharged
2 years later, returned
Fourth ventricular ependymoma

Daily Exercises

- Daily home-Epley or Brandt-Daroff
- Rationale: More treatment may resolve
- Unfortunately, does not reduce recurrence

(Survivor Function graph)

SURGERY

Surgery: Canal Plug Procedure – works 90% of the time (this was the pre CRP-treatment)

Select an experienced otologic surgeon. Roughly a 4% chance of hearing loss.

BPPV - Summary

- BPPV is easily diagnosed. Debris within specific anatomical locations have specific nystagmus patterns.
- PC BPPV treatment with mechanical maneuvers is highly successful.
- HC and AC BPPV have specific and logical maneuvers, but controlled studies are presently lacking.

For much more, including more movies, see: