

# Audiology-The University of Akron 4-15-2020

Dizziness, Imbalance, Tinnitus and Ear pain:  
A Physical Therapy Perspective

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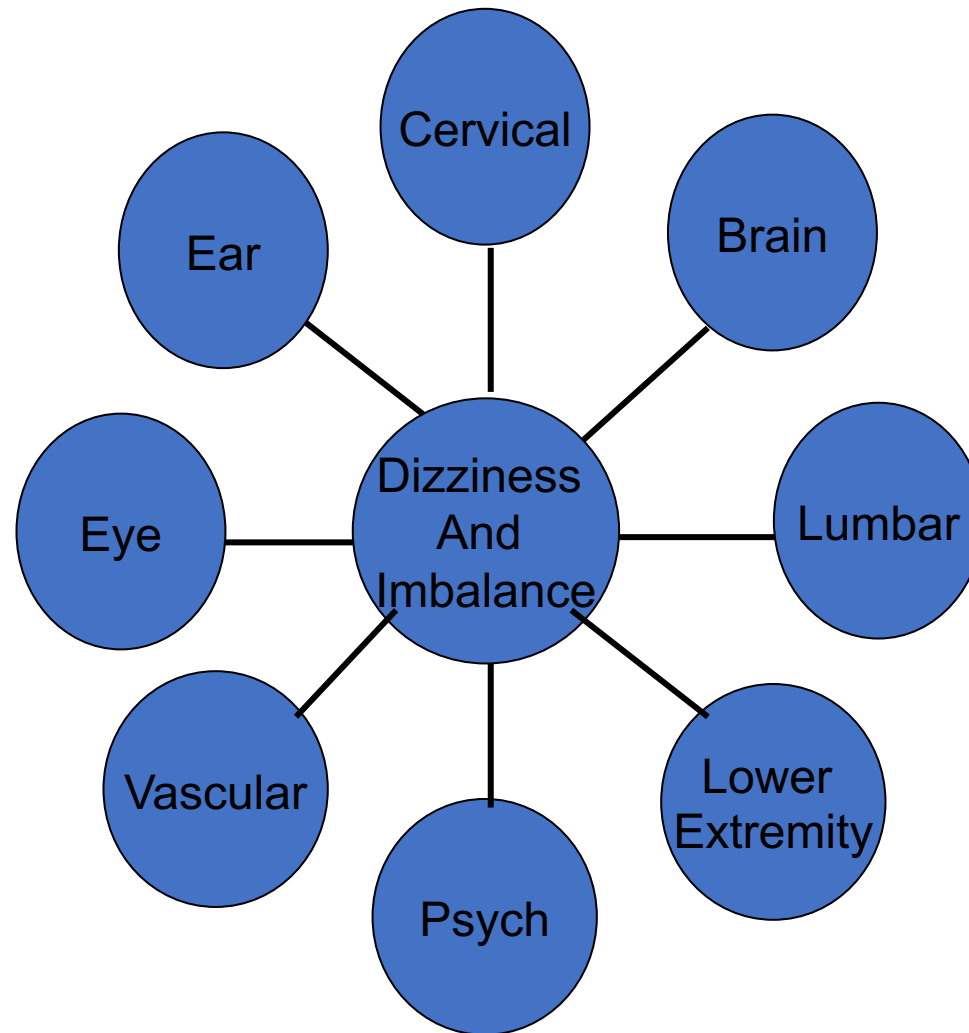
# OBJECTIVES

- Understand the systems that influence balance and dizziness
- Understand the impact vestibular lesions and the musculoskeletal system have on each other
- Identify common patient complaints that often occur with dizziness and imbalance
  - Tinnitus
  - Ear pain

# Three systems of balance

- **Eyes**- vision
- **Vestibular**- balance system of the inner ear
- **Joint receptors**- proprioception, helps determine the body's position in space
  
- For balance to be good enough to function well, (not optimally) two of these three systems must be working properly

# Systems to consider when evaluating a Patient with Imbalance/Dizziness



# The Upper Neck and Dizziness

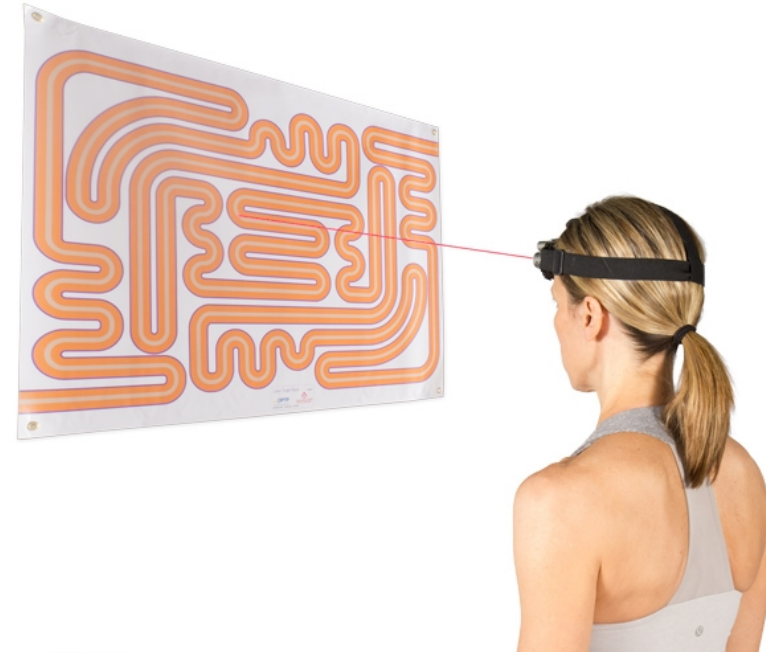
- The upper neck (cervical spine)- Occiput to C3
- Cervicogenic dizziness- a nonspecific sensation of altered orientation in space and disequilibrium
- Proprioception
  - Upper cervical spine joints contain a great number of receptors for sensing balance.
  - Upper Cervical spine is connected through a reflex to the vestibular system.
- Muscles
  - Weak posture- forward head
  - Shortened/tight muscles
- Joint biomechanics
  - If neck mechanics are not ideal, information from the neck may be inaccurate
  - Rotational misalignment of the top cervical vertebrae
  - Disc problem of the upper cervical vertebrae = excess pressure on receptors

# The Neck and Tinnitus

- Muscles and joints of the neck can play a role in tinnitus
- Tinnitus modulation with muscle palpation
- Tinnitus modulation with neck movements and resisted testing

# Upper Neck Treatment

- Weakness and forward head
  - Stretching and strengthening
  - Posture training
  - Dry needling
- Proprioception
  - Biofeedback
  - Laser target
- Joint biomechanics
  - Mobilizations



# Common Brain Diagnosis

- Vestibular migraine- a nervous system problem causing repeated dizziness in people w/ a history of migraines
  - Can mimic a vestibular loss and/or BPPV on VNG
- CVA- Stroke
  - Cerebellar lesion is most common diagnosis that we treat for balance
- Concussion-Mild traumatic brain injury from a direct or indirect force to the head.



# Brain Treatment

- Vestibular Migraine

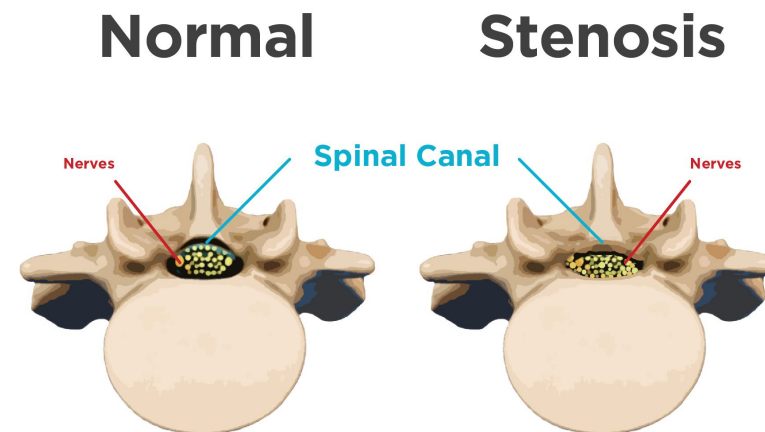
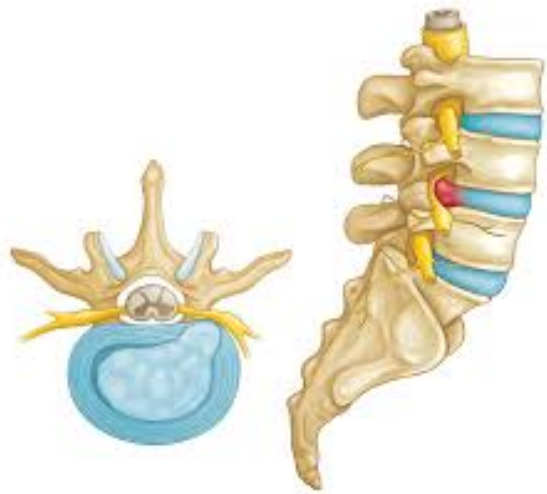
- Recognize
- Progress Slower
- Neck Program
- Prognosis

- Stroke/Concussion

- Gait training
- Central eye exercises
- Balance
- Strengthening/Stretching Neck and Lower Extremities
- Habituation

# Common Lumbar Disorders

- Stenosis
- Disk herniation
- Nerve impingement at lumbar spine causing problems in legs
  - Weakness, Numbness, Proprioception



# Lower Extremity Disorders

- Proprioception
- Sensation loss
  - Diabetic
  - Peripheral neuropathy
- Weakness
  - Ankle instability
    - Not as noticeable till performing activities of higher demand or other aspects of the balance system are injured

# Lower Extremity Treatment

- Strength
  - Progressing from machines to body weight
- Balance
  - Progressing difficulty by standing on foam or adding movements to the activity
  - Eyes closed to remove visual input
- Stretching
  - PT assisted
  - Self stretches

# 3PD- Persistent Postural Perceptual Dizziness

- A psychological maladaptive dysfunction of balance control and vestibular processing
- Chronic Vertigo & Worsening with standing (>3months)
- Presence of illness or shock at symptom onset
- Can NOT be associated to a structural cause
- Causes severe limitations in functional activities

# 3PD Treatment

- Cognitive Behavioral Therapy
- Habituation exercises
- Patient education
- Rehab Momentum- starting slow so the patient gains confidence

# Functional Gait Disorder

- In the past was thought of as conversion disorder
- Presents with intermittent bizarre gait patterns that are not directly linked to a physical disorder
- Treatment like 3PD requires multiple specialists
- PT treatment emphasizes ignoring abnormal gait movements and praising normal gait patterns

# Circulation Disorders

- POTS- Postural Tachycardia Syndrome
  - Orthostatic intolerance, vertigo/dizziness, autonomic dysfunction
  - Unknown origin 90% of the time
  - Theory- Heart is not big enough= decreased blood volume, stroke volume
  - HR increases without orthostatic hypotension
  - Exacerbated by deconditioning
- VBI- vertebrobasilar insufficiency in the neck
  - Vertigo, diplopia, graying or blurred vision, and weakness.
  - Injured with neck manipulation



# Circulation treatment

- POTS
  - Progressive cardio (sitting to standing)
  - Lower extremity strengthening for venous return
  - Compression stocking
  - Increase salt and water intake
- VBI
  - Identification
  - Avoid cervical end range motions
  - No manipulations



# Common Central Eye Disorders

- Smooth Pursuits
  - Have the patient follow the target slowly horizontally and then come back to center. Repeat test for vertical, moving the target slowly vertically.
- Saccades
  - Have the patient move their eyes between two targets positioned horizontally and again with targets oriented vertically
  - Overshooting, undershooting, fatigability
- Convergence
  - Hold the target 2 feet from the patient's face. Ask him/her to focus on the finger while you move it toward the bridge of the patient's nose. Ask the patient to tell you when the target becomes double.

# Central Eye Treatments



Figure 1: Movement of normal ocular convergence in a woman adult.

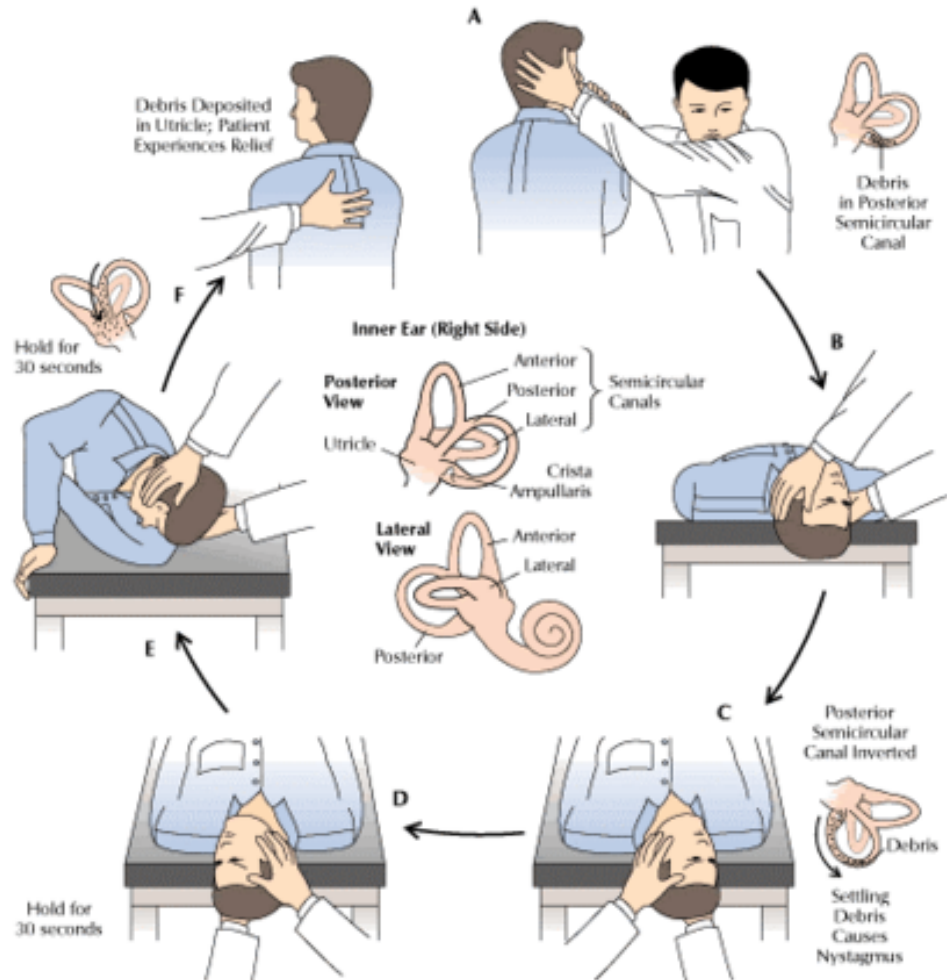
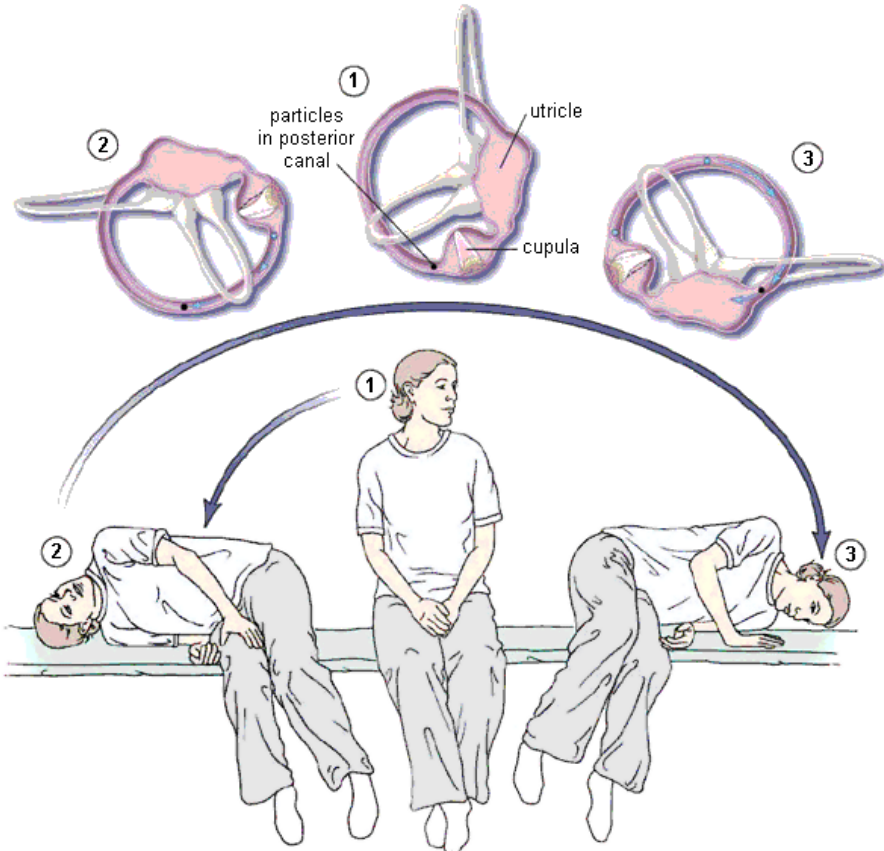


# Common Ear Disorders

- BPPV- Benign Paroxysmal Positional Vertigo
  - Causes increased tone in neck muscles
- UVL- Unilateral Vestibular Loss-vestibular nerve
  - Causes head tilt
- BVL- Bilateral Vestibular Loss-vestibular nerves
  - Oscillopsia during head movement, Unsteady gait in darkness

# BPPV Treatment

- Cupulolithiasis
- Canalithiasis



# Common Ear Treatments

- BBPV Repositioning
  - Anterior canal
  - Posterior canal-
  - Horizontal canal
- Unilateral Vestibular Loss
  - Adaptation exercises
    - VOR x1 and x2 (high neck demands)
    - Increasing difficulty from Sit to Stand, solid to busy background
- Complete Bilateral Loss
  - Compensation strategies

# Factors Associated with Poor Outcomes for Vestibular Disorders

- Neck Dysfunctions
- Bilateral Loss
- Brain Impairments
  - Migraines
  - Head injuries
  - Psychiatric/ Emotional issues
  - Cognitive Impairments
- Eye Impairments
- Systemic Disease
- Sensory Disturbance of the Lower Extremity
- Lumbar Spine Dysfunctions
- Osteoarthritis

# Jaw: Ear Pain and Tinnitus

- TMJ/Jaw
  - The jaw joint
    - Unilateral chewing, clenching, poor dentition, habitual posture
    - Disc in the joint can play a role in ear pain
  - The jaw musculature
    - Clenching common, especially with anxiety
    - Close role with Cervical spine
    - Muscle tightness commonly causes ear pain

**Palpate Joint and Muscles of the jaw to see if it reproduces ear pain or tinnitus**



# Jaw Treatments

- Soft tissue mobilization
- Dry Needling
- Mobilizations to the joint
- Posture corrections
- Educate
  - Chew bilaterally
  - No jaw 'leaning'
  - Teeth healthy



# Downbeat Case Study

- Patient was direct access to PT
- Having reports of constant dizziness
- Upon VNG exam PT noticed regular down beats
- Due to presentation PT was concerned about a bigger problem
- Sent to Audiology for testing for vestibular work up
- Saw down beats however they reported they were not fast enough to be concerning
  
- PT then tested with Neck vibration which was +
- Treatment then focused on the neck
- Patient has 95% improved dizziness

# Million dollar work up for BBPV

- Patient presented with constant dizziness
  - She saw Neurology an MRI and carotid work up was ordered. Results were NEGATIVE.
  - Referred to an ENT. Determined hearing was fine.
  - Considered Meniere disease so she was told to diet for 3 months then come back.
  - Referred to Cardiology who did a full cardio work up. Which was found to be NEGATIVE.
- 
- 4 Months Later
  - Patient the presented as direct access to PT
  - VNG confirmed an anterior cupulolithiasis

# Audiology and PT- More Cost Effective Diagnosis

- If we as clinicians can accurately screen for the different causes of a patient's symptoms then we can provide more cost effective and accurate care.

# Multiple Systems Case Study

- Patient had complaints of neck pain, lumbar pain, leg heaviness, dizziness and imbalance
  - Neck surgery
  - Lumbar surgery still leg numbness/weakness
  - Bilateral Total knee replacements
  - Lower extremity neuropathy from diabetes
  - Unilateral vestibular loss (UVL)
  
- Patient failed initial PT who did VOR training for adaptation.
- Made patient worse due to neck pain and headaches
- **Patient referred now to you: What would you do next??**

# Multiple Systems Case Study: Unilateral Vestibular Loss (UVL)

- We addressed neck first which helped cervicogenic dizziness.
- Then addressed VOR which further improved dizziness however patient still had imbalance.
- Lumbar stenosis was identified which had caused lower extremity numbness and weakness
- Addressed Stenosis with strengthening and mobilizing the scar from surgery
- Improved gait and balance partially
- Addressed proprioception disorder in knees due to surgeries and feet due to peripheral neuropathy from diabetes.
- Gait and balance have dramatically improved and we are working on higher level activities,

# Questions



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