



# CONFIDENT DYSPHAGIA PRACTICE

Amherst, Mass  
April, 2009

Jay Rosenbek, PHD  
Professor and Chair

[rosenbek@php.ufl.edu](mailto:rosenbek@php.ufl.edu)



## DEPENDS ON

- Training
  - Whether extensive or limited
  - Modern or from the 70s
- Psyche
  - Tolerance for ambiguity
  - Humility

## DEPENDS ON

- Knowing and acting on principles of neuromuscular plasticity
- Knowing what the methods accomplish
- Knowing the pattern of swallowing difficulty to be txd
- Knowing the treatment data

## EDUCATION

- Extensive is better
- But even brief needs to be modern
  - Rehabilitate rather than compensate unless rehab is ABSOLUTELY IMPOSSIBLE OR CONTRAINDICATED

## CLINICAL TALE

- 65 year old man with PD
- Choking especially on dry foods and difficulty swallowing pills
- UES opens too briefly and with limited range
- Was told to swallow multiple times

WRONG

WRONG

WRONG

## NEEDED REHABILITATION

- Possibility of neuroprotective effect
- And, for sure, possibility of improving swallow
- Why threaten quality of life with time-consuming compensations?

## NPO

- NPO and tubes or thickened coffee and pureed prunes were the 1970s
  - If pt aspirated on exam
  - Even if pt was at risk for aspiration
- NOW
  - Know that tubes have risks
  - Altered diets have risks
  - Aspirators will aspirate

## PSYCHE

- Can never know for sure
- Consider aspiration
- Not all aspirators get sick
- So who does and who doesn't

## WHO GETS SICK?

- Relationship of aspiration and pneumonia is "tentative"
  - Martin et al. Dysphagia, 1994
- Not all aspirators get sick
  - Only 5 of 26 aspirators got sick
    - Schmidt et al, Dysphagia, 1994

## LANGMORE ON WHO GETS SICK

- Langmore et al, Dysphagia, 1998
- Dependent for oral care
- Number of decayed teeth
- Number of medications
- Tube feeding

## OTHER PEDICTORS

- Dependent for feeding
- Now smoking
- Multiple medical diagnoses

## REMEMBER

- Aspirators will aspirate
- Making them NPO will not prevent aspiration
- Despite all we've been taught

## CORRECT DIET

- Clinicians act as if they know
- But we do not
- We have confused reliability with validity
- The proper diet is not what we say it is

## THUS

- Need tolerance for ambiguity
  - More likely to be unsure than sure
  - Unless you ignore the pt and just do what you've been taught
- Need to be humble
  - Chance of making a mistake is very high



## SO

- What to do?
- Fall back on principles
- And prepare to change in a millisecond

## DEPEND ON

- Knowing and acting on principles of neuromuscular plasticity
- Knowing what the methods accomplish
- Knowing the pattern of swallowing difficulty to be txd
- Knowing the treatment data

## PLASTICITY

- Can divide into
  - Behavioral-behavior changes
  - Muscular-muscle structure chemistry changes
  - Neural-nervous system changes
- First depends on the other two and especially on neural
- Lets examine

## PLASTICITY DEFINED

- Flexibility of neural substrates so that alteration to support function is possible
- Or, Filipek (2000). Brain's ability to recover function that was lost as result of insult.
- Thus we talk of neuroplastic changes in the anatomy and physiology of intact cortical and subcortical tissues (Nudo et al. 2000)

## REFERENCES ON PLASTICITY

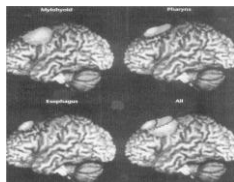
- Levin, Grafman (2000). Cerebral Reorganization of Function after Brain Damage. Oxford: Oxford University Press.
- Kolb (1995). Brain Plasticity and Behavior. Mahwah, NJ: Erlbaum.
- Dobkin. The Clinical Science of Neurologic Rehabilitation. Oxford, 2003.

## CONSIDER THESE STATEMENTS

- “The cortex can preferentially allocate area to represent the particular peripheral input sources that are proportionally most used”
- “The rules governing this cortical representational plasticity following manipulation of inputs, including learning, are increasingly well-understood”
  - Buonomano & Merzenich, Annual Review of Neuroscience, 1998, 21:149-186

## PRINCIPLE ONE

- Use it or lose it
  - Brain is precious real estate
  - If an activity is not performed nervous network transfers to other activity



## CRITICAL REHAB NOTION

- Plastic change does not occur completely on its own
- The guiding notions
- PLASTICITY IS USE/EXPERIENCE DEPENDENT
  - ALL USE/EXPERIENCE IS NOT EQUAL

## What to do with tx?

- We need to mold our methods to the principles of use-dependent plasticity
- Here is a list of all—does your treatment satisfy?

## IMPLICATION

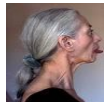
- Swallowing if NPO and tube fed without rehab
- Aphasia, dysarthria, AOS if no speech production opportunity
- Any condition in which compensation rather than rehab is prescribed

## RESULTS

- Further decline in function
- Perhaps a greater rehab challenge once treatment is finally introduced

## PRINCIPLE THREE

- Specificity matters
  - Get better at doing what you practice



- Skilled practice better than random or unguided repetition

## PRINCIPLE FOUR

- Repetition matters
- Neurons that fire together wire together
  - Changing neural circuits permanently requires repetition
  - Sometimes a huge number
    - Behavior may change before the brain changes but until the brain changes retention is impossible

## PRINCIPLE TWO

- Use it and improve it
- Simple imitation is less dynamic than target practice
  - Skill is more important than simple repetition of non or minimally skilled activity

## IMPLICATION

- A gillion come to mind
  - Stick out tongue and will get better at tongue protrusion-don't swallow with tongue protruded
  - Push out against a tongue blade and you'll be a better tongue blade pusher-don't swallow with forceful tongue protrusion
  - Swallow thick liquids and you'll mayget better with thick (if you can stand them)
  - NPO with no rehab and will get better at not swallowing

## PRINCIPLE FIVE

- Intensity matters
  - How those repetitions (previous principle) occur may be important
  - 200 repetitions per day may make more change than 50
  - Extreme exercise too early may cause neurotoxic (excitotoxic) effects
  - Delaying exercise may lengthen the time of vulnerability

## IMPLICATION

- Need to work out intensity on most of our treatments
- Usual is to stop too soon
- Need to figure out intensity in acute and elsewhere along continuum of care
  - Not best to delay tx
  - Best to figure out intensity along continuum

## IMPLICATION

- Treatment started early in disease course may slow progress of degenerative disease
  - PD
  - Frontotemporal dementias such as PNFA
- May be windows of opportunity

## PRINCIPLE SEVEN

- Salience matters
  - Stimuli and activities that matter to learners are more likely to drive plasticity
  - Reward can make them matter
  - Prior experience influences salience

## PRINCIPLE EIGHT

- Age matters
  - Older brains seem to require more reps
  - But don't forget the aging brain responds to experience

## PRINCIPLE NINE

- Transference: activity in one circuit can “promote” (Kleim and Jones) activity in others
  - Activity in one modality may generalize to another depending on overlap
  - One of the reasons why working on the oral stage can influence the pharyngeal

## PRINCIPLE TEN

- Interference: plasticity within a circuit may make new use of that circuitry less likely
  - Learning a compensation may inhibit relearning of an approximation of the premorbid performance
  - What patients do without treatment early on may hinder change with rehabilitation

## IMPLICATION

- Compensations rather than rehab may inhibit the best change
- Ignoring a patient early may make subsequent treatment less likely to proceed
- E-stim at certain frequencies and sites may inhibit the swallow
  - Fraser et al. Neuron, 2002

## ONE ADDITIONAL

- Its not just about the experience
- The person's environment influences neuroplasticity
- Even if the treatment is right it will have reduced success if the person leaves the clinic for an arid environment
- Lesson: treatment in a NH where nothing else happens the rest of the day is not likely to be of much success

## HEBB



Henry Kirke Hebb

- Gave name to Hebbian learning
- One of his most important contributions derived from his rats

## HEBB'S RATS

- He took half his rats home to live in the house with the family
- Then he compared the learning of those and the rats maintained in cages in the lab
- The learning of the home rats was superior



## THE LESSON

- Environmental enrichment can increase plasticity
- Experience or use dependent plasticity can be increased by:
  - The right training
  - A generally enriched environment

## ONE MORE

- Above were mostly for learning or relearning a skill
- What about strengthening?
  - Specificity as in skill
  - OVERLOAD
    - Activity must require more if to be therapeutic
    - So simply swallowing may not be maximally therapeutic

## DEPENDS ON

- Knowing and acting on principles of neuromuscular plasticity
- Knowing what the methods accomplish
- Knowing the pattern of swallowing difficulty to be txd
- Knowing the treatment data

## WHAT TXS ACCOMPLISH

- Three main options
  - Increase skill
  - Increase strength or endurance
  - Do both

## WAY TO THINK ABOUT IT

- Riding a bicycle
- Lifting weights

## WHY CARE?

- Clinical significance
- Influences timing of what you expect
- Influences prognosis
- And need for type of follow-up

## INCREASED SKILL

- Slow to develop in nervous system
  - Builds on placebo and neural activation
    - Placebo-physiologic response to situation
    - Activation-generalized recruitment of NS resources
- BUT becomes encoded more or less permanently in the nervous system
- Skill “is somehow persistently encoded within the nervous system”

Adkins et al. J. Applied Physiol, 101, 1776-1782, 200

## STRENGTH AND ENDURANCE

- Different and less substantial changes in nervous system
  - Biggest changes are in muscle chemistry cells etc
  - Does not persist and must be maintained

## KNOWING HOW TO TREAT

- Means especially in motor disorders
  - Knowing if your treatment is best at improving skill or strength and endurance

## SWALLOW METHODS

- Some are pretty easy
  - IOPI is tongue strength
  - EMST is respiratory strength
  - Shaker head raise is probably strength
  - Hard swallow is probably skill
  - Mendelsohn is traditionally skill
  - Supraglottic is skill primarily
  - Masako may be both

## DEPENDS ON

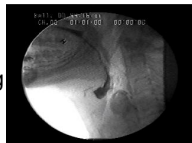
- Knowing and acting on principles of neuromuscular plasticity
- Knowing what the methods accomplish
- Knowing the pattern of swallowing difficulty to be tx'd
- Knowing the treatment data

## PATTERNS

- Structural abnormalities
  - Osteophytes etc
- Bolus movement abnormalities
  - Incomplete
  - Slow
  - Misdirected
- Underlying pathophysiology
  - Weakness, incoordination, abnormal tone

## PATTERN OF DIFFICULTY

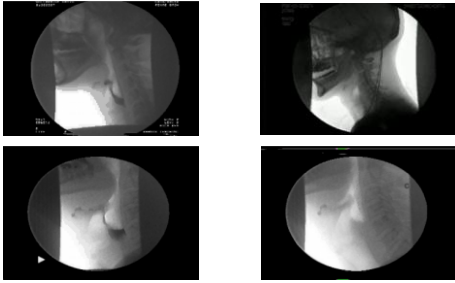
- Some are easy
  - Obstructions from structures
  - Inadequate laryngeal valving
  - Inadequate UES opening
- Some are harder
  - Premature spillage
  - Pharyngeal residual



## SOME ARE TOUGH

- Weakness is one although we act as if it were easy
- Dyscoordination can be tough
- Tone is for me a who knows

## EXAMPLES



## SO?

- Easiest to base treatment on the flow abnormalities
  - Penetration or aspiration, usually need to tighten laryngeal valving, improve cough
  - Pyriform residuals, usually need to open up UES
  - Oral residual, improve lingual activity
  - Residual throughout improve all parts of swallow

## DEPENDS ON

- Knowing and acting on principles of neuromuscular plasticity
- Knowing what the methods accomplish
- Knowing the pattern of swallowing difficulty to be txd
- Knowing the treatment data

REVIEW OF ALL WOULD TAKE A HALF DAY

THEREFORE I WILL REVIEW ONLY MOST INTERESTING

## BEST NEW TREATMENT

- EMST

## EMST

- Spring loaded pressure threshold device
- Set the pressure necessary to open the valve
- Pt blows with sufficient pressure, valve opens and air flows through



## TRAINING LOAD

- Can measure maximum inspiratory and expiratory pressures and train at 70-80% of max
- Using a spirometer



## USES

- So far used to treat speech and swallowing in PD, MSA, stroke and Lance-Adams syndrome
- Results are good
- Appears that hypophonia can be reduced
- Intelligibility improved
- Airway invasion reduced
- Cough strengthened

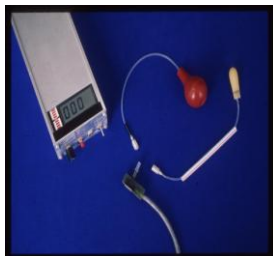
## HOWEVER

- All these conclusions are in need of replication
- Wanted to give you a heads up, however
- Devices being used in vent units to aid weaning
- Used in voice clinics
- In professional singing programs
- With asthmatics
- And in other environments and populations
- This train has left the station

Another strengthening approach with some supporting data

## THE IOPI

- Allows testing of maximum strength
- Allows calibrated training as percent of maximum
- Provides feedback of performance



## THE LITERATURE

- Robbins (2004) Dysphagia Research Society Proceedings.
  - 8 weeks of training improved
    - Pressure generation with tongue blade
    - Lingual pressure during swallow
    - Penetration-aspiration scale performance

– Rosenbek et al. (1996). Dysphagia, 11, 93-98

## WHEN

- When your hypothesis is that lingual weakness is the villain
- Lots of oral residual
- Difficulty moving bolus posteriorly
- Vallecular residual

## HOWEVER

- Data are either limited in most cases
- Or different pts get different effects
- Or variations of the same treatment give very different results

## LIMITED DATA

- Do what clinicians have always done
- Use your best clinical experience
- Combined with what the pt wants
- And monitor outcomes impassionately

## DIFFERENT EFFECTS IN DIFFERENT PEOPLE

## HARD SWALLOW

- Generally limited data show
  - Reduced penetration-aspiration events
  - Reduced residuals in pharynx
- Its become the reflexive method of choice for lots of clinicians with residual

## HOWEVER

- Garcia et al. 2004. Unexpected consequences of effortful swallowing: Case study report. JMS-LP. 12, 59-66
- 12 y-o male with dysphagia secondary to brainstem tumor and surgical tx
- Effortful swallow further impaired swallow with nasal regurgitation

## ANSWER

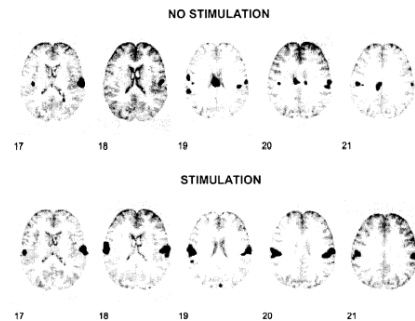
- Pt sealed his tongue against posterior pharyngeal wall prior to closing palate and bolus went into nose
- Had to learn an “effortless” swallow

## DIFFERENT VERSIONS

Consider our old friend electrical stimulation

## RECOVERY WITH TREATMENT

- E-stim to pharynx expands the cortical swallowing area in the intact hemisphere
  - » Fraser, et al, 2002; Hamdy et al, 1998
- 10 minutes of stim at 5Hz caused increased cortical excitability and expansion of cortical area
- Persisted for 30 minutes and accompanied by change in function
- Accompanying decrease in that of the esophagus
  - With unknown implications for the esophagus



## TIMING

- Cortical change occurs before functional
- Suggesting a causative relationship

## SITE OF STIMULATION

- E-stim to the anterior faucial pillars appears to have less effect on plasticity
  - » Powers et al, 2004
- Stimulation at 5 Hz inhibited cortical response
- Stimulation at 0.2 Hz influenced cortical response but had no effect on functional swallow
- Need to ask the same question of external e-stim as with vita-stim

## AND SOMETIMES

- The data are so good as to make you wonder

## SHAKER HEAD RAISE

## INTRODUCTION

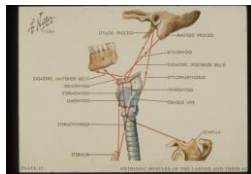
- Need to know human swallowing physiology
- Need to think about the abnormal physiology present on the swallow of a given patient
- Need to think about the physiologic effect of the treatment

## PHYSIOLOGY OF UES OPENING

- UES relaxes
- Anterior-superior movement of hyolaryngeal complex in part responsible for opening
- Intrabolus pressure also critical

## COMIC STRIP

- Selected muscles including mylohyoid, geniohyoid and anterior belly of diaphragm elevate the hyolaryngeal complex
- Laryngeal structures anterior attachment of UES

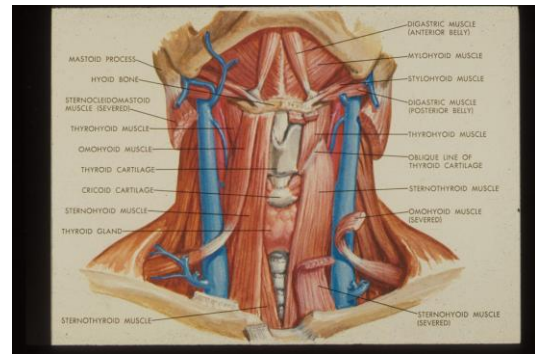


## RESULT

- With movement of hyolaryngeal complex opening of the UES occurs
- Failure of this movement compromises UES opening
- Other forces such as failure to relax can also influence of course

## MUSCLES TO TREAT

- Here they are



## THE EXERCISE

- Purpose is to strengthen the suprahyoid muscles that elevate the hyolaryngeal complex
- The exercise is described as an isometric/isokinetic exercise

## CANDIDATES

- Those with failed opening of the UES because of inadequate relaxation
- Those with inadequate opening of UES because of inadequate movement of hyolaryngeal complex
- Included are brainstem patients

## THE TECHNIQUE

- Lie flat with shoulders against a firm but not uncomfortable surface and then elevate head (only) and look at your feet
- Do three times in groups of 30 followed by
- Elevation and 60 second hold, done three times
- Duration is six weeks
- Data on intensity not available

## THE DATA

- First in normals
- 31 healthy geriatric volunteers randomized to shaker or sham
- The Shaker group after six weeks got improved opening of UES and in laryngeal excursion

## MORE DATA

- 19 patients with pyriform residual and aspiration because of reduced UES opening
- 17 of 19 got good enough to move to oral nutrition from tube
- Effects were apparently retained

## AND MORE

- Another group of mixed patients
- N=27 tube fed patients
- 6 weeks of tx
- All improved
- All maintained improvement at 12 months

## SPECTACULAR RESULTS

- The group calls for RCT
- The group calls for RCT
- Yep
- Modifications are emerging including 45 degree recline rather than 90
- But no data here

## THUS

- Practice in dysphagia is like any other form of health related practice
- You can be confident if
  - You always assume you are vulnerable to mistake
  - You work from principles
  - And you remember that the pt is the final arbiter

THANKS