

## 1 Ergonomics

The Art Of Protective Balancing

## 2 What's So Special About Dentistry?

- We sit
- We lean forward > ½ of working hours
- We have high stress
- Muscles fatigue, we compensate
- We age, life happens
- Dentistry literally reshapes us!
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## 3 Goals of Ergonomic Training

- Balanced strengthening
  - > Balance, flexibility, mobility, stability
  - > lean muscle mass, endurance, bone density
  - < injuries; chronic & acute
- Optimize neutral, protective postures
  - Avoid CTD's, muscle imbalances, pain
- Long, pain-free career

## 4 Training & Habits

- Initial training
- Practice "Muscle memory"
- Brain combines steps to form "chunks" of memory (act as one without conscious direction) = habit
  - Still subconscious oversight
- Change habits?
  - Remove prompts, engage cortex
  - Deconstruct "chunks"
  - Rebuild habits

## 5 Cumulative Trauma Disorders (CTD's)

- Musculoskeletal disorders
- Repetitive use injuries to:
  - Tendons, tendon sheaths
  - Bones
  - Muscles
  - Nerves
- Dentistry: upper extremity CTD's = most common

## 6 Causes of Median Nerve Symptoms

- Cervical alignment, pathology
- Median nerve impingement, compression, entrapment along length of nerve
- Thoracic outlet syndrome

- Carpal tunnel syndrome

#### 7 **The Nature of Carpal Tunnel Syndrome**

- Anatomy
  - Narrow, unyielding carpal tunnel contains:
    - Median nerve
    - 9 flexor tendons
    - Blood vessels
  - Swelling, inflammation causes compression within tunnel

#### 8 **Carpal Tunnel Symptoms**

- Hand, wrist numbness, first noticed at night
- Thumb, forefinger, part of middle finger (NOT little finger!)
- Progresses to weakness, pain, swelling – may manifest in forearm
- IF prolonged: loss of motor control of areas innervated by median nerve: clumsiness, burning
- Nerve compression progresses from outer (sensory) to inner (motor) nerve fibers

#### 9 **Wrist Postures**

- Deviated wrist positions increase pressure in Carpal tunnel:
  - Flexion: two fold
  - Extension: four fold
- Thenar muscle loss

#### 10 **CTS is More Likely With:**

- Wrist injury
- Arthritis
- Pregnancy
- Diabetic neuropathy
- Hypothyroidism
- Smoking
- Obesity
- Caffeine intake

#### 11 **CTS Work Risks**

- Force
- Posture
- Wrist alignment
- Repetition
- Temperature
- Vibration

#### 12 **Non- Surgical Treatment**

- 1 
  - Anti-inflammatory meds
  - Oral steroids
  - Vit. B-6

- Exercises
- 2  • Remove traumatic activity
  - Alter habits
  - Treat medical conditions
- 13  **CTS Surgery**
  - Open release
  - Endoscopic release
- 14  **Core Breathing**
  - Stand – heels together, toes ~4" apart
  - Elongate spine, neck (be tall)
  - Pull belly button to spine
  - Contract lower & upper abdominals
  - Hand on lower chest
  - Inhale deeply, expanding ribs laterally
  - Exhale
  - Repeat 3 times
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- 15  **Joint Hyperlaxity**
  - Joints have unusually large range of motion (arch your hands, thumbs to wrist)
  - Causes:
    - Bone shape at ends
    - Weak, stretched ligaments: collagen / protein problems, habits, genetics
    - Poor muscle tone
  - Dental hand risks:
    - Thumb may collapse, stress joints
    -
- 16  **Dull Instruments**
- 17  **Sharp Instruments**
- 18  **Shoulder Anatomy**
  - Improper scapular movement leads to shoulder pathology
    - Muscles hold bones in alignment
 (normal scapular plane shown)
- 19  **Shoulder Ligaments**
  - Connect bones to bones
  - Main source of shoulder stability
    - Prevent dislocation
  - Joint capsule is watertight sac around joint formed by capsular ligaments
- 20  **Rotator Cuff**
  - Capsule where head of humerus sits

- 4 major muscles stabilize rotator cuff, hold humerus in glenoid fossa
- Tendons attach muscles to bones
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#### 21 **Nerves**

- All hand and arm nerves travel through axilla (armpit)
  - Radial, Ulnar, Median
- Sensory: pain, temperature, proprioception
- Motor: movement, muscle stimulation
- Blood vessels follow nerves

#### 22 **Brachial Plexus Impingement**

- Neurovascular bundle:
  - Brachial plexus (network of motor & sensory nerves innervating arm, hand, shoulder)
  - C8 & T1 nerve roots
  - Subclavian artery & vein
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#### 23 **Thoracic Outlet Syndrome (TOS)**

- Group of disorders
- Nerve & vascular compression

#### 24 **TOS SIGNS**

- Anterior scalene (tightness, pain)
- Costoclavicular approximation
  - Clavical changes position
- Pectoralis minor tightness

#### 25 **TOS Symptoms**

- Pain, numbness, weakness, tingling in neck, shoulder, face, head
  - Clavicle, shoulder, inside arm, hand: ring & pinky
  - Symptoms worsen with use, arms lifted
- TMD, migraines
- Vascular symptoms = serious!
  - Arm, shoulder = heavy, cold, blue, swollen
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#### 26 **Causes of TOS**

- Sustained static postures
- Drooping shoulders / forward head posture
  - Osteoporosis
- Carrying heavy loads
  - Luggage, briefcases, shoulder bags
- Repetitive over-head arm movement

- Extra rib
- Car accidents
  - Seat belts

27  **TOS is Difficult to Diagnose**

- Confused with: (other disorders)
  - CTS (hand), cervical spine dis. (neck), nerve root compression (spine), tumors, bursitis (shoulder)
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28  **Ulnar Nerve Neuropathy**

- Dysfunction affects distal 21/2 fingers
- Caused by: injury, entrapment, compression
- Symptoms: pain, weakness

29

30  **Trigger Points are caused by:**

- Whiplash
- Falls
- Fractures
- Dislocation
- Sprains
- Excessive exercise
- Muscle overload, poor posture, muscle imbalances
- Emotional stress

31  **Upper Trapezius Tension**

Caused by:

- Prolonged elevated shoulder (s)
- Rotated neck
- Raised arm(s)
- Emotional stress (ischemic pain)

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32  **So.....**

- Relax
- Position patient correctly
- Stretch
- Sit correctly
- Heat, message
- Drink water!

33  **How Rheumatoid Arthritis differs from Osteoarthritis**



- anti-inflammatory

#### 42 **Preventive Exercises**

- Stop if you feel pain
- Warm & loosen muscles first
- Breathe
- Start easy: 2 sets of 10
- Don't exceed 3 sets of 20

#### 43 **Stretching Tips**

- Frequent micro-breaks = better than infrequent longer
- Stretching increases endurance & decreases micro-trauma
- Frequent breaks aid tissue repair
- Infrequent breaks do not!
- Seize the micro-moment!
- Sustain 15-30 sec., (2-3 breaths)

#### 44 **How To Stretch**

- Starting position
- Breath in
- Exhale as you reach stretch intensity
- Hold 2-3 breathing cycles
- Slowly release
- Return to neutral
- Find TRUE NEUTRAL

#### 45 **Kyphosis (Hunchback)**

- Increase in normal kyphotic curvature – thoracic spine
- Causes: prolonged poor posture, osteoporosis
- Symptoms:
  - prominent round back,
  - head forward,
  - neck strain,
  - chest / lung compression
  - Pain, stiffness, loss of range of motion
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#### 46 **Lordosis (Swayback)**

- Increased curvature of lumbar spine: excessive arching, prominent buttocks
- Causes:
  - Congenital, poor posture, abnormal positioning
- Symptoms:
  - Lower back pain
  - Sciatica / leg pain
  - Less mobility

47  **Scoliosis**

- S shaped curvature, thoracic region
- Causes:
  - Congenital
  - Prolonged lateral / rotated positioning
- Results:
  - Muscle shortening, 1 side
  - Muscle spasms
  - Chronic pain
- Adolescent scoliosis:
  - Mostly young teenage girls
- Degenerative:
  - 50 – 60 y/o males / females
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48  **The Slouch**

- Muscle ligaments stretch, shorten, strengthen or weaken to accommodate frequent positions
- "Resets" neutral to unbalanced posture
- Long term damage:
  - Muscle strain, trigger points
  - Headaches
  - Disc degeneration, herniation
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49  **Is This Your Reality?**

- Fitting worker to equipment
  - Hand-me-downs?
  - Shared with others? (size, preferences...)
  - Who makes equipment decisions?
  - No, wrong, or inadequate adjustments
  - Short cords, limited space
- Lighting: poor, excess, wrong spectrum, too limited
- Is there a culture of safety and prevention?
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50  **Crown Seating**

- Automatic seat tilt:
  - Better circulation to legs
  - < back strain
  - Get close to patient
- Back support
  - Up & down
  - In & out

- < back strain
- Better posture
- 5 Casters
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#### 51 **Low Back Pain**

- Experienced by 80 – 85% of adults
- Causes: injuries, arthritis, disc disease, aging
- Among top 5 worker complaints
- Prevention:
  - Strengthen key core “girdle” muscles: stabilize spine
    - Abdominals: transversus & rectus abdominus
    - Deep back muscles: lumbar multifidi
    - Pelvic floor

#### 52 **Lower Back Pain**

- Thoracic cage & abdomen = “hydraulic cylinder”: movement creates pressure
- When girdle fails, large superficial muscles strain
  - Can’t protect vertebrae
  - Spasm, knot
  - Aberrant hip movement – cascade
- MD’s rec: anti-inflammatory drugs, surgery
- Try: chiropractics, acupuncture, phys. therapy

#### 53

- Back posture directly impacts spinal disc degeneration & herniation
- Prolonged pressure on discs prevents inflow of nutrients
  - Like a sponge
  - Disc requires alternate compression & decompression (relaxation)
  - Lumbar disc compression increases 40% without lumbar support
  - Lumbar disc pressure always less with lumbar support!

#### 54 **Get Help!**

- See MD if:
  - pain @ night
  - Pain recurs, persists, increases
  - Leg numbness, tingling, weakness
  - Bowel, bladder dysfunction
  - Numbness in “saddle”
  - Loss of movement
- Always ask: Is pain local or referred?

#### 55 **Heads up!**

##### **(bowling ball on a stick)**

- Heads weigh 10 – 15 lbs.

- ~45 lbs stress bending forward
- < ¼ inch off neutral increases load 10 X
- Body accommodates, gets stuck
- Collagen lengthens: takes 20 min to stretch, 24 hrs to recover

#### 56 **Women's Head & Neck Issues**

- Women report 2-4 x more muscle pain than men
- Women's muscles are narrower, & must exert 2/3 more force
- Bra straps compress upper trapezius
- Modesty: separation from patient's head: must extend neck & arms

#### 57 **Depth of Field**

- > Range of focus allows movement, < neck, back, eye strain

#### 58 **Magnification**

- No industry standard in measuring
- Manufacturing tolerances vary
- Trade-off: with > magnification -
  - need more light
  - More weight
  - Less depth of field

#### 59 **What's Important When Choosing A Loupe?**

#### 60 **Weight**

1  TTL

2  •lighter in weight

- slightly wider and deeper field of view
- telescopes are positioned closer to the eye

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3  Flip-Up

4  • flip-ups employ a hinge mechanism to support the telescopes.

- Flip-Up loupes can deliver steeper angles of declination if necessary

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#### 61 **Weight**

Frames also vary in weight depending on design and materials

- Titanium and aluminum are lighter metals than stainless steel
- Plastic is usually lighter than metal, but plastic can also be too flimsy and warp or bend over time

#### 62 **Carrier Lens Material (Polymers)**

- 2 •CR 39
  - Lower grade, lower cost
  - Less visual acuity
  - Thicker, heavier
- 4 •Trivex: High index plastic
  - Best visual acuity
  - Lighter
  - Stronger
  - Anti-reflective coating
  - Supports prescriptions

#### 63 **Myopia: Urban Vision**

- N. Amer. & Eur.: 1/3 adults = myopic
- U.S. myopia:1970: 25% 2000: 42%
- (too fast for genetic change)
- Seoul & Shanghai myopia: 95% students
- Eye shape = determined by
  - Genetics
  - Growth in infancy, adolescence
  - \*\*\*Daily behavior = most important!
  - 
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#### 64 **Urban Myopia**

- Singapore young men: 80% myopic
  - 1980: 43%
  - now: "epidemic"
- Myopia is not increasing in rural areas
- Myopia increases risk of:
  - Cataracts
  - Glaucoma
  - Detached retina
- So...Increase outside light exposure

#### 65 **Computer Vision Syndrome**

- 70% of adults suffer digital eye strain
- Artificial blue light increases cataracts & macular degeneration
- Gunnar lenses filter blue light
- Crystalline: 10%
- Amber: 65%
- Outdoor: UVA, UVB