Ergonomic Application in Dental Practice

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Abstract

ERGONOMICS is a way to work smarter--not harder by **designing** tools, equipment, work stations and tasks to fit the job to the worker--NOT the worker to the job.

In every practioners' life there comes a time when it is clear that a change in the design of the workplace is necessary for efficient working. For some doctors, this happens early in practice, for others, a reawakening occurs later in the practice life that makes this transition desirable. Nevertheless, it is a point through which every dedicated caregiver crosses at some time. It is the area of scientific research and application concerned with the design of engineered system environments to be compatible with human capacities and limitations.

A system which is designed leading to less of fatigue, discomfort, injury or chronic health disorders and this system in dental practice, which brings about the change, is Dental Ergonomics.

Introduction

Ergonomics is derived from the Greek word 'ergon' (work) and 'nomos' (laws) to denote the science of work. It is a system-oriented discipline which now extends across all aspects of human activity.

Practicing ergonomics must have a broad understanding of the full scope of the discipline as ergonomics promotes holistic approach in which considerations of physical, cognitive, social, organizational, environmental and other relevant factors are taken into consideration.

In dentistry, the dentists expose themselves during their work to many burdensome and harmful factors. The irrational postures adopted by dentist during their work cause discomfort and disorders of musculoskeletal system and the peripheral nervous system. A positive relationship between fixed postures and musculoskeletal disorders (including pain, weakness and paresthesia) has been documented for a number of occupations; dentistry particularly is a high risk profession for the development of musculoskeletal disorders and is characterized by high visual demands which result in the adaptation of fixed postures. Reduction in the occurrence of musculoskeletal disorders is essential to the improvement of occupational health.

The issue of work-related pain in dentistry is undeniably multifaceted. It may include factors that cannot be controlled, such as congenital predisposition, gender, environmental effects, operatory layout, and injuries outside the office. The injuries include carpel tunnel syndrome, tendonitis, and neck or back problems. To control job-related injuries and relate the regulations to dental practice, OSHA has published ergonomic standards. The original ergonomic standard was written to require employers to adopt the principle of ergonomics fitting the job to the worker through adjusting a workstation, rotating between jobs, or using mechanical assistance. These standards require employer to inform all employees regarding musculoskeletal disorders in the workplace. The information was to include signs and symptoms, the importance of reporting injuries, risks of the job for musculoskeletal disorders.

The following are the trends in dental ergonomics and injury prevention:

- The proper use of equipment, including chairs, magnification systems, and handpieces, in dealing with dental-office injuries. It covers strategies to avoid poor positioning, gives tips for proper positioning, and offers advice on "What to look for" in ergonomics chairs.
- Trends in exercise and injury prevention, including strategies for dealing with prolonged, awkward posture.

Consequences of Poor Design in Work Place

- Discomfort during the procedures performed in the dental clinic leading to Chronic Pain.
- Accidents occurring during the performance of the procedures leading to Injuries.
- Fatigue due to continuous working leading to Increased Errors.
- Repetitive stress injuries.

Repetitive Stress Injury in Dentistry

- Musculoskeletal Disorders
- Cardiovascular Disease
- Neurotic Symptoms
- Tumors
- Diseases of the Nervous System

Long Term Effects of Repetitive Stress Injuries

- Back and Neck pain leading to Spondylosis
- Arthritis of fingers wrist and Knee Joints
- Nerve compression syndromes like carpal tunnel syndrome sciatica
- Tendonitis like tennis elbow
- Obesity
- Stress
- Hypertension etc

High Ergonomic Efficiency is Detailed in All the Below Fields:

- Instrument Design
- Operators Position
- Instrument Layout
- Patient Position

Instrument Design

A. Syringes & Dispensers

Look for:

- Adequate lumen size
- Ease in cleaning
- Knurled handles (no finger cut-outs)
- Easy activation and placement

B. Automatic Hand pieces

Look for:

- Lightweight, balanced models (cordless preferred)
- Sufficient power
- Built-in light sources
- Angled vs. straight-shank
- Pliable, lightweight hoses
- Swivel mechanisms
- Easy activation
- Easy maintenance

C. Hand Instruments

Look for:

- Hollow or resin handles
- Round, knurled or compressible handles
- Carbon steel construction (for instruments with sharp edges)

D. Operator Chair

- Height Adjustable Backrest
- Armrest Height - Articulation and Angle Adjustment
- Seat tilt tension control
- Armrest Width Adjuster
- Seat tilt Adjuster
- Swivel
- Seat Height Adjuster
- Backrest Angle Adjuster
- Back rest Depth Adjuster

E. Dental Chairs

Look for

- Stability (5 legged base with castors)
- Lumbar support
- Hands-free seat height adjustment
- Adjustable foot rests
- Adjustable, wrap-around body support
- Seamless upholstertry

Operators Position

A. Workstation Layout

Ensure:

- Instruments, materials, medications, etc. are accessible while seated
- Hoses are positioned away from the body
- Set-up can be adapted for different operators

B. Patient Chair

Goal: Promote patient comfort; maximize patient access

Look for:

- Stability
- Pivoting or drop-down arm rests (for patient ingress/egress)

- Supplemental wrist/forearm support (for operator)
- Articulating head rests
- Hands-free operation

Magnification Systems

Goal: Improve neck posture; Provide clearer vision

Consider

- Working distance
- Depth of field
- Declination angle
- Convergence angle
- Magnification factor
- Lighting needs

Factors Causing Repetitive Stress Injuries

A. Common Wrong Postures Adopted at Work

- Static Neck and Back postures
- Grasping small instruments for long periods
- Working with bent wrist
- Working with arms abducted
- Working with arms abducted and spine twisted to one side
- Improper back support sitting at the edge of the seat
- Feet not resting on correct plane
- Spine twisted to one side
- Poker chin position
- Over reaching for instruments

Ergonomically Efficient Working Positions

Simple Suggestions

- Keep neck straight
- Instruments tray within easy reach
- Tray height at the level of dominant hand elbow
- Keeping arms by the side at rest on the operators stool.
- Avoiding lumbar rotation
- Lumbar spine should be well supported
- Using index finger for instrument control
- Index finger has a better proprioceptive control while handling instruments
- Using larger muscle groups

Posture/Positioning

Goal: Avoid static and awkward postures

Potential Strategies

- Position patient so that operator's elbows are elevated no more than 30 degrees.
- Adjust patient chair when accessing different quadrants.
- Alternate between standing and sitting.
- Alternate between heavy and light work.

Care of the Cervical and Lumbar Spine

Shoulder Exercise

- Shrug / lift shoulders up

Upper back Stretch

- Take elbows apart and count 10
- Bring elbows in front and count 10

Isometric Neck exercise

- Press Right cheek with the respective palm and count 10
- Press Left cheek with the respective palm and count 10

Isometric Neck exercise

- Press forehead with both the palms and count 10
- Press back of the head with both the palms and count 10
- Press right temple with respective palm and count 10
- Press left temple with respective palm and count 10

Lumbar Spinal Exercises

Abdominal Exercises

- Lift head and shoulders up to clear the bed and hold for 5 seconds
- Lift each leg up and hold for 5 seconds
- Hold knee by hand and hold for 5 seconds
- Lift head and shoulders up together and hold for 5 seconds

Take Home Message

- Ergonomic practices and procedures are simple to adopt.
- It is inexpensive.
- Helps to improve productivity with less body fatigue.
- To facilitate early evaluation of Work Related Musculoskeletal disorders, all employees must be educated on the causes and symptoms of these disorders and encouraged to report symptoms to supervisors with subsequent referral to medical personality.
- Written health care management protocols should be established.
- Eg: Clinical Practice Guidelines developed for Acute Lob Back Problems for Health Care Policy and Research.
- Conservative treatment deserves adequate trial before surgery is contemplated (at least 6 months).
- Dental Ergonomics is new area of science, so there is scope for more Research.