GETTING A HANDLE: TECHNOLOGY FOR THE RESTORATION OF ARM & HAND FUNCTION

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The Miami Project is dedicated to finding more effective treatments and, ultimately, a cure for paralysis resulting from spinal cord injury.

www.themiamiproject.org

Helping people regain life thru neurotechnology

Focusing on education of and advocacy to access neurotechnology devices, therapies and treatments for people living with impairments, their care-givers and medical professionals.
The information presented in this session is not meant to replace the advice from a medical professional. You should consult a health care professional familiar with your specific case, concerns and condition.

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OBJECTIVES

- Anatomy of the arm & hand
- Common Clinical Concerns for Upper Extremity Impairment
- Understanding Terms: Exercise, Rehabilitation, Therapeutics & Prosthetics
- Overview of Assistive Devices
- Introduction to Neurotechnology Devices
  - Repetitive Motion Therapy
  - Sensing Orthotics
  - Stimulating & Sensing Therapy
  - Neural Prosthetics
- Resources to Learn More
ANATOMY OF THE ARM & HAND
COMMON CLINICAL CONCERNS OF THE NEUROLOGICALLY IMPAIRED UPPER LIMB

ATROPHY:

WEAKNESS is the main contributor to ACTIVITY LIMITATIONS and the ABILITY to use the arm.

SPASTICITY

POST STROKE SPASTICITY is found in chronic patients (> 3 months) with a FREQUENCY RANGING FROM 17%-42%. SIGNIFICANT IMPACT ON ADL’S IS THE RESULT.

SUBLUXATION

Shoulder subluxation affects up to 81% of stroke patients.

CONTRACTURES

Research states that CHANGES AND SHORTENING OF MUSCLES and connective tissue can start occurring within hours/days.

SOFT TISSUE SHORTENING has been found to begin in as little as 4 weeks in a non-functional hand.

APPROXIMATELY 50% of all stroke patients develop at least 1 contracture within 6 months. Shoulders and hips are most commonly affected.

PAIN

24% OF FIRST TIME STROKE PATIENTS experience shoulder pain by month 16.

Shoulder SUBLUXATION, soft tissue SHORTENING, and SPASTICITY are most FREQUENTLY ASSOCIATED WITH SHOULDER PAIN.

HAND FUNCTION

45% of patients had limited hand use at 18 MONTHS post stroke.

AT 6 MONTHS, 11.6% of stroke patients had achieved complete functional recovery, while 38% had some dexterity function.

FOUR YEARS POST STROKE, only 50% of stroke survivors had fair to good hand function.
Rehabilitation: is a treatment or treatments designed to facilitate the process of recovery from injury, illness, or disease to as normal a condition as possible.

Focus is
- Restoration/recovery
- Compensation
- Limitations/adjustment
- Independence

Exercise: is physical activity that is planned, structured, and repetitive for the purpose of conditioning any part of the body.

Focus is
- Improve health condition
- Maintain or improve fitness and
- Prevention/performance
**THERAPEUTIC VERSUS PROSTHETIC**

- **Therapeutic Application:**
  Rehabilitative approach designed to facilitate the process of recovery from injury, illness, or disease to as normal a condition as possible.

- **Focus is**
  - Restoration/recovery
  - Voluntary control and
  - Community Orientation

- **Prosthetic Application:**
  Tool used to compensate or replace lost function.

- **Focus is**
  - Improve health condition
  - Compensatory measures and
  - Prevention/performance
UPPER EXTREMITY: ASSISTIVE DEVICES

Gripability
http://gripability.de
- Entirely mechanical

Electric Powered Prehension Orthosis (EPPO) Wrist-Hand Orthosis
http://www.broadenedhorizons.com
- Uses wrist extensor strength to create a 3-point pinch

JACO Robotic Arm:
http://kinovarobotics.com
- Prosthetic device mounted to wheelchair; controlled by a joy stick; has 7 degrees of freedom
UPPER EXTREMITY DEVICES - EXERCISE

RT300 Arm: Restorative Therapies
www.restorative-therapies.com
-Uses electrical stimulation to enhance arm cycling movement
-No research results available

MotoMed: RECK
www.ri-llc.com
-Passive, motor-assisted, or active Resitive
-No research results available
UPPER EXTREMITY DEVICES - EXERCISE

Galileo UpX Dumbbell: Stim Designs
stimdesigns.com
-Vibration, depending on the frequency it can be used to enhance arm strength or promote relaxation of muscles

There is research that shows that whole body vibration during exercise can improve upper body strength. More research is needed regarding the effectiveness in different neurologically impaired populations.
NEUROTECHNOLOGY: REPETITIVE MOTION THERAPY

Armeo: Hocoma
www.hocoma.com

WAM Arm – Barrett Technology
www.wambotics.com

- Also called Robotic Rehabilitation Training
- Studies show users have greater benefit if they begin with some minimal function
Motion Therapy may also improve sensorimotor impairments, proprioception.
- American Heart Association & VA/DOD have recommended guidelines post-stroke.
NEUROTECHNOLOGY: SENSING ORTHOTICS

MyoPro: Myomo
www.myomo.com

SaeboGlove: Saebo
www.saebo.com
NEUROTECHNOLOGY: SENSING & STIMULATING THERAPY

Biomove Home: Curatronic Ltd
www.biomove.com

MyndMove: MyndTec
www.myndtec.com

Neuromove: Zynex Medical
www.zynexneuro.com/neuromove/

- Devices combine voluntary movement with electrical stimulation
- Studies show maintaining function movement post treatment
NEUROTECHNOLOGY: NEURAL PROSTHETICS

Ness H200: Bioness
www.bioness.com

- Task specific training and movement
- Studies have shown potential benefits of increase range of motion & hand function, reeducation of muscles, increase circulation & reduce muscle spasms
NEUROTECHNOLOGY: STIMULATING EXPERIMENTAL DEVICES

www.ClinicalTrials.gov

STIMuGRIP: FineTech
http://finetech-medical.co.uk/

Contralaterally Controlled FES for Stroke
http://fescenter.org

Upper Extremity for SCI
Freehand User Group
http://fescenter.org
RESOURCES

Experimental treatments for spinal cord injury: What you should know (Version 2)

Free download of this booklet: http://www.miamiproject.miami.edu/page.aspx?pid=428
Follow: Paralysis Support/Research Participation/Experimental Treatments


Free Fact Sheet Resources
Spinal Cord Injury, Stroke, MS, CP, Brain Injury, & more Listings: http://www.neurotechnetwork.org/factsheet.html
QUESTIONS

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