Tetraplegia Hand Surgery

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Key muscles upper limb

C3  Diaphragma
C4  M. deltoideus
C5  M. biceps brachii
C6  Handgelenksextensoren
C7  M. triceps brachii
C8  Fingerflexoren
Th1 intrinsische Muskulatur
Patient Prioritised Goals

- Chronic Pain
- Normal Sensation
- Walking
- Bladder/Bowel
- Trunk Stability
- Sexual Function
- Hand/Arm

Anderson K, J Neurotrauma 2004
Some Patient Statements

“I was ashamed of my table manners and didn’t dare go to the restaurant. Now I have more confidence because I know I can cut the meat”.

“I don’t need to ask for help as often, especially not those you do not know”.

“I don’t use assistants to write my messages over the Internet or my SMS anymore or even holding the phone”.

“Most importantly, a completely different freedom”.

“Greet people with a handshake really is my biggest win”.
Adding value to daily life...

- Expert Team
- Patient Participation
- Patient Reported Outcomes
- Awareness
- Development Research

Patient Value
Value based research and development

Improved Hand Control

- Surgical Developments
- Rehabilitation Refinements
- Biomechanics of Muscle-Tendon-Joint Complex
- Outcomes Improvement
Surgery

- Elbow Extensor
- Grip
- Spasticity
Conclusions Individuals with tetraplegia and preoperative neuropathic pain in the arm/hand improve after grip reconstructions in a similar way to those without pain. Patients with neuropathic pain therefore should be considered as surgery candidates to the same extent as those without pain.
Measurements

Data capture
  kinematic data: movement of upper extremities
  kinetic data: push forces

→ Shoulder and Elbow Model:
  glenohumeral contact force
  stability of glenohumeral joint
Deltoid - Triceps
Post-op: More natural propulsion pattern

Propulsion style related to lower load on upper extremity (Boninger 1999)

Trunk flexion
Pumping style

Double loop style
Perceived Outcomes
Canadian Occupational Performance Measurement (COPM)

Patients reported satisfaction with performance after reconstruction.

Prioritized goals met

Outcome Measurements

Surgeries

Elbow Extensor

- COPM
- ROM
- MRC
- Grip/Key Strength
  - GRT

Grip

- COPM
- ROM
- MRC

Spasticity

- COPM
- ROM
- MRC
- GRT

Nerve Transfer

- COPM
- ROM
- MRC

COPM – Canadian Occupational Performance Measurement
MRC – Medical Research Council Scale
ROM – Range of Motion
GRT – Grasp Release Test
ORIGINAL REPORT

PERFORMANCE OF PRIORITIZED ACTIVITIES IS NOT CORRELATED WITH FUNCTIONAL FACTORS AFTER GRIP RECONSTRUCTION IN TETRAPLEGIA

Johanna Wangdell, OT and Jan Fridén MD, PhD
Optimal Control and Function

Thumb Flexion
Finger Flexion
Hand Opening
Wrist Balance
Advanced Balanced Combined Digital Extensor Flexor Grip


Jan Fridén, MD, PhD, Carina Reinholdt, MD, István Turcsányi, MD, and Andreas Gohritz, MD

Tech Upper Extrem Surg, 2011

Within 24 hours postop
Nerve Transfer
Electrical Stimulation in Tetrahand Surgery

• Diagnostics and prognostics in nerve transfers
• Preop training
• Postop relearning (EMG-triggered)
• Denervated muscles?

• Adhesion treatments
• Muscle contracture treatment
Electrical stimulation—a mapping system for hand dysfunction in tetraplegia

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I have benefited from the surgery?

Percent

agree
disagree

Bunketorp-Käll et al.,2017
Teaching

FELLOWSHIP

Reconstructive Hand Surgery in Tetraplegia

In conjunction with the Federation of the European Societies for Surgery of the Hand and the Department of Tetraplegia Hand Surgery, Swiss Paraplegic Centre, Nottwil, Switzerland

The purpose of this fellowship is to teach the key items in the buildup of competence and infrastructure to provide surgical rehabilitation of hand and arm motor control in individuals living with tetraplegia.
“adding quality to life”

TETRAHAND WORLD CONGRESS

28-31 August 2018 | Nottwil, Switzerland
Thanks