Medical and Rehabilitation Trends in Spinal Cord Injury

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Objectives

Discuss:

• SCI Epidemiology
• Potential Functional Outcomes
• Complications of SCI
• SCI Trends
• Advancements in SCI Medicine
SCI Epidemiology

- In the US, 30-60 new spinal cord injuries per million people / year

- **Incidence** (new cases) – 10,000/year

- **Prevalence** (total # existing cases) – 200,000-250,000 cases
SCI Epidemiology

Causes of SCI

• MVA most common cause 44%
• Violence (mostly GSW) 24%
• Falls 22% (most common cause in elderly)
• Sports-related injuries (diving) 8%
• Other 2%
SCI Epidemiology

Gender – 82% male vs. 18% female
SCI Epidemiology

Age

- Average age of injury 31.7 years old
- 56% in 16-30 age group
- 4.5% under age 16
- 10% age >60
SCI Epidemiology

Time of Injury

• Season: **summer** (highest incidence in July)
• Day: **weekends** (usually Saturday)
• Time: **night**
SCI Epidemiology

Levels of Injury

• In tetraplegia, C5 most common level

• In paraplegia, T12 most common level
SCI Epidemiology

Type of SCI

- Tetraplegia 51%
  - Incomplete tetraplegia 29.6%
  - Complete tetraplegia 21.5%
- Paraplegia 49%
  - Incomplete paraplegia 21.5%
  - Complete paraplegia 28.1%
- Complete/substantial recovery by time of discharge 0.7%
- Persons for whom this info. is not available 0.7%
# SCI Potential Functional Outcomes

<table>
<thead>
<tr>
<th></th>
<th>C3-4</th>
<th>C5</th>
<th>C6</th>
<th>C7</th>
<th>C8-T1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Feeding</strong></td>
<td>May be able with adaptive equipment</td>
<td>Independent with equipment after set-up</td>
<td>Independent with equipment</td>
<td>Independent</td>
<td>Independent</td>
</tr>
<tr>
<td><strong>Grooming</strong></td>
<td>Dependent</td>
<td>Independent with equipment after set-up</td>
<td>Independent with equipment</td>
<td>Independent</td>
<td>Independent</td>
</tr>
<tr>
<td><strong>Dressing</strong></td>
<td>Dependent</td>
<td>Dependent</td>
<td>Requires assistance</td>
<td>Independent with equipment</td>
<td>Independent</td>
</tr>
<tr>
<td><strong>Bathing</strong></td>
<td>Dependent</td>
<td>Dependent</td>
<td>Independent with equipment</td>
<td>Independent</td>
<td>Independent</td>
</tr>
<tr>
<td></td>
<td>C3-4</td>
<td>C5</td>
<td>C6</td>
<td>C7</td>
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<tr>
<td><strong>Transfers</strong></td>
<td>Dependent</td>
<td>Requires assistance</td>
<td>Possible independence with transfer board</td>
<td>Independent except floor transfer</td>
<td>Independent</td>
</tr>
<tr>
<td><strong>WC propulsion</strong></td>
<td>Independent with PWC, Dependent with MWC</td>
<td>Independent with PWC, Short distance with MWC</td>
<td>Independent MWC with plastic rims on level surfaces</td>
<td>Independent except curbs</td>
<td>Independent</td>
</tr>
<tr>
<td><strong>Driving</strong></td>
<td>Unable</td>
<td>Unable</td>
<td>Specially adapted van</td>
<td>Car with hand controls</td>
<td>Car with hand controls</td>
</tr>
<tr>
<td><strong>Bowel/Bladder</strong></td>
<td>Dependent</td>
<td>Dependent</td>
<td>Requires assistance</td>
<td>Independent</td>
<td>Independent</td>
</tr>
</tbody>
</table>
SCI Complications

- Infection
- Heterotopic Ossification
- Pressure Ulcers
- Chronic Pain
- Spasticity
- Deep Venous Thrombosis (DVT) and Pulmonary Embolism (PE)
- Autonomic Dysreflexia
SCI Complications

Infection
- UTI
- Pneumonia
- Wound infection / osteomyelitis
- Sepsis
SCI Complications

UTI

• Most frequent medical complication during early rehab after SCI
• Common cause of morbidity throughout life
SCI Complications

UTI

• Etiology
• Prevention
  – Goal is no more than one UTI per year
• Treatment

Equal balance = No infection
SCI Complications

Heterotopic Ossification

• Abnormal formation of bone within soft tissue
• Can cause pain, ↓ ROM, deformity, nerve compression, vascular compression, lymphedema
• Affects major joints (shoulders, elbows, hips, knees)
SCI Complications

Heterotopic Ossification

• Affects 16-53% of SCI patients
• Tends to be persistent and recurrent in SCI
• Best diagnosed with 3-phase bone scan
• Prophylaxis – Didronel, NSAIDS, ROM
• Treatment - surgical
SCI Complications

Heterotopic ossification of the femur
SCI Complications

Pressure Ulcers

"No other single complication of SCI is as potentially preventable, as difficult to manage, or as much of a deterrent to the progress of rehabilitation as pressure ulcers."

– Pires and Adkins
SCI Complications

Areas with little fat and muscle over bony prominences are common sites of bed sores.
SCI Complications

Pressure Ulcers

- 85% of people with SCI will develop a pressure ulcer in their lifetime
- 30% will have recurrent pressure ulcers
- Associated with potentially life-threatening problems (osteomyelitis, sepsis, contracture, deformity)
- Significant cause of morbidity/mortality, accounting for up to 8% of deaths in SCI patients
SCI Complications

Pressure Ulcers

• Costly
  – Cost of treatment $8.5 billion/year
  – Up to ¼ of total cost of care for SCI patients
SCI Complications

Chronic Pain

• Etiology
• Treatment
  – Medications
    • Opioids
    • Tricyclic antidepressants
    • Anticonvulsants
  • Injections
  • Implantable devices
  – Surgery
How are you feeling today?
SCI Complications

Spasticity

• Etiology
• Complications
  – Contracture
  – Difficulty with self care
• Treatment
  – Medications
    • Oral (baclofen, zanaflex, dantrium)
    • Injections (botulinum toxin)
    • Implantable devices
SCI Complications

Spasticity

intrathecal baclofen pump system
SCI Complications

DVT / PE

• Etiology
• Prophylaxis
  – Heparin
  – LMWH
  – Filters
• Treatment
SCI Complications

Autonomic Dysreflexia

• Symptoms / Manifestations
  – Include HA, hypertension, facial erythema, diaphoresis, piloerection, arrhythmia, convulsion/spasticity, reflex bradycardia
  – Result from sympathetic hyperactivity and spinal cord reflexes below the level of the injury; not under supraspinal modulation
SCI Complications

Autonomic Dysreflexia

• Serious and life-threatening condition for spinal cord injured patients
• Can occur as a result of any noxious stimulus
• Treatment
AUTONOMIC DYSREFLEXIA

(SPINAL CORD INJURY AT T-6 OR HIGHER)

T-6 — TRIGGERED BY SUSTAINED
STIMULI AT T-6 OR BELOW FROM:

- RESTRICTIVE CLOTHING
- FULL BLADDER
- OR UTI
- PRESSURE AREAS
- FECAL IMPACTION

* FLUSHED FACE
* ↑ BP
* HEADACHE
* DISTENDED NECK VEINS
* ↓ HEART RATE
* ↑ SWEATING

VASODILATATION ABOVE
— LEVEL OF INJURY —

— VASOCONSTRICTION BELOW LEVEL OF INJURY —

* PALE
* COOL
* NO SWEATING

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SCI Trends

Natural history

• SCI patients living longer with advancements in medicine
• Decline in function with age
• Greater opportunity for potential complications
SCI Trends

Hospital Trends

- ↓ length of stay (LOS)
  - average LOS for SCI rehabilitation has decreased
    - 75 days in 1986
    - 35 days in 1998

- Shortened LOS negatively impact a patient's ability to integrate preventive behaviors essential for avoiding serious health problems.

- Recent statistics show that the prevalence of secondary complications occurring after discharge is steadily increasing
Advancements in SCI Medicine

New technology may be promising for quality of life improvements

- Stimulators
- Body weight support
- Tendon transfers
- Stem cell research
Advancements in SCI Medicine

Stimulators

Stimmaster Bike
Advancements in SCI Medicine

The FreeHand system consists of an implanted stimulator and electrodes, an external power and control unit, and a shoulder position sensor.
Advancements in SCI Medicine

Body
Weight
Support
Advancements in SCI Medicine

Tendon Transfers
Advancements in SCI Medicine

Stem Cell Research

Stem Cells (embryonic, fetal, adult)
- Multipotent – can give rise to neurons and glia
- Studies underway in which stem cell grafts are implanted into areas of damaged neural tissue
- Currently done in rats
- Once report of stems cells implanted in a human SCI patient (Korea)
Advancements in SCI Medicine

Fetal Neural Tube
SPINAL CORD ONLAY GRAFT
Summary

Spinal cord injury is a life-altering disability which has unique sequellae.

Spinal cord injured people can lead productive and happy lives.

Modern advances in medicine and research bring improvements and hope to spinal cord injured people.
References

References