Utilization Rates of Nerve and Tendon Transfer to Improve Upper Limb Function in Cervical Spinal Cord Injury

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Introduction

The loss of upper limb function in cervical spinal cord injury (SCI) contributes to substantial disability, loss of independence, and ultimately restricts participation and affects quality of life. People living with cervical SCI have identified **improvement of upper limb function** as a **top priority**.

Nerve transfer and tendon transfer surgery are currently the **only successful, widely translatable, safe, and cost-effective treatments** to improve upper limb function in cervical SCI.

Unfortunately, nerve and tendon transfer remain **under-utilized in this population** worldwide. The purpose of this study was to **assess the utilization** of nerve and tendon transfer surgery for individuals with cervical SCI **in Canada**.

We sought to determine **surgery rates, regional variations and changes in utilization** of nerve and tendon transfer over time.

Methods

Data was retrieved from the Canadian Institute for Health Information's Discharge Abstracts Database (CIHI-DAD) and the National Ambulatory Care Reporting System (NACRS). **Individuals who sustained a traumatic SCI between 2004/05 and 2019/20 were identified** in the DAD and NACRS databases using appropriate codes for SCI.

Methods

- **Frequencies** of nerve transfers and tendon transfers were calculated as events/year.
- Current **utilization of upper extremity reconstruction (UER)** in eligible individuals was determined by comparing frequencies to the national incidence of cervical SCI.
- Estimate of 50% was used to account for those **unwilling to undergo surgery**.
- Data across provinces were compared to determine **regional variation** in access to UER.
- Data across years were examined to determine **changes in utilization over time**.

Results

Only **1.3%** of eligible individuals underwent a nerve transfer and **1.0%** underwent a tendon transfer over the 2004/05-2019/20 period.

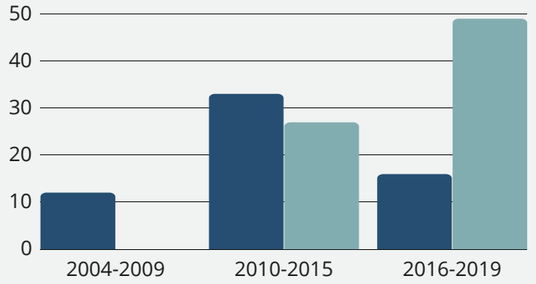
Procedure type	No. of individuals (all SCI levels)	No. of unique procedures in cervical SCI	Male (%)	Mean age (years)
Nerve Procedures				
Nerve transfer	124	≤ 80 *	81 %	38.3
Nerve decompression/ neurolysis	255	147	68 %	55.8
Tendon Procedures				
Tendon transfer	58	61	78 %	45.0
Arthrodesis/ joint fusions	52	40	70 %	47.1
Tendon release	108	108	62 %	54.6

** Exact data not available due to small cell suppression*

Results

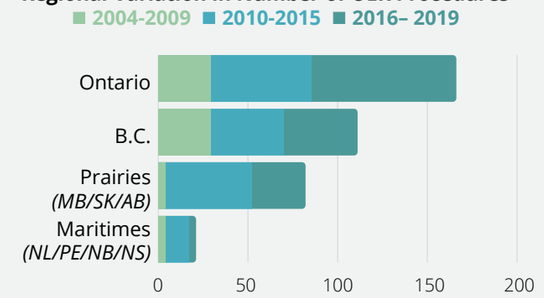
The **number of nerve transfers increased over time** (2004-2009, n=<5; 2010-2015, n=27; 2016-2019, n=49), while the number of tendon transfers has remained relatively constant.

Number of Nerve and Tendon Transfers Performed in Canada Over 5-Year Periods



The number of UER procedures was **highest** in **Ontario** (n=166) and **British Columbia** (n=119).

Regional Variation in Number of UER Procedures



AB, Alberta; BC, British Columbia; MB, Manitoba; NB, New Brunswick; NL, Newfoundland and Labrador; NS, Nova Scotia; ON, Ontario; PE, Prince Edward Island; SK, Saskatchewan.

Discussion

These rates of UER **may be an overestimation** based on the assumption that one procedure was performed per individual. However, a single individual may have several nerve and/or tendon transfers performed in each limb.

Many factors may influence the increase in UER procedures over the 16 year study period, such as increasing awareness of nerve transfers among individuals with SCI and/or their healthcare providers, and/or an increase in the number of surgeons offering these procedures.

The relatively higher incidence of surgery in British Columbia may reflect a difference in practices and relationships among SCI healthcare providers, surgeons, and advocacy organizations. Moreover, this province has a single rehabilitation hospital that cares for all patients with SCI.

Conclusion

Nerve and tendon transfer surgery to improve upper limb function in Canadians with cervical SCI **remains very low**.

This study has highlighted a **substantial gap in care** for this vulnerable population.

Identification of the barriers that prevent access to care is required to develop and promote best practice guidelines for delivering upper extremity surgical care.

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