

Review of Time to Surgical Decompression in Traumatic Spinal Cord Injured Patients

Abstract:

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Abstract

Interventions which may improve neurological outcomes, including time to surgical decompression, in traumatic spinal cord injury (TSCI) evoke much interest. The majority of TSCI patients in Ireland are managed acutely at the National Spinal Injuries Unit (NSIU). A retrospective review of healthcare records of TSCI patients, who had surgical management there, in 2010, 2011, 2012, was performed. From the information gathered, the duration of each stage of the patient pathway was calculated. Median duration between onset of injury and time of arrival at local hospital was 1 hour 25 minutes, between arrival at local hospital and referral to NSIU was 4 hours 17 minutes, between referral to and arrival at NSIU was 6 hours 25 minutes, between onset of injury and arrival at NSIU was 13 hours 7 minutes, between onset of injury and surgical decompression was 27 hours. A number of factors have been identified which could influence these time durations.

Introduction

Traumatic spinal cord injury (TSCI) can cause devastating physical, psychological, social and economic consequences for patients, their families and wider society. Any intervention which might improve outcomes evokes considerable interest. One such intervention is the timing of surgical intervention and if appropriate, decompression, a controversial topic for some time now. It has been suggested that earlier decompression (within 24 hours) is very unlikely to cause neurological deterioration, possibly results in neurological improvement, probably results in shorter hospital length of stay and fewer medical complications. However, many studies included in this review were low quality evidence of a case-control or retrospective study design. STASCIS was the first prospective cohort study examining outcomes between 2 patient groups, those who had surgical decompression within or after 24 hours from onset of cervical-level TSCI. Earlier decompression was associated with improved neurological recovery at 6 months post-injury; however, those in the early decompression group were younger and had more severe injury, therefore with greater potential for improvement. A worldwide survey of spinal surgeons revealed that the majority prefer to decompress the acutely injured spinal cord within 24 hours of onset of injury, particularly when TSCI was classified as incomplete, but may encounter logistical reasons, such as delayed transportation, for not being able to do so.

Regardless of surgical intervention, outcomes have been shown to be better, when patients are managed at a specialist acute spinal cord injury centre (SCIC) with a full multi-disciplinary team, than when managed in general hospitals. In particular, earlier admission to a specialist SCIC, ideally within 48 hours of injury, is associated with shorter lengths of hospital stay. Treatment in an acute SCIC also results in fewer delays to rehabilitation, greater rehabilitation gains, less risk of medical complications particularly pressure ulcers and lower mortality rates. In a three part prospective study, patient outcomes were shown to be significantly better where there was a pre-defined pathway to specialist acute and rehabilitation services for patients with TSCI, one aspect of which is prompt referral to and timely arrival at the acute SCIC. The improved outcomes included fewer medical complications, including pressure ulcers, shorter rehabilitation length of stay but with better rehabilitation outcomes both in terms of independence measures and home discharges. In addition to the current potential benefits of earlier arrival at a specialist acute SCIC, availability of future treatments might be also be time-dependent, based on current clinical trial protocols.

The NSIU, MMUH is the only specialist acute spinal cord injury centre (SCIC) in Ireland, where there is a complete multi-disciplinary team with expertise in management of acute TSCI. The majority of patients sustaining TSCI in Ireland are managed there. Following acute management, patients are transferred to the National Rehabilitation Hospital for rehabilitation. Patients sustaining TSCI are brought from the site of injury to their local hospital, usually by HSE road ambulance. Following assessment in the local emergency department and identification of a TSCI, the referral process to the National Spinal Injuries Unit (NSIU), Mater Misericordiae University Hospital (MMUH), commences. Contact is made with the on-call orthopaedic registrar in the NSIU. A detailed clinical referral form is completed and sent by facsimile to the NSIU. Imaging from the local emergency department is reviewed with the clinical information. If the patient requires transfer and is medically stable for transfer, the patient is accepted to the NSIU and transportation arranged to the NSIU, usually carried out by HSE road ambulance service. Upon arrival at the NSIU, patients' injuries are assessed using the ASIA (American Spinal Injuries Association) classification system and an ASIA work-sheet is completed. TSCI is classified by neurological level of injury and ASIA impairment scale (A indicating a complete injury, B, C, D, E indicating incomplete injury). All surgical house officers and registrars working in the NSIU are trained in the ASIA assessment. Relevant imaging is carried out where necessary and a decision regarding the need for surgical intervention is taken with the consultant spinal surgeon on-call. Because of current interest in time taken to surgical decompression from TSCI onset, it was decided to examine this process in Ireland. The objective of the study was to review the time taken for each stage of the patient pathway from onset of injury to the NSIU, with a view to considering if the process can be improved upon.

Methods

Cases were identified at the point of discharge from rehabilitation using the Patient Administration System of the National Rehabilitation Hospital for 2010, 2011 and 2012. The health-care records of these patients were then retrieved at the MMUH. A retrospective review of these healthcare records was carried out. All cases were confirmed as having had TSCI and surgical intervention. The NSIU referral form from the local acute hospital, ambulance documentation, written entries in the health-care record, theatre logs, ASIA work-sheets were searched for necessary information. Date and time of onset of TSCI, arrival at local hospital, referral to the NSIU, arrival at NSIU, completion of ASIA and surgical intervention were recorded and entered into a database. Patient demographic details, ASIA impairment scale and the HSE region (Dublin North-East, Dublin Mid-Leinster, West, South) from which the patient originated were also recorded. SPSS version 16 was used to analyse the data. Duration of each stage of the patient pathway was calculated. Influence of each of patient age, severity of injury and area of origin on time from TSCI onset to arrival at NSIU or surgical intervention was explored.

Results

Health-care records of 110 patients were retrieved during the time available for this study. There were 17 complete tetraplegics, 44 incomplete tetraplegics, 19 complete paraplegics, 30 incomplete paraplegics. Mean patient age was 44.4 years (SD 19). Much of the data was incomplete, particularly documentation on time of day. Times at the starting and finishing points of the patient pathway, onset of TSCI and surgical intervention, respectively, were available on 66 patients only. Table 1 displays the median duration of each stage and of the overall referral process. Recording of time at which ASIA examinations were performed was insufficient to perform any analysis. Surgery was performed in 31 of 66 patients (47%) within 24 hours of TSCI onset. Spearman's Rho correlation testing revealed a weak but significant correlation ($r=0.352$, $p=0.004$) between patient age and time to surgical intervention from onset of TSCI. There was no relationship between the HSE area of the country from which the patient originated and time taken to arrive at the NSIU or between severity of injury (complete or incomplete) and time to surgical intervention. It was subsequently noted that 26 patients had surgical intervention in the NSIU but were not admitted to the NRH for a range of reasons including death, too frail for specialist rehabilitation, adequate recovery to allow for home discharge or repatriation to another jurisdiction. These cases have not been included in this study.

Discussion

This study was carried out with the objective of exploring time taken from onset of TSCI to surgical intervention and each step in the process of referral and transfer to the NSIU, MMUH. No exploration was performed of the impact of the time taken for either arrival at the NSIU or surgical decompression on patient outcomes. However, the NSIU is now one of the study sites for a European prospective observational multicentre study examining surgical outcomes between patients who have surgical decompression within and after 12 hours of TSCI onset. The median time to arrival at the NSIU is within the suggested 48 hour window but other phases of the referral and transfer process seem prolonged, particularly time taken from arrival at local hospital to referral to NSIU and time taken from arrival at NSIU to surgical decompression. Several factors could contribute to these time periods. Financial constraints have impacted negatively on ambulance services in recent years which could increase time taken for the patient to be transported to the local hospital from the site of injury and for time taken for transfer from local hospital to the NSIU. Medical instability could also result in delayed transfer. Time taken from arrival at local hospital to referral to NSIU may be affected by 2 factors: firstly, lack of awareness among junior doctors, working in emergency departments, of the importance of prompt referral to a specialist SCIC and secondly, difficulty in making contact with spinal surgical services in NSIU e.g. if the orthopaedic registrar on-call is attending to a case in the operating theatre. Lack of theatre space may have had a role to play in the long duration between arrival at NSIU & surgical decompression. At the time when this study was carried out, there was no theatre space solely designated for spinal surgery within MMUH. Medical instability of the patient might also have influenced the time taken from arrival at NSIU to surgical intervention. In theory, bed availability could delay patient transfer from a local hospital although exceptional bed management usually eliminates this potential barrier.

The only factor which influenced, albeit weakly, time to surgical decompression was patient age, younger patients undergoing decompression earlier than older patients. This may be due to a lower likelihood of medical complications causing delays. HSE area of patient origin was not associated with time taken to arrival at the NSIU, again suggesting nationwide difficulties with the HSE ambulance services. Limitations to this study are the retrospective nature of data collection, difficulty retrieving all healthcare records within the limited allotted study time-frame, as well as poor recording of data, particularly on time of day, in many of the health-care records which were reviewed. For all clinical entries in healthcare records, recording of date and time (using 24 hour clock) should be included, as a basic requirement of data entry.

From this study, it has been identified that improvements in a number of areas might be possible. It is our understanding that the HSE and National Ambulance Service have commissioned an external review of the capacity of the service, which may in time result in improvements in transportation time. The role of a spinal coordinator within the NSIU, who would be more easily accessible to personnel in referring hospitals, is being explored. Additional theatre space reserved solely for spinal surgery is being developed. Finally, an education programme for junior doctors, working in emergency departments nationwide, on optimising early management of TSCI patients may be helpful in the future, coordinated through relevant training committees.

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