Methylprednisolone in acute spinal cord injuries

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Abstract

Background Methylprednisolone is the only neuroprotective therapy advocated in acute non-penetrating spinal cord injury. Trials indicate improved neurological outcome following early administration of a high dose regime. The National Spinal Injuries Unit (NSIU) has promoted this regime by a simple laminated poster sent to all Irish A&E departments.

Aim To assess the use of methylprednisolone in patients with spinal cord injuries.

Method A retrospective audit of patient data for all patients admitted with traumatic neurological impairment over a 12-month period.

Results One hundred ninety-six patients were admitted during the study period, 28 (14%) received intravenous methylprednisolone of which six had clear records documenting compliance. One patient received both dexamethasone and methylprednisolone in high doses and three had incorrect bolus dosages administered. Six patients received methylprednisolone infusion longer than the protocol, while five patients were given infusions shorter than recommended. Three patients were admitted to the unit that could have received the steroid regime at the point of transfer.

Conclusions There was poor documentation of prescription orders and timing of administration. Only six patients had clear documentation allowing confirmation of adherence to the protocol of the National Acute Spinal Cord Injury Study (NASCIS) III trial.

Introduction

The National Spinal Injuries Unit (NSIU) at the Mater Misericordiae Hospital serves as a tertiary referral centre for the treatment of spinal injuries for an Irish population of 3.5 million. Referrals are accepted nationwide. Following the publication of the NASCIS trials,1 3 a poster entitled ‘Management of spinal injuries’ was distributed to all A&E departments in the Republic of Ireland in 1998.1 A steroid protocol (see Figure 1) is included in the poster with reference to the NASCIS III trial.4 The aim of this study was to perform a retrospective audit of all patients with traumatic spinal cord injuries admitted to NSIU from 1 January to 31 December 2001.

Patients and methods

From 1 January to 31 December 2001, there were 196 admissions to the NSIU at the Mater Hospital. A retrospective audit of the records for all those patients admitted during this study period was performed. Patients were identified from a computerised database run by the NSIU of all patients treated for spinal injuries. In addition, the computerised hospital database was examined and a final check was performed by examination of a handwritten log of all patients admitted to the NSIU.

Data were collected under the following headings: referring hospital, age, sex, documentation of time of injury, mechanism of injury, level of injury, patient’s weight, timing of administration of bolus dose, calculation of bolus dose, timing of administration of maintenance dose, calculation of maintenance dose, duration of maintenance dose and whether or not the guidelines distributed by the NSIU were applied. All documents were examined for the above data including referral letters, accompanying nurse transfer letters, prescription orders and the intravenous fluid charts. Documentation and calculation for each of the variables listed was then audited against the protocol supplied on the poster.

Results

From 1 January to 31 December 2001, there were 196 admissions to the NSIU, of which methylprednisolone was administered in 28 patients (14%). Patients receiving methylprednisolone were transferred from 14 different hospitals within the State, one patient was repatriated from India and only one patient was treated solely by the NSIU. The mean age of patients in the study group was 39.5 years; there were 18 male patients and 10 female patients. The main mechanism of injury (see Table 1) was a fall or a motor vehicle accident (68%). The level of injury in each patient is shown in Table 2. The patient’s weight was documented in 15 cases and was estimated in the remainder.

Time of injury was documented in eight patients (29%) and time of administration of bolus dose was clearly recorded in 15 patients (54%). There was incorrect calculation of administered bolus dose in three patients as the dosage was based on an incorrect estimation of the patient’s weight. One patient received a bolus of methylprednisolone 24 hours following injury, there was no maintenance dose following this. One patient received a high dose bolus of both dexamethasone and methylprednisolone. Twenty patients’ files contained a clear record of the timing of administration of the maintenance methylprednisolone dose. In six patients, methylprednisolone was administered for a longer period than the recommended protocol and, in five patients, the maintenance dose was given for a shorter period than the recommended protocol.

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Inadequate records were present in four patients. Two patients with lumbar fractures but without neurological deficit were given the high dose methylprednisolone regimen.

During the review, it was noted that three patients with traumatic spinal cord injuries failed to receive the steroid protocol at the point of transfer. Two of the three patients were subsequently unable to receive steroids on arrival to the unit due to time delay. Only six patients had clear documentation allowing confirmation of adherence to the protocol of the NASCIS III trial.

Discussion

Although there have been concerns recently regarding the efficacy of the administration of high dose methylprednisolone, it is the only neuroprotective pharmacological intervention currently recommended by the NSIU. Recent trials of newer agents such as GM-1 Ganglioside, although promising, must await formal evidence-based guideline review. Complications with the administration of methylprednisolone in high dosage include sepsis, bronchopneumonia, gastrointestinal haemorrhage, wound infection and psychological neurosis.

The administration of the advocated regime is indicated in traumatic spinal cord injury with neurological deficit, either motor or sensory or both. Careful neurological examination is required to establish a spinal cord injury as the cause for any neurological deficit. This will avoid the administration of potentially harmful high dose steroids in patients with intact spinal cords. Patients with only nerve root involvement or cauda equina alone were excluded from the NASCIS trials.

Contraindications to the administration of the regime in the NASCIS trials include pregnancy, life-threatening morbidity, receiving maintenance steroids for other reasons, gunshot wounds and under 13 years of age.

The steroid protocol advocates the administration of methylprednisolone as the only recommended steroid evaluated by the NASCIS trials. One patient in our study received a bolus of both dexamethasone and methylprednisolone. Dexamethasone is a long-acting glucocorticoid of approximately six times the potency of methylprednisolone.

Despite the distribution of the protocol nationwide, our audit revealed numerous errors in calculating, reconstituting and documenting the administration of methylprednisolone. The most common omissions in documentation were: the time at which the injury occurred; the time of administration of the bolus dose; the patient’s weight upon which calculations were based; the actual bolus dose administered (not expressed as 30mg/kg); the time at which the maintenance dose was commenced; and the actual maintenance dose administered (not expressed as 5.4mg/kg per hour).

In the treatment of acute non-penetrating spinal cord injuries, pharmacological therapy with methylprednisolone is currently indicated, in our present state of knowledge. Careful evaluation and administration will avoid the complications associated with inappropriate high dose steroid administration. In addition, hypoxia and ischaemia at the site of injury should be minimised by optimising the haemodynamic status and oxygenation of any patient with a spinal cord injury.

Documentation of the time of injury, level of injury, patient’s weight (or estimate used), timing of administration of bolus and maintenance dose, calculation of bolus and maintenance dose and the duration of maintenance dose will assist in ensuring correct administration of high dose steroids.

We recommend that the steroid protocol for the administration of methylprednisolone be strictly adhered to and the assistance of a local hospital pharmacist be utilised.
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References


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