

Role of Steroids in Traumatic Spinal Cord Injury Patients

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Abstract

Objective: To evaluate the complications with use of steroids in patients more than 16 years of age, of traumatic acute spinal cord injury within the guidelines of NASCIS II, III scheme and their comparison with other traumatic acute spinal cord injury patients who did not receive steroids.

Methods: We did retrospective study in this original article. In this case control study we included only those traumatic acute spinal cord injury patients who were more than 16 year of age, treated in our working setup, evaluating the comparison between steroid therapy related complications between traumatic acute spinal cord injury patients who received steroids therapy and who were not, including various variables and data collections in form of tables.

Results: This study included total 20 patients in one year of period (2020-21) and among all the patients, 11 (55%) patients went through the steroid therapy. Out of these 11 patients, 2 patients (18%) required neuro intensive care unit admission, 4 patients (36%) developed Nosocomial pneumonia, 1 patient (9%) developed symptomatic bacteriuria, 1 patient (9%) landed in cardio-respiratory failure and 3 patients (27%) got complicated with gastrointestinal hemorrhage (GIB).

Conclusions: In this original study we found that steroid therapy in traumatic acute spinal cord injury patients is associated with significant risks. Before starting steroid therapy in traumatic acute spinal cord injury patients, it is always recommended to think seriously about benefits and complications together.

Key words: Traumatic acute spinal cord injury, Steroids, Nosocomial pneumonia, Gastrointestinal hemorrhage, Bacteriuria

INTRODUCTION

Spinal cord injury (SCI) is categorized as complete or partial includes impairment of motor and sensory functions of human body. Trauma is most common cause of spinal cord injury. High velocity vehicles, urbanization, newer high risk occupations and whopping rise in road traffic accidents are contributing factor of this injury.^[1,2]

Spinal cord injuries (SCI) are devastating disease which collapses the life of patients and their families and damaged the economical and social status of whole family and healthcare centers.^[2,3]

Mechanical impact is usually primary cause of spinal cord injury (SCI) followed by secondary sequels like, by ischemia, neurolysis, edema, inflammation, damage to the neuronal cell membrane, electrolyte impairments, and release of cytokines with free oxygen radicals, followed by demyelization, tissue edema, cell loss, irreversible cell death, and cell apoptosis.^[4,5] with this another mechanism started working to prevent more damages to cells from hypothalamic-pituitary-adrenal axis which activates OKis followed by cortisol release which reduces the process of inflammation.^[5-7]

With the time, treatment approach and methods improved with addition of steroid therapy, recent studies are especially advocating a corticosteroid named methylprednisolone sodium succinate. As per database, this corticosteroid is useful in recommended dose to reduce inflammatory reaction in spinal cord injury. It acts as glucocorticoid and creates lymphocytopenia, reduces antibodies and inhibits inflammatory reaction.^[8]

In the spinal cord injuries (SCI), methylprednisolone act as an inflammatory mediator, reduces the free radical

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production and lipid peroxidation. Additionally, this corticosteroid produces so many unwanted complications.

National Association Spinal Cord Injury Study (NASCIS) I trial and NASCIS II both published positive, favorable and promising results in outcome of acute spinal cord injury with use of MPSS in recommended doses, but catastrophic complications also noted in these trials.^[9-11]

Steroid therapy came in use with very short period of time without significant research and analysis of its pros and cons, first came in light around European and American continent, and within few years become recognized treatment for traumatic acute spinal cord injury (SCI).^[9] But within few years, complications and risks of steroid therapy came in front of whole world and the use of this therapy become controversial with lots of suspicion.^[12-14]

With the results of multiple retrospective researches and detail analysis, high dose steroid therapy, for any cause or disease, categorized as high risk treatment and associated with potential complications like gastrointestinal bleeding, urinary tract infection, sepsis, lung infection, bone marrow depression, pneumonia, respiratory complications, osteomyelitis, respiratory failure, pulmonary embolism, gastric and duodenal ulcer, which can be fatal.^[15-17] During ICU stay, steroid therapy enhanced the chances of nosocomial infection.^[18,19]

The basic fact of this original article is to compare the traumatic acute spinal cord injury (SCI) patients who received steroid therapy and who did not received, to find out the real role of steroid in spinal cord injury cases.^[20, 21]

Approximately, 15, 00,000 people are suffering with SCI in India. Every year, near about 20,000 new patients are being added in SCI. Around 70% of them are labor class, poor and illiterate people. Male gender used to get more spinal trauma in study. 16-35 year of age group found more prone for injury, which denoted high number of male young population. Getting paralyzed due to spinal injuries, most of the families lost their young active and earning candidate, which devastated whole family future. Due to increasing number of working woman in society, down fall in male female ratio noted in last few years. Fall from height, road traffic accidents, violence, sports injury are main reason of SCI.^[22]

Statistical analysis found spinal cord injury due to road traffic accidents 37% of cases, violence 28%, falls 21%, sport accidents 6% and another cause contribute 8%. Post traumatic quadriplegia and paraplegia found in approx 50% of the cases. Post injury neurological loss directly depend upon age, more the age more worst will be the neurology of patient.^[22-25]

Immediate emergency stabilization, spinal immobilization, surgical intervention require as soon as possible and steroid (methylprednisolone) as medical therapy under guidelines of NASCIS II, III in selected patients, which is a centre point of our study to compare between steroid group and non-steroid group of patient. Not only complications increases in steroid therapy, but also this therapy increases ICU stay and financial burden too. Although, this is retrospective case control study, where few patients didn't follow proper instructions and didn't come for proper follow-up, due to this reason few data were not possible to collect. Also our study has small sample size so conclusive result cannot be fully reliable, need of Multicentric study with large number of cases on this steroid therapy related outcome and complications to prove significance of high dose steroid in SCI.

Objectives of study: To find out the possible complications related with steroid therapy (steroid therapy done as per NASCIS II, III regimen guidelines) in the patients who were more than 16 years with acute spinal cord injury, and also to find out any significant difference in outcome between any difference between the control group and the patients who treated with methylprednisolone (MPSS).

MATERIAL AND METHODS

A case-control study on the 20 patients aged over 16 year, of traumatic acute spinal cord injury in the period of 2020-21 with the patients who complete the criteria for inclusion and exclusion at our tertiary care hospital. In this study, we decided to compare between patients who treated with methylprednisolone (MPSS) and those who were not go through steroid therapy.

We did use proforma to achieve details of each patient includes age, gender, clinical details, diagnosis, admission and discharge/death date, level of spine injury, injury progression time, surgical management, use of intensive care, NASCIS regimen type used, complications like nosocomial infection, wound infection, pneumonia, urinary tract infection, respiratory infection/failure, sepsis, pulmonary embolism, gastric ulcer, gastrointestinal bleeding, etc. with all this variables, we did comparison between the control group and the patients who treated with methylprednisolone (MPSS). Few patients reached hospital after 12, 24, 36, 48 or 72 hours of spinal trauma, who didn't receive steroid therapy, included in the control group, who did not get high dose steroid therapy.

Inclusion Criteria

1. Fully diagnosed and confirmed Traumatic spine injury patients

2. All those spine injury patients aged 16 years or more,
3. SCI history of less than 48 hours,
4. All genders included
5. Patients of SCI treated by NASCIS II regimen Methylprednisolone succinate (MPSS) with dose:- 30 mg/kg stat followed by 5.40 mg/kg/hour continues infusion for the next 23 hours
6. Patients of SCI treated by NASCIS III regimen (continues infusion extended up to 24 and 48 hours in SCI patients)
7. Traumatic acute spinal cord injury (SCI) without use of MPSS;

Exclusion Criteria (Non-Inclusion)

1. SCI patients below age of 16 years.
2. No clear history, evidence or radiological proof of trauma or spinal cord injury.
3. Patients underwent steroid treatment but didn't follow NASCIS II or III regimen.

Elimination Criteria

1. Patient received in Emergency room or initial treatment started after 48 hrs of SCI event
2. any patient who died before 48 hours after admission in hospital.

For the detail data collection, the variables to be analyzed are defined as described below:

Hospital acquired Pneumonia (Nosocomial pneumonia): If patient doesn't have chest or respiratory infection before admission or injury, and develops first 72 hrs of hospitalization known as nosocomial infection.^[26]

Chest X-ray and CT scan shows lung parenchyma infiltration, associated with fever above than 100 degree Fahrenheit or 38°C, Cough with or without purulent sputum, Leucopenia (4,000mm₃ or less), Leukocytosis (12,000 mm₃ or more), tachypnea, on chest auscultation - rhonchi, wheezing present, fall in SpO₂ etc.

To manage post spinal trauma, urinary incontinence or retention of urine, use of indwelling catheter is very common which creates urinary tract infection (UTI), appears with fever, body ache, malaise, nausea, vomiting, loin and groin pain, burning painful micturition or hematuria.^[27] It is necessary to send urine culture to find out and treat the causative organism.

Surgical wound infection: A wound can present various complications post-operatively like delayed healing, irregular healing, Fever 38 degree C or more inflammation signs and pain at wound site, scar formation, purulent discharge, and wound dehiscence.^[28]

Sepsis:- When surgical infection or any other infection reached in systemic inflammatory response state, and involve whole body known as systemic inflammatory response syndrome (SIRS), or Sepsis,^[29] presented with temperature more than 38°C or less than 36°C, heart rate more than 90 bpm, Hyperventilation and retention of CO₂ in ABG analysis, leukocytes above 12,000 or below 4,000 cells mm³.

Respiratory complication: Respiratory failure, distressed respiration, dyspnea, are common presentation in post SCI patients. Blood gas analysis and monitoring require for all the SCI patients presented with respiratory symptoms.^[30]

Pulmonary Embolism: Blockage of pulmonary artery, total or partial due to blood clots, fat embolus, air embolus etc^[31] presented with Cough especially dry cough, severe chest pain, and hemoptysis. ABG shows alteration in range of parameters, abnormal pulmonary parenchyma and atelectasis appears on chest x-ray. T wave inversion also noted on ECG, positive D-dimer, and large vessels embolus is common finding in chest CT scan, pulmonary angiography is gold standard to find out embolus in pulmonary artery with exact localization.

Gastrointestinal (GI) Ulcer and bleeding: blood in vomiting (coffee color vomit), or blood in stool (melena) with significant down fall in Hb (hemoglobin), always a alarming sign of GI bleeding.^[32]

Information Collection Methods

A well design proforma with multiple variables is basic platform of data collection in our study, with electronic record as well as physical hard copy records of the SCI victims who got select for the our original study.

RESULTS

As shown in Table 1, Demographical analysis.

This study included total 20 patients in one year of period (2020-21).

All patients were treated in our medical centre, included 18 (90%) males and 2 (10%) females, within range from 16 to 70 years.

The total in hospital time ranged from 1 - 42 days.

85% of the study patients were selected for surgical intervention.

Out of total 20 cases, 11 patients (55%) received steroid therapy (MPSS group) and 9 patients (45%) did not (control group); Out of these 11 patients (MPSS group), 2 patients

Table 1: Demographical analysis

Variable	Freq	Freq. %
Sex		
Male	18	90.00%
Female	2	10.00%
Corticosteroid therapy		
Yes	11	55%
No	9	45%
Intensive Care		
Yes	2	10.00%
No	18	90.00%
Surgery		
Yes	17	85%
No	3	15%
Pneumonia		
Yes	4	20.00%
No	16	80.00%
Infection (UTI)		
Yes	5	25%
No	15	75%
Respiratory Failure		
Yes	1	5%
No	19	95%
Sepsis		
Yes	0	0.00%
No	20	100.00%
Embolism		
Yes	0	0.00%
No	20	100.00%
GI Bleeding		
Yes	3	15%
No	17	85.00%
ASIA		
A	13	65%
B	4	20%
C	3	15%

N=20

(18%) required neuro-intensive care unit admission, 4 patients (36%) developed Nosocomial pneumonia, 1 patient (9%) developed symptomatic bacteriuria, 1 patient (9%) landed in cardio-respiratory failure and 3 patients (27%) got complicated with gastrointestinal hemorrhage (GIB). We didn't reported pulmonary embolism or sepsis in any of the patient.

Other side in control group, only 4 patients landed in Infection either UTI or respiratory infection. There were no patient require intensive care support, sepsis, respiratory failure, pneumonia, pulmonary embolism, gastrointestinal ulcer or bleeding.

We used ASIA (AMERICAN SPINAL INJURY ASSOCIATION) scale, to classify the degree of neurological deficit in SCI patients. 65% of SCI patients were kept in ASIA A, 20% ASIA B and 15% ASIA C.

DISCUSSION

In our original study, we found that SCI patients who received steroid therapy (MPSS group), requirement of

Intensive Care unit was more common as compare to control group. On the other point, more complications like pneumonia, GI bleed, GI ulcer, UTI, respiratory problems were more common in MPSS group as compare to control group. Due to high cost steroid therapy, long hospital stay and too many complications in MPSS group, they also had more financial losses due to SCI.

CONCLUSIONS

There are so many studies in favor of Steroid therapy in cases of traumatic spinal cord injury, but our original study shows that steroid therapy is not completely safe or risk – free, even without complete analysis and knowledge of steroid, it become more dangerous to SCI victim's health, his family environment, and his socio-economic status.

At last, by this small size case control study, we want to advise that physicians and surgeons should always compare the benefits and complications in each and every patient before steroid therapy in cases of traumatic acute spinal cord injury.

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