Medical and surgical management of acute spinal injury during pregnancy: A case series in a third-world country

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Abstract

Background: There is scant literature describing the management of acute spinal injury in pregnant patients. Here, we report our experience with five cases of pregnant patients including three females who suffered acute traumatic spinal cord injuries (SCIs).

Methods: This retrospective study evaluated five pregnant women presenting with traumatic spinal injuries over a 16-month period. All were assessed using the International Standards for Neurological Classification of Spinal Cord Injury Patients and the American Spine Injury Association Impairment Scale (AIS).

Results: Three patients sustained SCIs: two cervical spine (C4 AIS-A and C5 AIS-B) and one thoracolumbar junction fracture dislocation (T11 AIS-A). Two patients required surgical stabilization during pregnancy, with one undergoing surgery after delivery. All three patients subsequently delivered healthy newborns. The remaining two patients without neurologic deficits at admission were treated conservatively: one had a healthy child, whereas the other patient aborted the baby due to the initial trauma.

Conclusions: Our study demonstrates that the same surgical principals may be applied to pregnant women as to routine patients with SCIs. Further studies with
INTRODUCTION

Trauma during pregnancy is the leading nonobstetrical cause of maternal death, affecting up to 8% of all pregnancies.[3,6,11,14,16] Acute spinal cord injuries (SCIs) occur in women of childbearing age (15–40 years) (e.g., incidence up to 20%).[19] Treatment of this patient population can be particularly challenging due to difficulty with positioning and nursing care and the management of acute/chronic SCI-specific complications (e.g., blood clots, infections, hypotension, autonomic dysreflexia, respiratory and cardiovascular complications, etc.).[1] Few studies (nine reports including five case reports) focus on the treatment and management of spinal injuries during pregnancy.[2,8,10,13,17] Here, we present five pregnant women with traumatic spinal injuries including three patients with SCI who were treated surgically and delivered healthy newborns.

MATERIALS AND METHODS

From 2016 to 2017, we evaluated five pregnant women who sustained spinal trauma (Al-Thawra Model General Hospital, Sana’a-Yemen). Patient data were retrospectively assessed and included patient age, gestational age, Gravida, mechanism of injury, location of injury, American Spine Injury Association (ASIA) Impairment Scale (AIS),[5] surgery, length of hospital stay, type of delivery, complications, and obstetric outcomes. This was then combined with a review of the literature regarding “acute SCI” and “pregnancy” (e.g., using Ovid MEDLINE and Embase Databases).

RESULTS

Out of 392 patients with traumatic spinal injury, 19.6% were females of childbearing age (15–40 years) [Table 1]. Five patients were pregnant, of which three had sustained acute SCI involving two cervical fracture dislocations (C4 AIS-A and C5 AIS-B) and one thoracolumbar junction fracture dislocation (T12/L1 AIS-A SCI), whereas two remained neurologically intact with an L1 wedge fracture and a thoracic wedge fracture, respectively [Tables 2 and 3].

DISCUSSION

This series of five cases involving pregnant patients comprises three spinal cord-injured females with neurological deficits requiring surgery and two neurologically intact patients managed conservatively. The surgical procedures included an anterior C5 corpectomy and C4–6 fixation, an anterior C7 corpectomy and C6–T1 fixation [Figure 1] as well as a T12 laminectomy and T11–L1 posterior instrumentation and fusion [Figure 2]. Four patients delivered healthy babies, whereas one had an abortion due to the initial trauma [Table 4].

Table 1: Statistics of spinal cord injury patient demographics admitted to a tertiary care center during a 14-month period

|                                      | Number of cases | Percentage (%) |
|--------------------------------------|-----------------|----------------|
| Total number of cases                | 392             | 100            |
| Males                                | 258             | 65.8           |
| Females                              | 134             | 34.2           |
| Childbearing age                     | 77              | 19.6           |
| Pregnant                             | 5               | 1.3            |

Childbearing age was defined as females between age 15 and 40 years.

Key Words: Autonomic dysreflexia, management, pregnancy, spinal cord injury

Figure 1: (a) Preoperative MRI scan from case 2 demonstrating a C6/C7 fracture dislocation. (b) Postoperative imaging demonstrating adequate alignment and placement of the anterior plate.
Impact of positioning in pregnant females for spine surgery
Notably, utilizing the prone position for spine surgery is feasible during the first part of the second trimester but is contraindicated after 12 weeks of gestation. At this stage, the lateral decubitus position is recommended.

Management of acute SCI during pregnancy
The management of acute SCI during pregnancy is not well documented in the literature. In a case series of five patients, three were treated surgically and two conservatively with similar outcomes to our study, with the exception of one baby dying shortly after delivery, whereas all other newborns were healthy. The largest study describes nonsurgical management of 45 patients who suffered SCI during pregnancy; although 31 delivered healthy babies, 14 newborns had malformations and/or sustained significant disability. Another study reported a C7/T1 fracture dislocation and an unstable C5/6 fracture who respectively had a healthy infant, but the latter mother died of complications. Furthermore, two pregnant patients with SCI from gunshot wounds were treated conservatively and both delivered healthy babies at 37-week gestation. There are other small series that define surgical and/or conservative management strategies for pregnant patients with SCI with varied success [see Table 5].

Timing of surgical intervention versus safety of pregnancy
All three spinal cord-injured patients in this series underwent surgical intervention. Various studies document improved neurological recovery with early

Table 2: Summary of clinical and demographic information

| Case | Age | GA (weeks) and Gravida/Para | Mechanism | Injury | AIS | Time to operation (days) | Duration of hospitalization (days) | Type of delivery and GA | Other in-hospital complications |
|------|-----|----------------------------|-----------|--------|-----|--------------------------|---------------------------------|--------------------------|--------------------------------|
| 1    | 30  | 23, G5P3                   | Fall      | C5/6 fracture dislocation | C4 AIS-A | 132 | 154 | NVD (35 weeks) | UTI, hypotension, blood transfusion, pressure ulcer |
| 2    | 26  | 18, G5P4                   | MVA       | C6/7 fracture dislocation | C5 AIS B | 45  | 248 | NVD (36 weeks) | UTI, DVT, blood transfusion, pressure ulcers, hypotension |
| 3    | 30  | 17, G3P2                   | Fall      | T12/L1 fracture dislocation | T11 AIS A | 1   | 7   |              | UTI |
| 4    | 25  | 20, G3P2                   | Fall      | L1 wedge fracture         | –     | –   | 3   | C/S (39 weeks) | UTI |
| 5    | 22  | 12, G2P1                   | MVA       | T7 wedge fracture         | –     | –   | 24  | Abortion (12 weeks) | UTI, anemia, multiple trauma |
| Mean | 25.75 | 18                        | –         | –     | –   | 59  | 87.2 | –            | – |

GA=Gestation age, NVD=Normal vaginal delivery, C/S=Cesarean section, UTI=Urinary tract infection, DVT=Deep venous thrombosis, AD=Autonomic dysreflexia, AIS=American Spine Injury Association Impairment Scale

Table 3: Level of spinal injury in study patients

| Level of injury | Number of cases |
|-----------------|-----------------|
| Cervical        | 2               |
| Thoracic        | 1               |
| Lumbar          | 2               |
| Sacral          | 0               |

Table 4: Obstetric outcomes

|               | Number |
|---------------|--------|
| NVD           | 4      |
| Preterm       | 1      |
| Term          | 1      |
| C/S           | 1      |
| Preterm       | 1      |
| Full term     | 0      |
| Abortion      | 1      |
| Total         | 4      |

NVD=Normal vaginal delivery, C/S=Cesarean section

Figure 2: (a) Preoperative MRI from case 3 showing a T12 fracture dislocation with severe compression of the spinal cord. (b) A postoperative image demonstrating the posterior instrumented fusion
surgery. However, due to potential complications during pregnancy, a detailed multidisciplinary approach is crucial to determine when surgery is optimal in specific cases.

**Complications**

Complications occurring in these five pregnant patients with SCI included urinary tract infections, sacral pressure ulcers, and deep venous thrombosis, whereas low birth weight was the only complication among the newborns [Table 6]. All fetuses had satisfactory Appearance, Pulse, Grimace, Activity, Respiration (APGAR) scores at 1 and 5 min, and none required prolonged hospitalization.

**CONCLUSION**

This study demonstrates that successful surgical stabilization and good obstetrical outcomes were achieved in three pregnant patients with SCI who were managed operatively. Multifaceted treatment options and close monitoring should be continued throughout their hospital stay. Further studies are necessary to evaluate the optimal timing of surgical versus nonsurgical management of these patients.

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**Conflicts of interest**

There are no conflicts of interest.

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