

# Seizures Following Spinal Dysraphism - A Series of Four Cases with Literature Review

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## Abstract

Seizures are a rare and unexpected complication following spinal surgery. There is paucity of literature about seizure occurrence following spinal surgery including dysraphism. Only a few isolated reports in the form of case reports have been published in literature. So still this entity remains unfamiliar for neurosurgeons and orthopedists operating on traumatic spinal cases or spinal dysraphism. However, seizures can be quite debilitating for the patient leading to unnecessary morbidity and occasional mortality, following an otherwise straightforward surgery. A high index of suspicion needs to be kept for seizures in all patients undergoing spinal surgery with delayed reversal from anesthesia or unexplained altered sensorium. With proper intraoperative and postoperative management, this complication can be avoided. We discuss possible epileptogenic events in the intraoperative and perioperative period, their management along with a review of the pertinent literature.

## Keywords

Spinal Surgery, Detethering, Low Lying Tethered Cord, Seizures, Pneumocephalus, Complications

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## 1. Introduction

Seizures are well known to occur in patients with intracerebral pathology, especially lesions in supratentorial locations. They rarely have been reported to occur following surgery for lesions in the posterior fossa and in the upper cervical spine also. However seizures following surgery for detethering has not been reported. The authors report on patients who underwent lumbosacral spinal procedures and developed seizures following the surgery. Pertinent literature and a review of management have also been discussed.

## 2. Case Series

In the last ten years, over 500 spinal surgeries were performed at our institute. Out of these there were 4 cases where routine uncomplicated spinal surgery led to postoperative convulsive or nonconvulsive seizures.

### Case 1

A 14- year old boy with low lying tethered cord underwent detethering procedure under general anesthesia in prone position. Following uneventful surgery, the boy was extubated but had an episode of generalized tonic clonic seizure, which was controlled with antiepileptic drugs. A CT scan of the head revealed no abnormality and there were no further recurrences. The child was observed for the next few days and was discharged satisfactorily.

### Case 2

An 8 -year old girl underwent surgery for lumbosacral meningocele in prone position under general anesthesia. She underwent exploration and repair of the thecal sac with excision of redundant fibrofatty tissue. Following uneventful surgery, the patient had delayed reversal from anesthesia and could not be extubated. A CT scan of the head revealed pneumocephalus. She was presumed to have had silent seizures (nonconvulsive) and was promptly started on antiepileptics following which she

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recovered and was extubated the next day. By the third day, the pneumocephalus had subsided and patient was discharged satisfactorily.

### Case 3

A 10-year old boy was operated for a conus lipoma in prone position under general anesthesia. He underwent laminectomy and excision of the lipoma with duroplasty. Following uneventful surgery, this child too had delayed reversal from anesthesia and could not be extubated. Although the CT scan revealed no abnormality, the child was presumed to have had intraoperative/postoperative nonconvulsive seizure and started on antiepileptics. The boy regained consciousness and was extubated the next day.

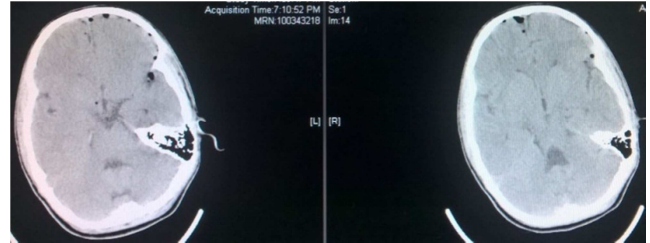


**Fig. 1.** Preoperative MRI showing low lying tethered cord with conus lying at the level of L3 along with caudal regression syndrome.

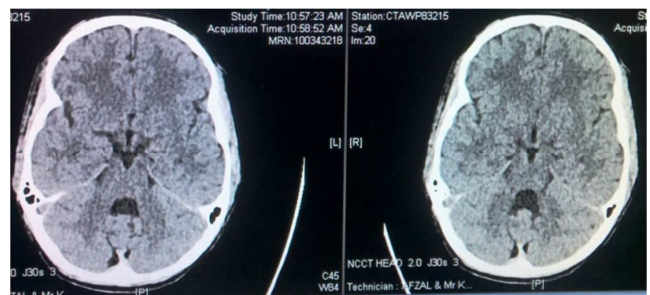
### Case 4

A 12-year old boy with caudal regression syndrome and a low lying tethered cord with conus ending at L3 level was operated [Fig 1]. He underwent detethering procedure under general anesthesia in prone position. The child was extubated and shifted to ICU in a stable condition when 2 hours following surgery he became unconscious and unresponsive. His GCS was E1V1M1 with pupils normal sized but not reacting to light. The child was reintubated and there was severe laryngeal edema seen. An NCCT Head was done

which showed pneumocephalus [Fig 2]. The child was started on antiepileptics and was kept intubated for 2 days for the edema to settle. A repeat scan on the third day showed that the pneumocephalus had completely subsided [Fig 3]. The child was extubated and discharged in a stable condition.



**Fig. 2.** Postop CT Head showing diffuse pneumocephalus.



**Fig. 3.** CT Head done 2 days later showed complete resolution of the pneumocephalus.

## 3. Discussion

Seizures may be the presenting symptom of intrinsic brain parenchymal pathology or extra-axially located intracranial lesion. Authors reported that seizure can be the first presenting symptom in extra-axial lesions like pituitary adenoma [1]. Hauser et al after analysis reported causes of first onset seizure in relation to age of onset of seizure, and idiopathic category accounted for more than 50% of cases but, only 45% of cases in the oldest age group [2]. Amongst the elderly, the most common pathology was cerebrovascular disease which accounted for 28% of all newly diagnosed cases, while in middle aged people (35-64 years) the predominant causes were trauma and neoplasms and both accounted equally. Among young adults, (15-40 years) the common identified aetiologies included central nervous system (CNS) infection, tumor, and neurological deficit since birth and birth trauma. While in the pediatric age-group, the greatest proportions were associated with neurological deficits, believed to be present since birth. Hauser et al concluded seizures are important warning signs of harbouring intracranial pathology especially in young or elderly age, which require full investigation and accordingly appropriate treatment. However our cases underwent surgery in the lumbosacral region, there was presence of pneumocephalus on CT scan head, which could be

contributing as a precipitating factor for the seizures, even decompensation of CSF formation and absorption may be also responsible. However, grossly no intracranial tumor was detected. Serum electrolytes, blood sugar, serum calcium and magnesium levels were within normal limits. As our cases had pneumocephalus, so we suggest that during positioning head should not be kept at a height greater than the operative level to avoid development of pneumocephalus.

Satyarthee et al. reported occurrence of symptomatic pneumocephalus following intracranial or transsphenoid surgery is a rare event, they could find out only two cases of symptomatic pneumocephalus in a series comprising of 480 transsphenoidal surgeries [4]. The first case had history of head injury 4 years earlier and had a left frontotemporal haematoma evacuation. He underwent surgery for sellar mass extending into suprasellar region. He developed postoperative CSF rhinorrhea and in spite of conservative therapy, developed progressive visual deterioration necessitating a re-exploration and repair leading to resolution of the neurological deficits. The second case presented with delayed CSF rhinorrhea leading to rapid alteration in sensorium, requiring external ventricular drainage. The leak subsided without any further surgical intervention. Although in the current study, none of our cases developed pneumocephalus significant to cause mass effect, yet presence of pneumocephalus definitely increases the mass effect in conjunction with hydrocephalus, increasing the potential for seizure occurrence.

Postoperative seizures after laminectomy may occur as a result of unrecognized dural tear, resulting in acute cerebrospinal fluid (CSF) loss and the drastic decrease in the CSF pressure. [6] Pneumocephalus has been reported as a reason for generalized convulsion after cervical laminectomy, [7] as can be considered in one of these cases. Different kinds of intracranial hemorrhage, particularly subdural, subsequent to CSF leakage after spinal procedures have been associated with seizures [6, 7].

In myelomeningocele incidence of seizure varies from 14.7% to 29% and postulated to be due to hydrocephalus and due to the ventriculoperitoneal shunt and its complications [8]. However lipomyelomeningoceles are usually not associated with hydrocephalus or postoperative seizures.

A review of the intraoperative factors in these cases by means of anesthesia charts revealed no episodes of hypotensive or hypoxic events in the current study and none of the anesthetic agents were known to be epileptogenic. Some manipulation of the spinal cord during surgery may itself act as an epileptogenic agent causing postoperative seizures. In the vagus nerve stimulation to suppress induced spinal cord seizure it was confirmed that the seizure had a spinal origin

[9]. Neurons located in the spinal cord similar to those in the cerebral cortex neurons, are known to get electrically polarized leading to spinal cord seizures. [10] The occurrence of spinal seizures with transverse myelopathy has been reported in human beings also [11]. Although the cases in the current series had no weakness of either extremity, during dysraphism surgery minor surgical manipulation might have stimulated the neuronal pathways acting as a trigger zone for spinal seizures.

Nowak et al observed that the increasing practice of putting pedicle screws in spinal surgery carries a potential risk of dural sac tear with subsequent CSF leakage, intracranial hypotension, and pneumocephalus remote from the surgical site and concluded that intracranial complications are potentially fatal and should always be considered after spinal surgery in the presence of early signs of neurological worsening. Emergency head and spinal imaging is required to confirm the diagnosis and prompt institution of therapy is necessary to provide good outcome. Nowak et al cautioned that awareness of this severe intracranial complication is especially important during spinal surgery including spinal instrumentation or open durotomy for intradural procedure for intramedullary or extra- medullary lesion excision and have inadvertent excessive loss of CSF with intracranial remote changes (12).

## 4. Conclusion

Although seizures following spinal surgeries are rare, they cause unnecessary morbidity and prolong hospital stay. A high index of suspicion needs to be kept for nonconvulsive seizures in all patients undergoing spinal surgery with delayed reversal from anesthesia or unexplained altered sensorium. With proper intraoperative and postoperative management, this complication can be avoided.

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