

Management of fracture dorso-lumbar spine in a pregnant female by surgery in prone position

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Received: 1 November 2016 / Revised: 23 April 2017 / Accepted: 7 May 2017
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Abstract Surgical management of thoraco-lumbar spine fracture in pregnancy has specific concerns during surgery like positioning, approach, and radiation exposure to fetus. We report a case of burst fracture of 12th thoracic vertebrae with paraplegia in a young female with 26 weeks of gestation. Surgery was performed in prone position on a Toronto frame. This report also discusses the management of thoraco-lumbar spine fracture in pregnancy with review of literature.

Keywords Dorso-lumbar fracture · Pregnancy · Toronto frame

Introduction

Fracture spine in pregnancy is uncommon [1]. They occur following traumatic event; however, relative osteoporosis of pregnancy is found to be associated [1, 2]. There are only few reports which discuss the management of thoraco-lumbar spine fracture in pregnancy [3–8]. We report a case of 26-week pregnancy with traumatic fracture of twelfth thoracic vertebrae (D12) with paraplegia, which was operated in prone position on Toronto frame.

Case history

A 28-year-old female with 26 weeks of gestation (G3P2L2) had a history of fall from ladder, came to casualty after referral from other primary care center of a remote place, presenting after 36 h with severe back pain and inability to move both lower limbs since fall. She had no history vaginal bleeding, pain in abdomen, or loss of consciousness. Pulse was 88/min, blood pressure—128/76 mmHg. Her fundal height on examination was approximately 26 weeks, fetal heart rate—156/min. Per vaginal examination was normal. Spine examination revealed tenderness at dorso-lumbar junction. Neurologically patient had total spinal cord injury below L1 segment level, which was American Spinal Injury Association (ASIA) grade—a neurological impairment. Knee and ankle reflexes were exaggerated. Urgent ultrasonography (USG) of abdomen showed normal fetus with no other organ injury. After taking consent from patient, plain radiograph of thoraco-lumbar spine was taken. X-ray

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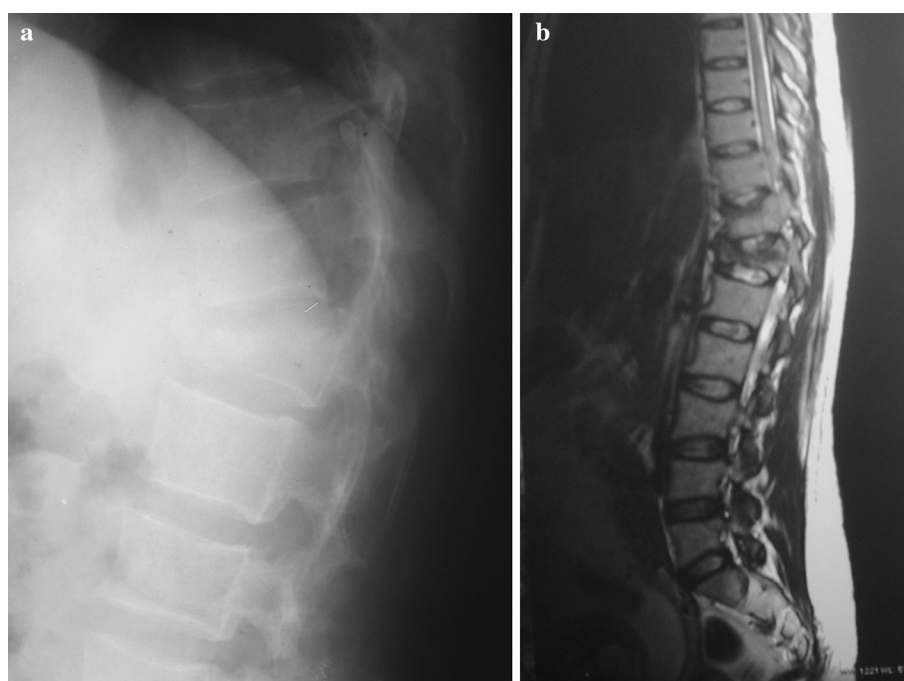
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Fig. 1 **a** Plain radiograph thoraco-lumbar spine showing anterior wedging of D12 vertebra. **b** MRI T2W sagittal image showing fracture D12 vertebra with cord compression, note the fetus in the uterus



showed anterior wedging of D12 vertebra (Fig. 1a). MRI showed burst fracture of D12 vertebra with cord compression (Fig. 1b). A decision of posterior surgical decompression was taken, after explaining the risk of maternal and fetal complications. Toronto frame was assembled and fixed to the radiolucent operating table. Patient was placed in a prone position on Toronto frame (Fig. 2), and height of the frame was adjusted so as the abdomen remained free (Fig. 3). The major advantage of this frame was minimal pressure on abdomen or pelvis, while the patient was supported in prone position by her shoulder and iliac crest. Before procedure FHS was assessed with handheld Doppler and intraoperative monitoring of fetal heart sounds was done by cardiotocogram machine with FHS belt. Care was taken to avoid

blood loss and hypovolemia which could cause fetal bradycardia. Fetal bradycardia if occurred was decided to be managed with rapid intravenous ringer lactate infusion, high flow oxygen inhalation, and if required left lateral position. Care was taken to finish procedure rapidly and achieve hemostasis to prevent hemorrhage. A D12 laminectomy with posterior decompression and short-segment pedicular screw fixation was done (Fig. 4). Postoperative period was uneventful and Doppler done immediately after the surgery did not show any evidence of fetal distress. Patient neurological status remained same during the indoor stay. At discharge, paraplegia care instructions were given and patient was mobilized in wheelchair with Taylors brace. At 39th week of pregnancy patient delivered, a healthy 2.8-kg baby by caesarian section under general anaesthesia. At recent follow-up of 2-year patient was paraplegic with partial recovery of bowel and bladder function.



Fig. 2 Toronto/scoliosis operating frame

Discussion

The management of spine fractures in pregnancy is poorly described in orthopaedics literature. Most of the reported cases discuss the obstetric aspect of this issue [6, 9]. Surgical indications, at a fundamental level involve a comparison of relative risks and benefit of two different treatment methods. Surgical management of spinal fracture in pregnancy carries a risk to both mother and fetus due to positioning, blood loss, and inherent risk of anaesthesia. Conservative management, on the other hand, precludes the early mobilization thus exposing the patient to hazards



Fig. 3 Patient was given prone position on Toronto frame, so the abdomen remained free

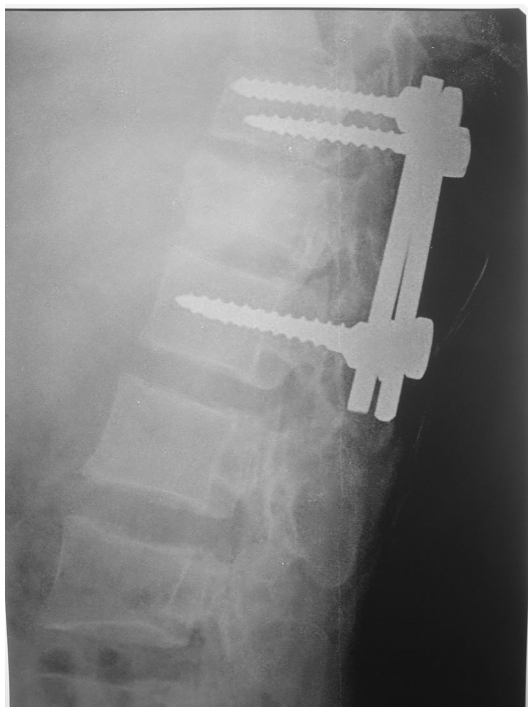


Fig. 4 Postoperative radiograph: short-segment fixation done with pedicular screws

of immobilization like deep venous thrombosis (pregnancy itself is a major risk factor for deep venous thrombosis) and pulmonary complications. An individualized approach is thus recommended in managing spinal surgery in pregnancy. It is always prudent to postpone the surgery until after delivery if the patient is near term; however, in earlier weeks of pregnancy, unstable spinal column injury and incomplete neurological deficit are definite indications to contemplate the surgery.

The surgical approach and positioning for these thoracolumbar fractures in pregnancy is also a debatable issue. Anterior approach has advantage of avoiding pressure on gravid uterus. However, in later weeks of gestation where gravid uterus reaches up to xiphisternum, approaching the thoraco-lumbar spine is difficult by anterior approach. Posterior approach has disadvantages of pressure on gravid uterus due to positioning and need of radiation exposure for pedicular screw fixation. Relton et al. [10] described a specialized frame (Toronto frame) for reducing blood loss in scoliosis surgery in prone position by relieving the extrinsic pressure on IVC. The frame consists of four supports with 45° inward tilt, which are arranged in two V-shaped pairs supporting the lateral aspects of the upper thoracic cage and antero-lateral aspects of the pelvic girdle between the iliac crests and the greater trochanters. With suitable adjustment, this frame gives adequate support and prevents extrinsic pressure on abdomen. Utilization of the same frame in our patient had worked to our advantage and we could give prone position without causing external pressure on the gravid uterus.

The hazardous effect radiation exposure as mentioned earlier is a peculiar concern in stabilizing spinal fractures by posterior approach. The potential biological effects of in utero radiation exposure of a developing fetus include prenatal death, intrauterine growth restriction, small head size, mental retardation, organ malformation, and childhood cancer [11]. The gestational age and the level of absorbed dose are important factors in occurrence of these effects. Most of the teratogenic effects of radiation occur because of exposure during the first trimester (period of organogenesis). From the 16th to the 25th week, very large doses of radiation are required to cause fetal malformations because of reduced radio sensitivity and after the 25th week major fetal malformations and functional anomalies highly improbable [12]. In our patient, because of gestational age of 26 weeks, we could use fluoroscopy for pedicular screw fixation. Nevertheless, care was taken to keep radiation exposure to minimum possible level.

Pregnancy complicated by traumatic paraplegia carries risk to fetus. Goller et al. [13] had done a retrospective investigation on pregnancy in paraplegic patients. He concluded that pregnancy complicated by paraplegia is threatened more than in normal circumstances by:

- (a) The trauma itself.
- (b) The immediate posttraumatic situation of the patient.
- (c) By chronic infections and anaemia in pregnancies following the spinal cord injury.

He also found that malformations and disabilities occurred in that group of patients who became paraplegic during the course of pregnancy.

Table 1 Review of literature on various spine injuries in pregnancy with management and outcome

	Author	Level	Gestation	Age (year)	MOI	Clinical presentation	Neurology	Asso.#	Intra op position	Management	Outcome	Comments/complications
1	Paonessa [4]	D7–8 # dislocation	22 weeks	27	RTA	Hypotension, with B/L pneumothorax, no fetal distress	ASIA A at D8	Multiple rib #		Posterior instrumentation with luque rods D4-D11. No bracing	Uneventful rehabilitation, presented at 34 weeks with SROM, elective CS for failure of labour	
2	Tachnev [3]	T12-L1 #	7 month	20	RTA	–	No	–		Bed rest, mild spinal extension on pillows till delivery	C–S	Following pregnancy presented with, increasing back pain and intermittent paresthesia, required postinstrumentation and fusion
3	“	T12-L1#	6 month	19	RTA	Spontaneous abortion within 24 h	No	–		Conservative—bed rest and orthosis	Segmental instability with kyphotic deformity and development of neurodefecit, rx with posterior fusion	
4	Snake [5]	D5,8	19 weeks	24 years	RTA	Back pain	No	–		Anterior thoracoscopically assisted reduction and stabilization @ D8 level	Final outcome improved neurodefecit	
5	Glison [6]	C6–7 subluxation	26 weeks	30	RTA	Neurogenic shock, neck pain, LRTI in 1st week of admission?	Paraplegia with sensory level @ D10			Cervical traction and management of neuro-shock followed by anterior spinal fusion	Improvement in hemodynamic and pulmonary status after spine sx	Stabilization of ex spine permitted nursing of patient in upright position
										Induction labour @ 38 week		

Table 1 continued

Author	Level	Gestation	Age (year)	MOI	Clinical presentation	Neurology	Asso.#	Intra op position	Management	Outcome	Comments/complications
6 Martinez Padilla [7]	D12-L1 # dislocation	9 weeks	31	Direct	Severe back pain	ASIA E			Posterior stabilization by transpedicular fixation D11-L3 during pregnancy followed by mobilization with brace. Elective Caesarian Section atterm. Anterior BG from D12-L2 6 weeks after delivery	Loss of correction at 10 weeks after 1st surgery without significant clinical manifestations	The radiation dose did not exceed the allowable cumulative dose
7 Lenarz [1]	D12 burst #	17 weeks	39	Fall from height	Back pain and wrist pain H/O paraneoplastic SZ	Paraparesis with bowel bladder incontinence	DER#	Rt lateral position	Anterior decompression by retroperitoneal approach with anterior fixation from D11-L1 along with carbon fibre cage and BG. Was mobilized without brace. Delivered by CS	Complete Recovery of power and bowel bladder continence With bony fusion.	Author considered anterior approach was the best option to provide safe positioning of the mother
8 Kuzkoisky [8]	C1-2 #	15 weeks	40	RTA	-	-	# ribs	Prone	Posterior cervical spinal fusion	Uneventful postoperative course and full recovery	Aggressive and timely surgical and anaesthetic management may be life saving

We reviewed the literature on management of spinal trauma in pregnancy (Table 1) and we could find only a few cases that have been managed by posterior approach. Martínez [7] described D12–L1 fracture dislocation operated by posterior approach at 9-week pregnancy. They calculated the maximum allowable safe dose of radiation and limited the radiation exposure below teratogenic level. In early weeks of pregnancy, the gravid uterus remains intra pelvic, and hence, there is a little fear of extrinsic compression. Paonessa [4] had described a case of D7–D8 fracture dislocation at 22 weeks of pregnancy treated by posterior fusion using Leque's rod. However, the details of positioning were not discussed in this paper.

In conclusion, spinal fractures and cord injury in pregnancy are complex issue. The treatment plan should be individualized by weighing the risk and benefits of conservative against the surgical management. A specialized frame described by Relton et al. [10] can be utilized to avoid pressure on gravid uterus in case posterior surgery is contemplated.

Compliance with ethical standards

Conflict of interest None of the authors has any potential conflict of interest.

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