



# Surgical management of cauda syndrome in third trimester of pregnancy focusing on spinal anesthesia and right lateral positioning during surgery as possible practices

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## Abstract

**Purpose** This article presents a surgical solution of a lumbar disc hernia of a pregnant woman focusing on the use of right lateral positioning, spinal anesthesia which has not previously been utilized in third trimester and discusses positioning options, and possible anesthesia methods with the surgical procedure options.

**Methods** Case report.

**Results** A left-sided L5/S1 lumbar disc hernia (verified by magnetic resonance imaging) of a 35-year-old, 32-week-pregnant woman with a deteriorating neurological status leading to cauda syndrome was treated successfully by microdiscectomy in right lateral position applying spinal anesthesia.

**Conclusions** So far examples are given for almost every possible patient position in the third trimester except the right lateral one. All the previously presented positionings (prone, left lateral) were equally effective regarding the outcome with none being better than another. For left-sided lumbar pathologies performed in the third trimester the right lateral position might be an alternative option for easier access. Based on the literature an epidural and general anesthesia can be applied successfully in the third trimester. Spinal anesthesia might be another anesthesia consideration.

**Keywords** Lumbar disc herniation · Pregnancy · Cauda syndrome · Spinal anesthesia · Right lateral position

## Introduction

Low back pain occurs often during pregnancy, mainly in the third trimester [1]. Lumbar disc herniation causing severe or progressive neurological deficit, especially cauda syndrome, is rare, and misdiagnosis or delay in treatment may lead to permanent neurological impairment. A cauda syndrome case solution regarding a pregnant woman in third trimester who underwent an urgent lumbar microdiscectomy and the review of the literature of the surgical positionings and the

anesthesiology methods are presented in this article. This case report highlights the possible usage of right lateral positioning and spinal anesthesia for lumbar discectomy in third trimester without complication.

## Case presentation

A 35-year-old, 32-week-pregnant (primigravida, nulliparous) woman presented with incapacitating low back pain, left sciatica and with a 12-day left foot palsy (foot dorsal flexion, hallux dorsal flexion and foot plantar flexion strength 3/5). Considering the moderate and non-acute palsy she was given a periradicular lidocaine injection, which was effective and the pain subsided. Two days later cauda syndrome occurred with an additional right-sided sciatica. A magnetic resonance imaging (MRI) scan demonstrated a L5/S1 lumbar disc hernia with a left-sided free fragment behind the S1 nerve root. On examination, the straight leg-raising test results were positive at 35° on the left, and 60° on the right side. Perineal and perigenital numbness with

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left S1 nerve root dermatomal hypoesthesia was revealed. Urinary hesitancy and post-voiding 350 ml urinary retention (i.e., bladder dysfunction) were noted after catheterization. The appropriate method of surgery, the surgical positioning, fetal monitoring and the optimal type of anesthesia were discussed by the obstetrician, neonatologist, anesthesiologist and neurosurgeon. The patient underwent urgent surgery, and the obstetrician and neonatologist were available on standby in case necessity of an acute cesarean section would have arisen. We used right-sided lateral positioning due to left-sided pathology, cushioning the abdomen with a pillow to lessen possible inferior vena cava and aorta compression. Spinal anesthesia, instead of an epidural or general anesthesia, was applied along with continuous electrocardiography, monitoring the mother's blood pressure and oxygen saturation non-invasively. The fetal heart was continuously monitored with cardiotocography, with no change detected. A left-sided L5/S1 lumbar microdiscectomy from L5 laminotomy, partial facetectomy, flavectomy was performed, utilizing the Caspar mini-open retractor system and operative microscope. The procedure took 60 min, and the post-operative course of a lumbar discectomy was uneventful. After surgery she was able to walk without support, and the sciatica showed significant improvement while the lumbar pain showed moderate resolution. Additionally, the bladder function resolved itself. Perineal hypoesthesia decreased and her foot palsy was mildly improved, although the left S1 dermatomal sensory deficit remained. The patient delivered a healthy girl at 36 weeks of gestation by cesarean section. Pre-termination of gestation was necessary due to her progressively elevated blood pressure and progressing edema, which affected the entire body with an increased amount of protein output in the urine.

## Discussion

Low back pain often occurs among pregnant women mainly in the third trimester, although the incidence of symptomatic lumbar disc herniation is low (1 of 10,000 pregnancies). The incidence of associated severe neurological deficit, especially cauda syndrome, is even lower [2–4].

In this day and age, more and more women become pregnant in their fourth decade when the occurrences of lumbar disc herniation are more frequent than under the age of 30. Consequently, the incidence of symptomatic lumbar disc herniation necessitating surgery during pregnancy may increase, which indicates why this topic might become more and more important.

When treating pregnant women with a lumbar disc hernia, surgeons must consider and be aware of the risks, advantages and potential drawbacks of the different surgical approaches, type of anesthesia methods and patient positionings.

There are only a few articles written about surgery for lumbar disc hernias in pregnant women. To the best of our knowledge case reports in the literature presenting surgically treated cauda syndrome during pregnancy are rare [2, 4–9]. We wish to highlight that in none of these above-mentioned articles were spinal anesthesia and right lateral positioning safely applied during the third trimester.

## Surgical indication

If the diagnostic imaging shows a corresponding lesion to cauda syndrome or other severe or progressive neurological deficits urgent surgical intervention is indicated in any trimester of pregnancy [2, 10, 11]. Additionally, those who have verified lumbar disc herniations which cause intolerable sciatica without neurological deficit and are resistant to conservative treatment are candidates for surgery [12]. If the intolerability of a sciatica, with or without low back pain, which is nonresponsive to conservative treatment is not in itself enough argument for surgery then consideration should be given to the high level of maternal stress caused by the pain which may increase the risk of spontaneous abortion or preterm birth as another indication [12–14]. Generally, in case of lumbar surgeries focusing on pain relief, consideration must be given to the neonatal survival rates by cesarean delivery (which might be necessary due to the lumbar surgical procedure) prior to 24 weeks of gestation [15].

## Positioning

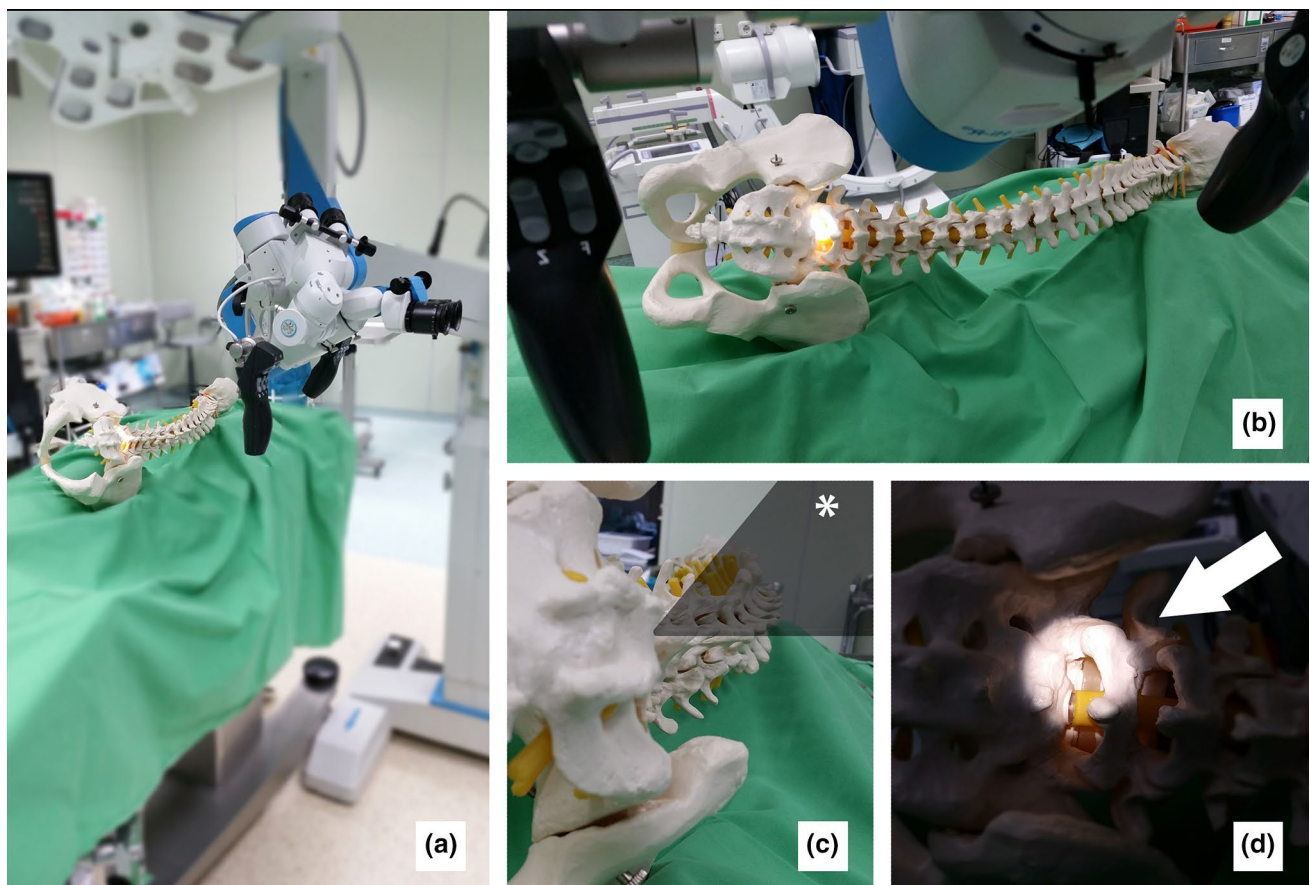
The majority of authors advise left lateral positioning for lumbar discectomy regardless of the side of the disc hernia in the second and third trimester. Their opinion is that too excessive abdominal pressure may cause preterm labor, and right lateral positioning may increase the risk of compression of the inferior vena cava and the aorta causing aortocaval syndrome [8, 15–18]. Although aortocaval syndrome occurs primarily in the supine position, there are some patients who had their surgeries performed in the prone position with chest and hip cushioning in the second trimester who experienced no complications [5, 10, 19]. One of these groups, Martel et al., admitted that the surgical party found lateral positioning an inconvenient one, and consequently used the prone positioning in the third trimester as well [19]. There are a few examples of performing a cesarean section and lumbar discectomy as a one-stage procedure near or at the end of gestation. In this procedure, the cesarean delivery was performed first in supine position after which the patient was turned so that the lumbar disc excision could be performed in the prone position [2, 6, 20, 21]. If the child has already been delivered, the question of excessive abdominal pressure becomes moot.

The left lateral positioning for left-sided standard lumbar disc hernia excision, even using a microscope, might provide less accessibility than right-sided positioning. If the surgeon desires a parallel approach to the dorsal midline spinal structures (the standard approach) without being obstructed by these structures the patient must be elevated to the surgeon's head level. This surgical setup may render the procedure inconvenient. Figure 1 shows that if the patient is laid on one side it is easier and more convenient to approach the opposite side of the lumbar disc in question. Consequently, if the patient has a right-sided lumbar disc hernia, for a convenient open surgical approach the patient should be laid on their left side, and vice versa.

There is no contraindication against sleeping on right side during pregnancy, including the second and third trimesters, and many women do so. Mills et al. found that 21% of the women examined in their third trimester slept on their right side, adopting a 90° tilt [22]. Bamber et al. measured cardiac output, as it is directly affected by aortocaval compression and is the key determinant of placental

blood flow in left lateral, right lateral, supine positions and in 12.5°, 5° tilted position (from supine) of both sides in pregnant women [23]. Their study showed that cardiac output is best optimized when pregnant women lie on their left sides (average 7.7 L/min  $\pm$  1.9 SD), while in supine position cardiac output is considerably less (average 6.5 L/min  $\pm$  1.4 SD). However, values in right-sided positioning do not fall short compared to those measured in left lateral position (in right lateral position average 7.3 L/min  $\pm$  2.2 SD). Therefore, we postulated that the chance of developing a hemodynamically significant compression on inferior vena cava and aorta during an approximately 1-h-long lumbar spinal procedure in the right lateral position in a patient who had not previously exhibited hypotension syndrome may be over-emphasized.

Weighing the chance of an aortocaval syndrome occurrence against a more comfortable operating position for the surgeon in right-sided lateral positioning approaching the left-sided lumbar pathology, we decided to perform the discectomy from the right lateral position.



**Fig. 1** A spine model is laid on the right side, microscope positioned for left-sided L5–S1 lumbar disc hernia surgery and the light of the microscope is aimed for the procedure, **b** same is shown from a different angle as on **a**, **c** spine model is presented in right lateral posi-

tion and the field of view which can be used for the approach for L5–S1 left-sided lumbar disc hernia is marked by asterisk, **d** light of microscope is illuminating L5–S1 lumbar disc through the spinal canal from posterior direction

The feasibility of endoscopic surgery in the third trimester was presented by Kim et al., while others used standard discectomy (microdiscectomy) procedures [7]. If endoscopic surgery is used, the choice between left- and right-sided positioning might not be influenced by the side of the lumbar lesion. Consideration should be given to the possibility that, in case endoscopic surgery is the chosen approach for lumbar discectomy and an intraoperative surgical complication occurs, conversion to open surgery may be necessary.

## Anesthesia

When choosing between different anesthesia methods for surgery required during pregnancy it is important to understand the physiological changes of the mother during pregnancy and the effect of drugs on both her and the fetus. It is mandatory to keep their safety in mind. It is also important to minimize alteration in maternal physiological parameters to maintain optimal oxygenation and uteroplacental perfusion during any surgical procedure [24, 25].

Epidural/spinal or general anesthesia is not contraindicated at any stage of pregnancy according to the literature [26]. In choosing the correct anesthesia for an L5/S1 microdiscectomy we can choose either general, epidural or spinal anesthesia.

### General anesthesia

Those who applied general anesthesia at any gestation trimester have the following arguments: a volatile agent like sevoflurane may suppress preterm labor. General anesthesia provides a rapid and reliable onset of anesthesia [8, 15, 16, 27]. When cesarian delivery and lumbar disc excision needed to be performed during the same surgery, general anesthesia was used in every case in which the cesarean section was done first (in the supine position), and lumbar procedure was accomplished next (in the prone position) [2, 6, 20, 21]. Brown and Brookfield applied general anesthesia for the cesarean section because they thought that the repeated Valsalva maneuvers required for vaginal delivery under epidural anesthesia could aggravate the cauda syndrome during induced labor [2]. If general anesthesia is used then increased cardiac output, minute ventilation, oxygen consumption,  $V/Q$  mismatch, the elevated intragastric pressure, and reduced lower oesophageal sphincter tone must be taken into account [28]. Uteroplacental blood flow is not autoregulated; therefore, it is dependent on uterine blood pressure. Although most of intravenous and inhalational anesthetic agents cause myocardial depression in various different ways the majority of complications relate to the airway. Failed intubation is much more common in obstetrics than non-obstetric anesthesia (1:250 v. 1:2000, respectively, although more recent reports suggest that this is perhaps

an overestimate) [29]. The effects of light general anesthesia and its associated catecholamine surge with resulting impaired uteroplacental perfusion are considerably more dangerous to fetus.

### Epidural/spinal anesthesia

Despite lack of evidence, regional anesthesia is preferred to general anesthesia where feasible.

**Pros** Regional anesthesia avoids the potential risk of failed intubation and aspiration especially in third trimester, due to the anatomical changes which occur in pregnancy [5, 25]. It also enables the mother to maintain her own airway, provides excellent postoperative analgesia and also has the advantage of avoiding the poly-pharmacy practiced in general anesthesia [25]. A cleaner operative field due to less bleeding may be explained by spontaneous breathing of the patient, causing lower intra-thoracic pressure with subsequent less distention of the epidural veins [30]. In the course of spinal anesthesia pencil-point-type needles reduce the dural injury (especially the 27G needle, which we used in this case), and using 0.5% hyperbaric bupivacaine the mean duration of anesthesia is 90–120 min. In the case of a prolonged operation, the intradural drug administration might be repeated by the surgeon, or the surgical site can be locally infiltrated [31, 32]. However, in case of a dural tear if the necessity of anesthetic administration arises these techniques can be combined, or if these fail anesthesia can be generalized.

**Cons** Regarding epidural anesthesia, the epidural vein engorgement, the decrease of the epidural space volume, the reduced albumin concentration with lower plasma binding increase the risk of local anesthetic toxicity. Interspinal ligaments are hormonally softened, causing difficulty with epidural loss of resistance techniques and higher risk of dural puncture [33, 34]. A further disadvantage of epidural and spinal anesthesia is that these can lead to sudden hypotension due to vasodilation of peripheral blood vessels, potentially resulting in decreased intra-uterine blood flow which may cause fetal distress and preterm labor [8, 19, 20, 29]. However, it can be easily treated with sympathomimetic agents (e.g., ephedrine, phenylephrine). Considering the aforementioned benefits of regional anesthesia and especially of spinal anesthesia, our group felt that using this anesthesia method was the best option.

### Fetal monitoring

Some authors state that fetal heart monitoring (cardiotocography/ultrasound) during surgery is indicated after 20 weeks of gestation while others define 23 weeks as the threshold [5, 12, 35].



Martel et al. did not monitor the fetal heart rate while operating on a woman in her 35th week of pregnancy in the prone position during the lumbar discectomy. They monitored the mother's blood pressure, using an arterial line to avoid hypotension which could result in decreased uterine blood flow [19].

We used cardiotocography (which showed no change in the fetus's heart rate) as it is advised planning an urgent cesarean section in case the need had arose. In case of an urgent cesarean section, the anesthesia would have been generalized if the spinal anesthesia had worn off too quickly.

## Conclusion

None of the few reports found in the literature presenting discectomy in cases of pregnant women in their third trimester revealed an adverse effect with either an epidural or general anesthesia. We also did not experience any complications with spinal anesthesia. Spinal anesthesia might be a viable option in the third trimester during pregnancy for selected lumbar procedures; however, no general conclusion can be drawn from this single case.

Concerning the positioning decisions for lumbar procedures performed on pregnant women, there are pros and cons for the different positions (i.e., cushioned prone, left lateral, right lateral) and examples of every positioning possibility. Because there is no contraindication for right-sided lateral positioning in this type of surgery, right lateral positioning might be an option for easier access in left-sided lumbar disc hernias.

## Compliance with ethical standards

**Conflict of interest** Viktor Zsolt Kovari and Laszlo Horvath declare that they have no conflict of interest.

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