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Suspected total spinal in patient having emergent Caesarean section, a case report and literature review

H. Virgin (MD) (Senior Consultant), E. Oddby (MD PhD) (Senior Consultant), J.G. Jakobsson (Adj. Professor Senior Consultant Director of Doctoral Education Clinical Research and Development)*

Department of Anaesthesia & Intensive CareInstitution for Clinical Science, Karolinska Institutet, Danderyds University Hospital, SE 182 88 Stockholm, Sweden

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ABSTRACT

INTRODUCTION: Epidural analgesia is commonly used for management of pain during childbirth. Need for emergent Caesarean section e.g. because of signs of foetal distress or lack of progress is however not an uncommon event. In females having an established epidural; general anaesthesia, top-up of the epidural or putting a spinal are all possible options. Dosing of the spinal anaesthesia in females having epidural is a matter of discussion.

PRESENTATION OF CASE: We describe a healthy 32 years, 0 para mother in gestation week 36 having labour epidural analgesia but due to foetal distress scheduled for an emergent Caesarean section category 2 that developed upper extremity weakness and respiratory depression after administration of standard dose high density bupivacaine/morphine/fentanyl intrathecal anaesthesia. She was emergent intubated and resumed motor function after 15–20 min.

DISCUSSION: A too extensive cephalic spread was the most plausible explanation to the event. Whether or not reducing the dose for a spinal anaesthesia in mothers having an established labour epidural analgesia is a matter of discussion. It is of course of importance to achieve a rapid and effective surgical anaesthesia but also avoiding overdosing with the risk for a too high cephalic spread.

CONCLUIOSN: To perform spinal anaesthesia for emergent Caesarean in patients having an epidural for labour pain is a feasible option and should be considered in category 2–3 section. The dose for a convert spinal block should be assessed on an individual basis and reasonably reduced.

1. Introduction

Anaesthesia for emergent Caesarean section (CS) in females having an epidural analgesia is a matter of discussion. In critical situations general anaesthesia is preferred increasing speed of induction and time to achieving surgical anaesthesia. In situations where the time to delivery is urgent, but not critical within minutes, spinal or top-up of the epidural anaesthesia may be safe, safer option avoiding the risk for regurgitation and aspiration associated to rapid sequence induction if a pregnant none-fasting female.

2. Case presentation

A healthy mother of 32 years was 36 weeks pregnant with her first baby. Labour had been induced for reasons of intrauterine growth restriction. An epidural catheter had been administered earlier in the labour process. A decision to perform an acute caesarean was taken due to signs of foetal distress during contractions. The obstetrician assessed the section to be grade 2. An epidural catheter had been administered earlier in the labour process, but the intermittent injections were reported to have had no or very limited effect on labour pain. The agents used for epidural anaesthesia were bupivacaine 1 mg/ml and sufentanil 0,5 mcg/ml, in volumes of 10 ml administered as a bolus at need with a minimum time laps of 60 min. A total of 55 ml had been administered over the course of 7 h. Last administrated dose was 135 min before spinal anaesthesia. The decision by the attending anaesthetist was therefore to perform a spinal anaesthesia.

In a sitting position, a dose of bupivacaine (with added glucose, "heavy" 5 mg/ml) 13 mg, fentanyl 25 mcg and morphine 0.4 mg/ml, 100 mcg was administrated intrathecally according to local routines. The patient was then immediately helped to supine position, with a left side tilt. Within one minute of administration, she showed signs of upper extremity weakness also became sluggish and was slow to respond to verbal stimuli. When vigorously stimulated with touch and speech, she could give eye contact and

* Corresponding author at: Department of Anaesthesia & Intensive Care, Danderyds Hospital, 18288 Danderyd, Sweden.
E-mail addresses: helena.virgin@ds.se (H. Virgin), eva.oddby-muhrbeck@ds.se (E. Oddby), jan.jakobsson@ki.se (J.G. Jakobsson).

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tried to form words, but made no sound. There were progressive signs of respiratory insufficiency and saturation started to decrease, and at saturation (SpO2) of 85% she became unconscious. Decision was made for immediate intubation – which was performed without any need of muscle relaxation. The baby was delivered immediately, cried seconds after delivery and proved good health afterwards. Within 8 min, the mother could open her eyes, and a few minutes later flex the fingers of both hands and accomplish voluntary breathing on request. After approximately 20 min she regained spontaneous breathing. Hemodynamic was controlled throughout the episode; systolic blood pressure of 100–115, and a pulse above 90. After closing the wound she was kept sedated and a CT scan of brain and thorax was performed to rule out the differential diagnosis e.g. cerebral insult or pulmonary embolus. Both turned out normal. There were no signs or laboratory deviations suggesting toxicosis. She was shortly after the negative CT extubated and could soon thereafter with her baby be transferred to a general maternity ward. The mother and child had a further completely uncomplicated course.

3. Discussion

The choice of anaesthetic technique for emergent CS should be based on the urgency for delivery of the neonate. A classification of urgency of CS was described by Lucas et al. in 2000 and this grading has become accepted in many institutions. 'Emergency' and 'elective' CS equate to categories 1–3 and category 4 respectively. Category 1 defined as immediate threat to life of woman or fetus; category 2 maternal or fetal compromise which is not immediately life-threatening, category 3 as needing early delivery but no maternal or fetal compromise and a category 4 as at a time to suit the patient and maternity team, thus merely elective event[i]. This grading system has become the recommended for national use by e.g. the National Institute for Clinical Excellence (NICE) in the UK since 2004 [2]. General anaesthesia is reasonably the preferred in the most urgent once (category 1) cases while it seems more than reasonable to consider both top-up of epidural or spinal in situation where some additional minutes are available; category 2–4. Kinsella et al. published in 2010 the results of a survey around anaesthetic techniques for emergent CS in England. They found some inconsistencies with regards to definitions. They saw that the terms emergency/urgent/scheduled/elective as described by Lucas et al. [1] to accompany the numeric categories from 1 to 4 in The Caesarean Section guideline as published by NICE were not explicitly used [2]. They found the median general anaesthetic rate to be 51%, 12% and 4%, for category the three categories 1, categories 2–3 (non-elective/emergency CS) and category-4 (elective), respectively and with rather huge variability.

There are general recommendations for decision to delivery time interval but no firm guide around anaesthetic technique to be used. The present NICE guidelines states[1]; *Decision-to-delivery interval for unplanned CS;* Use the following decision-to-delivery intervals to measure the overall performance of an obstetric unit: 30 min for category 1 CS both 30 and 75 min for category 2 CS. However there is no guide for anaesthetic technique. Tyner and Rayburn published in 2013 a review concluding that classification and time guidance is clear but explicit comments on techniques is vague. They found however sparse recommendations around explicit techniques to be used. US practice was described being regional anaesthesia as preferred technique for elective CS however general anaesthesia, although carrying risk, being commonly used practice for emergent cases [2]. Regan and O'Sullivan conducted a survey in UK published in 2009 [3]. They found a varying practice. Top-up was not uncommonly used but the top-up drug, volume and mixture as well as when/how the top-up was administered, in the labour ward or after transfer to the operating theatre varied considerable. The practice showed several aspects for improvement; *Of the 161 respondents thirty-three respondents reported a total of 43 adverse incidents associated with the extension of epidural blockade. These included high blocks, inadequate blocks and possible intravascular injections, the latter resulting in two seizures and one cardiac arrest.*

Combining spinal and epidural anaesthesia in obstetrics has been described since long. Raval et al. showed in 1988 the combined technique to be effective, providing better intraoperative anaesthesia than epidural and with no difference in side effects [4] while Ithnin et al. showed a more extensive block associated to the combined spinal epidural technique [5]. They injected a 10 mg hyperbaric bupivacaine at L3–L4 as single spinal or in conjunction to loss of resistance epidural. The maximal sensory block achieved in group combined technique was statistically higher than that in single spinal group (median C6 interquartile range, C5 to C8 versus median T3, T2 to T4, $P < 0.001$). Goy et al. conducted a sophisticated study looking for effective dose comparing single spinal and combined spinal epidural technique [6]. Blocks were put at L3–L4 with hyperbaric bupivacaine. They defined "successful" spinal anaesthesia outcome arbitrarily as sensory anaesthesia at or above the T6 dermatome lasting for 60 min. Median effective bupivacaine dose was found to be 9.18 mg (95% confidence interval, 8.89–9.47 mg) for the combined spinal epidural technique as compared with 11.37 mg (95% confidence interval, 10.88–11.86 mg) for single spinal ($P < 0.001$). Thus combined technique required 19.3% less local anaesthetic to achieve the defined clinical target. Horstman et al. studied also whether the combined spinal epidural technique was associated to changes in the epidural pressure and thus possibly could cause a more pronounced cephalic spread of the spinal anaesthesia [7]. They did not see any difference. The single spinal and the combined spinal and epidural techniques inserted in the lateral decubitus position resulted in similar extent of sensory blockade and cerebrospinal fluid pressure. They concluded that altering the intrathecal dose is not necessary and that any difference in intrathecal pressure associated with initial placement of an epidural needle in the epidural space during combined spinal epidural anaesthesia is clinically inconsequential.

There are also studies in none-obstetric patients suggesting that the combined technique is associated with a higher level of sensory block and thus a reduced need for local anaesthetic as compared with a single-shot spinal anaesthesia. Goy et al. studied the effects, spinal versus combined spinal epidural also in females undergoing minor gynaecological surgery [8]. They concluded that induction of subarachnoid block (10 mg hyperbaric bupivacaine) by a combined-spinal epidural technique produces a greater sensor motor anaesthesia and results in prolonged recovery when compared with a single-shot spinal technique. They found also more frequent incidence of hypotension with the combined technique. Leo et al. [9] conducted a study comparing 7, 8 and 9 mg hyperbaric bupivacaine in combination with 100 μg morphine injected in combination spinal epidural technique for Caesarean section [9]. They found the lowest dose of hyperbaric bupivacaine (7 mg) to provided equally rapid onset and effective anaesthesia for Caesarean delivery while reducing the incidence of hypotension compared with 8 and 9 mg. The 9 mg dose had a high median spread; T1 [C8-T2].

There are no explicit guidelines available for how to manage the emergent Caesarean class 1–3 in females having an established epidural analgesia. The use of top-up when feasible is not uncommon, but conversion to spinal anaesthesia has also become reasonably accepted. There are two recent papers describing the safe use of conversion. Visser et al. published in 2009 a retrospective analysis of females having had Caesarean section. Of the 693 patients, 508 (73.3%) had no epidural analgesia and received

[1] https://www.nice.org.uk/guidance/cg132/chapter/ftn.footnote_1.

spinal anaesthesia. There were 128 patients received, converting to spinal anaesthesia, following epidural anaesthesia for labour, 19 had a top-up epidural, and 38 received general anaesthesia. When comparing both spinal anaesthesia groups, no clinically relevant differences were observed regarding the incidence of total spinal block (0% in both groups) or high spinal block (0.2 vs 0.8%, P = 0.36). The number of hypotensive episodes, the total amount of ephedrine administered, and the Apgar scores recorded at 5 and 10 min were similar amongst groups. Huang et al. has recently published their clinical experience with spinal as an alternative for anaesthesia in prurient requiring section [10]. In all 2341 had labour epidural and 334 of them were converted to have a Caesarean section. Spinal anaesthesia was used with 163 parturients and epidural anaesthesia with 96. No high-level block or total blocks was noted. The time from anaesthesia to surgical incision and the total anaesthesia time were shorter, hypotension episodes were more frequent, the rate of perioperative ephedrine administration was higher, and the rate of midazolam was lower in the spinal anaesthesia group as compared to top-up epidural. They found no side-effects, more than somewhat more a more profound cardiovascular depression but they still consider transition to spinal a safe and effective practice.

Public domain literature contains very sparse reports of "total spinal" in conjunction to Wagner describes in 1994 a patient having a total spinal associated with rather minor cardiovascular effects following injection of 1.5 ml of 0.75 mg/ml hyperbaric bupivacaine some 7 h following accidental dura puncture [11]. Furst and Reisner describe two cases of high spinal anaesthesia following failed epidural block in obstetric patients scheduled for Caesarean delivery [12]. They also performed a retrospective chart review and estimated the incidence of high spinal anaesthesia to be 11% in patients after prior failed epidural blockade versus less than 1% in patients undergoing spinal anaesthesia alone. Gupta et al. published in 1994 a paper suggesting spinal anaesthesia as contraindicated following labour analgesia based on 3 cases with unintended high spinal [13] . In all 3 cases, caesarean section was required for failure to progress. Hyperbaric bupivacaine was given in doses of 10 mg, 12.5 mg and 15 mg respectively. Within 2–4 min all 3 patients had a high block, complained of difficulty in breathing and subsequently developed apnoea.

The decision to convert to spinal anaesthesia was based on the fact that this was a category 2/3 Caesarean section and that the epidural had not had optimal effect. The spinal anaesthesia drugs and doses were administered in accordance to routines of the department. We are not able to give any explicit reason for the described event. We are prone to believe that it was an effect of local anaesthetic cephalic spread possibly related to the prior epidural and doses administered. CT imaging of brain and thorax was found normal, and patient resumed muscle strength in reasonable time fashion. No signs of eclampsia were seen and patient had a subsequent complete unremarkable course.

In summary, it seems reasonably well-accepted to perform spinal anaesthesia in patients having or having had an epidural for labour pain "when needed". Top-up epidural is a likewise attractive alternative. The dose for a convert spinal block should reasonably be assessed on an individual basis but possibly reduced.

Conflicts of interest

None of authors have any conflict of interest in relation to the present case report, Spinal anaesthesia for emergent Caesarean section in patient having a labour epidural causing high spinal block, a case report and review of the literature.

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Not applicable, Ptainte has provided informed conset to publication of the case report.

Consent

Patient has provided explicit informed consent.

Author contribution

All authors have contributed equal to the preparation of the present paper; Spinal anaesthesia for emergent Caesarean section in patient having a labour epidural causing high spinal block, a case report and review of the literature.

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