



Spinal Anesthesia for Women with Quadruplet Pregnancy: A Preventive Approach to Decrease the Incidence of Nausea, Vomiting, and Hypotension During Cesarean Section

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Abstract

The incidence rates of triplet (0.09%) and quadruplet pregnancies (0.003%) are low, and considering the absence of established protocols anesthesia must be planned accurately. From the perspective of an anesthesiologist, elective cesarean sections in patients with multifetal pregnancies should be performed using SPA. Literature suggests the use of hyperbaric bupivacaine in combination with an intrathecally administered opioid to avoid side effects (nausea, vomiting, and hypotension). Patient blood management and all measures to treat anemia and reduce intraoperative blood loss are necessary (Misgav-Ladach Cesarean technique, normothermia, normocalcemia, balanced gas exchange). Hyperfibrinolysis should be interrupted by tranexamic acid.

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Abbreviations/Acronyms

ASA: American Society of Anesthesiology; °C: degree Celsius; dl: Deciliter; Fe: Ferric; Fig: Figure; G: Gauge; h: hour; 5-HT₃: 5-Hydroxytryptamin-Type-3; I.E.: International Units; kg: Kilogram; L: Lumbar; LA: Local Anesthetic; MCV: Mean Corpuscular Volume; mg: milligram; ml: milliliter; µg: microgram; NPH: Neutral Protamine Hagedorn long-acting basal insulin; %: Percent; s.c.: Subcutaneous; SPA: Spinal Anesthesia; TH: Thoracic

Introduction

In the United States of America (USA), 3400 triplet pregnancies (0.089%), 115 quadruplet pregnancies (0.003%), and 10 multifetal pregnancies with five or more children occurred in 2018 according to the National Vital statistics report [1]. The probability of quadruplet or multifetal pregnancies is 1:303331.

Most of the quadruplets are delivered by cesarean section and account for 98% of all the children with low birthweight (<2500 g birthweight) and 50% of all children with very low birthweight (<1500 g birthweight). They also account for 97% and 82% of all the children with gestational ages of <37 weeks and <34 weeks respectively.

World Health Organization (WHO) recommends various quality and safety tools, e.g. best practice protocols for clinical procedures or safety and checklists; however, no standard anesthesia protocols are established in this regard.

Some anesthesiologists and obstetrician suggest general anesthesia [2] and some perform neuraxial anesthesia like spinal or epidural anesthesia for operative delivery [3].

Herein, we report the use of Spinal Anesthesia (SPA) for multifetal childbirth by cesarean section. After obtaining written consent for publication from the patients, we report two cases of cesarean sections according to our new protocol, one for a triplet childbirth and another for a quadruplet childbirth, performed using SPA.

Case Presentation

Our patients were 28- and 32-year-old women in their 31st + 6th (quadruplet) and 33rd + 5th (triplet) week of pregnancy, respectively, when they cesarean section for childbirth. Because of

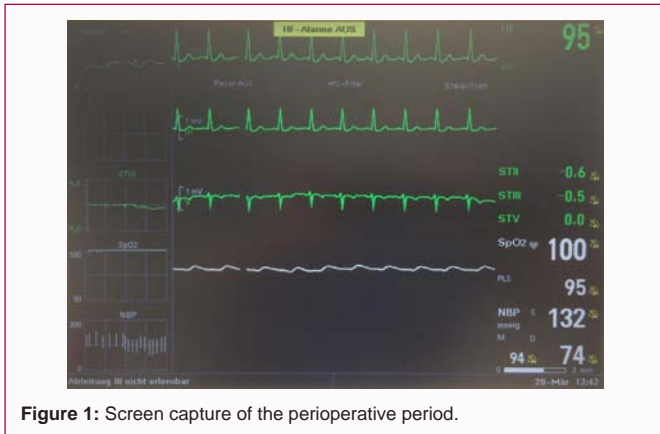


Figure 1: Screen capture of the perioperative period.

cervix insufficiency, both women were hospitalized in the 26th week of pregnancy. All departments (gynecology & obstetrics, neonatology, and anesthesiology departments) involved were informed about patient status and the surgical delivery was scheduled. The otherwise healthy woman with quadruplet pregnancy had developed iron deficiency anemia (hemoglobin, 8.9 g/dl; MCV, 76.1 fl; Transferrin Saturation, 12.7%; Fe, 66 µg/dl; Ferritin, 368 mg/dl), gastrointestinal reflux disease, hypothyroidism, and pregnancy-induced diabetes mellitus during her pregnancy. Diabetes was treated with 16 I.U. Protaphane (an NPH insulin [neutral Protamine Hagedorn long-acting basal insulin]) s.c. per day. L-thyroxine and pantoprazole was administered for the treatment of hypothyroidism and gastrointestinal reflux disease, respectively. The patient refused oral iron supplementation because of gastrointestinal side effects.

Weeks before surgery we discussed all possibilities and advantages and disadvantages of various anesthesia procedures with the patients. SPA was preferred to general anesthesia for elective cesarean section, as suggested by the ASA Task Force [4].

To prevent dural-puncture spinal headache, we used a 27 G Whitacre Pen point needle [5] and administered 9 mg hyperbaric bupivacaine (carbostesine® 0.5% hyperbaric, 1.8 ml) and 5 µg sufentanil (1 ml). The intrathecal injection was performed on level L3/4. Ondansetron (Zofran®, 4 mg) was administered prior to the incision and directly after the intrathecal injection of local anesthetic, in combination with sufentanil, to hemodynamically stabilize our patients and prevent nausea and vomiting because of hypotension. Parallely, a bolus of ephedrine (Ephedrine®, 15-30 mg) or a mixture of cafedrine/theodrenaline (Akrinor®, 30-60 mg/3.6 mg) was administered intravenously.

The course of the spinal anesthesia as well as the birth in both the patients with multifetal pregnancy was without any complications (Figure 1). Surgery could be start in 10 min after the intrathecal injection of LA and sufentanil. The Misgav-Ladach Cesarean technique was used, which is considered to be gentler than conventional techniques. All babies were born within 2 min to 4 min after the surgery had started. The obstetrician delivered the first and second quadruplet from the cranial position, the third from the transverse position and the fourth infant from the pelvic end position.

An adjacent OP was spared, and four workplaces were temporarily set up to care for the premature babies on site; warm beds and equipment for intubation and ventilation, monitoring of hemodynamics were arranged. Four neonatologists, four resident physicians, and a total of eight nurses of the neonatal intensive care

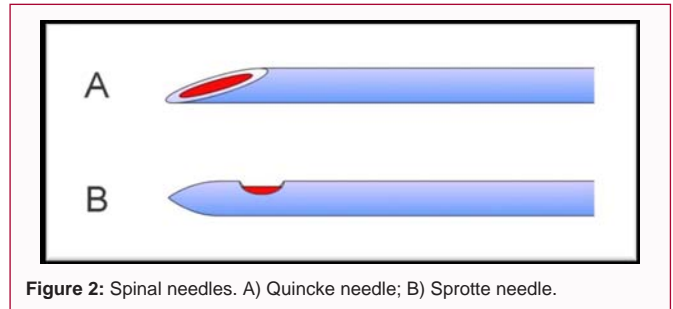


Figure 2: Spinal needles. A) Quincke needle; B) Sprotte needle.

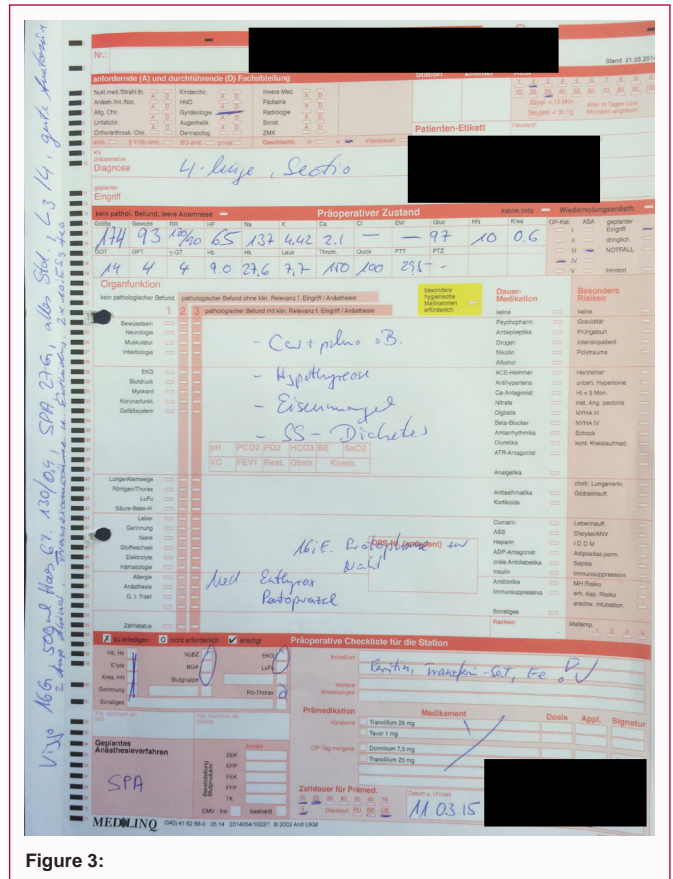


Figure 3:

unit took care of the four children.

During surgery, we used patient blood management protocols. We increased the room temperature up to 26°C, used prewarming and intraoperative warming mattress to maintain normothermia, and injected calcium gluconate and tranexamic acid to prevent hypocalcemia and hyperfibrinolysis.

Continuous infusion of oxytocin (10 I.U./2 h), after bolus administration (3-10 I.U.), was used as a first-line uterotonic for cesarean section in our delivery department. In quadruplet childbirth case, a second-line uterotonic use of methylergonovine was necessary [6].

The recovery of the patient was uneventful and not prolonged. Hemoglobin level increased within 5 days from 8.9 g/dl to 10.7 g/dl. There was no postoperative bleeding and no need for blood transfusion. The mothers were discharged from the hospital 5 (mother of triplets) and 7 days (mother of quadruplets) after surgery. All children were healthy and left the hospital 4 weeks after Cesarean section.

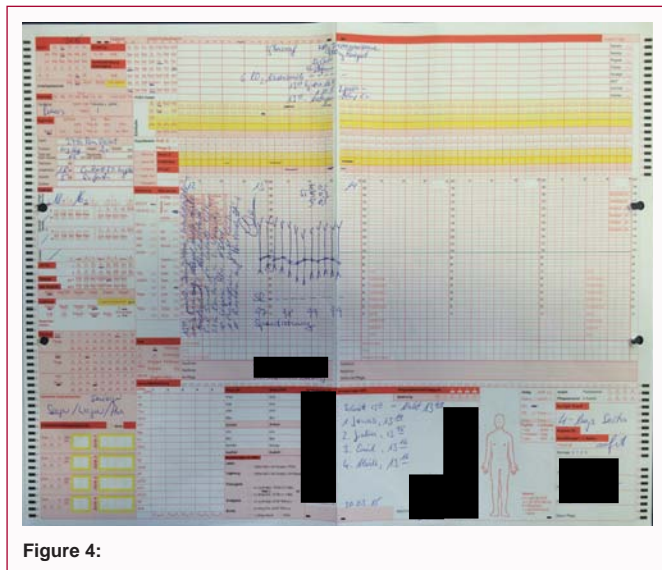


Figure 4:

Discussion

Atraumatic spinal needles

Different types of needles are used for SPA. Quincke needles are sharp and hollow with a bevel cut, while 'pencil-point-needles' are blunt and rounded. Sprotte or Whitacre type needles are atraumatic with a side standing hole (Figure 2). The initial hypothesis that these needles only displace nerve fibers instead of causing severe damage by cutting them has been disproved by Dittmann et al. [5].

Fast onset of the spinal block due to a combination of hyperbaric bupivacaine and intrathecal sufentanil

To prevent aortocaval compression syndrome we tried a fast onset of the spinal block. Faster time sensory blockade at Th 4-6 level and a higher reliability and speed of recovery can be achieved with hyperbaric solution than with plain local anesthetic solutions [7,8]. Therefore, we chose hyperbaric bupivacaine solution [9].

For the same reason sufentanil was combined with the hyperbaric local anesthetic. Karaman et al. [10] and Wilwerth et al. [11] compared SPA induced by 3 ml of hyperbaric bupivacaine 0.5% (=15 mg) and 2 ml of hyperbaric bupivacaine 0.5% (=10 mg) when administered intrathecally in combination with 5 µg sufentanil (intrathecally administered). Both showed a significantly faster onset of the spinal block and a clinically relevant reduction of adverse effects, such as hypotension. Therefore, we added sufentanil 5 µg to the hyperbaric local anesthetic [11].

Hemodynamic stability, prevention of nausea, and vomiting

5-Hydroxytryptamin-Type-3 (5-HT₃) antagonists effectively reduce the incidence of hypotension and bradycardia during cesarean section [12]; the effects are moderate but significant. Ondansetron (4 mg), 5-HT₃ antagonists, was administered prior to the incision and directly after the induction of the spinal block to prevent nausea, vomiting, and hypotension. A bolus of ephedrine (Ephedrine[®], 15-30 mg) or a mixture of cafedrine/theodrenaline (Akrinor[®], 30-60 mg/3.6 mg) was administered intravenously at the same time [13].

Patient blood management protocol

The management of iron deficiency anemia in pregnancy is important and currently very topical [14]. Ferric carboxymaltose

(Ferinject[®]) infusion corrects iron deficiency or various degrees of iron deficiency anemia efficaciously and safely in pregnant women. No serious adverse events have been recorded. We injected 500 mg ferric carboxymaltose [14].

Summary

Interdisciplinary multifetal childbirth must be scheduled in advance and planned accurately. From the perspective of an anesthesiologist, elective cesarean sections in patients with twin, triplet, and quadruplet pregnancies should be performed using SPA. In the literature the use of hyperbaric bupivacaine in combination with an intrathecally administered opioid is recommended to avoid side effects (nausea, vomiting, hypotension). Patient blood management and all measures to treat anemia and reduce intraoperative blood loss are necessary (Misgav-Ladach Cesarean technique, normothermia, normocalcemia, balanced gas exchange). Hyperfibrinolysis should be interrupted by tranexamic acid.

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