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ORIGINAL ARTICLE

# Effects of a head elevated ramped position during elective caesarean delivery after combined spinal-epidural anaesthesia

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## ABSTRACT

**Background:** Elevating the torso in a Head Elevated Ramped Position during caesarean delivery benefits the mother by improving comfort and ventilation while reducing reflux symptoms and providing a better airway position. We hypothesised that using an elevation pillow for an elective caesarean delivery under combined spinal-epidural anaesthesia would not significantly increase the time to achieve a T4 block.

**Methods:** Following ethical approval and informed consent, 60 women undergoing elective caesarean delivery under combined spinal-epidural anaesthesia were randomised to one of three groups: Control – horizontal with a small pillow under the head; Head Elevated Ramped Position – torso on an elevation pillow; and Head Elevated Ramped Position with initial position horizontal. Data collected were time to T4, block height at 30 and 120 min, adequate block at 12 min, need for epidural supplementation, maternal comfort and airway position assessment.

**Results:** Time to T4 among the three groups was not significantly different ( $P = 0.14$ ). However, there was a significant difference in achievement of block height of T4 at 12 min and greater need for epidural supplementation in the intervention groups compared to the control group ( $P = 0.021$ ). Non-inferiority analyses of time to T4 of both head elevated ramped positions were inconclusive about inferiority relative to the control. Head Elevated Ramped Position was significantly more comfortable than control ( $P = 0.007$ ). Using the level of the external auditory meatus to the sternal notch as an indicator for ease of laryngoscopy, Head Elevated Ramped Position provided a significantly better position than control ( $P < 0.001$ ).

**Conclusion:** Elevating the parturient undergoing elective caesarean delivery into the Head Elevated Ramped Position immediately or once the block had been established did not appear to significantly alter time to an adequate block height of T4; however, the need for epidural supplementation was greater in the intervention groups. Cautious use of this novel position change can provide a more comfortable experience and provide a better airway position should conversion to general anaesthesia be required.

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**Keywords:** Head elevated ramped position; Head elevated laryngoscopy position; Block height; Combined spinal-epidural; Caesarean delivery

## Introduction

The ramped position or head elevated laryngoscopy position (HELP), in which the head is visibly above the shoulders with horizontal alignment between the external auditory meatus (EAM) and sternal notch, improves the view during direct laryngoscopy compared to the sniffing position in bariatric patients.<sup>1</sup> The ramped position can be achieved by inserting folded blankets under the head and shoulders, by manipulating the operating

table into a back/trunk-up position or using a commercial device such as the TROOP® elevation pillow (a plastic covered foam pillow with an elevation angle of approximately 20 degrees). Other benefits of the ramped position include more efficient preoxygenation and easier bag-mask ventilation in severely obese patients.<sup>2</sup> Studies in term parturients have shown an increase in functional residual capacity and slower desaturation rates in the head-up position compared to the supine position.<sup>3,4</sup>

Difficult or failed intubation is a known cause of maternal morbidity and mortality associated with general anaesthesia for caesarean delivery (CD).<sup>5,6</sup> Although the majority of CDs are now performed under neuraxial anaesthesia, general anaesthesia is still required for many emergency deliveries or when complications related to neuraxial anaesthesia occur.

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Ideally, all parturients having surgery would be placed in the ramped position in order to ensure the best position for intubation, if general anaesthesia were needed. However, use of the ramped position before neuraxial block is established might result in inadequate surgical anaesthesia.

The effect of the ramped position on the level of spinal anaesthesia has not been studied. We hypothesised that the position of the parturient for an elective CD in the head elevated ramped position using an elevation pillow would not significantly increase the time for a block to reach T4.

## Methods

Approval was obtained from the local ethics committee (University of British Columbia, Vancouver, Canada) and the trial registered with Clinicaltrials.gov (NCT01161693). The target population was women >37 weeks of gestation undergoing elective or urgent CD under neuraxial anaesthesia, with a singleton fetus, American Society of Anesthesiologists classes 1 and 2. Exclusion criteria were general anaesthesia, women in active labour ( $\geq 3$  cm dilated with regular uterine contractions), emergency CD for fetal heart rate abnormalities, maternal age <19 years, body mass index (BMI) >40 kg/m<sup>2</sup>, possible uterine over-distension (e.g. polyhydramnios), estimated fetal weight >4 kg by ultrasound scan and maternal height <150 cm or >180 cm.

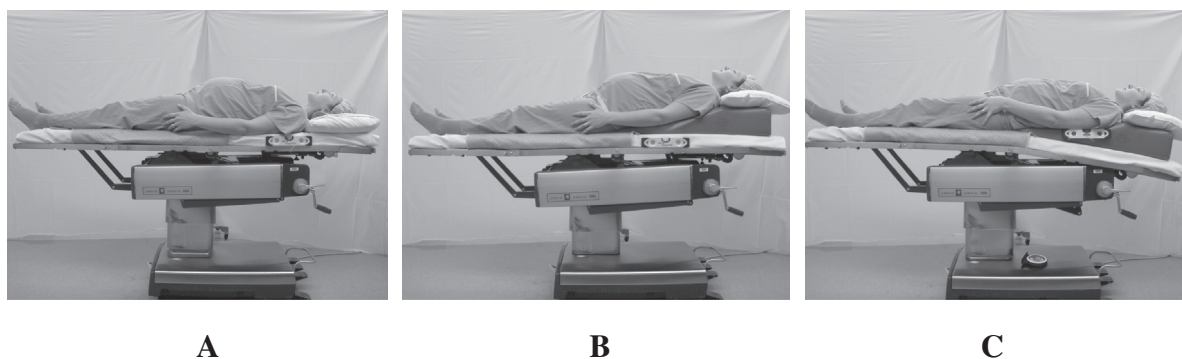
Following informed consent, women were randomised using a computer-generated table into one of three groups: Control (C) a standard pillow under the head (Fig. 1A); Head Elevated Ramped Position (HERP) with an elevation pillow and the operating table horizontal (Fig. 1B); and Head Elevated Ramped Position (HERP-H) achieved by lowering the back of the operating table so the elevation pillow was parallel to the floor (Fig. 1C). The latter position was maintained until an adequate block had been established, after which the

operating table back was levelled, making it in the same position as group HERP.

An intravenous cannula was inserted in each patient, and normal saline administered to keep the vein open. Before transfer to the operating room (OR), patients were positioned supine with a pillow under the head and a 3 L inflatable wedge under the right hip to provide left uterine displacement for 3 min and then the TROOP® pillow was introduced for 3 min. Comfort was compared by responses to the question “Is elevation more comfortable than lying flat?” using a 5-point Likert scale: strongly disagree, disagree, no difference, agree, strongly agree. Whilst on the elevation pillow, the relationship of the EAM to the sternal notch was determined using a spirit level and classified as: below the level of the sternal notch (Fig. 2A) or at the level of or above the level of the sternal notch (Fig. 2B). The patient was then moved into the OR where group allocation was determined by opening an opaque envelope containing a computer-generated randomised number.

In the OR, combined spinal-epidural (CSE) anaesthesia was performed in the sitting position at or below the L3-4 interspace. The epidural space was located using loss of resistance to normal saline (amount restricted to <5 mL). Once the subarachnoid space was identified, a mixture of hyperbaric 0.75% bupivacaine 1.5 mL, fentanyl 10 µg and morphine 100 µg was administered over 15 s. The spinal needle was removed and the epidural catheter threaded 5 cm into the epidural space and secured. The patient was immediately positioned according to group assignment with left uterine displacement.

Block height was determined using ice every 2 min until a T6 level was reached and then every minute until a T4 level was achieved. This time was recorded and surgery was then allowed to start. Routine anaesthetic management continued throughout the procedure. The block level at 30 min was recorded as maximum block height.



**Fig. 1** **A** Control (C) Standard pillow under head. **B** Head Elevated Ramped Position with Troop elevation pillow (HERP). **C** Head Elevated Ramped Position with Troop pillow in horizontal position (HERP-H), once block established the bed was raised to be identical to position **B**.

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