Effects of Position and Uterine Displacement on Spinal Anesthesia for Cesarean Section

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Even in the absence of brachial artery hypotension, aortocaval compression and its sequelae commonly occur in the supine position during late pregnancy.[1,2] Uterine displacement effectively prevents aortocaval compression and its subsequent complications, acidosis and decreased placental perfusion.[1,2] Consequently, it has been recommended that uterine displacement be utilized whenever a woman in the last trimester of pregnancy must assume the supine position.[1]

Frequently, when spinal anesthesia is given for cesarean section the patient is positioned temporarily in the supine position to assure an even distribution of anesthetic in the subarachnoid space. While in this position, uterine displacement can be performed only by direct manual or mechanical displacement, a method demonstrated to be less effective than elevation of the right hip by means of a wedge.[1] Thus, it would seem preferable in administering spinal anesthesia for cesarean section to use a technique that would minimize time in the supine position so that uterine displacement by hip elevation could be performed. Because the position of the patient during and following injection of the subarachnoid anesthetic partly determines the extent of spinal analgesia, it seemed possible that the patient's position during placement of the subarachnoid anesthetic could influence the time required in the supine position to establish the desired level of sensory anesthesia and thereby influence the type of uterine displacement used. This study examines that possibility.

METHODS

Forty-nine women scheduled for nonemergent cesarean section were studied. All consented to receive spinal anesthesia and came to the operating room unmedicated and in the lateral position. The patients were assigned sequentially to one of four groups. Patients in Group I were placed in the right lateral position during subarachnoid injection and immediately thereafter were turned to the left semi-lateral position with a 12-cm wedge under the right hip. Group II patients assumed the right lateral position during subarachnoid injection and immediately thereafter were turned to the supine position, in which manual displacement of the uterus was utilized. Patients in Group III were positioned in the left lateral position during subarachnoid injection and immediately thereafter were turned to the left semi-lateral position with a 12-cm wedge under the right hip. Group IV patients assumed the left lateral position during subarachnoid injection and immediately thereafter were turned to the supine position, in which manual displacement of the uterus was utilized.

TABLE 1. Time Required in the Supine Position to Develop the Level of Spinal Anesthesia and the Number of Inadequate Levels of Spinal Anesthesia

	N	Time, Mean ± SD (Min)	Inadequate Levels
Group I	15	0.0	0
Group II	15	4.2 ± 0.3	0
Group III	4	—	3
Group IV	15	4.6 ± 0.5	2

All patients received approximately 900 ml of 5 per cent dextrose in lactated Ringer's solution during the 20 minutes prior to administration of spinal anesthesia. Subarachnoid puncture was performed in the third or fourth lumbar interspace and spinal block was induced with 1 per cent tetracaine, 6–8 mg, in an equal volume of 10 per cent dextrose containing 0.1 mg epinephrine. The dose of tetracaine varied with patient height: 6 mg were used for a height of 61–64 inches, 7 mg for 64–66 inches, and 8 mg for 66–68 inches.

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The table was tilted, as required, in order to obtain analgesia to pin prick up to the fourth or fifth thoracic dermatome. After obtaining this level of sensory anesthesia, the patient was positioned in the left semilateral position with a wedge under the right hip, and the operation was commenced. Time required in the supine position to establish the level of sensory anesthesia and adequacy of the spinal anesthetic for the procedure were recorded.

Results

Table 1 shows for each group the average time required in the supine position to establish the level of anesthesia and indicates the number of patients who needed general anesthesia because of an inadequate level of spinal anesthesia. All patients in Group I developed an adequate bilateral level of sensory anesthesia without assuming the supine position. Patients in Group II required an average of 4.2 minutes in the supine position to establish the desired level of sensory anesthesia; spinal anesthesia was adequate in all patients in this group. The patients in Group III did not develop the desired level of sensory anesthesia. In Group III patients, the dermatome levels on the right side repeatedly developed 4–5 dermatome levels below that on the left; therefore, all of these patients were placed in a 15-degree head-down tilt and were turned from the left semi-lateral position to the supine position approximately 2 minutes after subarachnoid injection in an attempt to obtain a more uniform level of analgesia. A level of sensory anesthesia adequate for delivery was not achieved in two of these patients, and general anesthesia was necessary. Although adequate levels of analgesia developed initially in the other two patients, one needed general anesthesia 18 minutes after subarachnoid injection for pain relief. Only four patients were included in Group III because of the poor levels of spinal anesthesia that developed when the patients were positioned according to Group III protocol. Group IV patients developed a level of sensory anesthesia in an average of 4.6 minutes. Although this level was adequate for delivery in all cases in Group IV, supplemental general anesthesia was necessary in two patients 22 and 35 minutes after subarachnoid injection; both patients complained of right-sided pain. The desired level of anesthesia was obtained in Group IV patients, as well as in Group I and II patients, without table-tilting procedures.

Brachial artery systolic blood pressures remained above 100 torr in all patients except one in Group II and one in Group IV. These two episodes of relative hypotension were quickly corrected by intravenous administration of ephedrine.

Discussion

Clinical detection of aortocaval compression depends upon the extent of obstruction and sympathetic nervous system compensation, as well as the modalities selected for measurement. While fewer than 10 per cent of nonmedicated term patients manifest classic signs of the supine hypotensive syndrome,[4] recent studies have indicated that many patients without brachial artery hypotension do have metabolic acidosis,[3] decreased uterine perfusion,[2] and femoral-artery hypotension.[1] These sequelae of aortocaval compression can be alleviated by shifting the uterus, usually to the left, away from the aorta and vena cava.[1,2] This maneuver can be accomplished by either hip elevation or mechanical displacement, the former relieving the aortic component of the compression more effectively than the latter.[1] Thus, it appears that uterine displacement, preferably by elevation of the right hip, should be used whenever a woman in the last trimester must assume the supine position.

During spinal anesthesia for cesarean section, it is especially important to maintain uterine displacement because blockade of compensatory sympathetic activity can increase the adverse effects of aortocaval compression on both mother and fetus. This study shows that the patient receiving spinal anesthesia for cesarean section can be adequately managed without placing her in the supine position provided subarachnoid injection is performed in the right lateral position. When placed in the right lateral position during subarachnoid injection and turned immediately thereafter to the left semi-lateral position with a wedge under the right hip, the patient had adequate sensory anesthesia without assuming the supine position. However, when patients were positioned in the left lateral position during subarachnoid injection and then turned to the left semi-lateral posi-

tion, uniform levels of anesthesia did not develop. Consequently, all of these patients had to be turned to the supine position, and even then only two of four patients had adequate anesthesia.

Patients who were positioned in the right or left lateral position during subarachnoid injection and then turned supine required averages of 4.2 and 4.6 minutes, respectively, to establish adequate sensory anesthesia. Satisfactory anesthesia for the operation occurred in all of these patients except two who received subarachnoid injection in the left lateral position. Since both patients complained of right-sided pain shortly after delivery, these inadequate spinal anesthesias might have been prevented by leaving these patients in the supine position for longer periods.

Because the dose of tetracaine and the size of the wedge used for hip elevation can influence both the time required for development of the level of sensory anesthesia and the adequacy of anesthesia, a larger dose of tetracaine or a smaller wedge could have decreased the differences between the groups. However, a larger dose of tetracaine would predispose to an undesirably high level of anesthesia, and a smaller wedge would increase aortocaval compression. Therefore, in this study the tetracaine dose schedule, which has been shown to provide adequate anesthesia without a high incidence of high spinal anesthesia,[5] and the size of the wedge, which maximized uterine displacement short of actually positioning the patient in the lateral position, would enhance the importance of specific gravity in the distribution of the local anesthetic in the spinal fluid.

Thus, in summary, in order to avoid placing the parturient in the supine position, it appears preferable to administer the subarachnoid anesthetic in the right lateral position rather than the left. Such a technique allows for immediate uterine displacement by means of a wedge under the right hip without an intermediate period in the supine position to ensure an even distribution of anesthetic in the subarachnoid space.

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Delayed Asthmatic Response Following Occupational Exposure to Enflurane

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The delayed onset of asthma in an anesthesiologist following occupational exposure to enflurane has not previously been reported. We have observed such a reaction in an anesthesiology resident. A description of the clinical case and discussion of possible pathogenesis follow.

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Report of a Case

A 27-year-old black male anesthesiology resident was referred for evaluation of asthma. During childhood he had experienced mild seasonal rhinitis and asthma, which had resolved at about age 13. Since that time he had experienced only slight bronchospasm associated with upper respiratory infections, always relieved by a single spray from an isoproterenol inhaler.

While training in anesthesiology during 1973, he had administered many types of anesthetics without