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Literature Review: Fluid Therapy in Preventing Hypotension in Section Caesarean with Spinal Anesthesia

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Abstract

Hypotension is a complication that often occurs in section Caesarea with spinal anesthesia. Severe hypotension poses serious risks to the mother (such as loss of consciousness) and the baby (such as oxygen deprivation and brain damage). So to prevent hypotension, it can be done by giving crystalloid or colloid fluid therapy after spinal anesthesia is carried out. Articles were searched using 3 databases (PubMed, Pro-Quest, and Google scholar) with a randomized controlled trial research method. The literature was limited between 2010 and 2019. Seven articles with average results on administration of both preloaded and concomitant crystalline and colloidal fluids could reduce the incidence of hypotension, but for this technique Hypotension could not be completely reduced and should be used with Vasopresor. The incidence of hypotension after spinal anesthesia should be treated immediately to prevent injury to the kidneys, heart, and brain by giving oxygen and increasing the rate of infusion (colored) of 100 ml of colloid or crystalloid fluid within the first 5 minutes or less for improving blood pressure. If blood pressure is still low after fluids are given, a vasoconstrictor such as ephedrine 5-10 mg can be gradually given

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INTRODUCTION

Sectio Caesarea (SC) is the most common emergency surgery performed in the field of obstetric gynecology. *World Health Organization (WHO)* data shows the average Sectio Caesarea is about 5-15 % per 1000 births worldwide (Gibbons et al., 2010).

Spinal anesthesia is the technique of choice in mothers with Sectio Caesarea. However, hypotensive complications are very common and are a potential danger to the mother and fetus with an incidence of up to 80% (Oh et al., 2014) (Chooi et al., 2020). The definition of hypotension in this study was a decrease in blood pressure of more than 20% of normal values or a decrease in the blood pressure of the systo <90 mmHg. Although hypotension is defined as subnormal arterial blood pressure, to date that definition is certainly still controversial (Somboonviboon et al., 2008).

Severe hypotension poses serious risks for mothers (such as loss of consciousness) and infants (such as oxygen deprivation and brain damage). A review of 75 trials (4624 women) found that no single method could actually prevent hypotension, but its incidence was reduced by intravenous fluid administration, ephedrine, or phenylephrine drugs, and by compressing the feet with bandages, stockings, or rubber boots (Chooi et al., 2020).

The incidence rate and also the degree of hypotension after spinal anesthesia in pregnant women undergoing Sectio Caesarea is influenced by several risk factors, such as age, height, weight, *body mass index* (BMI), left oblique uterine position, a dose of bupivacaine, prehydration fluid, adjuvant dose of spinal anesthesia, position of the patient during spinal anesthesia, location of spinal anesthesia stabbing, length of anesthetic injection, the height of spinal anesthesia block, amount of bleeding, use of ephedrine as a vasopressor, and surgical manipulation (Chumpathong et al., 2006) (Mitra et al., 2013).

Based on the results of the study conducted hypotensive incidence rate during spinal anesthesia in section Caesarea reached 80%, although it has been done prehydration of fluid, the position of the uterus tilted to the left, and the use of vasopressors (Park, 2013; Rodrigues &Brandão, 2011)

As a result of hypotension, many research results are recommended in colloidal use compared to the use of crystalloid fluid after spinal anesthesia for cesarean section. However, some studies support the use of crystalloids with similar comparisons to colloids (Miller &McCartney, 2015). Hypotension is generally considered if systolic blood pressure <90–100 mmHg or a 20% decrease in blood pressure from the base value (Mitra et al., 2013).

Research conducted by azizah in 2016 observationally examined the effectiveness of crystalloid and colloidal fluids conducted in one of the hospitals in Indonesia stated that crystalloid fluid is significantly more effective than the colloidal fluid in reducing the risk of hypotension in sectio caesareans using spinal anesthesia, but the administration of crystalloid fluid should be kept in mind because it can cause severe edema and can affect the electrolyte balance of the body resulting in acid-base balance disorders. Another study conducted by Sarkar in 2014 said that until now, crystalloid fluid is still used because the price of crystalloid liquid is cheaper than colloidal fluid. (Azizah et al., 2016; Novara, 2009; Sarkar et al., 2014).

Research conducted by Dahlgren et al. by administering 1000 cc of dextran fluid 3% immediately before spinal anesthesia for elective cesarean section compared to Ringer lactate reported that the overall incidence of hypotension decreased from 85% to 66%, the incidence of clear clinical hypotension decreased from 60% to 30% and severe hypotension decreased from 23% to 3.6% (G Dahlgren et al., 2007; Gunnar Dahlgren et al., 2005).

This literature study was conducted to provide information from previous research on whether fluid therapy can prevent hypotension in patients section Caesarea with spinal anesthesia.

METHOD

The method of writing in this article used literature search through online databases namely PubMed, Pro-Quest, Google scholar. The literature was limited between 2010 and 2019 with the keyword *Crystalloid fluid therapy in preventing hypotension in cesarean section delivery* = fluid therapy in preventing hypotension in sectio caesareans with spinal anesthesia and obtained as many as 7 online literatures that matched the inclusion criteria set by the authors. There were six international online literatures (four journals from PubMed, two

journals from Pro-Quest) and one online literature in Indonesia was obtained from google scholar.

RESULTS

No	Author	Year	Design	Group	Result
1	Tawfik et al	2019	Randomize Control Trial (RCT)	Group combination: 6% hydroxyethyl star 500 ml and Ringer's acetate 500 ml Crystalloid coload group: received 1000 mL of Ringer's acetate	The combination of 500-mL colloid preload and 500-mL crystalloid coload did not reduce the total ephedrine dose or improve other maternal outcomes compared with 1000- mL crystalloid coload.
2	Mercier et al	2014	Double-blind study	HES group: 500 ml of 6% HES (130/0.4) + 500 ml of RL RL group: 1000 ml of RL i.v.	The incidence of both hypotension and symptomatic hypotension (i.e. with dizziness, nausea/vomiting, or both) was significantly lower in the HES group vs the RL group: 36.6% vs 55.3% (one-sided PÂ¼0.025) and 3.7% vs 14.1%.
3	Oh et al	2014	Prospective randomized controlled study	Preload group Crystalloid Coload group Crystalloid	The incidence of hypotension was lower in the coload group compared to the preload group (53% vs. 83%, P = 0.026). The blood pressure showed the bigger drop during spinal anesthesia in the preload group (34 ± 13 vs. 25 ± 10 mmHg, P = 0.002) and smaller dose of ephedrine was required in the coload group (7.5 [0-30] vs. 15 [0-40] mg, P = 0.015).
4	Gunusen et al	2010	Randomize Control Trial (RCT)	Rapid infusion group lactated Ringer's solution (20 ml.kg-1, n=40). 4% succinylated gelatin solution group (500 ml, n=40) before spinal anesthesia. Ephedrine infusion group (1.25 mg min-1) plus lactated Ringer's solution (1000 ml, n=40) after spinal anesthesia	The frequency of moderate or severe hypotension was lower in the ephedrine group than in the crystalloid or colloid preload group (10% vs 51% and 38%; 5% vs 21% and 23%, respectively, P < 0.05).
5	Saghafinia et al	2015	Randomize Control Trial (RCT)	120 mothers giving birth at term, American Society of Anesthesiologists (ASA) Class I-II were randomly assigned to two groups (control group or case group)	The results of this study show that hydroxyethyl starch 6% compared to normal saline are similar to prevent hypotension during spinal anesthesia for cesarean delivery.
6	Mitra et al	2014	a prospective, double-blinded and randomized controlled study	HES group (n = 32), receiving 10 ml/kg HES 130/0.4; SG group (n = 32), 10 ml/kg SG (4% liquid gelatin which modified); RL group (n = 32), 20 ml/kg RL	The decrease in systolic blood pressure (SBP) (<100 mm Hg) was recorded between 5 (15.63%), 12 (37.5%) and 14 (43.75%) mothers gave birth to each group HES, SG, RL. Vasopressors (phenylephrine) are used to treat hypotension when the SBP is < 90 mm Hg.
7	Azizah et al	2016	Observasional analitik cross sectional	20 patients were given crystalloid solutions; 20 patients were given colloid fluids.	On the statistical test value of systolic (P= 0.379) and diastolic (P= 0.654). It can be concluded that crystalloid and colloid fluid were equally efective to defend blood pressure in patients with spinal anesthesia for caesarean section.

DISCUSSION

The results of a journal analysis, research conducted by Mercier (2014) on *6% Hydroxyethyl starch (130/0.4) vs Ringer's lactate preloading before spinal anesthesia for Caesarean delivery* obtained results that colloidal group (HES) (30 patients, 36.6%) lower hypotension compared to the crystalloid group (47 patients, 55.3%) given preload (Mercier et al., 2014). This is supported by research conducted by Cyna (2006) that colloids are more effective than crystalloids (RR 0.68, 95% CI 0.52 to 0.89; 11 trials, 698 women) in preventing hypotension after spinal anesthesia in cesarean section (Cyna et al., 2006).

In contrast to the results of research conducted by Azizah (2016) and Gunusen (2010) it was found that in the crystalloid group and colloid group there was no significant difference in the prevention of hypotension (Azizah et al., 2016; Gunusen et al., 2010). This is supported by research conducted by Tawfik (2019) on *Combined Colloid Preload and Crystalloid*

Coload Versus Crystalloid Coload During Spinal Anesthesia for Cesarean Delivery with no significant differences from the two groups, colloid group there were 52 (52.5%) and the crystalloid group was 56 (56.6%) hypotension (Tawfik et al., 2019).

Hypotension is one of the acute complications that occur in spinal anesthesia, this diagnosis can be established in case of a decrease in systolic blood pressure of 20-30% of the original blood pressure or when the systolic blood pressure is less than 90 mmHg. The mechanism of hypotension is mainly caused by the blockade of the preganglionic sympathetic nerve that causes vasodilation that occurs in arteries, arterioles, veins, and venules resulting in a decrease in peripheral vascular resistance (Setyowati, 2005).

Hypotension that occurs in spinal anesthesia other than caused by sympathetic nerve blockade can also be caused by several factors such as the type of local anesthetic drugs, sensory inhibitor level, age, gender, weight, the physical condition of the patient, patient position, and manipulation of surgery (Finucane, 2007). The incidence of hypotension after spinal anesthesia should be treated immediately to prevent injury to the kidneys, heart, and brain by administering oxygen and increasing the speed of infusion fluid droplets (coload) 100 ml of colloidal or crystalloid fluid within the first 5 minutes or less to improve blood pressure. If blood pressure is still low after being administered fluid then it can be administered vasoconstrictors such as ephedrine 5-10mg gradually (Dobson, 2000).

Theoretically, the colloidal solution is a better option for the prevention of hypotension during spinal anesthesia, since the physical properties of colloids last longer in the vascular space as well as having the ability to increase plasma volume equivalent to several times the given volume (Fathi et al., 2013; Sharma et al., 1997). A study once conducted comparing colloidal fluid as preloading, with crystalloids as co-loading during spinal anesthesia for elective cesarean section. It can be concluded that in reducing hypotension, the use of crystalloids 1000 ml as co-loading fluid is the same as the application of colloidal fluid 500 ml as preloading, but from such techniques, no one can reduce hypotension completely and should be used in conjunction with vasopressors

CONCLUSION

The administration of crystalloid and colloidal fluids in addition to being given preload can also be given after the administration of spinal anesthesia, as a single dose, or at the same time as spinal anesthesia. This is done to prevent damage to the kidneys, heart and brain.

SUGGESTION

Patients with spinal anesthesia require administration of crystalline fluid and colloids to reduce the dose of ephedrine during hypotension.

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37

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