

## CURRENT GUIDELINES FOR THE PREVENTION OF HYPOTENSION INDUCED BY SPINAL ANESTHESIA

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[Attuali orientamenti nella prevenzione dell'ipotensione indotta da anestesia spinale]

### SUMMARY

The prevention and treatment of hypotension derived by spinal anesthesia was studied over time. In this review, the Authors estimate, reporting some surveys, the medical devices used to minimize the hypotensive effects of the anesthesia block. After referring the cardiovascular effects consequential pre-ganglionic sympathetic block induced by spinal anesthesia, they dwell on the prevention and treatment of hypotension. They also analyze the treatment of hypotension in pregnant and they share, based on their experience, the current guidelines in order to avoid severe hemodynamic disorders.

**Key words:** Spinal anesthesia, preganglionic sympathetic block, cardiovascular effects, prevention, therapeutic aid

### RIASSUNTO

La prevenzione e il trattamento dell'ipotensione da anestesia spinale è stata nel tempo oggetto di studio. In questo lavoro gli autori valutano, riportando anche alcuni studi, i presidi utilizzati per ridurre al minimo gli effetti ipotensivi del blocco. Dopo aver riportato gli effetti cardiovascolari conseguenziali al blocco simpatico pre-gangliare indotti dall'anestesia spinale, si soffermano sulla prevenzione e sul trattamento dell'ipotensione. Analizzano anche il trattamento dell'ipotensione nella gravida e condividono riportando, anche in base alla loro esperienza, gli attuali orientamenti al fine di evitare gravi turbe emodinamiche.

**Parole chiave:** Anestesia spinale, blocco simpatico pregangliare, effetti cardiovascolari, prevenzione, presidi terapeutici

### Introduction

The cardiovascular effects are due to pre-ganglionic sympathetic block induced by spinal anesthesia, remembering that the importance is always proportional to the extension of the block. The sympathetic block causes vasodilatation, which in turn has consequences on the blood pressure by reducing total peripheral resistance and preload. A block that stops below T10 does not alter particularly total peripheral resistance (RPT) since there is a reflex vasoconstriction of the unlocked areas. In the presence of a larger block, instead, we can reach a very large sympathetic paralysis with marked reduction of RPT and preload. Typically hypotension begins immediately after the execution of anesthesia and reaches its maximum intensity in the 25th minute persisting beyond the duration of muscle block.

### Prevention and treatment

A number of devices can reduce the incidence and severity of spinal hypotension as the administration of 10-15 ml/kg of polyelectrolyte solution before the spinal anesthesia. Studies comparing the efficacy of HES 130/0.4 (hydroxyethyl starch) to Ringer's lactate administration as a precautionary measure. They indicate that the routine use of HES can be considered a valid proposal for the prevention of hypotension during the spinal anesthesia. In agreement with previous studies, the administration of hetastarch in association with vasopressors (ephedrine and phenylephrine) is able to maintain optimal blood pressure. Excellent results can also be obtained using the combined simultaneous rapid infusion of crystalloid (Ringer's lactate) with high doses of phenylephrine.

According to others reviews, infusion of 100 mcg/min of phenylephrine can decrease the incidence, frequency and extent of hypotension. Similarly, others authors also proposed the systematic and prophylactic use to 15-30 mg of ephedrine, administered intramuscularly before the execution of the block.

However the unpredictable absorption of the drug and the possibility that surgery can be deferred make better its use intravenously during the execution of the block with a bolus doses of 5 mg, in single bolus of 10-30 mg or continuous perfusion solution, 0.01%, giving 5 mg per minute for two minutes and then 1 mg per minute for 15-20 minutes.

About the treatment of hypotension in pregnant, in recent years there is a major turnaround compared to the gold standard that included ephedrine administered, following the trend pressure, as first choice. Riley, in the British Journal, looks at the issue highlighting the need to focus first and foremost the maintenance of maternal blood pressure, even compared to the risk of placental vasoconstriction.

The reference work in this direction is by Kee et al.: the authors, taking umbilical artery pH as the neonatal outcome, and the less nausea such as maternal outcome, show that the optimal strategy is to maintain blood pressure at pre-block to 100 %: this guarantees a better fetal acid-base status compared to control groups which had a decreased of 10% to 20% above the baseline pressure. The maintenance was achieved by larger infusions of phenylephrine than the control groups.

Already in 2002, Cooper et al. had questioned the use of ephedrine as a drug of choice in the control of hypotension during spinal block for cesarean section. The most important issue is the appearance of more marked acidosis in infants whose mothers had received an infusion of ephedrine; conversely, infusion of phenylephrine or ephedrine + phenylephrine was associated with gasanalytical reassuring results. The addition of phenylephrine to ephedrine was already suggested by Mercier in 2001; they had a marked decrease in the incidence of hypotension (37% vs 75%) in the infusion mixture, as well as significantly better were pH values evaluated by sampling umbilical artery (7.24 vs. 7.19).

The drop systemic blood pressure still has to be countered, including the use of drugs that induce placental vasoconstriction for their strong alpha-stimulating effect. The risk of a placental vasoconstriction for many years has guided the choice to ephedrine, sympathomimetic with modest effects on uteroplacental

flow and small beta-agonist effect. The use of drugs with strong alpha-effect is justified on two reasons: the effect of vasoconstriction counteracts vasodilatation on sympathetic block, providing the pressure homeostasis, also the reduced sensitivity to sympathomimetic agents that emerges during pregnancy, can still help to protect the fetus from the effects of excessive vasoconstriction.

About the other devices used to minimize the hypotensive effects of the block, the editorial of Riley merely points out the effectiveness of the pre-load with colloids and the use of elastic bandages to the limbs.

More recent studies have finally shown that the use of new drugs such as the association cafedrina/teodrenalina can be effective in enabling a rapid and constant increase in blood pressure for the treatment of hypotension induced by sympathetic lysis, allowing also to not observe the negative impacts .

## Conclusions

Hypotension, an effect very often linked to spinal anesthesia is explained by the pre-ganglionic sympathetic block that induces vasodilation responsible for the drop in pressure connected to it. Therefore, the use of crystalloid or colloid solutions as a preventive measure, before the execution of the spinal anesthesia, is certainly a valid technical support. The use of sympathomimetic agents and vaso-pressors also is the safest way to counteract sympathetic block.

Thanks to the studies performed we can conclude that, although hypotension can not be separable from the procedure itself, it is easily controllable through devices at our disposal.

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