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SCIENTIFIC ARTICLE

Comparison between magnesium sulfate and dexmedetomidine in controlled hypotension during functional endoscopic sinus surgery

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Controlled hypotension;
Dexmedetomidine;
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Abstract
Background and objectives: It is crucial to decrease bleeding during functional endoscopic sinus surgery. Our primary goal was to investigate the effects of magnesium sulfate and dexmedetomidine used for controlled hypotension on the visibility of the surgical site.
Methods: 60 patients aged between 18 and 65 years were enrolled. In the magnesium sulfate group (Group M), patients were administered 40 mg/kg magnesium sulfate in 100 mL saline solution over 10 min as the intravenous loading dose 10 min before induction, with a subsequent 10–15 μg/kg/h infusion during surgery. In the dexmedetomidine group (Group D), patients were administered 1 μg/kg dexmedetomidine in 100 mL saline solution as the loading dose 10 min before surgery and 0.5–1 μg/kg/h dexmedetomidine during surgery. Deliberate hypotension was defined as a mean arterial pressure of 60–70 mmHg.
Results: Bleeding score was significantly decreased in Group D ($p = 0.002$). Mean arterial pressure values were significantly decreased in Group D compared to that in Group M, except for the initial stage, after induction and 5 min after intubation ($p < 0.05$). The number of patients who required nitroglycerine was significantly lower in Group D ($p = 0.01$) and surgeon satisfaction was significantly increased in the same group ($p = 0.001$). Aldrete recovery score ≥9 duration was significantly shorter in Group D ($p = 0.001$). There was no difference between the two groups in terms of recovery room verbal numerical rating scale.
Conclusions: Dexmedetomidine can provide more effective controlled hypotension and thus contribute to improved visibility of the surgical site.

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PALAVRAS-CHAVE
Hipotensão controlada;
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Cirugia funcional endoscópica dos seios paranasais;
Sulfato de magnésio

Comparação entre dexmedetomidina e sulfato de magnésio em hipotensão controlada durante cirurgia funcional endoscópica dos seios paranasais

Resumo
Justificativa e objetivos: Diminuir o sangramento durante a cirurgia funcional endoscópica dos seios paranasais é essencial. Nosso objetivo primário foi investigar os efeitos de dexmedetomidina e sulfato de magnésio, usados para o controle da hipotensão, sobre a visibilidade do sítio cirúrgico.
Métodos: Foram incluídos no estudo 60 pacientes entre 18 e 65 anos. No grupo sulfato de magnésio (Grupo M), receberam 40 mg de sulfato de magnésio em 100 mL kg^{-1} de solução salina durante 10 minutos como dose de carga intravenosa 10 minutos antes da indução e infusão subsequente de 10-15 $\mu g\,kg^{-1}\,h^{-1}$ durante a cirurgia. No grupo dexmedetomidina (Grupo D), receberam 1 $\mu g\,kg^{-1}$ de dexmedetomidina em 100 mL de solução salina durante 10 minutos como dose de carga 10 minutos antes da cirurgia e 0,5-1 $\mu g\,kg^{-1}\,h^{-1}$ de dexmedetomidina durante a cirurgia. Hipotensão controlada foi definida como pressão arterial média de 60-70 mmHg.
Resultados: O volume de sangramento diminuiu significativamente no grupo D ($p = 0{,}002$). Os valores da pressão arterial média foram significativamente menores no Grupo D, em comparação com o Grupo M, exceto no estágio inicial, pós-indução e cinco minutos pós-intubação ($p < 0{,}05$). No Grupo D, o número de pacientes que necessitou de nitroglicerina foi significativamente menor ($p = 0{,}01$) e o grau de satisfação do cirurgião foi significativamente maior ($p = 0{,}001$). O tempo de recuperação para atingir o escore de Aldrete ≥ 9 foi significativamente menor no grupo D ($p = 0{,}001$). Não houve diferença entre os dois grupos em relação aos escores da escala numérica de classificação verbal na sala de recuperação.
Conclusões: Dexmedetomidina pode proporcionar um controle mais eficaz da hipotensão e contribuir, assim, para uma melhor visibilidade do sítio cirúrgico.

Introduction

Controlled hypotension is performed in order to reduce blood loss and the need for transfusion during the surgery and to improve visibility of the surgical site by decreasing the arterial pressure until hypotension is reached.[1] The primary surgical treatment for chronic rhinosinusitis is functional endoscopic sinus surgery (FESS). Intraoperative bleeding can diminish the visibility of the surgical site, leading to an increased rate of complications. Therefore, improving the visibility of the surgical site by reducing bleeding during FESS is an important issue for anesthesiologists.[2] In controlled hypotension, several agents have been used, either alone or in combination with each other; however, an ideal agent for inducing controlled hypotension cannot be asserted. The ideal agent used for controlled hypotension must have certain characteristics, such as ease of administration, a short onset time, an effect that disappears quickly when administration is discontinued, rapid elimination without toxic metabolites, negligible effects on vital organs, and predictable and dose-dependent effects.[1,3–5]

Dexmedetomidine is a highly selective α_2-adrenoceptor agonist with sedative, anxiolytic, and analgesic characteristics. Dexmedetomidine mediates central α_{2A} and imidazoline type 1 receptors. The activation of these central receptors results in a decrease in norepinephrine release and leads to a decrease in blood pressure and heart rate.[6]

It has been reported that magnesium sulfate is a good agent for controlled hypotension, and that it stabilizes the cell membrane and intracytoplasmic organelles by mediating the activation of Na^+-K^+ ATPase and Ca^{++} ATPase enzymes, which play a role in transmembrane ion exchange during the depolarization and repolarization phases.[5,7,8] In addition, Mg^{++} inhibits the release of norepinephrine by blocking the N-type Ca^{++} channels at nerve endings and thus decrease the blood pressure.[9]

There are several studies which have assessed the effectiveness of dexmedetomidine and magnesium sulfate in controlled hypotension. These two agents have been compared with other hypotensive agents in terms of their role in hypotensive anesthesia, but to the best of our knowledge, no study comparing these two agents with each other has been cited in the scientific literature.[2,5,7,10]

Our primary goal in this study was to compare the effects of dexmedetomidine and magnesium sulfate agents on the visibility of the surgical site; our secondary goal was to compare these two agents in terms of satisfaction of the surgeon, recovery period, adverse effects and postoperative analgesia.

Materials and methods

This study is a randomized, prospective study and was conducted on 60 ASA I–II patients aged between 18 and 65 years