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Review Article

Hypotensive Anesthesia in Orthognathic Surgery - A Literature Review

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Abstract

Hypotensive anesthesia first introduced by Gardner in 1946 is a voluntary method of reducing blood pressure during the intraoperative time for providing a clean surgical field, improving visualization, reducing blood loss, and also reducing intraoperative time. This is done by using different drugs including inhalational anesthetic agents, beta-adrenergic antagonists, calcium channel blockers and directly acting vasodilators like nitroglycerin and sodium nitroprusside. Hypotensive anesthesia is a method used in surgeries to decrease blood pressure voluntarily and predictably. It is commonly applied to reduce blood loss and the consecutive need for allogeneic transfusions, also avoiding the resulting transfusion reactions. This also reduces the surgical field visualization and reduces the operating time. This literature review discusses the methods of providing hypotensive anesthesia and their uses in oral and maxillofacial surgery.

Keywords: *Hypotensive Anesthesia, Blood Loss, Oral Surgery, Orthognathic Surgery, Hemostasis*

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INTRODUCTION

Hypotensive anesthesia first introduced by Gardner in 1946 is a voluntary method of reducing blood pressure during intraoperative time. This is primarily done because of its advantages of providing a clean surgical field, improving visualization, reducing blood loss, and also reducing intraoperative time. The technique involves reducing the mean arterial pressure up to 50mmHg. This is done by using different drugs including inhalational anesthetic agents, beta-adrenergic antagonists, calcium channel blockers and directly acting vasodilators like nitroglycerin and sodium nitroprusside. When hypotensive anesthesia is planned for a patient, history taking plays a crucial role. The patient's age, medical history, and pre-operative baseline blood pressure must be taken into consideration.

Hypotensive anesthesia is a method used in surgeries to decrease blood pressure voluntarily and predictably. The idea of hypotensive anesthesia was first put forth by Cushing in 1917, for intracranial surgery [1]. Induced hypotensive anesthesia was first described by Gardner in 1946 when he performed an arteriotomy to reduce blood pressure during a surgical procedure, improving the quality of the surgical field [2]. In 1976, Schaberg et al. used hypotensive anesthesia for the first time in Oral and maxillofacial surgery for a clinical study [3]. It is commonly applied to reduce blood loss and the consecutive need for allogeneic transfusions, also avoiding the resulting transfusion reactions. This also reduces the surgical field visualization and reduces the operating time [4].

The technique involves reducing the mean arterial pressure up to 50 mmHg. This is done by using different drugs including inhalational anesthetic agents, beta-adrenergic antagonists, calcium channel blockers and directly acting vasodilators like nitroglycerin and sodium nitroprusside. When hypotensive anesthesia is planned for a patient, history taking plays a crucial role [5]. In oral and maxillofacial surgery, hypotensive anesthesia is commonly used for orthognathic surgeries. Because of the richly perfused head and neck region, considerably bleeding from both the incised soft tissues and bone is commonly encountered during orthognathic surgeries. Hence, hypotensive anesthesia has been used for the same to reduce intraoperative blood loss and improve quality of life.

Orthognathic surgery is well established for the correction of dentofacial deformities in terms of its outcome and safety, and bimaxillary osteotomies are frequently necessary to achieve an acceptable result [6,7].

MATERIALS AND METHODS

Articles were shortlisted from the following databases:

- PubMed
- Medline
- Embase
- Cochrane

An electronic search was initiated for scholarly articles on tissue engineering. The search was based on the following keywords, hypotensive anesthesia, blood loss, surgical field, intraoperative time, and normotensive anesthesia. The review consisted of two phases. Initially, the title and abstracts of the articles obtained through the search were reviewed and relevant articles were selected. The full-text access was obtained for the selected

articles. The search yielded 15 articles that were of high relevance to the current review and these consisted of a mixture of reviews and case reports or case series on induced hypotensive anesthesia.

RESULTS

The shortlisted articles included the following data:

Choi et al., [IJOMS, 2018] [8]:Reviews literature evidence on the risks and benefits of hypotensive anesthesia. 3 RCTs on orthognathic surgery, 5 controlled clinical trials, 8 prospective and 6 retrospective case series.

Ervens et al., [IJOMS, 2010] [9]:Comparison between induced anesthesia and isovolumic hemodilution in Orthognathic surgery. Parameters assessed: Blood loss and transfusion requirements.

Lin et al., [YJOMS, 2016] [10]:A systematic review and meta-analysis of RCTs.10 RCTs focus on the effects of hypotensive anesthesia on reducing intraoperative blood loss, duration of operation, and quality of the surgical field.

Praveen et al., [BJOMS, 2001] [11] Prospective study Evaluates the effect of hypotensive anesthesia on blood loss during orthognathic surgery.

DISCUSSION

Benefits of hypotensive anesthesia

1. Reduction in intraoperative blood loss

Hypotensive anesthesia results in the sparing of about 169ml of blood in orthognathic surgery in general. According to Lin et al., [10] a pooled estimate of 10 randomized controlled trials revealed a significant reduction in intraoperative blood loss. Similarly, Choi et al. [8], reported that 5 randomized controlled trials reviewed showed a statistically significant reduction in blood loss. However, 2 randomized controlled trials have contradicted the results. Praveen et al., [11] have achieved a 45% reduction in intraoperative blood loss under hypotensive anesthesia than normotensive anesthesia.

2. Type of osteotomy and blood loss

Patients undergoing bi-jaw procedures are at greater risk than single jaw surgeries [10].

3. Surgical field clearance and operating time

Reduction in bleeding and blood loss consecutively provides a clearer surgical field to work in. An improvement in this, it provides a clearer visualization of osteotomy sites and cuts, reducing the total intraoperative time. According to Ervens et al., [9] the surgical field rating was significantly higher in the hypotensive group. However, there was no significant decrease in the operating time. Despite this, its benefits include a safer and more accurate dissection and less tissue trauma. According to Choi et al., [8] only 2 randomized controlled trials supported the hypothesis of a clearer surgical field reducing intraoperative time, but 8 other randomized controlled trials didn’t show any such results.

Systemic effects

A potential risk factor is the potential to cause damage to vital organs due to hypoperfusion. Examining the cerebral effects, Choi et al, [8], reported that most studies showed no significant decrease in cerebral blood flow. There was also a significant difference in the cognitive scores.

Renal effects: Urine flow decreased during hypotensive state but returned to normalcy after recovery. Creatinine levels may increase or remain unchanged. One randomized controlled trial also showed no increase in serum creatinine, while there was a transient decrease in sodium fractional excretion rate.

Cardiac effects: Heart rate may be increased or stable depending on the drug used. Cardiac output may or may not change [9,10].

Hepatic effects: Even fewer articles investigating the hepatic effects of hypotensive anesthesia were available. Some studies failed to demonstrate any change in standard liver enzyme markers in the hypotensive group [4,5,7,9,11].

CONCLUSION

Hypotensive anesthesia is effective in reducing blood loss and improving the quality of the surgical field, and in reducing the operation time for orthognathic surgery. The use of local anesthesia in conjunction with hypotensive general anesthesia can further reduce the amount of intraoperative blood loss for orthognathic surgery.

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