Egyptian Journal of Anaesthesia (2016) **32**, 255–261

HOSTED BY

ELSEVIER

Egyptian Society of Anesthesiologists

Egyptian Journal of Anaesthesia

www.elsevier.com/locate/egja
www.sciencedirect.com

Research Article

Optimizing surgical field during cochlear implant surgery in children: Dexmedetomidine versus Esmolol

Sabry Mohamed Amin *, **Mohamed Gamal Eldin Elmawy**

Departments of Anesthesiology and Surgical Intensive Care, Faculty of Medicine, Tanta University, Egypt

Received 25 January 2016; revised 6 May 2016; accepted 8 May 2016
Available online 15 June 2016

KEYWORDS

Cochlear implant surgery;
Hypotensive anesthesia;
Hypotensive drugs;
The alpha-2 agonists;
Beta-antagonist

Abstract *Background:* The field of cochlear implantation has been expanding rapidly and it has been hailed as one of the greatest advances in otology. The technique of anesthesia plays a crucial role in success of cochlear implant surgery as the anesthesiologist has to produce conditions which facilitate surgery by inducing bloodless operative field.
Study objective: To determine the efficacy of dexmedetomidine versus esmolol usage as an adjunct to induce controlled hypotension in children undergoing cochlear implant surgery.
Design: Clinical trial study.
Setting: Operating room in a university hospital.
Patients: 70 children aged 2–4 years scheduled for cochlear implant surgery under general anesthesia. Patients were randomly allocated according to drugs used into two equal groups (35 patients in each group). Interventions: Group (D): The patients in this group received a bolus dose of dexmedetomidine 0.5 ug/kg over 10 min followed by continuous infusion 0.2–0.5 ug/kg/h after induction of anesthesia but before surgery. Group (E): The patients in this group received a bolus dose of esmolol 0.5 mg/kg over 10 min followed by continuous infusion 100–300 ug/kg/min after induction of anesthesia but before surgery.
Measurements: Heart rate, Mean Arterial blood Pressure, Quality of surgical field, operative time, adverse events.
Main results: The quality of surgical field was comparable between both groups in all times of measurements. The time to first analgesic request was statistically significant longer in group (D) than in group (E) and the total tramadol consumption was statistically significant less in group (D) than in group (E).
Conclusions: In our study both dexmedetomidine and esmolol were effective in reducing MABP, and lowering the heart rate providing dry surgical field and ensured good surgical condition during cochlear implant surgery in pediatric patients.

* Corresponding author at: Anesthesia Department, Tanta University Hospital, Tanta 31527, Egypt. Tel.: +20 1221793439.
E-mail addresses: sabry_amin@yahoo.com (S.M. Amin), dr.mogoma@yahoo.com (M.G.E. Elmawy).
Peer review under responsibility of Egyptian Society of Anesthesiologists.

http://dx.doi.org/10.1016/j.egja.2016.05.003

1. Introduction

The field of cochlear implantation has been expanding rapidly and now it is an acceptable therapeutic option for those patients with irreversible hearing loss and deaf mutism. It has been hailed as one of the greatest advances in otology [1].

The anesthesiologist is an integral member of the cochlear implant team whose anesthetic as well as communication skills are put to test. The technique of anesthesia plays a crucial role in success of cochlear implant surgery as the anesthesiologist has to produce conditions which facilitate surgery by inducing bloodless operative field, use of nerve stimulators and treat post-operative complications such as nausea, vomiting and vertigo [2].

A bloodless surgical field is ideal for cochlear implant surgery, as even small amounts of blood will obscure the surgeon's view in microsurgery. A combination of physical and pharmacologic techniques is used to minimize bleeding [3].

Controlled hypotension is commonly used to achieve a bloodless operative field. Although the primary premise for its use is to limit intraoperative blood loss, an additional benefit is improved visualization of the surgical field [4].

The use of controlled hypotension in pediatric surgery was first reported in 1953, thereafter, widely used in various pediatric surgical procedures, including scoliosis surgery, vascular surgery, and neurosurgery [5].

In older children (9–18 years) undergoing functional endoscopic sinus surgery under controlled hypotension, no adverse outcomes were noted, and safe reduction in blood pressure (BP) has been regarded as a maximum of 25% below baseline mean BP [6].

Various drugs have been used to induce controlled hypotension including vasodilators, alpha- and beta-adrenergic antagonist, beta-adrenergic antagonists, and high doses of potent inhaled anesthetics [7].

While hypotension has proved safe to use in children, some develop tachycardia that delays the onset of hypotension. The introduction of the short acting beta-blocker esmolol enabled more precise control of heart rate.

Esmolol is an ultra-short acting intravenous cardio selective beta-antagonist. It has an extremely short elimination half-life and a total body clearance approaching 3 times of cardiac output and 14 times of hepatic blood flow [8].

Dexmedetomidine is a specific and selective α_2-adrenoceptor agonist. Drugs acting as agonists at α_2-adrenoceptors may enhance anesthesia by providing dose-related sedation, anxiolysis, decreased upper airway secretions, perioperative hemodynamic stability and analgesia. There is substantial evidence that the α_2-agonists also exert an anesthetic-sparing effect [9].

The aim of this study was to determine the efficacy ofdexmedetomidine versus esmolol usage as an adjunct to induce controlled hypotension in children undergoing cochlear implant surgery. The primary outcomes are the quality of surgical field and surgical area bleeding score while duration of surgery and time to first analgesic request are the secondary outcomes.

2. Patients and methods

This randomized prospective double-blind study was conducted on 70 children aged 2–4 years scheduled for cochlear implant surgery under general anesthesia in the otorhinolaryngology department, Tanta University Hospital, after approval of the ethics committee and obtaining written informed consent from parents of each patient.

The approval code of ethics committee was 30290/05/15.

The randomization was performed using sealed numbered envelopes indicating the group of each patient. A blind nurse who did not participate in patients' follow-up read the number and made group assignments. Study drugs were prepared by an independent anesthesiologist.

All patients' data were confidential with secret codes and were used for the current study only.

Any unexpected risk appears during the course of the study was cleared to the guardian of the patient and the ethical committee on time and the proper measures were taken to minimize or overcome these risks.

2.1. Inclusion criteria

Pediatric patients aging 2–4 years of either sex with ASA I and II scheduled for cochlear implant surgery.

2.2. Exclusion criteria

Refusal to share in the study, known allergy to any of the study drugs, diabetes, liver and/or kidney disease, congenital heart disease and hemodynamic instability (Fig. 1).

2.3. Preoperative preparation

All patients were underwent preoperative assessment by history taking, physical examination and laboratory investigations as needed.

2.4. Intraoperative management

General anesthesia was induced by sevoflurane (7 vol.%,). After the patients' loss of consciousness, intravenous line was inserted. Orotracheal intubation was facilitated by 1 μg/kg fentanyl and cisatracurium 0.15 mg/Kg and confirmed by clinical observation of chest wall movement, auscultation of chest and presence of square wave of capnogram. The patients were connected to mechanical ventilation. The respiratory rate and tidal volume were adjusted to maintain an ETCO2 between 32 and 35 mmHg.

Arterial catheter was inserted in the radial artery after Allen's test for measurement of invasive blood pressure. Folly catheter was used to decompress the urinary bladder and to monitor urine output.

Anesthesia was maintained with sevoflurane 2–3 vol.% in 100 O_2 and top up dose of cisatracurium 0.02 mg/kg every 30 min. Standard patient monitoring (electrocardiogram, non-invasive arterial pressure, heart rate, pulse oximetry, and end-tidal CO_2) was used during anesthesia. All patients received a 5% dextrose in 0.45% saline at rate 5 ml/kg/h.

Facial nerve was identified intraoperatively by electrical stimulation after the effect of muscle relaxant has adequately reversed as evidenced by the nerve stimulator (train of four response); anesthesia was maintained during this stage by bolus dose of propofol 0.5 mg/kg and after the test was done muscle relaxant was given till the end of surgery.