Controlled hypotensive anesthesia for Rhinoplasty: A comparative study between Dexmedetomidine versus Propofol

A Thesis

Submitted for fulfillment of the M.D. degree In Anesthiology

By

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2015

Acknowledgements

*Foremost, I am deeply thankful to "**Allah**" by the grace of whom, this work was possible.*

*I would like to express my deep gratitude to **Prof. Dr. Laila Ali Elkafrawy,** Professor of Anesthesiology and Intensive Care Medicine – Faculty of Medicine - Ain Shams University, for her continuous support of my M.D. study and research, sincere help, her patience, motivation and immense knowledge.*

*I am very grateful to **Prof. Dr. Hoda Omar Mahmoud**, Professor of Anesthesiology and Intensive Care Medicine – Faculty of Medicine - Ain Shams University, for her close supervision, precious efforts and continuous encouragement throughout this work.*

*I would like to thank all members of the Department, Faculty of Medicine - Ain Shams University, for their support and continuous encouragement especially **Dr. Melad Ragaay Zekry** and **Dr. Mohammed Sayed Shorbagy** Lecturers of Anesthesiology and Intensive Care Medicine–Faculty of Medicine - Ain Shams University, for their great assistance, precious efforts and valuable guidance.*

Last but not the least, I would like to dedicate this work and express my deep appreciation to my parents, family , my dear wife and my beloved Kids (Mark and Clara) , to the soul of my mother, to whom I am greatly indebted for their love and spiritual support throughout my life

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List of abbreviations

ABGs	Arterial blood gases
ACE	Angiotensin converting enzyme
ACS	Average category scale
ANH	Acute Normovolemic Hemodilution
ASA- PS	American Society of Anesthesiology physical status
BP	Blood pressure
CABG	Coronary artery bypass grafting
cAMP	Cyclic adenine mono phosphate
CN	Cranial nerve
CNS	Central nervous system
CPB	Cardiopulmonary bypass
CT	Computed tomography
DEX	Dexmedetomidine
ECG	Electrocardiogram
EEG	Electroencephalogram
FDA	Food and Drug Administration
GABA	Gamma-aminobutyric acid
HR	Heart rate

IQR	Inter quartile range
MAP	Mean arterial pressure
MRI	Magnetic resonance imaging
N&V	Nausea and vomiting
NTG	Nitroglycerin
PaCO2	Arterial carbon dioxide partial pressure
PACU	Postanesthesia care unit
PaO2	Arterial oxygen partial pressure
PMNs	Polymorph nucleocytes
PRIS	Propofol infusion syndrome
RR	Respiratory rate
SD	Standard deviation
SNP	Sodium nitroprusside
SPO2	Oxygen saturation
TMN	Tuberomammillary nucleus
TSH	Thyroid stimulating hormone
TV	Tidal volume
VLPO	Venterolateral preoptic nucleus

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Introduction

The need for intentionally reducing blood pressure to hypotensive level in a variety of surgical procedures is gaining popularity today. Any technique of controlled hypotension during general anesthesia aims to lower the mean arterial blood pressure **(MAP)** to values between 55 and 65 mmHg in patients with normal blood pressure, with the goal of significantly reducing blood loss by maintaining it at this level throughout the operation process (***Clincikas 2003)***

Controlled hypotension is frequently used for obtaining better exposure during nasal surgery as small bleeding areas can reduce operative visibility and result in destruction of surrounding structures (***Baker and Baker, 2010)***

Various agents (e.g., magnesium sulphate, sodium nitroprusside, nicardipine, nitroglycrin, esmolol, α2-agonist, labetalol, and high doses of potent inhaled anesthetics) have been used to achieve controlled hypotension. Some of the disadvantages associated with these drugs include resistance to vasodilators, tachyphlaxis (with nitroglycrin), cyanide toxicity (with sodium nitroprusside), the possibility of myocardial depression (with esmolol and magnesium sulfate), and a long post-anesthetic recovery period (with isoflurane)***(Kol et al., 2009).***

Dexmedetomidine(DEX), an imidazol compound, a pharmacologically active dextroisomer of medetomidine

that displays a potent highly selective α2 adrenergic receptor agonism. It has sedative, analgesic and anesthetic sparing effect, and sympatholytic properties. The central and peripheral sympatholytic action of (DEX) is mediated by α2 adrenergic receptor and is manifested by dose-dependent decrease in arterial blood pressure, heart rate, cardiac output and norepinephrine release (***Richa et al., 2008)***

Propofolis a gentle, safe, non-opiate medication with rapid smooth action, and quick offset. It is exceedingly unlikely to cause any allergic reaction, and does not cause nausea. In the proper hands, it is easily controlled, and can be used for mild sedation to general anesthesia. It can be used for very short operations, lasting a few minutes, to long procedures lasting many hours ***(Harris et al., 2006)***

Ideally, hypotensive agents should be easy to administer, have a short time to onset, have effects that disappear quickly when administration is discontinued, have rapid elimination without toxic metabolites, have negligible effects on vital organs, and have predictable and dose-dependant effects ***(Degoute, 2007)***

Aim of the work

The present work was designed to compare the efficacy and safety of dexmedetomidine and propofol as a hypotensive agent in rhinoplasty with attention on the amount of blood loss, quality of the surgical field, hemodynamics, recovery profile, and tolerability in adult patients**.**

APPLIED ANATOMY OF THE NOSE

External nose

The external nose can be described as a pyramidal prominence projecting from the mid face, covering the anterior end of the nasal cavity. The upper bony portion comprises the paired frontal processes of the maxilla and the nasal bones, which are firmly attached to the frontal bone at the glabella superiorly. The rest of the nasal bridge is composed of the paired upper lateral cartilages and lower alar cartilages, which surround the anterior nares forming the columella centrally. The nasal bridge is supported by a midline cartilage, or septum, which is attached posteriorly to the rostrum on the anterior wall of the sphenoid. Although the septum separates the two nasal cavities, it is generally deviates to one side, usually to the left ***(Calder and Pearce, 2010)***

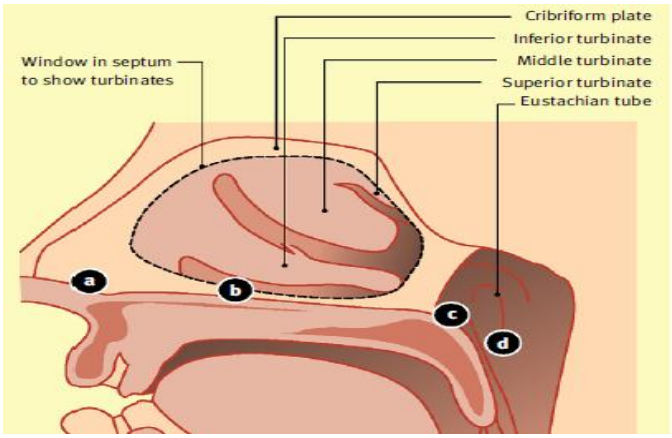

Fig.1: Anatomy of the nose. **a** anterior nares; **b**inferior turbinate; **c** closed nasopharynx**; d**open nasopharynx***(Hollingshead, 1982).***

The nasal cavity has a large volume, and is directed horizontally backwards. It is 4 cm wide, and the distance between the columella and the posterior wall of the nasopharynx is 6.5 cm. The nasal cavity is 4 cm from the floor to the cribriform plate. The nose acts as a heater and humidifier of incoming gases as well asa voice resonator and housing for the olfactory receptors ***(Ellis et al., 2004).***

Floor of nasal cavity–anteriorly: palatine process of the maxilla and palatine bone (hard palate); posteriorly: upper surface of the soft palate.

Roof of nasal cavity–anteriorly: external nose; posteriorly: cribiform plate.

Lateral wall of nasal cavity–superiorly: ethmoid sinuses;inferiorly: medial wall of the maxillary antrum. Arising from the lateral wall are three horizontal bones called the conchae.These bones are covered by fibrovascular erectile tissue to form the turbinates(Fig.1), which dramatically reduce the volume of the nose, but increase the surface area exposed to inflowing air, allowing for warming, filtration and humidification of air. The inferior turbinate is the largest and most easily seen at anterior rhinoscopy. Above the inferior turbinate is the middle turbinate, which forms the medial wall of the ethmoid sinuses, and further superiorly is the small superior turbinate found just below the cribriform plate. Below each turbinate is a corresponding meatus.

• **Inferior meatus**: drains tears from the eye via the nasolacrimal duct.

• **Middle meatus**: drains the ethmoidal, maxillary and fronta lsinuses via several ostia.

• **Superior meatus**: drains the posterior ethmiodal air cells viaostia (***Ellis et al., 2004).***

Clinical note– long-term nasal tubes can cause obstruction of the ostia and lead to sinusitis. When passing a nasogastric tubeor fibre-optic scope, a good analogy of the passage is similar to the lumen of a Tuohy needle, the nostril being the Huber point. A superiorly directed tube can penetrate the cribiform plate into the frontal lobes of the brain ***(Calder and Pearce, 2010)***

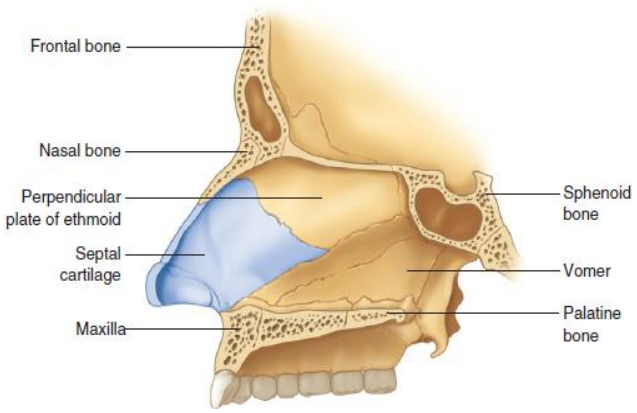

Fig.2: Lateral view of the left side of the nasal septum ***(Hollingshead, 1982).***