"VARIATION IN INDUCTION DOSE AND TIME OF PROPOFOL ON ADMINISTERING INHALED NITROUS OXIDE DURING INDUCTION: A PROSPECTIVE, RANDOMISED CONTROLLED STUDY"

By

Dr. DANDAMUDI SIRI CHANDANA

DISSERTATION SUBMITTED TO SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, KOLAR, KARNATAKA

DOCTOR OF MEDICINE

IN

ANAESTHESIOLOGY

Under the Guidance of

Dr. KIRAN. N

Professor

MD ANAESTHESIOLOGY

DEPARTMENT OF ANAESTHESIOLOGY,

SRI DEVARAJ URS MEDICAL COLLEGE,

TAMAKA, KOLAR-563101

MAY 2025

SRI DEVARAJ URS MEDICAL COLLEGE,

TAMAKA, KOLAR

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation/thesis entitled **"VARIATION IN INDUCTION DOSE AND TIME OF PROPOFOL ON ADMINISTERING INHALED NITROUS OXIDE DURING INDUCTION: A PROSPECTIVE, RANDOMISED CONTROLLED STUDY"** is a bonafide and genuine research work carried out by me under guidance of **Dr. KIRAN. N** Professor, Department of Anaesthesiology, Sri Devaraj Urs Medical College, Tamaka, Kolar.

Date: **Dr.DANDAMUDI SIRI CHANDANA**

Place: Kolar

SRI DEVARAJ URS MEDICAL COLLEGE,

TAMAKA, KOLAR-563101

CERTIFICATE BY THE GUIDE

This is to certify that the dissertation/thesis entitled **"VARIATION IN INDUCTION DOSE AND TIME OF PROPOFOL ON ADMINISTERING INHALED NITROUS OXIDE DURING INDUCTION: A PROSPECTIVE, RANDOMISED CONTROLLED STUDY"** is a bonafide and genuine research work carried out by **Dr. DANDAMUDI SIRI CHANDANA** in partial fulfilment of the requirement for the degree of **DOCTOR OF MEDICINE** in **ANAESTHESIOLOGY.**

Date :

Place : Kolar

Dr. KIRAN. N, MD.

Professor,

Department of Anesthesiology.

SRI DEVARAJ URS MEDICAL COLLEGE,

TAMAKA, KOLAR-

ENDORSEMENT BY THE HOD, PRINCIPAL / HEAD OF THE INSTITUTION

This is to certify that the dissertation/thesis entitled **"VARIATION IN INDUCTION DOSE AND TIME OF PROPOFOL ON ADMINISTERING INHALED NITROUS OXIDE DURING INDUCTION: A PROSPECTIVE, RANDOMISED CONTROLLED STUDY"** is a bonafide and genuine research work carried out by **Dr DANDAMUDI SIRI CHANDANA** in partial fulfilment of the requirement for the degree of **DOCTOR OF MEDICINE** in **ANAESTHESIOLOGY.**

Dr. SURESH KUMAR N MD IDCCM
Professor & HOD
Department of Anaesthesiology,
Sri Devaraj Urs Medical College,
Tamaka, Kolar

Date:
Place: Kolar

Dr. PRABHAKAR K
Principal,
Sri Devaraj Urs Medical College
Tamaka, Kolar

Date:
Place: Kolar

SRI DEVARAJ URS MEDICAL COLLEGE,

TAMAKA, KOLAR

COPY RIGHT

DECLARATION BY THE CANDIDATE

I hereby declare that the Sri Devaraj Urs Academy of Higher Education and Research Center, Kolar, Karnataka shall have the rights to preserve, use and disseminate this dissertation/thesis in print or electronic format for academic/research purpose.

Date:

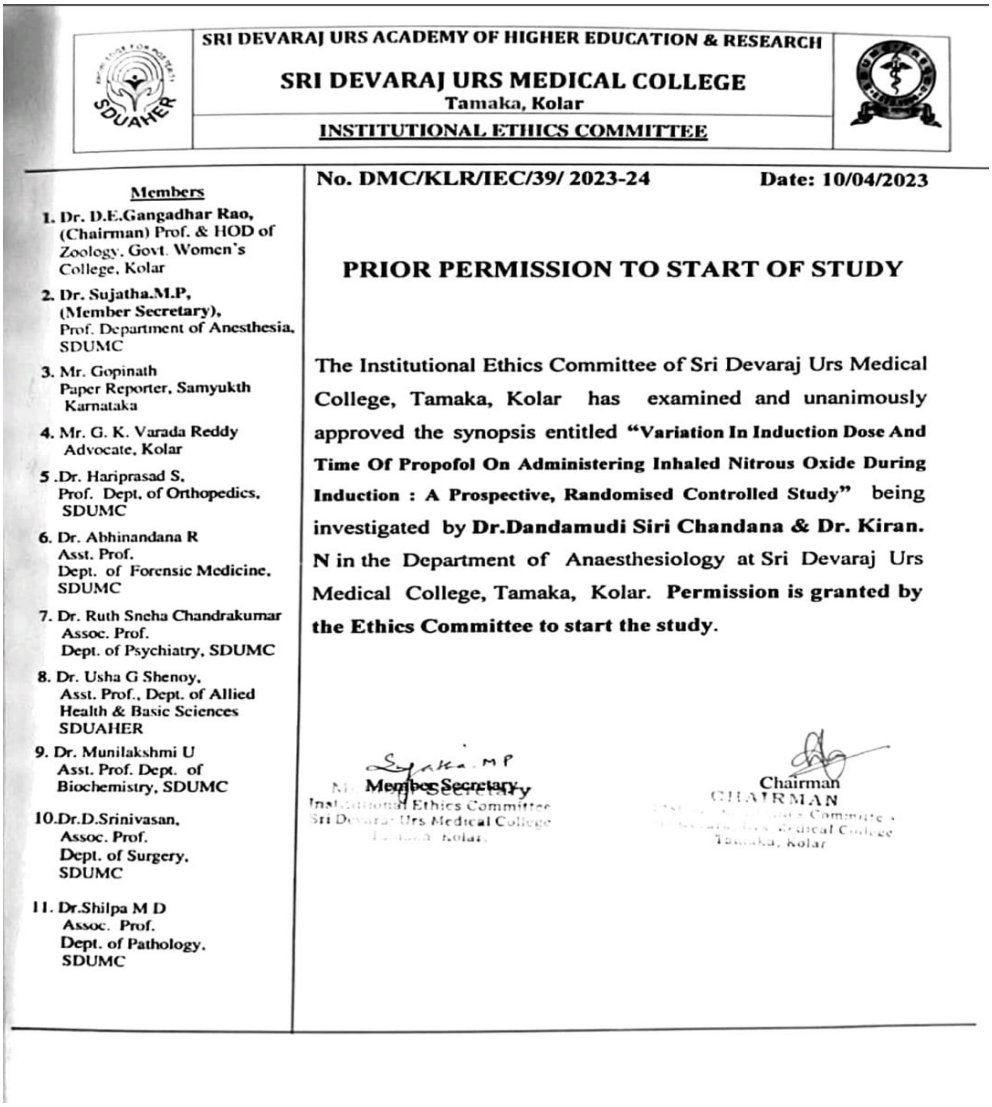
Place: Kolar **Dr. DANDAMUDI SIRI CHANDANA**

@ SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION TAMAKA, KOLAR, KARNATAKA

SRI DEVARAJ URS MEDICAL COLLEGE,

TAMAKA, KOLAR

ETHICAL COMMITTEE CERTIFICATE



SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH

SRI DEVARAJ URS MEDICAL COLLEGE
Tamaka, Kolar

INSTITUTIONAL ETHICS COMMITTEE

Members

1. Dr. D.E.Gangadhar Rao, (Chairman) Prof. & HOD of Zoology, Govt. Women's College, Kolar
2. Dr. Sujatha.M.P, (Member Secretary), Prof. Department of Anesthesia, SDUMC
3. Mr. Gopinath Paper Reporter, Samyukth Karnataka
4. Mr. G. K. Varada Reddy Advocate, Kolar
5. Dr. Hariprasad S, Prof. Dept. of Orthopedics, SDUMC
6. Dr. Abhinandana R Asst. Prof. Dept. of Forensic Medicine, SDUMC
7. Dr. Ruth Sneha Chandrakumar Assoc. Prof. Dept. of Psychiatry, SDUMC
8. Dr. Usha G Shenoy, Asst. Prof., Dept. of Allied Health & Basic Sciences SDUAHER
9. Dr. Munilakshmi U Asst. Prof. Dept. of Biochemistry, SDUMC
10. Dr.D.Srinivasan, Assoc. Prof. Dept. of Surgery, SDUMC
11. Dr.Shilpa M D Assoc. Prof. Dept. of Pathology, SDUMC

No. DMC/KLR/IEC/39/ 2023-24 **Date: 10/04/2023**

PRIOR PERMISSION TO START OF STUDY

The Institutional Ethics Committee of Sri Devaraj Urs Medical College, Tamaka, Kolar has examined and unanimously approved the synopsis entitled **"Variation In Induction Dose And Time Of Propofol On Administering Inhaled Nitrous Oxide During Induction : A Prospective, Randomised Controlled Study"** being investigated by **Dr.Dandamudi Siri Chandana & Dr. Kiran. N** in the Department of Anaesthesiology at Sri Devaraj Urs Medical College, Tamaka, Kolar. **Permission is granted by the Ethics Committee to start the study.**

Member Secretary
Institutional Ethics Committee
Sri Devaraj Urs Medical College
Tamaka, Kolar.

Chairman
CHAIRMAN
Institutional Ethics Committee
Sri Devaraj Urs Medical College
Tamaka, Kolar

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH
TAMAKA, KOLAR, KARNATAKA, INDIA 563103

CERTIFICATE OF PLAGIARISM CHECK

Title of the Thesis/Dissertation	**VARIATION IN INDUCTION DOSE AND TIME OF PROPOFOL ON ADMINISTERING INHALED NITRIOUS OXIDE DURING INDUCTION : A PROSPECTIVE , RANDOMISED CONTROLLED STUDY**
Name of the Student	DR. DANDAMUDI SIRI CHANDANA
Registration Number	22AN1036
Name of the Supervisor / Guide	DR.KIRAN N
Department	ANAESTHESIOLOGY
Acceptable Maximum Limit (%) of Similarity (PG Dissertation /Ph.D. Thesis)	10 %
Similarity	08%
Software used	TURNITIN
Paper ID	267366546
ORCID ID	0009-0004-0784-6241
Submission Date	05/05/2025

Signature of Student

Signature of Guide/Supervisor

Professor
R. L. Jalappa Hospital & RC
SDUMC/SDUAHER
Tamaka, Kolar-563103

Professor And Head
Department of Anaesthesiology
Sri Devaraj Urs Medical College
R.L. Jalappa Hospital & Research Centre
TAMAKA, KOLAR-563101.

HOD Signature

University Library
Learning Resource Centre
SDUAHER, Tamaka
KOLAR-563103

University Librarian

PG Coordinator
Sri Devaraj Urs Medical College
Tamaka, Kolar-563103

PG Coordinator

Document Viewer

Turnitin Originality Report

Processed on: 05-May-2025 10:59 IST
ID: 2657366546
Word Count: 7040
Submitted: 3

VARIATION IN INDUCTION DOSE AND TIME OF PROPO... By Dr. Siri Chandana

Similarity Index	Similarity by Source	
8%	Internet Sources:	7%
	Publications:	5%
	Student Papers:	2%

include quoted | include bibliography | excluding matches < 14 words | mode: quickview (classic) report | print | refresh | download

1% match (Internet from 28-Feb-2023)
https://www.ncbi.nlm.nih.gov/books/NBK532922/

1% match (Internet from 18-Dec-2024)
https://sasspublishers.com/article/6876/download/

1% match (Internet from 28-Dec-2022)
https://www.researchgate.net/publication/12534254_Inhaling_Nitrous_Oxide_Reduces_the_Induction_Dose_Requirements_of_Propofol

1% match (Internet from 10-Oct-2021)
http://www.asja.cg.net

<1% match (Internet from 01-Dec-2020)
https://www.ncbi.nlm.nih.gov/books/NBK557596/

<1% match (Internet from 21-Jun-2023)
https://www.jcdronline.org/admin/Uploads/Files/6480a7d752c805.72354206.pdf

<1% match (Anilkumar, Arekapudi. "Effect of 'Priming Principle' on the Induction Dose Requirements of Propofol - A Randomized Clinical Trial", Rajiv Gandhi University of Health Sciences (India), 2023)
Anilkumar, Arekapudi. "Effect of 'Priming Principle' on the Induction Dose Requirements of Propofol - A Randomized Clinical Trial", Rajiv Gandhi University of Health Sciences (India), 2023

<1% match (student papers from 12-Oct-2022)
Submitted to University of the Southern Caribbean on 2022-10-12

<1% match ()
Krishnamurthy, C. "Effects of Upper Extremity Isometric Exercises on Cardiovascular Responses in Normal and Obese Individuals", 2019

<1% match (Internet from 06-Jan-2023)
https://pnrjournal.com/index.php/home/article/download/4077/4278/5040

<1% match (Internet from 15-Jan-2023)
https://pdfs.semanticscholar.org/b66b/30373fa0bfe18e9843c9f4140eb932d648c5.pdf

<1% match (Internet from 27-Sep-2022)
https://www.jwmipt.org.pk/index.php/JWMIPT/article/download/12/8/9

<1% match (Mallikarjuna, Jyothi. "Co-Induction"- A Comparative Study of Midazolam, Ketamine and Propofol as Coinducing Agents to Propofol", Rajiv Gandhi University of Health Sciences (India), 2023)
Mallikarjuna, Jyothi. "Co-Induction"- A Comparative Study of Midazolam, Ketamine and Propofol as Coinducing Agents to Propofol", Rajiv Gandhi University of Health Sciences (India), 2023

<1% match (Internet from 17-Dec-2022)
https://ugspace.ug.edu.gh/bitstream/handle/123456789/33285/Psychological%20Burden%20and%20Reported%20Medication%20Adherence%isAllowed=y&sequence=1

<1% match (Internet from 17-Mar-2020)
https://www.researchsquare.com/article/rs-356/v3

<1% match (student papers from 08-Dec-2023)
Submitted to An-Najah National University on 2023-12-08

<1% match (Hadimani, Channagouda. "A Clinical Comparative Assessment of Intubating Conditions and Neuromuscular Blocking Effects of Two Different Doses, 0.15mg/Kg and 0.2mg/Kg of Cisatracurium", Rajiv Gandhi University of Health Sciences (India), 2023)
Hadimani, Channagouda. "A Clinical Comparative Assessment of Intubating Conditions and Neuromuscular Blocking Effects of Two Different Doses, 0.15mg/Kg and 0.2mg/Kg of Cisatracurium", Rajiv Gandhi University of Health Sciences (India), 2023

<1% match (Internet from 27-Nov-2023)
https://discovery.researcher.life/search/f/journal/The-Indian-Anaesthetists-Forum

<1% match (Internet from 29-Sep-2022)
http://www.ijss-sn.com

<1% match ("You're Wrong, I'm Right", Springer Science and Business Media LLC, 2017)

"You're Wrong, I'm Right", Springer Science and Business Media LLC, 2017

<1% match (student papers from 15-Mar-2024)
Submitted to Bournemouth University on 2024-03-15

<1% match (Internet from 30-May-2022)
https://journals.sbmu.ac.ir/jcma/article/download/34213/27597/

<1% match (Internet from 19-Jul-2023)
http://www.ijlbpr.com

VARIATION IN INDUCTION DOSE AND TIME OF PROPOFOL ON ADMINISTERING INHALED NITROUS OXIDE DURING INDUCTION: A PROSPECTIVE, RANDOMISED CONTROLLED STUDY I ABSTRACT Background: Commonly used intravenous induction agent, propofol is in contemporary anesthesia practice, valued for its rapid onset, amnestic properties, and ability to provide optimal conditions for intubation. Nitrous oxide, though a weak anesthetic, offers analgesic and anxiolytic benefits and is often used as an adjuvant to reduce the requirement for intravenous agents. The present study explores the role of inhaled nitrous oxide in optimizing propofol induction by reducing its dose and onset time while maintaining hemodynamic stability. Aim: To evaluate the variation in induction dose and induction time of propofol when combined with inhaled nitrous oxide during general anesthesia. Materials and Methods: This study was conducted on 96 patients (ASA I and II, aged 18–60 years) undergoing elective surgeries under general anesthesia at R.L. Jalappa Hospital. Participants were randomly divided into two groups (n=48 each). Group A received 70% nitrous oxide with 30% oxygen and propofol infusion; Group B received 100% oxygen with propofol infusion. Induction time, propofol dose, and hemodynamic parameters were recorded and analyzed using standard statistical tests. Results: Group A demonstrated significantly shorter induction times ($p<0.05$), with 85.4% achieving induction in <200 seconds compared to 12.5% in Group B. Propofol dose was also significantly lower in Group A. The systolic, diastolic, and mean arterial pressures, was better maintained in Group A. Heart rate differences were not statistically significant. Conclusion: The co-administration of inhaled nitrous oxide significantly reduces propofol induction time and dose while enhancing hemodynamic stability. This combination can be a safer and more efficient approach to anesthesia induction. II Keywords: Propofol, Nitrous oxide, General anesthesia, Induction dose, Induction time, Hemodynamic stability III INTRODUCTION Propofol has been the most often utilized drug for intravenous induction of anesthesia in recent years. It blunts the airway reflexes in hyperreactive airway. Propofol as an induction agent is safe and effective hypnotic, it provides rapid awakening, amnesic effect and better intubating conditions. However it results in significant post-induction hypotension, bradycardia, pain on injection, apnea hemodynamic and respiratory depression, hypertriglyceridemia.1 Nitrous Oxide is safe for majority of the patients due to its analgesic effect and anxiolytic effect. Nitrous oxide due to its weak anesthetic properties is used as an adjuvant. The use has decreased the necessity of intravenous anaesthetics.1–3 By inducing with nitrous oxide, we are trying to maximize the benefits of using propofol and also minimizing the side effects which are dose related. According to the studies done so far, there is a 44% reduction in Propofol dose requirement and induction time with 66% concentration of Nitrous oxide inhalation.4,5 Though Nitrous oxide has drawbacks like second gas effect, gas filled cavities expansion, nausea and vomiting postoperatively, it reduces propofol requirement. It is unknown, yet, how both medications affect general hemodynamics. REVIEW OF LITERATURE A medically induced condition of unconsciousness known as general anesthesia causes patients to lose their defensive reflexes and become totally unresponsive to painful, tactile, or spoken stimuli. It is accomplished by administering a variety of anesthetics that, when taken together, result in amnesia, analgesia, muscle relaxation, unconsciousness, and autonomic reflex suppression. To maintain airway patency, a laryngeal mask airway or endotracheal tube is often required due to the risk of upper airway obstruction.6 Historically, before the development of systematic monitoring techniques, determining the depth of anesthesia relied solely on physical examination, leading to frequent anesthetic overdoses, particularly by less experienced anesthetists. It was not until the 20th century that a structured approach to monitoring anesthesia depth emerged. Despite advancements in anesthetic agents and delivery methods that allow for quicker induction and recovery— sometimes bypassing certain stages—Guedel's classification remains a relevant reference in modern anesthesia practice.7 Guedel's Classification - Anesthesia Stages Stage 1 – Disorientation or Analgesia: often beginning in a preoperative anesthesiology holding area, is referred to as the induction stage. Patients receive medication that induces sedation while remaining conscious and conversational. Breathing remains slow and steady. The patient moves from analgesia without amnesia to analgesia with amnesia at the same time during this phase.8 The stage concludes when the patient loses consciousness. Stage 2 – Delirium or Excitement: Characterized by disinhibition, uncontrolled movements, delirium, and the loss of the eyelash reflex, this stage is associated with higher heart rate and blood pressure. Airway reflexes remain intact but become hypersensitive, increasing the risk of laryngospasm if manipulated. Any airway procedures, such as endotracheal tube placement or deep suctioning, should be avoided to prevent complications. Spastic movements, vomiting, and irregular breathing patterns may further endanger the airway. To minimize time spent in this phase, fast-acting anesthetic agents are often used to facilitate a smoother transition to the next stage.9 Stage 3 – Surgical Anesthesia: This level of anesthesia is the goal for most surgical procedures, marked by the absence of eye movements and significant respiratory depression, making airway manipulation safe. Surgical anesthesia is further classified into four planes.9,10 Stage 4 – Overdose: This dangerous phase results from excessive anesthetic administration relative to surgical stimulation, leading to profound brain and medullary suppression. It begins with respiratory cessation and, if not managed promptly, can result in death. Due to cardiac depression and severe vasodilation, patients at this stage exhibit flaccid skeletal muscles, locked and dilated pupils, and dangerously low blood pressure with weak, thready pulses. This stage poses a serious risk to life if cardiovascular and respiratory measures are not taken quickly. The primary goal of the anesthetist is to quickly induce Stage 3 anesthesia in the patient and maintain that level of anesthesia during the procedure.9,11 The General anesthesia can trigger physiological responses that, if not managed properly, may lead to morbidity or even mortality. As a high-risk medical intervention, its benefits must outweigh potential harms.12 Although deaths from anesthesia are rare, they can nonetheless happen as a result of complications such as severe allergic responses, airway blockage, or pulmonary aspiration of stomach contents. The primary cause is still human mistake, even though equipment failure might play a role. However, because to better safety procedures, better monitoring and detection tools, and the adoption of standardized norms, the death rate from anesthesia has significantly decreased over the last 20 years. Patient safety results have improved and errors have been drastically decreased as a result of these quality initiatives13,14. NITRIC OXIDE It is a colorless, odorless, non-flammable gas that can support combustion similarly to oxygen. Commonly known as laughing gas due to its euphoric effects, it is the least potent inhalational anesthetic. Nitrous oxide is usually paired with a more powerful volatile agent because it cannot be employed as a stand-alone anesthetic due to its minimum alveolar concentration (MAC) of 104percent. It contributes to the second gas effect, which increases the concentration of other volatile anesthetics in the lungs, because of its rapid onset and short offset caused by its limited blood solubility (blood-gas partition coefficient of 0.47).2 Nitrous gas finds extensive application in dental treatments, general anesthesia, procedural sedation, and pain management, especially in emergency and obstetric contexts. In these situations, it is frequently given as a 50percent oxygen mixture. =Overall minute ventilation stays constant even as the tidal volume drops and the respiratory rate increases. Although it has the potential to directly cause cardiac depression, sympathetic stimulation balances this effect, thus the overall effect is minimal.15,16 Mechanism of action Nitrous oxide exerts its effects through multiple targets in the CNS, acting as a non- competitive NMDA receptor inhibitor to produce anesthesia. Mediated through GABA-A activation. 3 According to pharmacokinetics, nitrous oxide enters the body quickly through the alveoli and

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	Dr. Siri Chandana
Assignment title:	PG Dissertation - 2025
Submission title:	VARIATION IN INDUCTION DOSE AND TIME OF PROPOFOL ON ...
File name:	PROPOFOL_ON_ADMINISTERING_INHALED_NITROUS_OXIDE_D...
File size:	295.92K
Page count:	54
Word count:	7,040
Character count:	38,919
Submission date:	05-May-2025 10:58AM (UTC+0530)
Submission ID:	2657366546


VARIATION IN INDUCTION DOSE AND TIME OF PROPOFOL ON ADMINISTERING INHALED NITROUS OXIDE DURING INDUCTION: A PROSPECTIVE, RANDOMISED CONTROLLED STUDY

University Library
Learning Resource Centre
SDUAHER, Tamaka
KOLAR-563103

Professor
Department of Anaesthesiology
R. L. Jalappa Hospital & RC
SDUMC/SDUAHER
Tamaka, Kolar-563103

ACKNOWLEDGEMENT

*First and foremost, I thank the **"Lord Almighty"** for showering his blessings and giving me the strength during my post-graduation and providing me everything that I required in completing my dissertation.*

I would like to acknowledge all those who have supported me, not only to complete my dissertation, but helped me throughout my post-graduation course.

*I attribute the success of my dissertation and owe immense gratitude to my mentor and guide **Dr. KIRAN. N,** Professor, Department of Anaesthesiology, for being very helpful throughout the study, whose valuable guidance has helped me patch this dissertation and make it a complete dissertation book. His suggestions and his instructions have served as the major contribution towards the completion of this study. His dedication, keen interest, professional knowledge and overwhelming attitude to help students had been solely and mainly responsible for completing my work.*

*I wish to express my sincere thanks to **Dr. RAVI M** Professor, Department of Anaesthesiology for his constant and continuous support. He has conveyed a spirit of adventure in regard to research and scholarship and an excitement in regard to teaching. Without his guidance and persistent help this dissertation would not have been possible.*

*My heartfelt thanks to **Dr. SURESH KUMAR. N** Professor and HOD, Department of Anaesthesiology for his immense support and guidance for teaching and also helping me for completion of my dissertation*

It gives me immense pleasure to extend my sincere thanks to Professors ***Dr. SUJATHA M P, Dr. LAVANYA K, Dr.VISHNUVARDHAN*** *and Associate Professor* ***Dr. SUMANTH T*** *for providing valuable suggestions and motivation throughout the course.*

I am extremely thankful to my Assistant Professor ***Dr. ABHINAYA MANEM, Dr. AMULYA*** *for their constant help and guidance throughout the course. They were a source of encouragement, support and for patient perusal to which I am deeply obliged.*

My heartfelt thanks to senior residents ***Dr. RAHUL K, Dr. SAI YASHASWINI, Dr. DHANALAKSHMI M, Dr. ANUSHRI, Dr. HUCHAPPA*** *and my seniors* ***Dr.REVATHI****,* ***Dr. K DINESH, Dr. HAZARATH NABI, Dr. SOBBANNA, Dr. SHRUTHI S P, Dr. USHASREE, Dr. ARUNSETH C, Dr. S M KUSHAL, Dr. RUKMINI K, Dr. SUSHMITHA S, Dr. HARINI DEV, Dr. HARITHA P,*** *for their practical tips, advice and constant encouragement.I thank my* ***JUNIORS*** *for providing useful tips and clues in completing this vast work.*

My sincere thanks to my colleagues and dearest friends ***Dr.HIMAJA, Dr.SUSMITHA.T,Dr.RATAN,Dr.REDDYSRI,Dr.DINESH,Dr.TARUN,Dr.MEGHANA, Dr.BHARATH,Dr.AKHIL,Dr.NAMRATHA,Dr.SADVI*** *for their co-operation and help in carrying out this study.*

I extend my sincere thanks to all the ***SURGEONS*** *who played an important role during the study.*

I am also thankful to all the ***OT, ICU*** *and* ***Paramedical Staff*** *for their valuable help while performing the study.*

*Thanks to my beloved **PARENTS Smt.D.VIJAYA LAKSHMI** and **Sri. D.V.S.KUTUMBA RAO** and my dearest **SISTER SHRAVYA CHANDANA** for giving me constant support, encouragement and unconditional love throughout my life.*

*Thanks to my **GRANDMOTHER DHANALAKSHMI** for showing me my purpose and role in life.*

*I am also thankful to **Dr. SUNANDA,** statistician for helping me with the statistical analysis.*

*Last but not the least, I express my special thanks to all my **PATIENTS** and their families, who in the final conclusion are the best teachers and without whom this study would have been impossible.*

Date: **Dr.DANDAMUDI SIRI CHANDANA**

Place: Kolar

TABLE OF CONTENTS

ABBREVIATIONS

ACOG – American College of Obstetricians and Gynecologists

ASA – American Society of Anesthesiologists

BIS – Bispectral Index

CI – Confidence Interval

EDTA – Ethylenediaminetetraacetic Acid

EKG – Electrocardiogram

ENIGMA – Evaluation of Nitrous Oxide in the Gas Mixture for Anaesthesia

FO – Propofol only (Group FO in Jain K et al. study)

FN – Propofol + Nitrous oxide (Group FN in Jain K et al. study)

GABA – Gamma-Aminobutyric Acid

ICU – Intensive Care Unit

IV – Intravenous

MAC – Minimum Alveolar Concentration

MAP – Mean Arterial Pressure

mg/kg – Milligrams per kilogram

min – Minutes

N_2O – Nitrous Oxide

NMDA – N-Methyl-D-Aspartate

O_2 – Oxygen

PACU – Post-Anesthesia Care Unit

PN – Propofol + Nitrous oxide (Group in Singh S et al. study)

PO – Propofol only (Group in Singh S et al. study)

PONV – Postoperative Nausea and Vomiting

QT – Time interval in EKG representing ventricular depolarization and repolarization

SpO_2 – Peripheral capillary oxygen saturation

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Background: Commonly used intravenous induction agent, propofol is in contemporary anesthesia practice, valued for its rapid onset, amnestic properties, and ability to provide optimal conditions for intubation. However, its use is associated with dose-dependent adverse effects such as hypotension, bradycardia, and respiratory depression. Nitrous oxide, though a weak anesthetic, offers analgesic and anxiolytic benefits and is often used as an adjuvant to reduce the requirement for intravenous agents. The present study explores the role of inhaled nitrous oxide in optimizing propofol induction by reducing its dose and onset time while maintaining hemodynamic stability.

Aim: To evaluate the variation in induction dose and induction time of propofol when combined with inhaled nitrous oxide during general anesthesia.

Materials and Methods: This study was conducted on 96 patients (ASA I and II, aged 18–60 years) undergoing elective surgeries under general anesthesia at R.L. Jalappa Hospital. Participants were randomly divided into two groups (n=48 each). Group A received 70% nitrous oxide with 30% oxygen and propofol infusion; Group B received 100% oxygen with propofol infusion. Induction time, propofol dose, and hemodynamic parameters were recorded and analyzed using standard statistical tests.

Results: Group A demonstrated significantly shorter induction times ($p<0.05$), with 85.4% achieving induction in <200 seconds compared to 12.5% in Group B. Propofol dose was also significantly lower in Group A. The systolic, diastolic, and mean arterial pressures, was better maintained in Group A. Heart rate differences were not statistically significant.

Conclusion: The co-administration of inhaled nitrous oxide significantly reduces propofol induction time and dose while enhancing hemodynamic stability. This combination can be a safer and more efficient approach to anesthesia induction.

Keywords: Propofol, Nitrous oxide, General anesthesia, Induction dose, Induction time, Hemodynamic stability

INTRODUCTION

INTRODUCTION

Propofol has been the most often utilized drug for intravenous induction of anesthesia in recent years. It blunts the airway reflexes in hyperreactive airway. Propofol as an induction agent is safe and effective hypnotic, it provides rapid awakening, amnesic effect and better intubating conditions. However it results in significant post-induction hypotension, bradycardia, pain on injection, apnea hemodynamic and respiratory depression, hypertriglyceridemia.[1]

Nitrous Oxide is safe for majority of the patients due to its analgesic effect and anxiolytic effect. Nitrous oxide due to its weak anesthetic properties is used as an adjuvant. The use has decreased the necessity of intravenous anaesthetics.[1–3]

By inducing with nitrous oxide, we are trying to maximize the benefits of using propofol and also minimizing the side effects which are dose related. According to the studies done so far, there is a 44% reduction in Propofol dose requirement and induction time with 66% concentration of Nitrous oxide inhalation.[4,5] Though Nitrous oxide has drawbacks like second gas effect, gas filled cavities expansion, nausea and vomiting postoperatively, it reduces propofol requirement. It is unknown, yet, how both medications affect general hemodynamics.

AIMS & OBJECTIVES

AIMS & OBJECTIVES

Objectives

1. To evaluate the variation in induction dose of propofol on administering inhaled nitrous oxide
2. To evaluate the variation in induction time of propofol on administering inhaled nitrous oxide

REVIEW OF LITERATURE

REVIEW OF LITERATURE

A medically induced condition of unconsciousness known as general anesthesia causes patients to lose their defensive reflexes and become totally unresponsive to painful, tactile, or spoken stimuli. It is accomplished by administering a variety of anesthetics that, when taken together, result in amnesia, analgesia, muscle relaxation, unconsciousness, and autonomic reflex suppression. To maintain airway patency, a laryngeal mask airway or endotracheal tube is often required due to the risk of upper airway obstruction.[6]

Historically, before the development of systematic monitoring techniques, determining the depth of anesthesia relied solely on physical examination, leading to frequent anesthetic overdoses, particularly by less experienced anesthetists. It was not until the 20th century that a structured approach to monitoring anesthesia depth emerged. Despite advancements in anesthetic agents and delivery methods that allow for quicker induction and recovery—sometimes bypassing certain stages—Guedel's classification remains a relevant reference in modern anesthesia practice.[7]

Guedel's Classification - Anesthesia Stages

Stage 1 – Disorientation or Analgesia: often beginning in a preoperative anesthesiology holding area, is referred to as the induction stage. Patients receive medication that induces sedation while remaining conscious and conversational. Breathing remains slow and steady. The patient moves from analgesia without amnesia to analgesia with amnesia at the same time during this phase.[8] The stage concludes when the patient loses consciousness.

Stage 2 – Delirium or Excitement: Characterized by disinhibition, uncontrolled movements, delirium, and the loss of the eyelash reflex, this stage is associated with higher heart rate and blood pressure. Airway reflexes remain intact but become hypersensitive, increasing the risk of laryngospasm if manipulated. Any airway procedures, such as endotracheal tube placement or deep suctioning, should be avoided to prevent complications. Spastic movements, vomiting, and irregular breathing patterns may further endanger the airway. To minimize time spent in this phase, fast-acting anesthetic agents are often used to facilitate a smoother transition to the next stage.[9]

Stage 3 – Surgical Anesthesia: This level of anesthesia is the goal for most surgical procedures, marked by the absence of eye movements and significant respiratory depression, making airway manipulation safe. Surgical anesthesia is further classified into four planes.[9,10]

Stage 4 – Overdose: This dangerous phase results from excessive anesthetic administration relative to surgical stimulation, leading to profound brain and medullary suppression. It begins with respiratory cessation and, if not managed promptly, can result in death. Due to cardiac depression and severe vasodilation, patients at this stage exhibit flaccid skeletal muscles, locked and dilated pupils, and dangerously low blood pressure with weak, thready pulses. This stage poses a serious risk to life if cardiovascular and respiratory measures are not taken quickly. The primary goal of the anesthetist is to quickly induce Stage 3 anesthesia in the patient and maintain that level of anesthesia during the procedure.[9,11]

The General anesthesia can trigger physiological responses that, if not managed properly, may lead to morbidity or even mortality. As a high-risk medical intervention, its benefits must outweigh potential harms.[12] Although deaths from anesthesia are rare, they can

nonetheless happen as a result of complications such as severe allergic responses, airway blockage, or pulmonary aspiration of stomach contents. The primary cause is still human mistake, even though equipment failure might play a role. However, because to better safety procedures, better monitoring and detection tools, and the adoption of standardized norms, the death rate from anesthesia has significantly decreased over the last 20 years. Patient safety results have improved and errors have been drastically decreased as a result of these quality initiatives[13,14].

NITROUS OXIDE

A colorless, odorless, non-flammable gas that can support combustion similarly to oxygen. Commonly known as laughing gas due to its euphoric effects, it is the least potent inhalational anesthetic. Nitrous oxide is usually paired with a more powerful volatile agent because it cannot be employed as a stand-alone anesthetic due to its minimum alveolar concentration (MAC) of 104percent. It contributes to the second gas effect, which increases the concentration of other volatile anesthetics in the lungs, because of its rapid onset and short offset caused by its limited blood solubility (blood-gas partition coefficient of 0.47).[2]

Nitrous Oxide finds extensive application in dental treatments, general anesthesia, procedural sedation, and pain management, especially in emergency and obstetric contexts. In these situations, it is frequently given as a 50percent oxygen mixture. =Overall minute ventilation stays constant even as the tidal volume drops and the respiratory rate increases. Although it has the potential to directly cause cardiac depression, sympathetic stimulation balances this effect, thus the overall effect is minimal.[15,16]

Mechanism of action

Nitrous oxide exerts its effects through multiple targets in the CNS, acting as a non-competitive NMDA receptor inhibitor to produce anesthesia. Mediated through GABA-A activation. [3]

According to pharmacokinetics, nitrous oxide enters the body quickly through the alveoli and starts working in two to five minutes.[17,18] Nitrous oxide's fast diffusion across alveolar membranes causes the second-gas effect, which concentrates residual gases and improves anesthetic absorption. Nitrous oxide is a mild anesthetic with a Minimum Alveolar Concentration (MAC) of 105percent, however it effectively relieves pain. Rapid diffusion back into the alveoli after anesthesia might lower oxygen levels and possibly result in diffusion hypoxia.[19] Nitrous oxide undergoes minimal metabolism, with only trace amounts reduced by anaerobic gut bacteria. Lung is primary route of, where it is exhaled unchanged.

Administration

It is delivered through inhalation using a laryngeal mask airway, face mask, or endotracheal tube. [19,20]

It is typically administered in concentrations of 30percent to 50percent mixed with oxygen while sedating for surgical or dental procedures. When used for general anesthesia, nitrous oxide is provided at 50percent to 70percent concentration, but due to its low potency, it must be combined with more potent anesthetic agents. Specially designed equipment is required to ensure a 50:50 nitrous oxide-to-oxygen ratio. Unlike

dental delivery systems, devices designed for obstetric use do not allow for manual adjustments of gas proportions.[21]

Induction

Nitrous oxide is one of the quickest anesthetics accessible because of its quick start of action and limited solubility in both blood and tissues. Its absorption in the lungs improves the absorption of oxygen and anesthetics that are breathed simultaneously, resulting in a faster induction and better arterial oxygenation.

Emergence

It facilitates rapid emergence due to its short elimination half-life. Its low lipid solubility ensures a swift washout from the brain, leading to quick postoperative recovery.[20]

Use in specific conditions;

Renal and Hepatic Impairment: There are no specific manufacturer recommendations regarding dosage adjustments.

Pregnancy Considerations: due to the risk of maternal sedation and hypoxemia, ACOG and the ASA advise against combining nitrous oxide with systemic opioids, sedatives, or hypnotics.[22]

Breastfeeding Considerations: Since nitrous oxide has a short half-life in the maternal system, it is unlikely to be transferred to the infant in significant amounts. Breastfeeding can be safely resumed once the mother has fully recovered from anesthesia.[23]

Adverse effect

Respiratory Depression: Nitrous oxide alone has minimal impact on respiratory function. However, when combined with sedatives, hypnotics, or opioids, it can amplify their respiratory depressant effects, increasing the risk of hypoventilation or apnea.

Diffusion Hypoxia: After discontinuing, the rapid reversal of the gas concentration gradient in the lungs leads to oxygen dilution in the alveoli, which can cause hypoxia. To prevent this, 100percent oxygen should be administered immediately following nitrous oxide cessation.

Postoperative Nausea and Vomiting (PONV): ENIGMA II study discovered that operations longer than two hours are associated with a higher prevalence of severe PONV. Nitrous oxide has not, however, been connected to increased mortality, cardiovascular problems, or surgical wound infections. PONV can be managed with the use of preventative antiemetic drugs.[24,25]

Hyperhomocysteinemia[26]

Subacute Myeloneuropathy: Subacute myeloneuropathy is a serious but perhaps treatable neurological condition that can be brought on by prolonged or excessive usage. This condition presents as an axonal sensorimotor neuropathy, leading to symptoms such as limb weakness, sensory deficits, and impaired coordination.[27]

Contraindications for Nitrous Oxide Use

While many contraindications to nitrous oxide are relative and depend on the provider's judgment, several conditions warrant caution or avoidance.

Patients who are Critically Ill

cardiovascular Disease

Pregnancy (First Trimester)

Conditions Involving Closed Gas Spaces: Pneumothorax

- Small bowel obstruction
- Retinal surgeries involving intraocular gas bubbles
- Middle ear surgery

Psychiatric Disorders

Impaired Consciousness

Pulmonary Hypertension[28]

Head and Neck Procedures Involving Cautery Use[29]

PROPOFOL[30]

Propofol is an IV anesthetic that can be used for procedural sedation, general anesthesia induction, or anesthesia therapy monitoring. A bolus, an infusion, or a mix of the two are the routes of administration. The lipid emulsion in which propofol is manufactured gives it its distinctive milky white look and the nickname "milk of amnesia."[31–33]

Mechanism of action[30]

Propofol's precise mechanism of action is unknown, like that of other general anesthetics, although it is believed to be connected to its effects on GABA-mediated chloride

channels in the brain. Propofol may increase GABA's inhibitory effects by reducing its dissociation from the brain's GABA receptors.[34]

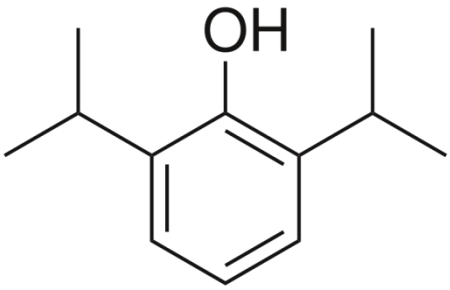


Figure 1: Structure of propofol

Adverse effect

- The most frequent side effect is temporary local injection site pain, that can be reduced by administering intravenous lidocaine prior to the propofol bolus.
- Hypotension is a common hemodynamic response.
- Myoclonic movements may occur.
- In rare cases, propofol has been associated with electrocardiographic changes, such as QT interval prolongation, though these are typically not clinically significant.
- Exceptionally rare cases of green-tinted urine discoloration have also been reported.[35–37]

Contraindications

Patients having a history of medication hypersensitivity reactions should not use it. Any patient with excessively low blood pressure has to be treated with caution.[38]

Various articles;

In a research by Kumar AA et al. (2006), the impact of priming on the propofol induction dosage needed was evaluated. Group II saw a 27.48percent reduction in the induction dosage needed for propofol, with an average reduction of 29.72 mg. Stable hemodynamics were maintained at the time of intubation and the required induction dosage was significantly reduced by 27.48percent by applying the Priming Principle during propofol induction. However, this approach was linked to a higher incidence of post-suxamethonium fasciculations.[39]

42.5percent of patients in the PN group were induced in less than 100 seconds, 57.5percent in less than 200 seconds, and no patient needed more than 200 seconds, according to a research by Singh S et al. (2014). In contrast, only 22.5percent of patients in the PO group were induced within 200 seconds, none were induced in less than 100 seconds, and 77.5percent of patients needed more than 200 seconds. These results imply that while maintaining stable hemodynamics, co-administration of nitrous oxide during induction considerably shortens the induction period and propofol dosage.[40]

According to a research by Sunil R et al. (2016), Group A needed a substantially lower dosage of propofol for induction than Group. The induction time of Group B was 5.09 ± 1.33 minutes, while that of Group A was 1.52 ± 1.31 minutes. The groups' heart rates were consistent throughout the study. Crucially, there were no instances of desaturation (SpO_2 < 90percent) found. Three minutes of 66percent nitrous oxide inhalation greatly decreased the amount of time needed for induction, decreased the amount of propofol needed, and preserved MAP stability during induction. Furthermore, it prevented oxygen desaturation while reducing the stress reaction to laryngoscopy and intubation.[41]

In a prospective randomized research, Jain K et al. (2017) discovered that Group FN had a considerably reduced induction time and dosage than Group FO. In particular, the average induction time in Group FO was significantly greater at 242 ± 43 seconds ($P < 0.001$) than in Group FN, which was 172 ± 32 seconds. Both the necessary induction dose and the duration to induction were successfully reduced when nitrous oxide (N_2O) was administered in addition to propofol during the induction of anesthesia. Additionally, it helped to keep hemodynamics steady with no known side effects.[5]

In Biyani C et al., (2022) study to evaluate the effect of nitrous oxide on consumption of propofol. It is noteworthy that none of the patients in Group D needed extra analgesics or suffered from nausea or vomiting. Both dexmedetomidine and nitrous oxide successfully decreased the overall amount of propofol used, making them suitable anesthetic adjuvants to lessen adverse effects associated with propofol. Dexmedetomidine could be a better and safer substitute for nitrous oxide because it doesn't have any negative long-term or environmental impacts.[42]

In Jain N et al., (2022) study included 50 patients, with group A, 76percent of patients achieved induction in under 200 seconds, while only 24percent required more than 200 seconds. In contrast, Group B had a significantly lower proportion of patients (32percent) induced within 200 seconds, with 68percent requiring a longer induction time. Group A's mean induction time (183 seconds) was much less than Group B's (256 seconds). These results show that the induction dose and induction duration were dramatically decreased when nitrous oxide (N_2O) and propofol were administered together.[43]

MATERIALS & METHODS

MATERIAL & METHOD

This study was conducted on 96 patients undergoing general anaesthesia with 48 patients in each group at "R.L.Jalappa Hospital and Research Centre attached to Sri Devaraj Urs Medical College, Tamaka, Kolar during the period from April 2023 to May 2025."

Study Design: Double blinded randomized control trial.

Sample Size: 48 in each group.

Duration of study: From May 2023 to October 2024.

Sampling Method: Computerized random sampling.

Sample size estimation:

The maximum sample size of 48 in each group can be taken for the present study which will satisfy both for induction time and induction dose.[5,44]

Formula :

$$n = \frac{2 \times \left(z_{1-\alpha/2} - z_{1-\beta}\right)^2 \times \sigma^2}{d^2}$$

Where n = minimum required sample size

$z_{1-\alpha/2}$= The critical value (Table value) from a standard normal distribution that the test statistic must exceed in order to show a statistically significant result at 'α' level of significance.

$z_{1-\beta}$= Standard normal table value for the power of the test $(1-\beta)$

σ = Standard deviation of the response variable (obtained from previous study

d = the effect size = the minimum clinically important difference that the investigator wishes to detect.

In the present case, $z_{1-\alpha/2} = 2.58$ at 1 % level of significance

$z_{1-\beta}$ = 1.28 at 90 % power

Inclusion criteria

- Age 18 - 60 years.
- Patients proposed for elective surgical procedures under general anaesthesia.
- ASA 1 and 2

Exclusion criteria

- Pregnant women.
- Patients with allergy to anesthetic agents.
- Morbidly obese patients.
- Patients with difficult airway.
- Patients with contraindications to the utilisation of N2O like increased intracranial pressure, obstruction of the bowel, pneumothorax, surgeries of the middle ear.

Method of collection of data:

- Patients undergoing general anaesthesia was randomly selected.
- Patients provided Informed consent.

- Result were recorded in proforma.

SAMPLING PROCEDURE

- History in detail was taken.
- Complete physical examination was done, followed by routine investigation.
- IV line was secured for fluids.
- General anesthesia procedure was clearly explained, consent was taken.
- Patients were asked to be on NPO overnight and Tab. Anxit 0.5mg was given on the night before the surgery to decrease anxiety.
- In the operation theatre, multipara monitors was connected to the patient and baseline heart rate, SBP, DBP, MAP and SpO2 were noted.
- Glycopyrrolate 0.2mg, Fentanyl 2mcg/kg was given as premedication.
- All patients were provided with 3 min of preoxygenation with 100% oxygen.
- Patients were divided into two groups randomly.

Group A: received a mixture of 70% N2O and 30% oxygen via Bains Circuit with 30mg/min(3ml/min) infusion of propofol.

Group B: received a mixture of 100% oxygen via Bains Circuit with 30mg/min(3ml/min) infusion of propofol.

"In both groups A and B, propofol infusion was initiated at a rate of 30 mg/min (equivalent to 3 ml/min). The infusion was discontinued once apnea was achieved. Induction time was defined as the interval between the start of propofol administration

and the onset of apnea, while the induction dose referred to the total amount of drug given during this period. Following this, patients received succinylcholine at a dose of 2 mg/kg and were intubated with a suitably sized cuffed endotracheal tube. Anesthesia was then maintained using oxygen, nitrous oxide, and other inhalational agents."

"The various hemodynamic parameters like HR, SBP, DBP & MAP were monitored and recorded at predefined time intervals: preoperatively (T1); immediately before initiating propofol infusion (T2); 1 minute (T3), 2 minutes (T4), 3 minutes (T5), and 4 minutes (T6) after starting the infusion; at the onset of apnea (T7); just before intubation (T8); and immediately following intubation (T9)."

PARAMETERS TO BE OBSERVED

"Heart rate, Mean Arterial Pressure, Systolic Blood Pressure, Diastolic Blood Pressure and SpO2 were monitored"

- Preoperatively - T1
- Before the start of propofol infusion - T2
- 1 minutes after the start of infusion - T3
- 2 minutes after the start of infusion - T4
- 3 minutes after the start of infusion - T5
- 4 minutes after the start of infusion - T6
- Apneic state - T7
- Before intubation - T8
- After intubation - T9

STATISTICAL ANALYSIS

The Collected data were coded and entered into an excel data base. All the quantitative measures were presented by (Mean+/-SD), Confidence interval (CI), qualitative measures like, ASA Physical status etc.…by proportions and CI. Independent sample t-test, Chi -square test were used to interpret the results. Data were analysed using SPSS v26.0 with significance value of $p < 0.05$ as statistically significant.

RESULTS

RESULTS

Present study included total of 96 patients, with 48 cases in group A and 48 cases in group B.

Table 1: Showing mean age between the groups

	Group A		Group B		p-value
	Mean.	SD	Mean.	SD	
Age in yrs	39.9	12.6	39.3	11.9	0.83

The mean age between the groups were comparable with no significant difference noted. The mean age was 39.9yrs in group A and 39.3yrs in group B patients,

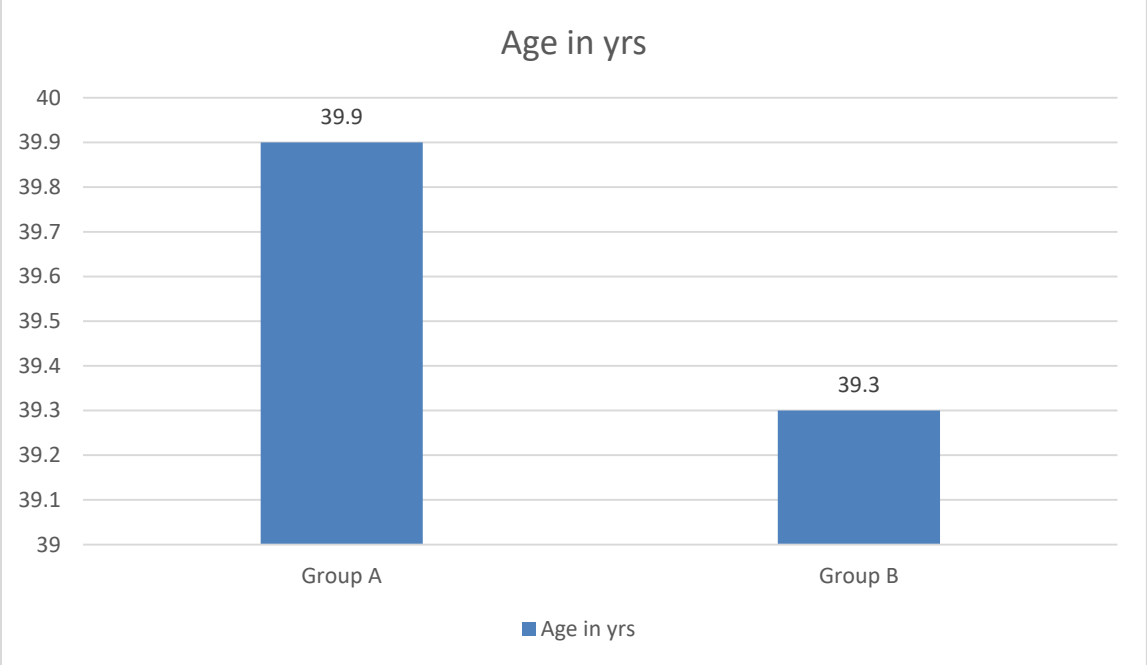


Figure 2: Showing mean age between the groups

Table 2: Gender distribution between the groups

		Group A		Group B		Chi-square (p-value)
		N	N %	N	N %	
Gender	Female	29	60.4%	25	52.1%	1.21 (0.21)
	Male	19	39.6%	23	47.9%	

Gender distribution is comparable with marginal female preponderance in both the groups.

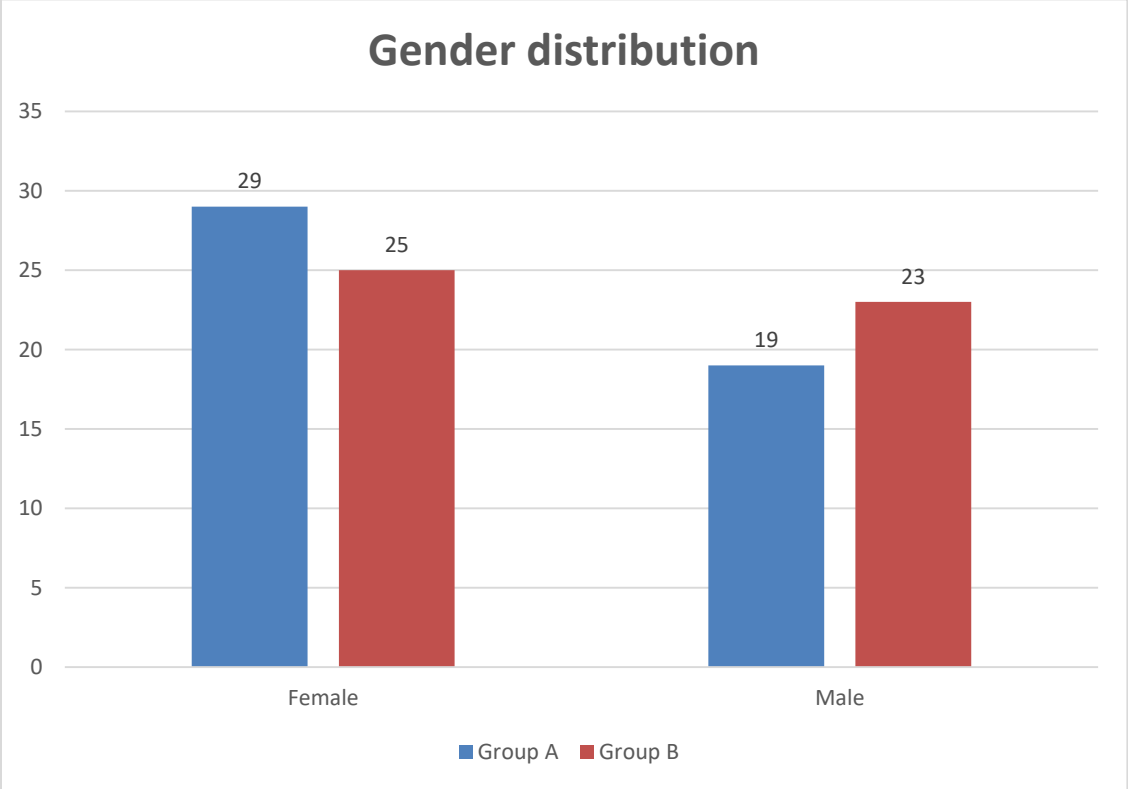


Figure 3: Gender distribution between the groups

Table 3: Distribution according to ASA grade

		Group A		Group B		Chi-square
		N	N %	N	N %	(p-value)
ASA Grade	1	31	64.6%	32	66.7%	0.52 (0.85)
	2	17	35.4%	16	33.3%	

The ASA grade distribution was found to be comparable between the groups, with majority of patients in ASA grade 1. (p>0.05)

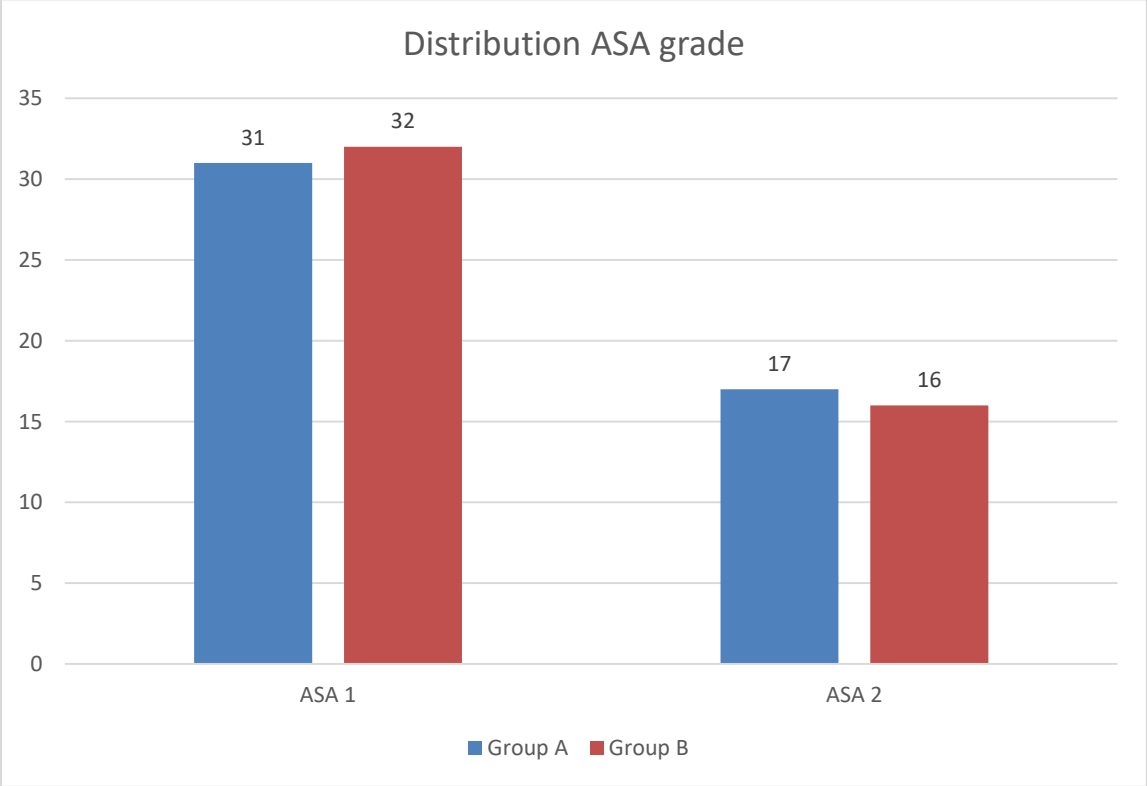


Figure 4: Distribution according to ASA grade

Table 4: Showing induction time between the groups

		Group A		Group B		
		N	N %	N	N %	Chi-square (p-value)
Induction time	<200sec	41	85.4%	6	12.5%	13.347 (0.05)*
	>200sec	7	14.6%	42	87.5%	

There is significant higher incidence of shortest induction time in group A compared to group B. 85.4% of the cases with induction time <200sec and 12.5 in group B. (p<0.05).

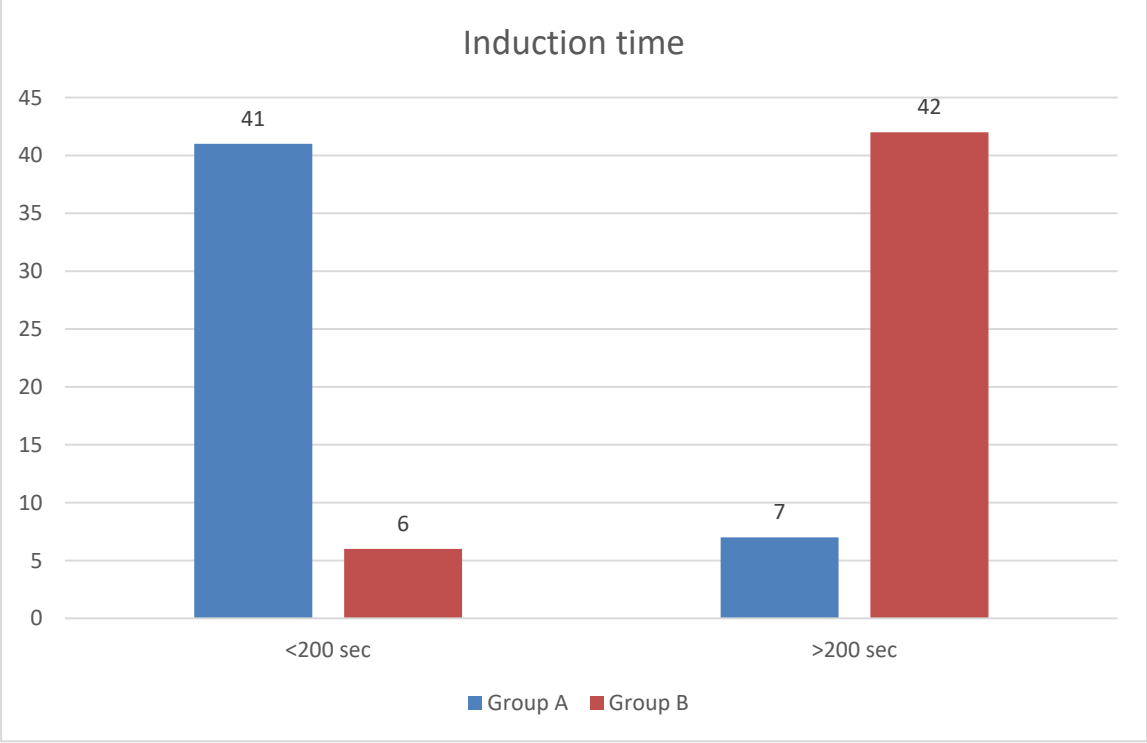


Figure 5: Showing induction time between the groups

Table 5: Showing the induction dose between the groups

		Group A		Group B		Chi-square (p-value)
		N	N %	N	N %	
Induction dose (mg/kg)	>1.5	0	0.0%	37	77.1%	73.11 (0.01)*
	0.5-1.0	36	75.0%	0	0.0%	
	1.0-1.5	12	25.0%	11	22.9%	

There is significant lower dose of induction seen in group A patients compared to group B. majority of patients in group A needed induction dose of 0.5-1mg/kg in 75% of the cases. Also, 25% cases in group A needed 1-1.5,g/kg, compared to group B (22.9%). ($p<0.05$)

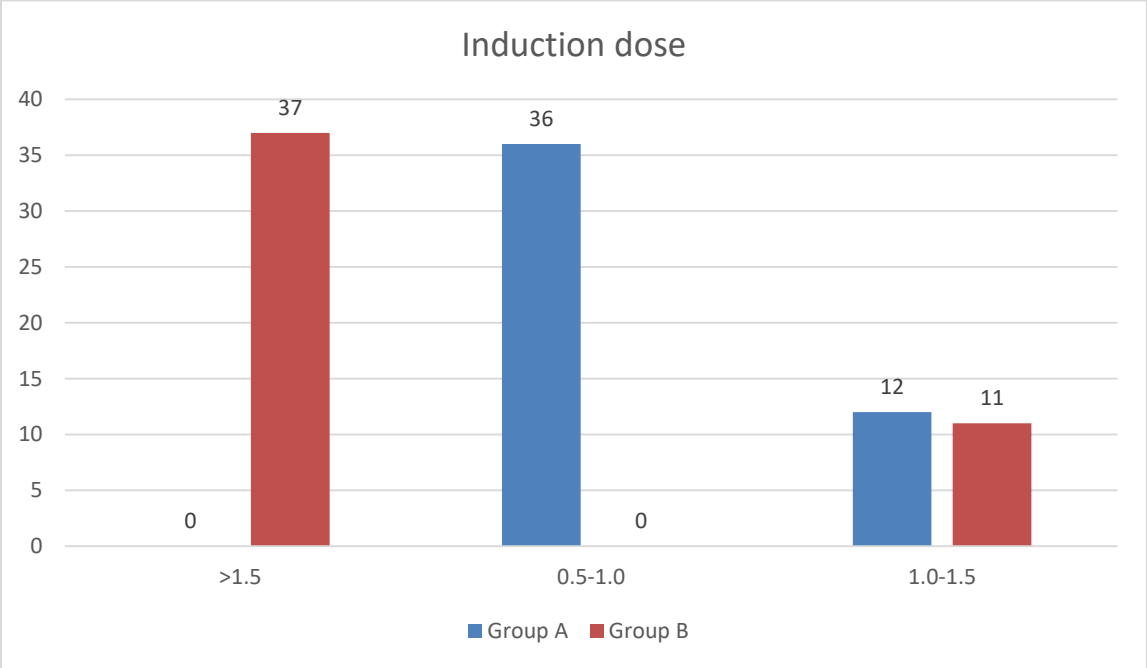


Figure 6: Showing the induction dose between the groups

Table 6: Comparison of systolic blood pressure between the groups

Systolic blood pressure	Group A		Group B		p-value
	Mean	SD	Mean	SD	
T1	123.5	8.0	124.8	11.3	0.52
T2	123.6	7.6	126.1	12.4	0.25
T3	122.3	8.0	125.5	13.1	0.14
T4	119.9	7.7	124.1	12.6	0.051
T5	118.3	8.3	122.7	12.3	0.04*
T6	116.3	8.1	121.2	12.7	0.02*
T7	116.4	7.8	120.0	12.7	0.09
T8	115.7	8.0	119.3	12.3	0.120
T9	118.3	8.1	124.9	11.4	0.02*

There is significant higher mean systolic blood pressure at T5, T6 and T9 in group B compared to group A. overall the group B systolic blood pressure was higher compared to patients in group A.

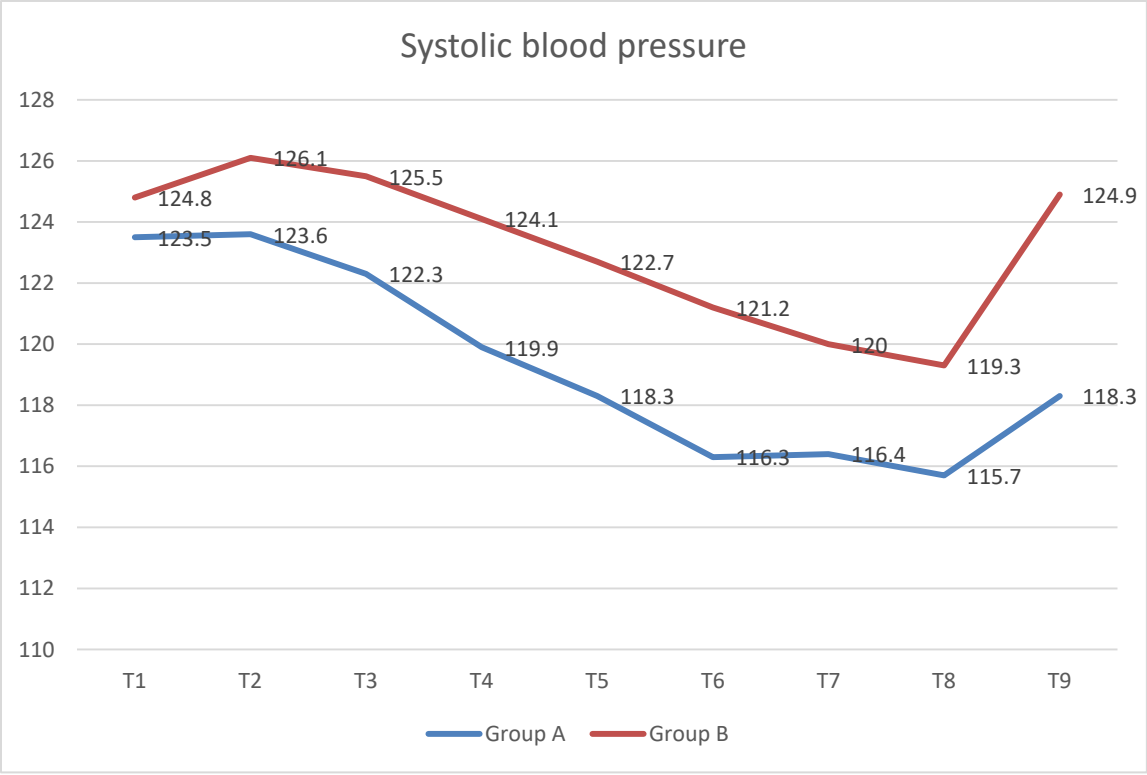


Figure 7: Comparison of systolic blood pressure between the groups

Table 7: Comparison of diastolic blood pressure between the groups

Diastolic blood pressure	Group A		Group B		p-value
	Mean	SD	Mean	SD	
T1	82.0	6.9	82.9	8.5	0.58
T2	81.2	7.5	83.5	8.2	0.15
T3	80.0	7.4	82.8	8.1	0.08
T4	78.7	7.4	81.8	7.9	0.052
T5	77.1	7.7	80.9	8.3	0.02*
T6	76.0	7.5	79.1	8.7	0.06
T7	76.0	7.8	78.3	8.4	0.159
T8	76.1	8.0	77.7	8.3	0.339
T9	78.4	8.3	82.4	8.4	0.02*

There is significant higher mean diastolic blood pressure at T5, and T9 in group B compared to group A. overall the group B diastolic blood pressure was higher compared to patients in group A.

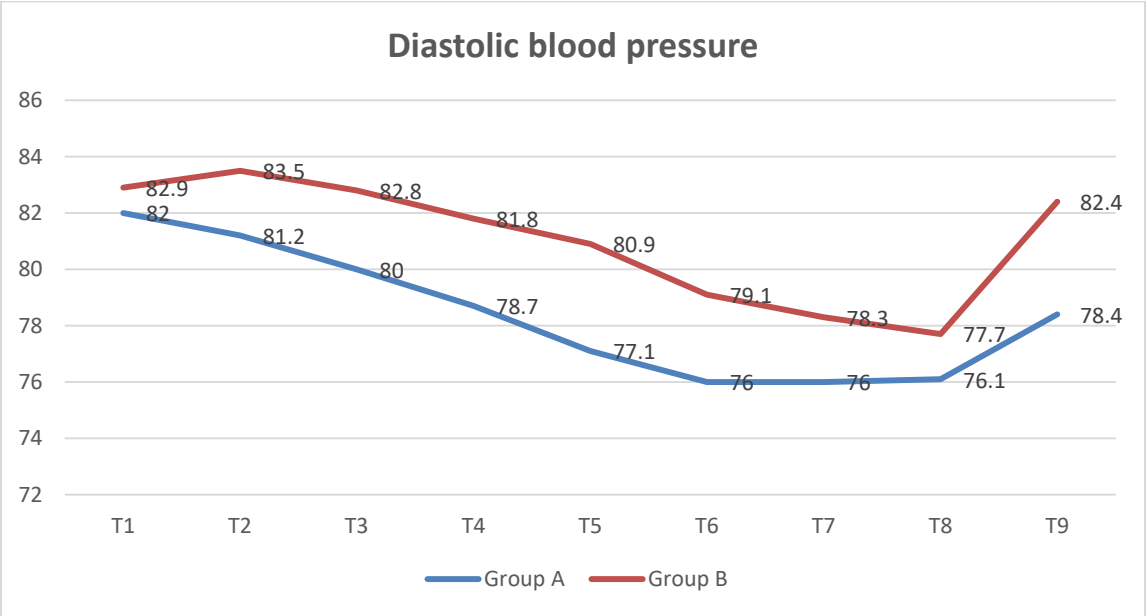


Figure 8: Comparison of diastolic blood pressure between the groups

Table 8: Comparison of mean arterial pressure between the groups

Mean arterial pressure	Group A		Group B		p-value
	Mean	SD	Mean	SD	
T1	95.9	6.4	96.9	8.2	0.515
T2	95.4	6.5	97.8	8.3	0.122
T3	94.1	6.6	96.9	8.1	0.07
T4	92.4	6.7	95.9	7.7	0.02*
T5	90.8	7.1	94.8	8.1	0.01*
T6	89.4	6.8	93.7	8.2	0.01*
T7	89.5	7.0	92.6	8.1	0.04*
T8	89.3	7.3	92.0	8.0	0.079
T9	91.5	7.3	95.1	8.1	0.02*

There is significant higher mean arterial pressure at T4, T5, T6, T7 and T9 in group B compared to group A. Overall the group B mean arterial pressure was higher compared to patients in group A.

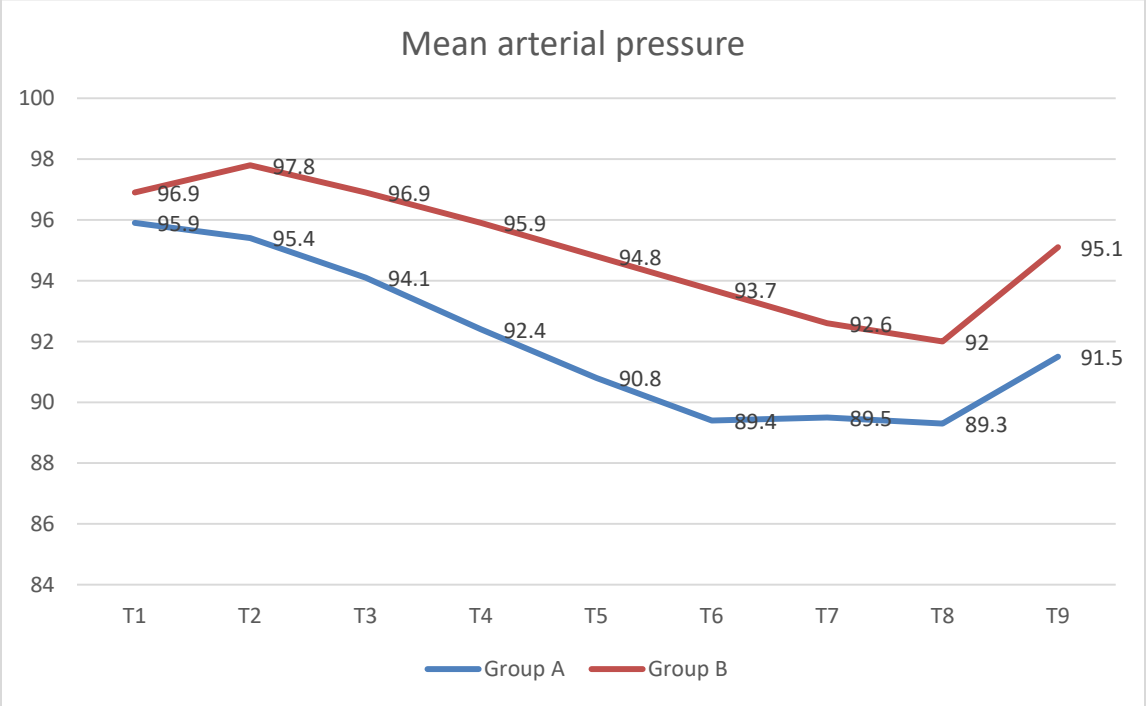


Figure 9: Comparison of mean arterial pressure between the groups

Table 9: Comparison of mean Heart Rate between the groups

Heart rate	Group A		Group B		p-value
	Mean	SD	Mean	SD	
T1	85.9	9.4	86.5	8.2	0.74
T2	87.2	9.9	87.6	8.9	0.81
T3	86.0	10.3	88.0	8.8	0.31
T4	85.3	9.3	87.1	8.6	0.38
T5	84.0	8.9	85.6	8.4	0.39
T6	83.3	8.5	84.3	8.3	0.57
T7	82.7	8.3	83.1	8.2	0.80
T8	82.9	8.9	82.6	7.7	0.86
T9	87.4	8.8	89.2	8.0	0.30

There is no significant difference in mean heart rate between the groups at different time interval. However, overall the mean heart rate was higher in group B patients compared to group A patients.($p>0.05$)

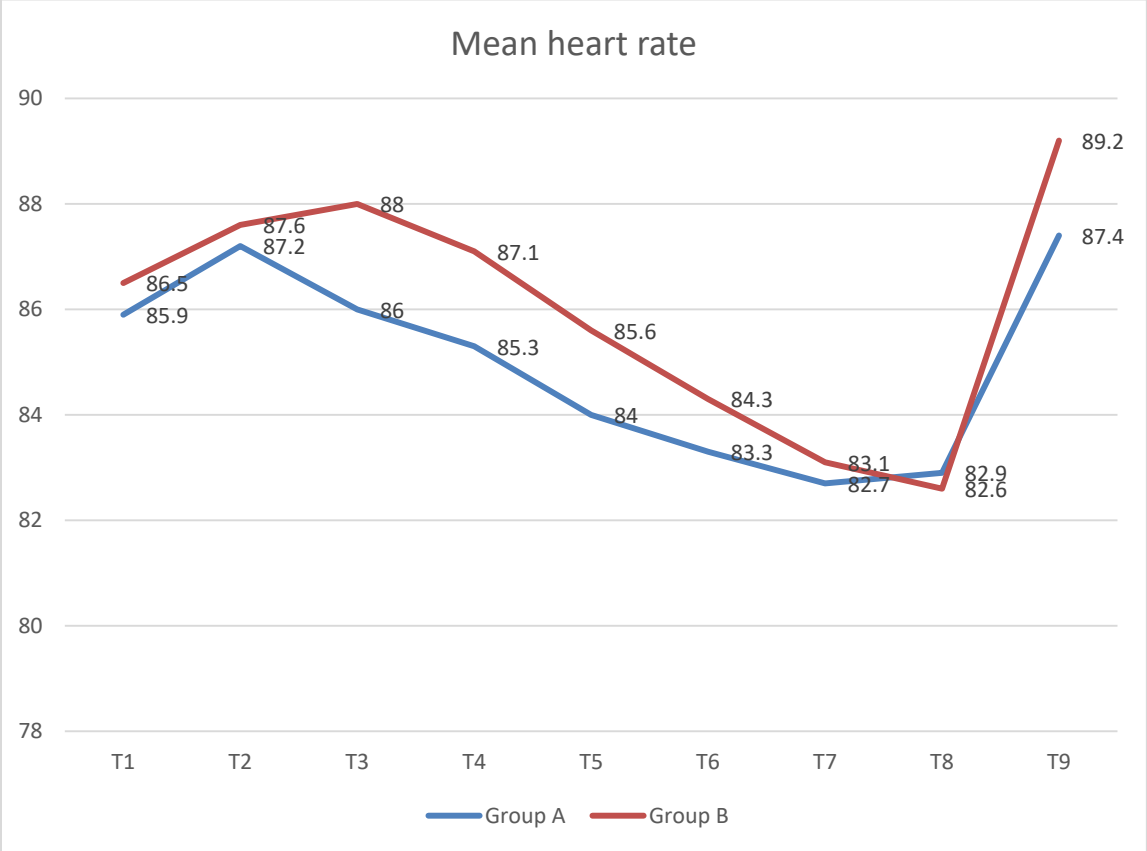


Figure 10: Comparison of Mean Heart Rate between the groups

DISCUSSION

DISCUSSION

Propofol's fast onset, easy induction, and quick recovery profile have made it the most popular drug for intravenous induction of general anesthesia in recent years. It is a highly effective hypnotic agent that offers excellent intubating conditions, amnesic effects, and suppression of airway reflexes, particularly in patients with hyperreactive airways. It is a recommended option for induction in a variety of therapeutic situations because of these qualities. Propofol usage is not without its problems, though. Adverse symptoms include bradycardia, apnea, respiratory depression, hypotension, injection discomfort, and hypertriglyceridemia are commonly linked to it. These side effects are often dose-dependent and can pose significant challenges, especially in hemodynamically unstable patients.

On the other hand, N_2O is a commonly used inhalational agent known for its analgesic and anxiolytic properties. Although it is a weak anesthetic on its own, nitrous oxide is often used as an adjuvant to reduce the dosage requirement of more potent anesthetic agents like propofol. Its use as a gaseous vehicle for volatile anesthetics and its potential to decrease the need for intravenous agents have been well documented. According to studies, giving 66% nitrous oxide before propofol induction can cut the amount of propofol needed by up to 44% and minimize the induction period, which helps to mitigate many of the negative effects of propofol's dosage.

Despite the benefits, nitrous oxide has some limitations, including the potential for gas expansion in closed cavities, the second gas effect, and an increased risk of postoperative nausea and vomiting. Nonetheless, the combined use of nitrous oxide and propofol offers a promising approach to balancing efficacy and safety in anesthesia induction. The

present study aims to further evaluate the impact of this combination on induction characteristics and overall hemodynamic stability.

96 patients in all, 48 of whom were in group A and 48 of whom were in group B. "There was no discernible difference in the mean age across the groups. There is a little female preponderance in both groups, but there is no discernible difference in the gender distribution. The mean age of the patients in groups A and B was 39.9 and 39.3 years, respectively. The majority of patients were in ASA grade 1, and the distribution of ASA grades was found to be similar across the groups." ($p>0.05$)

In a related research by Jain K et al., demographic traits including age, gender, and weight did not significantly change across the groups. In a similar vein, the groups' distribution of surgical operation types and ASA physical status classifications was similar.[5] Participants in the Singh S et al. research were between the ages of 18 and 60 in both the PN and PO groups. The PN and PO groups had mean ages of 37.05 ± 10.70 and 37.90 ± 11.35 years, respectively. The proportion of participants by gender was very similar, with 55% of the participants in both groups being female and 45% being male. Additionally, both groups' ASA physical status grade distributions were comparable, suggesting that the patients' initial clinical statuses were well matched.[40]

Compared to group B, group A had a noticeably greater incidence of the lowest induction time. In group B, induction times were 12.5 and less than 200 seconds in 85.4% of instances. ($p<0.05$) Additionally, group A patients had a noticeably lower induction dosage than group B patients. In 75% of instances, the majority of patients in group A required an induction dosage of 0.5–1 mg/kg. Additionally, compared to group B (22.9%), 25% of patients in group A required 1-1.5 g/kg. ($p<0.05$)

In study by Kumar AA et al., the Group II, the induction dose requirement for propofol was reduced by an average of 29.72 mg, representing a 27.48% decrease. [39] In study by Singh S et al., the PN group, 42.5% of patients achieved induction in less than 100 seconds, while 57.5% were induced within 200 seconds, with no patients requiring more than 200 seconds. Conversely, in the PO group, 77.5% of patients required more than 200 seconds, while only 22.5% were induced within 200 seconds, and none achieved induction in under 100 seconds. The PN group, which received 67% nitrous oxide in oxygen, had a significantly shorter induction time (113.38 seconds) compared to the PO group (258.00 seconds). Additionally, patients in the PN group required a lower induction dose of propofol (average 0.58 mg/kg) than those in the PO group (average 1.43 mg/kg), indicating that nitrous oxide effectively reduced both the time and dose needed for induction.[40]

In similar study by Sunil R et al., the required propofol dose for induction was significantly lower in Group A compared to Group B (30.4 ± 26.17 mg vs. 101.87 ± 26.19 mg). Similarly, induction time was notably shorter in Group A (1.52 ± 1.31 min) than in Group B (5.09 ± 1.33 min). [41] Also in study y Jain K et al., found that the mean induction time in Group FN was 172 ± 32 seconds, whereas it was notably longer in Group FO at 242 ± 43 seconds ($P < 0.001$). Additionally, the mean induction dose of propofol was reduced in Group FN, averaging 56.10 ± 13.92 mg, compared to 81.67 ± 17.64 mg in Group FO ($P < 0.05$). [5]

Group P (139.02 ± 65.24 μg) consumed considerably more propofol overall than Group N (94.72 ± 48.04 μg) and Group D (98.31 ± 39.45 μg) in the research by Biyani C et al. The mean differences were 44.3 μg between Groups P and N, 40.71 μg between Groups P and

D, and 3.59 μg between Groups N and D. The differences between Group P and the other two groups were statistically significant (P = 0.015).[42]

In Jain N et al., study found that Group A, 76% of patients achieved induction in under 200 seconds, while only 24% required more than 200 seconds. On the other hand, 68% of patients in Group B needed a longer induction period, and only 32% of patients were induced in less than 200 seconds. Group A's mean induction time (183 seconds) was much less than Group B's (256 seconds). These results show that the induction dose and induction duration were dramatically decreased when nitrous oxide (N_2O) and propofol were administered together.[43]

At T5, T6, and T9, group B's mean systolic blood pressure is noticeably higher than group A's. In general, patients in group B had greater systolic blood pressure than those in group A. There is significant higher mean diastolic blood pressure at T5, and T9 in group B compared to group A. overall the group B diastolic blood pressure was higher compared to patients in group A. Overall the group B mean arterial pressure was higher compared to patients in group A. The groups' mean heart rates at various time intervals do not differ significantly. Overall, nevertheless, group B patients had a greater mean heart rate than group A patients. ($p>0.05$)

One minute after induction, the control group (Group I) in the study by Kumar AA et al. showed a higher mean heart rate. The systolic, diastolic, and mean blood pressures of Group II were significantly higher at one minute after induction, immediately following intubation, and five minutes after induction. Furthermore, fasciculations occurred in 16% of Group II patients while none were seen in Group I. Propofol induction using the Priming Principle successfully reduces the induction dosage by 27.48% while preserving

stable hemodynamics during peri-intubation. Nevertheless, there is a higher risk of post-suxamethonium fasciculations with this method.[39]

The heart rate rose by 16.38% in the PN group and 6.42% in the PO group in the Singh S et al. research. These results imply that while maintaining stable hemodynamics, co-administration of nitrous oxide during induction considerably shortens the induction period and propofol dosage.[40] In a related study, Sunil R. et al. reported Throughout the trial, the heart rates of the groups were similar. At induction, however, Group A's mean arterial pressure (MAP) was much higher (94.51 ± 16.21 vs. 86.57 ± 15.47). Group B had considerably higher MAP at 5 and 10 minutes, but Group A had marginally greater oxygen saturation at induction (99.81 ± 0.46 vs. 99.96 ± 0.26). Crucially, there were no instances of desaturation (SpO_2 < 90%) found. Three minutes of 66% nitrous oxide inhalation greatly decreased the amount of time needed for induction, decreased the amount of propofol needed, and preserved MAP stability during induction. Furthermore, it prevented oxygen desaturation while reducing the stress reaction to laryngoscopy and intubation. [41]

Hemodynamic parameters were constant during the treatment, and no problems were noted in a related research by Jain K et al. Both the necessary induction dose and the duration to induction were successfully reduced when nitrous oxide (N_2O) was administered in addition to propofol during the induction of anesthesia. Additionally, it helped to keep hemodynamics steady with no known side effects.[5]

LIMITATIONS

LIMITATIONS OF THE STUDY

The study are with some limitations, which include first being a single centre study, which may limits its generalizability of the findings to other institutions or broader population. Secondly, the smaller sample size of 48 in each group, however it was statistically estimated and appropriate for the study objectives, still it may be insufficient to detect the rare adverse events or allow for robust subgroup analysis. The short-term observation as study mainly focused on induction parameters and immediate hemodynamic responses. To strengthen the present study findings, a larger sample size study conducted at different health centres is needed to generalise the findings to a larger population.

SUMMARY

SUMMARY

- There were 96 patients in the current study, 48 in both the groups.
- There was no discernible difference in the mean age across the groups. • There is a little female preponderance in both groups, but there is no discernible difference in the gender distribution. The mean age of the patients in groups A and B was 39.9 and 39.3 years, respectively.
- It was discovered that the groups' ASA grade distributions were similar, with the majority of patients falling into ASA grade 1. ($p>0.05$)
- Compared to group B, group A had a noticeably greater incidence of the lowest induction time. In group B, induction times were 12.5 and less than 200 seconds in 85.4percent of instances. ($p<0.05$)
- Patients in group A received a noticeably lower induction dosage than those in group B. In 75percent of instances, the majority of patients in group A required an induction dosage of 0.5–1 mg/kg. Additionally, compared to group B (22.9percent), 25percent of patients in group A required 1-1.5 g/kg. ($p<0.05$)
- Group B's mean SBP is noticeably greater than group A's at T5, T6, and T9. In general, patients in group B had greater systolic blood pressure than those in group A. Group B's mean DBP is significantly greater than group A's at T5 and T9. In general, patients in group B had greater diastolic blood pressure than those in group A.
- At T4, T5, T6, T7, and T9, group B's mean arterial pressure is noticeably greater than group A's. In general, the MAP of patients in group B was greater than that of patients in group A.

- The groups' mean heart rates at various time intervals do not differ significantly. Overall, nevertheless, group B patients had a greater mean heart rate than group A patients. ($p>0.05$)

CONCLUSION

CONCLUSION

In conclusion, the study affirms that the co-administration of inhaled nitrous oxide during induction with propofol is both effective and beneficial. It offers clear advantages in terms of faster induction, reduced drug requirement, and better hemodynamic control. Incorporating nitrous oxide into induction protocols can therefore enhance safety and efficiency in anaesthetic practice, particularly in patients where minimizing anaesthetic dosage and preserving cardiovascular stability are clinical priorities.

BIBLIOGRAPHY

REFERENCE

1. Sahinovic MM, Struys MMRF, Absalom AR. Clinical Pharmacokinetics and Pharmacodynamics of Propofol. Clin Pharmacokinet. 2018 Dec;57(12):1539–58.

2. Zafirova Z, Sheehan C, Hosseinian L. Update on nitrous oxide and its use in anesthesia practice. Best Pract Res Clin Anaesthesiol. 2018 Jun;32(2):113–23.

3. Emmanouil DE, Quock RM. Advances in understanding the actions of nitrous oxide. Anesth Prog. 2007;54(1):9–18.

4. Ng JM, Hwang NC. Inhaling nitrous oxide reduces the induction dose requirements of propofol. Anesth Analg. 2000 May;90(5):1213–6.

5. Jain K, Sethi SK, Damor M, Jain N. Effects of inhaled nitrous oxide on the induction dose and time requirements of propofol: a prospective, randomized, double-blind study. Anesth Essays Res. 2017;11(1):174–80.

6. Dodds C. General anaesthesia: practical recommendations and recent advances. Drugs. 1999 Sep;58(3):453–67.

7. Keys TE. Historical vignettes: Dr. Arthur Ernest Guedel 1883-1956. Anesth Analg. 1975;54(4):442–3.

8. Winterberg A V, Colella CL, Weber KA, Varughese AM. The Child Induction Behavioral Assessment Tool: A Tool to Facilitate the Electronic Documentation of Behavioral Responses to Anesthesia Inductions. J perianesthesia Nurs Off J Am Soc PeriAnesthesia Nurses. 2018 Jun;33(3):296-303.e1.

9. Douglas BL. A Re-evaluation of Guedel's Stages of Anesthesia: With particular

reference to the ambulatory dental general anesthetic patient. J Am Dent Soc Anesthesiol. 1958 Jan;5(1):11–4.

10. Hedenstierna G, Edmark L. Effects of anesthesia on the respiratory system. Best Pract Res Clin Anaesthesiol. 2015 Sep;29(3):273–84.

11. Mayer S, Boyd J, Collins A, Kennedy MC, Fairbairn N, McNeil R. Characterizing fentanyl-related overdoses and implications for overdose response: Findings from a rapid ethnographic study in Vancouver, Canada. Drug Alcohol Depend. 2018 Dec;193:69–74.

12. Albin M, NIkodemski T. Always check anaesthetic equipment. Vol. 50, Anaesthesiology intensive therapy. Poland; 2018. p. 85–6.

13. Morriss W, Ottaway A, Milenovic M, Gore-Booth J, Haylock-Loor C, Onajin-Obembe B, et al. A Global Anesthesia Training Framework. Anesth Analg. 2019 Feb;128(2):383–7.

14. Stiegler MP, Ruskin KJ. Decision-making and safety in anesthesiology. Curr Opin Anaesthesiol. 2012 Dec;25(6):724–9.

15. Quach DF, de Leon VC, Conway CR. Nitrous Oxide: an emerging novel treatment for treatment-resistant depression. J Neurol Sci. 2022 Mar;434:120092.

16. Galinski M, Hoffman L, Bregeaud D, Kamboua M, Ageron FX, Rouanet C, et al. Procedural Sedation and Analgesia in Trauma Patients in an Out-of-Hospital Emergency Setting: A Prospective Multicenter Observational Study. Prehospital Emerg care. 2018;22(4):497–505.

17. Becker DE, Rosenberg M. Nitrous oxide and the inhalation anesthetics. Anesth

Prog. 2008;55(4):122–4.

18. Khinda V, Rao D, Sodhi SP, Brar GS, Marwah N. Physiological Effects, Psychomotor Analysis, Cognition, and Recovery Pattern in Children Undergoing Primary Molar Extractions under Nitrous Oxide Sedation Using Two Different Induction Techniques: A Split-mouth Randomized Controlled Clinical Trial. Int J Clin Pediatr Dent. 2021;14(Suppl 2):S131–7.

19. Buhre W, Disma N, Hendrickx J, DeHert S, Hollmann MW, Huhn R, et al. European society of anaesthesiology task force on nitrous oxide: a narrative review of its role in clinical practice. Br J Anaesth. 2019;122(5):587–604.

20. Practice Guidelines for Moderate Procedural Sedation and Analgesia 2018: A Report by the American Society of Anesthesiologists Task Force on Moderate Procedural Sedation and Analgesia, the American Association of Oral and Maxillofacial Surgeons, American. Anesthesiology. 2018 Mar;128(3):437–79.

21. Collins M. Use of Nitrous Oxide in Maternity Care: AWHONN Practice Brief Number 6. J Obstet Gynecol neonatal Nurs JOGNN. 2018 Mar;47(2):239–42.

22. ACOG Practice Bulletin No. 209: Obstetric Analgesia and Anesthesia. Obstet Gynecol. 2019 Mar;133(3):e208–25.

23. Nitrous Oxide. In Bethesda (MD); 2006.

24. Myles PS, Leslie K, Chan MT V, Forbes A, Paech MJ, Peyton P, et al. Avoidance of nitrous oxide for patients undergoing major surgery: a randomized controlled trial. Anesthesiology. 2007 Aug;107(2):221–31.

25. Myles PS, Leslie K, Chan MT V, Forbes A, Peyton PJ, Paech MJ, et al. The safety

of addition of nitrous oxide to general anaesthesia in at-risk patients having major non-cardiac surgery (ENIGMA-II): a randomised, single-blind trial. Lancet (London, England). 2014 Oct;384(9952):1446–54.

26. Rao LK, Francis AM, Wilcox U, Miller JP, Nagele P. Pre-operative vitamin B infusion and prevention of nitrous oxide-induced homocysteine increase. Anaesthesia. 2010 Jul;65(7):710–5.

27. Swart G, Blair C, Lu Z, Yogendran S, Offord J, Sutherland E, et al. Nitrous oxide-induced myeloneuropathy. Eur J Neurol. 2021 Dec;28(12):3938–44.

28. Schulte-Sasse U, Hess W, Tarnow J. Pulmonary vascular responses to nitrous oxide in patients with normal and high pulmonary vascular resistance. Anesthesiology. 1982 Jul;57(1):9–13.

29. Miller AL, Theodore D, Widrich J. Inhalational Anesthetic. In Treasure Island (FL); 2025.

30. Folino TB, Muco E, Safadi AO, Parks LJ. Propofol. In: StatPearls [Internet]. StatPearls Publishing; 2022.

31. Zhang Q, Yu Y, Lu Y, Yue H. Systematic review and meta-analysis of propofol versus barbiturates for controlling refractory status epilepticus. BMC Neurol. 2019 Apr;19(1):55.

32. Heim M, Draheim R, Krupp A, Breihan P, O'Rourke A, Wells J, et al. Evaluation of a Multidisciplinary Pain, Agitation, and Delirium Guideline in Mechanically Ventilated Critically Ill Adults. Hosp Pharm. 2019 Apr;54(2):119–24.

33. Smithburger PL, Patel MK. Pharmacologic Considerations Surrounding Sedation,

Delirium, and Sleep in Critically Ill Adults: A Narrative Review. J Pharm Pract. 2019 Jun;32(3):271–91.

34. Antkowiak B, Rammes G. GABA(A) receptor-targeted drug development -New perspectives in perioperative anesthesia. Expert Opin Drug Discov. 2019 Jul;14(7):683–99.

35. Louer R, McKinney RC, Abu-Sultaneh S, Lutfi R, Abulebda K. Safety and Efficacy of a Propofol and Ketamine Based Procedural Sedation Protocol in Children with Cerebral Palsy Undergoing Botulinum Toxin A Injections. PM R. 2019 Dec;11(12):1320–5.

36. Hemphill S, McMenamin L, Bellamy MC, Hopkins PM. Propofol infusion syndrome: a structured literature review and analysis of published case reports. Br J Anaesth. 2019 Apr;122(4):448–59.

37. Haffar S, Kaur RJ, Garg SK, Hyder JA, Murad MH, Abu Dayyeh BK, et al. Acute pancreatitis associated with intravenous administration of propofol: evaluation of causality in a systematic review of the literature. Gastroenterol Rep. 2019 Feb;7(1):13–23.

38. Miller KA, Andolfatto G, Miner JR, Burton JH, Krauss BS. Clinical Practice Guideline for Emergency Department Procedural Sedation With Propofol: 2018 Update. Ann Emerg Med. 2019;73(5):470–80.

39. Kumar AA, Sanikop CS, Kotur PF. Effect of Priming Principle on The Induction Dose Requirements of Propofol - A Randomized Clinical Trial. Indian J Anaesth. 2006;50(4):11–6.

40. Singh S. Does inhalational nitrous oxide affect induction dose of propofol and haemodynamic. J Anesth. 2014;2:32–9.

41. Sunil R, Pillai SV, Lakshmi K. Effect of nitrous oxide inhalation on induction dose of propofol, induction time, oxygen saturation, and hemodynamic responses to laryngoscopy and intubation. Ain Shams J Anesthesiol. 2016;9(1).

42. Biyani G, Bhatia PK, Mohammed S, Bihani P, Kamal M, Chhabra S. Effect of nitrous oxide and dexmedetomidine on the consumption of propofol during general anesthesia in adult patients: A randomized controlled trial. In: The Indian Anaesthetists Forum. Medknow; 2022. p. 12–8.

43. Jain N. To Assess The Effect Of Inhaled Nitrous Oxide On Induction Time And Dose Requirement Of Propofol. J Pharm Negat Results. 2022;13(9):3232–5.

44. Das S, Mitra K, Mandal M. Sample size calculation: Basic principles. Indian J Anaesth. 2016;60(9):652–6.

ANNEXURES

ANNEXURE

PROFORMA

STUDY**:** VARIATION IN INDUCTION DOSE AND TIME OF PROPOFOL ON ADMINISTERING INHALED NITROUS OXIDE DURING INDUCTION : A PROSPECTIVE, RANDOMISED CONTROLLED STUDY.

Investigators: Dr Dandamudi Siri Chandana / Dr Kiran.N

1. Name of the patient: 2. Age/Sex: 3. Ward:

4. IP No: 5. ASA grade:

- **General physical examination:**

Pulse rate: respiratory rate: BP: Temperature:

Pallor/icterus/cyanosis/clubbing/lymphadenopathy/edema

- **Systemic examination:**

RS - **CVS -**

CNS - **P/A -**

- **Investigations:**

Blood group: Hb: WBC: Platelets:

RBS: Blood urea: Sr. Creatinine: Sodium:

Potassium:

ECG:

- **Diagnosis:**
- **Surgery:**

INDUCTION TIME	GROUP A	GROUP B
Less than 200 seconds		
More than 200 seconds		

Group A: Will Receive a mixture of 70% N2O and 30% oxygen via Bains Circuit with 30mg/min infusion of propofol.

Group B: Will Receive a mixture of 100% oxygen with 30mg/min infusion of propofol .

INDUCTION DOSE	GROUP A	GROUP B
0.5-1.0mg/kg		
1.0-1.5mg/kg		
More than 1.5mg/kg		

HEART RATE	GROUP A	GROUP B
Preoperatively - T1		
Before the start of propofol infusion - T2		
1 minutes after the start of infusion - T3		
2 minutes after the start of infusion - T4		
3 minutes after the start of infusion - T5		
4 minutes after the start of infusion - T6		
Apneic state - T7		
Before intubation - T8		
After intubation - T9		

MEAN ARTERIAL PRESSURE	GROUP A	GROUP B
Preoperatively - T1		
Before the start of propofol infusion - T2		
1 minutes after the start of infusion - T3		
2 minutes after the start of infusion - T4		
3 minutes after the start of infusion - T5		
4 minutes after the start of infusion - T6		
Apneic state - T7		
Before intubation - T8		
After intubation - T9		

SYSTOLIC BLOOD PRESSURE	GROUP A	GROUP B
Preoperatively - T1		
Before the start of propofol infusion - T2		
1 minutes after the start of infusion - T3		
2 minutes after the start of infusion - T4		
3 minutes after the start of infusion - T5		
4 minutes after the start of infusion - T6		
Apneic state - T7		
Before intubation - T8		
After intubation - T9		

DIASTOLIC BLOOD PRESSURE	GROUP A	GROUP B
Preoperatively - T1		
Before the start of propofol infusion - T2		
1 minute after the start of infusion - T3		
2 minutes after the start of infusion - T4		
3 minutes after the start of infusion - T5		
4 minutes after the start of infusion - T6		
Apneic state - T7		
Before intubation - T8		
After intubation - T9		

PATIENT INFORMATION SHEET

Study: VARIATION IN INDUCTION DOSE AND TIME OF PROPOFOL ON ADMINISTERING INHALED NITROUS OXIDE DURING INDUCTION : A PROSPECTIVE, RANDOMISED CONTROLLED STUDY

Investigators: Dr. D. Siri Chandana / Dr Kiran.N

Study location: R.L.Jalappa Hospital and Research Centre attached to Sri Devaraj Medical College, Tamaka, Kolar.

Details -

In this study patients undergoing general anaesthesia will be divided into two groups; Group A will receive a mixture of 67% N2O and 33% oxygen and Group B will receive a mixture of 100% oxygen. Both the groups will receive a 30mg/min infusion of propofol**.**The infusion will be stopped on temporary cessation of breathing. The induction dose and time will be calculated consequently.Patients will be given succinylcholine of 2ml/kg and will be intubated using cuffed endotracheal tube of appropriate size and then maintained with O2,N2O and other inhalational agents.

This study aims to reduce the disadvantages caused by propofol on the patients when used in higher doses, i.e decreased arterial blood pressure and heart rate. Patient and the patient's attenders will be completely explained about the procedure being done.

Please read the information above and discuss with your family members. You can ask any question regarding the study. If you agree to participate in the study, then relevant information and history will be taken. This information collected will be used only for dissertation and publication.

All information collected from you will be kept confidential and will not be disclosed to any outsider. Your identity will not be revealed. There is no compulsion to agree to this study. The care you will get will not change if you don't wish to participate. All the expenses required for the study will be endured upon by the candidate. There will not be any monetary benefits/incentives for taking part in this study. You are required to sign/ provide thumb impression only if you voluntarily agree to participate in this study.

For further information contact

Dr Dandamudi Siri Chandana	Dr. Kiran. N
Post graduate in Anaesthesiology,	Professor in Anaesthesiology,
SDUMC Kolar.	Department of anaesthesiology, SDUMC, Kolar.
Mobile no : 7330874979	9740468460

ರೋಗಿಯ ವಿಷಯ ಸೂಚಿ ಪಟ್ಟಿ

ಅಧ್ಯಯನ: ಮೊದಲು ಪ್ರವೇಶಿಸಲ್ಪಡುವ ಪ್ರಮಾಣದಲ್ಲಿ ಬದಲಾವಣೆ ಮತ್ತು ಮೊದಲ ಸಲ ನೈಟ್ರಸ್ ಆಕ್ಸೈಡ ಉಸಿರೆಳೆತದ ನಿರ್ವಹಣೆನೆಯಲ್ಲಿ ಪ್ರೋಪೋಫಾಲ್ ನ ವ್ಯವಧಿ : ನಿರೀಕ್ಷಿತ ಕ್ರಮರಹಿತ ನಿಯಂತ್ರಣದ ಅಧ್ಯಯನ

ಪರೀಕ್ಷಕರು : ಡಾ. ಡಿ ಸಿರಿಚಂದನ /ಡಾ.ಕಿರಣ್.ಎನ್

ಅಧ್ಯಯನ ಸ್ಥಳ: ಆರ್ ಎಲ್ ಜಾಲಪ್ಪ ಆಸ್ಪತ್ರೆ ಮತ್ತು ಸಂಶೋದನಾ ಕೇಂದ್ರ ಸಹಯೋಗ ಶ್ರೀ ದೇವರಾಜ ಅರಸ್ ಮೆಡಿಕಲ್ ಕಾಲೇಜ್ ಟ. ಮ. ಕ. ಕೋಲಾರ

ವಿವರಗಳು:ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಸಾಮಾನ್ಯ ಅನೆಸ್ತೆಸಿಯಾಕ್ಕೊಳಪಡುವ ರೋಗಿಗಳ ಎರಡು ಗುಂಪು ಗಳನ್ನಾಗಿ ಮಾಡಿ : ಗುಂಪು 'ಎ' ಗೆ ೬೭% ನೈಟ್ರಸ್ ಆಕ್ಸೈಡ ಮತ್ತು ೩೩% ಆಮ್ಲ ಜನಕ ಮಿಶ್ರಣವನ್ನು ಗುಂಪು 'ಬಿ' ಗೆ ೧೦೦% ಆಮ್ಲಜನಕ. ಎರಡು ಗುಮ್ಪಿನವೆರಿಗೂ ಕನಿಷ್ಠ ೩೦ ಎಂ.ಜಿ ಪ್ರೋಪೋಫಾಲ್ ತೂರಿಸುವುದು. ತಾತ್ಕಾಲಿಕ ಉಸಿರಾಟದ ಪೂರ್ಣ ನಿಲುಗಡೆಯಲ್ಲಿ ಒಳಗೆ ತೂರುವುದನ್ನುಸುವುದನ್ನು ನಿಲ್ಲಿಸುವುದು. ಮೊದಲ ಪ್ರಮಾಣ ಮತ್ತು ಕಾಲಾವಧಿಯ ಪರಿಣಾಮವನ್ನು ಲೆಕ್ಕಮಾಡುವುದು.ರೋಗಿಗಳಿಗೆ ಸಕ್ಸಿನಳ್ಕೊಲಿನ್ ಒಂದು ಕೆ.ಜಿ ಗೆ ೨ ಎಂ .ಎಲ್ ಮುಂಗೈ ಪಟ್ಟಿಯೊಂದಿಗೆ ಇಂಡೋ ಟ್ರಾಕ್ಯಲ್ ನಳಿಕೆಯನ್ನು ಅದಕ್ಕೆ ತಕ್ಕುದಾದ ಆಕರವನ್ನು ತೂರಿಸುವುದು ಅಲ್ಲದೆ ಆಕ್ಸಿಜನ್, ನೈಟ್ರಸ್ ಆಕ್ಸೈಡ ಇತರೆ ಉಸಿರೆಳೆ ತದ ಸಾಧನೆಗಳಿಂದ ಕಾಪಾಡಿಕೊಳ್ಳುವುದು.

ಈ ಅಧ್ಯಯನದ ಗುರಿ ರೋಗಿಗಳಮೇಲೆ ಪ್ರೋಪೋಫಾಲ್ ಹೆಚ್ಚಿನ ಪ್ರಮಾಣದಲ್ಲಿ ಉಪಯೋಗಿಸಿದಾಗ ಆರಟೀ ರಯಾಲ್ ರಕ್ತದೊತ್ತಡ ವನ್ನು ಮತ್ತು ಹೃದಯ ತೀವ್ರತೆಯಿಂದೊದಗುವ ಪ್ರತಿಕೂಲತೆಯನ್ನು ಕಡಿಮೆಮಾಡುವುದು ರೋಗಿಗಳಿಗೆ ಮತ್ತು ರೋಗಿಗಳ ಮೇಲ್ವಿಚಾರಕರಿಗೆ ಈ ವಿಧಾನವನ್ನು ಪೂರ್ತಿಯಾಗಿ ವಿವರಿಸುವುದು.

ದಯವಿಟ್ಟು ಇದನ್ನು ಓದಿ ನಿಮ್ಮ ಕುಟುಂಬದ ಸದಸ್ಯರೊಡನೆ ವಿವೇಚಿಸಿ. ಈ ಅಧ್ಯಯನದ ಬಗ್ಗೆ ಯಾವುದೇ ಪ್ರಶ್ನೆ ಕೇಳಬಹುದು ನೀವು ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳಲು ಒಪ್ಪಿದ್ದೀ ಆದರೆ ನಾವು ಇಲ್ಲಿ ಕೊಟ್ಟಿರುವ ಪ್ರೋಫಾರ್ಮ ದಂತೆ ನಿಮ್ಮಿಂದ ಅಥವಾ ಈ ಪರಿಸ್ಥಿತಿಗೆ ಹೊಣೆ ಅಥವಾ ಇಬ್ಬರ ಎಲ್ಲಾ ವಿವರಗಳನ್ನು ಪಡೆಯುತ್ತೇವೆ. ಸಂಬಂದ ಪಟ್ಟ ಪೂರ್ವಾಪರಗಳನ್ನು ಪಡೆದುಕೊಳ್ಳುತ್ತೇವೆ.

ನಿಮ್ಮಿಂದ ಪಡೆದ ಈ ವಿವರಗಳನ್ನು ನಮ್ಮ ಪ್ರಕಟಣೆಗೆ ಮತ್ತು ಉಪನ್ಯಾಸಗಳಿಗೆ ಉಪಯೋಗಿಸಿ ಕೊಳ್ಳುತ್ತೇವೆ. ಇದಕ್ಕೆ ಪೊದುಗುವ ಪೂರ್ತಿ ವೆಚ್ಚವನ್ನು ಇದಕ್ಕೆ ಸಂಬಂಧ ಪಟ್ಟ ವೈಧ್ಯರು ವಹಿಸಿಕೊಳ್ಳುತ್ತಾರೆ.

ನಿಮ್ಮಿಂದ ಪಡೆದ ವಿವರಗಳನ್ನು ಗೌಪ್ಯ ವಾಗಿ ಇಟ್ಟಿರುತ್ತಾರೆ. ಅಲ್ಲದೆ ಇದನ್ನು ಬೇರೆ ಯಾರೇ ಹೊರಗಿನವರಿಗೆ ಕೊಡುವುದಿಲ್ಲ.ನಿಮ್ಮ ವೈಯುಕ್ತಿಕ ಗುರುತನ್ನು ತಿಳಿಸುವುದಿಲ್ಲ. ಇದನ್ನು ಈ ಸಂಸ್ಥೆಯ ನೈತಿಕ ಹೊಣೆ ಹೊತ್ತಿರುವವರು ಆಗಾಗ ವಿಮರ್ಶಿಸುತ್ತಾರೆ . ನೀವು ಅವರನ್ನು ಸುಲಭವಾಗಿ ಭೇಟಿಯಾಗಬಹುದು. ಈ ಅಧ್ಯಯನಕ್ಕೆ ಒಪ್ಪಿಗೆಗೆ ಯಾವುದೇ

ಶೈಕ್ಷಣಿಕ ವ್ಯಾಸಂಗಕ್ಕೆ ಮತ್ತು ಸಂಶೋದನಾ ಉದ್ದೇಶದ ಶಸ್ತ್ರ ಚಿಕತ್ಸೆ ಮುಂತಾವುದಕ್ಕೆ ಇದು ವಿನಿಯೋಗವಾಗಲಿ. ವಿಡಿಯೋ ಅಥವಾ ಛಾಯಾ ಚಿತ್ರ ತೆಗೆದುಕೊಳ್ಳುವುದಕ್ಕೆ ಒಪ್ಪಿಕೊಳ್ಳುತ್ತೇನೆ

ಎಲ್ಲಾ ಮಾಹಿತಿಗಳನ್ನು ಪ್ರಕಟಿಸಬಹುದು ಅಥವಾ ಯಾವುದೇ ಶೈಕ್ಷಣಿಕ ಕಾರ್ಯ ಕ್ರಮಕ್ಕೆ ಉಪಯೋಗಿಸಬಹುದು. ಈ ಅಧ್ಯಯನದ ಮಾರ್ಗದಲ್ಲಿ ನಾನು ವೈದ್ಯರನ್ನಾಗಲೀ ಅಥವಾ ಸಂಸ್ಥೆ ಯನ್ನು ಯಾವುದೇ ರೀತಿಯ ಅನುಚಿತ ದುಸ್ಪರಿಣಾಮ ದಿಂದ ಅವರು ಹೊಣೆ ಎಂದು ಹೇಳುವುದಿಲ್ಲ.

ನನ್ನ ಒಪ್ಪಿಗೆ ತೆಗೆದೊಕೊಂಡ ಮಾಹಿತಿ/ವರದಿಯನ್ನು ಮತ್ತು ರೋಗಿಯ ವಿಷಯ ಸೂಚಿಯನ್ನು ಇಲ್ಲಿ ಭಾಗವಹಿಸುವವರೆಲ್ಲರಿಗೂ ಅದರ ಪ್ರತಿಯನ್ನು ಕೊಟ್ಟಿರುತ್ತೇನೆ.

ಸಹಿ /ಹೆಬ್ಬರಳ ಗುರುತು
ರೋಗಿಯ ಪರಿಚಾರಕ ಹೆಸರು

ಸಹಿ /ಹೆಬ್ಬರಳ ಗುರುತು
ರೋಗಿ/ಮೇಲ್ವಿಚಾರಕರು
ರೋಗಿಯೊಂದಿಗೆ ಸಂಬಂಧ

ಸಾಕ್ಷಿಗಳು -೧
ಸಾಕ್ಷಿಯ ಹೆಸರು

ರೋಗಿಯ ಸಂಬಂದ

ಅಧ್ಯಯನ / ಸಂಶೋದನೆ ಪರೀಕ್ಷಕ ವೈದ್ಯರ ಸಹಿ

INFORMED CONSENT FORM

Name of the institution: SRI DEVARAJ ACADEMY OF HIGHER EDUCATION AND RESEARCH.

Name of the principal investigator: Dr. Dandamudi Siri Chandana
Name of the guide: Dr. Kiran.N
Name of the subject/participant:

STUDY: VARIATION IN INDUCTION DOSE AND TIME REQUIREMENT OF PROPOFOL ON ADMINISTERING INHALED NITROUS OXIDE DURING INDUCTION : A PROSPECTIVE, RANDOMISED CONTROLLED STUDY.

Date:

I, _____ aged _____ ,after being explained in understandable language about the purpose of the study and the risks and complications of the procedure, hereby give my valid written informed consent without any force or prejudice for studying variation in induction dose and time requirement of propofol on administering inhaled nitrous oxide. The nature and risks involved have been explained to me to my satisfaction. I have been explained in detail about the study being conducted. I have read the patient information sheet and I have had the opportunity to ask any question. Any question that I have asked, have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research. I hereby give consent to provide my history, undergo physical examination, undergo the procedure, undergo investigations and provide its results and documents etc. to the doctor / institute etc. All the data can be used for any published, dissertation or study. I will not hold the doctors / institute etc. responsible for any untoward consequences during the procedure / study. I am aware that there wont be any monetary benefits for taking part in this study.

A copy of this Informed Consent Form and Patient Information Sheet has been provided to the participant.

_____ _____

(Signature & Name of Pt. Attendant) (Signature/Thumb impression & Name of Patient/Guardian)
(Relation with patient)

Witness 1:
Witness 2:

_____

(Signature & Name of Research person /doctor)

ಒಪ್ಪಿಗೆ ಕೊಟ್ಟ ಪತ್ರ

ಸಂಸ್ಥೆಯ ಹೆಸರು : ಶ್ರೀ ದೇವರಾಜ ಅರಸ್ ಮೆಡಿಕಲ್ ಕಾಲೇಜ್. ಉನ್ನತ ವಿದ್ಯಾ ಮತ್ತು ಸಂಶೋದನಾ ಅಕಾಡೆಮಿ ಟ . ಮ. ಕ. ಕೋಲಾರ
ಮುಖ್ಯ ಪರೀಕ್ಷಕರ ಹೆಸರು ಡಾ, ದಂದಾಮುಡಿ ಸಿರಿ ಹಂದನ
ಮಾರ್ಗದರ್ಶಿಯ ಹೆಸರು ಡಾ. ಕಿರಣ್ ಏನ್.
ವಿಷದ ಹೆಸರು /ಭಾಗವಿಸುವವರ
ಮೊದಲು ಪ್ರವೇಶಿಸಲ್ಪಡುವ ಪ್ರಮಾಣದಲ್ಲಿ ಬದಲಾವಣೆ ಮತ್ತು ಮೊದಲ ಸಲ ನೈಟ್ರಸ್ ಆಕ್ಸೈಡ ಉಸಿರೆಳೆತದ ನಿರ್ವಹಣೆನೆಯಲ್ಲಿ ಪ್ರೋಪೋಫಾಲ್ ನ ವ್ಯವಧಿ : ನಿರೀಕ್ಷಿತ ಕ್ರಮರಹಿತ ನಿಯಂತ್ರಣದ ಅಧ್ಯಯನ
ದಿನಾಂಕ:

ನಾನು ..... ವಯಸ್ಸು.....
ನಾನು ..... , ...ವರ್ಷ ದವನಾದ ನನಗೆ ಅರ್ಥವಾಗುವ ಭಾಷೆಯಲ್ಲಿ ಸಂಪೂರ್ಣ ವಾಗಿ ಇದರ ಉದ್ದೇಶ ವನ್ನು ತಿಳಿಸಿರುತ್ತಾರೆ. ಇನ್ವೆಸ್ಟಿಗೇಶನ್ ಆರ್. ಎ. ಎಂ. ಪಿ. ಸ್ಥಾನಕ್ಕೂ ಮತ್ತು ಎಲೆಕ್ಟಿವ್ ಸ್ಪಿಫಿಂಗ್ ನಲ್ಲಿರುವ ಇನ್ವೆಸ್ಟಿಗೇಶನ್ ಸ್ಥಾನಕ್ಕೂ ಇರುವ ಸ್ವಾಸ್ಥ್ಯದ ಒಂದು ತುಲನಾತ್ಮಕ ಧೃಷ್ಟಾಂತದ ಅಧ್ಯಯನ

ಆದ್ದರಿಂದ ಈ ಅಧ್ಯಯನಕ್ಕೆ ನಾನು ಲಿಖಿತ ರೂಪದಲ್ಲಿ ನನ್ನ ಒಪ್ಪಿಗೆಯನ್ನು ಯಾವುದೇ ಒತ್ತಡಕ್ಕೊಳಗಾಗದೆ ಪೂರ್ವಗ್ರಹ ಪೀಡಿತನಾಗದೆ ಒಪ್ಪಿಕೊಂಡಿರುತ್ತೇನೆ.
ಇಂಡೋ ಟ್ರಾಕ್ ಹೀಲ್ ಇನ್ವೆಸ್ಟಿಗೇಶನ್ಸ್ ಉದಾ ಲರೆನ್ಜೆಲ್ ಗಾಯ, ಇಂಡೋ ಟ್ರಾಕ್ ಹೀಲ್, ನಳಿಕೆ ಯ ಸ್ಥಾನ ಪಲ್ಲಟ, ರಕ್ತ ಸ್ರಾವ , ಹಲ್ಲು ಮತ್ತು ತುಟಿಗಳ ಹಾನಿ , ಕರ್ಕಶತೆ ಯನ್ನು ರೋಗಿಗೆ ಶಸ್ತ್ರ ಚಿಕಿತ್ಸೆಗೆ ಮುನ್ನ ವಿವರವಾಗಿ ತಿಳಿಸಿದ್ದಾರೆ. ಇದರ ಸ್ವಭಾವ ಮತ್ತು ಉಂಟಾಗುವ ಅಪಾಯ ಮತ್ತು ದುಸ್ಪರಿಣಾಮಗಳನ್ನು ವಿವರವಾಗಿ ನನಗೆ ಅರ್ಥವಾಗುವ ಹಾಗೆ ಸಮಂಜಸವಾಗಿ ತಿಳಿಸಿದ್ದಾರೆ.
ಇದರ ಬಗ್ಗೆ ನಡೆಸಿದ ಅಧ್ಯಯನವನ್ನು ವಿವರಿಸಿದ್ದಾರೆ. ನನಗೆ ರೋಗಿಯ ವಿವರಣಾ ಪತ್ರವನ್ನು ಓದಿ ನನಗೆ ಪ್ರಶ್ನಿಸುವುದಕ್ಕೆ ಅವಕಾಶವನ್ನು ಕೊಟ್ಟರು. ಯಾವುದೇ ಪ್ರಶ್ನೆ ಕೇಳಿದರೂ ನನಗೆ ಸಮಂಜಸ ಉತ್ತರ ಸಿಗುತ್ತಿತ್ತು. ಈ ಎಲ್ಲಾ ಅಧ್ಯಯನದಲ್ಲಿ ಉಂಟಾಗುವ ಖರ್ಚನ್ನು ಪರೀಕ್ಷಕರು ವಹಿಸುತ್ತಾರೆ. ಈ ಅಧ್ಯಯನ ಪೂರ್ತಿಯಾಗುವವರೆಗೂ ನನಗೆ ಖರ್ಚು ಬರುವುದಿಲ್ಲ. ಈ ಸಂಶೋದನೆಯಲ್ಲಿ ನಾನು ಮನಃ ಪೂರ್ತಿಯಾಗಿ ನನ್ನ ಒಪ್ಪಿಗೆಯನ್ನು ಮತ್ತು ಅವರಿಗೆ ಬೇಕಾದ ನನ್ನ ಎಲ್ಲಾ ವಿವರಗಳನ್ನು ಕೊಟ್ಟಿರುತ್ತೇನೆ. ಭೌತಿಕ ಪರೀಕ್ಷೆ ಪದ್ಧತಿ ಪ್ರಕಾರ ಅವರ ತನಿಖೆಗೆ ಮತ್ತು ಅಲ್ಲಿಂದ ದೊರೆತ ಫಲಿತಾಂಶ ಮತ್ತು ಎಲಾ ಮಾಹಿತಿಯನ್ನು ವೈಧ್ಯರಿಗಾಗಲೀ ಮತ್ತು ಸಂಸ್ಥೆಗಾಗಲೀ ಕೊಡುತ್ತೇನೆ.

ರೀತಿ ಒತ್ತಡವಿಲ್ಲ. ನೀವು ಪಾಲ್ಗೊಳ್ಳಲು ಇಷ್ಟವಿಲ್ಲದ್ದ ಪಕ್ಷದಲ್ಲಿ ನಿಮ್ಮ ಉಪಚಾರದಲ್ಲಿ ಯಾವುದೇ ರೀತಿ ವ್ಯತ್ಯಾಸ ವಿರುವುದಿಲ್ಲ . ನೀವು ನಿಮ್ಮ ಸಹಿ ಅಥವಾ ಹೆಬ್ಬೆಟ್ಟಿನ ಗುರುತನ್ನು ಕೊಡುವುದು. ವೈಯುಕ್ತಿಗಿ ಒಪ್ಪಿ ಮಾತ್ರ ಸಹಿ ಮಾಡಬಹುದು.

ಮಿಕ್ಕ ವಿವರಗಳಿಗೆ ಸಂಪರ್ಕಿಸಿ :

ಡಾ. ದಂದಾಮುಡಿ ಸಿರಿ ಚಂದನ . ಡಾ. ಕಿರಣ್. ಏನ್.
ಅನೆಸ್ಥ್ಸಿಯಾಸ್ಥಿಯಾಲಜಿ ಸ್ನಾತಕೋತ್ತರ ಪದವಿ . ಎಸ.ಡಿ .ಯು.ಎಂ.ಸಿ ಕೋಲಾರ .
ಅನೆಸ್ಥ್ಸಿಯಾಸ್ಥಿಯಾಲಜಿ, ಪ್ರಾಂಶುಪಾಲರು.
ಮೊ: 7330874979 ಅನೆಸ್ಥ್ಸಿಯಾಸ್ಥಿಯಾಲಜಿ, ವಿಭಾಗ Mo: 9740468460

MASTER CHART

KEY TO MASTER CHART

ASA : American Society of Anesthesiologists Physical Status Classification.

SBP : Systolic Blood Pressure

DBP: Diastolic Blood Pressure

MAP: Mean Arterial Pressure

HR : Heart Rate

MASTERCHART

SL.NO	Group	UHID NO.	AGE[YRS]	GENDER	ASA Grade	INDUCTION TIME	INDUCTION DOSE(mg	SBP_T1	SBP_T2	SBP_T3	SBP_T4	SBP_T5	SBP_T6	SBP_T7	SBP_T8	SBP_T9
1	Group A	340125	39	F	1	<200sec	1.0-1.5	128	126	126	122	120	118	118	120	122
2	Group A	340331	56	M	1	<200sec	0.5-1.0	130	128	124	120	120	118	116	116	118
3	Group A	333730	41	F	1	<200sec	0.5-1.0	130	126	124	118	116	114	116	118	120
4	Group A	329381	61	F	2	<200sec	0.5-1.0	130	126	126	122	120	118	120	122	124
5	Group A	331839	51	F	1	<200sec	1.0-1.5	110	110	106	104	104	100	121	120	114
6	Group A	330210	50	M	2	<200sec	0.5-1.0	120	124	120	118	118	116	122	120	128
7	Group A	315236	30	F	2	<200sec	1.0-1.5	130	127	130	119	114	110	110	114	122
8	Group A	340607	42	F	1	<200sec	1.0-1.5	122	128	124	120	120	118	118	120	122
9	Group A	365997	57	M	1	<200sec	1.0-1.5	128	130	132	130	128	124	124	122	128
10	Group A	367833	54	F	2	<200sec	0.5-1.0	130	126	126	122	120	118	120	122	124
11	Group A	367439	21	F	1	>200sec	1.0-1.5	120	122	116	114	112	110	110	110	114
12	Group A	361182	38	M	1	<200sec	0.5-1.0	140	140	136	134	132	132	128	126	130
13	Group A	361472	42	F	2	>200sec	1.0-1.5	128	126	126	122	120	118	118	120	122
14	Group A	366182	58	F	1	>200sec	0.5-1.0	110	108	108	106	104	104	101	101	106
15	Group A	366812	22	F	1	<200sec	0.5-1.0	120	118	116	116	114	114	114	112	114
16	Group A	58275	27	M	1	<200sec	0.5-1.0	124	126	124	124	122	120	118	118	122
17	Group A	348199	18	M	2	<200sec	0.5-1.0	122	120	120	118	118	116	116	114	118
18	Group A	327376	50	F	1	<200sec	0.5-1.0	112	116	114	114	112	110	110	108	112
19	Group A	293575	22	M	1	>200sec	1.0-1.5	116	118	118	116	116	112	112	110	114
20	Group A	387732	27	F	2	<200sec	0.5-1.0	132	134	134	134	132	130	130	130	132
21	Group A	59697	23	F	1	<200sec	1.0-1.5	128	126	126	124	124	122	120	118	122
22	Group A	347646	43	F	2	<200sec	0.5-1.0	120	127	130	130	126	124	124	122	124

23	Group A	379126	23	M	1	<200sec	0.5-1.0	130	127	130	122	120	118	118	120	122
24	Group A	377379	38	F	1	<200sec	0.5-1.0	122	126	124	122	122	116	116	114	118
25	Group A	377489	19	F	1	<200sec	0.5-1.0	124	126	124	122	122	120	118	116	116
26	Group A	383821	53	M	1	<200sec	0.5-1.0	130	130	128	126	126	124	120	120	122
27	Group A	408552	40	M	2	<200sec	0.5-1.0	112	112	110	108	106	104	104	102	104
28	Group A	366698	58	M	2	<200sec	0.5-1.0	120	118	118	116	114	112	112	112	116
29	Group A	379523	53	F	1	<200sec	0.5-1.0	140	140	138	136	134	132	132	130	132
30	Group A	386116	51	F	1	<200sec	1.0-1.5	122	120	118	118	116	114	114	112	114
31	Group A	416691	57	M	2	<200sec	0.5-1.0	118	118	116	114	114	114	112	110	114
32	Group A	393975	34	M	1	>200sec	0.5-1.0	116	116	114	112	112	110	108	106	108
33	Group A	408076	44	F	1	>200sec	0.5-1.0	110	110	108	104	102	102	100	98	96
34	Group A	410501	39	M	1	<200sec	1.0-1.5	112	112	110	110	96	96	96	94	98
35	Group A	422018	35	M	1	<200sec	0.5-1.0	122	122	124	122	120	118	116	114	114
36	Group A	411026	38	F	1	<200sec	0.5-1.0	132	132	130	128	128	126	126	124	122
37	Group A	410968	38	F	2	<200sec	0.5-1.0	120	120	118	116	114	114	112	112	116
38	Group A	556587	35	M	1	<200sec	0.5-1.0	124	126	126	124	122	120	118	118	122
39	Group A	436651	33	M	2	<200sec	0.5-1.0	118	118	116	116	114	112	112	110	108
40	Group A	542760	49	F	1	<200sec	0.5-1.0	120	124	120	118	118	116	122	120	128
41	Group A	562001	38	F	1	<200sec	0.5-1.0	140	140	136	134	132	132	130	128	126
42	Group A	562201	25	F	2	>200sec	1.0-1.5	120	122	116	114	112	110	110	110	114
43	Group A	556106	29	M	1	<200sec	0.5-1.0	118	118	116	116	114	112	110	110	116
44	Group A	555423	56	F	2	<200sec	0.5-1.0	124	126	124	122	120	118	118	116	114
45	Group A	560010	52	F	1	<200sec	0.5-1.0	140	138	138	136	136	132	132	132	134
46	Group A	554840	37	F	2	<200sec	0.5-1.0	130	126	126	122	120	118	120	122	124
47	Group A	348199	18	M	2	<200sec	0.5-1.0	122	120	120	118	118	116	116	114	118
48	Group A	327376	50	F	1	<200sec	0.5-1.0	112	116	114	114	112	110	110	108	112
49	GROUP B	379579	19	M	1	<200sec	>1.5	106	110	108	104	101	90	90	94	101

50	GROUP B	366727	30	F	1	>200sec	>1.5	128	130	126	128	126	124	124	124	135
51	GROUP B	363744	45	M	2	>200sec	1.0-1.5	148	144	146	144	142	140	140	138	142
52	GROUP B	379148	62	M	1	>200sec	1.0-1.5	130	130	126	128	126	124	122	120	128
53	GROUP B	372350	48	F	2	>200sec	>1.5	150	155	160	153	150	148	144	140	148
54	GROUP B	363744	40	M	1	>200sec	>1.5	128	130	126	128	126	124	124	120	135
55	GROUP B	388376	30	F	2	>200sec	1.0-1.5	140	144	142	140	138	136	134	134	138
56	GROUP B	371517	50	F	2	>200sec	>1.5	142	144	144	142	140	138	136	136	138
57	GROUP B	378038	49	F	1	>200sec	>1.5	130	130	128	126	124	124	122	122	120
58	GROUP B	377095	55	M	1	>200sec	>1.5	105	105	102	100	98	96	94	94	98
59	GROUP B	375454	58	M	2	>200sec	>1.5	130	132	132	130	128	126	123	124	128
60	GROUP B	374865	20	M	1	<200sec	1.0-1.5	120	120	118	116	114	112	110	110	116
61	GROUP B	374345	45	F	2	>200sec	>1.5	140	140	138	136	132	130	128	128	130
62	GROUP B	369252	50	F	2	>200sec	>1.5	134	138	138	134	134	130	128	128	124
63	GROUP B	371879	45	F	2	>200sec	>1.5	126	126	124	124	120	118	118	120	124
64	GROUP B	374842	46	F	1	>200sec	>1.5	128	128	128	126	126	126	124	124	120
65	GROUP B	394804	36	F	1	>200sec	>1.5	130	134	134	132	132	132	130	130	134
66	GROUP B	381310	39	M	1	>200sec	>1.5	110	108	108	108	106	106	104	104	122
67	GROUP B	387559	50	F	2	>200sec	>1.5	124	126	126	122	122	120	120	118	125
68	GROUP B	377533	36	F	2	>200sec	1.0-1.5	126	128	128	126	124	124	122	122	128
69	GROUP B	390646	31	M	1	<200sec	>1.5	110	110	106	104	104	102	102	98	112
70	GROUP B	105237	50	M	2	>200sec	>1.5	124	124	128	126	126	124	124	122	126
71	GROUP B	253649	30	F	1	>200sec	1.0-1.5	110	112	112	110	112	110	110	108	114
72	GROUP B	419632	57	M	1	>200sec	>1.5	116	114	114	116	118	118	116	116	122
73	GROUP B	177530	42	F	1	>200sec	>1.5	122	124	126	126	124	124	122	122	124
74	GROUP B	418105	23	F	1	>200sec	>1.5	132	132	134	132	130	130	132	132	138
75	GROUP B	414693	46	M	1	<200sec	>1.5	126	126	126	124	123	123	119	119	121
76	GROUP B	413744	34	M	1	>200sec	1.0-1.5	119	117	117	117	115	115	113	115	122

77	GROUP B	365143	20	M	1	>200sec	1.0-1.5	117	115	115	115	113	113	111	111	118
78	GROUP B	404648	43	M	1	>200sec	>1.5	126	128	126	126	124	124	124	122	128
79	GROUP B	407004	36	F	1	>200sec	>1.5	110	110	106	106	104	104	102	101	112
80	GROUP B	395726	34	F	1	>200sec	>1.5	124	126	128	126	126	124	124	124	126
81	GROUP B	467455	43	M	2	>200sec	>1.5	124	124	126	126	124	122	122	120	124
82	GROUP B	418942	31	M	1	>200sec	1.0-1.5	110	114	114	112	110	108	106	104	108
83	GROUP B	381381	22	M	1	>200sec	>1.5	108	106	104	104	104	102	102	100	108
84	GROUP B	374716	49	F	2	<200sec	>1.5	122	120	124	122	122	120	120	118	126
85	GROUP B	362296	40	F	1	>200sec	1.0-1.5	110	110	106	104	104	102	102	102	110
86	GROUP B	421071	33	F	1	>200sec	1.0-1.5	130	134	134	132	132	130	130	130	134
87	GROUP B	252487	20	F	1	>200sec	>1.5	126	126	126	124	124	122	122	120	126
88	GROUP B	435303	24	F	1	<200sec	>1.5	110	110	108	108	106	106	104	104	110
89	GROUP B	522216	26	M	1	>200sec	>1.5	130	134	132	132	130	130	128	126	132
90	GROUP B	517913	49	F	2	>200sec	>1.5	120	124	126	126	124	122	120	118	126
91	GROUP B	524993	58	M	1	>200sec	>1.5	130	136	136	134	132	132	130	128	132
92	GROUP B	526064	22	M	1	>200sec	>1.5	130	134	136	134	132	130	130	128	134
93	GROUP B	194784	45	M	2	>200sec	>1.5	140	148	144	142	140	140	138	138	144
94	GROUP B	525471	30	F	1	>200sec	>1.5	110	108	106	106	104	102	100	100	106
95	GROUP B	437041	39	F	2	>200sec	>1.5	140	148	146	144	142	142	142	138	142
96	GROUP B	371855	58	M	1	>200sec	>1.5	138	136	136	134	132	130	130	130	136

DBP_T1	DBP_T2	DBP_T3	DBP_T4	DBP_T5	DBP_T6	DBP_T7	DBP_T8	DBP_T9	MAP_T1	MAP_T2	MAP_T3	MAP_T4	MAP_T5	MAP_T6	MAP_T7	MAP_T8	MAP_T9	HR_T1	HR_T2	HR_T3	HR_T4	HR_T5	HR_T6	HR_T7	HR_T8	HR_T9
80	82	82	80	78	78	80	82	84	96	97	97	94	92	91	93	95	97	76	80	82	84	82	80	82	84	86
90	86	86	84	84	82	80	82	84	103	100	99	96	96	94	92	93	95	82	84	84	82	84	86	86	90	96
86	84	86	82	78	80	80	82	88	101	98	99	94	91	91	92	94	97	88	90	88	86	84	84	82	88	92
80	76	78	76	72	70	76	78	82	97	93	94	91	88	86	91	93	96	86	86	84	84	88	86	86	86	94
90	90	86	80	76	78	88	90	93	97	97	93	88	85	85	99	100	99	88	90	86	84	82	80	88	96	101
88	86	84	86	74	72	76	86	92	99	99	96	97	89	87	91	97	104	92	90	88	86	86	88	86	90	96
80	82	80	80	76	70	80	80	80	97	97	97	93	89	83	90	91	94	86	86	84	82	80	82	84	96	94
80	80	78	74	74	76	74	76	80	96	96	93	89	89	90	89	91	94	76	76	74	72	72	80	80	84	86
90	88	88	86	84	80	80	80	84	103	102	103	101	99	95	95	94	99	78	80	82	80	78	76	80	84	88
80	76	78	76	72	74	76	78	82	97	93	94	91	88	86	91	93	96	86	86	84	84	88	86	86	86	94
90	90	88	84	86	84	84	82	86	100	101	97	94	95	93	93	91	95	101	112	114	992	88	86	84	86	92
90	88	88	86	86	84	84	84	88	107	105	104	102	101	100	99	98	102	90	94	92	94	90	88	86	86	98
80	82	82	80	78	78	80	82	84	96	97	97	94	92	91	93	95	97	76	80	82	84	82	80	82	84	86
70	70	64	60	58	60	60	62	64	83	83	79	75	73	75	74	75	78	98	101	101	96	94	92	90	90	94
90	88	86	88	86	84	84	88	90	10	98	96	97	95	94	94	96	98	82	84	82	80	78	80	78	82	86

									0																
88	86	86	84	84	82	80	78	82	100	99	99	97	97	95	93	91	95	88	86	86	84	84	82	82	80	86
78	78	76	76	74	76	74	74	78	93	92	91	90	89	89	88	87	91	90	92	94	94	92	92	90	90	94
78	76	74	74	72	72	70	68	72	89	89	87	87	85	85	83	81	85	94	94	92	92	90	90	88	88	94
80	82	82	80	80	78	78	76	80	92	94	94	92	92	89	89	87	91	88	90	86	84	82	82	80	80	84
94	96	94	94	92	92	90	90	88	107	109	107	107	105	105	103	103	103	90	92	90	90	88	88	86	86	84
84	86	86	84	82	80	80	78	76	99	99	99	98	96	94	93	91	91	76	78	78	80	82	82	80	80	88
80	86	84	82	82	82	80	78	82	93	100	99	98	97	96	95	93	96	82	80	80	78	78	76	76	74	80
92	90	88	86	86	86	84	84	86	105	102	102	98	97	97	95	96	98	98	103	103	101	98	96	96	94	101
80	78	76	76	74	72	72	70	72	94	94	92	91	90	87	87	85	87	72	70	68	68	66	66	64	64	72
90	90	88	88	86	86	84	84	82	101	102	100	99	98	97	95	95	93	101	98	98	96	96	94	92	90	94
90	90	88	86	86	84	86	82	83	103	103	101	99	99	97	97	95	96	98	99	101	96	94	94	92	90	92
80	78	78	76	76	74	74	72	70	91	89	89	87	86	84	84	82	81	68	68	66	66	64	64	64	62	66
76	74	74	72	70	70	68	68	72	91	89	89	87	85	84	83	83	87	78	78	76	76	74	72	72	70	74
90	90	88	88	88	86	86	84	84	107	107	105	104	103	101	101	99	100	98	98	96	96	94	94	92	92	96
78	76	76	74	72	72	70	70	74	93	91	90	89	87	86	85	84	87	88	88	86	84	84	82	82	80	82
82	82	80	80	78	78	76	74	76	94	94	92	91	90	90	88	86	89	90	92	90	90	90	88	88	86	88
68	66	66	64	62	62	60	60	64	84	83	82	80	79	78	76	75	79	90	94	94	92	92	88	86	86	88
70	68	66	66	64	62	60	60	62	83	82	80	79	77	75	73	73	73	72	74	74	76	76	76	74	72	72
70	68	68	68	66	64	62	60	64	84	83	82	82	76	75	73	71	75	78	76	74	74	72	72	70	70	76
82	82	80	80	78	78	74	74	72	95	95	95	94	92	91	88	87	86	98	101	101	98	98	96	96	94	98

90	92	88	88	86	84	84	82	84	104	105	102	101	100	98	98	96	97	76	78	78	80	82	82	82	80	84
78	76	74	74	72	70	70	72	76	92	91	89	88	86	85	84	85	89	68	68	66	64	64	64	62	62	70
74	72	70	68	68	66	64	64	66	90	90	88	86	88	84	82	82	84	86	86	88	90	90	86	86	84	90
68	66	66	64	64	62	62	62	60	84	83	82	81	83	78	78	78	76	76	78	78	80	78	76	76	72	78
74	72	72	70	70	68	68	70	72	89	89	88	86	82	84	86	87	91	88	90	90	88	86	84	84	82	88
80	76	76	78	78	74	74	72	70	100	97	96	97	91	93	93	91	88	101	98	98	96	96	94	92	90	94
90	90	88	84	86	84	84	82	86	100	101	97	94	89	93	93	91	95	68	68	66	66	64	64	64	62	66
84	86	86	84	82	80	78	80	84	95	97	96	95	95	91	89	90	95	88	90	86	86	84	84	82	82	88
90	88	88	86	86	84	84	84	86	101	101	100	98	95	95	95	95	95	98	98	86	94	94	92	92	90	92
78	78	76	76	74	72	72	76	76	99	98	97	96	103	92	92	95	95	78	82	78	78	76	74	74	72	78
80	78	76	76	74	72	72	70	72	97	94	93	91	89	87	88	87	89	90	92	90	90	88	88	86	84	88
78	78	76	76	74	76	74	74	78	93	92	91	90	89	89	88	87	91	90	92	94	94	92	92	90	90	94
78	76	74	74	72	72	70	68	72	89	89	87	87	85	85	83	81	85	94	94	92	92	90	90	88	88	94
90	88	88	86	84	70	72	70	82	96	101	96	94	92	90	90	88	101	96	101	96	94	92	90	90	88	101
86	86	88	88	90	86	84	80	92	100	101	101	101	102	101	97	93	106	82	89	86	86	84	82	80	80	90
96	96	94	94	92	90	90	90	94	113	112	111	111	109	107	107	106	110	88	86	86	84	84	82	82	80	88
90	90	88	86	88	86	84	80	84	103	103	101	100	99	97	93	99	93	78	78	76	78	80	78	76	78	84
90	92	90	88	86	86	84	84	90	110	113	110	107	107	105	104	103	109	80	82	84	80	80	78	78	84	88
86	86	88	88	90	86	84	80	92	100	101	101	101	102	101	97	93	106	82	84	86	86	84	82	80	80	90

80	86	84	82	80	80	76	76	82	100	105	103	101	99	99	95	95	101	82	84	86	86	84	82	82	80	88
82	84	82	80	78	76	78	78	80	102	104	103	101	99	97	97	97	99	84	84	88	86	84	86	86	86	90
80	82	80	76	78	76	74	74	72	97	98	96	93	93	92	90	90	88	86	88	86	84	82	80	78	80	86
80	80	76	74	70	70	68	68	74	88	88	85	84	79	79	77	77	82	96	94	94	92	90	88	88	86	96
80	78	78	76	74	72	72	70	74	97	96	96	94	92	90	89	88	92	82	84	86	84	82	80	78	78	86
90	90	88	86	84	82	82	82	84	100	100	98	96	94	92	91	91	95	92	94	94	92	90	88	86	86	92
90	88	86	84	82	80	80	80	84	107	105	103	101	99	97	96	96	99	98	98	96	94	92	90	88	88	92
80	86	86	84	82	80	80	78	82	98	103	103	101	99	97	96	95	96	82	80	84	86	84	82	80	80	88
80	78	78	76	76	70	70	68	74	95	94	93	92	91	86	86	85	91	88	86	84	84	80	80	78	78	88
88	88	86	86	84	84	84	82	88	101	101	100	99	98	98	97	97	94	86	84	84	82	82	80	78	78	84
92	94	94	92	90	90	88	88	92	106	107	107	105	104	104	103	102	103	72	70	68	70	68	68	66	66	62
70	74	74	72	72	70	70	68	74	83	85	85	84	83	83	81	81	86	82	80	80	78	78	76	76	74	80
88	88	86	86	84	84	82	82	80	101	101	99	98	97	96	96	94	96	90	94	94	92	92	90	88	86	92
88	86	84	84	84	83	83	82	88	101	100	99	98	97	97	96	96	97	88	90	92	90	88	86	85	84	90
90	88	88	86	86	86	84	82	80	97	95	94	92	92	91	91	89	92	82	80	84	86	84	82	80	82	88
92	92	90	90	88	88	86	86	92	103	103	103	102	101	100	100	98	99	92	92	94	94	90	89	86	86	92
70	74	74	74	72	72	72	70	76	84	87	87	86	85	85	85	84	85	68	66	68	68	66	64	64	62	72
70	72	72	74	72	70	70	70	74	85	86	86	88	87	87	85	85	87	88	90	88	88	86	86	84	88	92
78	80	82	82	84	84	86	86	88	93	95	97	97	97	97	97	98	99	76	78	82	80	82	84	84	84	92
92	90	90	88	88	86	84	82	88	10	10	10	10	10	10	10	10	10	98	10	10	10	10	10	10	98	10

									5	4	5	3	2	2	1	0	1		1	3	5	3	1	1		2
90	88	88	88	86	86	84	84	88	102	101	101	100	98	98	97	96	96	86	88	90	90	86	84	84	82	90
70	68	66	66	64	64	62	62	68	86	84	83	83	81	81	80	80	82	88	86	86	84	84	82	82	84	88
72	74	74	72	70	70	68	68	72	86	88	88	86	84	84	84	82	85	84	86	84	84	82	82	80	80	90
82	82	80	80	80	78	78	78	84	97	97	95	95	95	96	93	93	95	92	92	90	90	88	88	86	86	94
70	72	72	72	70	68	68	68	74	83	85	83	83	81	81	79	79	83	101	104	104	102	102	100	100	98	106
90	92	92	90	90	88	88	86	92	102	103	104	102	102	101	100	100	99	64	68	72	72	68	68	70	70	78
90	94	94	92	92	92	90	92	94	101	104	105	103	103	102	102	100	103	92	92	94	94	90	88	88	86	94
88	88	88	86	84	84	82	82	88	97	97	97	95	93	92	91	89	91	94	96	96	94	94	92	90	88	96
78	78	82	82	82	80	80	80	84	87	87	89	89	89	89	87	87	89	98	98	96	96	96	94	94	90	94
80	84	84	84	82	82	82	80	86	93	96	97	97	95	95	95	94	95	72	70	68	68	66	66	64	64	68
90	88	86	84	84	82	82	82	86	97	95	92	91	91	90	89	89	91	88	88	86	86	84	82	82	80	86
90	90	92	92	92	90	88	88	92	105	105	106	105	105	105	103	102	103	78	78	76	74	74	74	72	74	80
92	90	90	88	88	86	86	84	88	103	102	102	100	100	99	98	97	98	82	84	82	82	80	78	80	78	84
70	72	72	74	74	72	72	70	74	83	85	84	85	85	85	83	83	83	88	88	90	92	92	90	88	86	92
70	74	72	72	70	68	66	66	72	90	94	92	92	90	88	87	86	92	89	92	94	92	90	88	88	86	96
70	70	68	66	68	66	66	70	72	86	88	87	86	86	84	84	86	90	101	103	100	98	96	96	94	94	98
70	70	68	64	64	62	58	58	62	90	92	90	87	86	85	82	81	85	84	88	92	88	86	86	84	84	92
80	78	78	76	74	72	70	78	82	96	96	97	95	93	91	90	94	99	94	96	98	98	94	92	88	88	94
90	90	88	88	86	84	84	84	88	106	109	106	106	104	102	102	102	106	84	88	92	88	86	84	82	80	88
70	66	66	68	64	58	62	60	64	83	80	79	81	77	72	74	73	78	88	96	94	92	90	90	88	86	92

100	100	96	94	94	92	90	90	94	113	116	112	110	110	108	107	106	110	98	100	106	106	104	104	102	100	102
80	84	84	86	88	86	86	84	90	99	101	101	102	102	100	100	99	105	88	88	86	84	84	82	80	80	86