

ISOFLURANE VS ISOFLURANE + DEXMEDETOMIDINE FOR CONTROLLED HYPOTENSIVE ANAESTHESIA IN MIDDLE EAR SURGERIES – A PROSPECTIVE COMPARATIVE STUDY

Dr. Gulshan Rai

junior resident md anesthesia Department of Anaesthesiology
Rama Medical College, Hospital & Research Centre

Dr. Swati Trivedi

Professor
Department of Anaesthesiology
Rama Medical College Hospital & Research Centre

Dr. Rekha Agarwal

Associate professor,
Department of Anaesthesiology
Rama Medical College, Hospital & Research Centre

Dr Anshu garg,

senior resident Department of Anaesthesiology
Rama Medical College, Hospital & Research Centre

Abstract

Middle ear surgeries require a bloodless field for optimal visualization. Controlled hypotensive anaesthesia (CHA) improves surgical precision. Isoflurane is commonly used, while dexmedetomidine offers additional sympatholytic and hypotensive benefits. To compare the efficacy of Isoflurane alone versus Isoflurane + Dexmedetomidine for achieving controlled hypotensive anaesthesia in middle ear surgeries. This prospective randomized study was conducted on 80 patients (ASA I–II) undergoing elective middle ear surgery at Rama Medical College Hospital and Research Centre, Kanpur from 1st March 2024 to 31st October 2024. Patients were allocated into Group I (Isoflurane) and Group ID (Isoflurane + Dexmedetomidine). Hemodynamic parameters, surgical field quality, anesthetic consumption and recovery characteristics were assessed. Group ID demonstrated significantly lower MAP (62 ± 4 mmHg) compared to Group I (70 ± 5 mmHg), improved surgical field quality, reduced isoflurane requirement ($p < 0.05$) and faster recovery. Dexmedetomidine as an adjunct to Isoflurane provides superior hypotensive control and surgical conditions with better hemodynamic stability.

Keywords: *Controlled hypotension, Isoflurane, Dexmedetomidine, Middle ear surgery, Tympanoplasty*

INTRODUCTION

Middle ear surgeries are microsurgical procedures that demand a dry operative field. Even minimal bleeding can obscure visibility and compromise outcomes. Controlled hypotensive anaesthesia aims to reduce intraoperative blood loss while preserving vital organ perfusion.

Isoflurane reduces blood pressure by decreasing systemic vascular resistance but may cause reflex tachycardia. Dexmedetomidine, a selective α_2 -agonist, reduces sympathetic outflow, lowering heart rate and blood pressure while providing sedation and analgesia.

This study evaluates whether the addition of dexmedetomidine to isoflurane offers superior controlled hypotension compared to isoflurane alone.

MATERIALS AND METHODS

Study Design

Prospective randomized comparative clinical study.

Study Setting & Period

Department of Anaesthesiology, Rama Medical College Hospital and Research Centre, Kanpur
(1st March 2024 – 31st October 2024)

Sample Size Calculation

$$n = 2(Z\alpha + Z\beta)^2 \times \sigma^2 / d^2$$

Where:

$Z\alpha = 1.96$ (95% CI)

$Z\beta = 0.84$ (80% power)

$\sigma = 10$

Expected difference (d) = 6 mmHg

Calculated n = 36 per group → Final: 40 per group

Inclusion Criteria

- Age 18–55 years
- ASA I & II
- Elective middle ear surgery

Exclusion Criteria

- Cardiac disease
- Severe systemic illness
- Bradyarrhythmias
- Allergy to study drugs

Group Allocation

Group	Drug Regimen	n
Group I	Isoflurane alone	40
Group ID	Isoflurane + Dexmedetomidine	40

Anaesthesia Technique

Group I:

- Induction: Propofol 2 mg/kg + Butrophenol 0.02 mg/kg
- Maintenance: Isoflurane 0.8–1.2 MAC

Group ID:

- Dexmedetomidine 1 µg/kg loading over 10 mins
- Maintenance 0.4–0.7 µg/kg/hr
- Isoflurane titrated to maintain MAP 60–65 mmHg

Monitoring: ECG, SpO₂, EtCO₂, NIBP, Temperature

Statistical Analysis

Data analyzed using SPSS v26.0
Student t-test, Chi-square test applied
p < 0.05 significant

RESULTS

Table 1: Demographic Profile

Variable	Group I	Group ID	p-value
Age (years)	34.6 ± 8.2	33.8 ± 7.9	>0.05
Weight (kg)	62 ± 6	60 ± 7	>0.05
Duration (min)	110 ± 15	108 ± 12	>0.05

Table 2: Hemodynamic Parameters

Parameter	Group I	Group ID	p-value
MAP (mmHg)	70 ± 5	62 ± 4	<0.001
HR (bpm)	88 ± 6	74 ± 5	<0.01

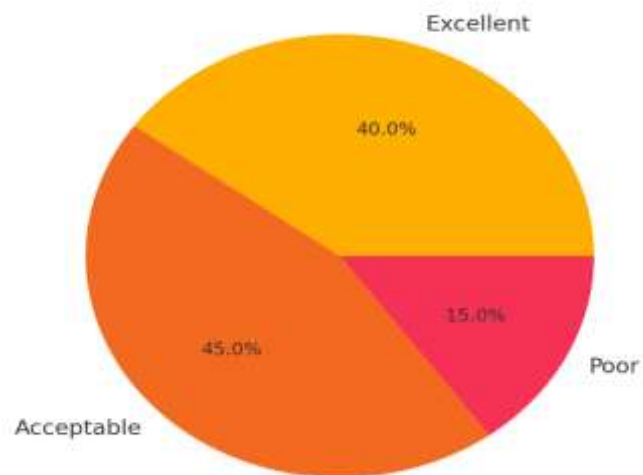
Table 3: Surgical Field Quality

Grade	Group I (%)	Group ID (%)
Excellent	40	72
Acceptable	45	25
Poor	15	3

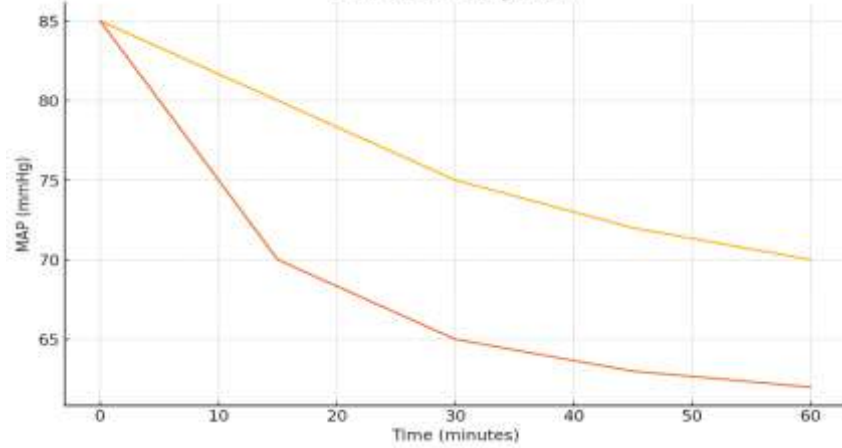
Table 4: Isoflurane Requirement

Group	Mean MAC
Group I	1.15
Group ID	0.75

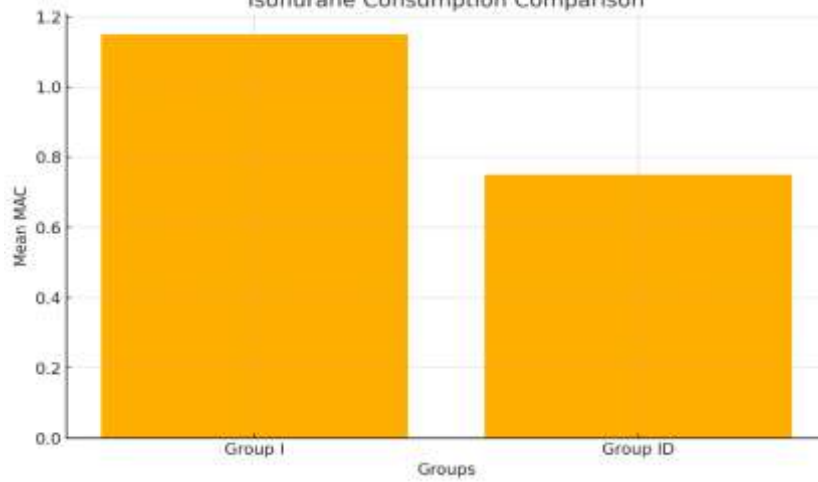
Surgical Field Quality - Group I



MAP Trend Comparison



Isoflurane Consumption Comparison



DISCUSSION

The present study demonstrates that dexmedetomidine enhances the effectiveness of isoflurane in producing controlled hypotension. The reduction in MAP and HR was more stable in Group ID, improving surgical visibility. Similar observations were reported by Bajwa et al. and Degoute et al.

Reduced volatile requirement also correlates with smoother emergence and lower postoperative agitation. Dexmedetomidine's sympatholysis plays a critical role in maintaining hemodynamic equilibrium.

CLINICAL SIGNIFICANCE

- Better surgical field visibility
- Reduced volatile anesthetic dose
- Lower bleeding risk
- Stable cardiovascular parameters
- Faster recovery profile

LIMITATIONS

- Single-center study
- Limited sample size
- Subjective grading of surgical field
- No measurement of actual blood loss volume

CONCLUSION

Dexmedetomidine combined with Isoflurane offers superior controlled hypotension compared to Isoflurane alone in middle ear surgeries with improved operative conditions and stable hemodynamics. Its routine use is recommended in ENT surgeries requiring hypotensive anaesthesia.

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