` Dissertation on

COMPARATIVE EVALUATION OF ORAL ATENOLOL Vs ORAL CLONIDINE AS PREMEDICANTS FOR HYPOTENSIVE ANESTHESIA FOR PATIENTS UNDERGOING FUNCTIONAL ENDOSCOPIC SINUS SURGERY UNDER GENERAL ANESTHESIA

Dissertation Submitted in partial fulfillment of

M.D. DEGREE EXAMINATION

BRANCH X – ANAESTHESIOLOGY

MADRAS MEDICAL COLLEGE, CHENNAI.

The Tamilnadu Dr. MGR Medical University,
Chennai
Tamilnadu

March 2007

Declaration

I hereby declare that this dissertation entitled "Comparative evaluation of oral atenolol vs. oral clonidine as premedicants for hypotensive anaesthesia for patients undergoing functional endoscopic sinus surgery under general anaesthesia", has been prepared by me under the guidance of **Prof.Dr.G.Sivarajan, M.D., D.A** Professor and Head of Department of Anaesthesiology, Madras Medical College, Chennai in partial fulfillment of the regulations for the award of the degree of M.D. (Anaesthesiology), examination to be held in March 2007..

This study was conducted at Madras Medical College and Government General Hospital, Chennai.

I have not submitted this dissertation previously to any university for the award of any degree or diploma.

Date:
Place: Chennai. Dr. M.Amarnath

Certificate

This to certify that this dissertation entitled "Comparative study of oral atenolol vs. oral clonidine as premedicants for hypotensive anaesthesia for patients undergoing functional endoscopic sinus surgery under general anaesthesia", has been prepared by ***Dr.M.Amarnath,*** *post graduate student in M.D.Anaesthesiology done under my direct guidance and supervision at Madras Medical College, Chennai in partial fulfillment of the regulations for the award of the degree of M.D. (Anaesthesiology), examination to be held in March 2007.*

He has shown keen interest in preparing this dissertation and I have a great pleasure in forwarding this dissertation to the University.

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Certificate

This to certify that this dissertation entitled "Comparative study of oral atenolol vs. oral clonidine for hypotensive anaesthesia for patients undergoing functional endoscopic sinus surgery under general anaesthesia", has been prepared by ***Dr.M.Amarnath****, post graduate student in M.D.Anaesthesiology, Madras Medical College, Chennai, done under the guidance and supervision of* ***Prof. Dr.G.Sivarajan, M.D., D.A.****, Dept. of Anesthesiology at Madras Medical College and Government General Hospital, Chennai in partial fulfillment of the regulations for the award of the degree of M.D.(Anaesthesiology), examination to be held in March 2007.*

Date:
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Dean,
Madras Medical College,
Chennai.

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CONTENTS

CHAPTER I

Introduction

Anaesthesia for Functional endoscopic sinus surgery is a challenging job. The surgeons' operating field itself is very small and surrounded with mucus membranes. It is imperative for the surgeons to look at a clear surgical field in order to identify the diseased tissue properly. A small amount of blood within the field is enough to occlude the view through the endoscope making things difficult for the surgeon, and incomplete removal of the diseased tissue will cause the disease to reoccur. Anaesthesiologists have devised various techniques to prevent this bleeding, of which induced hypotension has stood the test of time. This surgery per se is not a major one by its standards and surgeons recently have been trying to accomplish FESS as a daycare surgery. A good premedication with an antihypertensive agent can help to minimize the amount of volatile agents and vasodilators used to induce hypotension, thereby ensuring much hemodynamic stability and speedy recovery from anaesthesia. Thus I have chosen to study and compare the effects of clonidine and atenolol as oral premedicants for the same.

This study proposes to analyze the anaesthetic challenge of keeping the operating field free of blood through pharmacological therapy. It compares how premedicating with either atenolol or clonidine affects the conduct of the fixed anaesthesia protocol evolved in our institute on patients undergoing FESS

procedure under GA, and requiring a hypotensive technique to improve operating conditions.

CHAPTER II

Hypotensive anesthesia

Hypotensive anesthesia is a technique, used intraoperatively to help minimize surgical blood loss, thereby decreasing the need for blood transfusion and also to provide a clear surgical field. The technique entails the controlled lowering of blood pressure and is defined as a reduction of the systolic blood pressure to between 80-90 mmHg. An alternative definition is a decrease in mean arterial pressure (MAP) to 50-70 mmHg in a normotensive patient.

Inducing hypotension

Deliberate hypotension is induced by a variety of pharmacological agents and nonpharmacological methods. Since there is no single agent capable of safely and effectively lowering arterial pressure in all situations, the anesthetist may need to employ a variety of agents or techniques in order to achieve the target pressure.

Pharmacological agents can generally be divided into two categories: peripheral vasodilators and inhalation agents.

The three most commonly used vasodilators are: sodium nitroprusside (SNP), nitroglycerin (NTG), and trimethaphan.

SNP acts as a vascular smooth muscle relaxant and has a rapid onset but brief duration of action. Its primary influence is on arteriolar and venous vessels, but without significant myocardial effects.

NTG reduces blood pressure by relaxing venous smooth muscle and, like SNP, has rapid onset of action but short duration. NTG is less toxic than SNP; however, it is less potent than SNP in its capacity to reduce blood pressure.

Trimethaphan produces hypotension through ganglionic blockade and direct vasodilator properties. It is also short acting and provides tight control of blood pressure.

Commonly used inhalation agents, or volatile anesthetic agents, include halothane and isoflurane. The concentration of a volatile anesthetic agent produces a dose-dependent decrease in mean arterial pressure.

$Alpha_2$ agonists and beta blockers are also used for this purpose.

Spinal and epidural anesthesia can also be used to produce controlled hypotension. Unfortunately, these techniques require large infusions of fluids and the deliberate hypotension can be erratic and difficult to control.

Indications to Hypotensive Anaesthesia

- Excision of intracranial tumors
- Aneurysm excisions (Cerebral, Carotid, Aortic)
- FESS procedure
- Middle ear surgeries
- Spine / hip surgeries

Contraindications to Hypotensive Anaesthesia

- Congenital heart disease
- Severe anemia
- Coronary artery disease
- Congestive heart failure
- Poorly controlled hypertension
- Increased intracranial pressure
- Significant cerebro-vascular disease
- Low flow states to the liver or kidney

CHAPTER III

Functional Endoscopic Sinus Surgery

Rhinology and sinus surgery have undergone a tremendous expansion since the discourses of Messerklinger and Wigand in the late 1970s. Imaging advances, increased understanding of the anatomy and the pathophysiology of chronic sinusitis, and image-guided surgery have allowed surgeons to perform more complex procedures with increased safety.

Functional endoscopic sinus surgery is the primary approach used today for the surgical treatment of chronic sinusitis.

Indications

Endoscopic sinus surgery is most commonly performed for inflammatory and infectious sinus disease. The most common indications for endoscopic sinus surgery are as follows:

- Chronic sinusitis refractory to medical treatment
- Recurrent sinusitis
- Nasal polyposis
- Antrochoanal polyps
- Sinus mucoceles
- Excision of selected tumors
- Cerebrospinal fluid (CSF) leak closure

- Orbital decompression (e.g., Graves ophthalmopathy)
- Optic nerve decompression
- Dacryocystorhinostomy (DCR)
- Choanal atresia repair
- Foreign body removal
- Epistaxis control

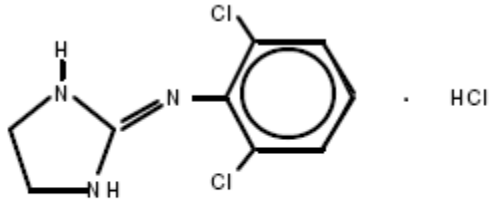
FESS is a delicate and time consuming procedure; it is performed routinely under general anaesthesia. Anaesthesiologists have to plan the technique in such a way that will facilitate the operating team for achieving a bloodless field for better visualization of the intranasal structures and minimise intraoperative bleeding, because even minimal bleeding can obstruct the view of the operating endoscope. **Hence comes the role of hypotensive anaesthesia.** Many pharmacological agents, including isoflurane as a combination, are in use for inducing intraoperative hypotension. It is easy to administer and control its concentration, does not require infusion pump and can be quickly washed out from body by hyperventilation. As isoflurane induces hypotension slower than the other pharmacological agents like sodium nitroprusside, continuous intra-arterial blood pressure monitoring is not mandatory. It causes least arrhythmia in presence of exogenous adrenaline which is routinely infiltrated into the operative field for creating a bloodless field.

CHAPTER IV
PHARMACOLOGY OF THE STUDY DRUGS

Clonidine:

Clonidine hydrochloride USP is a centrally acting antihypertensive agent available as tablets for oral administration in three dosage strengths: 0.1 mg, 0.2 mg and 0.3 mg. The 0.1 mg tablet is equivalent to 0.087 mg of the free base.

Clonidine hydrochloride is an imidazoline derivative and exists as a mesomeric compound. The chemical name is 2-(2,6-dichlorophenylamino)-2-imidazoline hydrochloride. It has the following molecular formula: C9H9CI2N3 • HCl, with molecular weight of 266.56. its structural formula is:



$C_9H_9Cl_2N_3 \cdot HCl$
M. W. 266.56

Pharmacokinetics and Metabolism

Clonidine hydrochloride is an odorless, bitter, white, crystalline substance soluble in water and alcohol. Clonidine hydrochloride acts relatively rapidly. Following oral administration about 40-60% of the absorbed dose is recovered in the urine as unchanged drug in 24 hours. The patient's blood pressure

declines within 30 to 60 minutes after an oral dose, the maximum decrease occurring within 2 to 4 hours. The plasma level of clonidine hydrochloride peaks in approximately 3 to 5 hours and the plasma half-life ranges from 12 to 16 hours. About 50% of the absorbed dose is metabolized in the liver.

Pharmacodynamics

Clonidine stimulates alpha-adrenoreceptors in the brain stem, resulting in reduced sympathetic outflow from the central nervous system and a decrease in peripheral resistance: at a 45° tilt there is a smaller reduction in cardiac output and a decrease of peripheral resistance. During long-term therapy, cardiac output tends to return to control values, while peripheral resistance remains decreased. Slowing of the pulse rate has been observed in most patients given clonidine, but the drug does not alter normal hemodynamic response to exercise.

It also causes a reduction in plasma renin activity and in the excretion of aldosterone and catecholamines. Tolerance may develop in some patients.

Dosage and administration

Adults: The dose of clonidine hydrochloride must be adjusted according to the patient's individual blood pressure response.

Initial Dose: 0.1 mg tablet twice daily (morning and bedtime). Elderly patients may benefit from a lower initial dose.

Maintenance Dose: Further increments of 0.1 mg per day may be made if necessary until the desired response is achieved. The therapeutic doses most

commonly employed have ranged from 0.2 mg to 0.6 mg per day given in divided doses.

Renal Impairment: Dosage must be adjusted according to the degree of impairment, and patients should be carefully monitored. Half life in such patients may extend up to 41 hours.

Side effects

Most adverse effects are mild and tend to diminish with continued therapy. The most frequent (which appear to be dose-related) are dry mouth, drowsiness, dizziness, constipation and sedation.

Drug interactions

If a patient receiving clonidine hydrochloride is also taking tricyclic antidepressants, the effect of clonidine may be reduced. Clonidine hydrochloride may enhance the CNS-depressive effects of alcohol, barbiturates or other sedatives.

Withdrawal: Sudden cessation of clonidine treatment, regardless of the route of administration, hours in some cases, resulted in symptoms such as nervousness, agitation, headache, and tremor, accompanied or followed by a rapid rise in blood pressure. Rebound hypertension following abrupt withdrawal has been extensively reported.

Precautions

Clonidine hydrochloride should be used with caution in patients with severe coronary insufficiency, recent myocardial infarction, cerebrovascular disease or chronic renal failure.

Perioperative Use

Administration of clonidine hydrochloride should be continued to within four hours of surgery and resumed as soon as possible thereafter. The blood pressure should be carefully monitored and appropriate measures instituted to control it as necessary.

Overdose

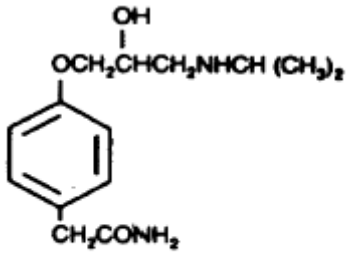
The signs and symptoms of clonidine hydrochloride over dosage include hypotension, bradycardia, lethargy, irritability, weakness, somnolence, diminished or absent reflexes, miosis, vomiting and hypoventilation.

Contraindications

None known.

Atenolol

Atenolol, a synthetic, beta1-selective (cardioselective) adrenoreceptor blocking agent, may be chemically described as benzeneacetamide, 4 -[2'-hydroxy-3'-[(1- methylethyl) amino] propoxy]-. The molecular and structural formulas are:



$C_{14}H_{22}N_2O_3$

Atenolol is available as 25, 50 and 100 mg tablets for oral administration.

Atenolol is a beta1-selective (cardioselective) beta-adrenergic receptor blocking agent without membrane stabilizing or intrinsic sympathomimetic (partial agonist) activities. This preferential effect is not absolute, however, and at higher doses, atenolol inhibits beta 2 - adrenoreceptors, chiefly located in the bronchial and vascular musculature.

Pharmacokinetics and Metabolism

In man, approximately 50% of an oral dose is absorbed from the gastrointestinal tract, the remainder being excreted unchanged in the feces. Peak

blood levels are reached between two (2) and four (4) hours after ingestion. Atenolol undergoes little or no metabolism by the liver, and the absorbed portion is eliminated primarily by renal excretion. Over 85% of an intravenous dose is excreted in urine within 24 hours compared with approximately 50% for an oral dose.

The elimination half-life of oral atenolol is approximately 6 to 7 hours, and there is no alteration of the kinetic profile of the drug by chronic administration. Following intravenous administration, peak plasma levels are reached within 5 minutes. Declines from peak levels are rapid (5- to 10-fold) during the first 7 hours; thereafter, plasma levels decay with a half-life similar to that of orally administered drug.

Pharmacodynamics

The beta-adrenoreceptor blocking activity of atenolol has been demonstrated by: (1) reduction in resting and exercise heart rate and cardiac output, (2) reduction of systolic and diastolic blood pressure at rest and on exercise, (3) inhibition of isoproterenol induced tachycardia, and (4) reduction in reflex orthostatic tachycardia.

This effect is maximal at about 2 to 4 hours, and persists for at least 24 hours. Maximum reduction in exercise tachycardia occurs within 5 minutes of an intravenous dose. By blocking the positive chronotropic and inotropic effects of catecholamines and by decreasing blood pressure, atenolol generally reduces the

oxygen requirements of the heart at any given level of effort. Atenolol can increase oxygen requirements by increasing left ventricular fiber length and end diastolic pressure, particularly in patients with heart failure.

Indications and Usage

Hypertension

Angina Pectoris Due to Coronary Atherosclerosis

Acute Myocardial Infarction

Dosage and Administration

Hypertension

The initial dose of atenolol is 50 mg given as one tablet a day either alone or added to diuretic therapy. If an optimal response is not achieved, the dosage should be increased to atenolol 100 mg given as one tablet a day.

Extra care to be exercised when prescribing beta blockers in patients with CCF, DM, Hypoglycemia and COPD.

Anesthesia and Major Surgery

It is not advisable to withdraw beta-adrenoreceptor blocking drugs prior to surgery in the majority of patients. However, care should be taken when using anesthetic agents such as those which may depress the myocardium. Vagal dominance, if it occurs, may be corrected with atropine (1-2 mg IV).

Atenolol, like other beta blockers, is a competitive inhibitor of beta-receptor agonists and its effects on the heart can be reversed by administration of such agents: e.g., dobutamine or isoproterenol with caution.

Overdose

The predominant symptoms reported following Atenolol overdose are lethargy, disorder of respiratory drive, wheezing, sinus pause, bradycardia, congestive heart failure, hypotension, bronchospasm and/or hypoglycemia.

Treatment of overdose should be directed to the removal of any unabsorbed drug by induced emesis, gastric lavage, or administration of activated charcoal. Atenolol can be removed from the general circulation by hemodialysis. Other treatment modalities should be employed at the physician's discretion and may include:

BRADYCARDIA: Atropine intravenously. If there is no response to vagal blockade, give isoproterenol cautiously. In refractory cases, a transvenous cardiac pacemaker may be indicated.

HEART BLOCK (SECOND OR THIRD DEGREE): Isoproterenol or transvenous cardiac pacemaker.

CARDIAC FAILURE: Digitalize the patient and administer a diuretic. Glucagon has been reported to be useful.

HYPOTENSION: Vasopressors such as dopamine or norepinephrine (levarterenol). Monitor blood pressure continuously.

BRONCHOSPASM: A beta2 stimulant such as isoproterenol or terbutaline and/or aminophylline.

HYPOGLYCEMIA: Intravenous glucose.

Based on the severity of symptoms, management may require intensive support care and facilities for applying cardiac and respiratory support.

CONTRAINDICATIONS

Atenolol is contraindicated in sinus bradycardia, heart block greater than first degree, cardiogenic shock, and overt cardiac failure.

Atenolol is contraindicated in those patients with a history of hypersensitivity to the atenolol or any of the drug product’s components.

CHAPTER V

REVIEW OF LITERATURE

This study was constructed to evaluate if clonidine and atenolol premedication offers any advantage for the conduct of hypotensive anaesthesia technique for patients undergoing FESS procedure under GA. The Null hypothesis postulated for testing was such premedication would offer superior hemodynamic stability and decrease the need of vasoactive drugs to decrease the BP to the desired level. Literature was reviewed to analyze the existence of similar studies.

Maroof et al[7], in their study on 'Clonidine premedication for induced hypotension with TIVA for middle ear microsurgery' recruited 30 ASA I or II adult patients and surgery done using TIVA with Propofol and fentanyl. Group I received meperidine and promethazine, group II received clonidine 4mcg/kg with meperidine and promethazine. They found that addition of clonidine premedication with TIVA can provide stable hypotensive anaesthesia with minimum labetalol requirements.

Mikawa et al[8], in their study 'Attenuation of catecholamine response to tracheal intubation with oral clonidine' recruited 105 ASA I children in a randomized double blind study and have shown that tracheal intubation caused an increase in plasma catecholamine concentrations, blood pressure and heart rate in children receiving diazepam, and that clonidine 4mcg/kg PO blunted these changes.

Attenuation of the pressor and tachycardic responses to tracheal intubation with an oral high dose of clonidine could be due at least in part due to suppression of catecholamine release.

Buggy et al[4], in their study on ‘ Clonidine at induction reduces shivering after general anaesthesia’ used 60 ASA I or II patients scheduled for orthopedic limb surgeries into two groups, one receiving clonidine 150 mcg i.v. and the other group saline i.v. They found that clonidine at the induction of anaesthesia reduces shivering.

Bellaiche et al[6], in their study on ‘Clonidine does not delay recovery from anaesthesia’ studied 46 ASA I or II undergoing thyroid surgery. Patients were randomly allocated into three groups and 2 hours before surgery received flunitrazepam 1 mg orally (group I), clonidine 150 mcg (group II), both (group III). Anaesthetic procedure was same for three groups. There was no difference between the three groups in regard to recovery characteristics.

Nicolaou et al[14], in their study on ‘Clonidine decreases vasoconstriction and shivering threshold without affecting the sweating threshold’ took 6 subjects who were studied for 4 days after taking oral clonidine of either 0, 3, 6 or 9 mcg/kg. The study was designed in a double blind fashion. They found out that the decreases in core temperature thresholds for cold responses and increased inter

threshold range are consistent with the effects of several anaesthetic agents and is indicative of central thermoregulatory inhibition by clonidine.

Carabine et al[9], in their study 'Pre anaesthetic medication with clonidine – a dose response study' on 80 normotensive female patients in which orally administered clonidine 0.1mg, 0.2mg, 0.3mg were compared with standard benzodiazepine premedicants. The study was conducted in a randomized double blind fashion. They found out that clonidine 0.2 mg produced significant reduction in anxiety and a better quality of induction of anaesthesia. The decreases in arterial pressure and heart rate with clonidine 0.3 mg was significant. In view of the potential for undesirable hemodynamic instability persisting into the post-op period, they did not recommend the use of clonidine 0.3 mg as a routine premedicant.

Murakami et al[10], in their study 'Oral clonidine reduces the requirement of prostaglandin E_1 for induced hypotension' studied the effects of 75 mcg or 150 mcg clonidine in a randomized double blind study. The study showed that preanaesthetic oral clonidine decreased the dose of PGE_1 to produce hypotension and decrease the blood loss during operation.

Goyagi et al[12], in their study 'Oral clonidine premedication reduces induction dose and prolongs awakening time from Propofol – Nitrous oxide anaesthesia' used 39 female ASA I or II, who were randomly allocated to receive 5mcg/kg

clonidine or placebo 90 minutes before induction of anaesthesia. The induction dose of propofol in the clonidine group was less than that of the control group, while the awakening time of the clonidine group was longer than that of the control group.

Doak et al[13], in their study 'Oral clonidine premedication attenuates the hemodynamic effects associated with ketamine induction' used 40 patients who were randomly allocated into clonidine (5mcg/kg), diazepam or placebo groups in a double blind fashion and anaesthesia induced with ketamine. They found out that increases in heart rate and blood pressure were less in patients given clonidine preoperatively than in those who received either diazepam or placebo.

Zaugg et al[1], in their study 'Beneficial effects from beta adrenergic blockade in elderly patients undergoing noncardiac surgery' used 63 patients who were randomly assigned to one of the three groups. Group I (no atenolol), Group II (Pre and post-op atenolol) & group III (intra-operative atenolol). They showed that perioperative beta blockade did not significantly alter the hormonal stress response. However the beta blocked patients showed improved hemodynamic stability during emergence and post-operatively. It also confers other advantages including decreased analgesic requirements and faster recovery from anaesthesia.

CHAPTER VI

AIM

To evaluate the effect of oral atenolol vs. oral clonidine premedication for induced hypotension during general anesthesia for patients undergoing functional endoscopic sinus surgery based on

1. Intra-operative hemodynamic stability.
2. Requirement of additional vasodilators.
3. Peri-operative side effects and complications.
4. Post-operative hemodynamic stability.

CHAPTER VII
MATERIALS AND METHODS

After getting clearance from the ethics committee, the study was formulated as follows.

Study Design

Randomized experimental double blind study

Case Definition

Inclusion Criteria:

1. Patients belonging to ASA I & II.
2. Patients between ages 16 to 60.
3. Patients undergoing FESS procedure.

Exclusion Criteria:

1. Hypertensive patients.
2. H/o Cerebro-vascular accident / Transient ischaemic attack.
3. Moderate and severe IHD, EF < 40%
4. Poor respiratory reserve.
5. Significant hepatic or renal disease.
6. Contraindication for the use of study drug like bronchospasm, COPD, conduction defects and hypersensitivity.

7. Patients who are not willing to participate in the study.

Sampling Frame

Patients undergoing Functional endoscopic sinus surgery at the Upgraded Institute of Otorhinolaryngology, Madras Medical College and Hospital, Chennai, India.

Probability Sampling

Randomization using the lottery method. Sixty lots (twenty in each group) were placed to randomize the people who were willing to take part in the study. All the patients stand an equal chance of getting into any group with this method. All the patients were aware of the study and informed consent obtained.

Sample Size

Sixty patients, twenty in each of clonidine, atenolol and placebo groups.

Data collection

A structured assessment schedule was constructed using experts opinion for measuring the haemodynamic stability and to monitor the use of intraoperative drugs.

Patient data, vital signs, baseline investigations like haemogram, Hb%, Urea, Creatinine, 12 lead EKG and chest X-ray were collected preoperatively.

Hemodynamic and ventilation parameters like Heart rate, NIBP, Oxygen saturation, Lead II EKG were monitored using L&T Planet^{TM} monitor. FiO_2, and

ventilatory parameters were monitored using the inbuilt ventilator in the Drager Fabius^{TM} anaesthesia machine. $ETCO_2$ monitored using Criticare^{TM} monitor intraoperatively.

Continuous lead II EKG monitoring, SpO2, NIBP and heart rate monitoring using L&T Planet^{TM} continued for a minimum of six hours postoperatively in the post anaesthesia care unit.

Anaesthesia protocol

Two 16G IV lines started for the patient on table, standard monitoring (ECG, NIBP, SpO_2, Temp, $ETCO_2$) were carried out intra-operatively. All the patients are preloaded with 500 ml normal saline before induction.

Nasal packing done with 4% lignocaine with 1:200000 epinephrine. Patient preoxygenated for 5 minutes, Anesthesia carried out with Glycopyrrolate 0.2 mg + Pethidine 1.0 mg/kg + Xylocard 1.0 mg/kg + Propofol 2.5 mg/kg + Vecuronium 0.1 mg/kg. Endotracheal intubation done orally with appropriate size ET tube. Throat packing done within 1 – 3 minutes post-intubation.

Anesthesia maintained with 66% nitrous, 33% oxygen, 0.75% isoflurane, with IPPV and vecuronium.

Plan:

The plan is to maintain the MAP at 70 mm Hg. If MAP is more than the set value the following plan of action was taken.

Step 1: Increase isoflurane up to 1%. If no response in 10 minutes go to step 2.

Step 2: To start a titrated NTG infusion. (Each increase in NTG dose done with an interval of 5 minutes to allow equilibration of serum therapeutic levels.)

Intra-operative hypotension is managed by

1. IV fluids LR/NS 200 ml
2. Taper down NTG/volatiles
3. Ephedrine 3mg i.v. boluses

Intra-op Tachycardia (HR > 150 bpm) controlled using i.v. Metoprolol 1-5 mg maximum.

Intra-op Bradycardia (HR < 55 bpm) managed by Glycopyrrolate 0.2 mg IM, if not corrected Atropine 0.3 mg IM after 5 min followed by repeated similar doses of atropine till desired response is achieved.

Intra-op Arrhythmias:

If haemodynamically stable, continue with the study but with close and increased monitoring.

If unstable, abandon hypotension, volume resuscitate and manage accordingly.

At the end of procedure standard reversal (Neostigmine 50mcg/kg + Glycopyrrolate 8mcg/kg) and extubation carried out.

Data Management and Analysis

The variables were entered into SPSS, version 11, statistical software for analysis. The descriptive statistics of the variables studied are represented as two-way tables. The categorical factors are represented by the number and frequency (%) of cases. The continuous variables are represented by measures of central frequency (like mean, median & mode) and deviation (say, standard deviation and range). The differences in the proportions of are tested for statistical significance using non-parametric Chi-square test for variables measured on nominal scale. For variables measured on a continuous scale, one-way analysis of variance (ANOVA) is employed to elicit the statistical significance of three variables taken together. When testing for two groups, Student “t” test is used to test for statistical significance in the differences of the two means. Line graphs were used to illustrate the hemodynamic monitoring at different time points. Box plot graphs were employed to depict the distribution of other factors in the three groups.

CHAPTER VIII

METHOD DESIGN

Study Population
(Patients at ENT ward, MMC, GH, who are enrolled in the study)

↓

Informed Consent

↓

Pre-operative evaluation

↓

Randomization
[Placebo(20) Clonidine(20) Atenolol(20)]

↓

FESS Procedure

↓

Monitoring and Evaluation

Patient Assessment

Data Collection

↓

Data entry and management

↓

Data Analysis

↓

Study outcome

Intervention

A non labeled multi vitamin tablet was given PO to the patients in the placebo group at 7.00 pm the day before surgery and also 2 hours before surgery.

A non labeled clonidine tablet was given PO to the patients in the clonidine group in the dose of 2mcg/kg at 7.00 pm the day before surgery and 4mcg/kg 2 hours before surgery.

A non labeled atenolol 25 mg tablet was given PO to the patients in atenolol group at 7.00 pm the day before surgery and also 2 hours before surgery.

Blinding

The study was a double blind study where in the investigator (Anaesthetist) and the study patients were not aware of the interventions done.

Duration of the study

The study was completed in a duration of four months.

Measurement of study variables

The study instrument measured the following parameters

1. Heart rate
2. Systolic blood pressure
3. Diastolic blood pressure
4. Mean arterial pressure
5. Requirement of Isoflurane and Nitroglycerin
6. Preoperative and postoperative sedation scores
7. Postoperative shivering
8. Intraoperative problems (Hypotension, Hypertension, Arrhythmias, Tachycardia, Bradycardia, Ischaemia)
9. Duration of surgery
10. Operating field
11. Post operative analgesic request time
12. Post anaesthesia discharge criteria

Intra-op drug scores:

ISOFLURANE	VOL%	SCORE
	0 – 0.75%	0
	0.75%	1

	1.0%	2

NITROGLYCERIN	DOSE	SCORE
	0.3mcg $kg^{-1}min^{-1}$	1
	0.6mcg $kg^{-1}min^{-1}$	2
	1.0mcg $kg^{-1}min^{-1}$	3
	1.5mcg $kg^{-1}min^{-1}$	4
	2.0mcg $kg^{-1}min^{-1}$	5
	2.5mcg $kg^{-1}min^{-1}$	6
	3.0mcg $kg^{-1}min^{-1}$	7
	4.0 mcg $kg^{-1}min^{-1}$	8
	5.0 mcg $kg^{-1}min^{-1}$	9

METOPROLOL	DOSE	SCORE
	< 2mg	1
	2-4 mg	2
	>4mg	3

Sedation score:

(Based on Ramsay sedation scale)

Anxious, Agitated, Restless.	1

Co-operative, Oriented, Tranquil. 2

Asleep, Brisk response to light glabellar tap / loud auditory stimulus. 3

Asleep, sluggish response to brisk glabellar tap / loud auditory stimulus. 4

No response to above. 5

No response to pain. 6

POST ANAESTHESIA DISCHARGE SCORING SYSTEM			
Score	0	1	2
Vital signs	>40% of preoperative baseline	20 – 40% of preoperative baseline	Within 20% of preoperative baseline
Activity	Unable to ambulate	Dyspnoeic, requires assistance	Steady gait, no dizziness or pre-op level
Nausea & Vomiting	Continues after repeated treatment	Moderate, treated with IM medications	Minimal, treated with PO medications
Pain (Acceptable to the patient; controlled with PO meds)	-	No	Yes
Surgical bleeding	Minimal, no dressing change required	Moderate, up to two dressing changes	Severe, more than three dressing changes

A score of 9 or more is required to meet the fitness for discharge.

CHAPTER IX
OBSERVATION AND RESULTS

DEMOGRAPHIC DATA

TABLE I

Age distribution[$]

Age	PLACEBO (P)	CLONIDINE (C)	ATENOLOL (A)	p-value
No. of cases	20	20	20	
Mean	27.0	25.9	23.5	
S.D.	7.36	7.66	4.71	0.25
Median	25	24	22	
Mode	22	19	10	
Range	19-48	16-43	17-35	
Stat. Significance		p-value		
C vs. P		0.66		
A vs. P		0.08		
C vs. A		0.23		

[$] *Not statistically significant*

The mean age between the comparison groups are almost similar. The minimum age taken for the study is 16 and the maximum is 48.

TABLE II

Sex distribution[$]

	PLACEBO (P)		CLONIDINE (C)		ATENOLOL (A)		p-value
	No.	%	No.	%	No.	%	
MALE	14	70.0	13	65.0	11	55.0	0.61
FEMALE	6	30.0	7	35.0	9	45.0	
Stat. Significance			p-value				
C vs. P			0.52				
A vs. P			0.33				
C vs. A			0.74				

[$] *Not statistically significant*

A male preponderance is forthcoming in all the study groups. However, the distribution of sex among the groups is not statistically significant.

TABLE III

Weight distribution

Weight	PLACEBO (P)	CLONIDINE (C)	ATENOLOL (A)	p-value
No. of cases	20	20	20	
Mean	53.9	55.4	51.3	
S.D.	9.47	8.65	9.44	0.36
Median	50	50	50	
Mode	50	50	40	
Range	40-80	45-75	40-70	
Stat. Significance	p-value			
C vs. P	0.59			
A vs. P	0.39			
C vs. A	0.16			

The mean distribution of cases by weight was observed to be not statistically significant between Group 1 and Group 2 as well as between the groups and control.

TABLE IV

Intra operative Hemodynamic parameters			
Parameter	Placebo Group	Clonidine group	p Value
Heart Rate			
Before Induction	99.1 ± 17	78.1 ± 20	0.001*
After Induction	99.3 ± 17.1	75.4 ± 12.7	0.000*
After Intubation	104.9 ± 9.1	78.2 ± 2.34	0.001*
Average Intra-op	84.7 ± 4	72.5 ± 2.05	0.000*
Immediate Post-op	103.3 ± 6.1	77.1 ± 2.6	0.003*
Systolic Blood Pressure			
Before Induction	131.6 ± 16.8	106.4 ± 14.3	0.000*
After Induction	112.1 ± 17	96.9 ± 13.9	0.004*
After Intubation	117.6 ± 19.7	95.8 ± 5.7	0.078
Average Intra-op	91.5 ± 3.59	90 ± 4.69	0.482
Immediate Post-op	125.7 ± 8.47	108.8 ± 2.81	0.030*
Diastolic Blood Pressure			
Before Induction	89.9 ± 11.9	72.4 ± 11.5	0.000*
After Induction	76.6 ± 12.3	62.7 ± 13.2	0.001*
After Intubation	80.2 ± 13.3	64 ± 4	0.059
Average Intra-op	61.5 ± 2.7	60 ± 2.67	0.293
Immediate Post-op	86.5 ± 5.61	75.7 ± 3.3	0.046*
Mean Arterial Pressure			
Before Induction	102.4 ± 15	83.6 ± 11.2	0.000*
After Induction	84.9 ± 22.7	74.5 ± 13.2	0.085
After Intubation	92.5 ± 15.4	74.4 ± 4.6	0.066
Average Intra-op	71.4 ± 2.93	70 ± 3.37	0.382
Immediate Post-op	99.2 ± 6.8	86.7 ± 3.1	0.044*

TABLE V

Intra operative Hemodynamic parameters			
Parameter	Placebo Group	Atenolol Group	p Value
Heart Rate			
Before Induction	99.1 ± 17	67.2 ± 8.23	0.000*
After Induction	99.3 ± 17.1	67 ± 9.95	0.000*
After Intubation	104.9 ± 9.1	72.2 ± 2.47	0.000*
Average Intra-op	84.7 ± 4	66.6 ± 1.47	0.000*
Immediate Post-op	103.3 ± 6.1	68.7 ± 5.13	0.002*
Systolic Blood Pressure			
Before Induction	131.6 ± 16.8	111.7 ± 9.09	0.000*
After Induction	112.1 ± 17	95.1 ± 7.22	0.000*
After Intubation	117.6 ± 19.7	105.1 ± 10.48	0.30
Average Intra-op	91.5 ± 3.59	89.1 ± 1.28	0.09
Immediate Post-op	125.7 ± 8.47	117.5 ± 6.69	0.259
Diastolic Blood Pressure			
Before Induction	89.9 ± 11.9	79.1 ± 7.58	0.001*
After Induction	76.6 ± 12.3	64.3 ± 7.52	0.001*
After Intubation	80.2 ± 13.3	73 ± 7.62	0.384
Average Intra-op	61.5 ± 2.7	59.9 ± 1.91	0.191
Immediate Post-op	86.5 ± 5.61	81.7 ± 7.17	0.406
Mean Arterial Pressure			
Before Induction	102.4 ± 15	89.8 ± 7.96	0.002*
After Induction	84.9 ± 22.7	74.4 ± 6.91	0.054
After Intubation	92.5 ± 15.4	83.5 ± 8.26	0.343
Average Intra-op	71.4 ± 2.93	68.9 ± 1.49	0.046
Immediate Post-op	99.2 ± 6.8	93.6 ± 6.64	0.364

TABLE VI

Intra operative Hemodynamic parameters			
Parameter	Clonidine group	Atenolol Group	p Value
Heart Rate			
Before Induction	78.1 ± 20	67.2 ± 8.23	0.035*
After Induction	75.4 ± 12.7	67 ± 9.95	0.026*
After Intubation	78.2 ± 2.34	72.2 ± 2.47	0.012*
Average Intra-op	72.5 ± 2.05	66.6 ± 1.47	0.000*
Immediate Post-op	77.1 ± 2.6	68.7 ± 5.13	0.065
Systolic Blood Pressure			
Before Induction	106.4 ± 14.3	111.7 ± 9.09	0.172
After Induction	96.9 ± 13.9	95.1 ± 7.22	0.611
After Intubation	95.8 ± 5.7	105.1 ± 10.48	0.172
Average Intra-op	90 ± 4.69	89.1 ± 1.28	0.608
Immediate Post-op	108.8 ± 2.81	117.5 ± 6.69	0.106
Diastolic Blood Pressure			
Before Induction	72.4 ± 11.5	79.1 ± 7.58	0.037*
After Induction	62.7 ± 13.2	64.3 ± 7.52	0.632
After Intubation	64 ± 4	73 ± 7.62	0.083
Average Intra-op	60 ± 2.67	59.9 ± 1.91	0.9
Immediate Post-op	75.7 ± 3.3	81.7 ± 7.17	0.262
Mean Arterial Pressure			
Before Induction	83.6 ± 11.2	89.8 ± 7.96	0.053
After Induction	74.5 ± 13.2	74.4 ± 6.91	0.438
After Intubation	74.4 ± 4.6	83.5 ± 8.26	0.103
Average Intra-op	70 ± 3.37	68.9 ± 1.49	0.4
Immediate Post-op	86.7 ± 3.1	93.6 ± 6.64	0.179

- There is a statistically significant difference in the mean **heart rate** measured during the five intraoperative events (presented in the tables 4, 5 and 6) among the placebo and the treatment groups. There is a significant reduction in heart rate in the atenolol group when compared to the clonidine group.
- There is a statistically significant difference in **systolic BP** between the placebo group and the treatment groups during the five events. However there is no statistically significant difference between the clonidine and the atenolol group.
- **Diastolic BP**, when measured before and after induction had a statistically significant difference among the placebo and the treatment groups. Between the clonidine and atenolol groups there is a significant difference only before induction. All other events were not statistically significant.
- The **mean arterial pressure** before induction is statistically significant between the placebo group and the treatment group. Here again between the clonidine and the atenolol group no statistical significance is demonstrated.

TABLE VII

Intraoperative requirement of Isoflurane			
	High requirement	Moderate requirement	Low requirement
Placebo group	60%	40%	0
Clonidine group	0	10%	90%
Atenolol group	0	5%	95%

Interpretation of Isoflurane requirements

- High – Patients requiring 1% for 15 minutes or more
- Moderate – Patients requiring 0.75% or more for more than 15 minutes
- Low – Patients who require less than 0.75% isoflurane

Majority cases in the treatment group have a low requirement of isoflurane intraoperatively which is in contrast to the majority of cases in the placebo group which has a high requirement of isoflurane intraoperatively. None of the cases in either of the treatment groups had a high requirement of isoflurane intraoperatively.

TABLE VIII

Intraoperative requirement of Nitroglycerin	
Placebo group	60%
Clonidine group	0
Atenolol group	0

Majority of cases in the control group required nitroglycerin intraoperatively. None of the cases in either of the treatment groups required nitroglycerin intraoperatively.

TABLE IX
INTRA-OPERATIVE ADVERSE EVENTS

Intra operative Problems	PLACEBO		CLONIDINE		ATENOLOL		p-value
	No.	%	No.	%	No.	%	
ARRYTHIMIA							
Yes	0	0.0	0	0.0	0	0.0	-
No	20	100.0	20	100.0	20	100.0	
HYPOTENSION**							
Yes	8	40.0	5	25.0	1	5.0	0.03*
No	12	60.0	15	75.0	19	95.0	
HYPERTENSION							
Yes	3	15.0	2	10.0	0	0.0	1.00
No	17	85.0	18	90.0	20	100.0	
TACHYCARDIA							
Yes	0	0.0	0	0.0	0	0.0	-
No	20	100.0	20	100.0	20	100.0	
BRADYCARDIA							
Yes	1	5.0	1	5.0	1	5.0	0.60
No	19	95.0	19	95.0	19	95.0	
ISCHAEMIA							
Yes	0	0.0	0	0.0	0	0.0	-
No	20	100.0	20	100.0	20	100.0	

Majority of the cases in the placebo group tended to develop adverse events, Hypotension was the commonest recorded adverse event.

In the **atenolol group,** majority of cases did not develop any haemodynamic instability except one, who developed hypotension.

In the **clonidine group** five cases developed hypotension and two developed hypertension.

The incidence of **bradycardia** was one case each in placebo and clonidine group.

Intra operative problems such as **tachycardia, arrhythmias and ischaemia** are not seen in any of the groups

TABLE X
EVALUATION OF OPERATING CONDITIONS BY SURGEON

Operating Field		Placebo Group	Clonidine Group	Atenolol Group	Total
	Excellent	9	11	7	27
	Good	11	9	13	33
Total		20	20	20	60

TABLE X (Cont'd)

Chi square tests

	Value	Degree of freedom	p Value
Pearson Chi-Square	1.616	2	.446
Likelihood Ratio	1.628	2	.443
N of Valid Cases	60		

TABLE XI

EFFECT OF STUDY DRUGS ON DURATION OF SURGERY

Duration of surgery	PLACEBO (P)	CLONIDINE (C)	ATENOLOL (A)	p-value
No. of cases	20	20	20	
Mean	70.3	59.0	70.5	
S.D.	20.49	22.34	15.72	0.31
Median	65	57.5	67.5	
Mode	55	40	65	
Range	45-120	25-110	45-115	
Stat. Significance		p-value		
C vs. P		0.11		
A vs. P		0.97		
C vs. A		0.07		

$ *Not statistically significant*

- All the groups provided similar operating field conditions. They provided either excellent or good operating field conditions, with no statistically significant difference among them.
- There is no statistical significant difference in the duration of surgery between the three groups.

TABLE XII

POST-OPERATIVE SHIVERING

		Placebo Group	Clonidine group	Atenolol Group	Total
Post operative shivering	NO	13	20	14	47
	YES	7		6	13
Total		20	20	20	60

TABLE XII (Cont'd)

Chi square tests

	Value	Degree of freedom	p Value
Pearson Chi-Square	8.445	2	.015

Likelihood Ratio	12.386	2	.002
N of Valid Cases	60		

- None of the patients in the clonidine group developed postoperative shivering.
- 30% and 35% of the patients developed postoperative shivering in the atenolol and the placebo groups respectively.
- There is a statistical significance between the clonidine group and the other two groups.

TABLE XIII
POST-OP SEDATION SCORE

		Placebo Group	Clonidine Group	Atenolol Group	Total
Post-op Sedation Score	2	6	3	1	10
	3	2	8	9	19
	4	11	9	10	30
	5	1			1
Total		20	20	20	60

TABLE XIII (Cont'd)

Chi Square Tests

	Value	Degree of freedom	p value
Pearson Chi-Square	10.526	6	.104
Likelihood Ratio	11.863	6	.065
Linear-by-Linear Association	.164	1	.685
N of Valid Cases	60		

Majority of cases in all the three groups had a postoperative sedation score of 4.

There is no statistical significant difference among groups.

TABLE XIV

TIME FOR ANALGESIA REQUEST

Analgesic request (hours after extubation)	PLACEBO (P)	CLONIDINE (C)	ATENOLOL (A)	p-value
No. of cases	20	20	20	
Mean	0.2	6.4	0.4	
S.D.	0.37	1.54	0.81	<0.001*
Median	0	7	0	
Mode	0	7	0	
Range	0-1	2-8	0-3	
Stat. Significance	p-value			
C vs. P	<0.001*			
A vs. P	0.32			
C vs. A	<0.001*			

* *Statistically significant*

The median hours after extubation for request of rescue analgesic by the patient was 7 in clonidine group compared to <1 hour among atenolol group and placebo group. The mean distribution of cases by analgesic request (in hours after extubation) was observed to be statistically significant between clonidine group and atenolol group as well as between the clonidine group and placebo group. However, it was not statistically significant between atenolol group and placebo group.

TABLE XV

PADSS – 6 HOURS POST-OP

PADSS-6 pm on the day of surgery	PLACEBO (P)		CLONIDINE (C)		ATENOLOL (A)		p-value
	No.	%	No.	%	No.	%	
6	0	0.0	3	15.0	0	0.0	
7	5	25.0	17	85.0	3	15.0	<0.001*
8	13	65.0	0	0.0	17	85.0	
9	2	10.0	0	0.0	0	0.0	
Stat. Significance	p-value						
C vs. P	<0.001*						
A vs. P	0.22						
C vs. A	<0.001*						

** Statistically significant*

PADSS – 18 HOURS POST-OP

PADSS-6 am 1st POD	PLACEBO (P)		CLONIDINE (C)		ATENOLOL (A)		p-value
	No.	%	No.	%	No.	%	
7	1	5.0	2	10.0	0	0.0	
8	0	0.0	0	0.0	1	5.0	0.07
9	12	60.0	18	90.0	14	70.0	
10	7	35.0	0	0.0	5	25.0	
Stat. Significance	p-value						
C vs. P	0.01*						
A vs. P	0.48						
C vs. A	0.04*						

** Statistically significant*

There is a statistically significant difference in PADSS among the three groups with only 10% of the cases in the placebo group meeting the discharge criteria on the same day of surgery. Majority of the patients were fit to be discharged the next day morning with no statistical significance among the three groups.

CHAPTER X

DISCUSSION

Premedication is not only for sedation and anxiolysis, but also to enhance the quality of induction, maintenance and recovery from anaesthesia. The primary goal of an anaesthetist in FESS procedure is to provide better surgical access, a bloodless operating field, conduct of balanced anaesthesia and prompt recovery. To provide a bloodless operating field, induced hypotension is a clear answer in addition to proper positioning (15^0 reverse trendelenberg position) to promote venous drainage. In order to achieve a better operating field, the surgeon on his part packs the nasal cavity with vasoconstrictor and infiltrates the field with adrenaline before incision. Most surgeons use concentrations of more than 1:200000 for this purpose. This infiltration of adrenaline poses a challenge to the anaesthetist in performing induced hypotension along with the problem of managing intubation responses. The patient's anxiety compounds the problem.

In order to manage all these problems, adequate and appropriate premedication plays an important role in this regard.

This study has compared the efficacy of oral clonidine and oral atenolol to achieve these desired conditions. As per this study the three groups did not demonstrate any statistical significance in demographic distribution.

The resting heart rate and blood pressure were significantly reduced in the treatment groups compared to the placebo group, with atenolol faring better than clonidine.

The pre-op sedation score did not vary between the three groups, but the clinical significance was demonstrated with two patients in the placebo group presenting with restlessness before surgery.

Intubation responses were blunted among the treatment groups when compared with the placebo groups, once again atenolol doing better.

The results of the study of **Mikawa et al**[8], that premedication with oral clonidine attenuates intubation response concurs with the findings of the study.

Patients in the treatment group mostly had a low requirement for isoflurane, with 5-10% of the patients requiring isoflurane of 0.75% or more for more than 15 minutes. In the placebo group, 40% of the patients required more than 0.75% isoflurane for more than 15 minutes, while 60% of the cases required 1% isoflurane for more than 15 minutes. In the clonidine group 10% of the patients had a moderate requirement of isoflurane in comparison with only 5% in the atenolol group. The atenolol group fared better than clonidine group in the intra-op requirements for isoflurane.

There was no significant difference in the hemodynamic parameters intra-operatively among the three groups.

The results of the study of **Maroof et al**[7], that premedicating with 4mcg/kg of clonidine for hypotensive anaesthesia resulted in better hemodynamic stability have concurred with the findings of the study.

The findings of **Zaugg et al**[1], in their study that premedication with atenolol confer advantages of decreased analgesic requirements and faster recovery did not correlate with the findings of the study.

None of the patients in the treatment group required NTG intra-operatively.

Intra-operative problems like arrhythmia, tachycardia and ischaemia were never encountered among the three groups.

Hypotension was the most common intra-operative problem encountered, with 8 (40%) and 5(25%) patients in the placebo and clonidine group respectively, demonstrating statistical significance. Only one patient had hypotension in the atenolol group.

Hypertension was encountered in three patients in the placebo group, two patients in clonidine group and none in atenolol group. The hypertension that occurred in the clonidine group was possibly in response to adrenaline infiltration. Failure to standardize the concentration of adrenaline used for infiltration has been a limitation in this study to merit any further comment.

One patient in each group experienced bradycardia which was promptly treated with intravenous atropine. The atenolol group encountered the least number of intra-operative problems.

Excellent to good operating field conditions were provided with all the three groups. No significant difference in the duration of surgery was produced between the treatment and placebo groups. Failure to standardize the operating surgeon limits further comment.

There was a statistically significant difference with extubation responses between the placebo group and the clonidine group with no statistically significant difference between the atenolol and the placebo group.

None of the patients experienced post operative shivering in the clonidine group, whereas 30 – 35% patients suffered post-op shivering in the other two groups.

The results of the study of **Buggy et al**[4], that clonidine at induction reduces shivering after GA, supports our evidence of decreased incidence of shivering in the clonidine group.

The post-op sedation scores did not significantly vary among the three groups with a majority of the patients in the three groups having a sedation score of 4.

The results in the study of **Bellaiche et al**[6], that clonidine does not delay recovery from anaesthesia supports our evidence of statistical insignificance in post-op sedation score among the three groups.

The results of the study by **Goyagi et al**[12], that awakening time of patients premedicated with clonidine was longer than the control group contrasted with the findings of the study. However the dose of clonidine used by Goyagi was higher than that was used in the study, which necessitates further analysis in this regard.

Patients in the clonidine group did not require post-op analgesic supplement for a mean duration of 6.4 hours after surgery in comparison with 0.2 and 0.4 hours in placebo and atenolol groups respectively. Thus clonidine has offered better post-op analgesia in comparison with other groups.

Only 10% of the patients in placebo group met the discharge criteria at 6.00 pm on the day of surgery, none meeting the criteria in the treatment groups. While 90 – 95% of the patients in the three groups met the discharge criteria at 6.00 am on the next day of surgery. Patients in clonidine group scored lower in PADSS when compared to the other two groups. The findings in this study seem to suggest that FESS procedure is not ideal for being performed as a daycare surgery. The fact that the patients in clonidine group landed up with poor PADSS score precludes the use of oral clonidine as premedicant when daycare anaesthesia is contemplated.

CHAPTER XI

SUMMARY

This prospective randomized study aimed to analyze the effect of atenolol and clonidine premedication on the peri-operative characteristics of patients undergoing FESS procedure under GA and induced hypotensive anaesthetic technique.

The important conclusions from this study include

1. Clonidine and atenolol premedication produces predictable and superior hemodynamics during peri-operative period, with atenolol being superior to clonidine.
2. Clonidine and atenolol premedication decreases the intra-operative requirement of vasodilators like NTG.
3. Clonidine and atenolol premedication decreases the requirement of inhalational anaesthetics like isoflurane to maintain hemodynamic control.
4. Clonidine premedication produces increased incidences of undesirable alterations in BP, which extended into the early post-op period, but could be easily treated.
5. Clonidine produces better sedation and anxiolysis pre-op and reduces the requirement of post-op analgesia as noted by delayed TAR times.
6. Clonidine reduces the incidence of post-anaesthetic shivering.

7. Atenolol produces lesser perturbations in HR and BP in response to intubation.
8. Atenolol produces very minimal hemodynamically adverse events during the perioperative period.
9. Lack of standardization of vasoconstrictors infiltrated by the surgeon maybe a limiting factor in the study.
10. Clonidine premedication produces poorer PADSS score reflecting inability to meet discharge criteria of daycare surgery.
11. FESS procedures seem to be inappropriate for consideration for daycare surgery with the most common morbidity factors being headache and pain.
12. Balanced anaesthesia technique with meticulous attention to patients needs is the single most important factor in production of controlled hypotension during surgery.

CHAPTER XII

CONCLUSION

Clonidine and Atenolol premedication provides superior and predictable perioperative hemodynamic control, reduces the requirement of hypotensive agents and produces acceptable recovery characteristics.

The lesser incidence of complications recorded with Atenolol gives it a more favorable profile when compared to Clonidine.

Clonidine or Atenolol premedication can form an important and desirable part of hypotensive anaesthesia for surgical procedures like FESS.

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COMPARATIVE STUDY OF ORAL ATENOLOLVERSUS ORAL CLONIDINE FOR HYPOTENSIVE ANESTHESIA FOR PATIENTS UNDERGOING FUNCTIONAL ENDOSCOPIC SINUS SURGERY UNDER GENERAL ANESTHESIA – PROFORMA.

NAME: AGE: SEX:

WEIGHT:

IP NUMBER:

DIAGNOSIS: SURGEON:

PROCEDURE: ANESTHETIST:

RANDOM NUMBER:

PRE-OP SEDATION SCORE*:

PRE-OP EVALUATION:

Pulse: BP: SpO_2: ECG:

PFT: ECHO:

BREATH HOLDING TEST: Hb%:

LFT: Renal parameters:

Intra-op Drugs		Dosage	Total dose given
Narcotics	Pethidine		
Induction agent	Propofol		
Muscle relaxant	Vecuronium		
Others	Xylocard		

HEMODYNAMICS MONITORING

Events	HR	SBP	DBP	MAP	SpO2	ETCO2	Rhythm	U/O	Iso	NTG	Others
Pre-induction											
After induction											
After intubation											
1’											
2’											
3’											
4’											
5’											
10’											
15’											
20’											
25’											
30’											
35’											
40’											
45’											
50’											
55’											

60’											
65’											
70’											
75’											
80’											
85’											
90’											
95’											
100’											
105’											
110’											
115’											
120’											
125’											
130’											
135’											
140’											
145’											
150’											
155’											
160’											
Events	HR	SBP	DBP	MAP	SpO2	ETCO2	Rhythm	U/O	Iso	NTG	Others
165’											
170’											
175’											
180’											
185’											
190’											
195’											
200’											
205’											
210’											
215’											
220’											
225’											
230’											
After neostigmine											
2’											
4’											
10’											
After extubation											
2’											
5’											

15’											
30’											

INTRA-OPERATIVE PROBLEMS:

Hypertension (20% above baseline)	Yes/No	Episodes:
Hypotension (BP below set value – MAP 60 mmHg)	Yes/No	Episodes:
Arrhythmias	Yes/No	Episodes:
Bradycardia (HR < 50 bpm)	Yes/No	Episodes:
Tachycardia (HR < 150 bpm)	Yes/No	Episodes:
Ischaemic changes	Yes/No	Episodes:

SURGEONS ASSESMENT OF FIELD:

Excellent Good Fair Poor

Duration of surgery:

Time between reversal of NM blockade and extubation:

Surgeon’s Comments (if any):

POST-OPERATIVE FACTORS:

Delayed recovery	Yes/No
Shivering	Yes/No
Time of 1st analgesic request	
Hemodynamic changes	Yes/No
Vomiting	Yes/No

Post-op sedation score:

INTRA-OP DRUG SCORES:

ISOFLURANE -	VOL%	SCORE
	0 – 0.75%	0
	0.75%	1
	1.0%	2
NITROGLYCERIN	DOSE	SCORE
	0.3mcg $kg^{-1}min^{-1}$	1
	0.6mcg $kg^{-1}min^{-1}$	2
	1.0mcg $kg^{-1}min^{-1}$	3
	1.5mcg $kg^{-1}min^{-1}$	4

	2.0mcg $kg^{-1}min^{-1}$	5
	2.5mcg $kg^{-1}min^{-1}$	6
	3.0mcg $kg^{-1}min^{-1}$	7
	4.0 mcg $kg^{-1}min^{-1}$	8
	5.0 mcg $kg^{-1}min^{-1}$	9

METOPROLOL	DOSE	SCORE
	< 2mg	1
	2-4 mg	2
	>4mg	3

* **SEDATION SCORES:**

(Based on Ramsay sedation scale)

Anxious, Agitated, Restless.	1
Co-operative, Oriented, Tranquil.	2
Asleep, Brisk response to light glabellar tap / loud auditory stimulus.	3
Asleep, sluggish response to brisk glabellar tap / loud auditory stimulus.	4
No response to above.	5
No response to pain.	6

Post anaesthesia discharge scoring system (PADSS)

Vital signs (BP & Pulse)
2 = Within 20% of preoperative baseline
1 = 20 – 40% of preoperative baseline
0 = >40% of preoperative baseline

Activity
2 = Steady gait, no dizziness or pre-op level
1 = Dyspnoeic, requires assistance
0 = Unable to ambulate

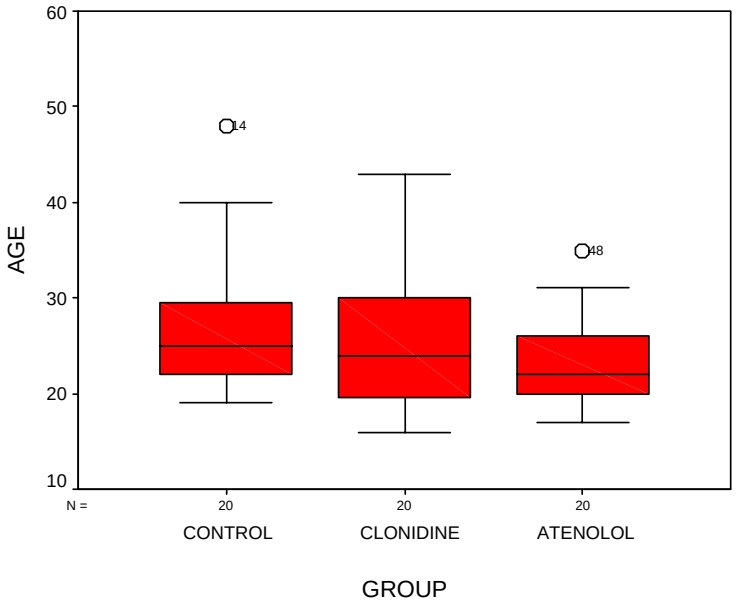
Nausea & Vomiting
2 = Minimal, treated with PO medications
1 = Moderate, treated with IM medications
0 = Continues after repeated treatment

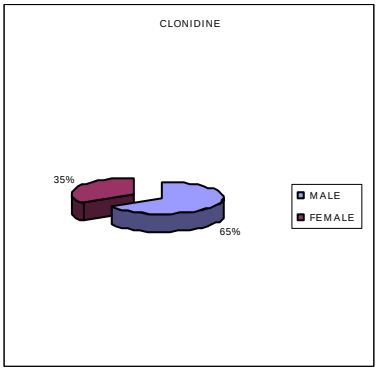
Pain
Acceptable to the patient; controlled with PO meds
2 = Yes
1 = No

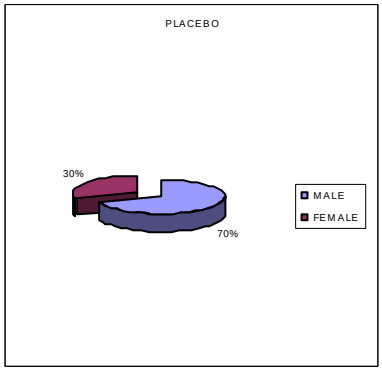
Surgical bleeding

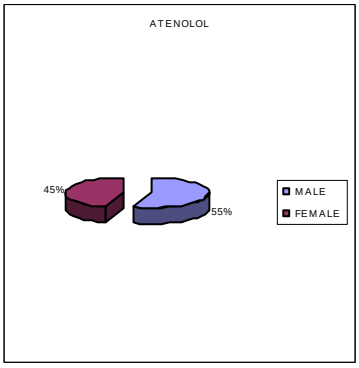
2 = Minimal, no dressing change required
1 = Moderate, up to two dressing changes
0 = Severe, more than three dressing changes

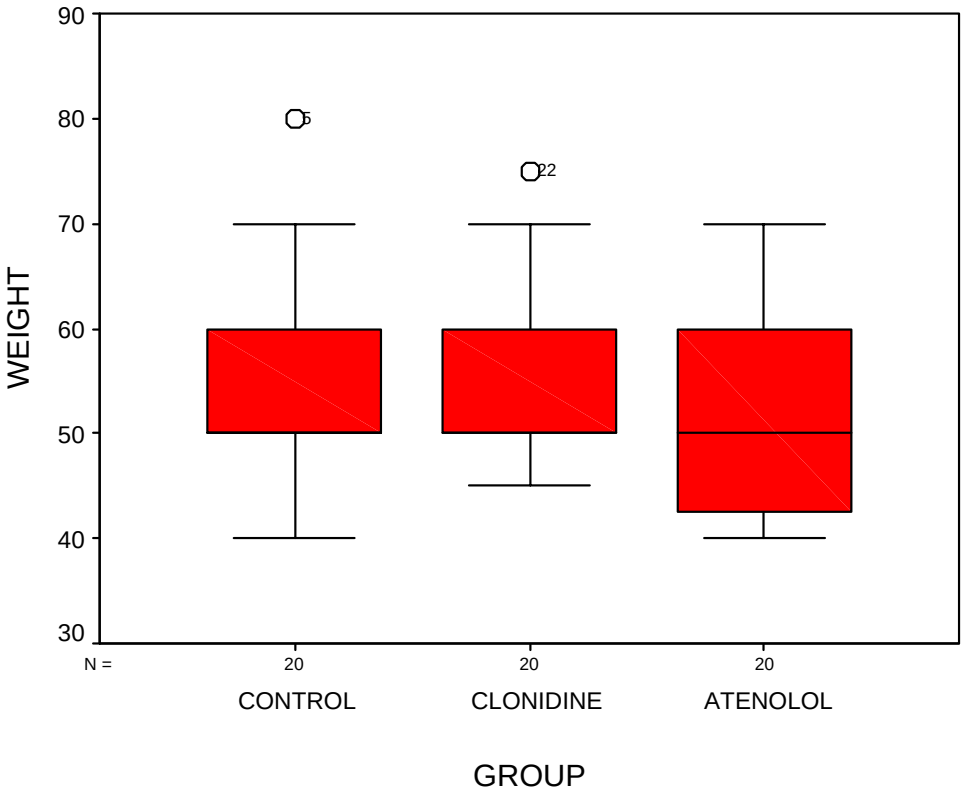
Patient Score	
6.00 pm on the day of surgery	
6.00 am 1st POD	



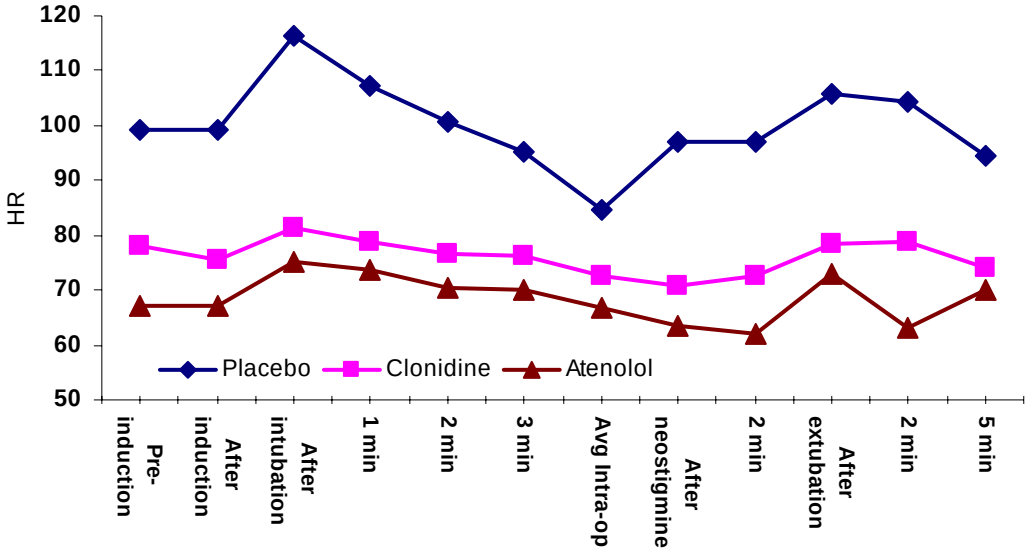




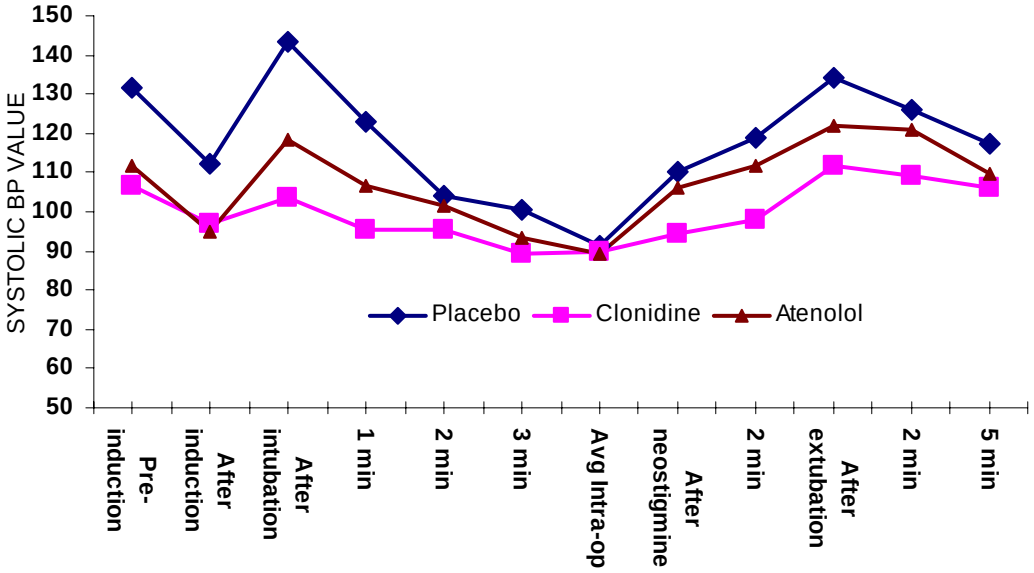



90
80
70
60
50
40
30
WEIGHT
5
22
N =
20
20
20
CONTROL
CLONIDINE
ATENOLOL
GROUP

MEAN DISTRIBUTION OF HR VALUES BY GROUP



MEAN DISTRIBUTION OF SBP VALUES BY GROUP



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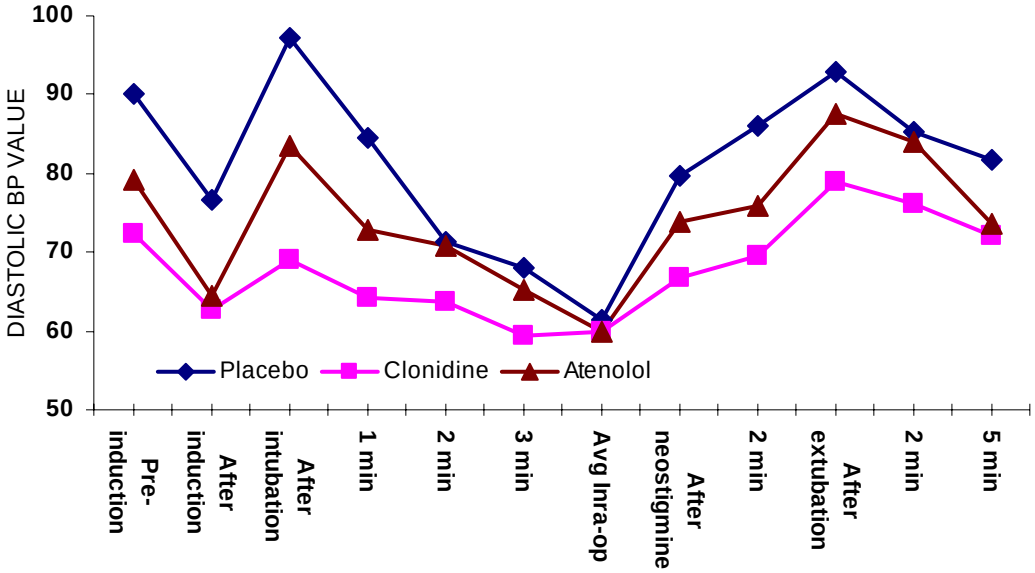
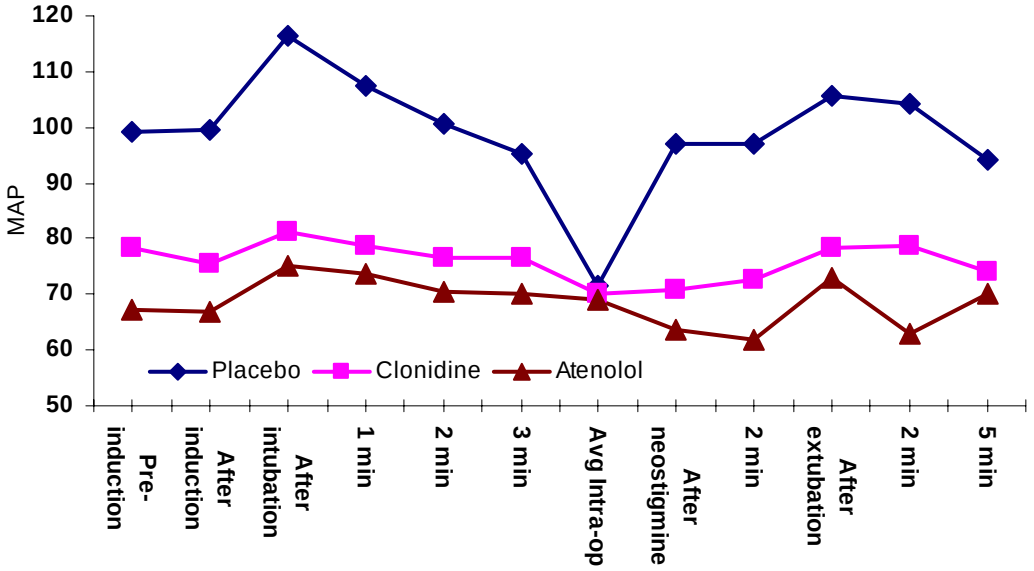


MEAN DISTRIBUTION OF MAP VALUES BY GROUP



NAME	AGE	SEX	WEIGHT	IP NUMBER	PRE OP SEDATION SCORE
MAHESWARI	22	F	40	791910	2
RASHEEDA	31	F	40	785915	2
MURALINATHAN	19	M	60	785816	2
KOKILA	25	F	40	782946	2
RAMYA	17	F	50	783254	2
VIJAYAN	19	M	45	785092	2
PRAKASH	22	M	50	785559	2
RAJA	35	M	65	787789	2
MURUGANANTHAM	24	M	60	795603	2
PREMA	20	F	50	795717	2
PICHANDI	30	M	55	795796	2
ANANDAN	22	M	60	795813	2
DURAI	19	M	45	795836	2
RAMAKRISHNAN	27	M	70	795884	2
VIJAYA	23	F	60	795902	2
THANGADURAI	25	M	60	795917	2
SEETHAMMA	28	F	45	796008	2
JUSTIN	20	M	40	796213	2
PONNU	21	F	40	796227	2
FATHIMA	20	F	50	796309	2

PRE INDUCTION						AFTER IN		
HR	SBP	DBP	MAP	SOFLURAN	NTG	HR	SBP	DBP
92	113	80	91	0	0	91	105	72
71	104	76	85	0	0	72	88	52
68	118	76	90	0	0	80	101	68
73	113	76	88	0	0	81	82	57
64	100	70	80	0	0	84	93	58
73	103	73	83	0	0	69	102	72
67	102	68	77	0	0	61	94	55
62	112	79	90	0	0	59	102	72
69	128	96	107	0	0	60	99	67
61	107	78	88	0	0	60	94	55
55	117	81	93	0	0	54	92	69
59	110	72	85	0	0	56	81	48
57	127	86	100	0	0	61	102	67
60	96	74	81	0	0	62	99	67
63	105	77	86	0	0	64	90	63
67	122	91	101	0	0	65	105	70
72	118	78	91	0	0	70	96	73
77	105	77	86	0	0	63	100	70
69	112	79	90	0	0	67	91	68
66	123	95	104	0	0	61	86	64

DUCTION			AFTER INTUBATION					
MAP	SOFLURAN	NTG	HR	SBP	DBP	MAP	SOFLURAN	NTG
83	0	0	89	130	96	107	0	0
64	0	0	99	149	102	118	1	0
79	0	0	95	127	87	100	0	0
65	0	0	97	96	82	87	1	0
70	0	0	86	97	68	78	1	0
82	0	0	72	123	95	104	1	0
68	0	0	67	132	98	109	1	0
82	0	0	64	127	86	100	1	0
77	0	0	63	101	77	85	1	0
68	0	0	69	105	77	86	1	0
77	0	0	67	128	89	102	1	0
59	0	0	71	118	78	91	1	0
76	0	0	77	116	78	91	1	0
77	0	0	69	118	78	91	1	0
72	0	0	66	107	71	83	1	0
82	0	0	72	106	75	85	1	0
80	0	0	81	132	88	103	1	0
80	0	0	66	112	79	90	1	0
76	0	0	68	124	90	101	1	0
71	0	0	62	124	75	81	1	0

1'						2		
HR	SBP	DBP	MAP	SOFLURAN	NTG	HR	SBP	DBP
79	101	67	78	2	0	79	101	67
94	102	68	79	1	0	72	98	66
98	124	82	96	1	0	91	96	64
101	122	96	105	1	0	89	97	71
86	98	69	79	1	0	84	97	69
74	113	72	86	1	0	70	96	73
65	109	77	88	1	0	64	106	76
63	100	66	77	1	0	66	107	78
61	100	70	80	1	0	62	97	69
67	102	69	80	1	0	61	102	72
72	109	78	88	1	0	70	102	72
74	100	73	82	1	0	72	103	73
64	109	60	76	1	0	71	107	72
69	110	77	88	1	0	68	103	73
64	124	75	81	1	0	63	107	72
69	95	68	79	1	0	65	104	63
72	109	78	88	1	0	70	107	72
70	98	71	80	1	0	66	98	73
70	108	71	83	1	0	69	101	72
59	101	68	79	1	0	54	102	68

2'						3'		
MAP	SOFLURAN	NTG	HR	SBP	DBP	MAP	SOFLURAN	NTG
78	2	0	83	95	63	74	2	0
77	1	0	79	96	63	74	1	0
75	1	0	85	94	63	73	1	0
80	2	0	81	85	56	66	2	0
78	2	0	84	91	65	74	2	0
80	2	0	78	94	60	71	2	0
86	2	0	62	91	69	76	2	0
88	2	0	59	97	58	71	2	0
78	2	0	65	101	77	85	2	0
82	2	0	67	98	74	82	2	0
82	2	0	76	95	56	69	2	0
83	2	0	76	90	68	75	2	0
84	2	0	58	90	68	75	2	0
83	2	0	63	91	62	72	2	0
84	2	0	61	89	60	70	2	0
81	2	0	67	91	67	75	2	0
84	2	0	74	91	68	76	2	0
81	2	0	62	98	71	80	2	0
82	2	0	64	90	64	73	2	0
79	2	0	55	105	73	84	2	0

		4'						5
HR	SBP	DBP	MAP	SOFLURAN	NTG	HR	SBP	DBP
79	109	77	88	2	0	71	96	63
77	95	60	72	1	0	75	94	60
80	93	62	72	1	0	77	93	61
77	83	54	64	2	0	75	81	54
84	89	64	72	2	0	83	84	62
79	89	67	74	2	0	79	89	67
64	92	61	71	2	0	65	89	59
60	91	58	69	2	0	61	80	59
64	100	66	77	2	0	62	82	56
63	91	59	70	2	0	63	86	61
67	94	61	72	2	0	65	89	59
69	87	62	70	2	0	69	87	62
60	92	60	71	2	0	59	83	60
61	91	66	74	2	0	57	83	57
61	79	54	62	2	0	61	79	54
70	83	57	66	2	0	66	98	67
74	86	62	70	2	0	63	92	53
60	93	58	70	2	0	53	98	67
62	91	63	72	2	0	62	91	63
55	90	62	71	2	0	53	82	56

5'						10'		
MAP	SOFLURAN	NTG	HR	SBP	DBP	MAP	SOFLURAN	NTG
74	2	0	72	94	60	71	0	0
71	1	0	84	93	59	70	2	0
72	1	0	77	93	61	72	1	0
63	0	0	76	90	62	71	0	0
69	1	0	83	84	61	69	0	0
74	2	0	77	83	57	66	2	0
69	2	0	65	90	55	67	2	0
66	2	0	60	94	55	68	2	0
65	2	0	63	83	59	67	2	0
69	2	0	63	82	56	65	2	0
69	2	0	65	100	55	70	2	0
70	2	0	65	92	53	66	2	0
68	2	0	59	93	50	64	2	0
66	2	0	59	92	53	66	2	0
62	2	0	65	99	54	69	2	0
77	2	0	63	80	50	60	2	0
66	2	0	68	69	44	52	2	0
77	2	0	58	89	59	69	2	0
72	2	0	60	80	59	66	2	0
65	2	0	54	77	50	60	2	0

		15'						2(
HR	SBP	DBP	MAP	SOFLURAN	NTG	HR	SBP	DBP
66	101	60	73	0	0	64	86	62
74	88	57	67	1	0	73	88	57
74	91	59	70	1	0	73	90	55
73	81	55	64	0	0	72	83	56
86	83	59	67	0	0	86	83	59
78	95	56	69	1	0	63	92	44
62	80	59	66	1	0	65	87	62
59	88	83	71	2	0	69	90	62
65	90	68	75	2	0	59	95	64
67	91	62	72	2	0	57	89	62
76	83	60	68	2	0	61	88	61
76	82	56	65	1	0	66	82	54
58	94	57	69	2	0	63	89	62
63	94	57	69	2	0	53	89	63
61	92	56	68	2	0	62	88	61
67	83	60	68	2	0	61	91	63
74	84	63	70	2	0	55	87	66
62	86	62	70	2	0	59	89	62
64	96	56	69	1	0	57	88	61
55	86	62	70	2	0	60	92	60

0'						25'		
MAP	SOFLURAN	NTG	HR	SBP	DBP	MAP	SOFLURAN	NTG
70	0	0	73	106	89	95	0	0
67	0	0	68	92	54	67	0	0
67	1	0	72	90	55	67	0	0
65	0	0	72	86	58	67	0	0
67	0	0	90	90	60	70	0	0
60	1	0	61	85	62	70	1	0
70	2	0	55	92	56	68	1	0
71	2	0	59	86	62	70	1	0
74	2	0	57	84	63	70	1	0
71	2	0	60	96	56	69	1	0
70	1	0	63	86	54	65	1	0
63	1	0	67	87	62	70	1	0
71	2	0	72	96	56	69	1	0
72	2	0	73	83	60	68	1	0
70	2	0	72	85	55	65	1	0
72	2	0	66	98	73	81	2	0
73	2	0	61	99	66	73	2	0
71	2	0	55	99	59	72	1	0
70	2	0	59	94	64	74	2	0
71	2	0	57	85	61	69	1	0

		30'						3
HR	SBP	DBP	MAP	SOFLURAN	NTG	HR	SBP	DBP
74	94	63	73	0	0	72	108	79
66	90	56	67	0	0	73	93	60
70	89	55	66	0	0	72	76	48
69	86	60	69	0	0	66	86	60
89	89	60	70	0	0	88	87	61
64	89	61	70	1	0	78	96	56
62	92	60	71	1	0	62	89	62
61	84	59	67	1	0	59	87	62
54	88	61	70	2	0	65	82	54
62	87	62	70	2	0	67	86	54
63	89	62	71	2	0	76	89	62
61	91	85	74	2	0	76	96	56
72	87	66	73	2	0	58	95	64
73	86	54	65	1	0	63	84	63
72	91	63	72	2	0	61	90	62
66	87	62	70	2	0	67	86	62
65	88	61	70	2	0	74	92	44
61	96	56	69	1	0	62	92	56
62	89	63	72	2	0	64	85	62
63	86	57	67	1	0	55	96	64

5'						40'		
MAP	SOFLURAN	NTG	HR	SBP	DBP	MAP	SOFLURAN	NTG
89	0	0	78	102	67	79	0	0
71	0	0	62	99	73	82	2	0
57	0	0	68	85	54	65	0	0
69	0	0	66	86	60	69	0	0
70	0	0	86	85	63	70	0	0
69	0	0	62	87	58	68	1	0
71	1	0	59	83	53	63	0	0
70	0	0	65	84	57	66	0	0
63	0	0	67	93	58	70	1	0
65	0	0	86	83	60	68	0	0
71	0	0	76	83	53	63	0	0
69	0	0	68	86	57	67	0	0
74	1	0	66	85	55	65	0	0
70	0	0	68	84	58	67	0	0
71	0	0	70	91	66	74	1	0
70	0	0	66	85	55	65	0	0
60	0	0	65	83	58	66	0	0
68	0	0	69	86	57	67	0	0
70	1	0	65	87	62	70	1	0
75	2	0	57	86	53	64	0	0

		45'						5
HR	SBP	DBP	MAP	SOFLURAN	NTG	HR	SBP	DBP
75	108	73	85	0	0	77	103	69
61	92	61	71	2	0	62	90	64
68	86	54	65	0	0	68	87	54
62	86	61	69	0	0	67	87	62
83	84	63	70	0	0	81	82	63
79	78	56	63	0	0	78	92	44
65	94	53	67	0	0	62	96	56
61	81	54	63	0	0	59	87	62
62	96	50	65	0	0			
63	87	62	70	1	0	67	90	62
65	83	60	68	0	0	76	86	54
69	89	61	70	0	0	76	95	64
59	87	61	70	0	0	58	96	56
57	86	57	67	0	0	63	89	62
61	100	55	70	1	0	61	84	63
66	84	58	67	0	0	67	88	61
63	96	56	69	0	0	74	86	62
53	89	67	74	0	0	62	82	54
62	91	66	74	0	0	64	92	56
53	93	58	70	0	0	55	89	62

0'						55'		
MAP	SOFLURAN	NTG	HR	SBP	DBP	MAP	SOFLURAN	NTG
87	0	0	78	98	66	77	0	0
73	1	0	74	107	76	86	2	0
65	0	0	66	87	54	65	0	0
70	0	0	64	99	70	80	1	0
69	0	0	77	83	62	69	0	0
60	0	0	65	89	63	72	1	0
69	0	0	61	85	55	65	1	0
70	0	0	62	88	61	70	1	0
71	0	0	60	91	63	72	1	0
65	0	0	53	96	56	69	1	0
74	0	0	57	87	62	70	1	0
69	0	0	55	87	66	73	1	0
71	0	0	58	86	54	65	1	0
70	0	0	66	89	62	71	1	0
70	0	0	67	96	56	69	1	0
70	0	0	74	88	61	70	1	0
63	0	0	62	92	60	71	1	0
68	0	0	64	84	63	70	1	0
71	0	0	60	86	62	70	1	0

			60'					6
HR	SBP	DBP	MAP	SOFLURAN	NTG	HR	SBP	DBP
74	103	71	82	0	0	66	100	70
64	92	61	71	1	0	62	103	72
67	86	55	65	0	0	65	86	58
61	86	58	67	1	0	63	85	59
79	82	62	69	0	0	84	63	45
69	98	73	81	2	0	62	86	53
66	99	59	72	1	0	56	83	59
68	85	61	69	1	0	57	87	62
68	87	62	70	1	0	63	83	58
66	85	62	70	1	0	62	89	59
68	91	85	74	1	0	54	85	55
70	86	62	70	1	0	57	84	57
65	87	62	70	1	0	62	93	58
69	83	60	68	1	0			
66	98	73	81	2	0	67	83	53
58	99	59	72	1	0			
61	85	61	69	1	0			
64	82	56	65	1	0	61	83	60

5'						70'		
MAP	SOFLURAN	NTG	HR	SBP	DBP	MAP	SOFLURAN	NTG
80	0	0						
82	0	0	70	117	76	88	0	0
67	0	0						
68	1	0	56	85	60	68	0	0
51	0	0	78	143	94	110	2	0
64	1	0						
67	1	0	58	83	58	66	1	0
70	1	0	60	84	57	66	1	0
66	1	0	63	83	53	63	1	0
69	1	0	63	87	62	70	1	0
65	1	0						
66	1	0	60	90	60	70	1	0
70	1	0	65	93	50	64	1	0
63	1	0	69	94	56	69	1	0
68	1	0						

		75'						8
HR	SBP	DBP	MAP	SOFLURAN	NTG	HR	SBP	DBP
56	86	61	69	0	0	65	89	63
86	114	81	92	2	0	83	104	73
61	87	58	68	1	0			
63	85	55	65	1	0	62	83	59
62	90	63	72	1	0			

0'						85'		
MAP	SOFLURAN	NTG	HR	SBP	DBP	MAP	SOFLURAN	NTG
72	0	0	59	109	81	90	2	0
83	1	0	82	95	63	74	0	0
67	1	0						

			90'					9
HR	SBP	DBP	MAP	SOFLURAN	NTG	HR	SBP	DBP
62	104	76	85	2	0	57	96	71
79	84	59	67	0	0	78	87	62

5'						100'		
MAP	SOFLURAN	NTG	HR	SBP	DBP	MAP	SOFLURAN	NTG
79	2	0	58	93	69	77	2	1
70	0	0	76	91	85	74	0	0

			105'					11
HR	SBP	DBP	MAP	SOFLURAN	NTG	HR	SBP	DBP
62	91	65	74	2	2	62	89	63
78	94	65	75	0	0			

10'						115'		
MAP	SOFLURAN	NTG	HR	SBP	DBP	MAP	SOFLURAN	NTG
72	2	2	62	91	64	73	2	2

						AFTER NEOSTIGMINE		
		120'						
HR	SBP	DBP	MAP	SOFLURAN	NTG	HR	SBP	DBP
						63	100	70
						74	120	83
						86	107	76
						81	111	81
						81	111	81
						56	108	73
						66	99	73
						61	106	76
						56	103	68
						61	98	71
						59	117	80
						61	115	83
						55	114	77
						59	101	68
						56	100	66
						60	81	53
						55	117	80
						68	88	63
						59	123	84
						55	102	69

E			2'				AFTER EXTUBATION		
MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP
80	63	102	68	79	69	106	76	85
95	71	127	87	100	83	127	87	100
85	83	104	76	85	87	110	81	91
91	81	110	75	87	75	117	87	95
91	78	134	78	97	89	128	93	105
85	53	105	78	89	85	138	103	115
82	51	98	71	80	80	128	96	107
86	60	123	84	97	65	122	84	97
80	61	108	77	87	60	128	96	107
80	48	97	69	78	77	117	81	93
92	54	109	78	88	67	119	82	94
94	51	124	75	91	76	133	101	112
89	67	120	83	95	65	122	91	101
79	57	106	76	86	70	128	91	103
77	59	109	78	88	76	117	85	96
62	71	106	76	86	61	122	99	101
92	55	128	84	99	70	117	81	93
71	60	100	64	76	70	116	78	91
97	55	124	75	91	70	128	84	97
80	59	102	68	79	66	113	75	88

2'				5'				HYPOTENSION
HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	
64	106	74	84	61	100	73	82	N
85	134	78	97	86	133	82	99	N
83	104	76	85	72	112	72	93	Y
76	116	87	95	73	100	70	80	N
83	110	66	81	84	110	67	81	N
67	118	78	91	71	100	70	80	N
59	116	78	91	70	106	76	86	N
51	118	78	91	71	110	75	87	N
64	109	74	86	61	101	63	76	N
51	128	89	102	58	101	67	78	N
68	131	96	108	64	103	68	80	N
55	132	88	103	88	127	86	100	N
56	134	104	114	63	100	66	77	N
56	137	104	115	80	121	87	98	N
63	132	98	109	70	115	83	94	N
59	110	72	85	76	124	75	91	N
59	134	92	106	69	101	68	79	N
61	113	80	91	74	103	59	74	N
50	127	86	100	55	109	78	88	N
51	112	79	90	56	121	89	98	N

INTRAOPERATIVE PROBLEMS				
HYPERTENSION	ARRYTHMIAS	TACHYCARDIA	BRADYCARDIA	ISCHAEMIA
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N
N	N	N	N	N

DURATION OF SURGERY	OPERATING FIELD	POST OP SEDATION SCORE	ANALGESIC REQUEST (Hrs after extubation)
65	GOOD	3	0
70	GOOD	3	0
65	GOOD	3	0
115	GOOD	4	0
105	EXCELLENT	4	0
65	GOOD	4	2
70	GOOD	4	0
75	GOOD	4	0
45	GOOD	4	0
80	EXCELLENT	4	1
70	EXCELLENT	3	0
65	GOOD	4	0
75	EXCELLENT	2	0
55	GOOD	4	3
75	EXCELLENT	3	0
60	EXCELLENT	3	0
70	EXCELLENT	3	0
60	GOOD	4	0
60	GOOD	3	1
65	GOOD	3	0

PADSS	
6.00 pm	6.00 am 1st POD
8	9
8	9
8	9
8	10
8	10
8	9
8	9
8	10
8	9
8	9
8	9
7	8
8	10
8	9
8	9
8	9
7	9
7	9
8	10
8	9