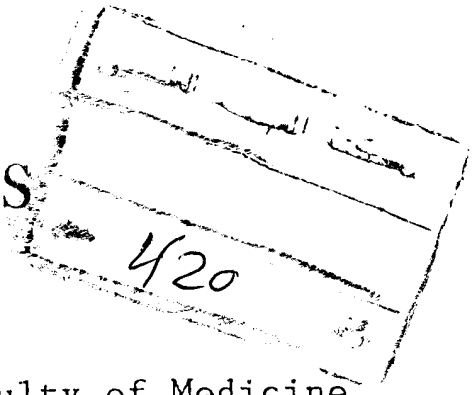
٤٠٦

EFFECT OF THIOPENTONE AND MIDAZOLAM INDUCTION WITH AND WITHOUT LIDOCAINE ON INTRAOCULAR PRESSURE



THESIS

Submitted to the Faculty of Medicine
University of Alexandria
In Partial Fulfilment of the Requirements of the Degree of

MASTER OF ANAESTHESIA

By

AHMED MANSOUR AHMED ABDOU

MB BCh

FACULTY OF MEDICINE
UNIVERSITY OF ALEXANDRIA

1988

SUPERVISORS

Prof. Dr Fawzy Ahmed Neemat Allah,

Professor of Anaesthesiology,
Faculty of Medicine,
Alexandria University.

Dr. Amal Mohamed Sabry Ahmed,

Lecturer of Anaesthesiology,
Faculty of Medicine,
Alexandria University.

A C K N O W L E D G E M E N T

I would like to express my deepest thanks and gratitude to my supervisor Professor Dr. Fawzy Ahmed Neemat Allah, Professor of Anaesthesia, Faculty of Medicine, Alexandria University, for his valuable advice, continuous interest and encouragement throughout this work.

I owe special gratitude to Dr. Amal Mohamed Sabry Ahmed, Lecturer of Anaesthesia, Faculty of Medicine, Alexandria University, who kindly and patiently supervised this work. Her continuous encouragement and helpful criticism helped me very much to complete this work.

C O N T E N T S

CHAPTER I

INTRODUCTION

I N T R O D U C T I O N

Anatomic considerations:

The eyes are complex sense organs that have evolved from primitive light-sensitive spots on the surface of invertebrates.

The outer protective layer of the eye ball, "the sclera", is modified anteriorly to form the transparent cornea.

Inside the sclera is the choroid, a pigmented layer that contains many of the blood vessels which nourish the structures in the eye ball.

Lining the posterior two thirds of the choroid is the retina, the neural tissue containing the receptor cells.

The crystalline lens is a transparent structure held in place by a circular lens ligament or zonule which is attached to the thickened anterior part of the choroid, the ciliary body.

The ciliary body contains circular and longitudinal fibres that attach near the corneoscleral junction.

In front of the lens is the pigmented and opaque iris, which is the coloured portion of the eye. Variation in the diameter of the pupil can produce up to 5-folds change in the amount of light reaching the retina.

The space between the lens and the retina is filled primarily with a clear gelatinous material called the vitrous humour. Aqueous humour is produced in the ciliary body by diffusion and active transport. It flows through the pupil to fill the anterior chamber of the eye. It is normally reabsorbed through a network of trabeculae into the canal of Schlemm, a venous channel at the junction between the iris and the cornea (anterior chamber angle).(1)

The aqueous humour is chiefly responsible for maintenance of the intraocular pressure, and hence the constancy of the optical dimensions of the eye ball.(2) It carries glucose and amino-acids and mediates the exchange of respiratory gases. It also contains a high concentration of ascorbic acid.(3)

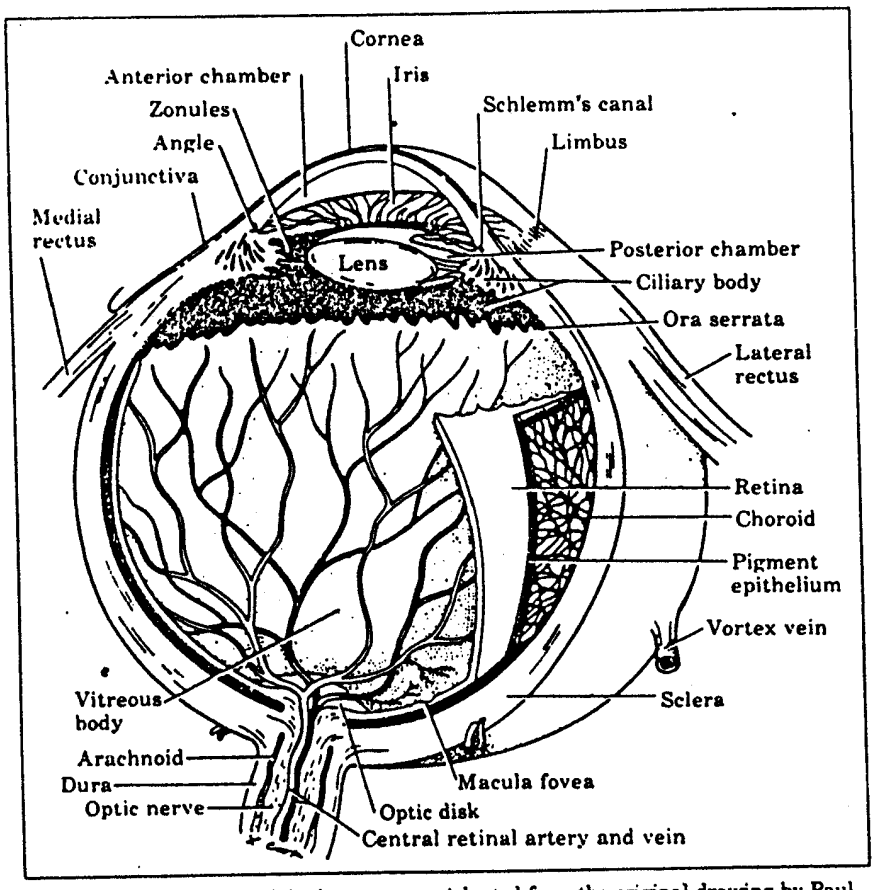


Figure 1: The internal structures of the human eye. (Adapted from the original drawing by Paul Peck, *Anatomy of the Eye*. Courtesy of Lederle Laboratories, Pearl River, N.Y.)

Physiological considerations:

Intraocular pressure (I.O.P.) is defined as the pressure exerted by the contents of the eye against its containing wall.(4)

Intraocular pressure is considered normal within the range of 10 - 22 mm Hg, but ranges more widely in the general population. Diurnal variation of 2 - 3 mm Hg is normal.(5) This pressure is higher than the pressure in any other chamber in the body; this is necessary for proper refraction of the incoming rays since it maintains a good curvature of the cornea.(6)

The I.O.P. is determined by the volumes of the various components within the eye which cause pressure to be exerted outward, the intrinsic compliance, and the external compressive forces which cause pressure to be exerted inwards.(4)

The components within the eye that can undergo significant changes in volume include aqueous humour and blood. Changes in these volumes can significantly alter intraocular pressure.(4)

Aqueous humour is the most important factor that affect the I.O.P. and it fills the anterior (0.25 ml) and posterior (0.06 ml) chambers of the eye. The amount present at any time is dependent on the rate of the formation and drainage.(7)

Aqueous humour is formed in the epithelial cells of the ciliary process by an active secretory process. This accounts for two thirds of its production, while the other one third comes from simple filtration, through the anterior surface of the iris to the anterior chamber.(8) External compression of the globe, either through extraocular muscle contraction or otherwise, can produce direct and indirect increase in IOP by inducing changes in the volumes of the intaocular components.(4) Besides, IOP is under control of the diencephalon through neural and humoral effects.(9)

Once the eye is opened, the IOP becomes atmospheric and any sudden increase in it can lead to loss of vitrous and iris or lens prolapse.(10)

Factors affecting IOP:

1- Changes in systemic arterial blood pressure.

2- Changes in central venous pressure.

3- Changes of intraocular blood volume.

4- Changes in aqueous humor formation.

5- Changes in aqueous drainage.

6- Effect of external compression.

1- Effect of changes in systemic arterial blood pressure:

Arterial blood pressure plays a limited role in the control of the intraocular pressure. Over a physiological range of arterial blood pressure, this role is relatively minor as the eye is capable of autoregulation of its blood supply.(11)

Acute increase in arterial blood pressure causes a slight rise in IOP because of the minimal increase in choroidal volume. In normal eyes, IOP returns rapidly to normal level due to the increase of aqueous drainage.(12)

Moderate decrease in arterial pressure also has a little effect on IOP. However, at values of systolic pressure less than 85 - 90 mm Hg, marked reduction in IOP occurs.(13) At systolic arterial blood pressure of 50 - 60 mm Hg, IOP rapidly approaches zero.

The reduction in IOP is partly due to the decrease in choroidal volume and partly due to the failure of aqueous production.(14)

2- Effect of changes in central venous pressure:

An increase in central venous pressure has a more serious effect on IOP than the increase in arterial blood pressure.(15) Elevation of the central venous pressure inhibits blood efflux from the eye with consequent increase

in IOP. Changes of venous pressure are associated with corresponding changes in the diameter of intraocular blood vessels (most probably vessels of the ciliary process). These will alter the intraocular volume with corresponding change in IOP.(16)

Obstruction of venous return may be caused by coughing, straining on endotracheal tube, vomiting or Valsalva manoeuvre. This causes an immediate increase in choroidal blood volume. If the globe is intact, there is also a reduction in outflow of the aqueous due to back pressure on the veins which drain the canal of Schlemm .(17)

The studies that demonstrate the effects of posture on venous pressure and IOP proved that there is parallel change in CVP and IOP with alteration from Trendelenburg to head up position.(18)

3- Effect of changes of intraocular blood volume:

The most important factor affecting intraocular blood volume is the tone of the intraocular vessels, because alteration in the vascular tone alters the capacitance of these vessels. Intraocular vascular tone is predominantly affected by arterial carbon dioxide tension and by central controlling areas in the diencephalon.(4)

An increase in arterial P CO_2 will result in an increase

in IOP as a result of choroidal vasodilatation or elevation in CVP or more likely a combination of both mechanisms.(19)

The central control of IOP is complex because it involves control of vascular and extravascular muscle tone apart from its possible direct effect on IOP per se. Nevertheless, specific areas of the diencephalon that have been isolated, proved to have specific action on the intraocular tension.(4)

4- Effect of changes in aqueous humor formation on IOP:

Aqueous humor is formed by ultrafiltration from plasma through the ciliary epithelium and by active secretion from these cells. Administration of drugs with sympathetic or parasympathetic effect is associated with stimulation or depression of aqueous formation.(20)

Besides, changes in systemic blood pressure have been shown to depress aqueous formation only when reduced to levels incompatible with adequate perfusion.(21)

Acetazolamide (Diamox) has a significant effect on aqueous humor formation probably through the inhibition of enzyme carbonic anhydrase. Carbonic anhydrase is present on the non-pigmented cells of the ciliary process, where it plays an important role in the formation of aqueous humor. This leads to reduction in IOP, so, it is widely used in

treatment of glaucoma.[22]

It has been suggested that β-adrenergic blocking drugs decrease intraocular pressure by depressing aqueous formation, but evidence for this mechanism of action is still unconclusive.[23]

5- Effect of changes in aqueous drainage:

Drainage of aqueous humor occurs by two routes. The main route is entrance of aqueous humor into the anterior chamber via the pupil and then laterally to the iridocorneal angle. From there, most of the aqueous enters Schlemm 's canal by passing through three layers of meshwork that separate the anterior chamber from the canal.[4]

A smaller proportion of aqueous moves through the interstitial spaces of the ciliary muscle and leaves the eye through the substance of the sclera.[4]

Contraction of the ciliary muscle has been shown to decrease the outflow resistance by opening of the trabecular meshwork.[24]

Resistance to outflow drainage is also influenced by adrenergic stimulation. The studies of the effect of topical epinephrine, norepinephrine and isoproterenol on aqueous humor dynamics, IOP and pupillary size found that α-stimulation induced mydriasis, a decrease in IOP, and increased tonographic

outflow facility. β stimulation decreased IOP without affecting pupillary size or outflow facility.

Epinephrine administration caused β-stimulatory effect at low doses, and α-stimulation at higher dosage. It was postulated that alteration of blood flow through the ciliary processes was the main mechanism by which these various responses were affected.(25)

Some anaesthetics increase aqueous outflow facility, contributing in part to their effect in decreasing IOP. However, this is of minor importance due to their complex effect on IOP.(26)

6- Effect of external compression on IOP:

Digital compression of the globe results in reduction of intraocular pressure. The greatest reduction in IOP occurred in the first minute of compression, less reduction occurred if digital compression is maintained over the next few minutes. The optimal duration of digital pressure was about five minutes, after which time, further compression had little effect.(27)

Effect of anaesthesia on IOP:

Intraocular pressure may be affected in a variety of wasys by drugs administered in the perioperative period:

a- They may act directly on the eye to induce changes in aqueous or intraocular blood volume.

b- They may act locally by altering the tone of the extra-ocular muscles and thus alter the extraocular compression of the sclera.

c- Or they may act indirectly by altering vascular tone or central control of intraocular tension.(4)

Premedication:

Diazepam:

Has been used as a premedicant of special value in ophthalmic surgery, and as a mean to prevent the increase in IOP induced by succinyl choline.(28)

Diazepam when given in a dose of 10 mg just prior to induction of anaesthesia, significantly decreases IOP below control values. But when used as a pretreatment to attenuate the effect of succinyl choline on IOP, it has been found

to be partially effective.[29]

Morphine:

When given intramuscularly, to subjects with or without glaucoma, decreases IOP.[30] The effect of other opiates on IOP has not been studied.

Anticholinergic drugs:

Applied topically to the eye has significant effect on the eye, however, when given intramuscularly as antisialogogic premedicants, they have no effects on IOP. This has been shown for atropine, scopolamine and glycopyrrolate.[30]

Induction agents:

With exception of ketamine, all agents commonly used to induce general anaesthesia reduce IOP.[4]

Thiopentol, midazolam and diazepam were found to reduce IOP to the same degree.[31]

Ketamine is a useful agent because it facilitates examination of the eyes in otherwise uncooperative children, but it increases IOP.[32] Therefore, ketamine is considered as undesirable drug for intraocular surgery, but retains a place as a useful agent for pediatric ophthalmological examination.[4]

Inhalational agents:

It appears that the volatile agents are associated with dose-dependent reduction in IOP, but the factors such as Pa CO_2 and posture may also play an important role in spontaneously breathing patients.(4)

Inhalational anaesthetics are thought to alter IOP in a number of ways: by an effect on the central controlling areas in the midbrain, by altering aqueous outflow facility, and by altering intra and extraocular muscle tone.(4)

Diethyl ether and cyclopropane produce a depression of IOP of similar magnitude at equal depths of anaesthesia.(33)

The more modern volatile anaesthetics (halothane, enflurane and isoflurane) also have a similar effect.(34)

Neuromuscular blocking agents:

Depolarizing agents:

Succinyl choline raises the IOP and so, its use to facilitate tracheal intubation for ocular surgery, especially in emergency open eye, has been a controversial topic among anaesthetists.(35)

It is suggested that succinyl choline produces its

effect partly by increasing extraocular muscle tension and partly by contracting orbital smooth muscles.[36]

The studies of the time course of this effect showed that IOP was elevated 1 min after succinyl choline injection, maximal at 2 - 4 min and subsided at 6 minutes.[37]

In an attempt to offset this undesirable effect of succinyl choline in certain patients, a number of methods have been used including pretreatment with small doses of competitive neuromuscular relaxants, "self taming" small doses of succinyl choline, and drugs such as Acetazolamide, lignocaine and diazepam. However, it is proved that no method of pretreatment is consistently and completely effective in preventing the increase in IOP associated with succinyl choline administration.[4]

Non depolarizing (competitive) agents:

- d-tubocurarine: a decrease in IOP of various degrees has been reported in almost all studies of the effect of d-tubocurarine on IOP. This has been attributed mainly to a decrease in extraocular muscle tone but the concomitant decrease in systemic arterial pressure has also been implicated.[38]

- Pancuronium: the studies of the effect of pancuronium on IOP have produced different results, probably as a result

of differences in methods of evaluation and timing of measurements. Some studies showed that pancuronium caused no change in IOP, but others showed that pancuronium produced a decrease in IOP after 1 minute from its administration.(39)

- Alcuronium: has been shown to have an effect similar to that of pancuronium on intraocular pressure at clinically used dosages.(40)

- Gallamine: has been used in ophthalmic surgery mainly in an attempt to inhibit the increase in IOP occurring after succinyl choline administration but studies failed to confirm this effect.(41)

- Fazadinium: it did not increase IOP but it cannot afford any protection against the increase in IOP accompanying tracheal intubation. So, Fazadinium is considered as an acceptable alternative to use of succinyl choline for emergency intraocular surgery for its rapidity of action.(42)

- Vecuronium: it is considered as an acceptable drug for ophthalmic surgery as it decreases IOP and has a rapid onset of action.(43)

- Atracurium: one of the new non depolarizing agents, causes no change in IOP in patients under steady state anaesthesia.(44)

Endotracheal intubation:

Laryngoscopy and endotracheal intubation can cause striking changes in hemodynamics (increase in heart rate and arterial blood pressure), increase in intracranial pressure and in intraocular pressure. In most patients these changes are transient, highly variable, and probably of little consequence.(45)

In patients who are at risk for developing increased intracranial pressure, arterial hypertension, myocardial ischaemia or rupture globe, however, these changes may be very dangerous.(45) Although deep levels of volatile anaesthetics may limit the cardiovascular response to endotracheal intubation, such an anaesthetic technique may cause intracranial hypertension and seriously reduce cerebral perfusing pressure which is dangerous especially in patients with intracranial mass lesions.(46)

Administration of a larger dose of thiopentone than that commonly used for induction of anaesthesia, might have effectively prevented arterial and intracranial hypertension after endotracheal intubation, but there would have been an increased risk of causing arterial hypotension in at least some patients.(47) It is because of clinical considerations such as these that lidocaine is often administered either intravenously or laryngotracheally before endotracheal

intubation.[48]

Requirements of an ideal muscle relaxant for intubation:

The ease with which tracheal intubation is achieved depends on technical proficiency, depth of anaesthesia, and the degree of muscular relaxation.

In cases where passive regurgitation or active vomiting possess a hazard to the pateint during induction of anaesthesia, the rapid securing of the airway is of prime importance. So, an ideal muscle relaxant for endotracheal intubation must be potent, giving good intubation condition, with rapid onset, and relatively short duration of action with ease of reversibility. Its pharmacodynamic effect should be limited to neuromuscular blockade with no cardiovascular or other side effects such as histamine release.[49]

Pathological factors affecting IOP:

a) Size of the lens: an acute increase in the size of the lens, as in cases of traumatic or congenital cataract, can push the iris leading to angle obstruction with subsequent decrease in aqueous outflow.(50)

b) Inflammation: leads to an increase of IOP.(50)

c) Scleral rigidity: which increased with old age and severe myopia, can change the consistency of the vitreous from gel to fluid. This leads to loss of the binding properties of water and easy displacement of the lens. Therefore, it is better to have the glucomatous patient slightly dehydrated before surgery because overhydration of the normal vitreous increases the IOP.(50)

d) Intraocular tumour: can also increase the IOP.(50)

e) Intravascular osmotic pressure may influence the IOP if the tonicity of the intravascular components is sufficiently increased. Water from extravascular components within the eye and orbit will be drawn e.g. as in diabetic ketoacidosis.(51)

Methods of intraocular pressure measurements:

1. Finger tension:

A rough but reasonably accurate determination of IOP may be made by palpation of the eye ball through closed lids. Pressure just sufficient to indent the globe slightly should be applied.

2. Tonometry:

Accurate IOP may be determined by use of tonometers. Normal range of IOP is 10 - 22 mm Hg. Pressures greater than 25 mm Hg are generally accepted as being glaucomatous.

Types of tonometers:

a) Schiotz tonometer:

It is the device most commonly used by the general physician for measuring intraocular pressure.

b) Applanation tonometer:

This allows a very accurate method for measuring IOP. May be performed with an applanation tonometer mounted on a routine slit lamp biomicroscope or with a handheld applanation tonometer. In myopic patients or patients with

thyroid ocular disease applanation tonometry is more accurate than Schiotz tonometry.

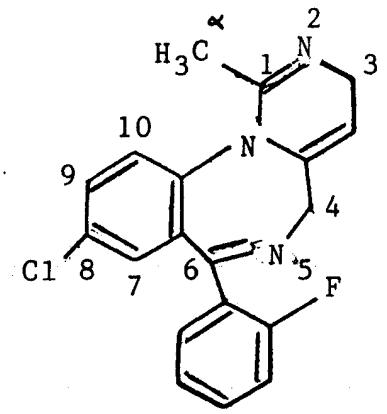
c) The Mackay-Marg tonometer:

It is an electronic tonometer that has its greatest use in patients with corneal scarring or altered corneal shape such that conventional Schiotz or applanation tonometers cannot be employed with any accuracy whatever.

d) The air puff non contact tonometer:

It is an accurate electronic tonometer that has the great advantage of use without topical anaesthetic. This machine is ideal for use in mass glaucoma-screening programs.(52)

Midazolam (Dormicum)



Chemical structure:

It is 8-chloro-6 (2-flurophenyl)-1-methyl-4-H-imidazo [1,5 - a][1,4] benzodiazepine.

Midazolam is a benzodiazepine derivative bearing an imidazol ring fused in position 1,2 with the diazepam ring. Salts of midazolam can be prepared with hydrochloric, maleic or lactic acid and they are easily soluble and very stable in water at a pH <4.(53)

The pharmacological potency of midazolam is similar to that of diazepam. However, its remarkably short duration of action, combined with the excellent water solubility of its salts, confers unique properties on this novel imidazo-benzo diazepine.(54)

Pharmacological actions:

1. Sedative and hypnotic effect:

Both intravenous and oral midazolam possess a hypnotic effect which is not clearly dose related.(55) Some subjects are only mildly sedated after midazolam administration.(56)

2. Effect on psychomotor function:

Considerable suppression of performance was noted one hour after ingestion of midazolam.(57) But, no impairement of performance remained seven to nine hours after single dose up to 30 mg.(58)

3. Suppression of stress response:

Midazolam in common with other benzodiazepines reduces the adrenergic but not the cortisol or renin response to surgical stress. It also decreases plasma concentration of antidiuretic hormone.(59)

4. Effect on memory:

Early studies established the anterograde amnestic action of intravenous midazolam which was maximal at two to five minutes after injection.(60)

5. Cardiovascular effects:

Midazolam causes minimal changes in cardiovascular function. A small increase in heart rate and a decrease in systemic vascular resistance seen especially in people with raised systemic vascular resistance, as in hypertensive patients and those emotionally stressed.(61)

6. Effect on respiration:

In therapeutic doses, intravenous midazolam causes a decrease in tidal volume, compensated for by an increase in respiratory rate, so that minute volume does not change. Midazolam neither reduces the functional residual capacity nor the residual volume.(62)

It causes central depression of respiration, however it does not cause bronchoconstriction in healthy volunteers.(63)

7. Local effects of intravenous midazolam:

Midazolam does not cause pain on injection or subsequent phlebitis or thrombosis which is a problem with intravenous administration of diazepam.(64)

Side effects of midazolam:

Side effects are usually confined to occasional reports of erythema and pain at the site of intramuscular injection.[65] A low incidence of phlebitis, thrombosis and thrombophlebitis follow intravenous injection and have been reported to be less frequently with midazolam than with diazepam in organic solvents.[66]

Apnoea and respiratory depression have occurred with varying frequency when midazolam was used to induce anaesthesia. The incidence has usually been lower with midazolam than with thiopentone.[67] The degree of respiratory depression with midazolam is similar to that with therapeutically equivalent doses of diazepam.[68]

Dosage and administration:

Should be titrated according to patient response but as a guide midazolam in a dose of 0.07 - 0.1 mg Kg^{-1} is usually given for intravenous sedation, and 0.15 - 0.3 mg Kg^{-1} when used for induction of anaesthesia, the recommended dose for intramuscular preoperative sedation is 0.07 - 0.08 mg Kg^{-1}. Although midazolam has a short half life, it influences psychomotor function for several hours after administration.[69]

Atracurium (Tracrium)

Atracurium, a non-depolarizing neuromuscular blocking drug, has been introduced recently to clinical practice.[70] The studies of its metabolic pathways suggest that the molecule may decompose at physiologic pH to inactive metabolites by two mechanisms:

a) Spontaneously by Hofmann elimination, and

b) By an enzymatic ester hydrolysis not dependent on plasma cholinesterase.[71]

The drug produces neuromuscular block of about 30 - 40 minutes in a fully paralytic dose of 0.5 mg Kg^{-1}. The duration of its action is not prolonged by the absence of hepatic or renal pathways of excretion. Recent reports have suggested that owing to its rapid metabolism, it may be the relaxant of choice for patients in renal failure.[72]

Also, it was found that 0.5 mg Kg^{-1} produces good intubation conditions in two minutes.[72]

In addition, the consistent pattern of recovery observed after repeated doses of atracurium for maintenance of neuromuscular blockade indicates that it is essentially a non cumulative relaxant.[73]

In those few instances in which antagonism of residual block was necessary, it was easily accomplished by administration of neostigmine and atropine.(74)

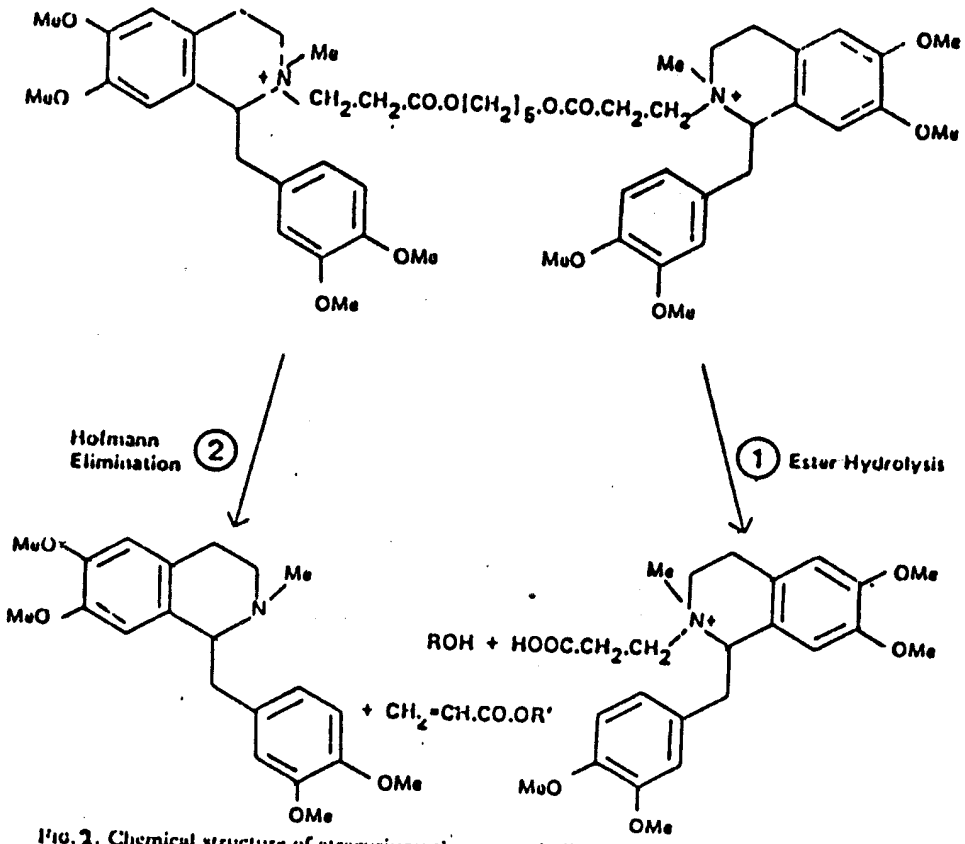
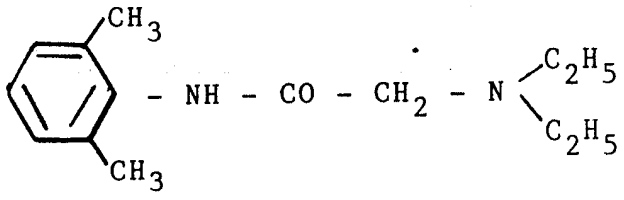


FIG. 2. Chemical structure of atracurium; the arrows indicate the likely metabolic pathways.

Lidocaine (Xylocaine, Lignocaine)



Lidocaine is a local anaesthetic of moderate potency and duration, good penetrative power and rapid onset of action. It is effective by all routes of administration and its advent was partly responsible for the increased popularity of epidural anaesthesia, because its excellent penetration renders blockade by this method highly successful.(75)

Lignocaine is very effective as a surface anaesthetic. Absorption from mucosal surfaces, however, is rapid and may give rise to high blood levels unless the dose is carefully controlled.(76)

Lignocaine is a useful drug in the treatment of cardiac dysrhythmia. It stabilises the membrane of damaged and excitable cells, tending to supress ectopic foci. In therapeutic doses it causes no consistent rate changes, and does not depress conduction in Purkinje tissues.(77)

Lidocaine has also been used to prevent the cardiovascular, intracranial pressure and intraocular pressure changes which occur by intubation by administrating the drug intravenously prior to intubation.(47)

Toxicity of the drug is minimal, but cardiovascular (hypotension and dysrhythmia) and central nervous symptoms (seizures) of poisoning may occur. It has a cerebral effect, causing drowsiness and amnesia.(78)

The suggested maximum dose of lidocaine for a 70 Kg man with adrenaline is 500 mg, i.e. 7 mg/Kg^{-1} and without adrenaline is 200 mg, i.e. 3 $mg\ Kg^{-1}$.(79)

CHAPTER II

AIM OF THE WORK

AIM OF THE WORK

This study was designed to:

1. Assess the effect of midazolam and thiopentone on intraocular pressure.

2. To find out whether pretreatment with intravenous lidocaine (Xylocaine) is effective in preventing the changes in intraocular pressure that are associated with induction and intubation.

3. To find out whether pretreatment with topical lidocaine (Xylocaine) spray of the upper airway can obtund the changes in intraocular pressure associated with intubation.

CHAPTER III

MATERIAL AND METHODS

MATERIAL AND METHODS

Material:

This work included sixty adult patients admitted to the surgical department of the Main Alexandria University Hospital. They were scheduled for elective non ophthalmic operations under general anaesthesia.

Patients were selected of nearly matched age, weight and sex and have normal cardiovascular, respiratory and metabolic systems (of the American Society Association class I).

The age ranged from 18 - 45 years and weight ranged from 55 - 70 Kg.

Patients were classified into two main groups (thirty patients each) and each main group was subdivided into three subgroups (ten patients each).

Table I: Age, weight, sex, diagnosis and type of operation in patients of group I (A).

Patient	Age (years)	Weight (Kg)	Sex	Diagnosis	Operation
1	35	60	M	Chronic appendicitis	Appendicectomy
2	26	65	F	Chronic cholecystitis	Cholecystectomy
3	38	65	F	Breast lump	Excision biopsy
4	19	60	M	Varicocoele	High ligation
5	42	65	M	Thyroid swelling	Thyroidectomy
6	32	70	M	Indirect inguinal hernia	Herniorrhaphy
7	27	65	M	Indirect inguinal hernia	Herniorrhaphy
8	33	55	F	BHF splenomegaly	Splenectomy
9	25	60	M	Varicose veins	Stripping
10	28	55	F	Breast lump	Excision biopsy
Range	19-42	55-70			
$\bar{X}$	30.5	62.0			
S.D.±	6.82	4.83			

Table II: Age, weight, sex, diagnosis and operations in patients of group I (B).

Patient	Age (years)	Weight (Kg)	Sex	Diagnosis	Operation
1	33	65	M	Peptic ulcer	Vagotomy
2	31	60	F	BHF splenomegaly	Splenectomy
3	27	65	M	Varicocoele	High ligation
4	26	60	M	Varicose veins	Stripping
5	28	65	M	Indirect inguinal hernia	Herniorrhaphy
6	31	60	F	Thyroid swelling	Hemithyroidectomy
7	41	65	F	Chronic cholecystitis	Cholecystectomy
8	21	60	M	Hydrocoele	Excision version
9	24	60	F	Breast lump	Excision biopsy
10	45	65	F	Cancer breast	Mastectomy
Range	21-45	60-65			
$\bar{X}$	30.7	62.5			
S.D.	7.44	2.64			

Table III: Age, weight, sex, diagnosis and operations in patients of group I (C).

Patient	Age (years)	Weight (Kg)	Sex	Diagnosis	Operation
1	23	60	M	Piles	Excision
2	25	65	M	Lymphoma	L.N. biopsy
3	34	65	F	Incisional hernia	Herniorrhaphy
4	28	70	M	Indirect inguinal hernia	Herniorrhaphy
5	30	60	F	BHF splenomegaly	Splenectomy
6	25	55	F	Simple nodular goitre	Hemithyroidectomy
7	32	60	M	Indirect inguinal hernia	Herniorrhaphy
8	31	55	F	Breast lump	Excision biopsy
9	27	60	M	Varicose vein	Stripping
10	26	60	M	Chronic appendicitis	Appendicectomy
Range	23-34	55-70			
$\bar{X}$	28.1	61.0			
S.D.	3.54	4.59			

Table IV: Age, sex, weight, diagnosis and operations in patients of group II (A).

Patient	Age (years)	Weight (Kg)	Sex	Diagnosis	Operation
1	25	60	M	Chronic appendicitis	Appendicectomy
2	26	65	M	indirect inguinal hernia	Herniorrhaphy
3	32	60	F	Breast lump	Excision biopsy
4	27	55	F	Thyroid swelling	Hemithyroidectomy
5	35	65	M	BHF splenomegaly	Splenectomy
6	27	60	M	Anal fistula	Fistulectomy
7	33	55	F	Incisional hernia	Keel's repair
8	19	60	M	Varicocoele	High ligation
9	18	55	M	Varicose veins	Stripping
10	41	60	F	Incisional hernia	Herniorrhaphy
Range	18-41	55-65			
$\bar{X}$	28.3	59.5			
S.D.	7.10	3.61			

Table V: Age, weight, sex, diagnosis and operations in patients of group II (B).

Patient	Age (years)	Weight (Kg)	Sex	Diagnosis	Operation
1	23	60	M	Indirect inguinal hernia	Herniorrhaphy
2	21	60	F	Simple nodular goitre	Hemithyroidectomy
3	26	65	M	BHF splenomegaly	Splenectomy
4	28	55	F	Breast lump	Excision biopsy
5	33	60	M	Varicocoele	High ligation
6	42	65	F	Chronic cholecystitis	Cholecystectomy
7	27	55	F	Breast lump	Excision biopsy
8	32	65	M	Peptic ulcer	Vagotomy
9	35	65	F	Cervical rib	Scalenectomy
10	24	60	M	Chronic appendicitis	Appendicectomy
Range	21-42	55-65			
$\bar{X}$	29.1	61.0			
S.D.	6.40	3.94			

Table VI: Age, weight, sex, diagnosis and operations in patients of group II (C).

Patient	Age (years)	Weight (Kg)	Sex	Diagnosis	Operation
1	25	65	M	Varicose vein	Stripping
2	27	55	F	Simple nodular goitre	Hemithyroidectomy
3	28	65	M	Indirect inguinal hernia	Herniorrhaphy
4	41	70	F	Chronic cholecystitis	Cholecystectomy
5	45	65	M	Cervical lymphadeno-pathy	Lymph node biopsy
6	23	55	F	Breast lump	Excision biopsy
7	37	70	M	Varicocoele	High ligation
8	33	60	F	Incisional hernia	Keel's repair
9	26	65	M	Piles	Excision
10	20	60	M	Indirect inguinal hernia	Herniorrhaphy
Range	20-45	55-70			
$\bar{X}$	30.5	62.5			
S.D.	8.20	5.40			

Methods:

Premedication:

All patients were premedicated with pethidine 1 mg Kg^{-1}. No atropine sulphate was given till the IOP was measured.

Induction:

Group I:

Patients received midazolam (Dormicum) intravenously in a dose of 0.3 mg Kg^{-1} as an induction agent. The thirty patients were subdivided into three equal subgroups (10 patients each).

Group I (A):

Patients received midazolam only.

Group I (B):

Patients were pretreated with intravenous lidocaine (Xylocaine) 2% in a dose of 2 mg Kg^{-1} five minutes before induction with midazolam.

Group I (C):

Patients were pretreated with lidocaine spray 10% in a dose of 2 mg Kg^{-1}. Lidocaine was sprayed into the mouth,

tongue, pharynx and larynx five minutes before midazolam induction.

Group II:

Patients received thiopentone sodium 2.5% in a dose of 5 mg Kg^{-1} as an induction agent. The thirty patients were further subdivided into three equal subgroups (10 patients each).

Group II (A):

Patients received thiopentone only.

Group II (B):

Patients were pretreated with lidocaine I.V. 2% in a dose of 2 mg Kg^{-1} five minutes before induction with thiopentone.

Group II (C):

Patients were pretreated with lidocaine spray 10% in a dose of 2 mg Kg^{-1}. Lidocaine was sprayed into the mouth, tongue, pharynx and larynx five minutes before thiopentone induction.

After induction of anaesthesia with the chosen drug, atracurium (Tracrium) in a dose of 0.5 mg Kg^{-1} was administered, artificial ventilation via a face mask was done with

oxygen till complete relaxation occurred, then endotracheal intubation with a cuffed endotracheal tube of the appropriate size was performed.

Maintenance:

Maintenance of anaesthesia was carried out with oxygen (30%), nitrous oxide (70%) supplemented with halothane 0.5-1% and muscle relaxnat (Tracrium). Controlled ventilation was done using Magill attachment.

Measurements:

1. Vital signs:

- Heart rate (beat/min), systolic, diastolic and mean arterial blood pressure (mm Hg) were measured using blood pressure monitor (Vita-stat 900/S).
- Electrocardiogram (ECG) lead II was recorded.

2. Intraocular pressure:

Intraocular pressure was measured using Schiotz tonometer.

The Schiotz tonometer:

It consists of a foot plate curved to fit the average

normal cornea, with a metal plunger in the center for holding various weights, on top of the plunger is a short, curved arm with a lever whose long arm is a pointer for reading positions on a scale. 0 reading on the scale is seen when the ocular end of the plunger fits flush with the curved foot plate. As the plunger indents the cornea, the scale reading increases according to the resistance encountered. Each instrument is accompanied by a graph that expresses the scale readings in millimiters of mercury of internal pressure within the eye.(52)

Timing of measurements:

The previous haemodynamic parameters (H.R., Mean ABP and ECG) and IOP were measured at the same intervals of time:

- Prior to pretreatment.
- After pretreatment and just before induction.
- After induction.
- 60 seconds after intubation.
- 3 minutes after intubation.
- 5 minutes after intubation.

Prior to measurements, a surface anaesthetic (Benoxate hydrochloride 0.4% ophthalmic solution) was used to abolish

the corneal reflex.[80]

3. Conditions of intubation:

The conditions of intubation were classified according to the scheme described by Young, Clarke and Dundee in 1975:[81]

1- Jaw relaxation:

- Good: Jaw is completely relaxed.
- Fair: Jaw is incompletely relaxed.
- Poor: Normal muscle tone of the jaw.

2- Vocal cord relaxation:

- Good: The cords are fully abducted.
- Fair: The cords are partially abducted and gentle pressure is required to pass a tube.
- Slight: The cords are almost adducted.

3- Reaction to intubation:

- Nill: No bucking on the tube.
- Slight: Slight bucking on the tube.
- Marked: Bucking with coughing on the tube.

Statistical methods

From the quantitative data of the results, the following will be calculated:

1- Arithmetic mean of each group ($\bar{X}$):

$$\bar{X} = \frac{\Sigma X}{n}$$

Where: ΣX = Sum of observations.

n = Total number of observations.

2- Standard deviation of each group (S.D.):

$$S = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n - 1}}$$

3- Arithmetic mean of the differences between two groups (d') :

$$d' = \frac{\Sigma d}{n}$$

Where: Σd = Sum of differences between the observations of the group before and after administrations

of drugs.

n = number of observations.

4- Standard deviation of differences between two groups (Sd):

$$Sd = \sqrt{\frac{\Sigma d^2 - \frac{(\Sigma d)^2}{n}}{n - 1}}$$

5- t-test (paired comparison) within group:

$$t = \frac{d' \times \sqrt{N}}{Sd}$$

Level of significance is 5%:

- $P < 0.05$: significant. - $P > 0.05$: insignificant.

6- t-test (comparison between means of two groups):

$$\text{Pooled variance: } (Sp^2) = \frac{S_1^2 (n_1-1) + S_2^2 (n_2-2)}{n_1 + n_2 - 2}$$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{Sp^2}{n_1} + \frac{Sp^2}{n_2}}}$$

Where: n_1 = n° of 1st group.

n_2 = n° of 2nd group.

$\bar{X}_1$ = mean of 1st group.

$\bar{X}_2$ = mean of 2nd group.

S_1^2 = standard deviation of the 1st group.

S_2^2 = standard deviation of 2nd group.

7- f-test: comparison between more than two groups:

$$f = \frac{\text{Between Mean Squares}}{\text{Within Mean Squares}}$$

Least significant difference, it is used to detect significance between each two groups if f-test is significant.

CHAPTER IV

RESULTS

R E S U L T S

The results obtained from this study can be summarized as following:

I. Intraocular pressure: (IOP)

Group IA: Table VII, figure 3,4 (Midazolam).

The preoperative value of IOP ranged between 12.2 and 20.6 mm Hg with a mean of 16.37 ± 2.69 mm Hg. After induction, these values ranged between 9.4 and 15.9 mm Hg with a mean of 11.85 ± 2.60 mm Hg. The mean percentage change from the preoperative values (-28.31 ± 7.59 %) showed significant reduction in IOP after midazolam induction (t = 11.82).

After atracurium, IOP values ranged between 9.1 and 15.6 mm Hg with a mean of 11.79 ± 2.54 mm Hg. The mean percentage change from the post-induction values (0.4 ± 3.39 %) showed an insignificant decrease in IOP (t = 0.37).

Sixty seconds after intubation, the mean percentage change (86.20 ± 18.58) from pre-intubation values showed a significant increase in IOP (t = 14.67) and their values

ranged between 17.3 and 24.4 mm Hg with a mean of 21.62 ± 2.83 mm Hg.

Three minutes after intubation, IOP ranged between 17.3 andd 22.4 mm Hg with a mean of 20.09 ± 1.92 mm Hg. The mean percentage change from the pre-intubation level (74.94 ± 25.05 %) showed a significant increase in IOP (t = 9.46).

Five minutes after intubation, the mean percentage change from the pre-intubation values (43.07 ± 18.71) still showed a significant increase in IOP (t = 7.28) the values of IOP ranged between 13.1 and 20.1 mm Hg with a mean of 16.59 ± 2.58 mm Hg.

Group I B: (I.V. lidocaine pretreatment + Midazolam induction)

Table VIII, figure 3,4.

The preoperative values of IOP ranged between 12.2 and 20.1 mm Hg with a mean of 16.30 ± 2.29 mm Hg. Their values after induction ranged between 9.4 and 17.3 mm Hg with a mean of 12.59 ± 2.38 mm Hg. The mean percentage change from the preoperative values (-23.06 ± 5.94 %) showed a significant reduction in IOP after induction (t = 12.28).

After atracurium administration, IOP values ranged between 9.4 and 17.1 mm Hg with a mean of 12.63±2.41 mm Hg.

Their mean percentage change from the post induction values (0.29 ± 1.75 %) showed an insignificant increase in IOP (t = 0.52).

Sixty seconds after intubation, the mean percentage change from the pre-intubation values (0.48 ± 0.82 %) showed an insignificant increase in IOP (t = 1.85). Their values ranged between 9.4 and 17.3 mm Hg with a mean of 12.7 ± 2.48 mm Hg.

The mean percentage change from the pre-intubation values (-2.46 ± 3.88 %) also showed an insignificant decrease in IOP (t = 2.01). Their values ranged between 9.4 and 14.7 mm Hg with a mean of 12.34 ± 2.43 mm Hg.

Five minutes after intubation, IOP values ranged between 9.4 and 14.6 mm Hg with a mean of 12.04 ± 2.44 mm Hg. Their mean percentage change from the pre-intubation values (-4.91 ± 3.61 %) showed a significant decrease in IOP (t = 4.30).

Group IC: (Lidocaine spray pre-treatment + Midazolam induction) Table IX, figure 3,4.

The pre-operative values of IOP ranged between 12.2 and 20.6 mm Hg with a mean of 16.68 ± 2.40 mm Hg. Their values after induction ranged between 9.4 and 17.3 mm Hg with a mean of 12.62 ± 2.35 mm Hg. Their mean percentage

change from the pre-operative values was (-24.48 ± 6.96 %) which indicates a significant reduction in IOP (t = 11.12).

After atracurium, the mean percentage change from post-induction values (1.75 ± 4.63 %) showed an insignificant increase in IOP (t = 1.20). The values of IOP ranged between 10 and 16.5 mm Hg with a mean of 12.73 ± 2.46 mm Hg.

Sixty seconds after intubation, IOP values ranged between 11.2 and 17.3 mm Hg with a mean of 13.59 ± 2.85 mm Hg. Their mean percentage change from the pre-intubation values (7.35 ± 2.85 %) showed a significant increase in IOP (t = 8.16).

Three minutes after intubation, IOP ranged between 10.2 and 16.5 mm Hg with a mean of 12.92 ± 1.90 mm Hg. Their mean percentage change from the pre-intubation values (1.36 ± 4.07 %) showed an insignificant increase in IOP (t = 1.06).

Five minutes after intubation, IOP values ranged between 9.4 and 16.5 mm Hg with a mean of 12.24 ± 2.08. Their mean percentage change was (-3.41 ± 4.29 %) which revealed a significant decrease in IOP (t = 2.51).

Group II A: (Thiopentone induction) Table X, figure 3, 4.

The pre-operative values of IOP ranged between 13.4

and 17.3 mm Hg with a mean of 15.55 ± 1.56 mm Hg. Their values after induction ranged between 9.4 and 14.6 mm Hg with a mean of 11.60 ± 1.82 mm Hg. The mean percentage change from the pre-operative values (-25.61 ± 5.91) revealed a significant reduction in IOP after induction (t = 13.70).

After atracurium administration, the IOP values ranged between 9.4 and 14.6 mm Hg with a mean of 11.47 ± 1.75 mm Hg. Their mean percentage change from the post induction values (-0.96 ± 4.77 %) showed an insignificant reduction in IOP (t = 0.36).

Sixty seconds after intubation, the mean percentage change from the pre-intubation values (91.15 ± 32.54 %) showed a significant increase in IOP (t = 8.86). The IOP values ranged between 18.9 and 24.6 mm Hg with a mean of 21.56 ± 2.02 mm Hg.

Three minutes after intubation, IOP values ranged between 17.3 and 20.9 mm Hg with a mean of 20.41 ± 1.48 mm Hg. Their mean percentage change from the pre-intubation values (81.38 ± 29.17 %) showed a significant increase in IOP (t = 8.82).

Five minutes, IOP values ranged between 14.3 and 20.1 mm Hg with a mean of 17.24 ± 1.86 mm Hg. The mean percentage change from the pre-intubation values (52.25 ± 20.52) also,

showed a significant increase in IOP (t = 8.05).

Group II B: (I.V. lidocaine pre-treatment + Thiopentone induction) Table XI, figure 3, 4.

The pre-operative values of IOP ranged between 13.4 and 18.5 mm Hg with a mean of 15.85 ± 1.71 mm Hg. After induction, IOP ranged between 9.4 and 14.6 mm Hg with a mean of 11.93 ± 1.80 mm Hg. Their mean percentage change from the pre-operative values was (-24.97 ± 5.03 %) which showed a significant reduction in IOP (t = 15.70)

After atracurium administration, IOP values ranged between 9.4 and 14.1 mm Hg with a mean of 11.90 ± 1.53 mm Hg. Their mean percentage change from the post-intubation values (0.1 ± 3.72 %) revealed an insignificant increase in IOP (t = 0.09).

Sixty seconds after intubation, the mean percentage change from the pre-intubation values was 0.6 ± 0.99 % which indicated insignificant increase in IOP (t = 1.92). The IOP values ranged between 9.4 and 14.3 with a mean of 11.98 ± 1.61 mm Hg.

Three minutes after intubation, IOP ranged between 9.4 and 14.3 mm Hg with a mean of 11.76 ± 1.70 mm Hg. Their percentage change from the pre-intubation values (-1.71 ± 2.53 %) revealed an insignificant decrease in IOP (t = 2.14).

Five minutes after intubation, IOP ranged between 9.4 and 14.1 mm Hg with a mean of 11.48 ± 1.54 mm Hg. Their mean percentage change from the pre-intubation condition (-1.82 ± 3.56 %) showed an insignificant reduction in IOP (t = 1.40).

Group II C: (Lidocaine spray pre-treatment + Thiopentone induction) Table XII, figure 3, 4.

The pre-operative values of IOP ranged between 13.4 and 22.0 mm Hg with a mean of 17.67 ± 2.89 mm Hg. After induction, their values ranged between 10.0 and 17.3 mm Hg. with a mean of 13.39 ± 2.61 mm Hg. The mean percentage change from the pre-operative values (-25.62 ± 6.33 %) showed a significant reduction in IOP (t = 12.80).

After atracurium, there was as insignificant increase in IOP from the post-induction values (t = 1.40) with a mean percentage change of 1.74 ± 3.96 %. The IOP values ranged between 10.0 and 18.5 mm Hg with a mean of 13.63 ± 2.65 mm Hg.

Sixty seconds after intubation, there was a significant increase in IOP from the pre-intubation values (t = 3.49) with a mean percentage change of 4.95 ± 4.49 %. The IOP values ranged between 10.5 and 20.1 mm Hg with a mean of 14.33 ± 3.11 mm Hg.

Three minutes after intubation,the IOP values ranged

between 10.0 and 20.1 mm Hg with a mean of 13.79 ± 3.10 mm Hg. The mean percentage change from the pre-intubation values (-3.46 ± 2.91 %) revealed a significant reduction in IOP ($t = 3.96$).

Five minutes after intubation, IOP ranged between 9.4 and 18.9 mm Hg with a mean of 13.27 ± 2.85 mm Hg. Their mean percentage change from the pre-intubation values (-3.60 ± 3.28 %) showed a significant reduction in IOP ($t = 3.47$).

By comparing the effect of both midazolam and thiopentone induction on the IOP in the three subgroups of each main group (Table XIII), it was apparent that midazolam produced similar degree of reduction in IOP in the three subgroups as the f-test was insignificant ($f = 1.543$) and also, thiopentone produce a similar degree of reduction in IOP in the three subgroups as the f-test was insignificant ($f = 0.041$).

However, after intubation, the f-test was significant between the three subgroups of the main group I ($f = 192.26$) and between the three subgroups of the main group II ($f = 72.44$) indicating that the effect of intubation on IOP in the three subgroups was different.

When comparing the changes in IOP after induction in the similar subgroups using the t-test for comparison

between two groups (Table XIV) we noticed that both midazolam and thiopentone produce a similar degree of reduction in IOP [groups IA and IIA (t=0.888), groups IB and IIB (t=0.766) and groups IC and IIC (T=0.388)].

Also, there was no significant difference between the changes in IOP after intubation in the similar subgroups as the t-test was insignificant [groups IA and IIA (t=0.418), groups IB and IIB (t=0.295) and groups IC and IIC (t=1.427)].

Table VII: Changes in IOP in patients in group IA.

Case / Time	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	18.9	14.6	14.6	23.8	20.6	18.9
2	15.9	9.4	10.2	20.6	20.6	18.9
3	12.2	9.4	9.1	18.5	17.3	13.1
4	17.3	14.6	14.6	24.4	20.6	17.3
5	20.6	15.9	15.6	24.4	21.9	20.1
6	14.6	9.4	9.4	17.3	18.9	14.3
7	17.3	12.2	12.2	23.8	22.4	17.1
8	18.9	13.4	13.1	24.4	22.4	18.5
9	13.4	10.2	10.0	20.1	18.9	13.4
10	14.6	9.4	9.1	18.9	17.3	14.3
$\bar{X}$	16.37	11.85	11.79	21.62	20.09	16.59
S.D.±	2.69	2.60	2.54	2.83	1.92	2.58
Mean % change		-28.31 ±7.59	-0.4 ±3.39	86.20 ±18.58	74.94 ±25.05	43.07 ±18.71
t		11.82*	0.373	14.67*	9.46*	7.28*

* t is significant at $P < 0.05$

V_1 = IOP values after induction.

V_2 = IOP values after atracurium.

V_3 = IOP values 60 sec after intubation.

V_4 = IOP values 3 min after intubation.

V_5 = IOP values 5 min after intubation.

Table VIII: Changes in IOP in patients in group IB.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	17.3	13.4	13.4	13.4	13.1	13.1
2	16.5	14.3	14.9	15.1	14.7	14.6
3	20.1	17.3	17.1	17.3	16.5	16.5
4	15.9	11.2	11.2	11.2	11.2	10.5
5	14.6	10.2	10.2	10.2	10.2	9.4
6	14.3	11.2	11.2	11.2	10.2	10.2
7	18.9	14.3	14.6	14.6	14.3	13.4
8	17.3	13.4	13.1	13.4	13.4	13.1
9	12.2	9.4	9.4	9.4	9.4	9.4
10	15.9	11.2	11.2	11.2	10.2	10.2
$\bar{X}$	16.30	12.59	12.63	12.70	12.34	12.04
S.D.±	2.29	2.38	2.41	2.48	2.43	2.44
Mean % change		-23.06 ±5.94	0.29 ±1.75	0.48 ±0.82	-2.46 ±3.88	-4.91 ±3.61
t		12.28*	0.52	1.85	2.01	4.30*

Table IX: Changes in IOP in patients in group IC.

Case \ Time	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	18.5	17.3	16.5	17.3	16.5	16.5
2	17.0	13.1	13.1	14.1	13.1	13.1
3	15.6	11.2	11.5	12.0	12.0	12.0
4	20.6	15.1	15.1	15.6	16.5	14.6
5	18.9	13.1	13.1	14.1	12.2	11.2
6	16.5	12.2	12.0	13.1	13.1	12.0
7	14.3	10.2	11.2	12.0	11.2	10.2
8	12.2	9.4	10.0	11.2	10.2	9.4
9	15.9	11.2	12.0	13.1	12.2	11.2
10	17.3	13.4	13.1	13.4	13.1	12.2
$\bar{X}$	16.68	12.62	12.73	13.59	12.92	12.24
S.D.±	2.40	2.35	2.46	2.85	1.90	2.08
Mean % change		-24.48 ±6.96	1.75 ±4.63	7.35 ±2.85	1.36 ±4.07	-3.40 ±4.29
t		11.12*	1.20	8.16*	1.06	2.51*

Table X: Changes in IOP in patients in group IIA.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	16.5	11.2	10.2	20.6	20.6	18.9
2	17.3	12.2	12.2	24.6	22.2	20.1
3	15.5	11.2	11.2	18.9	18.9	15.6
4	14.3	10.2	10.5	18.9	17.3	15.9
5	13.4	9.4	10.0	24.4	22.4	16.5
6	14.6	10.2	9.4	22.4	20.9	14.3
7	17.3	14.6	14.1	20.6	20.6	17.3
8	15.9	12.2	12.0	21.9	20.0	17.3
9	13.4	10.2	10.5	20.6	20.6	18.9
10	17.3	14.6	14.6	22.2	20.6	18.5
$\bar{X}$	15.55	11.60	11.47	21.56	20.41	17.24
S.D.±	1.56	1.82	1.75	2.02	1.48	1.86
Mean % change		-25.61 ±5.91	-0.96 ±4.77	91.15 ±32.54	81.38 ±29.17	52.25 ±20.52
t		13.70*	0.36	8.86*	8.82*	8.05*

Table XI: Changes in IOP in patients in group IIB.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	15.9	11.2	11.2	11.2	10.5	10.5
2	13.4	9.4	10.0	10.0	9.4	9.4
3	16.5	13.4	13.1	13.4	13.1	12.2
4	15.1	12.0	12.0	12.0	12.0	11.2
5	17.3	13.4	13.4	13.4	13.1	12.2
6	16.5	13.4	13.1	13.4	13.4	13.4
7	18.5	14.6	14.1	14.3	14.3	14.1
8	14.6	10.5	11.2	11.2	11.2	11.2
9	17.3	12.0	11.5	11.5	11.2	11.2
10	13.4	9.4	9.4	9.4	9.4	9.4
$\bar{X}$	15.85	11.93	11.90	11.98	11.76	11.48
S.D.±	1.71	1.80	1.53	1.61	1.70	1.54
Mean % change		-24.97 ±5.03	0.1 ±3.72	0.6 ±0.99	-1.71 ±2.53	-1.82 ±3.56
t		15.70*	0.09	1.92	2.14	1.40

Table XII: Changes in IOP in patients in group IIC.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	17.3	13.1	13.1	13.4	13.4	13.1
2	20.6	13.4	14.6	15.6	14.6	14.3
3	18.9	15.9	15.6	15.9	15.6	14.6
4	14.6	11.2	12.0	12.0	11.2	11.2
5	20.6	17.3	18.5	20.1	20.1	18.9
6	17.0	12.2	13.1	13.1	12.2	12.0
7	22.0	16.5	16.5	18.5	17.3	16.5
8	15.6	11.2	10.9	12.0	11.5	11.5
9	16.5	12.2	12.0	12.2	11.5	11.2
10	13.4	10.0	10.0	10.5	10.0	9.4
$\bar{X}$	17.67	13.39	13.63	14.33	13.79	13.27
S.D.±	2.89	2.61	2.65	3.11	3.10	2.85
Mean % change		-25.62 ±6.33	1.74 ±3.96	4.95 ±4.49	-3.46 ±2.91	-3.60 ±3.28
t		12.80*	1.40	3.49*	3.96*	3.47*

Table XIII: Comparison of IOP change in patinets of similar groups in the two main groups.

Group	Time	Pre-operative	After induction	% change	Before intubation	After intubation	% change
IA	$\bar{X}$	16.37	11.85	-28.31	11.79	21.62	86.20
	S.D.±	2.69	2.60	7.59	2.54	2.83	18.58
IIA	$\bar{X}$	15.55	11.60	-25.61	11.47	21.56	91.15
	S.D.±	1.56	1.82	5.91	1.75	2.02	32.54
	t			0.888			0.418
IB	$\bar{X}$	16.30	12.59	-23.06	12.63	12.70	0.48
	S.D.±	2.29	2.38	5.94	2.41	2.48	0.82
IIB	$\bar{X}$	15.85	11.93	-24.97	11.9	11.98	0.60
	S.D.±	1.71	1.80	5.03	1.53	1.61	0.99
	t			0.776			0.295
IC	$\bar{X}$	16.68	12.62	-24.48	12.73	13.59	7.35
	S.D.±	2.40	2.35	6.96	2.46	2.85	2.85
IIC	$\bar{X}$	17.67	13.39	-25.62	13.63	14.33	4.95
	S.D.±	2.89	2.61	6.33	2.65	3.11	4.49
	t			0.388			1.427

Table XIV: Comparison of the IOP changes in patients of the three subgroups in each main group.

Group	Time	Pre-oper.	After ind.	% change	Before intub.	After intub.	% change
IA	$\bar{X}$	16.37	11.85	-28.31	11.79	21.62	86.20
	S.D.±	2.69	2.60	7.59	2.54	2.83	18.58
IB	$\bar{X}$	16.30	12.59	-23.06	12.63	12.70	0.48
	S.D.±	2.29	2.38	5.94	2.41	2.48	0.82
IC	$\bar{X}$	16.68	12.62	-24.48	12.73	13.59	7.35
	S.D.±	2.40	2.35	6.96	2.46	2.85	2.85
F				1.543			192.26*
IIA	$\bar{X}$	15.55	11.60	-25.60	11.47	21.56	91.5
	S.D.±	1.56	1.82	5.91	1.75	2.02	32.54
IIB	$\bar{X}$	15.85	11.93	-24.97	11.90	11.98	0.6
	S.D.±	1.71	1.80	5.03	1.53	1.61	0.91
IIC	$\bar{X}$	17.67	13.39	-25.62	13.63	14.33	4.95
	S.D.±	2.89	2.61	6.33	2.65	3.11	4.49
F				0.041			72.44*

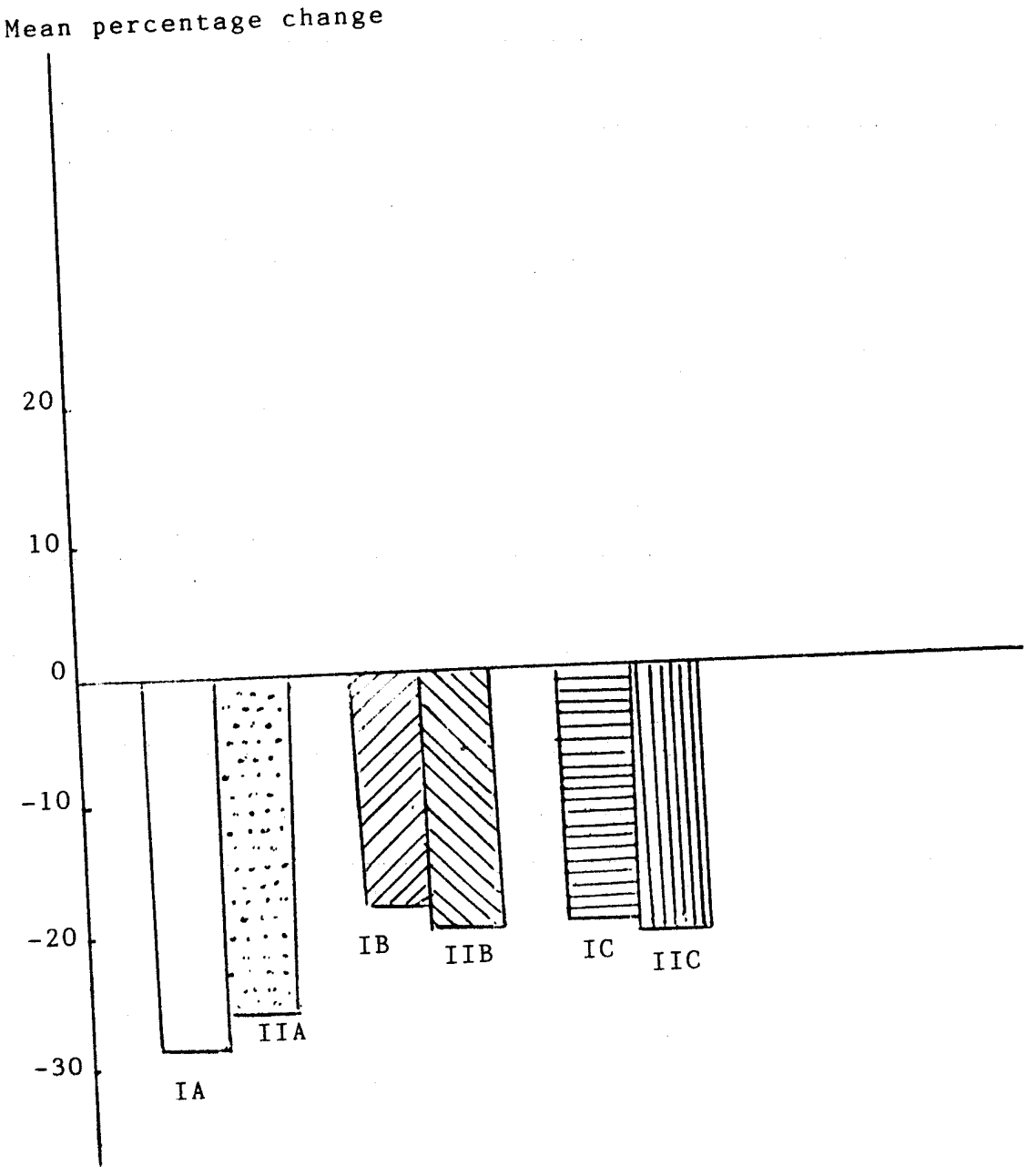


Figure 3: Mean percentage change in IOP after induction.

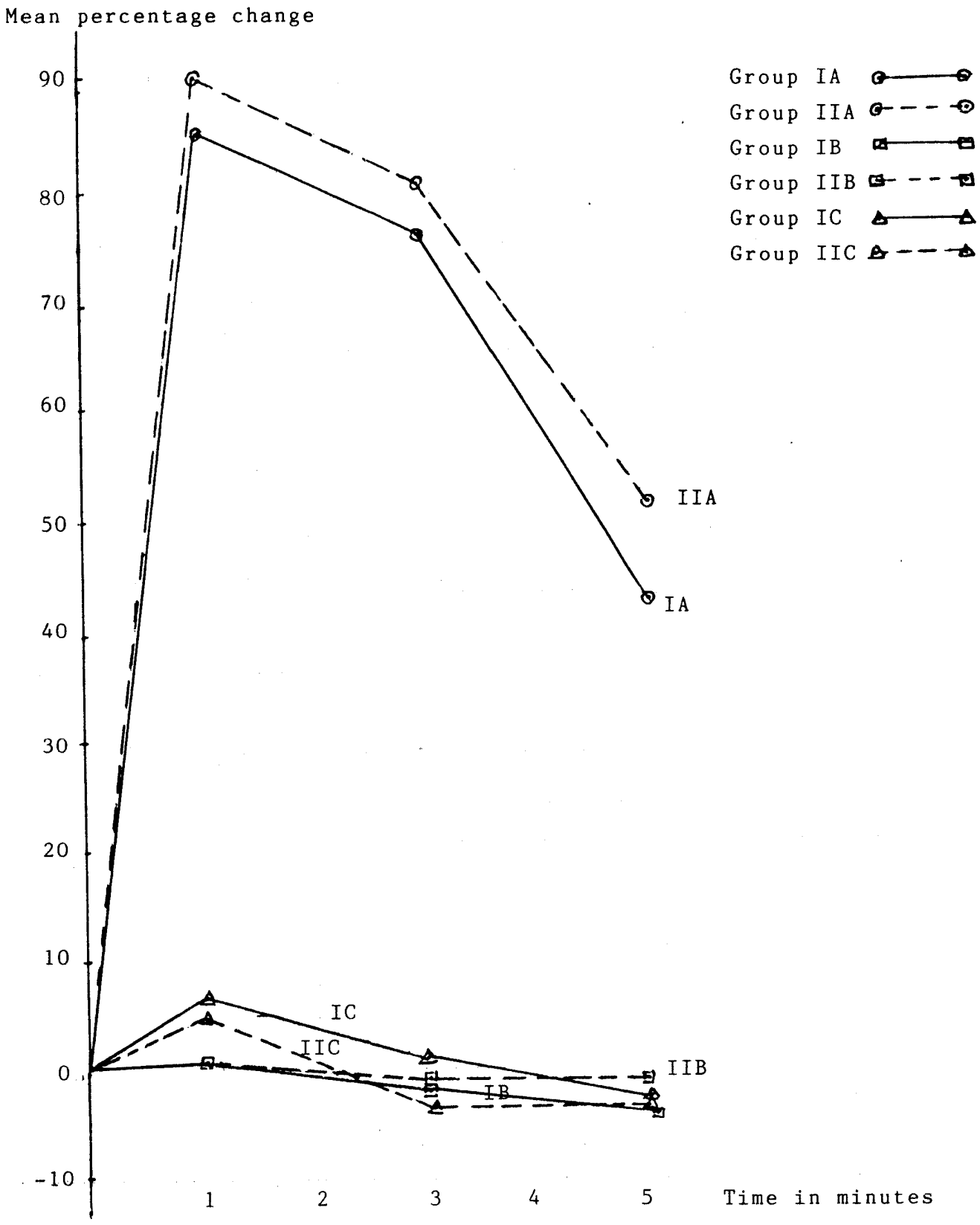


Figure 4 ; Mean percentage changes in IOP after intubation.

II. Mean arterial blood pressure:

Group IA: (Midazolam induction) Table XV, figure 5, 6.

The pre-operative values of mean ABP ranged between 85 and 93 mm Hg with a mean of 90.4 ± 2.5 mm Hg. After induction, it ranged between 77 and 88 mm Hg with a mean of 82.7 ± 3.47 mm Hg. The mean percentage change from the pre-operative values (-8.44 ± 1.78 %) showed a significant decrease in mean ABP ($t = 14.99$).

After atracurium administration, it ranged between 79 and 88 mm Hg with a mean of 82.9 ± 2.96 mm Hg. Their mean percentage change from the post-induction values (0.29 ± 2.1 %) revealed an insignificant increase in mean ABP ($t = 0.43$).

Sixty seconds after intubation, mean ABP ranged between 102 and 123 mm Hg with a mean of 109.0 ± 5.96 mm Hg. The mean percentage change from pre-intubation values was 31.45 ± 4.42 % which indicated significant increase in mean ABP ($t = 22.5$).

Three minutes after intubation, the mean percentage change from the pre-intubation values (27.1 ± 4.0 %) showed

a significant increase in mean ABP (t = 21.42). Their values ranged between 101 and 112 mm Hg with a mean of 105.3 ± 3.5 mm Hg.

Five minutes after intubation, mean ABP ranged between 91 and 101 mm Hg with a mean of 96.3 ± 3.02 mm Hg. Their mean percentage change from pre-intubation values (16.28 ± 5.14 %) showed a significant increase in mean ABP (t = 10.02).

Group IB: (I.V. lidocaine pretreatment + midazolam induction) Table XVI, figure 5, 6.

The pre-operative values of mean ABP ranged between 88 and 101 mm Hg with a mean of 95.0 ± 4.78 mm Hg. After induction it ranged between 80 and 91 mm Hg with a mean of 85.6 ± 4.33 mm Hg. The mean percentage change from the pre-operative values (-9.89 ± 0.99 %) showed a significant reduction in mean ABP (t = 31.59).

After atracurium, mean ABP ranged between 80 and 92 mm Hg with a mean of 85.2 ± 4.26 mm Hg. There was an insignificant reduction in mean ABP (t = 1.75) with a mean percentage change of -0.89 ± 1.61 % from the post-induction values.

Sixty seconds after intubation, mean ABP ranged from 86 to 97 mm Hg with a mean of 91.4 ± 3.41 mm Hg. The mean percentage change from the pre-intuabtion values (7.35 ±

2.38 %) showed a significant increase in mean ABP (t = 9.77).

Three minutes after intubation, the mean percentage change (4.76 ± 2.01 %) also showed a significant increase in mean ABP (t = 7.49). The mean ABP ranged between 85 and 95 mm Hg with a mean of 89.2 ± 3.22 mm Hg.

Five minutes after intubation, mean ABP ranged between 81 and 90 mm Hg with a mean of 85.70 ± 3.20 mm Hg. The mean percentage change from pre-intubation values was 0.65 ± 2.08 % which revealed an insignificant increase in mean ABP (t = 0.99).

Group IC: (Lidocaine spray pretreatment + midazolam induction) Table XVII, figure 5, 6.

The pre-operative values of mean ABP ranged between 85 and 94 mm Hg with a mean of 91.1 ± 3.38 mm Hg. After induction, it ranged between 82 and 88 mm Hg with a mean of 83.1 ± 3.75 mm Hg. The mean percentage change from the pre-operative values (-8.8 ± 1.37 %) showed a significant reduction in mean ABP after induction (t = 20.31).

After atracurium, mean ABP ranged between 81 and 89 mm Hg with a mean of 83.4 ± 2.95 mm Hg. Their mean percentage change from the post-induction values was 0.42 ± 2.15 % which indicated an insignificant increase in mean ABP (t =

0.62).

Sixty seconds after intubation, a significant increase in mean ABP was detected (t = 23.40) with a mean percentage change from the pre-intubation values of 17.54 ± 2.37 %. The mean ABP values ranged between 92 and 103 mm Hg with a mean of 98.0 ± 3.23 mm Hg.

Three minutes after intubation, the mean ABP values ranged between 88 and 100 mm Hg with a mean of 93.8 ± 4.29 mm Hg. The mean percentage change from pre-intubation values was 12.48 ± 3.75 % which revealed a significant increase in mean ABP (t = 10.52).

An insignificant increase in mean ABP was detected five minutes after intubation (t = 0.58) with a mean percentage change of 0.4 ± 2.23 %. The mean ABP ranged between 80 and 88 mm Hg with a mean of 83.7 ± 2.71 mm Hg.

Group II A: (Thiopentone induction) Table XVIII, figure 5,6.

The pre-operative values of mean ABP ranged between 83 and 105 mm Hg with a mean of 91.4 ± 6.55 mm Hg. After induction, it ranged between 71 and 92 mm Hg with a mean of 82.5 ± 5.89 mm Hg. The mean percentage change from the pre-operative values (-9.75 ± 2.51 %) revealed a significant reduction in mean ABP (t = 12.28).

After atracurium, the mean percentage change from the post-induction values (-0.64 ± 4.09 %) showed an insignificant decrease in mean ABP (t = 0.5). It ranged between 76 and 94 mm Hg with a mean of 81.9 ± 5.82 mm Hg.

Sixty seconds after intubation, mean ABP ranged between 102 and 127 mm Hg with a mean of 117.5 ± 8.85 mm Hg. Its mean percentage change from the pre-intubation values (43.79 ± 10.90 %) revealed a significant increase in mean ABP (t = 12,70).

Three minutes after intubation, it ranged between 101 and 124 mm Hg with a mean of 110.5 ± 7.06 mm Hg. The percentage change (35.35 ± 10.78 %) also showed a significant increase in mean ABP (t = 10.37).

Five minutes after intubation, the mean ABP is still significantly higher than pre-intubation values (t = 8.57) as indicated by the mean percentage change (21.97 ± 8.11 %). It ranged between 94 and 110 mm Hg with a mean of 99.6 ± 5.13 mm Hg.

Group IIB: (I.V. lidocaine pretreatment + Thiopentone induction) Table XIX, figure 5, 6.

The pre-operative values ranged between 84 and 105 mm Hg with a mean of 94.6 ± 6.80 mm Hg. After induction,

it ranged between 76 and 93 mm Hg with a mean of 85.0 ± 5.94 mm Hg resulting in a mean percentage change of -10.13 ± 1.34 % which revealed a significant decrease in mean ABP ($t = +23.91$).

An insignificant decrease in mean ABP was detected after atracurium administration ($t = 0.30$) as determined by the mean percentage change of -0.18 ± 1.87 %. The values of mean ABP ranged between 80 and 93 mm Hg with a mean of 84.8 ± 5.47 mm Hg.

Sixty seconds after intubation, the mean percentage change from the pre-intubation values (8.73 ± 1.63 %) revealed a significant increase in mean ABP ($t = 16.94$). Mean ABP ranged between 82 and 101 mm Hg with a mean of 92.2 ± 6.11 mm Hg.

Three minutes after intubation, it ranged between 80 and 96 mm Hg with a mean of 89.1 ± 5.22 mm Hg. The mean percentage change from pre-intubation values (4.99 ± 1.35 %) revealed a significant increase in mean ABP ($t = 11.69$).

After five minutes, an insignificant increase in mean ABP was detected ($t = 0.58$) as indicated by the mean percentage change (0.87 ± 2.37 %). It ranged between 80 and 95 mm Hg with a mean of 85.5 ± 5.33.

Group IIC: (Lidocaine spray pretreatment + Thiopentone induction) Table XX, figure 5, 6.

The pre-operative values ranged between 85 and 106 mm Hg with a mean of 96.5 ± 6.98 mm Hg. After induction, it ranged between 76 and 98 mm Hg with a mean of 87.4 ± 7.34 mm Hg, producing a mean percentage change of -9.49 ± 1.39 % indicating a significant decrease in mean ABP (t = 21.75).

After atracurium, an insignificant increase in mean ABP was detected (t = 1.84) as the mean percentage change from the post-induction values was 0.39 ± 0.67 %. The mean ABP ranged between 77 and 99 mm Hg with a mean of 87.7 ± 6.91 mm Hg.

Sixty seconds after intubation, it ranged between 94 and 112 mm Hg with a mean of 103.8 ± 6.63 mm Hg. The mean percentage change from the pre-intubation values (18.56 ± 5.0 %) indicated a significant rise in mean ABP (t = 11.74).

Three minutes after intubation, it ranged between 89 and 103 mm Hg with a mean of 95.5 ± 4.45 mm Hg. The mean percentage change (9.27 ± 3.98 %) revealed a significant increase in mean ABP (t = 7.37).

After five minutes, an insignificant increase in mean

ABP was detected (t = 1.04) and the mean percentage change was 0.46 ± 1.40 %. The mean ABP ranged between 79 and 100 mm Hg, wiht a mean of 88.1 ± 7.05 mm Hg.

By comparing the effect of both midazolam and thiopentone induction on the mean ABP in the three subgroups of each main group (Table XXI), it was apparent that midazolam produced a similar degree of reduction in mean ABP in the three subgroups as the f-test was insignificant (f = 0.838) and also, thiopentone produce a similar degree of reduction in mean ABP in the three subgroups as the f-test was insignificant (f = 0.310).

However after intubation, the f-test was significant between the three subgroups of the main group I (f = 114.122) and between the three groups of the main group II (f = 52.016) indicating that the effect of intubation on mean ABP was different in the three subgroups.

When comparing the change in mean ABP after induction, in the similar subgroups using t-test for comparison between two groups, table XXII, we noticed that both midazolam and thiopentone produce a similar degree of reduction in mean ABP as the t-test was insignificant [groups IA, IIA (t=1.346), groups IB and IIB (t=0.456) and groups IC and IIC (t=1.118)].

After intubation, the t-test between two groups was

only significant between groups IA and IIA ($t = 3.318$) but was insignificant between groups IB and IIB ($t = 1.694$) and groups IC and IIC ($t = 0.583$).

Table XV: Changes in mean arterial blood pressure in patients in group IA.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	90	82	83	110	108	99
2	89	81	80	106	105	98
3	88	78	79	105	103	97
4	91	82	83	109	107	95
5	92	85	83	102	103	94
6	93	86	88	123	112	93
7	85	77	79	103	101	91
8	91	83	85	112	108	101
9	93	85	83	111	105	98
10	92	88	86	109	101	97
$\bar{X}$	90.4	82.7	82.9	109.0	105.3	96.3
S.D.±	2.50	3.47	2.96	5.96	3.50	3.02
Mean % change		-8.44 ±1.78	0.29 ±2.1	31.45 ±4.42	27.1 ±4.0	16.28 ±5.14
t		14.99*	0.43	22.5*	21.42*	10.02*

V_1 = values of mean ABP after induction.

V_2 = values of mean ABP after atracurium.

V_3 = values of mean ABP 60 seconds after intubation.

V_4 = values of mean ABP 3 minutes after intubation.

V_5 = values of mean ABP 5 minutes after intubation.

Table XVI: Changes in mean arterial blood pressure in patients in group IB.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	94	85	85	92	90	88
2	98	88	87	94	91	87
3	101	90	92	95	93	90
4	90	82	80	88	85	82
5	91	80	81	86	86	83
6	97	88	86	90	88	84
7	100	91	91	97	95	90
8	100	90	87	93	90	87
9	91	82	83	90	88	85
10	88	80	80	89	86	81
$\bar{X}$	95.0	85.6	85.2	91.4	89.2	85.70
S.D.±	4.78	4.33	4.26	3.41	3.22	3.20
Mean % change		-9.89 ±0.99	-0.89 ±1.61	7.35 ±2.38	4.76 ±2.01	0.65 ±2,08
t		31.59*	1.75	9.77*	7.49*	0.99

Table XVII: Changes in mean arterial blood pressure in patients in group IC.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	90	82	83	99	99	85
2	94	86	85	101	98	88
3	96	88	89	103	100	88
4	87	80	83	95	92	84
5	92	85	82	100	96	82
6	93	87	86	98	94	84
7	85	76	78	92	88	80
8	90	80	81	95	90	82
9	94	85	84	99	92	81
10	90	82	83	98	89	83
$\bar{X}$	91.1	83.1	83.4	98.0	93.8	83.7
S.D.±	3.38	3.75	2.95	3.23	4.29	2.71
Mean % change		-8.80 ±1.37	0.42 ±2.15	17.54 ±2.37	12.48 ±3.75	0.4 ±2.23
t		20.31*	0.62	23.40*	10.52*	0.58

Table XVIII: Changes in mean arterial blood pressure in patients in group IIA.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	95	85	83	102	101	95
2	90	83	80	117	109	101
3	85	79	81	127	113	98
4	92	83	78	112	110	95
5	91	81	85	125	109	98
6	105	92	94	125	113	105
7	83	71	75	109	107	94
8	87	79	76	110	101	97
9	98	90	88	121	118	103
10	88	82	79	127	124	110
$\bar{X}$	91.4	82.5	81.9	117.5	110.5	99.6
S.D.±	6.55	5.89	5.82	8.85	7.06	5.13
Mean % change		-9.75 ±2.51	-0.64 ±4.09	43.79 ±10.9	35.35 ±10.78	21.97 ±8.11
t		12.28*	0.5	12.70*	10.37*	8.57*

Table XIX: Changes in mean arterial blood pressure in patients in group IIB.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	92	80	80	88	85	83
2	100	91	93	101	96	95
3	105	93	92	100	95	92
4	103	92	90	98	94	91
5	98	88	86	92	90	85
6	88	80	81	89	85	82
7	95	87	85	91	90	84
8	90	81	80	87	85	82
9	84	76	77	82	80	80
10	91	82	84	94	91	81
$\bar{X}$	94.6	85.0	84.8	92.2	89.1	85.5
S.D.±	6.80	5.94	5.47	6.11	5.22	5.33
Mean % change		-10.13 ±1.34	-0.18 ±1.87	8.73 ±1.63	4.99 ±1.35	0.87 ±2.37
t		23.91*	0.30	16.94*	11.69*	0.58

Table XX: Changes in mean arterial blood pressure in patients in group IIC.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	97	87	88	104	96	89
2	105	95	94	105	100	95
3	106	98	99	110	103	100
4	95	86	87	112	95	85
5	92	81	83	99	92	83
6	98	90	90	107	97	91
7	104	96	95	112	99	95
8	89	80	81	95	94	80
9	85	76	77	94	89	79
10	94	85	83	100	90	84
$\bar{X}$	96.5	87.4	87.7	103.8	95.5	88.1
S.D.±	6.98	7.34	6.91	6.63	4.45	7.05
Mean % change		-9.49 ±1.39	0.39 ±0.67	18.56 ±5.0	9.27 ±3.98	0.46 ±1.40
t		21.75	1.84	11.74*	7.37*	1.04

Table XXI: Comparison of changes in mean ABP in patients of similar groups in the two main groups.

Group	Time	Pre-oper.	After ind.	% change	Before intub.	After intub.	% change
IA	$\bar{X}$	90.4	82.7	-8.44	82.9	109.0	31.45
	S.D.±	2.50	3.47	1.78	2.96	5.96	4.42
IIA	$\bar{X}$	91.4	82.5	-9.75	81.9	117.5	43.79
	S.D.±	6.55	5.89	2.51	5.82	8.85	10.90
t				1.346			3.318*
IB	$\bar{X}$	95.0	85.6	-9.89	85.2	94.7	7.35
	S.D.±	4.78	4.33	0.99	4.26	4.47	2.38
IIB	$\bar{X}$	94.6	85.0	-10.13	84.8	95.9	8.73
	S.D.±	6.80	5.94	1.34	5.47	7.74	1.63
t				0.456			1.694
IC	$\bar{X}$	91.1	83.1	-8.80	83.4	98,0	17.54
	S.D.±	3.38	3.75	1.37	2.95	3.23	2.37
IIC	$\bar{X}$	96.5	87.4	-9.49	87.7	103.8	18.56
	S.D.	6.98	7.34	1.39	6.91	6.63	5.0
t				1.118			0.583

Table XXII: Comparison of the mean ABP changes in patients of the three subgroups of each main group.

Time / Group		Pre-oper.	After ind.	% change	Before intub.	After intub.	% change
IA	$\bar{X}$	90.4	82.7	-8.44	82.9	109.0	31.45
	S.D.±	2.50	3.47	1.78	2.96	5.96	4.42
IB	$\bar{X}$	95.0	85.6	-9.89	85.2	94.7	7.35
	S.D.±	4.78	4.33	0.99	4.26	4.47	2.38
IC	$\bar{X}$	91.1	8.31	-8.80	83.4	98.0	17.54
	S.D.±	3.38	3.75	1.37	2.95	3.23	2.37
F				0.838			114.122*
IIA	$\bar{X}$	91.4	82.5	-9.75	81.9	117.5	43.79
	S.D.±	6.55	5.89	2.51	5.82	8.85	10.90
IIB	$\bar{X}$	94.6	85.0	-10.13	84.8	95.9	8.73
	S.D.±	6.80	5.94	1.34	5.47	7.74	1.63
IIC	$\bar{X}$	96.5	87.4	-9.49	87.7	103.8	18.56
	S.D.±	6.98	7.34	1.39	6.91	6.63	5.0
F				0.310			52.016*

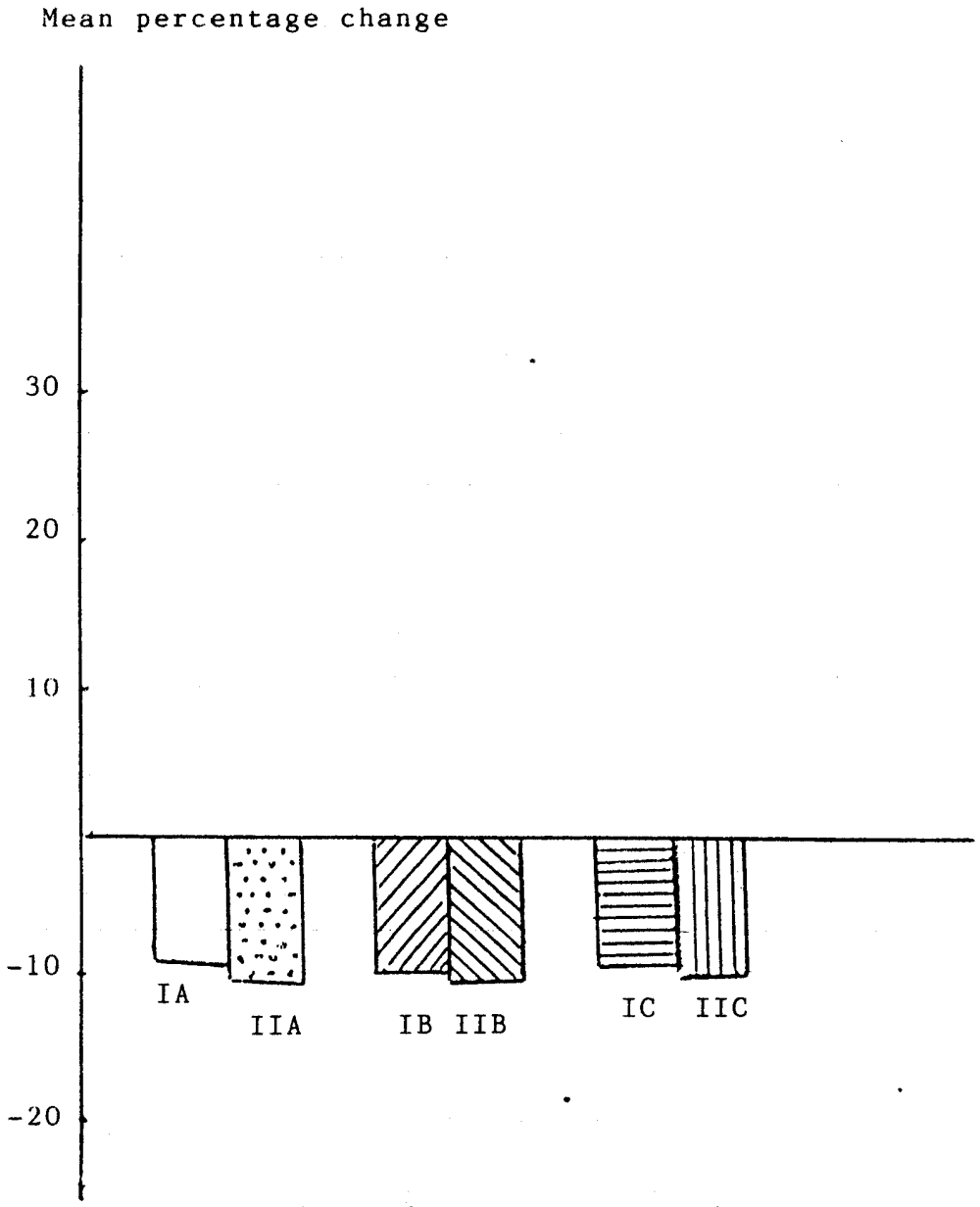


Figure 5: Mean percentage change in mean arterial blood pressure after induction.

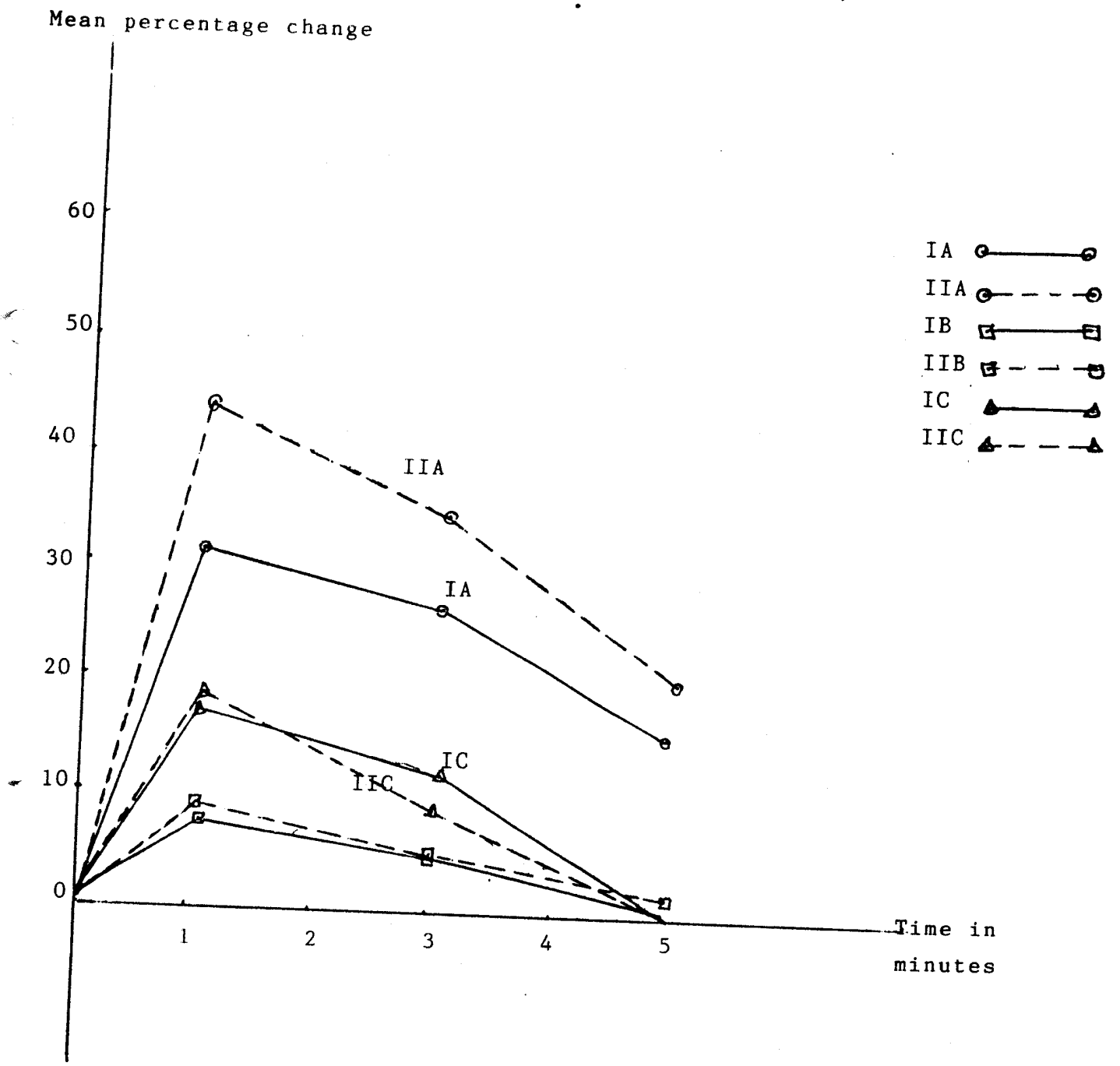


Figure 6 : Mean percentage changes in mean ABP after intubation.

III. Heart rate:

Group IA: Table XXIII, figure 7, 8.

The pre-operative values ranged between 80 and 93 b/min with a mean of 86.1 ± 4.93 b/min. After induction, it ranged between 83 and 96 with a mean of 92.8 ± 5.20 b/min. This resulted in a mean percentage change of 7.80 ± 1.63 % which revealed a significant increase in H.R. (t = 15.13).

After atracurium, it ranged between 85 and 100 b/min with a mean of 93.6 ± 5.27 b/min. The mean percentage change from the post-induction values (0.88 ± 2.13 %) showed an insignificant increase in H.R. (t = 1.31).

Sixty secinds after intubation, it ranged between 94 and 111 with a mean of 101.7 ± 5.56 b/min resulting in a mean percentage change of 9.96 ± 1.62 % from the pre-intubation values. This showed a significant increase in H.R. (t = 19.44).

After three minutes, the increase in H.R. was still significant (t = 4.11) and the mean percentage change was 3.99 ± 3.07 %. The heart rate ranged from 92 to 107 b/min with a mean of 97.3 ± 5.62 b/min.

After five minutes, H.R. ragned between 86 and 98 b/min

with a mean of 91.3 ± 3.59 b/min. The mean percentage change from the pre-intubation values was -2.34 ± 3.0 which revealed an insignificant decrease in H.R. (t = 2.47).

Group IB: Table XXIV, figure 7, 8.

The pre-operative values of H.R. ranged between 77 and 95 with a mean of 83.4 ± 5.89 b/min. After induction, it ranged between 85 and 99 b/min with a mean of 89.6 ± 5.34 b/min. The mean percentage change from the pre-operative values was 7.52 ± 2.02 % which revealed a significant increase in H.R. (t = 10.81).

After atracurium administration, it ranged between 85 and 99 b/min with a mean of 90.3 ± 5.12 b/min. The mean percentage change (0.8 ± 1.16 %) from the post-induction values showed an insignificant increase in H.R. (t = 2.18).

Sixty seconds after intubation, it ranged between 89 and 102 b/min with a mean of 94.8 ± 4.76 b/min. The mean percentage change from the pre-intubation condition (5.05 ± 2.76 %) showed a significant increase in H.R. (t = 5.79).

After three minutes, it ranged between 87 and 101 b/min with a mean of 92.6 ± 5.25 b/min and a mean percentage change of 2.57 ± 2.56 %. This showed a significant increase in H.R. (t = 3.18).

Five minutes after intubation, it ranged between 81 and 87 b/min with a mean of 87.7 ± 4.74 b/min. The mean percentage change (-2.83 ± 2.95 %) showed a significant decrease in H.R. from the pre-intubation values (t = 3.03).

Group IC: Table XXV, figure 7, 8.

The pre-operative values of H.R. ranged between 77 and 93 b/min with a mean of 85.4 ± 5.72 b/min. After induction, it ranged between 84 and 99 b/min with a mean of 93.2 ± 5.71 b/min. The mean percentage change from the pre-operative values (7.39 ± 5.91 %) revealed a significant increase in H.R. (t = 6.30).

An insignificant increase in H.R. was detected after administration of atracurium (t = 0.76) as the mean percentage change was 0.32 ± 1.33 %. Heart rate ranged between 85 and 101 b/min with a mean of 93.5 ± 5.91 b/min.

Sixty seconds after intubation, it ranged between 91 and 108 b/min with a mean of 100.2 ± 7.25 b/min. The mean percentage change from the pre-intuabtion values (7.12 ± 2.24 %) showed a significant increase in H.R. (t = 10.05).

Three minutes after intubation, it ranged between 90 and 107 b/min with a mean of 98.6 ± 6.19 b/min. The mean

percentage change from the pre-intuabtion values (5.55 ± 4.73 %) revealed a significant increase in H.R. (t = 3.71).

After five minutes, it ranged between 85 and 95 b/min with a mean of 90.9 ± 3.48 b/min producing a percentage change of -2.55 ± 5.1 % which revealed an insignificant decrease in H.R. (t = 1.58).

Group IIA: Table XXVI, figure 7, 8.

The pre-operative values of H.R. ranged between 78 and 95 b/min with a mean of 86.3 ± 7.10 b/min. After induction, it ranged between 85 and 115 b/min with a mean of 95.0 ± 9.56 b/min. The mean percentage change from the pre-operative values (10.03 ± 4.62 %) revealed a significant increase in H.R. (t = 6.87).

After atracurium administration, it ranged between 84 and 120 b/min with a mean of 96.2 ± 11.06 b/min producing a mean percentage change from the post-induction values of 1.17 ± 2.81 % which revealed an insignificant increase in H.R. (t = 1.32).

Sixty seconds after intubation, it ranged between 104 and 172 b/min with a mean of 126.6±18.88 b/min. The mean percentage change from the pre-intubation values (31.51 ± 10.39 %) revealed a significant increase in H.R. (t = 9.59).

After three minutes, it ranged between 95 and 128 b/min with a mean of 112.1 ± 9.30 b/min. The mean percentage change was 17.05 ± 7.84 % which revealed a significant increase in H.R. (t = 6.88).

After five minutes, the mean percentage change (6.09 ± 10.13 %) revealed an insignificant increase in H.R. (t = 1.90). Heart rate ranged between 93 and 114 with a mean of 101.3 ± 7.42 b/min.

Group IIB: Table XXVII, figure 7,8.

The pre-operative values ranged between 80 and 100 b/min with a mean of 89.1 ± 6.94 b/min. After induction, it ranged between 85 and 117 b/min with a mean of 97.4 ± 9.43 b/min. The mean perecntage change from the pre-operative values (9.21 ± 3.59) showed a significant increase in H.R. (t = 8.11).

After atracurium, it ranged between 86 and 120 b/min with a mean of 97.9 ± 10.02 b/min. The mean percentage change from the post-induction values (0.48 ± 1.10 %) showed an insignificant increase in H.R. (t = 1.38).

Sixty seconds after intubation, it ranged between 93 and 131 b/min with a mean of 106.9 ± 11.78 b/min resulting in a mean percentage change of 9.24 ± 5.33 % which revealed a significant increase in H.R. (t = 5.48).

Three minutes after intubation, it ranged between 92 and 123 b/min with a mean of 104.7 ± 10.22 b/min. The mean percentage change was 7.12 ± 5.75 % which showed a significant increase in H.R. (t = 3.92).

After five minutes, an insignificant decrease in H.R. was detected (t = 2.05) with a mean perecntage change of -3.05 ± 4.70 %. It ranged between 87 and 109 b/min with a mean of 94.6 ± 6.8 b/min.

Group II C: Table XXVIII, figure 7, 8.

The pre-operative values ranged between 80 and 99 b/min with a mean of 88.9 ± 5.82 b/min. After induction, it ranged between 88 and 110 b/min with a mean of 97.6 ± 2.23 b/min. The mean percentage change from the pre-operative values (9.81 ± 2.23 %) showed a significant increase in H.R. (t = 13.91).

After atracurium administration, it ranged between 88 and 104 b/min with a mean of 97.1 ± 4.79 b/min resulting in a mean percentage change of 0.41 ± 1.65 % which revealed an insignificant increase in H.R. (t = 0.79).

Sixty seconds after intubation, it ranged between 107 and 115 b/min with a mean of 109.6 ± 4.25 % producing a mean percentage change of 13.02 ± 5.08 % which showed a signifi-

cant increase in H.R. (t = 8.10).

After three minutes, it ranged between 95 and 109 b/min with a mean of 100.6 ± 4.45 b/min producing a mean percentage change of 3.65 ± 2.35 % which revealed a significant increase in H.R. (t = 4.91).

After five minutes, it ranged from 88 to 100 b/min with a mean of 92.8 ± 4.83 b/min. The mean perecntage change from the pre-intubation values (-4.42 ± 2.27 %) revealed a significant reduction in H.R. (t = 6.16).

By comparing the effect of midazolam induction on the heart rate in the three subgroups of the main group I (Table XXIX), it was apparent that there was an insignificant difference between the mean percentage change of them as indicated by the insignificnat f-test between them (f = 0.062) Table

However after intubation (1 minute), the f-test was significant (f = 11.946) indicating that the change in heart rate after intubation in the three subgroups was different.

As regards the main group II, also, the f-test between the three subgroups after induction was insignificant (f = 0.138) indicating that the effect of thiopentone induction on heart rate was the same in the three groups. However, after intubation (1 min), the f-test was significant (t =

26.273) indicating a difference in the effect of intubation on the heart rate in the three subgroups.

When comparing the effect of midazolam and thiopentone on induction on heart rate in the similar subgroups (groups IA and IIA, groups IB and IIB and groups IC and IIC) by using the t-test for comparison between two groups (Table XXX), it was apparent that both midazolam and thiopentone produce similar effects as the t-test was insignificant (t=1.439, t=1.269 and t=1.768 respectively).

However, the t-test between each similar subgroups after intubation was significant [groups IA and IIA (t=6.481), groups IB and IIB (t=2.208) and groups IC and IIC (t=3.361)]. This revealed that the mean percentage change in H.R. after intubation was different in the similar subgroups.

Table XXIII: Changes in heart rate in patients in group IA.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	80	86	87	96	91	89
2	83	89	89	99	93	90
3	90	96	99	111	107	98
4	89	95	93	104	101	90
5	77	83	85	94	90	86
6	90	99	99	106	101	95
7	87	95	93	101	92	89
8	87	93	91	105	98	91
9	93	98	100	110	102	95
10	85	94	94	103	98	90
$\bar{X}$	86.1	92.8	93.6	101.7	97.3	91.3
S.D.±	4.93	5.20	5.27	5.56	5.62	3.59
Mean % change		7.80 ±1.63	0.88 ±2.13	9.96 ±1.62	3.99 ±3.07	-2.34 ±3.0
t		15.13*	1.31	19.44*	4.11*	2.47

V_1 = Heart values after induction.

V_2 = Heart rate values after atracurium.

V_3 = Heart rate values 60 seconds after intubation.

V_4 = Heart rate values 3 minutes after intubation.

V_5 = Heart values 5 minutes after intubation.

Table XXIV: Changes in heart rate in patients in group IB.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	83	90	90	99	96	90
2	87	94	95	101	100	91
3	91	99	98	98	96	90
4	95	97	99	102	101	97
5	77	85	87	93	91	89
6	83	89	88	90	88	85
7	80	87	88	93	90	87
8	79	85	86	91	87	81
9	81	86	87	92	90	85
10	78	84	85	89	87	82
$\bar{X}$	83.4	89.6	90.3	94.8	92.6	87.7
S.D.±	5.89	5.34	5.12	4.76	5.25	4.74
Mean % change		7.52 ±2.2	0.8 ±1.16	5.05 ±2.76	2.57 ±2.56	-2.83 ±2.95
t		10.81*	2.18	5.79*	3.18*	3.03*

Table XXV: Changes in heart rate in patients in group IC.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	88	92	92	101	104	93
2	91	96	95	103	107	93
3	93	98	98	107	103	95
4	87	98	100	106	100	91
5	92	99	99	107	101	95
6	87	99	101	108	102	89
7	83	92	90	98	98	93
8	78	84	85	90	90	88
9	84	89	89	91	90	85
10	77	85	86	91	91	87
$\bar{X}$	85.4	93.2	93.5	100.2	98.6	90.9
S.D.±	5.72	5.71	5.91	7.25	6.19	3.48
Mean % change		7.39 ±5.91	0.32 ±1.33	7.12 ±2.24	5.55 ±4.73	-2.55 ±5.10
t		6.30*	0.76	10.05*	3.71*	1.58

Table XXVI: Changes in heart rate in patients in group IIA.

Case	Time Pre-operative	V_1	V_2	V_3	V_4	V_5
1	93	99	99	123	115	108
2	83	90	92	124	111	104
3	81	91	89	127	115	109
4	91	97	100	131	118	103
5	78	85	85	104	95	93
6	79	86	84	105	99	94
7	78	85	89	129	113	98
8	91	99	97	122	115	97
9	95	103	107	123	112	93
10	94	115	120	172	128	114
$\bar{X}$	86.3	95.0	96.2	126.6	112.1	101.3
S.D.±	7.10	9.56	11.06	18.88	9.30	7.42
Mean % change		10.03 ±4.62	1.17 ±2.81	31.51 ±10.39	17.05 ±7.84	6.09 ±10.13
t		6.87*	1.32	9.59*	6.88*	1.90

Table XXVII: Changes in heart rate in patients in group IIB.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	79	85	85	93	94	90
2	87	97	98	101	99	91
3	100	117	120	131	123	109
4	98	105	104	122	120	101
5	93	100	100	110	110	100
6	85	91	90	107	105	89
7	92	97	98	104	101	95
8	87	98	99	102	101	91
9	80	85	86	94	92	87
10	90	99	99	105	102	93
$\bar{X}$	89.1	97.4	97.9	106.9	104.7	94.6
S.D.±	6.94	9.43	10.02	11.78	10.22	6.8
Mean % change		9.21 ±3.59	0.48 ±1.10	9.24 ±5.33	7.12 ±5.75	-3.05 ±4.70
t		8.11*	1.38	5.48*	3.92*	2.05

Table XXVIII: Changes in heart rate in patients in group IIC.

Time / Case	Pre-operative	V_1	V_2	V_3	V_4	V_5
1	80	88	88	101	95	85
2	86	94	96	105	98	92
3	99	104	104	113	107	97
4	97	110	104	111	109	100
5	91	100	98	107	100	92
6	86	95	96	109	96	88
7	90	97	95	115	99	91
8	88	98	98	112	102	98
9	83	91	93	113	99	89
10	89	99	99	110	101	96
$\bar{X}$	88.9	97.6	97.1	109.6	100.6	92.8
S.D.±	5.82	2.23	4.79	4.25	4.45	4.83
Mean % change		9.81 ±2.23	0.41 ±1.65	13.02 ±5.08	3.65 ±2.35	-4.42 ±2.27
t		13.91*	0.79	8.10*	4.91*	6.16*

Table XXIX: Comparison of changes in heart rate in the similar groups of the three main groups.

Group	Time	Pre-oper.	After ind.	% change	Before intub.	After intub.	% change
IA	$\bar{X}$	86.1	92.8	7.80	93.6	101.7	9.96
	S.D.±	4.93	5.20	1.63	5.27	5.56	1.62
IIA	$\bar{X}$	86.3	95.0	10.03	96.2	126.6	31.51
	S.D.±	7.10	9.56	4.62	11.06	18.88	10.39
t				1.439			6.481*
IB	$\bar{X}$	83.4	89.6	7.52	90.3	94.8	5.05
	S.D.±	5.89	5.34	2.20	5.12	4.76	2.76
IIB	$\bar{X}$	89.1	97.4	9.21	97.9	106.9	9.24
	S.D.±	6.94	9.43	3.59	10.02	11.78	5.33
t				1.269			2.208*
IC	$\bar{X}$	85.4	93.2	7.39	93.5	100.2	7.12
	S.D.±	5.72	5.71	3.71	5.91	7.25	2.24
IIC	$\bar{X}$	88.9	97.6	9.81	97.1	109.6	13.2
	S.D.±	5.82	2.23	2.23	4.79	4.25	5.08
t				1.768			3.361*

Table XXX: Comparison of changes in heart rate in the three subgroups of each main group.

Group	Time	Pre-oper.	After ind.	% change	Before intub.	After intub.	% change
IA	$\bar{X}$	86.1	92.8	7.80	93.6	101.7	9.96
	S.D.±	4.93	5.20	1.63	5.27	5.56	1.62
IB	$\bar{X}$	83.4	89.6	7.52	90.3	94.8	5.05
	S.D.±	5.89	5.34	2.20	5.12	4.76	2.76
IC	$\bar{X}$	85.4	93.2	7.39	93.5	100.2	7.12
	S.D.±	5.72	5.71	3.71	5.91	7.25	2.24
F				0.062			11.946*
IIA	$\bar{X}$	86.3	95.0	10.03	96.2	126.6	31.51
	S.D.±	7.10	9.56	4.62	11.06	18.88	10.39
IIB	$\bar{X}$	89.1	97.4	9.21	97.9	106.9	9.24
	S.D.±	6.94	9.43	3.59	10.02	11.78	5.33
IIC	$\bar{X}$	88.9	97.6	9.81	97.1	109.6	13.2
	S.D.±	5.82	2.23	2.23	4.79	4.25	5.08
F				0.138			26.273*

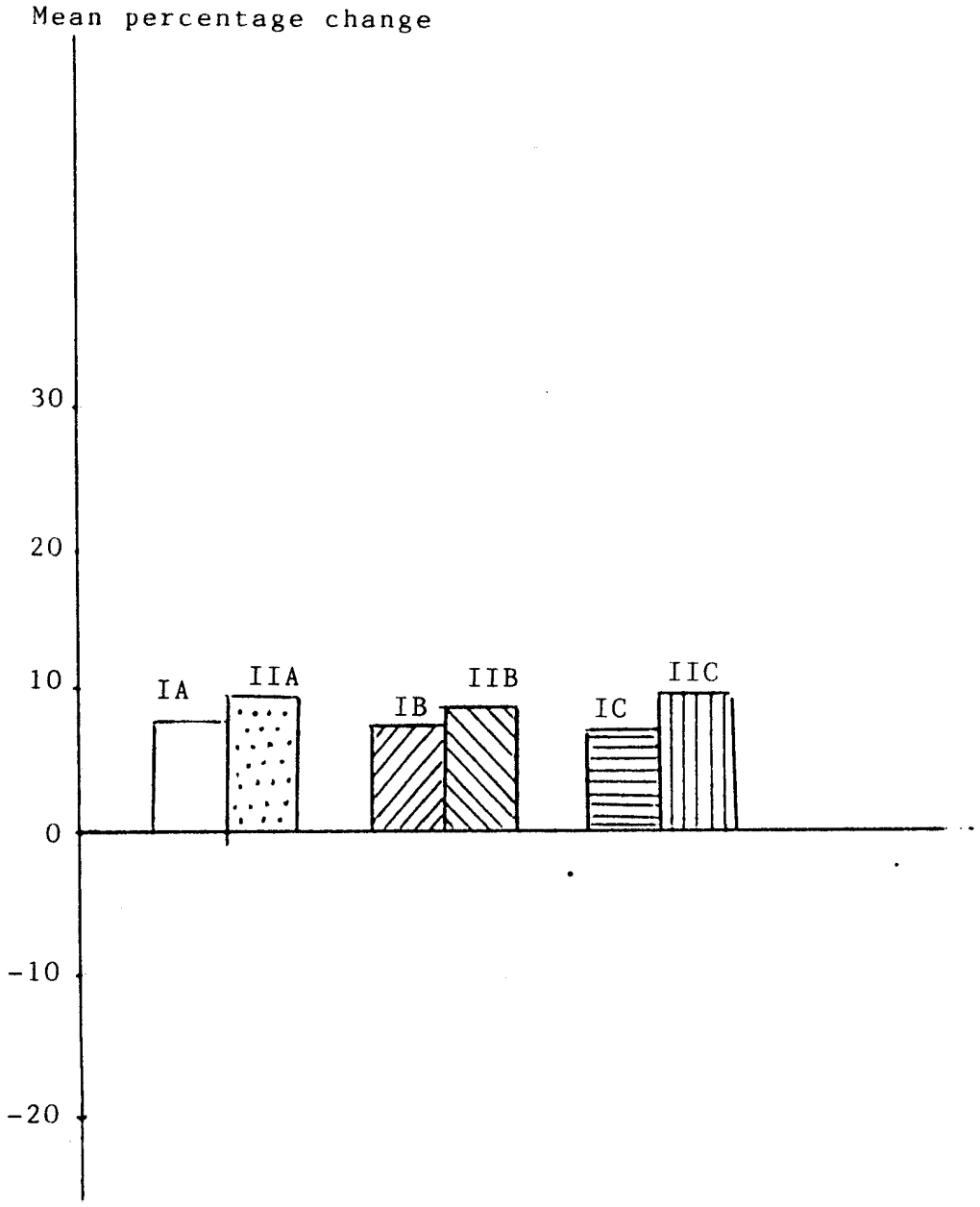


Figure 7 : Mean percentage change in heart rate after induction.

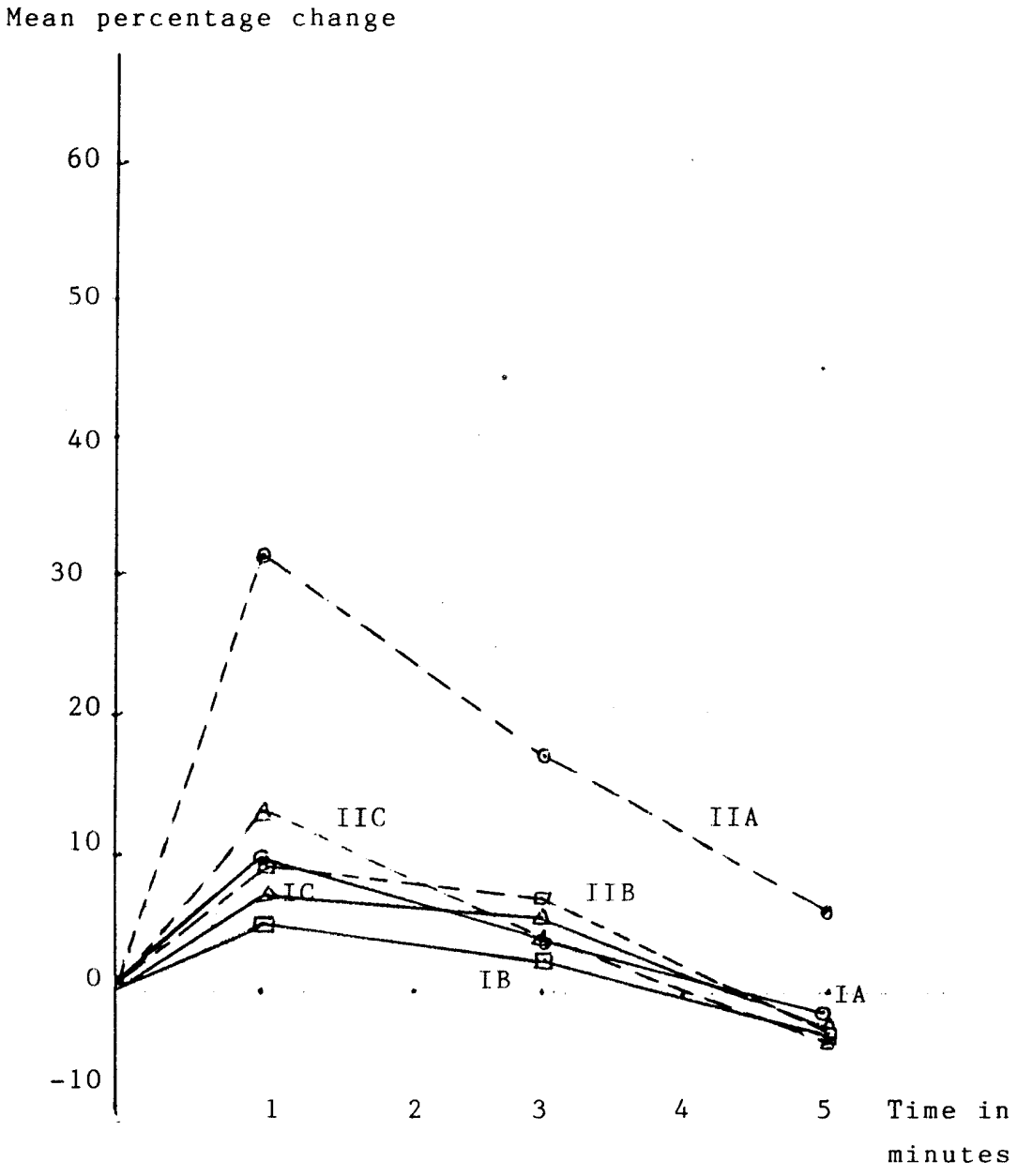


Figure 8 : Mean percentage changes in heart rate (HR) after intubation.

IV. Blood gases: Table XXXI

Group IA:

The pre-operative values for P CO_2 ranged between 40 and 45 with a mean of 42.1 ± 1.66 mm Hg and for P O_2 ranged between 95 and 98 with a mean of 96.5 ± 1.27 mm Hg.

After intubation, P CO_2 values ranged between 36 and 44 with a mean of 39.8 ± 2.66 mm Hg and for P O_2 ranged between 248 and 559 with a mean of 434.7 ± 96.42 mm Hg.

Group IB:

The pre-operative values for P CO_2 ranged between 40 and 45 with a mean of 41.6 ± 2.07 mm Hg and for P O_2 ranged between 92 and 97 with a mean of 94.9 ± 1.66 mm Hg.

After intubation, P CO_2 values ranged between 37 and 44 with a mean of 40.2 ± 2.30 mm Hg and for P O_2 ranged between 330 and 509 with a mean of 430.4 ± 60.43 mm Hg.

Group IC:

The pre-operative values for P CO_2 ranged between 38 and 44 with a mean of 41.3 ± 2.06 mm Hg and for P O_2 ranged between 90 and 97 with a mean of 93.9 ± 2.33 mm Hg.

After intubation, P CO_2 ranged between 36 and 44 with a mean of 39.4 ± 2.32 mm Hg and for P O_2 ranged between 362 and 512 with a mean of 410.3 ± 59.88 mm Hg.

Group IIA:

The pre-operative values of P CO_2 ranged between 39 and 45 mm Hg with a mean of 41.8 ± 1.93 mm Hg and for P O_2 ranged from 92 to 96 with a mean of 95.3 ± 1.89 mm Hg.

After intubation, P CO_2 values ranged from 36 to 43 with a mean of 39.2±2.04 mm Hg and for P O_2 ranged from 280 to 536 mm Hg with a mean of 445.6 ± 89.5 mm Hg.

Group IIB:

The pre-operative values for P CO_2 ranged between 39 and 45 mm Hg with a mean of 42.0 ± 1.94 mm Hg and for P O_2 ranged from 92 to 98 mm Hg with a mean of 95.1 ± 2.02 mm Hg.

After intubation, P CO_2 values ranged from 36 to 43 mm Hg with a mean of 39.9 ± 2.18 mm Hg and for P O_2 ranged from 286 to 511 with a mean of 424.0 ± 64.23 mm Hg.

Group IIC:

The pre-operative values for P CO_2 ranged between 39

and 45 with a mean of 41.4 ± 2.22 mm Hg and for P O_2 ranged between 91 and 98 mm Hg with a mean of 94.8 ± 2.49 mm Hg.

After intubation, P CO_2 values ranged from 36 to 42 mm Hg with a mean of 39.2 ± 1.87 mm Hg and for P O_2 ranged between 318 and 507 mm Hg with a mean of 415.5 ± 80.50 mm Hg.

Table XXXI: Oxygen and carbon dioxide tension levels in arterial blood in the six groups.

Parameter		$Pa\ CO_2$		$Pa\ O_2$	
Group		Pre-operative	After intubation	Pre-operative	After intubation
IA	$\bar{X}$	42.1	39.8	96.5	434.7
	S.D.±	1.66	2.66	1.27	96.42
IB	$\bar{X}$	41.6	40.2	94.9	430.4
	S.D.±	2.07	2.30	1.66	60.43
IC	$\bar{X}$	41.3	39.4	93.9	410.3
	S.D.±	2.06	2.32	2.33	59.88
IIA	$\bar{X}$	41.8	39.2	95.3	445.6
	S.D.±	1.93	2.04	1.89	89.54
IIB	$\bar{X}$	42.0	39.9	95.1	424.0
	S.D.±	1.94	2.18	2.02	64.23
IIC	$\bar{X}$	41.4	39.2	94.8	415.5
	S.D.±	2.22	1.87	2.49	80.47

V. Intubation condition: Table XXXII.

- Jaw relaxation:

The time for good jaw relaxation after injection of atracurium ranged from 1 to 1.5 min. In group I (A, B and C), 40 % of cases (12 patients) showed good jaw relaxation after 1 min, while in group II (A, B and C) only 30 % (9 patients) of cases showed good jaw relaxation after 1 min but after 1.5 min, 100 % of cases (60 patients) had good jaw relaxation.

- Cord relaxation:

The time needed for good cord relaxation ranged between 1.5 and 2 min after atracurium injection. In group I (midazolam), 60 % of cases (18 patients) had good cord relaxation after 1.5 min, while in group II (thiopentone), only 50 % of cases (15 patients) had good cord relaxation after 1.5 min. After 2 min, 100 % of cases had good cord relaxation.

- Reaction to intubation:

The time needed for intubation without any reaction, ranged between 1.5 and 2 min. In groups IA and IIA, the

reaction was nil in 40 % of cases after 1.5 min while in groups IB, IC, IIB and IIC it was nil in 60 % of cases after 1.5 min. After 2 min, it was nil in 100 % of cases.

The overall intubation condition showed that atracurium provides a good intubation in 55 % of cases after 1.5 min and in 100 % of cases after 2 min.

Table XXXII: Percentage of patients showing good intubation condition.

Group	Good jaw relaxation		Good cord relaxation			No reaction to intubation		
	1 min	1.5 min	1min	1.5min	2min	1min	1.5min	2min
IA	4	10	-	6	10	-	4	10
IB	4	10	-	5	10	-	6	10
IC	4	10	-	7	10	-	6	10
Total	12	30	-	18	30	-	14	30
%	(40%)	(100%)		(60%)	(100%)		(53%)	(100%)
IIA	3	10	-	5	10	-	4	10
IIB	3	10	-	6	10	-	7	10
IIC	3	10	-	4	10	-	6	10
Total	9	30	-	15	30	-	17	30
%	(30%)	(100%)		(50%)	(100%)		(58%)	(100%)

The overall intubation condition was good in:

- 55 % of cases (33 patients) after 1.5 min.
- 100 % of cases (60 patients) after 2 min.

CHAPTER V

DISCUSSION

D I S C U S S I O N

The increased use of general anaesthesia in ophthalmic surgery bears witness to the significant contribution made by the anaesthetist in this regard. The anaesthetist can optimize conditions for such surgery due to the development of improved anaesthetic agents and techniques. Apart from providing an immobile and uncongested field, he can decrease the intraocular pressure, and thus minimize the danger of expulsion of intraocular contents when the eye is opened.(4)

Many studies suggest a risk in giving succinyl choline to patients anaesthetized for intraocular surgery because it might cause a rise in intraocular pressure (IOP), which could in turn cause the expulsion of vitreous humour from the surgically incised eye.(82) Therefore, the anaesthetic management of patients with penetrating eye injury present problems peculiar to ophthalmic surgery. Such patients have rarely undergone the full routine of pre-anaesthetic preparation, and must be considered to have full stomach. They are, therefore, vulnerable to the hazards of aspiration of gastric contents during induction of anaesthesia. The problem facing the anaesthetist here is how to intubate

the trachea rapidly without causing an accompanying rise in intraocular pressure.(42)

No completely satisfactory method of induction has evolved to eliminate these complications, although various techniques have been suggested to minimize the hazards. This included the pretreatment with a small dose of non-depolarizing muscle relaxant prior to the use of suxamethonium though this has been proved to be ineffective,(83) and the induction of anaesthesia using a full paralysing dose of non depolarizing muscle relaxant,sometimes utilizing a head up or head down tilt.(42) If a non depolarizing relaxant is used, then the agent with the fastest onset of action which will allow rapid intubation and provides a good intubation condition will have the advantages over those of slower onset.(84)

In the present study, the basal readings of intraocular pressure were within the normal physiological limits.

The mean percentage changes in group IA, IB and IC showed a significant decrease in IOP from the preoperative values after midazolam induction. On the other hand, there was an insignificant difference between the three groups, which means that there was a similar reduction

in IOP in these three groups.

Fragen and Hauch [31] reported similar results, and they postulated that midazolam has an effect on the central nervous system where it depresses certain areas of the diencephalon and hypothalamus that influences the IOP.

In groups IIA, IIB and IIC, a significant reduction in IOP from the preoperative values was observed after thiopentone induction.

Comparing the three groups by the f-test, there was insignificant differences which indicate an identical reduction in IOP after thiopentone induction.

The reduction in IOP after thiopentone was in agreement with the results reported by Kornblueth et al [17] who postulated that thiopentone depresses the central controlling areas of IOP, beside , it increases the facility for aqueous drainage.[85]

By comparing the reduction in IOP after induction between the similar subgroups (groups IA, IIA, groups IB, IIB and groups IC and IIC), it was found that both midazolam and thiopentone produced a comparable reduction in IOP.

These results coincided with those reported by Fragen

and Hauch [31] who found that midazolam induction reduces IOP to the same degree as diazepam and thiopentone.

Sixty seconds after intubation, there was a significant increase in IOP from the pre-intubation values in groups IA and IIA. This increase in IOP was similar in both groups and indicates that both midazolam and thiopentone cannot prevent the rise in IOP during intubation. The maximum increase in IOP in the first minute after intubation, was followed by gradual reduction, but IOP values were still higher than the pre-intubation values five minutes after intubation.

These results were in agreement with those obtained by Couch et al[42] who found that inspite of the reduction in IOP after thiopentone induction, there was an increase in IOP following intubation.

In groups IB and IIB (I.V. lidocaine), there was an insignificant rise in IOP sixty seconds after intubation from the pre-intubation values. Five minutes after intubation, IOP values were equal to or slightly less than the pre-intubation values.

Mahajan and Grover[86] reported similar results in their study, in which they used intravenous lidocaine

pretreatment in a dose of 1 mg Kg^{-1} five minutes prior to induction of anaesthesia.

In contradiction to these results, were those obtained by Smith et al[87] who concluded that lidocaine pretreatment in a dose of 1 - 2 mg Kg^{-1} was ineffective in preventing the increase in IOP following succinyl choline and intubation. This contradiction could be explained by the fact that in the study of Smith et al, the readings of IOP were not recorded between succinyl choline and tracheal intubation, making it difficult to define whether the increase was due to succinyl choline or tracheal intubation or both.

The action of intravenous lidocaine in preventing the rise in IOP following tracheal intubation may be attributed to an obtained haemodynamic response[88] suppression of cough reflex[89], and increased depth of anaesthesia following lidocaine pretreatment.[86]

In groups IC and IIC, there was a significant increase in IOP from the pre-intubation values which returned gradually to the pre-intubation values five minutes after intubation.

From the present work, and by comparing the mean percentage changes in the control groups (IA and IIA) with

those in lidocaine spray groups (IC and IIC), it was apparent that the rise in IOP in the control groups was much greater than in the lidocaine spray groups. This means that lidocaine spray cannot obtund completely the rise in IOP that accompanied intubation, however, it prevents its great increase compared to the pre-intubation values.

Viegas and Stoelting[90] in their study on the effectiveness of laryngotracheal spray of lidocaine for prevention of the adverse reactions to intubation, proved that the action of lidocaine spray was not only due to its local effects, but also due to its systemic absorption from the mucous membrane, They concluded that blood lidocaine level was low one minute after laryngotracheal spray, but it gradually rose to a peak value between 4 and 15 minutes.

Pelton et al[91] stated that absorption of lidocaine from the mucous membrane was complete and rapid and its blood level was similar to its blood level after intravenous administration of the same dose. However, the contradiction between the effect of intravenous lidocaine and spray might be due to some factors that interfere with its absorption. These factors include the presence of secretions, state of the mucosa and its vascularity, the size of the inhaled droplets and the effeciency of spraying the larynx and

trachea.[92]

As regards the effect of atracurium on IOP, this work showed that it produced insignificant changes in IOP. These results were in agreement with those obtained by Maharaj et al[44] who concluded that atracurium produces no change in IOP and this provides a steady state for ocular surgery.

The basal readings of mean arterial blood pressure and heart rate were within normal physiological limits.

The mean percentage changes showed a significant reduction in mean arterial blood pressure and a significant increase in heart rate after both midazolam and thiopentone induction. In addition, these changes were similar in the three subgroups of each main group.

Al Khudhairi et al[93] in their study on the haemodynamic changes after midazolam induction obtained similar results and they attributed the drop in blood pressure to the decrease in systemic vascular resistance. They postulated that the venous pooling and the fall in systemic vascular resistance induced by midazolam may possibly be helpful in reducing preload and after load; thus improving cardiac performance.

The haemodynamic changes after thiopentone induction were in agreement with those reported by Fieldman et al.[94] This action of thiopentone may be due to reduction in cardiac output and dilatation of the vascular bed especially in the skin and muscles, perhaps due to depression of the vasomotor tone.[79]

By comparing the haemodynamic changes after midazolam and thiopentone induction, it was apparent that both drugs produce similar effects. These results were in agreement with those reported by Lebowitz et al[95] who found that slow induction with thiopentone and midazolam produces similar reduction in ABP which is not important clinically in fit subjects.

Sixty seconds after intubation, there was a significant increase in mean ABP and H.R. in all groups. This increase was great 60 seconds after intubation.

Although, there was a gradual reduction in mean ABP and H.R., yet it did not reach the pre-intubation values five minutes after intubation in subgroups IA and IIA (patients not pretreated with lidocaine). The comparison of the changes in the three subgroups in each main group revealed much greater cardiovascular response in groups

IA and IIA (midazolam or thiopentone only) than in subgroups B and C (lidocaine pretreatment).

This indicates that lidocaine pretreatment whether administered intravenously or by spray can greatly reduce the cardiovascular response to intubation. In support to our results were those reported by James et al[47] and by Mounir Abou-Madi et al[88] who postulated that the action of lidocaine spray in preventing the cardiovascular response to intubation and the prevention of arrhythmia to be partly due to systemic absorption of lidocaine.

Prys-Robert et al[96] postulated that cardiovascular reactions after stimulation of the upper respiratory tract are mediated by increased sympathetic nervous activity, and therefore, they started to use beta-blockers for prevention of the reactions that accompany laryngoscopy and intubation. However, this technique was not generally accepted as it was not satisfactory to anaesthetizing patients for elective surgery while they were under treatment with beta-blockers.

Bromage and Robson[97] in their study of the blood levels of lidocaine after various methods of administration, found that systemic absorption of lidocaine obtunds

laryngeal reflexes. Similarly, Steintraus and Gaskin[98] showed that intravenous lidocaine is very effective in suppressing cough reflex during intubation.

In the present work, no electrocardiographic abnormalities can be detected except in patient number 10 in group II A (Thiopentone group) whose ECG showed S-T segment depression during laryngoscopy and intubation which remained for three minutes after intubation. This patient suffered the most acute rise in B.P. and heart rate.

By comparing the haemodynamic changes after intubation in groups I A (Midazolam) and II A (Thiopentone), it was apparent that there was a significant difference between them. At the same time; the cardiovascular reactions were more exagerated in the thiopentone group than in midazolam group. This means that midazolam was associated with more cardiovascular stability than thiopentone. In support to these results were those observed by Boralessa et al.[99]

The reduction in cardiovascular response to intubation is desirable particularly in patients with ischaemic heart disease, since this response may cause an imbalance between myocardial oxygen supply and demand and can lead to serious complications such as myocardial infarction and left ventricular failure.[45]

As regards atracurium, there was an insignificant increase in mean ABP and HR after its administration. This agrees with the results recorded by Hughes and Payne in their study on the evaluation of atracurium in anaesthetised man.(73)

Although other non-depolarizing muscle relaxants such as pancuronium and alcuronium have minimal effects on IOP, however both drugs possess significant haemodynamic side effects (rise of BP). Since atracurium fulfil the criteria of IOP and cardiovascular stability, so, its use would appear to be relatively advantageous over other relaxants.(73)

The study of the intubation conditions of atracurium showed that atracurium provides an overall good intubation conditions in 1.5 - 2 minutes. The results showed that 40% of patients who received midazolam had good jaw relaxation after one minute compared to 30% of patients, who received thiopentone. Besides, cord relaxation was good in 60% of cases after 1.5 minutes in midazolam group, while only 50% of patients in thiopentone group had good cord relaxation after 1.5 minutes.

These results mean that midazolam has a muscle relaxant effect, and this coincides with the results of Pernikoff M (100) who showed that benzodiazepines had a muscle relaxant effect.

Besides, 60% of patients who received lidocaine showed no reaction to intubation compared to 40% in other groups after 1.5 minutes from administration of atracurium. This may be due to the effect of lidocaine in obtunding laryngeal reflexes.(89)

The results also showed that all patients had good jaw relaxation after 1.5 minutes and had good cord relaxation without reaction to intubation afte two minutes. The overall intubation conditions revealed that 55 % of patients had good intubation conditions after 1.5 minutes and 100% of patients after two minutes. These results were in agreement with those obtained by Rowland. (101)

The blood gases analysis in this study showed that the preoperative values were within normal physiological limits. Endotracheal intubation was accompanied by a significant rise in arterial oxygen tension and an insignificant decrease in arterial carbon dioxide tension, thus hypoxia and hypercapnoea were excluded.

Hvidberg et al(18) found that changes in P CO_2 were accompanied by parallel changes in CVP and concluded that an increase in IOP after an increase in P CO_2 occurred as a result of choroidal vasodilatation or evaluation in CVP or, more likely, a combination of both mechanisms.

Smith et al[101] maintained a stable CVP at different values of P CO_2 and still found a linear correlation with IOP. They concluded that intraocular vasodilatation must be the cause.

CHAPTER VI

SUMMARY AND CONCLUSION

S U M M A R Y

There is a general agreement that the anaesthetic technique for intraocular surgery should avoid marked fluctuations in intraocular pressure during surgery, beside, it should reduce or maintain it at normal value.

As the anaesthetic agents can affect IOP in a variety of ways, we must choose the ideal technique that can provide stable ocular conditions in addition to stable haemodynamic conditions.

As succinyl choline and tracheal intubation were known to increase IOP, we must research for a non depolarizing muscle relaxant that can provide a good intubation condition in a short time in addition to a method for prevention of the effect of tracheal intubation on IOP.

This work aimed to assess the effect of thiopentone and midazolam on intraocular pressure and to find out whether pretreatment with lidocaine (intravenous and spray) is effective in preventing the changes in intraocular pressure that are associated with endotracheal intubation.

This study was carried out on sixty adult patients of

both sexes scheduled for surgical non-ophthalmic operations. The general conditions of all patients were good, they were clinically free from any cardiovascular, respiratory, metabolic and endocrinal diseases.

Patients were categorized into two main groups (thirty patients each), each main group was further subdivided into three subgroups (ten patients each).

All patients received atracurium as a muscle relaxant for intubation in a dose of 0.5 mg Kg^{-1}. The patients of the main group I received midazolam as an induction agent in a dose of 0.3 mg Kg^{-1} and patients of the main group II received thiopentone 2.5 % as an induction agent in a dose of 5 mg Kg^{-1}. However, patients of subgroup B in the two main groups were pretreated with intravenous lidocaine in a dose of 2 mg Kg^{-1} five minutes before induction, while patients of subgroup C in the two main groups were pretreated with lidocaine spray in a dose of 2 mg Kg^{-1} five minutes before induction.

Premedication was carried out with pethidine hydrochloride in a dose of 1 mg Kg^{-1}. Anaesthesia was induced with the chosen drug, followed by the muscle relaxant (atracurium) and intubation was carried out with the suitable size cuffed tube. Maintenance of anaesthesia was carried out with nitrous

oxide and oxygen in a ratio of 70 % : 30 %, supplemented with fluothane 0.5 - 1 %.

The parameters studied in this work were intraocular pressure and vital signs (heart rate, mean arterial blood pressure and ECG). They were recorded pre-operatively, after induction, after muscle relaxant, one, three and five minutes after intubation. Intubation conditions were also observed and recorded.

The results obtained from this work can be summarized as follows:

There was a significant similar decrease in IOP after induction of anaesthesia in the two groups (midazolam and thiopentone). The changes in IOP after atracurium were insignificant. After intubation, there was a significant rise in IOP in subgroup A in the two main groups, however, in subgroup B (I.V. lidocaine), the rise in IOP was insignificant. Inspite of the significant increase in IOP in subgroup C (lidocaine spray), it was clinically unimportant.

As regards the haemodynamic changes, there was a significant similar decrease in mean arterial blood pressure and an increase in heart rate after induction in both main groups. The cardiovascular changes after atracurium were

insignificant. After intubation, there was a significant increase in mean ABP and HR in all groups, however, the greatest increase was observed in subgroup A (no pretreatment) and the least found in subgroup B (I.V. lidocaine pretreatment).

As regards the electrocardiographic recording: no abnormal patterns were detected except in one patient in group IIA (thiopentone only) and this was accompanied with the greatest cardiovascular response to intubation.

The presence of hypoxia or hypercarbia during the period of measurement was excluded by blood gases study.

The intubation conditions were found to be good in 55 % of patients after 1.5 minute and in 100 % of patients after 2 minutes from the injection of atracurium.

C O N C L U S I O N S

From the previous work, we can conclude the following:

1- Both midazolam and thiopentone produce similar reduction in intraocular pressure.

2- Both midazolam and thiopentone cannot prevent the increase in IOP or the cardiovascular reactions that accompany endotracheal intubation. However, midazolam produced relatively more cardiovascular stability than thiopentone.

3- Pretreatment with intravenous lidocaine can obtund the increase in IOP and greatly reduces the cardiovascular reactions that accompany endotracheal intubation. However, such effects were less after pretreatment with lidocaine spray.

4- The insignificant intraocular pressure and cardiovascular changes accompanying atracurium beside the good intubation conditions makes it favourable for intubation in patients scheduled for eye surgery.

REFERENCES

R E F E R E N C E S

1- Ganong WF. Review of medical physiology. 9th ed. Los Altos, California. Vision: anatomic considerations, 1979; 89.

2- Warwik R, William BL, eds. Gray's anatomy. 35th ed. Edinburgh: Longman group Ltd, 1973, 1095 - 134.

3- Fine ES, Tonsini AJ. Structure of the vitreous body and suspensory ligaments of the lens. Arch Ophthalmol 1961; 65: 95 - 110.

4- Dermot F Murphy, F Farcsi. Anaesthesia and intraocular pressure. Anaesth Analg 1985; 64: 520 - 30.

5- Follmann P, Mucsi, Gati J. Distribution of normal intra-ocular pressures. Trans Ophthalmol Soc UK 1977; 97: 683 - 5.

6- Wilson TM. Functional organization of the human eye.

Br J Anaesth 1980; 52: 646.

7- Tripath RC. Mechanism of aqueous outflow across the trabecular wall of Schlemn's canal. Exp Eye Res 1970; 10: 111 - 16.

8- Robert A. Origin of the aqueous. In: Ader's physiology of the eye. 7th ed. St. Louis, London, Toronto: C.V. Mosby company, 1980; 8: 227 - 54.

9- Schmerl E, Steinberg B. The role of diencephalon in regulating ocular tension. Research Ophthalmologist of the Ophthalmic Foundation 1977; 6: 155 - 8.

10- Adams AK, Jones RM. Anaesthesia for eye surgery: General considerations. Br J Anaesth 1980; 52: 663.

11- Macri FJ. Vascular and intraocular pressure. Arch Ophthalmol 1961; 65: 571 - 4.

12- Adams AK, Barnett KC. Anaesthesia and IOP. Anaesthesia 1966; 21: 202.

13- Schroeder M, Linseen GH. IOP and anaesthesia. Anaesthesia

1972; 27: 165.

14- Holloway KB. Control of the eye during general anaesthesia for intraocular surgery. Br J Anaesth 1980; 52: 671.

15- Cooper RL., Beale DG, Constable IJ, Grose GC. Continuous monitoring of intraocular pressure: Effect of central venous pressure, respiration and eye movements on continual recordings of intraocular pressure in rabbit, dog and man. Br J Ophthalmol 1979; 63: 799 - 804.

16- Duke-Elder S. The venous pressure of the eye and its relation to intraocular pressure. J Physiol 1926; 61: 409 - 18.

17- Kornblueth W, Aladjunoff L, Mogora F, Grabby A. Influence of general anaesthesia on IOP in man. Arch Ophthalmol 1959; 61: 84.

18- Hvidberg A, Kessing SVV, Fernandes A. Effect of changes in P CO_2 and body position on intraocular pressure during general anaesthesia. Acta Ophthalmol 1981; 59: 465 - 75.

19- Petounis AD, Chonrali S, Vadaluka-Sekioti A. Effect of hypercapnoea and hyperventilation on human intraocular

pressure during general anaesthesia. Br J Ophthalmol 1980; 64: 422 - 5.

20- Usitalo R. Effect of sympathetic and parasympathetic stimulation on the secretion and outflow of aqueous humour in the rabbit eye. Acta Physiol Scand 1972; 86: 315 - 26.

21- Bill A. The effect of changes in arterial blood pressure on the rate of aqueous formation in a primate. Ophthalmology 1970; 1: 193 -200.

22- Berson FG, Epstein DL. Separate and combined effects of timolol maleate and acetazolamide in open angle glaucoma. Am J Ophthalmol 1981; 92: 788 - 91.

23- Mac Donald MJ, Gore SA, Gullen PM, Philips CI. Comparison of ocular hypotensive effects of acetazolamide and atenolol. Br J Ophthalmol 1977; 61: 345 - 8.

24- Rohen JW, Lutjen E, Barany E. the relation between the ciliary muscle and trabecular meshwork and its importance for the effect of miotics on aqueous outflow resistance. Arch Ophthalmol 1967; 172: 23 - 47.

25- Laugham ME, Kitazawa Y, Hart RW. Adrenergic responses in the human eye. J Pharmacol Exp Ther 1971; 1971: 47 - 55.

26- Duncalf D, Folders FF. Effect of anaesthetic drugs and muscle relaxants on intraocular pressure. Int Ophthalmol Clin 1973; 13: 21 - 6.

27- Kirsch RE. Further studies on the use of digital pressure in cataract surgery. Arch Ophthalmol 1957; 58: 641 - 6.

28- Trew CT, Manus NJ, Jackson DM. Intraocular pressure and premedication with oral diazepam. Anaesthesia 1982; 37: 339 - 40.

29- Al-Abrak MH. Diazepam and intraocular pressure. Br J Anaesth 1978; 50: 866.

30- Leopold IH, Comrae JH. Effect of intramuscular administration of morphine, atropine, scopolamine and neostigmine on the human eye. Arch Ophthalmol 1948; 40: 285 - 90.

31- Fragen RJ, Hauch T. The effect of midazolam maleate and diazepam on IOP in adults. Arzneimittelforsch 1981;

31: 2223 - 5.

32- Peuler M, Glass DD, Arens JF. Ketamine and intraocular pressure. Anaesthesiology 1975; 43: 575 - 8.

33- Al-Abrak MH, Samuel JR. Effects of general anaesthesia on IOP in man. Br Ophthalmol 1975; 59: 107 -10.

34- Magora F, Collins VJ. The influence of general anaesthetic agents on intraocular pressure in man. Arch Ophthalmol 1961; 66: 806 - 11.

35- Cunningham AJ, Albert O, Cameson J, Watson AG. The influence of intravenous diazepam on the rise of IOP following succinyl choline. Can Anaesth Soc J 1981; 28: 591.

36- Katz RL, Eakins KE. Mode of action of succinyl choline in intraocular pressure. T Pharmacol Exp Ther 1968; 162: 1 - 9.

37- Pandey K, Badola RP, Kumar S. Time course of intraocular hypertension produced by suxamethonium. Br J Anaesth 1972; 44: 191 - 5.

38- Roche JR. Curare for ocular surgery. Am J Ophthalmol 1950; 33: 91 - 7.

39- Litwiller RW, Difazio CD, Rushia EL. Pancuronium and intraocular pressure. Anaesthesiology 1975; 42: 750 - 2.

40- Balamoutsos NG, Tsakona H, Kanakondes PS. Alcuronium and intraocular pressure. Anaesth Analg 1983; 62: 521 - 3.

41- Giala MM, Balamoutsos NG. Failure of gallamine to inhibit succinyl choline induced increase in intraocular pressure. Anaesthesiology 1971; 35: 567 - 71.

42- Cauch JA, Eltringham RJ, Magauron DM. The effect of thiopentone and fazadinium on intraocular pressure. Anaesthesia 1979; 34: 588 - 9.

43- Sia RL, Rashkovesky OM. Org. NC 45 and intraocular pressure during anaesthesia. Acta Anaesthesiol Scand 1981; 25: 219 - 21.

44- Maharaj RJ, Humphery D, Kaplan N, Kadwa H, Blignant P, Brock-Utne JG, Welsh N. Effects of atracurium on intra-

ocular pressure. Br J Anaesth 1984; 56: 459 - 63.

45- Fox EJ, Sklar GS, Hill CH. Complications related to the pressor response to endotracheal intubation. Anaesthesiology 1977; 47: 524 - 5.

46- Shapiro HM, Wyte SR, Harris AB : Acute intraoperative intracranial hypertension in neurosurgical patients: Mechanical and pharmacologic factors. Anaesthesiology 1972; 37: 399 - 405.

47- James F, Robert F, David C. Lidocaine before endotracheal intubation: intravenous or laryngotracheal. Anaesthesiology 1981; 55: 578 - 81.

48- Steinhaus JE, Gaskin L: a study of intravenous lidocaine as a suppressant of cough reflex. Anaesthesiology 1963; 24: 285 - 90.

49- Gerigis SD. Intubation conditions after atracurium and suxamethonium. Br J Anaesth 1983; 55: 835 - 85.

50- Ruiz RS, Saluronsen PC. Expulsive choroidal effusion. Acta ophthalmol 1976; 43: 573.

51- Wilson TM, Le May M, Holloway KB, Strong R, McKenzie E. Experimental and clinical study of factors influencing choroidal blood flow. Transophthalmol Soc (United Kingdom) 1974; 94: 378.

52- Langston DP. Manual of ocular diagnosis and therapy. 3rd ed, Boston, Toronto, Little Brown and Company. Ocular examination techniques and diagnostic tests 1985; 9 - 11.

53- Gereke M. Chemical structure and properties of midazolam compared with other benzodiazepines. Br J Clin Pharmacol 1983; 16: 115.

54- Pieri L, Schaffner R, Scherschlicht R, Pok P, Sepinwall J, Davidson A, Mohler H, Cumin R, Daprada M, Burkard WP, Keller HH, Muller RKM. Pharmacology of midazolam. Arznei-mittel-Forsch 1981 a; 31: 2180.

55- Ziegler G, Ludwig L and Klotz U; Effect of midazolam on sleep. Br J of Clin Pharmacol 1983; 16: 18 S.

56- Huges TJ and Thornoton JA. Midazolam on an intravenous induction agent (Correspondance). Anaesthesia 1982; 37: 465.

57- Hindmarch I and Subhan Z; the effect of midazolam in conjunction with alcohol on sleep. Psychomotor performance and car driving ability. Inter J of Clin pharmacol Res 1983; 3: 323.

58- Nicholson AM, Stone BM. Midazolam sleep and performance studies in middle age. Br J Clin Pharmacol 1983; 16: 115 S.

59- Sjovall S, Kanto J, Himberg JJ, Hovi-Viander M and Salo M; CSF penetration and pharmacokinetics of midazolam. Eur J Clin Pharmacol 1983; 25: 247.

60- Dundee JW, Samuel IO, Toner W, Howard PJ. Midazolam: A water soluble benzodiazepine. Studies in volunteers. Anaesthesia 1980; 35: 454.

61- Lebowitz DW, Cote ME, Daniels AL. Comparative cardiovascular effects of midazolam and thiopental in healthy patients. Anaesth Analg 1982 b; 61: 771.

62- Gelb A, Southhorn P, Rehder K, Didier EP. Sedation and respiratory mechanics in man. Br J Anaesth 1983; 55: 809.

63- Southhorn P, Rehder K, Didier EP. Sedation and respira-

tory mechanics in man. Br J Anaesth 1981; 55: A 367.

64- Graham CW, Pagano RR, Conner JT. Pain and clinical thrombophlebitis following intravenous diazepam and lorazepam. Anaesthesia 1978; 33: 188.

65- Hildebrand PJ, Elwood RJ, McClean E, Dundee JW. Intramuscular and oral midazolam. Some factors influencing uptake. Anaesthesia 1983; 38: 1220.

66- Kawar P, Dundee JS. Frequency of pain on injection and venous sequelae following the intravenous administration of certain anaesthetics and sedatives. Br J Anaesth 1982; 54: 935.

67- Gross JB, Zebrowski ME, Carel WD, Gardner S, Smith TC. Time course of ventilatory depression after thiopental and midazolam in normal subjects and in patients with chronic obstructive pulmonary disease. Anaesthesiology 1983; 58: 540.

68- Feldman SA. A comparative study of four premedications. Anaesthesia 1983; 18: 169.

69- Forester A, Gardaz JP, Sutter, Gemperle M. Intravenous midazolam as an induction agent for anaesthesia: A study in volunteers. Br J Anaesth 1980; 52: 907.

70- Stenlake JB. Ions- cyclic nucleotids-cholinergy. In: Stoclet JC, ed. Advances in pharmacology and therapeutics. New York: Perganon press, 1979; 303.

71- Hughes R,Chapple DJ. The pharmacology of atracurium: a new competitive neuromuscular blocking agent. Br J Anaesth 1981; 53: 31 - 44.

72- Hunter JM, Jones RS, Utting JE. Use of muscle relaxant atracurium in anephric patients: preliminary communication. J Roy Soc Med 1982; 75: 336.

73- Payne JP, Hughes R. Evaluation of atracurium in anaesthetized man. Br J Anaesth 1981; 53: 45 - 54.

74- Salvator J Basta, Ali HH, Savarese JJ. Clinical pharmacology of atracurium besylate. Anaesth Analg 1982; 61: 723 - 9.

75- Wylie and Churchill-Davidson's. A practice of anaesthesia. 5th ed. Lloyd-Luke Medical books. Ltd. The pharmacology of local anaesthetic drugs, 1984 , 847.

76- Curran J, Hamilton C, Taylor T. Topical analgesia before

tracheal intubation. Anaesthesia 1975; 30: 765.

77- Bigger JT, Heissenbuttel RH. The use of procaine amide and lidocaine in the treatment of cardiac arrhythmias. Progr Cardiovasc Dis 1969; 11: 515.

78- Francis F, Robert M, Pearl G. Comparison of toxicity of intravenously given local anaesthetic agent in man. Anaesthesia, 1970; 14: 89 - 94.

79- Atkinson RS, Alfred JA. Synopsis of anaesthesia. 10th ed. Wright Bristol. Regional analgesia : pharmacology and pharmacokinetics of drugs used in local anaesthesia, 1987; 1 - 6.

80- Kolker A, Hetherington J. Tonometry and tonography in Becker-Shaffer's diagnosis and therapy of the glaucomas. 5th ed. St Louis Toronto. The C.V. Mosby Company, 1983; 3: 60 - 5.

81- Young HS, Clarke RS, Dundee J. Intubation condition with AH 8165 and suxamethonium. Anaesthesia 1975; 30: 30 - 3.

82- Chandrashekar J, David L. Thiopental and succinyl choline:

action on intraocular pressure. Anaesth Analg 1975; 54: 471 - 5.

83- Bowen S, Mcgrand JC, Hamilton AG. Intraocular pressure after suxamethonium and endotracheal intubation: the effect of pretreatment with tubocurarine and gallamine. Anaesthesia 1978; 33: 518.

84- Hey VMF. Relaxants for endotracheal intubation: a comparison of depolarizing and non depolarizing neuromuscular blocking agents. Anaesthesia 1973; 28: 32.

85- Stone HH, Prijot EL. The effect of barbiturate and paraldehyde on aqueous humour dynamics in rabbits. Arch Ophthalmol 1955; 54: 834 - 40.

86- Mahajan, Grover. Double blind comparison of lidocaine, tubocurarine and diazepam pretreatment in modifying intraocular pressure increases. Can J Anaesth 1987; 34: 41 - 5.

87- Smith RB, Babinski M, Leana N. The effect of lidocaine on succinyl choline-induced rise in intraocular pressure. Can Anaesth Soc J 1979; 26: 482 - 3.

88- Abou-Madi MN, Keszler H, Yacoub JM. Cardiovascular reaction to laryngoscopy and tracheal intubation following small and large I.V. doses of lidocaine. Can Anaesth Soc J 1977; 24: 9 - 12.

89- Poulton TJ, Tames EM. Cough suppression by lidocaine. Anaesthesiology 1979; 50: 470 - 2.

90- Viegas O, Stoelting RK. Lidocaine in arterial blood after laryngotracheal administration. Anaesthesiology 1975; 43: 491 - 3.

91- Pelton DA, Daly M, Cooper PD, Conn AW. Lidocaine: concentration in plasma following aerosol application to trachea and bronchi. Can Anaesth Soc J 1970; 17: 250.

92- Telivua L. An experimental study on the absorption of some local anaesthetics through the lower respiratory tract. Acta Anaesth Scand Supp 1965; 16: 121.

93- Al Khudairi D, Whitwam JG, Chakrabarti MK, Askito-Paulou H, Grundy M, Powries. Haemodynamic effects of midazolam and thiopentone during induction of anaesthesia of coronary artery surgery. Br J Anaesth 1982; 54: 831.

94- Fieldman EJ, Ridley RW, Wood EH. Haemodynamic studies during thiopental sodium and nitrous oxide anaesthesia in humans. Anaesthesiology 1955; 16: 473.

95- Lebowitz DW, Daniels AL, Davidson JK. Comparative cardiovascular effects of midazolam and thiopental in healthy patients. Anaesth Analg 1982 b; 61: 771.

96- Prys-Roberts C, Foex P, Bivo GP, Robert JG. Studies of anaesthesia in relation to hypertension: adrenergic beta-receptor blockade. Br J Anaesth 1973; 45: 671.

97- Bromage R, Robson J. Concentration of lignocaine in the blood after intravenous, intramuscular, epidural and endotracheal administration. Anaesthesia 1961; 16: 461.

98- Steinhaus JE, Gaskin L. A study of intravenous lidocaine as a suppressant of cough reflex. Anaesthesiology 1963; 24: 285 - 90.

99- Boralessa H, Senior DF, Whitwam JG. Cardiovascular response to intubation- a comparative study of thiopentone and midazolam. Anaesthesia 1983; 38: 623 - 7.

100- Pernikoff M. Treatment of acute and chronic muscle spasm

EFFECT OF THIOPENTONE AND MIDAZOLAM INDUCTION WITH AND WITHOUT LIDOCAINE ON INTRAOCULAR PRESSURE

تأثير الادخال التخديرى لعقارى الثيوبنتون والميدازولام مع أو بدون الليدوكايين على ضغط العين .

Protocol of a thesis submitted
to the Faculty of Medicine,
University of Alexandria,
in partial fulfilment of the
requirements for the degree of

MASTER OF ANAESTHESIA

by

Ahmed Mansour Ahmed Abdou,
MBBCh, Alexandria,
Resident of Anaesthesia,
Alexandria University Hospitals.

خطة بحث مقدمة
لكلية الطب
جامعة الاسكندرية
ايفاء اجزئيا
لشرط الحصول على درجة

ماجستير التخدير

من

أحمد منصور أحمد عبده
بكالوريوس طب وجراحة / الاسكندرية
طبيب مقيم تخدير
بمستشفيات جامعة الاسكندرية

Department of Anaesthesia,
Faculty of Medicine,
Alexandria University.
1987.

قسم التخدير
كلية الطب
جامعة الاسكندرية
١٩٨٧ .

SUPERVISORS

المشـــــــــــرفون :

Prof. Dr Fawzy Ahmed Neemat Allah,
Professor of Anaesthesia,
Faculty of Medicine,
Alexandria University.

الاستاذ الدكتور / فوزى أحمد نعمة اللـه
أســـــــتاذ التخـــــــدير
كليـــــــة الطـــــــب
جامعة الاسكندريـــــــة

Dr Amal Mohamed Sabry Ahmed,
Lecturer of Anaesthesia,
Faculty of Medicine,
Alexandria University.

دكتورة / أمل محمد صبرى أحمـــــــد
مدرس التخـــــــدير
كليـــــــة الطـــب
جامعة الاسكندريـــة .

INTRODUCTION

The ideal anaesthetic technique for intraocular procedure should produce moderate reduction in intra-ocular pressure (I.O.P.) or maintain it at normal values and avoid marked fluctuation during surgery.[1] Any increase in the I.O.P. while the globe is open may cause expulsion of the vitreous with subsequent loss of vision.[2]

Anaesthetic agents can affect I.O.P. in a variety of ways by altering the physiological determinants of I.O.P.. They may act directly on the eye to induce changes in aqueous or intraocular blood volume, they may act locally by altering the tone of extra-ocular muscles and thus alter external compression of the sclera, or they may act indirectly by altering vascular tone or central control of I.O.P..[3]

Suxamethonium (succinyl choline) is known to raise the I.O.P., so its use to facilitate tracheal intubation especially in emergency open eye has been a controversial topic among anaesthetists.[4]

Furthermore, the rise in I.O.P. following succinyl choline is aggravated by tracheal intubation.[5,6]

Therefore, succinyl choline has been replaced by non-depolarizing muscle relaxants. It is demonstrated that d-tubocurarine,[7] and pancuronium[8] can reduce I.O.P. while atracurium causes no change in I.O.P..[9]

As regards induction agents, thiopentone was found to reduce I.O.P. by depression of the central controlling areas for I.O.P., although increased facility for aqueous drainage has also been shown to occur.[10]

Benzodiazepines (diazepam, midazolam,...etc.) reduce I.O.P. via their centrally mediated muscle relaxing properties[11] and peripheral muscle relaxant effect.[12]

Lidocaine (xylocaine) pre-treatment has been reported to prevent the rise in I.O.P. following intubation, this might have been due to an obtunded haemodynamic response,[13] suppressed cough reflex and increased depth of anaesthesia following pre-treatment.[14]

AIM OF THE WORK

This study will be designed to:

1. Assess the effect of Thiopentone and Midazolam on intraocular pressure.

2. To find out whether pre-treatment with intravenous Lidocaine (xylocaine) is effective in preventing the changes in intraocular pressure that are associated with induction and intubation.

3. To find out whether pre-treatment with topical lidocaine (xylocaine) spray of the upper airway can obtund the changes in intraocular pressure associated with intubation.

MATERIAL

This study will be carried out on sixty (60) patients free from any cardiovascular, respiratory, metabolic or neuromuscular disease (of the American Society Association [ASA class I and II]). These patients will be chosen at random as regards sex, age and weight and are scheduled for elective non-ophthalmic operation carried out under general anaesthesia.

METHODS

Premedication:

All patients will be premedicated with pethidine 1 mg Kg^{-1}. No atropine sulphate will be given till the measurement of I.O.P. is done.

Patients will be classified into two main groups (30 patients each).

Group I:

Patients will receive Midazolam (Dormicum) intravenously in a dose of 0.3 mg Kg^{-1} as an induction agent. The thirty patients will further be subdivided into three equal subgroups (ten patients each):

Group A_1: Patients will receive Midazolam (Dormicum) only.

Group B_1: Patients will be pre-treated with intravenous Lidocaine (Xylocaine) 2% in a dose of 2 mg Kg^{-1} five minutes before induction with Midazolam.

Group C_1: Patients will receive pre-treatment in the form of 10% Lidocaine spray 2 mg Kg^{-1}. Lidocaine will be sprayed into the mouth, tongue, pharynx, larynx 5 minutes prior to Midazoalm induction.

Group II:

Patients will receive thiopentone sodium 2.5% in a dose of 5 mg Kg^{-1}. These patients will be further subdivided into 3 equal subgroups (10 patients each):

Group A_2: Patients will receive Thiopentone only.

Group B_2: Patients will be pre-treated with Lidocaine I.V.(Xylocaine) 2% 2 mg Kg^{-1} 5 minutes before induction with Thiopentone.

Group C_2: Patients will receive pre-treatment in the form of 10% Lidocaine (Xylocaine) spray 2 mg Kg^{-1} Lidocaine will be sprayed into the mouth, tongue, pharynx and larynx 5 minutes prior to thiopentone induction.

After induction of anaesthesia with the chosen drug, Atracurium (Tracrium) in a dose of 0.5 mg Kg^{-1} will be administered, artificial ventilation via a face mask will be done with oxygen till complete relaxation, then endotracheal intubation with a cuffed endotracheal tube of appropriate size will be performed.

Maintenance:

Maintenance of anaesthesia will be carried out with oxygen (30%), nitrous oxide (70%) supplemented with fluothane 0.5 - 1%. Controlled ventilation will be done using Magill attachment.

Continuous monitoring of pulse rate and mean ABP via the Vitastat will be done. The electrocardiogram will be also continuously displayed to detect the occurrence of any arrhythmia.

Measurements:

1) Vital signs:

Heart rate (beats/minute), systolic, diastolic and mean arterial blood pressure (mm Hg) will be measured using blood pressure monitor (Vitastat 900/S).

Electrocardiogram (ECG). Lead II.

2) Intraocular pressure:

Will be measured using Schiotz indentation tonometry after application of surface anaesthesia in the eye (Benoxinate hydrochloride - 0.4% ophthalmic solution) to abolish corneal reflex.(15)

3) Intubation conditions:

According to the scheme described by Young, Clarke and Dundee in 1975.(16)

1. Jaw relaxation:

Good: Jaw is completely relaxed.

Fair: Jaw is incompletely relaxed.

Poor: Normal muscle tone of the jaw.

2. Vocal cord relaxation:

Good: The cords are fully abducted.

Fair: The cords are patially abducted and gentle pressure is required to pass a tube.

Slight: The cords are almost adducted.

3. Reaction to intubation:

Nill: No bucking on the tube.

Slight: Slight bucking on the tube.

Marked: Bucking with coughing on the tube.

Timing:

The haemodynamic data (H.R. and A.B.P. and E.C.G.) and I.O.P. will be measured at the same intervals of time:

- Prior to pre-treatment.
- After pre-treatment and just before induction.
- After induction.
- 60 seconds after intubation.
- 3 minutes after intubation.
- 5 minutes after intubation.

RESULTS

The results will be tabulated and statistically analysed.

DISCUSSION

The findings will be discussed in view of achievement of the aim. The significance of these findings and their comparison with other works will be done.

REFERENCES

1. Adams AA, Freedman A, Henvilte JD. Normocapnic anaesthesia for intraocular surgery. Br J Anaesth 1979; 63: 204.

2. Bowen DJ, McGrond JC, Hamilton AC. Intraocular pressure after suxamethonium and tracheal intubation. The effect of pre-treatment with tubocurarine or gallamine.Anaesthesia. 1978; 33: 518 - 22.

3. Dermot F, Murphy F, Farcs. Anaesthesia and intraocular pressure. Anaesth Analg 1985; 64: 520 - 30.

4. Cunningham J, Albert D, Cameron J and Watson AG. The effect of intravenous diazepam on rise of intraocular pressure following succinyl choline . Can Anaesth Soc J Vol 28 N°6 November 1981.

5. Pandey K, Badola RP, Kumar S. Time course of intra-ocular hypertension produced by suxamethonium. Br J Anaesth 1977; 44: 191 - 6.

6. Wyanards JE, Growell DE. Intraocular tension in association with succinyl choline and tracheal intubation. A preliminary report. Can Anaesth Soc J 1960; 7: 39.

7. Katz RL, Eakins KE. The action of neuromuscular blocking agents on extraocular muscles and intra-ocular pressure. Proc Roy Soc Med 1969; 62: 1217 - 20.

8. Litwiller RW, Difazio CD, Rushia EL. Pancuronium and intraocular pressure. Anesthesiology 1975; 42: 750 - 2.

9. Maharaj RJ, Humphrey D, Kaplan N, Kadwa H, Blignant P, Brock-utne JG, Welsh N. Effects of atracurium on intraocular pressure. Br J Anaesth 1984; 56: 459 - 63.

10. Couch JA, Eltringham RJ, Magauran DM. The effect of thiopentone and fazadinium on I.O.P. Anaesthesia 1979; 34: 586 - 91.

11. Pernikoff M. Treatment of acute and chronic muscle spasm with diazepam . Clin Med 1964; 71: 699 - 705.

12. Dretchen K, Ghoneim MM., Long JP. The interaction of diazepam with myoneural blocking agents. Anesthesioloy 1971; 34: 463 - 8.

13. Abou-Madi MM, Keszler H, Yacoub JM. Cardiovascular reaction to laryngoscopy and tracheal intubation following small and large intravenous doses of Lidocaine Can Anaesth Soc J 1977; 24: 12 - 9.

14. Poulton TJ, James EM: Cough suppression by lidocaine Anesthesiology 1979; 50: 470 - 2.

15. Kolker A, Hetherington J. Tonometry and tonography in Becker-Shaffer's diagnosis and therapy of the glaucomas. 5th ed St Louis Toronto The C.V. Mosby company 1983; 3: 60 - 5.

16. Young HS, Clark RSJ, Dundee JW, intubation condition with AH 81.65 and suxamethonium. Anaesthesia 1975; 30: 30 - 3.

ARABIC SUMMARY

الملخص العربي

بسم الله الرحمن الرحيم

الملخص العربي

نظرا للاستخدام المتزايد للتخدير الكلى فى عمليات جراحة العيون ،فانه من المفروض أن تتوافر عدة شروط فى نوع التخدير المستخدم فى هذه الجراحة . من أهم هذه الشروط الحفاظ على مستوى ضغط العين أو تقليله نسبيا أثناء اجراء الجراحة ، كذلك العمل على عدم ارتفاعه لما لهذه الزيادة فى ضغط العين الداخلى من نتائج ضارة أثناء الجراحة ومابعدها وعلى كفاءة القدرة البصرية للعين فيما بعد . أيضا يجب منع التغيرات الشديدة فى ضغط الدم وسرعة النبض أثناء الجراحة .

ولما كان عقار السكسينيل كولين المستخدم كمرخى للعضلات لاتتوافر فيه ميزة المحافظة على ضغط العين بل يودى الى ارتفاعه ، لذا فان استخدامه فى عمليات الرمد الجراحية غير مرغوب فيه على الرغم من أنه يعتبر من أفضل مرخيات العضلات المستخدمة لتركيب أنبوبة القصبة الهوائية . هذا الى جانب أن عملية تركيب أنبوبة القصبة الهوائية نفسها تؤدى الى زيادة فى ضغط العين . وعلى هذا لزم البحث عن طريقة للتخدير الكلى تتوافر فيها الشروط المذكورة سابقا واستخدام مرخى للعضلات ليس له عيوب عقار السكسينيل كولين .

ولقد أجرى هذا البحث على ستين مريضا تم تقسيمهم الى مجموعتين أساسيتين تضم كل مجموعة ثلاثون مريضا . ثم بعد ذلك تم تقسيم كل مجموعة اساسيه الى ثلاث مجموعات فرعية تضم كل واحدة منها عشرة مرضى . وقد تم تخدير المرضى جميعا بطريقة واحدة .

ففى العملية التحضيرية أعطى لهم ٥٠ مجم من عقار البيثيدين ثم تلا ذلك عملية الادخال التخديرى التى تمت بواسطة عقار

الميدازولام للمجموعة الاولى الاساسية وعقار الثيوبنتون للمجموعة الثانية الاساسية .

وقد استخدم الميدازولام بجرعة ٠٫٣ مجم لكل كيلوجرام من وزن المريض والثيوبنتون بجرعة ٥ مجم لكل كيلوجرام من وزن المريض مع ملاحظة أنه لم يستخدم أى عقار قبل عملية الادخال التخديرى للمجموعة الفرعية الاولى فى كل من المجموعتين الاساسيتين ، فى حين أنه تم حقن مرضى المجموعة الفرعية الثانية فى كل من المجموعتين الاساسيتين بعقار الليدوكايين وريديا بجرعة تساوى ٢ مجم لكل كيلوجرام من وزن المريض . وأيضا تم رش عقار الليدوكايين (الزيلوكايين) موضعيا فى منطقة القم والبلعوم والحنجرة لمرضى المجموعة الثالثة الفرعية فى كل من المجموعتين الاساسيتين بجرعة تساوى ٢ مجم لكل كيلو جرام من وزن المريض . هذا وقد تم استخدام عقار الليدوكايين وريديا وموضعيا قبل عملية الادخال التخديرى بخمس دقائق . ثم تم بعد ذلك حقن عقار الاتراكوريوم كمرخى للعضلات لكل المرضى بجرعة تساوى ٠٫٥ مجم لكل كيلوجرام من وزنهم . تبع ذلك اجراء عملية تنفس صناعى لكل المرضى باستخدام الاوكسجين بنسبة ١٠٠٪ ثم أدخلت أنبوبة القصبة الهوائية وبدأت مرحلة الاستمرار التخديرى باستخدام مزيج من الاوكسجين بنسبة ٣٠ ٪ وأكسيد النيتروز بنسبة ٧٠ ٪ الى جانب عقار الهالوثان بتركيز يتراوح بين ٠٫٥ — ١ ٪ هذا الى جانب عملية التنفس الصناعى طوال العملية .

ولقد تم قياس كل من الضغط الداخلى للعين

ومتوسط ضغط الدم وسرعة النبض خلال كل من المراحل الآتية :

١- قبل عملية الادخال التخديرى مباشرة .

٢- بعد عملية الادخال التخديرى مباشرة .

٣- بعد حقن مرخى العضلات .

٤- بعد ستون ثانية ، وثلاث ، وخمس دقائق من ادخال أنبوبة القصبة الهوائية .

ولقد اخذ فى الاعتبار الظروف المصاحبة لادخال انبوبة القصبة الهوائية وقد قمنا بتصنيفها باستخدام الجدول الموصوف بواسطة يونج وكلارك ودانددى سنة ١٩٧٥ . مع العلم بأنه قد تم استخدام جهاز القياسات ٩٠٠١ س لقياس النبض ومتوسط ضغط الدم وجهاز الشويتس تونو ميتر لقياس الضغط الداخلى للعين .

وقد كانت النتائج المستخلصة من هذه الدراسة كالآتى :

١- وجود نقص ذو دلالة معنوية فى كل من الضغط الداخلى للعين ومتوسط ضغط الدم وأيضا زيادة ذات دلالة احصائية فى سرعة النبض بعد عملية الادخال التخديرى بواسطة عقارى الميدازولام والثيوبنتون . وكانت قيمة كل من النقص والزيادة متشابهة بالنسبة للعقارين .

٢- وجد أن مرخى العضلات الاتراكوريوم ليس له تأثير ذو دلالة احصائية على كل من سرعة النبض ومتوسط ضغط الدم وكذلك على الضغط الداخلى للعين .

٣- وجد أن هناك زيادة مضطردة فى ضغط العين بعد عملية ادخال انبوبة القصبة الهوائية فى مرضى المجموعتين الفرعيتين

اللتين لم يحقن فيهما عقار الليدوكايين نهائيا قبل عملية الادخال التخديرى ، وكانت هذه الزيادة متشابهة فى كل منهما .

٤ـ كانت هناك أيضا زيادة فى ضغط العين بعد عملية ادخال أنبوبة القصبة الهوائية فى مرضى المجموعتين الفرعيتين اللتين استخدم فيهما عقار الليدوكايين موضعيا ولكن بنسبة تقل كثيرا عنها فى المجموعتين السابقتين فى حين أنه لم تلاحظ زيادة ذات دلالة احصائية فى المجموعتين الفرعيتين اللتين استخدم فيهما عقار الليدوكايين وريديا قبل عملية الادخال التخديرى .

٥ـ وجد أن عملية ادخال أنبوبة القصبة الهوائية كان مصحوبا بزيادة فى متوسط ضغط الدم وسرعة النبض فى جميع المرضى ولكن هذه الزيادة كانت بسيطة فى مرضى المجموعات الفرعية التى استخدم فيها عقار الليدوكايين وريديا قبل عملية الادخال التخديرى وكانت متوسطة فى مرضى المجموعتين اللتين استخدم فيهما الليدوكايين موضعيا ، فى حين أنها كانت زيادة مضطردة فى مرضى المجموعات التى لم يستخدم فيها الليدوكايين نهائيا .

٦ـ فى مرضى المجموعتين الفرعيتين اللتين لم يستخدم فيهما عقار الليدوكايين نهائيا كانت الزيادة فى متوسط ضغط الدم وسرعة النبض بعد عملية ادخال أنبوبة القصبة الهوائية كبيرة فى مرضى المجموعة التى استخدم فيها عقار الثيوبنتون عنها فى مرضى المجموعة التى

استخدم فيها عقار الميدازولام للادخال التخديرى .

٧ـ وجد أن الظروف الصاحية لادخال أنبوبة القصبة الهوائية كانت جيدة فى ٥٥ ٪ من المرضى بعد دقيقة ونصف من ابتداء حقن مرخى العضلات (الاتراكوريوم) وكانت جيدة فى ١٠٠ ٪ من المرضى بعد دقيقتين .

من الدراسة السابقة أمكن استنباط الاتى :

١ـ أن عملية الادخال التخديرى بواسطة عقارى الميدازولام والثيوبنتون ينتج عنها هبوط فى الضغط الداخلى للعين ومتوسط ضغط الدم وزيادة فى سرعة النبض بقيم متشابهة .

٢ـ كل من عقارى الميدازولام والثيوبنتون غير قادرين وحدهما على منع الزيادة فى ضغط العين المصاحب لعملية ادخال أنبوبة القصبة الهوائية .

٣ـ حيث أن الزيادة فى متوسط ضغط الدم وسرعة النبض المصاحب لعملية ادخال أنبوبة القصبة الهوائية كانت كبيرة فى مجموعة الثيوبنتون عنها فى مجموعة الميدازولام ، لذا فان الميدازولام يعتبر أميز من الثيوبنتون خصوصا أن هذه الزيادة يمكن اعتبارها خطيرة فى المرضى ذوى الحالات الحرجة .

٤ـ استخدام الليدوكايين وريديا قبل عملية الادخال التخديرى كان كفيلا بمنع الزيادة فى ضغط العين المصاحب لعملية ادخال أنبوبة القصبة الهوائية ، ولكن استخدامه

موضعيا لم يمنع هذه الزيادة وان كان قد حد منها كثيرا .

٥ ـ استخدام الليدوكايين وريديا أو موضعيا كان مصحوبا بزيادة بسيطة فى متوسط ضغط الدم وسرعة النبض الصاحب لعملية ادخال أنبوبة القصبة الهوائية ، فى حين أن هذه الزيادة تكون كبيرة فى حالة عدم استخدام الليدوكايين نهائيا قبل عملية الادخال التخديرى .

٦ ـ عقار الاتراكوريوم يوفر ظروف جيدة لعملية ادخال أنبوبة القصبة الهوائية فى مدة تتراوح بين دقيقة ونصف ودقيقتين ، كما أنه لايسبب تأثير ملحوظ على ضغط العين الداخلى أو متوسط ضغط الدم وسرعة النبض .

المشـــــــــــــرفون

الاســـتاذ الدكتور / **فوزى أحمـــــــد نعمـــة اللـــــه**
أستاذ التخـــــدير
كليـة الطـب ـ جامعـة الاسكـندريـة

دكتـــــــــــورة / **أمـــل محمـــد صبـــرى أحمـــــد**
مدرس التخـــديـر
كليـة الطـب ـ جامعـة الاسكـندريـة

تأثير الادخال التخديرى لعقارى الثيوبنتون والميدازولام مع او بدون الليدوكايين على ضغط العين

رسالة

مقدمة الى كلية الطب جامعة الاسكندرية

ايفاءا جزئيا للحصول على درجة ماجستير

التخدير

من الطبيب

أحمد منصور أحمد عبده

بكالوريوس الطب والجراحة (الاسكندرية)

كلية الطب

جامعة الاسكندرية

١٩٨٨