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INTRAOPERATIVE COMPARISON BETWEEN ISOFLURANE AND NITROGLYCERIN FOR HYPOTENSIVE ANAESTHESIA

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Abstract

Introduction

All surgeries involve cutting of the blood vessels which will obviously result in bleeding.
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Deliberate hypotension is a method to produce a controlled and safe reduction in the intravascular pressure, while preserving organ perfusion.
By enhancing the visualization of the surgical field, hypotension allows accurate delineation of lesions thereby causing fewer traumas to the delicate structures. Therefore intricate operations may be performed easily, exactly and therefore more successfully. Extensive surgical procedures are associated with considerable haemorrhage during and after surgery.

The concept of intentionally decreasing arterial BP to hypotensive levels during surgery was first proposed by **Cushing** in **1917** for intracranial surgery and was introduced into clinical practice by **Gardner in 1946.**
Since then, this technique has been variously named as **controlled hypotension, Induced hypotension, deliberate hypotension and hypotensive anaesthesia**.
Deliberate hypotension is defined as the intentional reduction of the systemic perfusion pressure. Most studies define deliberate hypotension as reduction in systolic blood pressure (SBP) to 80-90mm Hg (30% decrease in the SBP from the baseline pressure). According to another definition, deliberate hypotension is a decrease in the mean arterial pressure (MAP) to 50-65 mm Hg in normotensive patients.
Main purpose of hypotensive anaesthesia is to decrease intraoperative blood loss, thereby improving operating condition or decreasing the need for blood transfusions.
Different techniques have been used to achieve controlled hypotension.
1. PHYSIOLOGIC TECHNIQUES:-
Body positioning, the haemodynamic effects of mechanical ventilation, and changes in heart rate and circulatory volume can be used with drugs to lower blood pressure to the desired level. The appropriate use of physiologic maneuvers helps decrease the dose of potentially toxic drugs needed to produce hypotension.
2. **PHARMACOLOGIC TECHNIQUES:-** These includes:-

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 11, 2023

 Volatile Anaesthetics -- Halothane, Isoflurane, Sevoflurane,Enflurane, Desflurane.
 Directly acting vasodilators -- Sodium Nitroprusside, Nitroglycerine, Hydralazine, Adenosine.
 Ganglion Blocking Agents -- Trimethapan
 Beta Blockers -- Propanolol, Esmolol
13
 Combined α & β blocker -- Labetalol
 Calcium channel blocker -- Nicardipine
 Prostaglandins -- PGE1
 Spinal and Epidural Anaesthesia

The **ideal hypotensive agent** should have a predictable, dose dependent effect, rapid onset and recovery, quick elimination without producing toxic metabolites and should not disrupt auto regulation of vital organs.

Nitroglycerine is an organic nitrate which causes direct nonspecific, vascular smooth muscle relaxation, consequently decreasing both preload and after load on heart leading to fall in both systolic and diastolic blood pressure.

Isoflurane is a halogenated methyl ether and a potent inhalational anaesthetic. Isoflurane produces rapid hypotension by decreasing peripheral vascular resistance without myocardial depression . It also provides better myocardial perfusion than halothane or enflurane . With isoflurane baroreflex activity is better mained in hypotensive anaesthesia .It 14 has rapid onset and recovery , more potent peripheral vasodilating effect .It also has the ability to protect the brain from hypoxia due to decrease in cerebral metabolic rate . (**Artru 1984 : Michenfelder et al in 1987**). With these advantages , Isoflurane has been gaining increasing interest recently as a hypotensive agent in induced hypotension . Isoflurane has been used as the sole agent to induce hypotension in orthoganthic surgery and has significantly reduced blood loss and improved the quality of surgical field .

Since both these drugs are safe and easily available , an attempt has been made to study comparing Nitroglycerine with Isoflurane as hypotensive agents during spinal surgeries in the Operation theatres of SCB Medical College and Hospital ,Cuttack.

Materials & Methods

The study titled **“ Comparison between Nitroglycerine and Isoflurane for Hypotensive anaesthesia ”** was carried out at SCB Medical College and Hospital ,Cuttack, in patients of both the sexes in the age group of 18 – 60 years belonging to ASA (American Society of Anaesthesiologists) grade I and II posted for elective spine surgery (lumber laminectomy and decompression) in operation theatres under general anaesthesia . The study was undertaken during the period August 2014 to July 2015.

After getting due permission from the Hospital ethical committee , informed consent was obtained from sixty patients selected at random . They were thoroughly assessed preoperatively to exclude the presence of any significant systemic illness other than the disease for which they have

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 11, 2023

taken admission .
The cases suitable for the study were prepared for surgery .

PREOPERATIVE ASSESSMENT : ---

Preoperative assessment was done by --

 History .

74

 Clinical examination .

 Laboratory inventigations .

1. **HISTORY : --**

Patients having past history of

- Central Nervous system and cardio vascular system diseases like Cerebro vascular accidents , Transient Ischemic Attacks , Myocardial Infarction , Angina or Intermittent Claudications .
- Brain pathologies like h/o migraine , tumor or epilepsy .
- Asthma , breathlessness on exertion or coagulation disorders .
- Drug therapy such as β –blockers , oral contraceptive pills , antihypertensives or anti –coagulant therapy .
- Liver and kidney dysfunctions .
- Relevant endocrinological disorders .
- Addiction to alchol , smoking and narcotics .
- Grossly anaemic and hypovolemic patients .
- Chronically diseased and debilitated patients.

Were excluded from the study .

75

2. **CLINICAL EXAMINATION : --**

This was done by :-

i. General Examination
ii. Systemic Examination
iii. Specific Examination

i) **GeneralExamination:**

A detailed physical examination was done and patients having gross pallor , icterus , cyanosis , clubbing , oedema , lymphadenopathy , raised JVP and ascites were excluded from the study .

ii) **Systemic Examination:**

All the systems were examined thoroughly in every patient and if any abnormality detected then excluded from the study .

iii) **Specific Examination:**

To assess :

- The upper airway patency by inspecting nose , buccal cavity and pharynx .

76

- Difficult intubations by Mallampati Classification , patients having more than grade II were excluded .
- Cardio respiratory reserve by sabrasez test , breath holding for more than 30 seconds .

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 11, 2023

- Overall fitness for general anaesthesia .

3) LABORATORY INVESTIGATIONS : -

i) **Routine Tests**

- Haemogram—Hb%
- DC ,TLC ,TRBC
- BT , CT , Blood Sugar (fasting and 2 hrs post prandial)
- Serum Urea , Creatinine for renal function assessment .
- Serum Electrolytes (sodium and potassium).
- Platelet count .

Urine :

- Routine
- Microscopic

Stool :

77

- Routine
- Microscopic
- ECG and CXR – Routinely in patients over 40 yrs of age and in cardio respiratory abnormality .

If any abnormality detected the cases were excluded from the study .

ii) Special :

The following special investigations were done when felt necessary and if any abnormality detected than the patients were excluded from the study .

- Liver function tests
- Lung function test
- 2D – ECHO
- X –Ray skull , CT Scan , EEG
- Ultrasono Gram of abdomen and renal system .
- Bllod urea , serum creatinine
- Serum hormone assays (e.g. thyroid)

78

PREOPERATIVE PREPARATION :

After thorough assessment and confirmed diagnosis , sixty patients were thus selected and all the cases were kept over night fasting or 6hr before surgery and tablet ranitidine 150mg and tablet Alprazolam 0.5mg was given orally on the night before operation.

Patients were then divided into two demographically identical groups of 30 each at random and informed consent for the study was taken . They were named into two groups depending upon the type of hypotensive agent used .

 Group N: Patients received IV Nitroglycerine infusion.

 Group I: Patients received inhalation Isoflurane by fluotec vaporizer.

On the of operation patients were brought to the preanaesthetic room atleast 60 minutes before surgery in the early hours of morning (around 9 .00 AM) and one intravenous infusion was started with 18 G venous cannula . Intravenous infusion of Ringers lactate solution was administered

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 11, 2023

at the rate of 8 – 10 ml/kg/hr to maintain hourly urine output of atleast 1ml/kg/hr (50 ml or more).

In the operation room a preoperative check of blood pressure , pulse rate , SPO2 was done and ECG cables were attached for monitoring .

79

Premedication :

They were premedicated with inj. Glycopyrrolate 0.2mg i.v., inj. Butrophanol 0.2mg/kg i.v. and injection Midazolam 0.05mg/kg i.v. 20-30 mins prior to induction.Patients will be preoxygenated for 3 minutes with 100% oxygen at a flow rate of 5lit/min.

Induction :

All the patients were induced with an induction dose of Propofol 2.5mg/kg intravenously .

Intubation :

All the patients were intubated with appropriate size cuffed endotracheal tube after adequate relaxation by vecuronium bromide 0.1mg/kg. and mask ventilation with 100% oxygen . The cuff was inflated just to obliterate audible leakage , and fixed with adhesive tape .

.**Maintainance :**

Anesthesia will be maintained with 60% N2O in oxygen; adequate muscle relaxation will be achieved with intermittent vecuronium bromide. Ventilation (tidal volume 8-10 ml/kg) will be adjusted to maintain end tidal carbon dioxide <35 mmHg.

80

Under all aseptic precautions a 15 cm central venous catheter will be inserted via the right internaljugular vein. Radial artery was cannulated using 20 G cannula , connected to a transducer for beat by beat blood pressure monitoring . All the patients will be catheterized with Foley's catheter for measuring urine output.

As surgery will be performed in prone position firm supports under chest and pelvis will be kept so that the abdominal movements and the venous return will not hampered. Compression of the abdomen by faulty positioning would result in the increase in central venous pressure (CVP) and engorged epidural veins. The eyes will be closed and covered and arms will be padded.

The selected hypotensive agent will be started after changing the patient to prone position.

The group N received Nitroglycerine infusion by syringe pump which was prepared by addition of 25 mg of nitroglycerine to 50 ml of 0.9% NS . The infusion was started with 1μg/kg/min and titrated to achieve the systolic blood pressure to less than 100 mm Hg before the skin incision and maintained in the range of 80 – 100 mm Hg or maintained the mean arterial pressure between 60 – 70 mm Hg . However it was decided not to exceed the maximal rate of Nitroglycerine infusion above 10 μg/kg/min .

81

In group I isoflurane will be started at 0.5 vol % and adjusted to

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 11, 2023

achieve the systolic blood pressure to less than 100 mm Hg before the skin inscision and maintained in the range of 80 – 100 mm Hg or maintained the mean arterial pressure between 60 – 70 mm Hg . However it was decided not to exceed the inspired concencentration of Isoflurane above 4% .

Monitoring of following parameters will be done: BP, HR, SpO2, ETCO2, ECG, CVP, Temperature, urine output.

The systolic blood pressure was lowered to less than 100 mm Hg before the skin inscision and maintained in the range of 80 – 100 mm Hg throughout the surgery in both the nitroglycerine (Group – N) and Isoflurane (Group – I) groups , by adjusting the dose of nitroglycerine and concentration of Isoflurane . The blood loss was replaced by whole blood when the loss exceeds 10% 0f estimated blood volume .Surgens were advised to not to use any adrenaline infiltration before the skin inscision .All datas was recorded on a specially prepared anaesthesia record sheet .

The loss of blood was assessed by weighing of tetras , blood in the suction bottle and in the kidney tray deducing any amount of irrigating fluid used during the surgery .The swabs were weighted before they were used and weighted again after they were soaked with blood and thrown

82

individiuallt into a collecting basket . The difference in the weight was taken as the amount of blood loss . 1gm gain in weight = 1 ml of blood loss .

For evaluation of the visibility of the operative field during surgery , the quality scale proposed by **Fromm and Boezaart** was used .

Grade – 1 – Slight bleeding – No suctioning of blood required .

Grade – 2 -- Slight bleeding – Occasional suctioning required . Surgical field not threatened .

Grare – 3 – Slight bleeding – Frequent suctioning required . Bleeding threatens surgical fieled a few seconds after suction is removed .

Grade – 4 – Moderate bleeding – Frequent suctioning required . Bleeding threatens surgical field directly after suction is removed .

Gread -5 -- Sever bleeding – Constant suctioning required . Bleeding appears faster than can be removed by suction . Surgical field threatens severely and surgery impossible .

The hypotensive agents were discontinued before suturing of the wounds.

83

The systolic blood pressure was allowed to return to pre hypotensive levels or near to it to check for the hemostasis .

The operative time was measured from the start of skin incision to the end of skin closure .

Fluid input during surgery period will be determined based on preoperative fasting, blood loss and clinical criteria (arterial pressure, heart rate and observation of the patient).

Ondansetron 8 mg i.v. was given before end of the surgery .

Reversal :

The patients were reversed at the end of surgery with appropriate doses

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 11, 2023

of inj. Neostigmine (0.05 mg /kg) and inj. Glycopyrolate (0.01 mg/kg)
Then the patients were kept in recovery room till they fully recoverd .
Then the patients were shifted to the ward .

Monitoring :

The patients were constantly monitered for vital functions like : NIBP, HR, SpO2, ETCO2, ECG, CVP, Temperature, urine output from premedication till the recovery and recoreded as follows : -

(a) Before premedication

84

(b) Before induction,
(c) Before intubation ,
(d) After intubation ,
(e) Every 5 minutes till 30 minutes and then 10 minutes till the end of surgery .

Post operatively the patients were monitored in ICU and the above parameters were noted every two hourly .

If wide and frequent variations in the vital functions were observed they were recorded and steps were taken to correct them . These patients were excluded from study .

SPECIFIC OBSERVATIONS :

Pulse , blood pressure , ECG recording during and before induction of hypotension was observed .

(i) Pre operatively .
(ii) Before premedication .
(iii) Before intubation .
(iv) At the start of hypotensive agents .

85

(v) 5 minutes after starting the hypotensive agent and then every 5 minutes interval for 30 mins and then at 10 mins interval till the end of surgery .
(vi) at hypotensive agent discontinuation
(vii) after extubation
(viii) Blood loss was assessed from the suction bottle , weight difference of dry and wet tetra and from the kidney tray by a 20 cc syringe .

At the end of surgery dizziness , nausea , drousiness , or any other postoperative complications were assessed .

The following points were specifically noted during induced hypotension in both the groups .

(i) Speed of onset of hypotension :

The time taken to lower systolic blood pressure to less than 100 mmHg or MAP to less than 70 mm Hg was noted in both the groups .This was taken as induction time .

(ii) Heart rate variations during induced hypotension.

(iii) Speed of recovery from hypotension .

86

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 11, 2023

The time taken for spontaneous recovery of systolic blood pressure to pre – induction value after discontinuation of the hypotensive agent was observed in both the groups was taken as the recovery from hypotension .

(iv) Effectivity of the hypotensive technique :

This was judged , taking into account the following parameters :

(a) Mean intra –operative blood loss

(b) Duration of surgery

(c) No. of patients requiring intra –operative blood transfusion .

(d) Surgeons score (about the dryness of surgical field)

(e) Incidence of post –operative complication.

The data were entered into a Microsoft Excel Computer programme . Data were analysed using Medcal software . Descriptive statistics in the form of frequencies , Mean ,Median, Standard Deviations and was compared by using unpaired T –Test and data in proportion was compared by using Chi – square Test and Fisher's exact test ($p < 0.05$ = significant .).

Observations

A clinical comparative study of the use of Glyceryl Trinitrate (GTN) and Isoflurane in controlled intraoperative hypotension during spine surgery was undertaken in sixty patients of ASA Gr. I and II 0f either sex , varying from 18 – 60 yrs of age , at S.C.B. Medical college and Hospital , Cuttack .

The observations were done as per the following parameters .

1. Age.
2. Sex .
3. Body weight.
4. Cardiovascular changes with respect to ;
   - Heart rate
   - Systolic Blood Pressure
   - Diastolic Blood Pressure
   - Mean Arterial Pressure.
5. Speed of onset of Hypotension in both the groups
6. Speed of recovery of hypotension in both the groups
7. Blood loss
8. Surgeon's score
9. Percent fluctuation of various parameters.

HR and BP were recordaed before premedications , before intubation , at the time of start of hypotensive agent and 1 , 5 , minutes after administration of hypotensive agent and then every 5 minutes till 30 minutes and then every 10 minutes till the end of surgery . Post reversal half hourly during recovery then two hourly in the recovery room . Again on the next day morning.

89

Discussion

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 11, 2023

The study " **The comparision of Nitroglycerine and Isoflurane in Hypotensive anaesthesia "** is carried out in spinal surgery procedures in S.C.B Medical college and Hospital , Cuttack taking sixty healthy ASA grade I and II patients posted for elective surgeries on spine (Lumber Laminectomy and Decompression) belonging to both sexes , and in the group of 18 – 60 years . The study was carried out during the period of august 2014 to July 2015 .

The result of the study are discussed with observations of other workers in the field of work , taking steps to account for difference or similarity as far as possible . The various aspects of discussed this study are as follows : --

AGE OF THE PATIENTS : --

In the Nitroglycerine group (Group – N) and Isoflurane group (Group - I) , the mean age of the patients are 39.300 ± 6.482 and 39.00 ± 7.86 years respectively . Almost equal age wise distributions are observed in both the groups . The age group 18 – 60 yrs was chosen to circumvent the variables at the extremes of age . We have deliberately excluded the geriatric age group because of the associated changes in cardiovascular physiology which would have interfered with our study . There is decreased 105

arterial compliance , decreased beta adrenergic responsiveness , decreased barorecepter sensitivity , decreased SA node automaticity in geriatric patients . **(Harrisions Internal Medicine 2011, 19 th Edn.**) . Similarly younger patients are more resistant to the action of hypotensive drugs because of an exaggerated baro receptor response . They too were excluded from the study for this reason .

SEX OF THE PATIENTS : --

In Group – N and Group – I the male female ratio was respectively . Almost equal sex wise distribution are observed in both the groups . In our study too there was a male preponderance 50(83.33%) and female 10 (16.66%) . This male preponderance can be attributed to the fact that Men are devoted to the farming activities and are laborers lifting heavy weights, hence many workmen engage in activity that involves strain or trauma of lumbar spine.

WEIGHT OF THE PATIENTS : --

The weight of the patients had been considered for the purpose of dosages calculations of different types drugs used . Patients in both the 106

Groups didn't show any significant variations and were in the range of 35 – 70 kg.

Thus all the patients were demographically identical in relation to age , sex , and weight in both the groups .

Table No. – IV shows the preoperative vitals in the two study groups . Heart rate , SBP , DBP , MAP were in the identical range in the two groups .

ONSET OF HYPOTENSION : --

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 11, 2023

In the present series , time of onset of hypotension was measured as the time to lower SBP to 100 mm Hg or below .Our study differs from the work of **Pal and Parmink (1976)** who judged the onset of action as the time to lower the SBP below 80 mm Hg .

We have maintained SBP in the range of 80 – 100 mm Hg and the MAP pressure around 70 mm Hg in order to prevent the disruption of autoregulatory blood flow to vital organs .

Nitroglycerine could reduce SBP faster than Isoflurane . In our study the mean onset of hypotension time was 5.60 ±1.276 (Mean ± SD) in Nitroglycerine group . Onset time was 13.567 ± 2.176 (Mean ± SD) in the Isoflurane Group .

107

In our study the time required by NTG to achieve desired SBP was 5.60 ±1.276 min correlating well with the studies of **Tannieres et al (4-6 min**)and **Shenoy et al (3-6)min.**

Seigle Morach and Green (1986) who could achieve hypotension with Nitroglycerine in 2.1 minutes in most of their cases .

The quick action of Nitroglycerine has been attributed to the direct musculotropic action on the blood vessels , both the venous and arterial systems . **(Goodman and Gillman)** .

In our study the time required by Isoflurane to achive desired SBP is 13.567 ± 2.176 corelating well with studies of **Ankichetty SP , Ponniah M, Thomas S et al (2011) (16 ± 7 mins) .**

RECOVERY FROM HYPOTENSION : --

Recovery from the hypotensive effects is of special significance as bleeding within the spinal canal cann't be controlled by usual maneuvers like pressure once the skin is closed .

In this series , we found out that the recovery from hypotension was much more faster in the Nitroglycerine group than Isoflurane group . Mean recovery time was 6.33 ± 1.373 in NTG group . It was 13.467 ± 3.098

108

in Isoflurane group group . This difference was found to be significant . ($p < 0.001$) .

Our observations corroborate with the findings of **Yajnik et al (1977)** and **P. Jindal, R. Gupta & J. P. Sharma 2008** who had concluded that onset and recovery from controlled hypotension using organic nitrates is extremely rapid and thus nitrates are definitely superior and more potent hypotensive agents compared to others .

Kadam PP , Saksena SG (1993) and Ankichetty SP , Ponniah M, Thomas S, also had a similar opinion .

DOSE REQUIRED FOR INDUCED HYPOTENSION:-

Both Nitroglycerine and Isoflurane -- based techniques were equally capable of producing controlled hypotension .

The highest concentration used in Isoflurane group to achieve target blood pressure was an inspired concentration of 2.5% - 3.5% and maintenance was achieved with a concentration of 0.5% – 2.5 %. In a study

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 11, 2023

by **Tirelli et al** a concentration of 1 – 2 % of Isoflurane was used in Isoflurane group for the maintenance which is almost similar to our study . In Nitroglycerine group the dose required to maintain the blood pressure at the desired level ranged from average of 0.9482 to 1.716µg/kg/min which
109
is quite similar to the doses used by **Fahmy and Shiraishi et al** . (1.023 ± 0.468).

HEART RATE : --

Table shows the variations in mean heart rate after start of hypotensive agent .

Heart rate was compared in two groups .In group -- N there was a significant increase in heart rate seen from the baseline after induction. There was a highly significant increase in heart rate at 15, 30 minutes after the start of the hypotensive agent and highly significant increase in heart rate almost at a constant level till the end of the surgery when compared with the baseline values.

On comparing intra group we observed that HR had decreased significantly in group - I as compared to group --N . at 15, 30 min.In group - I there was a significant increase in heart rate after induction, at 5min after induction , at the start of hypotensive agent in group I but there was no significant alterations at other time intervals when compared to baseline values.

Kapaln JA , Dunbar RW , 1967 . Kadam PP , Saksena SG , 1993. didn't observe significant change in heart rate when Nitroglycerine was used to control blood pressure during coronary artery surgery . They suggested that gradual reduction in blood pressure by Nitroglycerine prevented a higher
110
increase in heart rate in heart rate . Similar results were reported by **Bale et al , Fahmy NR , 1978 and Dauchet PJ , 1979 .** Our study corroborated well with the findings of **P. Jindal, R. Gupta & J. P. Sharma 2008, and Ankichetty SP , Ponniah M, Thomas S, Kumar K et al 2011** that organic nitrates has significantly raised heart rate than inhalational agents.

AMOUNT OF BLOOD LOSS : --

The total amount of blood loss assessed in spine surgeries for Group - N was 219.96 ± 12.992 and for Group - I it was 225.96 ± 11.978 which shows that the mean intraoperative blood loss in Nitroglycerine group was significantly less ($p < 0.0259$) compared to the Isoflurane group .

These findings conforms to the observations of Kakiuchi . M (Osaka , Japan 1998) who demonstrated that the main source of bleeding during posterior spinal surgery is the bone and is venous rather than arterial . The reduced venous pressure decreases intraosseos pressure , drastically reducing bleeding .
111
Nitroglycerine predominantly dilates the venous capacitance vessels causing pooling of blood away from the operating site .

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 11, 2023

The reduced oozing in GTN Group led to a dried and clearer surgical field where as the field was wet and interfered with surgical dissection in the Isoflurane group .

Ankichetty SP , Ponniah M, Thomas S, Kumar K et al 2011 also had a similar opinion .

DURATION OF SURGERY : --

In Group – N the duration of surgery was 134.70 ± 13.754 minutes and in Group – I the duration was 140.83 ± 10.158 minutes .

Though the blood loss is more in Isoflurane group due more oozing, the duration of surgery is statistically not significant . Our observations corroborated well with the study by P. Jindal, R. Gupta & J. P. Sharma (2008) and Ankichetty SP , Ponniah M, Thomas S, Kumar K et al (2011) who had emphasized there is no significant advantage of NTG over Isoflurane inhalational anaesthetic technique in terms of duration of surgery .

112

GRAPH - 7,8,9

The SBP was well maintained in between 80-95mm Hg in groups N and I during the hypotensive period. There was no significant in various groups during the course of hypotension. There was no incidence of rebound hypertension seen in any of the hypotensive group .

There was statistically no significant difference ($p>0.05$) in diastolic blood pressure before induction in all the groups. Average 33-40% reduction in DBP was seen from the baseline values in all the hypotensive groups. When compared to baseline, the DBP at 15, 30, 45,60min till the drug discontinuation the variation was highly significant due to deliberate hypotension.

Mean arterial pressure (MAP) decreased from 31-35% in all the two groups. There was no significant difference in MAP in two groups during the course of hypotension.

COMPLICATIONS : --

The complications that had or might have been observed were shown in the table .

113

Prolonged drowsiness for up to 2-4 hrs was seen in cases in 2 cases in Isoflurane group compared to nil in group – N .

None of the patients in two groups had postoperative nausea and vomiting . This could be due to prophylactic administration of ondansetron in both the groups .

There were no signs of cerebral dysfunction in either of the groups . Not a single case of allergic manifestations was observed in this series . Rebound hypotension was also not observed in any patients after discontinuation of respective hypotensive agent . There was no evidence of tolerance or tachyphylaxis to the action of Nitroglycerine .

No other life threating complications was observed .

ISSN: 0975-3583, 0976-2833 **VOL14, ISSUE 11, 2023**

Summary

60 cases from Neurosurgery Inpatients resister of S.C.B.
Medical college and Hospital , Cuttack , posted for elective spine surgery (Lumber laminectomy and decompression ; posterior approach) where controlled hypotension was indicated were taken up for this study .
The cases were divided into two demographically identical groups. In one group hypotension was induced by using Nitroglycerine infusion in the dose range 1 – 10 μg /kg / min and in other group , Isoflurane inhalation was used in flutech Vaporiser in a concentration of 1 – 4 % . All the patients were administered general . SBP was lowered to 80 – 100 mmHg before skin incision and maintained throughout the surgery by titrating the doses of drugs in both the groups .
The following points were noted for each drug and tabulated .
1. Speed of onset of hypotension .
2. Intraoperative heart rate variations .
3. Speed of recovery from hypotension .
4. Mean blood loss .
5. Duration of surgery .
6. No of patients requiring blood transfusion .
116
7. Surgeon's scoring .
8. Post operative complications
Obeservations were compared between the two groups using standard statistical analysis .
The following conclusions were derived from the study .
 Nitroglycerine induces hypotension more rapidly and speed of recovery from hypotension is also faster .
 Intra- operative blood loss is significantly less in Nitroglycerine group as oozing is more in isoflurane group than Nitroglycerine group .
 Because of the reduced blood loss the need for blood transfusion is less in Nitroglycerine group .
 In both the groups all the patients belong to Grade 3 and below which denotes highly acceptable surgical field as far as the surgeon concerned , However the no. of patients in Grade 3 are more in Isoflurane group than Nitroglycerine group.

Conclusiuon

Though controlled hypotension is produced effectively and surgical field is acceptable with isoflurane , Nitroglycerine is a safe and potent drug to achieve controlled hypotension

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 11, 2023

during surgical operations .□□

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