"COMPARATIVE STUDY OF INTRAVENOUS TRAMADOL AND DEXMEDETOMIDINE IN PREVENTION OF POST-ANESTHESIA SHIVERING. - A ONE YEAR RANDOMIZED CLINICAL TRIAL."

BY

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Dissertation

Submitted to

KAHER, Belagavi, Karnataka,

In partial fulfilment of the requirements for the degree of

M.D.

In

ANAESTHESIOLOGY

DEPARTMENT OF ANAESTHESIOLOGY,
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JUNE/JULY - 2023

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Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"COMPARATIVE STUDY OF INTRAVENOUS TRAMADOL AND DEXMEDETOMIDINE IN PREVENTION OF POST – ANESTHESIA SHIVERING" : A ONE YEAR RANDOMISED CLINICAL TRIAL.** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

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LIST OF ABBREVATIONS

1. L.C. = Laparoscopic Cholecystectomy.
2. L.A. = Laparoscopic Appendicectomy.
3. L.H.R. = Laparoscopic Hernia Repair.
4. O.R.I.F. = Open Reduction Internal Fixation.
5. L.E. = Lump Excision.
6. T.R. = Tumour Resection.
7. D.L. = Diagnostic Laparoscopy.
8. C.E. = Cyst Excision.
9. D & G = Debridement and Grafting.
10. LY. EX = Lymphoma Excision.
11. L.S. = Laparoscopic Sterilization.
12. H.E. = Haemangioma Excision.
13. ASA = American Society of Anaesthesiology.
14. Kgs = Kilograms.
15. Inj = Injection.
16. mg = Milligrams.
17. mcg = Micrograms.
18. I.V. = Intravenous.
19. N.S. = Normal Saline.
20. Group-D = Group-Dexmedetomidine.
21. Group-T = Group- Tramadol.
22. NBM = Nil by Mouth.
23. VAS = Visual Analog Scale.
24. ◦C = Degree Celsius.

25. S.D. = Standard Deviation.

26. Cms = Centimetres.

27. ◦F = Degree Fahrenheit.

28. H.R. = Heart Rate.

29. B.P. = Blood Pressure.

30. SPO2 = Saturation.

ABSTRACT

BACK GROUND

Shivering is most common complication following general anesthesia. The primary cause of post-anesthesia shivering is the peri-operative hypothermia. Shivering primarily increases oxygen consumption, which is detrimental to people with low cardiac reserve. The intracranial pressure and intraocular pressure increase when you shiver. In the current study, we evaluated the effectiveness of Tramadol and Dexmedetomidine injections to prevent post-anesthesia shivering in patients undergoing general anesthesia for surgery.

METHODOLOGY

The two groups; GROUP-T and GROUP-D, were randomly assigned to a total of 60 patients with ASA Grades 1 and 2 who were of either gender. In Group-D, patients received 50 mcg of Injection dexmedetomidine (100 mcg diluted in 20 ml N.S. in which 10 ml was given over 10 minutes); In Group-T, patients received 50 mg of Injection Tramadol (100 mg diluted in 20 ml N.S. in which 10 ml was given over 10 minutes) just after the completion of intubating the patient. For the first hour, vital signs were taken every ten minutes; the next hour, they were taken every 20 minutes. Prior to induction, immediately after induction, and then every 30 minutes for the duration of the 2 hours of surgery, the tympanic membrane's core temperature was measured. H.R, B.P, spo2, tympanic membrane temperature was measured at the time of entry to the recovery room (T0), after 10 minutes (T10), after 20 minutes (T20),

30 minutes(T30) and then every half hour for the following hour in post-operative period. Incidence of Post –anesthesia shivering, nausea, vomiting, post-operative analgesic requirement was noted.

RESULTS

Patients undergoing general anesthesia for surgery experienced less post-anesthesia shivering when given dexmedetomidine or tramadol, respectively. Both injection Tramadol and Dexmedetomidine were equally successful in preventing post-anesthesia shivering. Out of 60 patients, 5 patients of Group-D and 10 patients of Group-T had shivering. The incidence of nausea, vomiting and use of post-operative analgesia was more with Group-T compared to Group-D. There was statistically significant variations in hemodynamics between both groups.

CONCLUSION

In patients undergoing surgery under general anesthesia, intravenous Dexmedetomidine and tramadol were equally effective in preventing post-anesthesia shivering. When compared to Tramadol, Dexmedetomidine had fewer adverse effects such as vomiting and nausea and required less rescue analgesia. So, both Dexmedetomidine and Tramadol were equally effective drugs in prevention of post-anesthesia shivering.

KEY WORDS

Shivering, Nausea, Vomiting, Analgesia, Dexmedetomidine, Tramadol.

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INTRODUCTION

Shivering is a common and very unpleasant & physiological symptom experience to many patients which can occur during or after surgery. It is "a repetitive, involuntary activity of skeletal muscles"[15]. Shivering is a frequent complication of anesthesia in post-operative period, which has been reported as 20 to 70%. The incidence of shivering varies in patients after spinal anesthesia and general anesthesia which is about 5 to 65% after general anesthesia and 33% after spinal anesthesia. Shivering obscures monitoring during surgery like ECG, SPO2, BP. It increases the intra-ocular pressure & intra-cranial pressures. Shivering can occasionally result in a cold sensation that hurts more than the pain of surgery.

Post-anesthesia shivering is mostly caused by peri-operative hypothermia, which is also a major source of metabolic acidosis, prolonged drug metabolism, increased oxygen consumption, delayed recovery, decreased platelet activity, and impaired immunological responses. Human core temperature normally is average of 98.6◦F, ranging from 97◦F to 99◦F (36.5◦C to 37. 5◦C). Since mammals are homeothermic, they need a nearly constant internal body temperature.

Anterior hypothalamus integrates thermal inputs from body and compares peripheral information with a set point. Temperature lower than the set point will result in body changes to warm the body and when the temperature increases, it will trigger reflexes which will cool the body.

Treatment for shivering includes both pharmacological and non – pharmacological methods. Non-pharmacological treatment includes external heating like use of the blankets, air warmers, warmed fluids, operation theatre temperature regulation etc.,

Pharmacological treatment is the next mode of treatment choice for hypothermia. Numerous drugs have been used for treatment of shivering. For the treatment of post-anesthesia shivering, medications such as Tramadol, alpha-agonists, opioids, MgSO4, Steroids, and serotonin antagonists are utilized.[1]

SNRI (Serotonin/Norepinephrine Reuptake Inhibitor) and centrally acting opioid agonist tramadol are both used to treat moderate to severe pain in humans. Through the binding of parent & M1 metabolite to -opioid receptors and weak suppression of the absorption of nor-epinephrine & serotonin, tramadol changes the descending pain pathways within the central nervous system.

Dexmedetomidine is a selective α2 adrenergic agonist and has a greater selectivity for the α2 adrenoceptor than the α1 receptor. It produces sedation, analgesia, anxiolysis and has anti-shivering properties.

There are many medications available to treat post-anesthesia shivering. The effectiveness of a preventive infusion of tramadol and dexmedetomidine in patients awaiting surgery under general anesthesia, however, has not been thoroughly examined in any study. [4] The current study compares the effectiveness of Tramadol and intravenous dexmedetomidine in preventing post-anesthesia shivering.

AIM AND OBJECTIVES

AIM

To evaluate the comparative efficacy of intra-venous Dexmedetomidine and intra-venous Tramadol in prevention of post-anesthesia shivering in patients undergoing surgery under general anesthesia.

OBJECTIVES

PRIMARY OBJECTIVE

1. To evaluate the effectiveness of dexmedetomidine and tramadol intravenously in preventing post-anesthesia shivering.

SECONDARY OBJECTIVE

1. To compare the side effects of both drugs: Nausea, vomiting.
2. To compare the use of additional analgesics.

REVIEW OF LITERATURE

A thorough review of the literature found that Tramadol and Dexmedetomidine, used separately, have been shown to be effective for treating post-anesthesia shivering, but few studies on comparison of randomized trial for efficacy has been conducted.[1]

In **2008, E G Elvan et.al,** conducted a study on Dexmedetomidine and post operative shivering in patients undergoing elective abdominal hysterectomy. 90 female patients were included in the study. One group received a normal saline infusion after endo tracheal intubation, whereas the other received a loading dose of 1mcg/kg of dexmedetomidine for 10 minutes, followed by a maintenance dose of 0.4mcg/kg/hr. This study found that dexmedetomidine infusion during surgery may be useful in preventing post-anesthesia shivering.[19]

In **2014, Geeta Mittal et.al,** conducted a randomized double blinded comparative study of Dexmedetomidine and Tramadol in post spinal anesthesia shivering. The study included 50 patients with 25 patients in each group. Each group received either Dexmedetomidine (0.5 mcg/kg) or Tramadol (0.5 mg/kg) by slow I.V. infusion. The study concluded that both Dexmedetomidine and Tramadol were equally effective in treatment of post spinal anesthesia shivering. But time taken to control shivering was less with Dexmedetomidine group with minimal side effects compared to Tramadol. [24]

In **2015, Lewis SR et.a**l, published a data base review which included 20 studies on comparing dexmedetomidine against a control and clonidine against a control. The study concluded that clonidine and dexmedetomidine can reduce post-

operative shivering, but patients given dexmedetomidine may be more sedated[2].

In **2015 Hoffman et.al,** published a database of systematic reviews and implementation reports on effectiveness of Dexmedetomidine use in general anesthesia to prevent post operative shivering. This study included eight randomized controlled trials with 625 participants. It showed a relative risk ratio of 0.27 which is in favour of dexmedetomidine. The result of meta-analysis revealed that prophylactic administration of intravenous dexmedetomidine had a statistically significant reduction in the incidence of postanesthetic shivering in patients undergoing general anesthesia. [3]

In **2015 Fern L et al.** conducted a prospective, randomized, double blind study on comparison of dexmedetomidine, pethidine and tramadol in treatment of post-neuraxial anesthesia shivering by taking 60 patients. The study concluded that dexmedetomidine 0.5mcg/kg was more effective than 0.5mg/kg of tramadol and 0.5mcg/kg of pethidine; and both pethidine and tramadol were found to have similar efficacy[6.]

In **2015, Zhen-Xiu Liu et.al** conducted a meta-analysis of clinical trials on efficacy of dexmedetomidine on post operative shivering. This study included 39 trials with 2,478 patients. This study concluded that Dexmedetomidine reduced post operative shivering compared with placebo with a minimum effective dose of 0.5 mcg/kg. This study also stated that anti-shivering effect can be achieved both intravenously and epidurally when administered within 2 hours prior to the end of surgery. This study indicated that Dexmedetomidine showed superior to placebo, but not over other anti-shivering agents.[12]

In **2016 Venkataraman et.al** conducted a prospective, randomized, double blind study by taking 90 patients and randomly allocated into 3 groups with 30 patients in each group receiving Tramadol, clonidine, dexmedetomidine. Because of its quicker onset and lower recurrence rate, Dexmedetomidine is superior to tramadol and clonidine in controlling shivering, according to the study.[4]

Shikha Sahi et al. conducted a randomized clinical trial in **April–June 2016** with 120 patients; 30 patients in each group were scheduled for elective laparoscopic cholecystectomy under general anesthesia, and patients were given Clonidine 2mcg/kg, tramadol 1mg/kg, dexmedetomidine 1mcg/kg, and N.S IV 5ml at random. The efficacy of these drugs was compared. The study found that all three medications worked well to stop post-anesthesia shivering. However, it has been discovered that tramadol is more effective at preventing postoperative shivering.[1]

In **2017 Tanveer Singh et al.** conducted a prospective double blind randomized controlled study on efficacy of dexmedetomidine and tramadol on post-spinal anesthesia shivering by taking 100 patients having shivering after Spinal anaesthesia. out of which 50 received dexmedetomidine (Group A) and 50 received tramadol (Group B). The study concluded that dexmedetomidine offers better results than tramadol with fewer side effects.[11]

A comparison study of intravenous Dexmedetomidine and intravenous Clonidine for post-spinal shivering in patients following lower limb orthopedic procedures was carried out in **2017 by Manohar Panneer et al.** A total of 60 patients with age between 18 and 60 years of ASA 1 & 2 class were included and were allotted to two groups (Group-D and Group-C). Group-D received 0.5 mcg/kg of Dexmedetomidine and Group-C received 1 mcg/kg of Clonidine. The study

concluded that Dexmedetomidine 0.5 mcg/kg was more efficient than Clonidine 1 mcg/kg in controlling post spinal blockade shivering. [14]

50 patients were included in a prospective, randomized, double-blind research in **2019 by Prasad P et al.,** with 25 of each group given either tramadol or dexmedetomidine IV**.** The study concluded that both the drugs are effective in treatment of shivering but dexmedetomidine takes lesser time in cessation of shivering, less recurrence rate and having less side effects[5].

In **2020 Sonalika Tudimilla et.al.** conducted a prospective, randomized study of comparison of injection Nalbuphine and Tramadol for the control of post spinal anesthesia shivering by taking 60 patients and patients were divided into 2 groups with 30 each. Each group received either tramadol 1mg/kg I.V or Nalbuphine 0.05 mg/kg I.V. The study concluded that both Tramadol and Nalbuphine were effective in treating post spinal anesthesia shivering with minimal hemodynamic changes. But the time taken to treat post spinal anesthesia shivering was less with Tramadol compared to Nalbuphine. [23]

In **2021 Poonam Nain et.al,** conducted a randomized, prospective comparative study of Tramadol and Gabapentin in prophylaxis of post spinal anesthesia shivering. The study included 150 patients divided into 3 groups with 50 patients in each group. Each group receives either of Tramadol (100 mg) or Gabapentin (600 mg) orally 30 minutes before inducing spinal anesthesia. The study concluded that both Tramadol and Gabapentin were equally effective in prophylaxis of post spinal anesthesia shivering.[37]

BASIC SCIENCE

THERMOREGULATION

The body temperature is centrally regulated by the feedback mechanisms that operate mainly by the pre-optic nucleus of anterior hypothalamus. The pre-optic nucleus receives afferent inputs from the thermoreceptors which are present in skin, tissues and the spinal cord. These afferent inputs which are received will modulate in the brain stem and the spinal cord and then reaches hypothalamus.

The thermo-regulatory responses are processed by the following three components. These include: (Figure. A.)

1. Afferent inputs.
2. Central regulation (Figure. B)
3. Efferent responses.

All these three components combinedly maintains normal body core temperature[7,8,9]. General anesthesia affects all the three components which regulate the body core temperature.

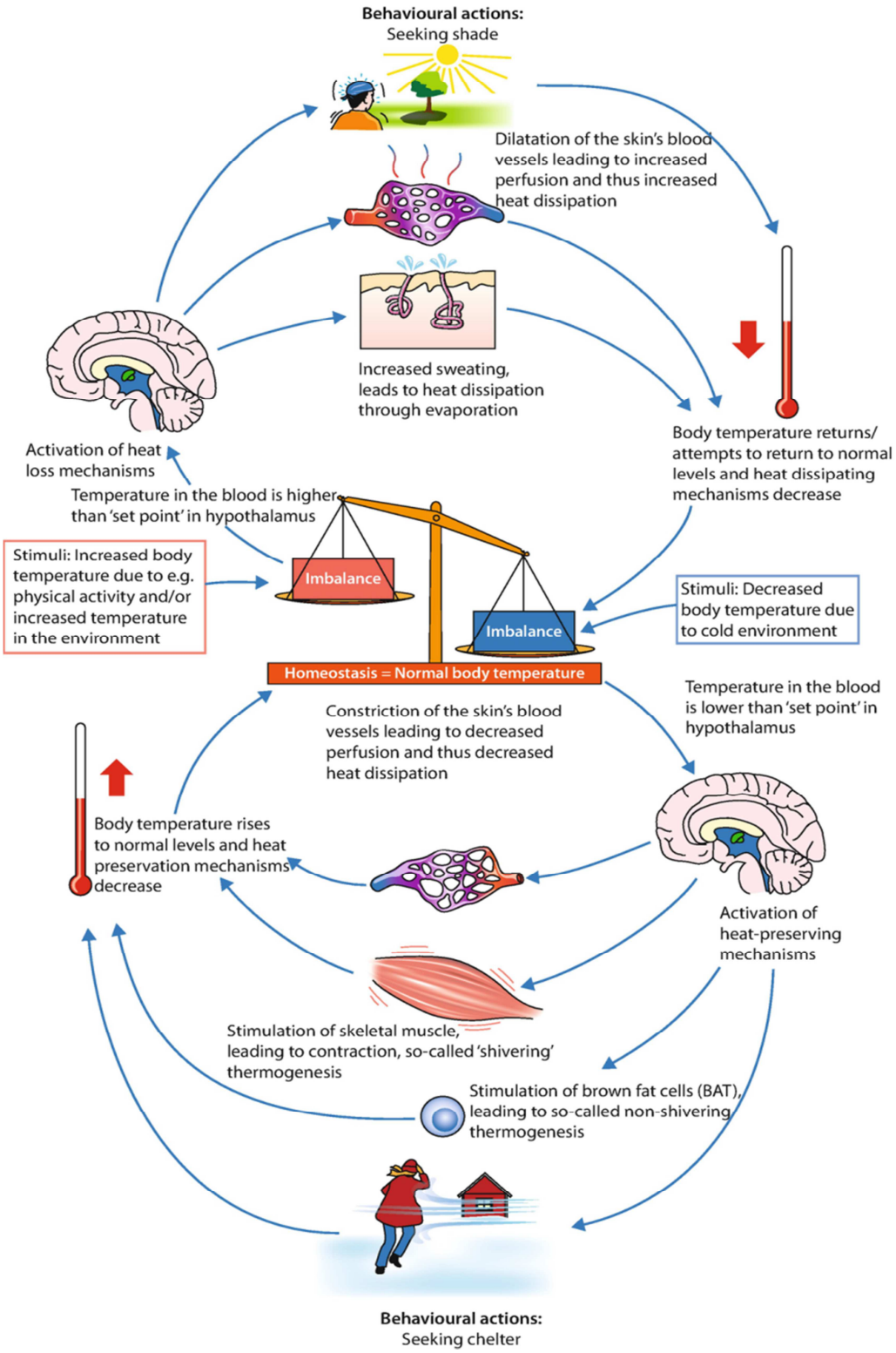


FIGURE .A. Thermoregulation Physiology in human body.

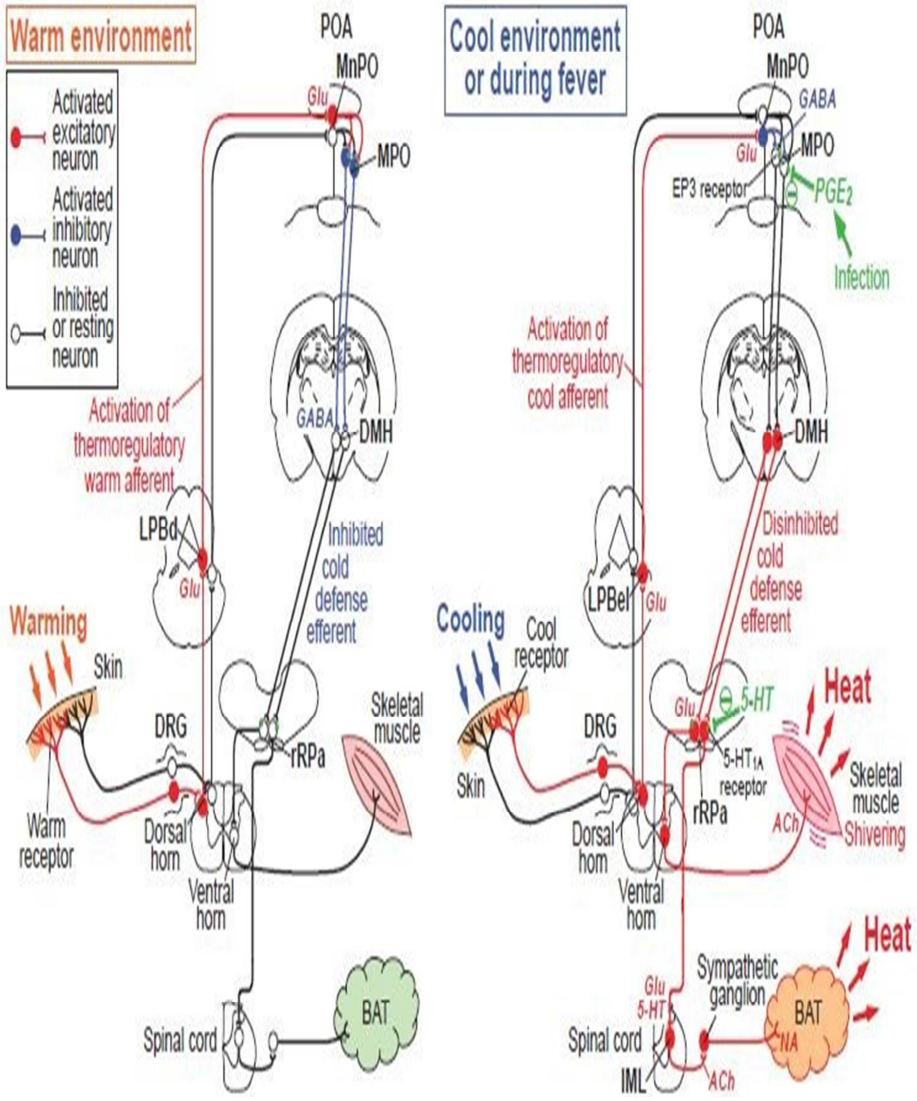


FIGURE. B. Neural regulation of body temperature.

Afferent Thermal Inputs:

The information about temperature changes is received from thermally sensitive cells present all over the body. These thermo-receptors are of two types 1) cold sensory receptors and 2) warm sensory receptors. These receptors will detect temperature changes both centrally and peripherally.[10]

The warm signals are sensed and carried by un-myelinated C fibers whereas cold signals are sensed and carried by A delta fibers.[10] These inputs are further transmitted to central thermoregulatory center hypothalamus through lateral spinothalamic tract. Before reaching the hypothalamus, at the level of spinal cord these inputs get integrated and modulated. The warm receptor signals which are carried by Unmyelinated C fibers have a peak discharge at 45◦C to 50◦C. The cold receptor signals which are carried by A delta fibers have a maximum discharge at 25◦C to 30◦C.

Peripheral cold sensing receptors are more effective than central cold thermoreceptors. These central thermoreceptors will be active only when the temperature falls below the set point. The hypothalamus, spinal cord, thoracic and other abdominal tissues, skin surface accounts for 20% each of total thermal inputs to central regulating system.

In spinal cord, anterior spinothalamic tract transmits most of the thermal sensation to brain. Since no single tract is responsible for transmitting entire thermal sensation, in order to completely abolish the thermal sensation entire anterior spinal cord should be abolished. In mammals, spinal cord acts as a primary thermoregulatory control because it senses & modifies the thermal signals before reaching the hypothalamus.

Few areas in brain stem like sub-coeruleus and the raphe magnus nucleus are the relay station for transmitting thermal information from skin before reaching the hypothalamus.

The locus sub coeruleus contains many nor-adrenergic neurons and the raphe magnus nucleus situated in the medulla have numerous thermo-responsive (mainly warm sensitive) neurons.[14]

CENTRAL REGULATION:

The pre-optic region in hypothalamus is the predominant thermoregulator in mammals. The afferent thermal information was controlled by the anterior hypothalamus, whereas posterior hypothalamus controls the descending pathways to effectors. There are 2 types of neurons in pre-optic area of hypothalamus.1) temperature sensitive 2) temperature in-sensitive neurons.

The temperature in-sensitive neurons respond to non-thermal stimuli such as plasma osmolality, reproductive hormones, glucose concentration, blood pressure, noxious stimuli, co2 and emotional stimuli.

The temperature sensitive neurons are again divided into heat responsive and cold responsive neurons. In pre-optic neurons heat sensitive neurons are about four times greater than the cold sensitive neurons. In response to increased local heat, the heat responsive neurons increase their discharge rate and heat loss mechanism gets activated. When the cold sensation from skin reaches the pre-optic area of hypothalamus, the cold responsive neurons get activated.

The hippocampus delivers much of the excitatory inputs to the warm responsive neurons by connecting the limbic system to the thermo-regulatory responses. Most of the thermal information is pre-processed in spinal cord and other parts of the brain before reaching the hypothalamus. Warm responsive neurons compare the non-thermal and the thermal inputs from spinal cord and also senses the core temperature.

The body temperature varies during sleep and circadian rhythm mainly because of changes in the ascending reticular activating system and suprachiasmatic nucleus neurons which modulates the hypothalamus thermoregulatory center.[13,14]

The gain of thermoregulatory response is the slope of response between intensity and core temperature. The response intensity which is constant with further deviation in core temperature identifies the maximum intensity.

There are four neural mechanisms responsible for autonomic thermoregulation. They are:

1. Peripheral detection of cold
2. Central detection of warmth
3. Inhibition of thermoregulatory sweating by cooling of skin
4. Central warm inhibition of metabolic response to cold

Though the mechanism for the absolute threshold temperature appears to be mediated by the chemical mediators like norepinephrine, acetylcholine, dopamine, serotonin, neuropeptides, prostaglandinE1; the exact mechanism determined by the body is not known.

Thresholds vary in both sexes (circadian rhythm) and during monthly menstruation in women by 0.5◦C. Exercise, food intake, infection, hyperthyroidism, hypothyroidism, anesthesia drugs, cold & warm adaptation are some of the factors that alter threshold temperatures.

The thermal inputs from core structures determines approximately 80% of control of autonomic response.[15] But skin surface is responsible for large fraction of

behavioral response. The inter threshold range (core temperature not triggering autonomic thermoregulatory responses) is only 0.4◦C (36.7◦C to 37.1◦C).

This threshold has vasoconstriction at its lower end and sweating at its upper end. During general anesthesia this inter threshold range increases by 4.0◦C.

The vascular sweating thresholds are 0.3◦C to 0.5◦C higher in women than men (Figure. C). In follicular phase and luteal phase of menstrual cycle in women, these thresholds are higher.[16,17] In premature newborns, central thermoregulatory control is somewhat intact when compared to elderly. [18]

EFFERENT RESPONSES:

In efferent system, multiple inputs received are integrated to common efferent signal. These effector systems are in an orderly fashion, ensuring optimal regulation in both animals and humans. Thermal perturbations of body activate the effector systems that acts by altering the environmental heat loss or by increasing the metabolic heat production. Each thermoregulatory effector has its own threshold and gain and is an orderly progression of responses and response intensities in proportion to the need.[7]

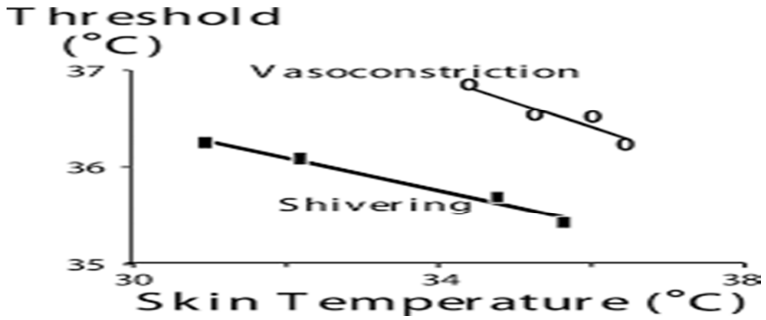


Figure. C.: Relationship between core temperature and mean skin temperature triggering shivering and vasoconstriction.

The thermoregulation responses are characterized by:

1. Alteration in behavior (most effective mechanism)
2. Shivering and rise in metabolic rate.
3. Vasomotor response; which includes vasodilatation and sweating in response to heat and vasoconstriction and piloerection as a response to cold.[7]

At specific temperature range, the activation of thermoregulatory effector response is triggered. In conscious patients, alteration in behavior plays an important role in body temperature regulation than compared to autonomic regulatory mechanisms.

When the hypothalamus senses extremely cool temperature from body and the impulses reaches the cerebral cortex, it gives cold sensation to the individual and results in behavioral alteration. This behavioral alteration includes increased motor activity, wearing extra additional clothes to cover the body or moving to warmer environment.[7]

The autonomic effector responses for temperature changes are activated when the set point temperature range of 36.7◦C to 37.1◦C is breached. Each of

the specific responses has a specific threshold, gain & maximum response intensity.

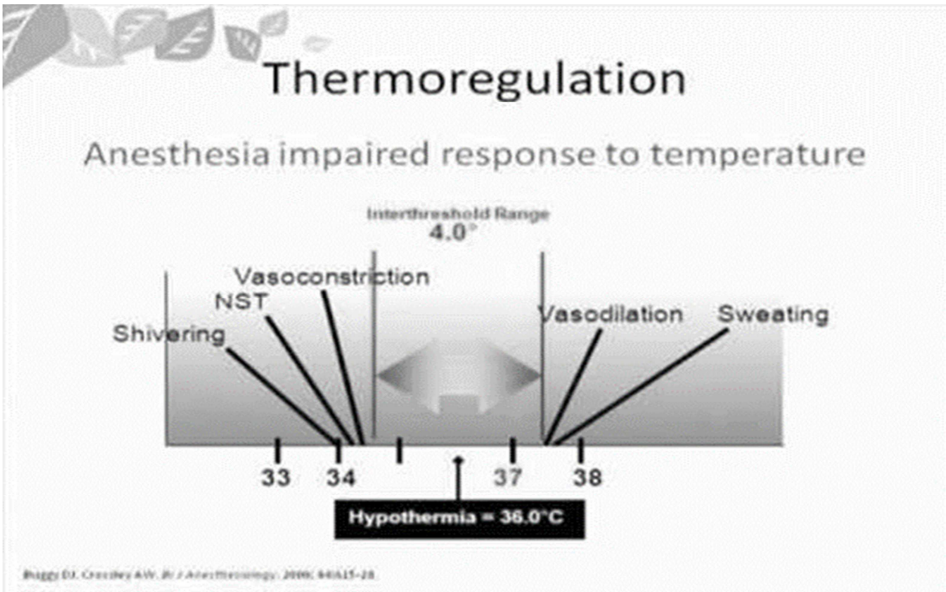


Figure D: Thermoregulatory effector responses at specific temperatures in anesthesia individuals.

The most effectively used autonomic effector mechanism is cutaneous vasoconstriction. Heat loss is generally regulated without causing major responses like sweating or shivering by vasomotor changes like cutaneous vasoconstriction or vasodilation.

Cutaneous vasoconstriction regulates the temperature by preserving metabolic heat and thereby preventing the decrease in body temperature. When behavioral compensation and maximum A-V shunt vasoconstriction are insufficient to maintain core temperature, then shivering develops as a last defense.

Metabolic heat is lost mainly by convection, radiation from the skin surface. Vasoconstriction reduces the loss. The digital blood flow in total is divided into thermoregulatory (AV Shunt) vasoconstriction and nutritional (capillary) vasoconstriction. [7]

The biologic rhythms also alter the body temperature. Fluctuations in core body temperature occur as lower temperatures in the early hours of morning in relation to melatonin secretion. This circadian rhythm produces responses in temperature by 1.5◦C.

SHIVERING:

Shivering is an involuntary, oscillatory muscle activity which augments metabolic heat production. A doubling of heat production is all that can be sustained over long periods. The electromagnetic study in humans showed that around 200 HZ is the fundamental tremor frequency. It also indicated that tremor had a 4-8 cycles/min, waxing and waning pattern (Figure E).[14]

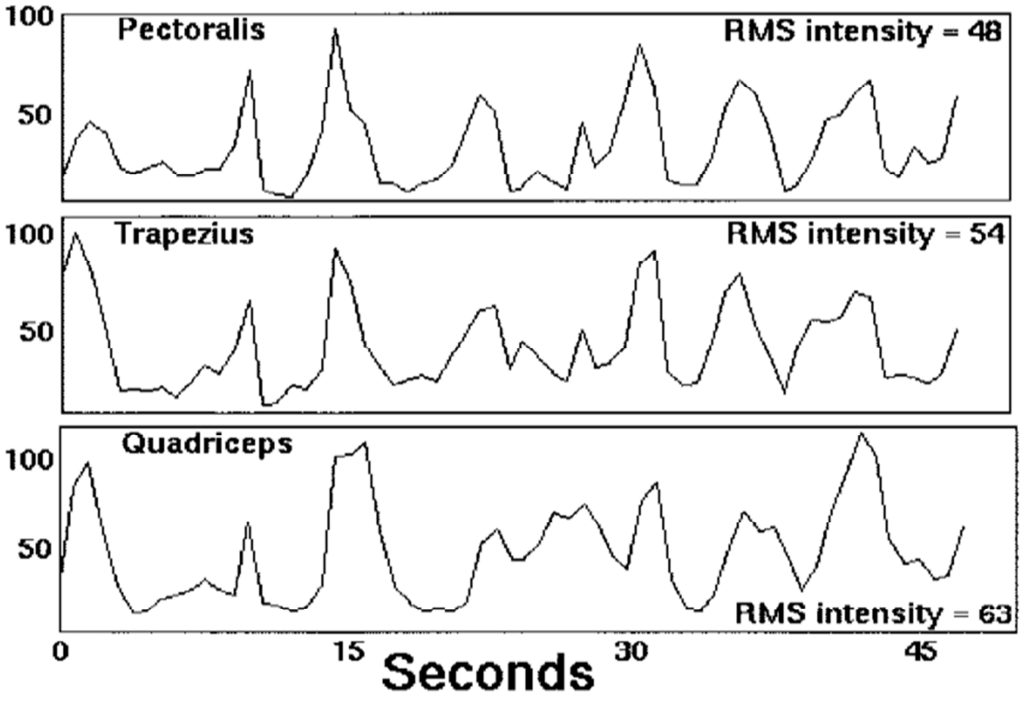


Figure E: Pattern of shivering

When the preoptic nucleus receives the cold stimulus, the efferent signals results in shivering by passing along the medial forehead bundle. In order to suppress shivering, the posterior hypothalamus is inhibited by the preoptic anterior hypothalamus. From the posterior hypothalamus the central descending pathway of shivering arises. But it is yet to be confirmed whether the inputs for reticulospinal neurons are from the posterior hypothalamus or from anterior hypothalamus.[14]

The spinal motor neurons and their axons are considered as the final common pathway for both the shivering and coordinated movement. The relation between cell size and excitability is the excitability of motor neurons is inversely proportional to cell size.

When there is a cold stimulus, the motor neurons will be recruited in the sequence of increasing size. Due to the recurrent inhibition of Renshaw cells (a group of inhibitory interneurons), the larger motor neurons show synchronized discharges than the smaller ones during shivering.

THERMOREGULATION DURING GENERAL ANAESTHESIA:

During and after the general anesthesia, various major disturbances in thermoregulation are observed. With the induction of general anesthesia, the impairment in the function of neurons of preoptic nuclei and hypothalamus are observed, thereby reducing the temperature at which activation of responses to hypothermia usually occurs. All general anesthetics tested markedly inhibit autonomic thermoregulatory control. Anesthetic induced thermoregulation slightly elevates the warm response and markedly reduces cold response threshold. The inter threshold range increases from its normal range of near 0.2◦C to approximately 2◦C to 4◦C. The gain and maximum intensity of some responses remain normal, the other responses are reduced by general anesthesia.[7]

TEMPERATURE MONITORING:

Accurate temperature monitoring should be considered. Since the mercury in glass thermometers are cumbersome to use, these are replaced by electronic systems. The sites for measuring core body temperature includes nasopharynx, distal part of esophagus, tympanic membrane, pulmonary artery. The core temperature component consists of highly perfused tissues where the temperature is high when compared with the rest of the body. Core temperature can also be measured using oral, axillary and rectal temperatures.

Patterns of intraoperative hypothermia:

Hypothermia which occurs during general anesthesia has a characteristic pattern. It includes:

1. Initial rapid decrease.
2. Slow linear reduction.
3. Stabilization of core temperature.

When sufficient hypothermia develops, triggers thermoregulatory vasoconstriction.

Monitoring of temperature should be accurate in determining the temperature. Variation in core body temperature during the perioperative period leads to variations in the measured temperatures at various body sites. Earlier mercury-in-glass thermometers were used. Since these are slow and cumbersome this mercury-in-glass thermometers are replaced by electronic systems. The most commonly used electronic systems are thermistors and thermocouples. Infrared monitors for monitoring tympanic membrane temperature are also available.[7]

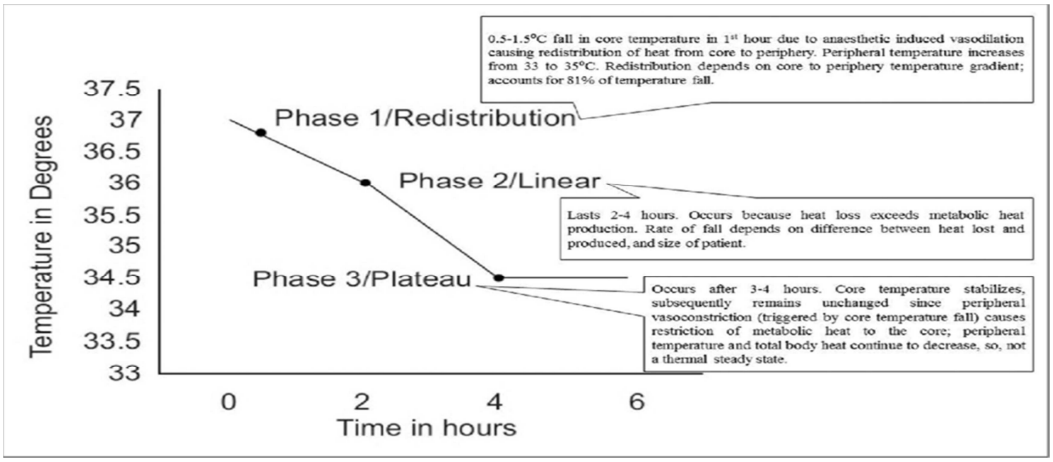


Figure F: Core temperature after administration of anesthesia.

Monitoring of temperature.

COMPLICATIONS OF HYPOTHERMIA AND SHIVERING:

There are various complications associated with hypothermia leading to shivering. It includes:

1. Delayed drug metabolism
2. Increased blood transfusion
3. Delayed wound healing
4. Increased risk of infection
5. Reversible coagulopathy
6. Increased peripheral vascular resistance
7. Increased oxygen consumption
8. Left shift of oxygen-hemoglobin dissociation curve.
9. Cardiac arrythmias and cardiac ischemia
10. Increased basal metabolic rate
11. Altered mental status
12. Monitoring artifacts.[20,21,22]

MANAGEMENT OF POST ANESTHESIA SHIVERING:

The heat balance during regional anesthesia and drugs will delay the heat recovery, so prevention and management of post anesthesia shivering is not restricted to pharmacotherapy alone. Therefore, first of all shivering is prevented by preventing hypothermia. Measures which reduce core hypothermia will reduce anesthesia induced shivering.

Maintaining the operation theatre room temperature is a critical step which determines the heat loss to surroundings. Heat loss varies in adults and in infants. Cutaneous heat loss is directly proportional to body surface area. In infants, head forms the bulk of body surface area. In adults, exposed arms contribute more than the head and results in substantial heat loss.

Measures that reduce core hypothermia includes:

1. Passive insulators
2. Active Warming
3. Pharmacotherapy

1.PASSIVE INSULATORS:

Passive insulators reduce heat loss from the body to environment. These include cloth or paper surgical drapes, cotton blankets, disposable plastic drapes, plastic bags. The conservation of heat is proportional to the area of body covered. A single layer of passive insulator decreases the heat loss by 30%.[7] Adding additional layers of passive insulator does not proportionately increase the benefit. Passive insulators are not of much benefit in long and extensive surgeries.[7]

2.ACTIVE WARMING:

Passive warming alone is not sufficient in regulating heat loss, so active skin warming methods are needed. In active warming, warmed air is forced through a quilt over the skin. It causes warming directly and replaces the normal body "air envelope" with warm air envelope. Active warming is a most effective system compared to passive insulators in conservating body heat. It includes radiant heat system like infrared light, thermal ceiling lights and other measures like warming inspired air, warming intra venous fluids, blood and blood components before infusion, maintaining warm post-operative environment are useful in preserving body temperature and reducing shivering.[7]

3.PHARMACOTHERAPY:

Various drugs are used for treatment of shivering. Drugs like Tramadol, alpha-agonists, opioids, MgSO4, Steroids, serotonin antagonists have been proposed for treatment of post-anesthesia shivering. All these drugs control shivering by modulating the central thermoregulatory control mechanisms. All these drugs have diverse function and the predominant site of action of these drugs are yet to be identified.[7]

Tramadol modulates the descending pain pathways within central nervous system through the binding of parent & M1 metabolite to μ -opioid receptors and weak inhibition of the reuptake of nor-epinephrine & serotonin. Dexmedetomidine is a selective α2 adrenergic agonist and has a greater selectivity for the α2 adrenoceptor than the α1 receptor. It produces sedation, analgesia, anxiolysis and has anti-shivering properties.

DEXMEDETOMIDINE:

Dexmedetomidine is a selective α2 agonist which have properties of sedation, analgesia, anxiolysis and sympatholytic effect. Since dexmedetomidine is having all these properties, it is used in perioperative period and in intensive care unit for sedation, analgesia. Few studies have shown that dexmedetomidine have anti-shivering properties.

Physical and Chemical Properties:

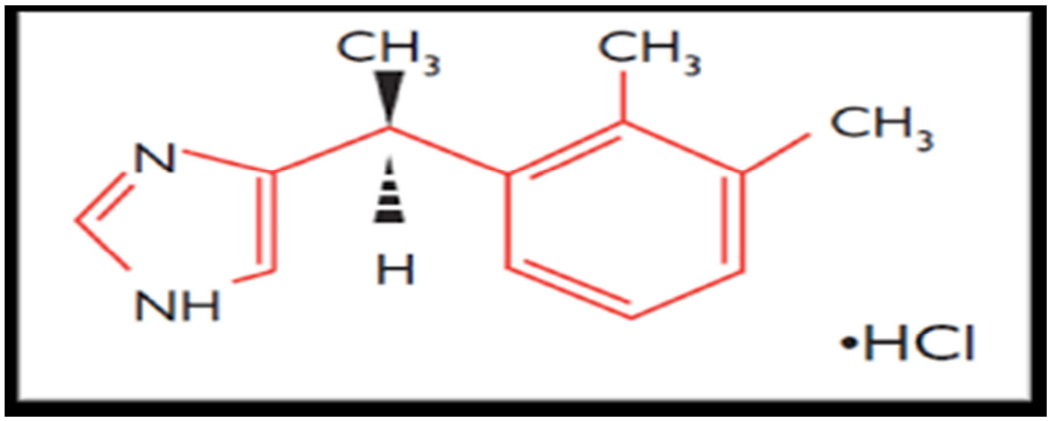


Figure G: Dexmedetomidine chemical formula

Dexmedetomidine is a d-enantiomer of medetomidine which belongs to imidazole group of α2 agonists. It has high specificity for α2 receptors than α1 receptors (α2: α1 = 1600:1) when compared to clonidine (α2: α1 = 200:1). Dexmedetomidine is highly water soluble. pKa is about 7.1.

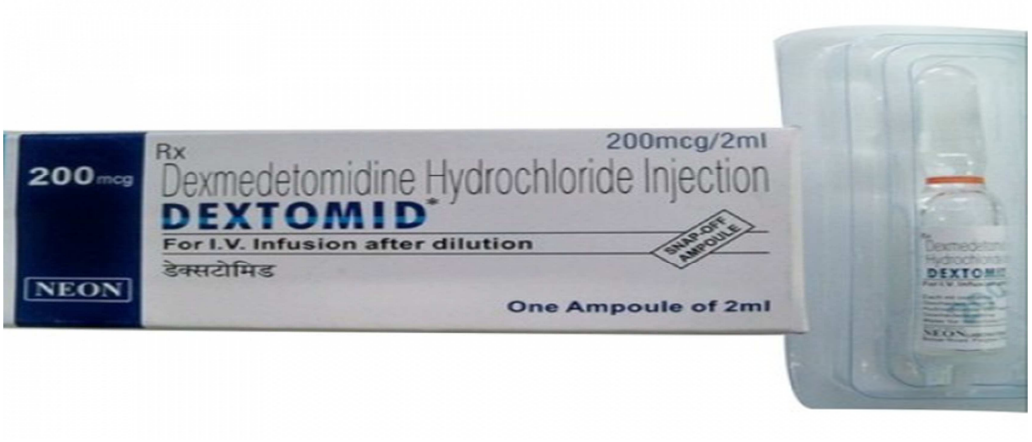


Figure H: drug ampule of dexmedetomidine.

The presynaptic αadreno receptors which regulates the release of Noradrenaline was designated as α2 adrenoreceptors. These α2 adreno receptors are widely distributed in CNS and peripheral tissues, thereby controlling the modules of sympathetic nervous system. The α2 receptors subdivided into α_{2A} , α_{2B}, $\alpha_{2c\ etc.;}$. All these are required for normal regulation of presynaptic neurotransmitter release from the central nor-adrenergic area and from sympathetic nerves in heart.

Pharmacokinetics:

Dexmedetomidine is a dextro-isomer of medetomidine. It is administered by intravenous route. It is short acting with linear concentration dependent kinetics.

Dosing and administration:

The pharmacodynamic effects of the drug are achieved at a plasma concentration of 0.5-1.2ng/dl. The dose of the drug approved by FDA is a loading dose of 1mcg/kg body weight over a period of 10 minutes followed by a maintenance dose of continuous intravenous infusion of 0.2 to 0.7 mcg/kg/hr.

The rate flow of this infusion is titrated according to required level of sedation and by careful monitoring of hemodynamics of the patient. Dexmedetomidine is used as a good sedative agent in ophthalmic surgeries. In these surgeries the drug is administrated intravenously as a loading dose of 0.5 mcg/kg followed by a maintenance dose of 0.6 mcg/kg/hr.

Distribution:

Dexmedetomidine is significantly bound to plasma protein (94%). The pharmacokinetics of this drug is explained as a “two-compartment model”. After intravenous injection it is rapidly distributed with a distribution half-life of 6 minutes. The elimination half-life of the drug is 2 to 2.5 hours. The steady state volume of distribution is estimated as approximately 68L to72 L.

METABOLISM AND ELIMINATION:

The dexmedetomidine is mostly metabolized in the liver by the cytochrome P450 enzymes by glucuronidation and biotransformation.

There are various metabolic pathways by which dexmedetomidine is metabolized.

1. N-glucuronidation to inactive metabolites (41%).
2. N-methylation to produce 3-hydroxy N-methyl dexmedetomidine (21%).
3. Hydroxylation followed by conjugation.
4. Conjugation and N-methylation.
5. Hydroxylation followed by conjugation.

Most of the drug undergoes complete biotransformation which results in minor quantity of drug to be excreted in urine and feces as unconjugated form. The elimination half-life of the drug is approximately 2 hours with an average clearance of 45L/hour in adults.

The pharmacokinetics of the drug are impaired in patients with hepatic and renal diseases. In hepatic diseases, there is an increase in half-life, volume of distribution and as well as decrease in clearance and protein binding of the drug. In renal diseases, there is a decrease in terminal elimination half-life, but no change in clearance and volume of distribution.

Table-1: PHARMACOKINETICS OF DEXMEDETOMIDINE

Molecular weight	236.7 Daltons
Lipid solubility	30
Distribution half life	6 minutes
Protein Binding	94%
Volume of distribution	118 L
Elimination t1/2	120 – 180 minutes
Context sensitive half life	4- 250 minutes

Mechanism of action:

Dexmedetomidine is a potent α2 agonist. The α2 receptors are a part of both central nervous system and peripheral nervous system. These receptors are also present in liver,

kidney and pancreas. The site of action of these receptors are presynaptic, post synaptic and extra synaptic regions among which presynaptic site is of major concern. So, depending on site of action of these receptors, various responses are evaluated. The presynaptic site is the region where modulation of release of Nor-adrenaline and ATP occurs. Since it is a potent α2 agonist; it mainly acts on presynaptic region and causes inhibition of release of nor-adrenaline. Its main action is to inhibit the neuronal firing in the brain and spinal cord by action on the α2 receptors and thus leading to bradycardia, hypotension, sedation and analgesia.

Pharmacodynamics:

Dexmedetomidine after its initial dose administration exerts a brief biphasic pattern of cardiovascular response. This response is seen after a loading dose of 1microgram/kg of body weight. There is initial increase in blood pressure followed by reflex bradycardia. This initial increase in blood pressure is because of stimulation of α2b receptors which are present in smooth muscles. This is followed by decrease in blood pressure which is because of central sympathetic system outflow blockade.

Dexmedetomidine inhibits the release of noradrenaline, thus leading to further hypotension and bradycardia. Postoperative bradycardia is commonly noticed with dexmedetomidine injection. Cautious use of dexmedetomidine to patients with poor left ventricular function should be considered.

Dexmedetomidine sedative effects are achieved by action on α2 adrenoreceptor located on postsynaptic membrane. It inhibits the G-protein which leads to increase in conductance through the potassium channels. The sedative effect of dexmedetomidine is achieved by action on locus coeruleus located in brain stem.

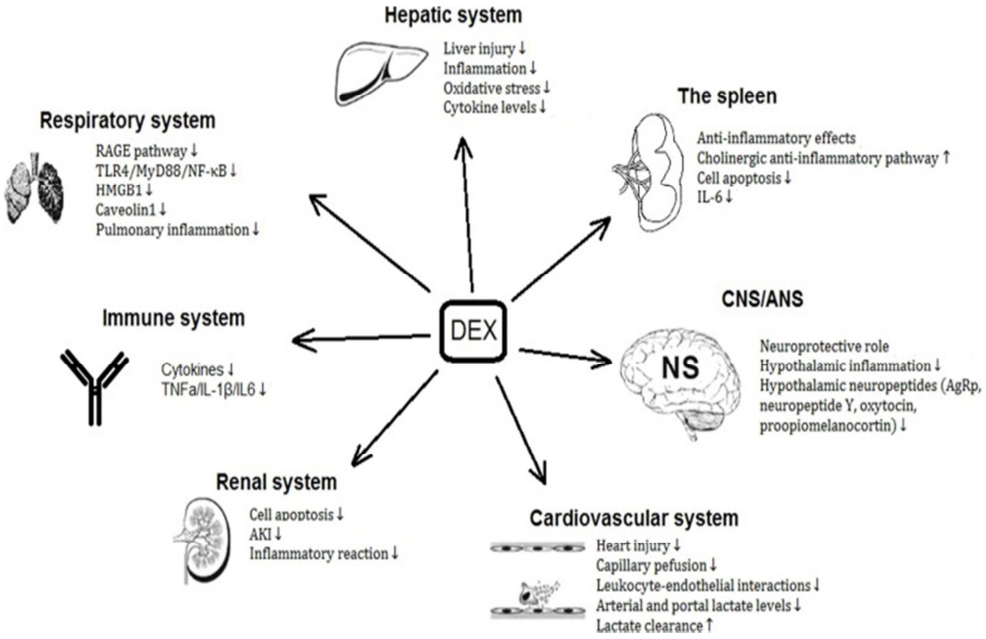


Figure I: Dexmedetomidine clinical effects.

USES:

The uses of the drug dexmedetomidine are as follows:

1. Sedation of intubated patients in ICU. (**NOTE**: it should be used more than 24 hours.)
2. Sedation of surgery patients without being intubated.
3. Reduction of use of opioids and other anesthetic agents.
4. Anxiolytic.
5. Before performing laryngoscopy to reduce intubation response.
6. Anti-shivering property.

   (Dexmedetomidine acts as anti-shivering agent by binding to α2 receptors, thus mediate vasoconstriction and acts as anti-shivering agent. Dexmedetomidine reduces vasoconstriction and shivering threshold by acting on central thermoregulatory mechanisms rather than peripheral neurotransmitter.)
7. As an adjuvant to spinal anesthesia and peripheral nerve blocks.

ADVERSE EFFECTS:

1) Bradycardia
2) Sinus arrest.
3) Hypotension.
4) Transient hypertension.
5) Hypoxia
6) Nausea and vomiting.
7) Anemia
8) Atrial fibrillations
9) Fever, tachycardia.
10) Headache, agitation and nervousness (occurs if the drug is used for more than 24 hours.)

CONTRAINDICATIONS:

1) Drug hypersensitivity.
2) Cardiac dysfunction (mainly left ventricular dysfunction mainly)
3) Advanced cardiac blocks.
4) Shock/ hypovolemia.

TRAMADOL:

Tramadol is a centrally acting opioid group of drugs. It is a racemic mixture of two enantiomers. Between these two enantiomers, one enantiomer is responsible for inhibition of noradrenaline uptake and the other enantiomer is responsible for inhibition of 5-hydroxytryptamine reuptake and accelerates its release and facilitates the action of this drug tramadol at mu receptors.

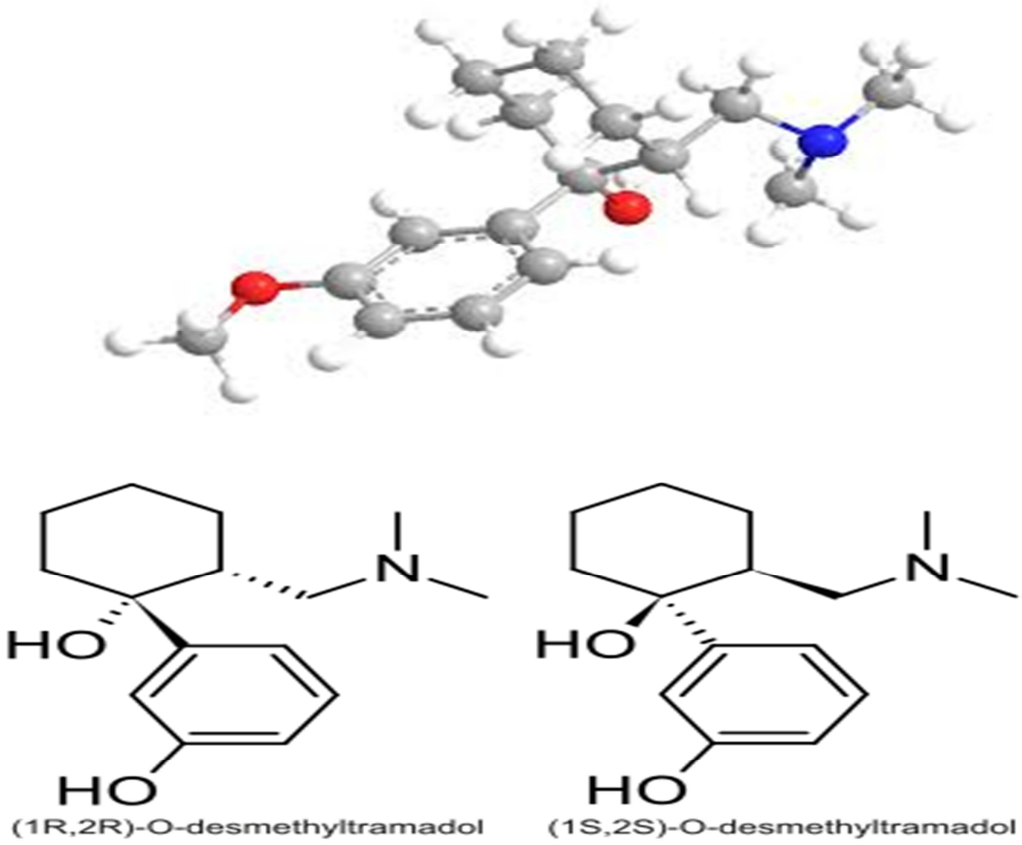


Figure-J: Chemical structure of Tramadol.

ROUTE OF ADMINISTRATION: oral, intravenous, Intra muscular, Rectal, Caudal, epidural.

PHARMACOKINETICS:

Absorption: The bioavailability of tramadol after oral administration is 685 and after intravenous or intramuscular injection is 100%. The affinity of tramadol for mu opioid receptors is $1/6000^{th}$ of morphine.

Distribution: The drug is 20% bound to plasma proteins. The volume of distribution of tramadol is about 2.6 – 2.9 L/Kg. Tramadol has high affinity for tissues and thus total volume of distribution after its oral administration is 306 L and about 203 L after parenteral administration. Tramadol crosses blood brain barrier and attains peak brain concentrations in 10 minutes after oral administration. when the maternal drug concentrations reach approximately 80% then it crosses the placental barrier.

Metabolism: Tramadol undergoes extensive first pass metabolism in liver. 85% of the injected drug is metabolized in liver by demethylation and conjugation via enzyme named cytochrome P450. It leads to formation of its metabolite O-des-methyl tramadol which is a active metabolite and has almost 200 times affinity for mu opioid receptors than tramadol. This metabolite binds to mu opioid receptors and exerts its action on GABAnergic transmission.

Excretion: Tramadol is excreted primarily by liver and its metabolites are excreted by kidney. Tramadol metabolites almost 90% is excreted by kidneys. unchanged drug in urine and 60% is excreted as metabolites. The mean terminal plasma elimination half-life of racemic tramadol is 6.3±1.4 hours. In patients with liver and renal diseases the

elimination half- life is doubled. So, it should be given cautiously in patients with liver and kidney disorders and not recommended in patients with end stage renal failure.

HALF-LIFE: Tramadol reported a half-life of 5 to 6 hours and its M1 metabolite presents a half-life of 8 hours.

CLEARANCE: Tramadol clearance ranges approximately from 8.5 ml/Kg/min in healthy adults and about 3.73 ml/Kg/min in renal disease patients.

Table-2: PHARMACOKINETICS OF TRAMADOL.

Molecular weight	263.381Daltons
Protein Binding	20%
Volume of distribution	203 L
Elimination t1/2	5 to 6 hours

Figure-k: Ampule of injection Tramadol.

MECHANISM OF ACTION:

Tramadol has two pathways of its mechanism of action.

1. Opioid pathway: Tramadol acts on mu, kappa, delta receptors and has a agonist mechanism at these receptors. It is a moderate affinity for mu receptors and weak affinity for kappa and delta receptors. By this mechanism it has anti-nociceptive property.
2. Non-opioid property: Tramadol inhibits the reuptake of nor-adrenaline and 5 hydroxy tryptamines (serotonin). It also acts as 5 HT2C receptor antagonist and Nicotinic, M1 and M3 muscarinic receptor antagonist, NMDA antagonist and GABA receptor antagonist. [9,15]

PHARMACODYNAMICS:

Tramadol modulates the descending pain pathways within the central nervous system through binding to mu opioid receptors and weak norepinephrine and serotonin reuptake inhibitor.

In **Central nervous system,** tramadol has no effect on heart rate, left ventricular function or cardiac index but in some patient's orthostatic hypotension has been observed. Tramadol produces respiratory center depression, depresses cough reflex by its effect on cough center in medulla. It also causes miosis and seizures.

In **Gastro intestinal system,** tramadol reduces motility by increasing tone of smooth muscle in antrum of stomach and duodenum. Delayed digestion in small intestine and decreased propulsive contractions in colon. Decreased gastric, biliary and pancreatic secretions and transient elevations in serum amylase.

In **Endocrine system**, tramadol influence hypothalamic-pituitary-adrenal or gonadal axes. It may cause increase in serum prolactin and decrease in plasma cortisol and testosterone. It may also lead to hyponatremia.

In **Cardio vascular system,** tramadol administration may lead to hypotension whose ability to maintain adequate blood pressure is compromised by reducing blood volume. May lead to QT interval prolongation.

Dosage: 1 to 3mg/kg body weight 4 to 6^{th} hourly with a maximum dose of 400 mg /day.

USES OF TRAMADOL:

1. Mild to severe pain
2. Acute and chronic pain
3. Slow gastric emptying
4. Post operative shivering.

Toxicity of drug: toxicity of tramadol manifests as

- Hypotension
- Bradycardia
- Seizures
- Coma
- Rhabdomyolysis

SIDE EFFECTS OF TRAMADOL:

1. Nausea
2. Vomiting
3. Indigestion
4. Dry mouth
5. Vertigo
6. Dizziness
7. Constipation
8. Drowsiness
9. Headache.

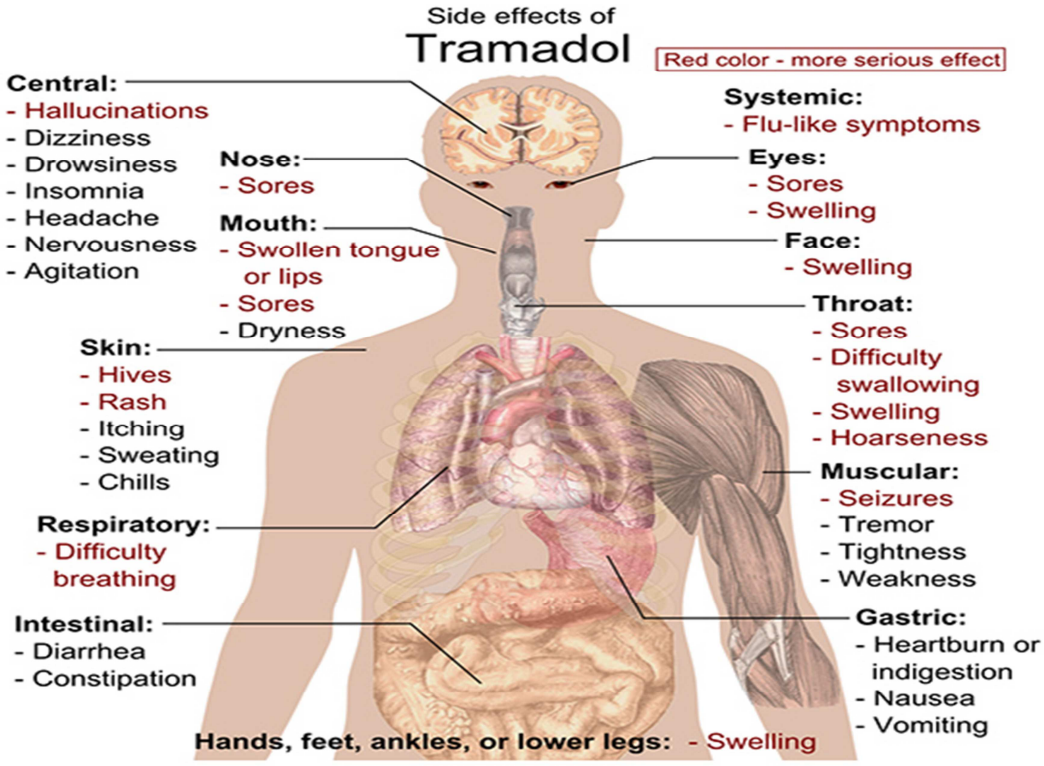


Figure. L: Side effects of injection Tramadol.

MATERIALS AND METHODS

This study conducted on patients aged 18-50 years of either gender, belonging to ASA grade 1 and 2, undergoing elective surgery under general anaesthesia at KLE'S DR. Prabhakar Kore charitable Hospital and Medical Research centre, Nehru Nagar, Belagavi-10 during the period from January 2021 to December 2021. On 60 patients, this prospective randomized trial was carried out over the course of a year. A thorough clinical history and a general physical examination were obtained during the pre-anaesthesia evaluation. Routine reliable investigations like complete blood count, renal function tests, viral serology were done. After explaining about the anaesthesia procedure to the patient, written informed consent was attained.

SAMPLE SIZE AND RANDOMIZATION:

Based on statistical analyses of earlier studies, a sample size of 60 was determined.

Based on mean and standard deviation, the formula for the minimal sample size is

$$n = \frac{(Z_{\alpha}+z_{\beta})^2(s_1^2+s_2)}{(\overline{X1} - \overline{X2})^2}$$

where z is associated with the test's power and z is associated with the test's level of significance. Z values of 1.96 and 0.84 at 5% level of significance and 80% power of the test, respectively.

X1 is the first group's mean (137.4), and X2 is the second group's mean (127.7). The first group's standard deviation is s1 (13.8), while the second group's standard deviation is s2 (8.6). 1

With these settings, a sample size of 22 is obtained.

To make the study more confirmative, the sample size will be raised to 30 in each group.

The patients were allotted randomly into 2 groups of 30 each and were named as Group-D (Dexmedetomidine 50 mcg) and Group-T (Tramadol 50 mg).

Computer-generated randomization was used to assign the patients to groups at random. The operation was carried out with the observer blinded to the presence of the drug. The study's coding sheet was made public at the conclusion.

INCLUSION CRITERIA:

1. ASA Grade 1 and 2.
2. Age between 18 to 50 years.
3. Weight between 50 to 70 kgs.
4. Patients having elective surgery while under general anesthesia.
5. Duration of surgery 60 min-120 minutes.
6. Provides consent.

EXCLUSION CRITERIA:

1. Morbidly obese patients (BMI>30 Kg/m2).
2. Co-existing diseases such as IHD, Hepatic & Renal insufficiency, Neuro-muscular Disorders, psychiatric disturbances.
3. Body temperature under 35°C while undergoing surgery.
4. Pre-operative febrile condition.
5. Hypothyroidism.
6. Hyperthyroidism.

MATERIALS:

The following tools, medications, and monitors were maintained on hand for administering anesthesia.

Equipment:

1. IV cannula
2. Sterile gloves
3. Endotracheal tube
4. 10 ml syringe
5. IV fluids
6. Infusion pump
7. 100 cm extension
8. Laryngoscope with all size blades
9. 20 ml syringe
10. Endotracheal tube plasters
11. Lignocaine gel
12. Oropharyngeal airways
13. Bougie
14. Suction apparatus

DRUGS:

1. Inj. Glycopyrrolate.
2. Inj. Midazolam.
3. Inj. Fentanyl.
4. Inj. Propofol.
5. Inj. Succinylcholine.

6. Inj. Vecuronium.
7. Inj. Dexmedetomidine.
8. Inj. Tramadol.
9. Inj. Diclofenac.
10. Inj. Paracetamol.
11. Volatile agents
12. Oxygen source
13. Inj. Ondansetron
14. Inj. Pethidine

MONITORS:

A multiparameter monitor showing following values was made available.

1. Electrocardiography
2. Non-invasive blood pressure
3. Pulse oximetry
4. Tympanic membrane temperature.
5. EtCO2

The following emergency drugs should also keep ready:

1. Adrenaline
2. Ephedrine
3. Atropine

METHODOLOGY:

Using a computer-generated random number list, the patients were randomly assigned to 2 groups, each with 30 patients.

Group-T: Tramadol 100mg/ I.V. diluted in 20 ml N.S. in which 10 ml (50 mg) was given to patient by infusion pump over 10 minutes.

Group-D: Dexmedetomidine 100mcg/IV diluted in 20 ml N.S. in which 10 ml (50 mcg) was given to patient by infusion pump.

In the pre-operative period, we informed the patients about Visual analog scale (VAS) [5]. After confirming the NBM status, IV cannula was secured and patient was shifted inside operation theatre. Baseline measurements of the patient's heart rate, blood pressure, respiratory rate, oxygen saturation, and body temperature (tympanic membrane) were taken as soon as they entered the operation room. The operating room was kept at a temperature of 22 °C.[1] Before beginning the process of inducing anesthesia, administer Glycopyrrolate 0.005 mg/kg, midazolam 0.05 mg/kg, ondansetron 8 mg, and Fentanyl 2 mcg/kg during a 5-minute interval. Propofol 2 mg/kg was injected. Using Inj. succinylcholine 2 mg/kg as a bolus dosage, tracheal intubation was made easier. Vecuronium injection of 0.1 mg/kg was given as a loading dose after tracheal tube alignment was confirmed by etco2 and the auscultation test revealed bilateral equal air admission. Anesthesia maintained on oxygen, nitrous oxide, Isoflurane, Vecuronium (0.025 mg/kg).

After the patient was intubated, the test drug was administered intravenously using a syringe pump.

In **Group-T**: Tramadol 100mg/IV diluted in 20 ml N.S. in which 10 ml (50 mg) was given over 10 minutes.

Group-D: Dexmedetomidine 100mcg/IV diluted in 20 ml N.S. in which 10 ml (50 mcg) was given over 10 minutes.

A blind observer made all of the observations and documented them.[1]

All patients were draped by surgical drapes throughout the surgery and there was no active warming.

For the first hour, vital signs (HR, BP, RR) were taken every 10 minutes; the next hour, they were taken every 20 minutes. Using an infrared tympanic membrane thermometer, the patient's core temperature was taken prior to induction, immediately after induction of anesthesia, and then every 30 minutes for two hours.

After the surgery, Neostigmine 0.05 mg/kg and Glycopyrrolate 0.01 mg/kg intravenously were injected to counteract the neuro-muscular blockage. When the patient's breathing was satisfactory and he or she could follow verbal instructions, the trachea was extubated.

After surgery, the patient was given O2 through a face mask at a rate of 5 lit/min while being wrapped in a single blanket. H.R, B.P, RR, tympanic membrane temperature was measured at the time of entry to the recovery room (T0), after 10 minutes (T10), after 20 minutes (T20), 30 minutes(T30) and then every half an hour for the following hour in post-operative period.[1] Additionally, the patient’s pain, nausea, vomiting, and shivering episodes were monitored.

SHIVERING is an "involuntary, oscillatory muscular activity that increases metabolic heat production."[15]

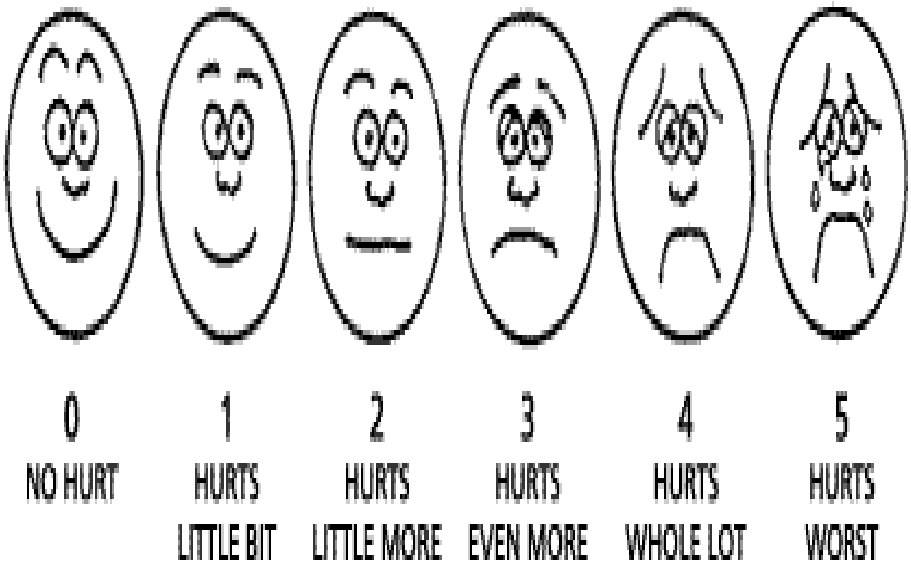
GRADE	CLINICAL CHARACTERISTICS
Grade-1	No shivering
Grade-2	A small face or neck twitch muscle bundles, free arm movement without ECG interference.
Grade-3	More than one muscle with trembling twitch.
Grade-4	Gross muscular jitter of entire body.

Table-3: Grading of shivering.

RESPIRATORY DEPRESSION is defined as if the respiratory rate is less than 8cycles per minute (cpm).

NAUSEA is the conscious recognition of excitation of an area in the medulla that is associated with vomiting centre.

PAIN is highly un-pleasant physical sensation caused by illness or injury. The pain will be assessed by using 0-5 VAS score.



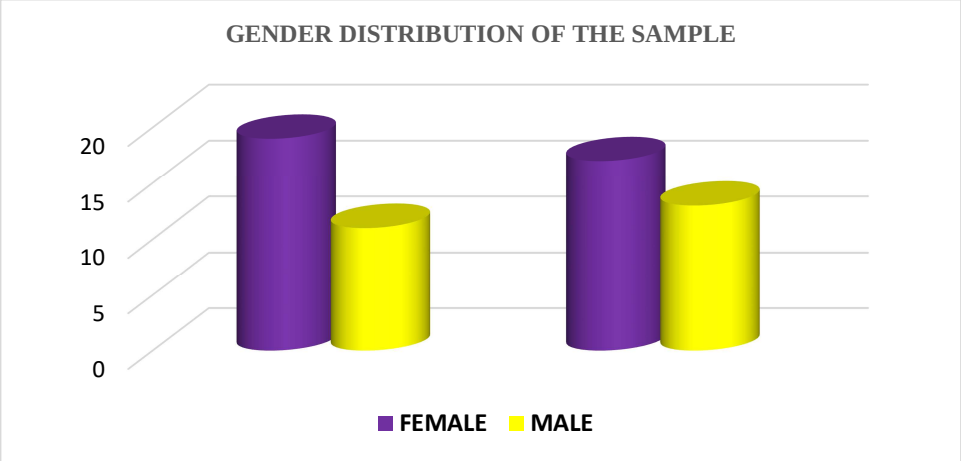
VOMITING: vomiting describes the forceful expulsion of the contents of the stomach via the mouth or sometimes the nose.

when the temperature dropped to 35 ℃ or below, a 50 mg dose of Tramadol was administered along with active patient rewarming. Diclofenac sodium 75 mg IV in 100 ml N.S. injections were used to treat VAS scores greater than 3. In the two hours following surgery, it was documented how many patients needed rescue analgesia.

OBSERVATION AND RESULTS

Table-4: GENDER DISTRIBUTION OF SAMPLE.

	GROUP D		GROUP T	
GENDER	**NUMBER**	**%**	**NUMBER**	**%**
FEMALE	19	63.33	17	56.67
MALE	11	36.67	13	43.33
TOTAL	30	100.00	30	100.00



In our study, the tramadol group majority of patients (n=17, 56.6%) were female. The majority of patients in the Dexmedetomidine group (n=19, 63.3%) were women as well. It demonstrates that there is no statistically significant correlation between comparative groups and gender distribution.

INTER GROUP COMPARISION:

In the following tables P value was calculated using ***STUDENTS UNPAIRED t-Test.***

Table-5: AGE AND WEIGHT

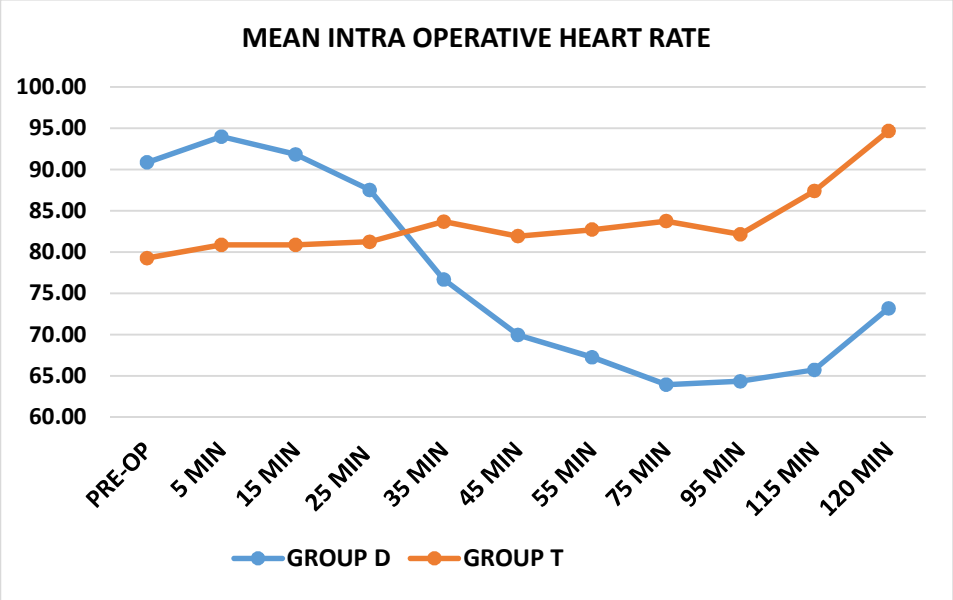
	GROUP D		GROUP T			
	MEAN	**S.D.**	**MEAN**	**S.D.**	**p VALUE**	**INFERENCE**
AGE	36.77	10.75	37.43	10.51	0.8089	NS
WEIGHT	57.10	2.77	56.76	4.3	0.7223	NS

In Dexmedetomidine group of this study, patients belong to age group of 19 to 50 years (Mean= 36.7 years). In Tramadol group, patients belong to age group of 19 to 50 years (Mean= 37.4 years). Since age of the patients of both study groups were similar, it was not statistically significant.

In Dexmedetomidine group, majority of patients weight was between 50 to 60 kilograms (mean= 57.1 kgs). In Tramadol group, majority of patients weight was between 42 to 60 kilograms (Mean= 56.7 kgs). The difference between both the groups was minimal P> 0.05. the association between weight, age with comparison groups was not statistically significant.

Table-6: INTRA-OPERATIVE HEART RATE

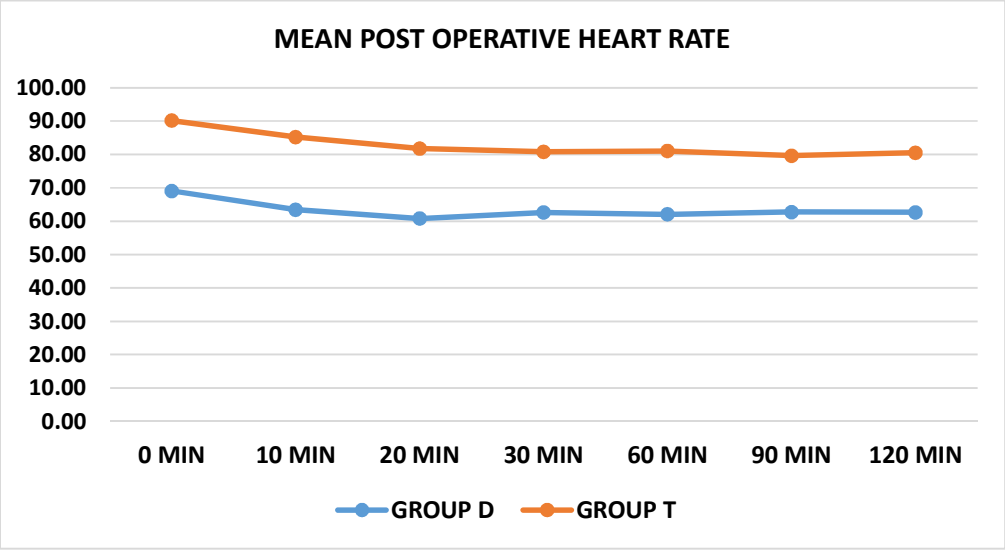
		HEART RATE									
		GROUP D				GROUP T					
		MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
INTRA-OPERATIVE	PRE-OP	90.83	15.35	74	145	79.27	12.40	45	106	0.0022	VS
	5 MIN	93.97	20.06	65	138	80.87	17.26	42	118	0.0088	VS
	15 MIN	91.80	20.00	61	136	80.87	18.15	38	118	0.0305	S
	25 MIN	87.50	18.20	59	132	81.23	14.22	39	108	0.1427	NS
	35 MIN	76.67	15.70	56	116	83.67	15.02	43	110	0.0829	NS
	45 MIN	69.97	11.08	55	104	81.90	12.94	45	108	0.0003	HS
	55 MIN	67.27	9.10	51	88	82.70	12.55	46	109	< 0.0001	HS
	75 MIN	63.93	7.65	49	83	83.73	14.99	45	111	< 0.0001	HS
	95 MIN	64.33	8.64	50	85	82.13	12.85	47	99	< 0.0001	HS
	115 MIN	65.73	9.35	51	84	87.37	13.43	48	114	< 0.0001	HS
	120 MIN	73.17	9.79	56	98	94.64	16.43	48	123	< 0.0001	HS



After 45 to 120 minutes, the intra-operative mean heart rate in the Dexmedetomidine and Tramadol groups is substantial. In Dexmedetomidine group mean ranges from 63.93 to 73.17. The mean for the tramadol group ranges from 81.9 to 94.62. There was statistical significance because the P value was less than 0.05.

Table-7: POST-OPERATIVE HEART RATE

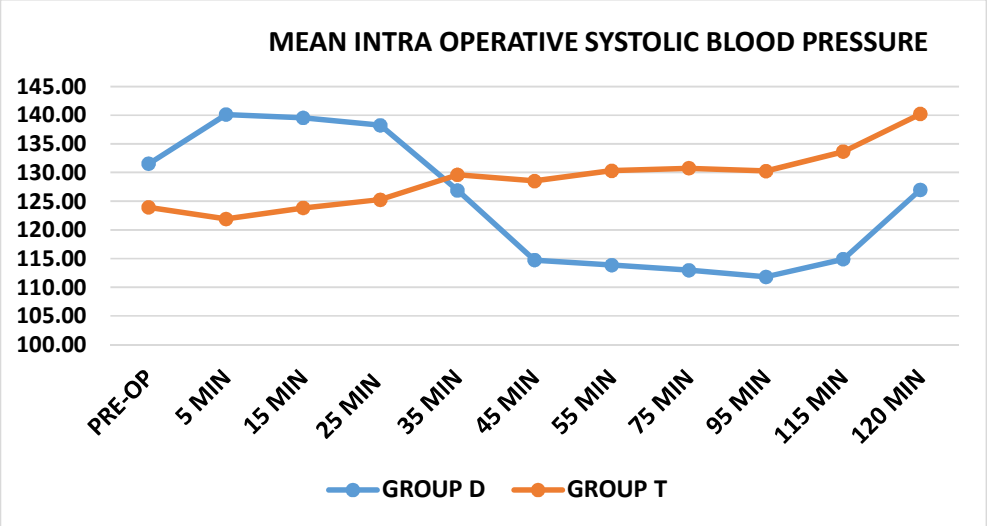
		HEART RATE									
		GROUP D				GROUP T					
		MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
POST OPERATIVE	0 MIN	69.07	7.75	56	91	90.13	18.05	49	121	< 0.0001	HS
	10 MIN	63.43	7.17	51	84	85.23	15.77	53	119	< 0.0001	HS
	20 MIN	60.80	8.18	47	83	81.80	15.22	50	124	< 0.0001	HS
	30 MIN	62.60	7.98	51	81	80.80	13.82	53	116	< 0.0001	HS
	60 MIN	62.03	8.07	49	85	81.03	12.19	54	108	< 0.0001	HS
	90 MIN	62.73	8.56	51	89	79.60	12.41	43	103	< 0.0001	HS
	120 MIN	62.66	7.80	53	87	80.52	13.88	41	108	< 0.0001	HS



The post operative heart rate in Dexmedetomidine group of patients from 0 minutes to 120 minutes was ranging with a mean= 60.80 to 69.07. In Tramadol group of patients, the post operative heart rate was ranging with mean= 79.60 to 90.13. There was statistical significance because the P value was less than 0.05.

Table-8: INTRA-OPERATIVE SYSTOLIC BLOOD PRESSURE

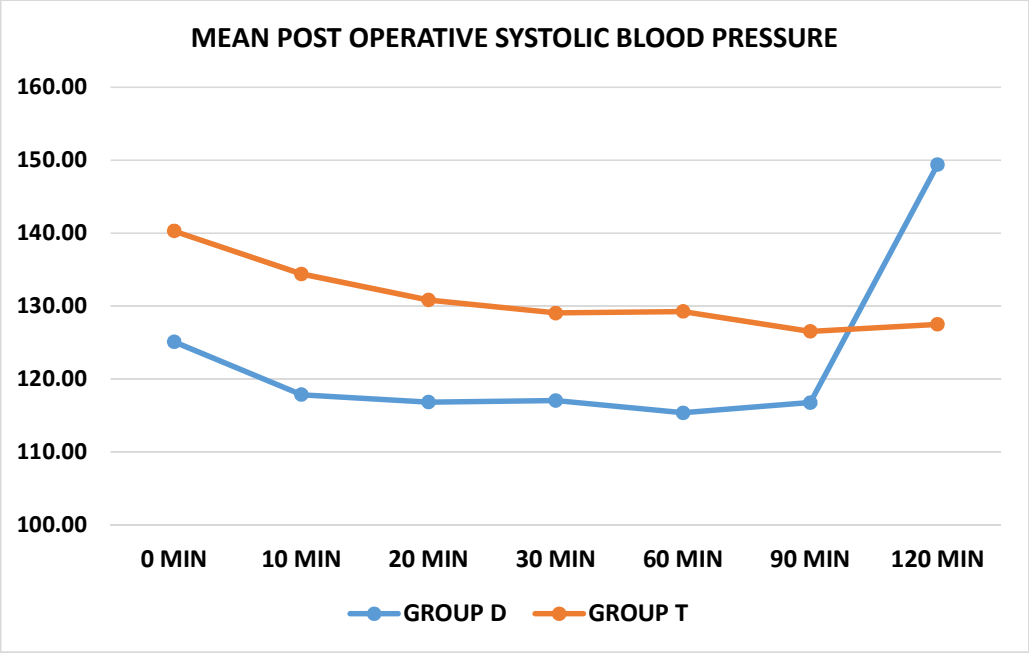
		SYSTOLIC BLOOD PRESSURE									
		GROUP D				GROUP T					
		MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
INTRA OPERATIVE	PRE-OP	131.53	14.82	110	170	123.93	13.80	90	150	0.0443	S
	5 MIN	140.10	19.89	99	170	121.90	13.72	100	148	0.0001	HS
	15 MIN	139.53	28.03	40	171	123.83	20.85	90	158	0.0168	S
	25 MIN	138.23	15.95	106	170	125.27	16.16	91	157	0.0028	VS
	35 MIN	126.90	19.02	90	173	129.60	14.14	98	152	0.5350	NS
	45 MIN	114.73	13.56	90	151	128.53	15.37	100	160	0.0005	HS
	55 MIN	113.87	14.02	94	156	130.30	14.42	100	158	< 0.0001	HS
	75 MIN	112.97	12.10	98	150	130.77	14.31	100	154	< 0.0001	HS
	95 MIN	111.83	13.49	89	148	130.27	16.45	100	186	< 0.0001	HS
	115 MIN	114.90	14.12	90	148	133.63	14.15	108	166	< 0.0001	HS
	120 MIN	127.00	14.88	98	156	140.21	15.90	101	169	0.0018	VS



The intra-operative systolic blood pressure with Dexmedetomidine group of patients after 5 minutes to 120 minutes with a mean was ranging 111.83 to 140.10. In Tramadol group intra-operative blood pressure after 5 minutes to 120 minutes was ranging with a mean of 121.90 to 140.21. There was statistical significance because the P value was less than 0.05.

Table-9: POST-OPERATIVE SYSTOLIC BLOOD PRESSURE

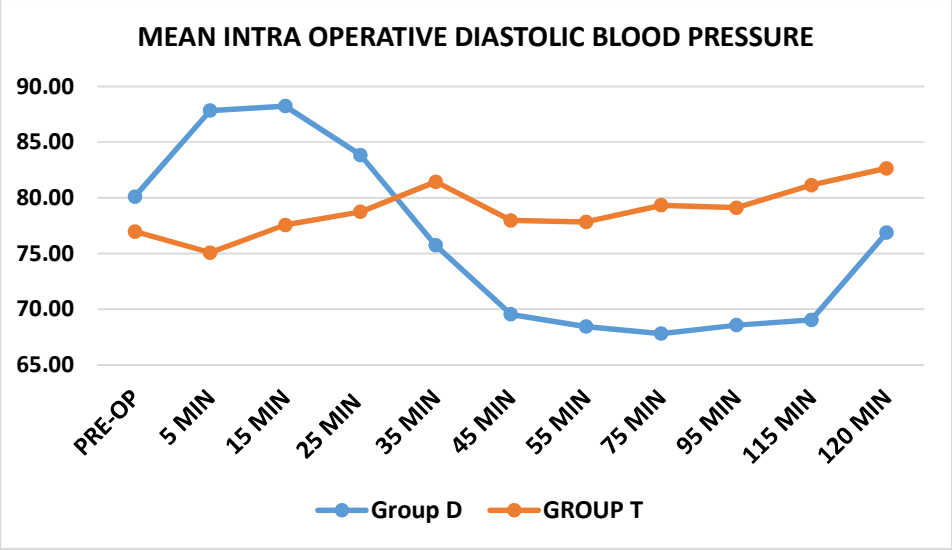
		SYSTOLIC BLOOD PRESSURE									
		GROUP D				GROUP T					
		MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
POST OPERATIVE	0 MIN	125.10	15.98	97	166	140.30	14.03	108	160	0.0002	HS
	10 MIN	117.87	15.67	91	149	134.40	13.39	101	152	0.0000	HS
	20 MIN	116.83	15.13	90	147	130.83	12.85	103	152	0.0003	HS
	30 MIN	117.03	13.62	96	147	129.03	11.84	110	150	0.0006	HS
	60 MIN	115.37	14.78	91	147	129.27	12.46	108	149	0.0002	HS
	90 MIN	116.77	13.87	98	155	126.53	11.69	106	147	0.0046	VS
	120 MIN	149.40	181.06	91	1105	127.48	12.00	103	158	0.5181	NS



The post-operative systolic blood pressure in Dexmedetomidine group varied with a mean ranging from 115.37 to 149.40. In Tramadol group, post operative systolic blood pressure varied with a mean ranging from 126.53 to 140.30. There was statistical significance because the P value was less than 0.05.

Table-10: INTRA-OPERATIVE DIASTOLIC BLOOD PRESSURE

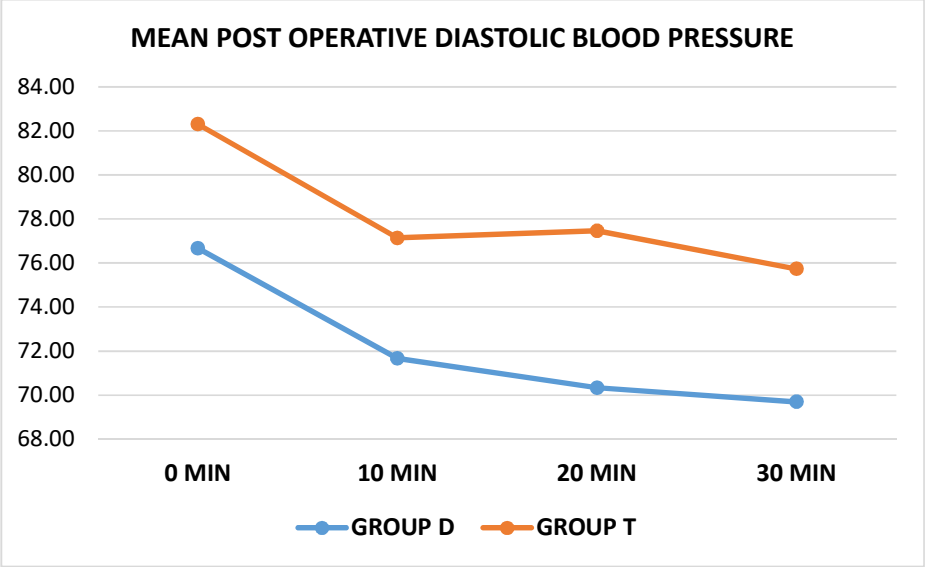
		DIASTOLIC BLOOD PRESSURE									
		GROUP D				GROUP T					
		MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
INTRA OPERATIVE	PRE-OP	80.10	6.46	70	90	76.97	8.92	60	100	0.1245	NS
	5 MIN	87.83	12.32	67	120	75.07	8.72	60	91	0.0000	HS
	15 MIN	88.23	11.45	70	114	77.57	14.45	50	114	0.0024	VS
	25 MIN	83.83	12.07	62	112	78.73	11.66	60	111	0.1014	NS
	35 MIN	75.73	10.58	58	96	81.43	10.52	60	110	0.0407	S
	45 MIN	69.53	9.06	56	92	77.97	9.73	60	100	0.0010	VS
	55 MIN	68.43	9.37	52	88	77.83	9.47	60	104	0.0003	HS
	75 MIN	67.80	9.36	51	90	79.33	10.39	60	101	< 0.0001	HS
	95 MIN	68.57	10.03	51	93	79.10	9.81	60	98	0.0001	HS
	115 MIN	69.03	9.02	50	87	81.13	11.90	57	109	0.0000	HS
	120 MIN	76.87	9.67	57	99	82.64	11.36	54	109	0.0411	S



In Dexmedetomidine group, intra-operative diastolic blood pressure varied from 5 minutes to 120 minutes in a mean range of 67.80 to 88.23. In Tramadol group, the intra-operative diastolic blood pressure varied from 5 minutes to 120 minutes in a mean range of 75.07 to 82.64. There was statistical significance because the P value was less than 0.05.

Table-11: POST OPERATIVE DIASTOLIC BLOOD PRESSURE:

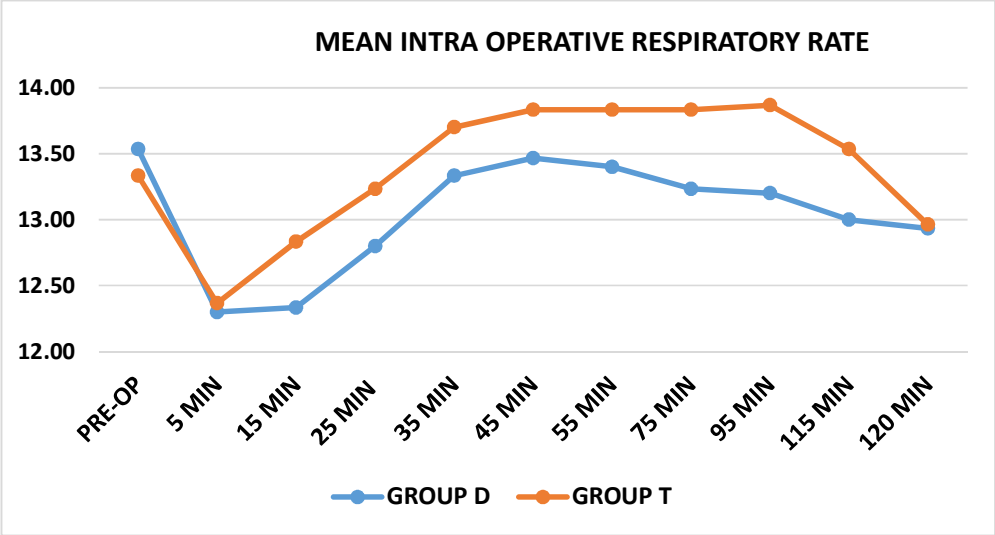
		DIASTOLIC BLOOD PRESSURE									
		GROUP D				GROUP T					
		MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
POST OPERATIVE	0 MIN	76.67	8.57	54	93	82.30	10.50	61	110	0.0265	S
	10 MIN	71.67	9.80	51	91	77.13	8.44	61	92	0.0242	S
	20 MIN	70.33	9.46	51	94	77.47	7.54	60	91	0.0020	VS
	30 MIN	69.70	9.46	54	90	75.73	7.51	60	91	0.0083	VS
	60 MIN	68.67	9.76	51	87	73.37	7.44	61	87	0.0403	S
	90 MIN	68.80	7.30	59	89	73.87	7.85	61	91	0.0121	S
	120MIN	68.43	10.22	54	91	75.97	5.96	67	89	0.0011	VS



The post-operative diastolic blood pressure of Group-D patients varied with a mean range of 68.43 to 76.67. In Group-T patients it varied with a mean range of 73.37 to 82.30. The P value of both the groups was < 0.05. Hence, it was statistically significant.

Table-12: INTRA-OPERATIVE RESPIRATORY RATE

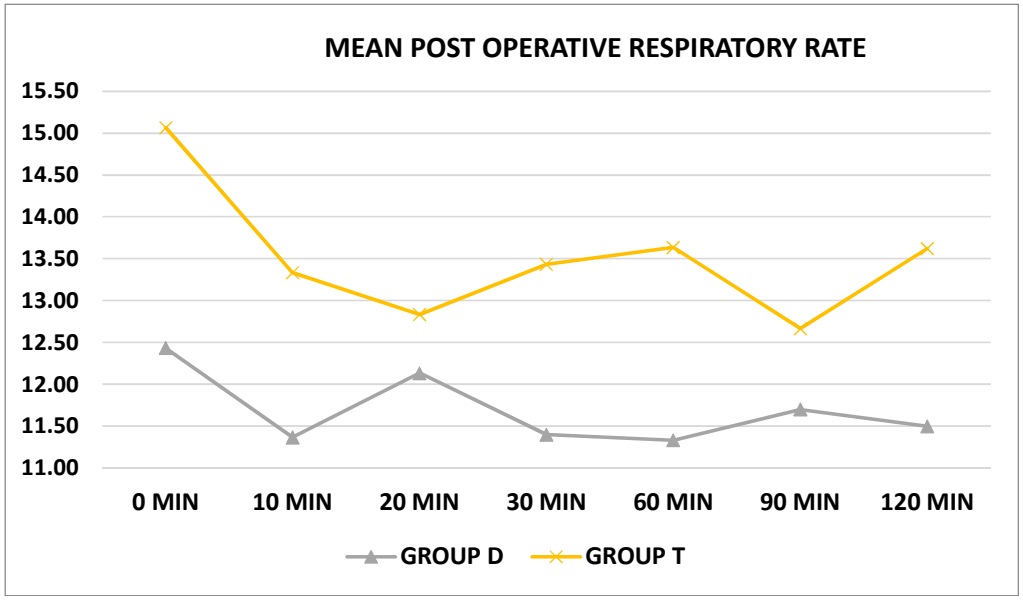
		RESPIRATORY RATE									
		GROUP D				GROUP T					
		MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
INTRA OPERATIVE	PRE-OP	13.53	1.72	11	18	13.33	1.54	11	16	0.6365	NS
	5 MIN	12.30	0.95	11	16	12.37	1.13	11	16	0.8056	NS
	15 MIN	12.33	1.03	11	16	12.83	1.66	10	18	0.1666	NS
	25 MIN	12.80	1.61	11	18	13.23	1.81	10	16	0.3312	NS
	35 MIN	13.33	1.83	11	18	13.70	2.05	10	18	0.4678	NS
	45 MIN	13.47	2.01	11	18	13.83	2.32	10	20	0.5158	NS
	55 MIN	13.40	1.89	11	18	13.83	2.32	10	20	0.4306	NS
	75 MIN	13.23	1.98	9	18	13.83	2.32	10	20	0.2855	NS
	95 MIN	13.20	1.77	11	18	13.87	2.05	12	18	0.1824	NS
	115MIN	13.00	1.70	11	18	13.53	1.85	12	16	0.2502	NS
	120MIN	12.93	2.08	11	20	12.96	1.63	12	16	0.9529	NS



The mean value of intra operative respiratory rate of Group-D patients varied in a range of 12.30 to 13.53 from 5 minutes to 120 minutes. In Group-T patients the mean varied in a range of 12.37 to 13.87 from 5 minutes to 120 minutes. P value was more than 0.05, as a result, it was not significant.

Table-13: POST OPERATIVE RESPIRATORY RATE

		RESPIRATORY RATE									
		GROUP D				GROUP T					
		MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
POST OPERATIVE	0 MIN	12.43	3.24	10	25	15.07	1.82	11	19	0.0003	HS
	10 MIN	11.37	3.59	6	24	13.33	1.77	10	17	0.0092	VS
	20 MIN	12.13	3.56	8	26	12.83	1.90	10	17	0.3457	NA
	30 MIN	11.40	3.39	6	26	13.43	2.28	10	18	0.0085	VS
	60 MIN	11.33	3.77	7	27	13.63	2.25	10	18	0.0058	VS
	90 MIN	11.70	3.09	8	25	12.67	1.63	10	16	0.1345	NS
	120 MIN	11.50	3.04	8	24	13.62	1.78	10	16	0.0019	VS

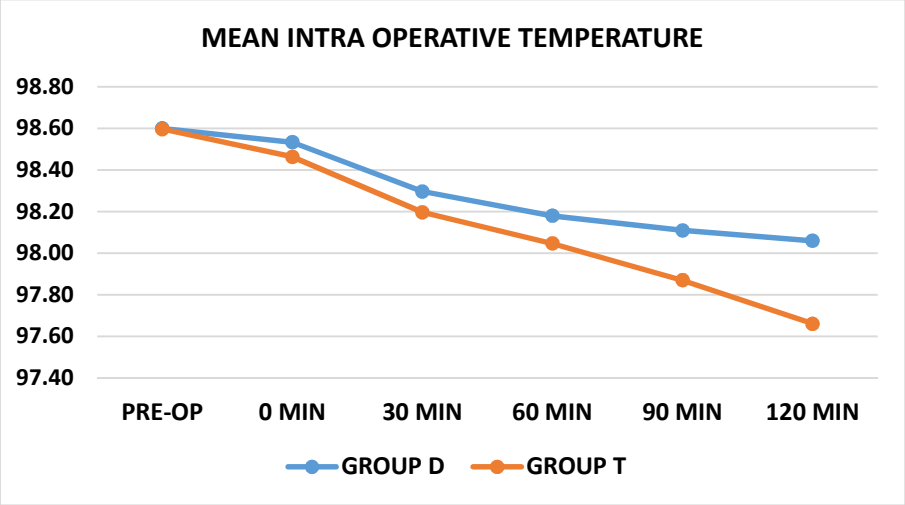


The post operative respiratory rate of Group-D patients from 10 minutes to 120 minutes varied with a mean range of 11.33 to 12.43. In Group-T patients, the Post operative respiratory rate from 10 minutes to 120 minutes varied with a mean range of 12.67 to 15.07 The P value was <0.05 at 10 minutes, 30 minutes, 60 minutes and 120

minutes. Hence it was statistically significant at 10 minutes, 30 minutes, 60 minutes and 120 minutes.

Table-14: INTRA OPERATIVE TEMPERATURE

		TEMPERATURE									
		GROUP D				GROUP T					
		MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
INTRA OPERATIVE	PRE-OP	98.60	0.00	98.6	98.6	98.60	0.02	98.5	98.6	0.3215	NS
	0 MIN	98.53	0.12	98.1	98.6	98.46	0.19	97.8	98.6	0.0903	NS
	30 MIN	98.30	0.19	97.7	98.6	98.20	0.28	97.3	98.6	0.1140	NS
	60 MIN	98.18	0.21	97.7	98.5	98.05	0.42	96.7	98.6	0.1267	NS
	90 MIN	98.11	0.22	97.6	98.5	97.87	0.50	96.3	98.5	0.0201	S
	120MIN	98.06	0.23	97.6	98.5	97.66	0.64	96.1	98.4	0.0023	VS

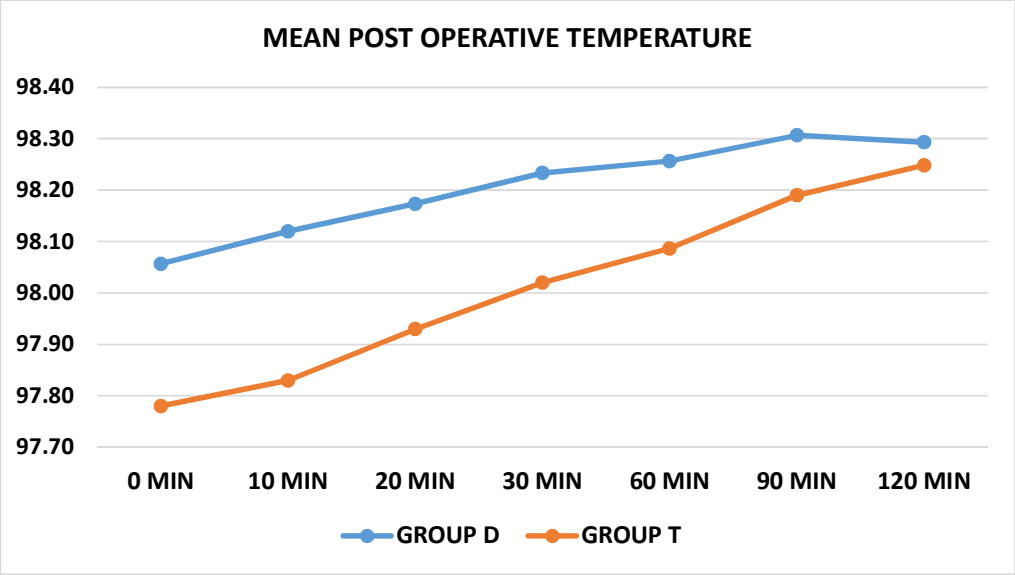


The intra-operative temperature of Group-D patients from 0 minutes to 120 minutes varied with a mean range of 98.06◦F to 98.53◦F. In Group-T patients, the intra-operative temperature from 0 minutes to 120 minutes varied with a mean range of 97.66◦F to 98.46◦F. The P value was <0.05 at 90 minutes to 120 minutes. Hence it

was statistically significant at 90 minutes and 120 minutes. The P values from 0 minutes to 60 minutes was >0.05. Hence intraoperative temperature was statistically insignificant from 0 to 60 minutes.

Table-15: POST OPERATIVE TEMPERATURE

		TEMPERATURE									
		GROUP D				GROUP T					
		MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
POST OPERATIVE	0 MIN	98.06	0.23	97.6	98.5	97.78	0.52	96.4	98.4	0.0102	S
	10 MIN	98.12	0.21	97.7	98.5	97.83	0.51	96.8	98.5	0.0052	VS
	20 MIN	98.17	0.23	97.7	98.6	97.93	0.50	97	98.6	0.0186	S
	30 MIN	98.23	0.23	97.8	98.6	98.02	0.47	97.2	98.6	0.0296	S
	60 MIN	98.26	0.21	98	98.6	98.09	0.44	97.2	98.7	0.0607	NS
	90 MIN	98.31	0.21	97.9	98.6	98.19	0.36	97.4	98.7	0.1317	NS
	120MIN	98.29	0.24	97.7	98.6	98.25	0.31	97.6	98.8	0.5308	NS



The post operative temperature of Group-D patients from 0 minutes to 30 minutes varied with a mean range of 98.06 to 98.23. In Group- T patients the post operative temperature varied from 0 minutes to 30 minutes with a mean range of 97.78 to 98.02. The P value was <0.05 from 0 minute to 30 minutes. Hence statistically significant from 0 to 30 minutes.

Table-16: POST OPERATIVE NAUSEA

	GROUP D		**GROUP T**	
	NUMBER	**%**	**NUMBER**	**%**
PRESENT	1	3.33	11	36.67
ABSENT	29	96.67	19	63.33
TOTAL	30	100.00	30	100.00

The percentage of Group-D patients with nausea was 3.33% which was 1 in 30 patients and about 96.6% of Group-D were without nausea which was 29 in 30 patients. In Group-T, patients with nausea were 36.7% which was 11 in 30 patients and about 63.33% which was 19 in 30 patients were without nausea. The presence of nausea was statistically significantly correlated with the intervention groups. The P value was (0.0012),<0.05 obtained by Chi square test. Nausea was significantly higher in Group-T patients than Group-D patients.

Table-17: POST OPERATIVE VOMITING

	GROUP D		GROUP-T	
	NUMBER	**%**	**NUMBER**	**%**
PRESENT	0	0.00	3	10.00
ABSENT	30	100.00	27	90.00
TOTAL	30	100.00	30	100.00

The percentage of Group-D patients with vomiting was Nil; which was 100% of patients of Group-D were without vomiting (30 in 30 patients were without vomiting). In Group-T, patients with vomiting were 10% (3 in 30 patients) and about 90% (27 in 30 patients) were without vomiting. There was no statistically significant association between intervention groups and occurrence of vomiting. The P value was (0.0756) >0.05 which was obtained by Chi-square test. The occurrence of vomiting was more or less same in the both groups.

Table-18: USE OF RESCUE ANALGESIA

	GROUP D		GROUP T	
	NUMBER	**%**	**NUMBER**	**%**
PRESENT	12	40.00	21	70.00
ABSENT	18	60.00	9	30.00
TOTAL	30	100.00	30	100.00

The percentage of Group-D patients with rescue analgesia was 40% among 100% which was 12 in 30 patients and about 60% of patients of Group-D were without use of rescue analgesia which was 18 in 30 patients. In Group-T, patients with use of rescue analgesia were 70% which was 21 in 30 patients and about 9% which was 9 in 30 patients were without use of rescue analgesia. There was a statistically significant association between intervention groups and occurrence of nausea. The P value is (0.0195) < 0.05 which was obtained by Chi-square test. There was significantly higher number of cases in Group-T patients.

Table-19: POST OPERATIVE SHIVERING

	GROUP D				GROUP T					
	MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
POST-OP SHIVERING SCORE	1.37	0.89	1	4	1.77	1.19	1	4	0.1467	NS
PAIN SCORE	1.87	0.82	1	3	2.77	0.94	1	5	0.0002	HS

Post-operative shivering in Group-T patients than Group-D patients was with a mean incidence of 1.77 and 1.37, respectively. The P-value exceeded 0.05. statistically insignificant as a result. It shows that Tramadol and Dexmedetomidine are equally efficient at preventing post-anaesthesia shivering.

Patients in Group-D had a mean pain score of 1.87, while those in Group-T had a mean score of 2.77. P value was less than 0.05. It is statistically significant as a result.

DISCUSSION

Shivering is one of the most common post-anaesthesia complications encountered by an anaesthesiologist following general anaesthesia. Even though shivering is most common complication, till today there is no confirmed gold standard drug/ definitive therapy for its treatment. There are various mechanisms which are involved in shivering and various drugs like Tramadol, alpha- agonists, opioids, MgSO4, Steroids, serotonin antagonists acting by various mechanisms are used for treatment of shivering. On the other hand, these drugs have various adverse effects like hypotension, bradycardia, respiratory depression, sedation, nausea and vomiting which limits their use.

There are numerous studies explaining about the treatment of intra-operative shivering. But there are only few studies which explained about the prevention of post operative shivering. The search for definitive/ gold standard therapy for shivering is still in search.

In the current study, the effectiveness of intravenous Dexmedetomidine and intravenous Tramadol in preventing post-anesthesia shivering in patients having general anesthesia is compared. In this study, we also compared the incidence of side effects like nausea, vomiting, respiratory depression and better control of pain.

The individuals who participated in our current study ranged in age from 18 to 50. Patients in the Dexmedetomidine group averaged 37 years old, compared to 38 years old in the Tramadol group. No statistically significant age gap existed between the two groups. Selection bias was thus eliminated.

In our study, the mean weight of the Dexmedetomidine and Tramadol groups of patients was 57.1 kg and 56.7 kg, respectively. Between the two groups, there was no statistically significant weight difference. Selection bias was thus eliminated.

There are few studies in which correlation of hemodynamic changes like heart rate, blood pressure, respiratory rate, temperature and prevention of post anesthesia shivering, side effects of Injection Tramadol and Injection Dexmedetomidine. But there was no study explaining the prophylactic infusion of tramadol and Dexmedetomidine in prevention of post anesthesia shivering.

In our study, mean post anesthesia shivering score in Dexmedetomidine group patients was about 1.37, whereas in Tramadol group patients it was 1.77. The prevention of post-anesthesia shivering was not significantly associated with intervention groups. Shivering was completely eliminated in patients who got Tramadol and dexmedetomidine in a study conducted in **2016 by Kundra Singh T.S. et. al.** However, Shivering returned in 3 patients in the dexmedetomidine group and 8 patients in the Tramadol group in post-operative period. In both the studies it was concluded that Injection Dexmedetomidine and Tramadol were equally effective in prevention of post anesthesia shivering.

Between the baseline and 120 minutes into the operation, the mean heart rate of the Dexmedetomidine group patients ranged from 63.93 to 93.97 intra-operatively and 60.80 to 69.07 post-operatively in our study. Similar to this, between baseline and 120 minutes during surgery, patients in the tramadol group had a mean heart rate that ranged from 79.27 to 94.64; 79.60 to 90.13 post-operatively. Except at 25 and 35 minutes into the operation, the association between the intervention group and heart rate was deemed statistically significant. In post-operative period, there was statistical

significance in heart rate between the intervention groups. There was no statistically significant difference between baseline HR and HR at the commencement of shivering in the **Kundra T.S et al.** investigation. However, the HR considerably dropped in the Dexmedetomidine group compared to the Tramadol group right away after the shivering stopped. At all other time intervals, there was no statistically significant variation in HR. [11]

In our study, mean systolic blood pressure changes of Dexmedetomidine group patients was between 111.83 to 140.10 between baseline to 120 minutes intra operatively and 115.37 to 149.40 post operatively. similarly in Tramadol group patients, the mean systolic blood pressure changes ranges from 121.90 to 140.21 from baseline to 120 minutes intra operatively and between 126.53 to 140.30 post operatively. A statistically significant relationship existed between the intervention group and systolic blood pressure both during and after surgery.

In our study, mean diastolic blood pressure changes in Dexmedetomidine group was statistically significant from baseline intraoperatively ranging between 67.80 to 88.23 and similarly post operatively 68.43 to 76.67. In Tramadol group patients, the mean diastolic blood pressure changes were statistically significant from baseline to 120 minutes intra operatively and post operatively ranging between 75.07 to 82.64 and 73.37 to 82.30 respectively. In **2016 Venkataraman et.al** conducted a prospective, randomized, double blind study by taking 90 patients and randomly allocated into 3 groups with 30 patients in each group receiving Tramadol, clonidine, dexmedetomidine. There was reduction in systolic and diastolic blood pressure more so in the dexmedetomidine group than clonidine and tramadol groups.[4]

In our study, mean respiratory rate of Dexmedetomidine patients ranges

between 12.30 to 13.53 intra operatively and post operatively 11.33 to 12.43. Similar to other patients in the Tramadol group, the mean respiratory rate fluctuates between 12.37 and 13.87 during surgery and 12.67 to 15.07 afterward. Although it was statistically significant after 30 minutes, the relationship between the intervention groups and respiratory rate was not statistically significant during surgery. But was statistically significant in post-operative period.

In order to determine the effectiveness of dexmedetomidine infusion in reducing shivering, **Sukhminderjit Jit Singh Bajwa et al.** conducted a study on 80 patients, aged 22 to 59, belonging to ASA physical status 1 and 2, who had laparoscopic surgical operations under general anesthesia. Two groups of patients, group N (n = 40) and group D (n = 40), were randomly assigned to the patients. In contrast to group N, which received saline during the peri-op period, group D received 1 mcg/kg of dexmedetomidine intravenously. During the preoperative, intraoperative, and postoperative phases, cardiorespiratory parameters including heart rate (HR), blood pressure, and oxygen saturation (SpO2), Respiratory rate were continually measured. Patients were examined for shivering during the postoperative period and graded according to the shivering grading system. Hypotension and bradycardia were side effects that were seen, noted, and symptomatically managed. When compared to group N, which received normal saline, the incidence of shivering was considerably lower in group D, which received dexmedetomidine intravenously. Shivering was experienced by about 42.5% of patients in group N, which was statistically extremely significant (P = 0.014). Clinically and statistically, group D patients' heart rates, Respiratory rate and mean arterial pressure also significantly varied during the postoperative period (P 0.008 and 0.012).[27]

In our study, mean temperature of Dexmedetomidine group patients ranges between 98.06◦F to 98.6◦F from baseline to intraoperatively 120 minutes and post operatively between 98.06◦F to 98.31◦F from 0 minutes to 120 minutes. Similarly in Tramadol group, intra-operatively ranges between 97.66◦F to 98.6 ◦F and post operatively between 97.78◦F to 98.25◦F. The association between intervention groups and temperature changes was significant after 90 minutes intra operatively and till 30 minutes post operatively. Tympanic temperatures in both groups (Dexmedetomidine group and Normal saline group) demonstrated a statistically significant decrease at the end of the procedure when compared to the baseline values (P 0.05), according to a **2008 study by Elvan et al.** The intraoperative values did not significantly differ between the groups. Tympanic temperature assessments after surgery were lower in the dexmedetomidine group than in the saline group (P 0.05). Postoperative temperatures in both groups were greater than the preoperative values at 60 minutes (P 0.05).[19]

In our study, mean pain scale in Dexmedetomidine group patients was about 1.87, whereas in Tramadol group patients it was 2.77 with P- value less than 0.05. Hence it was statistically significant. The patients with pain scale more than 03 was treated with injection diclofenac 75 mg/intra venous in 100 ml N.S. Thus, the patients in Dexmedetomidine group requiring rescue analgesia (injection Diclofenac) were about 12 in 30 patients. similarly in Tramadol group patients requiring rescue analgesia was about 21 in 30 patients. So, there was statistically significant association between the intervention groups. The prophylactic effects of intravenous injections of Dexmedetomidine, pethidine, ondansetron, and control groups on post-anesthesia shivering were compared in the study by **Mitra Jabalameli et al.,** and it was found that there was a statistically significant difference in pain intensity between

these groups (P value 0.001). The mean dose of received pethidine varied substantially among the four groups. The control group received the most pethidine, while the dexmedetomidine group received the least (P = 0.035).)[26]

In our study, 11 out of 30 patients in the tramadol group and 1 out of 30 patients in the dexmedetomidine group had nausea. As a result, there was a statistically significant correlation between the intervention groups and the incidence of nausea. In the study by **Mitra Jabalameli et al.,** vomiting was significantly different across the groups, but there was no significant difference in the prevalence of nausea between the four groups of Dexmedetomidine, Pethidine, Ondansetron, and controls (P = 0.013). [26]

In our study, no patients in dexmedetomidine group had experienced episode of vomiting. Whereas, 3 patients of tramadol group had vomiting. It was more or less statistically similar in both the intervention groups. Complication rates were noticeably greater in Group B (Tramadol) than in Group A (Dexmedetomidine) in the study conducted by **Kundra T.S. et al** in **2016**. In Group B, nausea and vomiting were more common than in Group A. With a highly significant P value of 0.001, none of the patients in Group A felt nausea compared to 28.00% of those in Group B. Additionally, a significant P value of 0.041 showed that 8.0% of patients in Group B experienced vomiting compared to 0 in Group A.

CONCLUSION

- In the current study, injection Tramadol and injection Dexmedetomidine were roughly equally effective at preventing post-anesthesia shivering.
- When compared to tramadol, dexmedetomidine had superior pain management and a lower incidence of nausea and vomiting, but it was associated with bradycardia and hypotension.

LIMITATIONS

1. More research is required to assess the effectiveness and negative effects of intravenous injection Tramadol and injection Dexmedetomidine in the treatment of post-anesthesia shivering.

2. The study should include one type of surgery to compare the pain among patients of both groups to avoid bias.

SUMMARY

60 cases of American society of Anaesthesiologists physical status 1 & 2 who were posted for elective surgeries under general anaesthesia were randomized into two groups; Group-D and Group-T, by double blinded method. In both groups after the induction of anaesthesia, the test drug was administered intravenously using a syringe pump.

In **Group-T**: Tramadol 100mg/IV diluted in 20 ml N.S. in which 10 ml (50 mg) was given over 10 minutes.

Group-D: Dexmedetomidine 100mcg/IV diluted in 20 ml N.S. in which 10 ml (50 mcg) was given over 10 minutes.

Following parameters were observed in present study:

- For the first hour, H.R, B.P, R.R. vital signs were taken every 10 minutes; the next hour, they were taken every 20 minutes. Using an infrared tympanic membrane thermometer, the patient's core temperature was taken prior to induction, immediately after induction of anesthesia, and then every 30 minutes for two hours.

- H.R, B.P, R.R., tympanic membrane temperature was measured at the time of entry to the recovery room (T0), after 10 minutes (T10), after 20 minutes (T20), 30 minutes(T30) and then every half hour for the following hour.[1] Additionally, the patients' discomfort, nausea, vomiting, and shivering episodes were monitored.

In the present study, the observations were as follows:

- Injection Tramadol and injection Dexmedetomidine were roughly equally effective at preventing post-anesthesia shivering.
- When compared to tramadol, dexmedetomidine had superior pain management and a lower incidence of nausea and vomiting, but it was associated with bradycardia and hypotension.

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ANNERURE- I

INFORMED CONSENT FOR PARTICIPATION IN RESEARCH STUDY

"COMPARATIVE STUDY OF INTRAVENOUS TRAMADOL AND DEXMEDETOMIDINE IN PREVENTION OF POST-ANESTHESIA SHIVERING."-A ONE YEAR RANDOMIZED CLINICAL TRIAL.

PRINCIPAL INVESTIGATOR:

Dr.
Post graduate student,
Department of Anesthesia,
J.N. Medical college, Belagavi-590010.

CO-INVESTIGATOR:

Dr.
Professor,
Department of Anesthesia,
J. N. Medical college, Belagavi-590010.

INTRODUCTION AND PURPOSE

The present study conducted among adult patients scheduled for various elective surgeries under general anesthesia under Department of Anesthesia at KLE'S Dr. Prabhakar Kore Charitable Hospital and Medical Research Centre, Belagavi. You are requested to participate in the study and your participation is completely voluntary.

The aim of the study is to find out the efficacy of the intra-venous Tramadol and Intravenous Dexmedetomidine in preventing post-anesthesia shivering. This will help to prevent the patient of post-anesthesia shivering with a drug having better results with minimum side effects.

PROCEDURE:

If you agree to participate in the study, the relevant data will be collected as per the proforma. Once the patient is induced in the study, he/she will be randomly allocated to either one of the study groups and the drug is given based on the assigned group. Efficacy of the two drugs will be assessed by monitoring vitals, shivering episodes, pain along with complications incidence like nausea, vomiting and need of rescue analgesia.

BENEFITS:

Patient will not be eligible for any kind of monetary benefits or free services by virtue of participation in the study.

RISKS: Methods applied to do the study are safe.

COST OF PARTICIPATION:

The cost of the investigation will be borne by the study subject. The other indirect expenses will be borne by the investigator.

PRIVACY AND CONFIDENTIALITY:

The results of the study may be published in journals for scientific purposes. However, your identity will not be revealed. All information collected will be coded so that no one other than the investigator will know your identity.

WITHDRAWAL FROM THE STUDY:

You can withdraw from the study at any time if you wish to do so.

ALTERNATIVES:

The researcher may use the information gathered from this study for presentation in scientific meetings. However, your identity will not be revealed. Any information that is obtained in connection with this study and that can be identified with your identity will remain confidential.

INSTITUTIONAL/SPONSORS POLICY:

In the event of any injury related to this study, no reimbursement or compensation will be given by law. However, treatment will be made available at KLE'S Hospital & MRC, Belagavi. If you face any untoward event, you may contact Dr. _____ Post graduate student. Department of Anesthesiology under the guidance of Dr. _____ professor, Department of Anesthesia, J.N. Medical college, Belagavi under KAHER, Belagavi.

LEGAL RIGHTS:

By signing this consent form, you are not waiving any of your legal rights.

QUIERIES AND CONTACT:

If you have any queries about your rights as research participant, you can contact **Dr. Harsha Hegde**, Chairperson, J.N. Medical college institutional Ethical Committee for Human Subjects Research, scientist, ICMR, National Institute of Traditional Medicine, Belagavi .

CONSENT STATEMENT TO PARTICIPATE IN RESEARCH STUDY

Mr/Mrs_____voluntarily agree for the participation as a subject for the study. By signing this consent form I am not giving up any of my legal right. I may withdraw from the study any time. I am signing the consent form after having read or been read to me in my vernacular language, including the risk and the benefits and having all my queries cleared.

Name of study patient: ----------

Signature or the left thumb impression: ----------

Name and signature of relative: ----------

Name and signature of witness: -------- ----------

Name and signature of investigator: ----------

Date: ---------- place: ----------

ANNERURE-II

PROFORMA

"COMPARATIVE STUDY OF INTRAVENOUS TRAMADOL AND DEXMEDITOMIDINE IN PREVENTION OF POST-ANESTHESIA SHIVERING": A ONE YEAR RANDOMISED CLINICAL TRIAL.

NAME:	AGE:
SEX:	WEIGHT:
HEIGHT:	DATE OF EXAMINATION:
ADDRESS:	OCCUPATION:
BMI:	IP.NO.:

HISTORY:

- HTN / DM / Arrythmia / LVH / Valvular Heart diseases/ hypothyroidism/ hyperthyroidism.
- H/O previous surgery(s) where airway difficulty was encountered.

General physical examination:

Weight:	Temperature(°F): (Tympanic)	Pallor:
Cyanosis:	Pedal edema:	Clubbing
P.R:	B.P:	R.R:

SYSTEMIC EXAMINATION:

RS:	CNS:
CVS:	GIT:

PRE-OPERATIVE PHYSICAL STATUS: ASA GRADE: 1 2

PRE-OPERATIVE AND INTRA-OPERATIVE VITALS

		GROUP-D				**GROUP-T**			
	TIME	H.R.	B.P.	R.R	SPO2	H.R.	B.P.	R.R	SPO2
1.	Pre operative								
2.	After anesthesia								
	5 min								
	15 min								
	25 min								
	35 min								
	45 min								
	55 min								
	75 min								
	95min								
	115 min								
	120 min								

TEMPERATURE

		GROUP-T	**GROUP-D**
	TIME	Tympanic membrane temperature (◦F)	Tympanic membrane temperature(◦F)
1.	Pre-operative		
2.	Immediately after anesthesia.		
3.	30 min		
4.	60 min		
5.	90 min		
6.	120 min		

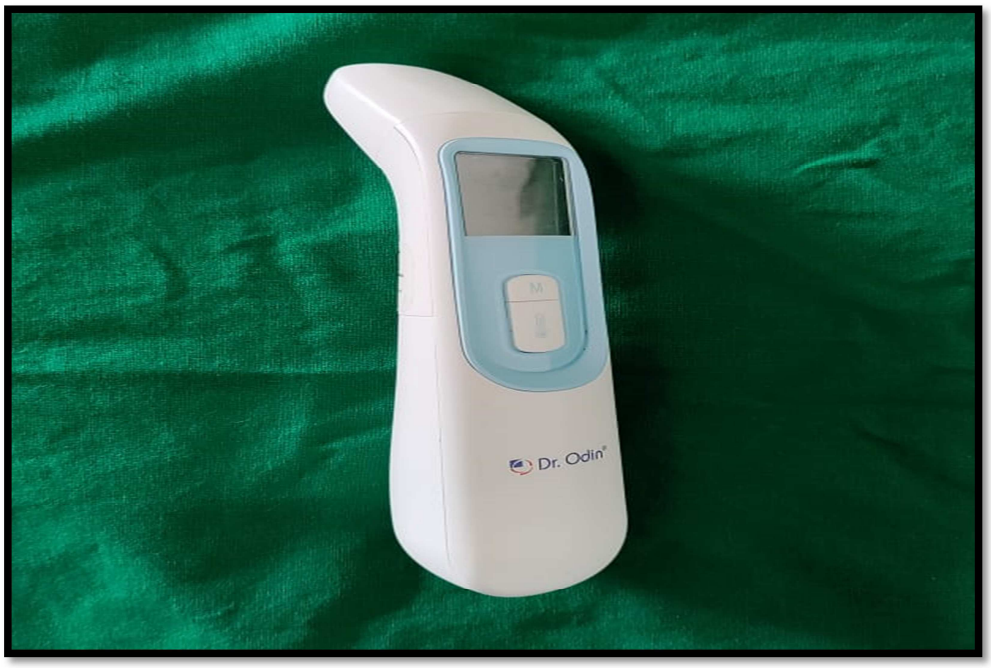
POST OPERATIVE VITAL SIGNS

	GROUP-D					**GROUP-T**				
TIME (MIN)	**TEMP** T.M	H.R	B.P	SPO2	R.R	**TEMP** T.M	H.R	B.P	SPO_2	RR
0										
10										
20										
30										
60										
90										
120										

INCIDENCE OF COMPLICATIONS

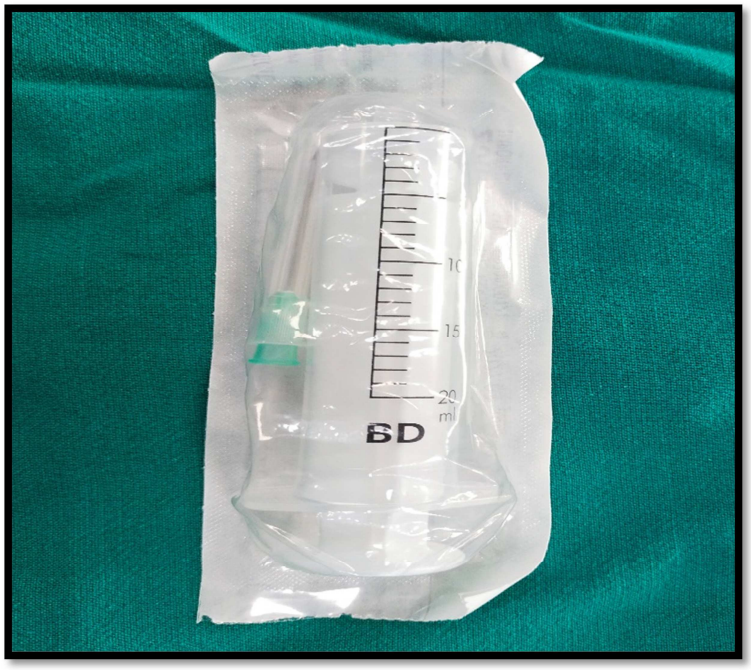
	GROUP-D	**GROUP-T**
Post anesthesia shivering		
Pain		
Nausea		
Vomiting		
Use of rescue analgesia		

ANNEXURE III – PHOTOGRAPHS



PHOTOGRAPH-1: TYMPANIC MEMBRANE THERMOMETER.

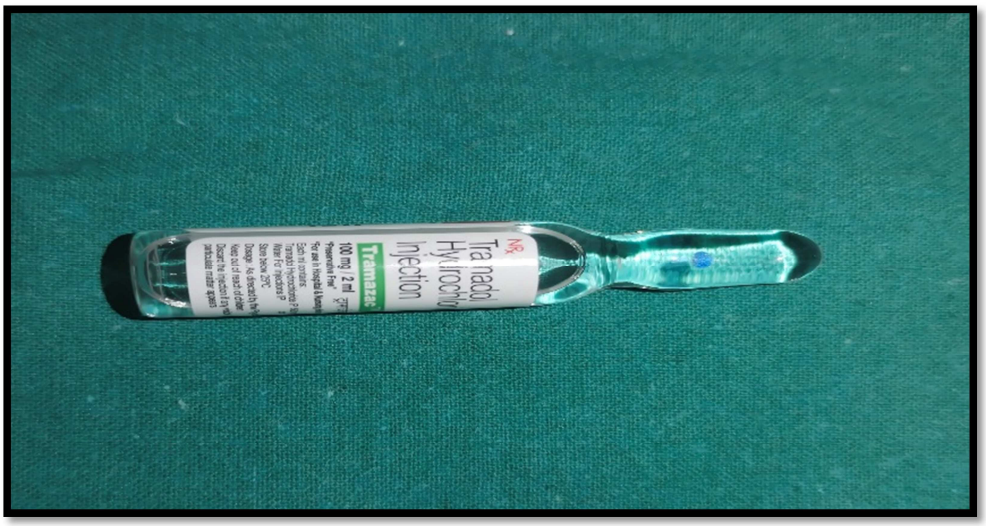
PHOTOGRAPH-2: SYRINGE PUMP.



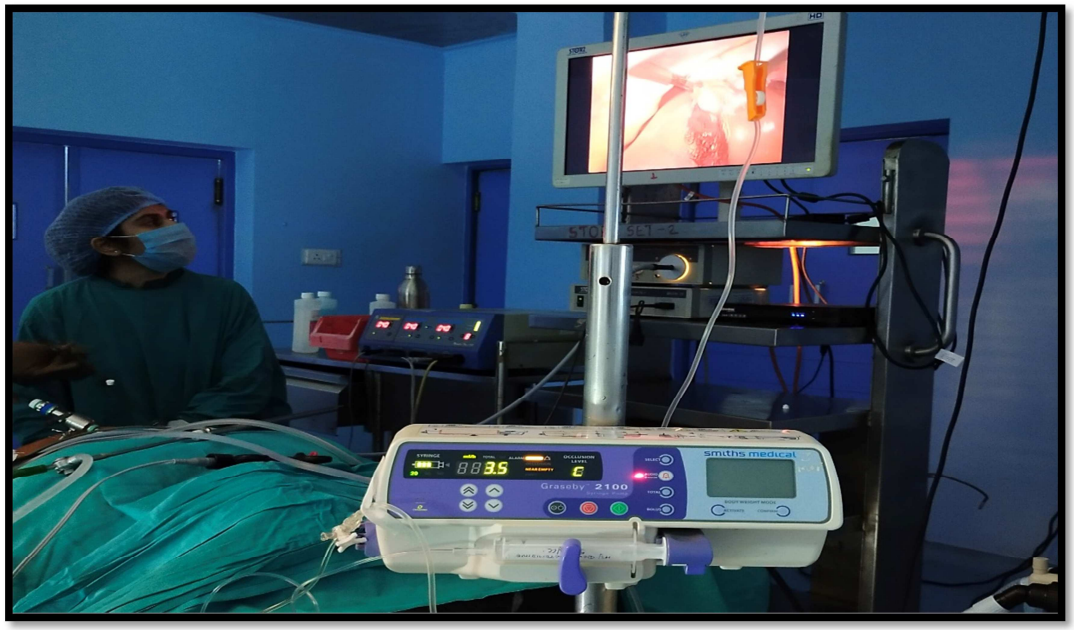
PHOTOGRAPH-3: 20 C.C. SYRINGE.

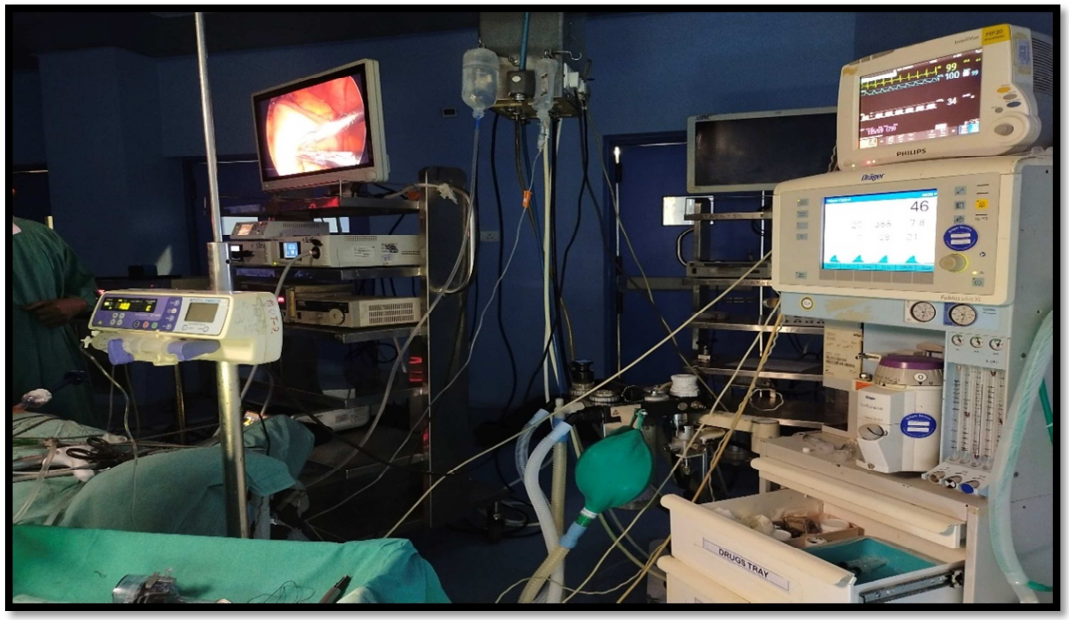
PHOTOGRAPH-4: 100 CMS EXTENSION.

PHOTOGRAPH-5: INJECTION DEXMEDETOMIDINE.



PHOTOGRAPH-6: INJECTION TRAMADOL





PHOTOGRAPH-7: OT SETTING.

ANNEXURE IV- MASTER CHARTS

GROUP-T

HEART RATE (Beats/min)																										
									INTRA-OPERATIVE										POST-OPERATIVE						
S.NO	NAME	SURE GRY	AGE(Years)	WEIGHT	ASA	IP.NO	SEX	PRE-OP	5 MIN	15 MIN	25 MIN	35 MIN	45 MIN	55 MIN	75 MIN	95 MIN	115 MIN	120 MIN	0 MIN	10 MIN	20 MIN	30 MIN	60 MIN	90 MIN	120 MIN
1	Sudha	Mandible C.E.	37	56 kgs	Grade-1	1038556	Female	81	105	91	83	84	86	84	80	82	84	88	116	118	106	108	97	100	102
2	Pavithra	Breast L.E.	19	42 kgs	Grade-1	1039031	Female	100	118	106	96	98	91	89	101	87	108	106	121	119	124	116	108	103	108
3	Pragati	L.A.	23	55 kgs	Grade-1	1084212	Female	76	89	94	87	89	86	89	81	83	97	103	104	97	81	83	86	84	81
4	Laxmi bai	MRM	37	54 kgs	Grade-2	1016078	Female	78	69	73	84	91	78	97	81	99	91	98	108	101	98	93	74	79	78
5	Krishnappa	L.H.R.	44	60 kgs	Grade-1	1046810	Male	87	72	76	81	84	108	86	111	78	102	113	94	91	87	82	90	87	86
6	Sumitra	L.H.R..	50	60 kgs	Grade-1	1039018	Female	82	80	72	80	63	69	69	68	73	72	85	74	79	73	81	75	74	73
7	Savitha	L.C.	29	54 kgs	Grade-1	1039261	Female	78	99	101	100	97	91	94	89	96	93	98	54	71	78	81	79	84	69
8	Bharat	Sebaceous C.E.	35	57 kgs	Grade-2	1047876	Male	87	97	107	91	103	92	98	101	91	93	112	98	91	97	90	88	96	97
9	Prema	MRM	39	58 kgs	Grade-1	1047842	Female	75	68	61	64	60	56	61	108	87	64	60	59	62	66	61	71	73	75
10	Aminsab	L.A.	50	60 kgs	Grade-1	1031655	Male	68	65	60	62	68	74	68	60	50	67	69	62	64	64	68	67	61	66
11	Khanderao	O.R.I.F.	39	58 kgs	Grade-1	1067312	Male	76	70	71	74	96	70	83	91	81	89	98	93	87	72	71	73	76	75
12	Yankanna	D & G	50	59 kgs	Grade-2	1057555	Male	106	100	94	78	70	71	78	72	78	84	87	94	86	81	89	86	87	89
13	Sunitha	L.A.	38	60 kgs	Grade-1	1076537	Female	70	84	78	73	79	89	71	76	60	80	83	89	78	71	83	84	74	71
14	Annapurna	D.L.	30	56 kgs	Grade-1	1044307	Female	81	74	89	96	103	87	88	79	86	91	96	85	78	71	76	70	68	71
15	Shankarlal	LY. EX.	49	54 kgs	Grade-2	3021704	Male	104	87	84	81	86	87	78	84	89	91	98	86	84	81	80	89	87	91
16	Keerthi	L.A.	21	52 kgs	Grade-1	1056214	Female	82	74	79	90	91	84	94	81	96	91	92	81	84	87	83	80	78	74
17	Durgavva	L.S.	37	58 kgs	Grade-1	1059240	Female	81	78	94	76	84	77	81	98	92	99	101	86	81	87	79	84	74	75
18	Jyothi More	H.E.	22	51 kgs	Grade-1	1068164	Female	78	64	87	79	98	91	90	78	83	81	106	99	104	102	96	101	90	95
19	Mubarak	left PCNL	40	60 kgs	Grade-1	1095235	Male	88	71	94	108	97	91	109	101	98	114	111	99	91	92	87	89	91	97
20	Rawalappa	Right PCNL	52	60 kgs	Grade-2	1096106	Male	76	109	118	94	91	89	93	88	91	98	123	118	98	87	81	89	88	86
21	Rahul	Mastoidectomy	20	54 kgs	Grade-1	1079542	Male	84	111	108	101	110	97	94	93	89	87	108	98	91	87	88	96	78	87
22	Laxmi	Breast L.E.	36	60 kgs	Grade-1	1059232	Female	87	78	67	68	72	78	81	79	86	98	105	84	78	71	70	74	79	81
23	Rohit	L.A.	19	46 kgs	Grade-1	1037350	Male	79	65	62	63	67	90	80	86	78	73	98	91	84	82	71	71	73	79
24	Shivaputra	L.H.R.	45	57 kgs	Grade-2	1038537	Male	70	84	78	73	79	89	71	76	60	80	83	89	78	71	83	84	74	71
25	Shaila hukund	Breast L.E.	37	51 kgs	Grade-1	1039887	Female	61	60	62	68	84	79	80	62	80	98	112	101	69	63	60	58	67	63
26	Laxmi Iligar	L.A.	34	53 kgs	Grade-1	1040796	Female	86	94	92	91	82	80	86	85	89	87	96	86	74	72	72	71	73	81
27	Pandu.L	L.H.R.	45	55 kgs	Grade-2	1050002	Male	63	86	60	81	78	73	80	72	80	83	79	81	71	82	76	84	78	73
28	Basalingappa	L.A.	50	52 kgs	Grade-1	1057659	Male	62	67	68	76	64	63	66	67	61	78	85	78	68	60	61	69	63	65
29	Sujatha	Breast L.E.	46	58 kgs	Grade-1	1078654	Female	76	74	69	94	89	91	79	96	87	89	97	105	99	91	98	89	91	97
30	Rajashree	Breast L.E.	50	57 kgs	Grade-2	3021809	Female	81	76	71	79	89	94	89	99	87	91	107	111	106	91	87	85	89	84

BLOOD PRESURE (mm of Hg)																		
			INTRA-OPERATIVE											POST-OPERATIVE					
SL..NO	NAME	PRE-OP	5 MIN	15 MIN	25 MIN	35 MIN	45 MIN	55 MIN	75 MIN	95 MIN	115 MIN	120 MIN	0 MIN	10 MIN	20 MIN	30 MIN	60 MIN	90 MIN	120 MIN
1	Sudha	130/80	122/84	141/86	148/95	152/94	160/100	158/94	140/84	130/86	130/78	140/90	140/80	139/80	131/71	136/74	140/78	141/85	139/79
2	Pavithra	100/60	140/70	119/71	128/76	126/77	113/70	119/74	129/78	116/74	113/81	145/86	140/80	139/81	136/74	137/71	131/69	128/69	125/73
3	Pragati	116/82	140/89	152/87	143/84	141/87	138/81	139/83	133/81	138/86	141/87	157/81	158/79	130/68	120/81	127/89	126/79	125/85	128/81
4	Laxmi bai	138/73	123/71	117/69	126/73	134/78	112/64	148/79	136/74	146/83	137/75	147/82	156/98	148/91	134/83	131/80	126/61	128/69	126/71
5	Krishnappa	140/80	129/74	127/71	131/74	136/76	160/87	131/76	150/84	128/71	152/87	168/83	150/84	152/81	138/76	131/74	146/71	132/73	142/81
6	Sumitra	120/80	118/72	140/98	124/82	116/82	113/80	110/80	110/80	118/82	116/84	132/86	131/82	121/81	119/81	120/83	114/69	111/69	118/71
7	Savitha	100/60	130/70	131/100	120/70	130/68	130/61	127/64	129/63	131/71	120/63	140/85	160/110	150/70	148/70	150/71	143/68	147/72	139/75
8	Bharat	109/65	136/78	141/84	139/79	146/87	138/77	143/71	136/68	131/67	130/86	145/89	158/68	148/61	152/72	148/68	143/64	141/68	158/71
9	Prema	120/80	110/71	147/82	138/71	127/68	116/62	123/68	148/101	127/76	117/64	101/61	108/69	101/67	103/66	110/60	113/70	108/71	110/71
10	Aminsab	130/80	118/63	110/62	113/64	118/67	140/79	125/79	120/72	108/65	136/65	135/68	120/61	118/62	113/60	120/63	117/61	108/63	105/67
11	Khanderao	130/80	110/74	107/77	108/64	150/89	121/69	136/73	154/74	130/68	140/63	143/71	150/80	140/79	131/73	123/74	121/71	120/68	125/70
12	Yankanna	140/80	118/72	106/68	100/67	101/68	114/71	116/73	118/74	119/72	120/79	121/74	118/72	120/71	130/78	136/81	139/81	134/86	138/89
13	Sunitha	120/80	140/86	120/83	127/81	130/83	126/78	120/74	136/83	120/81	118/79	140/83	130/80	120/81	120/83	110/78	110/71	110/68	120/71
14	Annapurna	120/81	148/88	143/81	136/78	131/80	130/76	126/71	128/70	121/73	137/71	118/63	121/78	128/79	130/80	127/68	126/61	121/61	123/69
15	Shankarlal	140/100	120/80	100/64	91/72	98/77	100/68	118/71	139/78	186/98	158/69	169/91	140/84	138/71	134/76	131/68	130/71	128/74	130/80
16	Keerthi	130/80	110/80	98/68	121/95	134/98	121/74	138/72	126/81	136/94	129/91	138/97	143/89	136/78	121/84	110/80	108/71	106/72	103/70
17	Durgavva	150/90	138/81	143/86	131/79	132/78	136/81	138/86	148/94	147/96	156/101	178/109	159/103	148/91	151/90	145/89	146/87	142/91	144/87
18	Jyothi More	90/60	126/68	135/71	128/74	134/89	143/83	137/74	106/68	126/71	143/90	154/87	150/80	148/78	146/81	143/83	142/81	134/76	129/79
19	Mubarak	140/80	110/71	148/87	157/101	141/89	151/81	149/80	138/84	137/81	166/109	171/111	148/89	137/81	139/83	140/80	141/78	140/81	143/76
20	Rawalappa	130/80	146/91	158/96	139/84	143/89	134/78	146/91	138/89	156/84	148/91	156/89	150/81	148/84	149/81	150/78	149/69	131/75	130/78
21	Rahul	120/80	120/84	136/87	127/81	139/84	129/89	133/71	136/81	138/78	140/90	141/89	131/86	128/81	121/84	128/71	122/78	132/77	136/81
22	laxmi	130/70	123/68	110/61	113/60	119/69	129/73	118/70	121/63	131/71	140/73	151/86	130/70	125/68	113/61	114/71	118/68	114/64	123/76
23	Rohit	125/78	108/74	100/70	103/70	119/89	146/91	156/104	147/101	139/97	135/94	139/91	147/95	145/92	138/91	132/91	137/87	136/91	130/80
24	Shivaputra	140/80	100/60	90/50	100/60	100/60	100/60	100/60	100/60	100/60	108/57	107/54	135/71	134/71	135/71	132/72	136/71	128/68	125/76
25	Shaila Hukund	120/70	118/71	110/60	115/81	120/85	109/75	110/73	109/77	110/71	120/87	143/89	130/80	110/81	110/76	110/72	108/74	107/70	110/70
26	Laxmi Iligar	110/80	130/78	136/95	121/87	129/80	125/84	123/86	119/83	117/79	134/86	131/82	127/91	130/90	131/87	128/79	131/81	130/75	131/86
27	Pandu.L	120/90	121/90	100/68	140/80	150/110	129/92	127/89	123/81	114/81	118/78	127/81	126/74	118/63	121/81	116/83	119/81	123/83	116/78
28	Basalingappa	130/70	105/64	157/114	154/111	136/89	122/89	118/91	138/94	127/87	139/89	159/109	150/81	148/79	141/71	130/70	136/73	138/71	129/89
29	Sujatha	120/70	100/60	90/60	110/80	137/80	140/80	151/80	152/89	147/81	138/81	134/78	156/89	151/78	145/81	130/80	140/87	130/70	138/76
30	Rajashree	110/70	100/70	103/71	127/89	119/73	131/86	126/78	116/71	134/89	130/86	145/89	147/85	134/76	125/78	126/71	120/70	123/71	128/69

RESPIRATORY RATE (Cycles/minute)																		
			INTRA-OPERATIVE										POST-OPERATIVE					
SL NO	NAME	PRE-OP	5 MIN	15 MIN	25 MIN	35 MIN	45 MIN	55 MIN	75 MIN	95 MIN	115 MIN	120 MIN	0 MIN	10 MIN	20 MIN	30 MIN	60 MIN	90 MIN	120 MIN
1	Sudha	13	12	12	12	12	12	12	12	12	12	12	12	10	10	12	10	11	10
2	Pavithra	11	12	12	12	12	12	12	12	12	12	16	14	11	12	14	11	13	13
3	Pragati	14	12	12	12	12	12	12	12	12	12	12	15	11	13	14	15	12	13
4	Laxmi bai	14	12	12	12	12	12	12	12	12	12	12	16	14	11	13	11	12	12
5	Krishnappa	16	14	14	14	14	14	14	14	14	14	14	16	14	11	12	14	13	15
6	Sumitra	12	12	12	12	12	12	12	12	12	12	12	16	14	14	13	16	11	14
7	Savitha	12	12	14	14	14	14	14	14	14	14	12	15	13	15	14	15	13	15
8	Bharat	14	12	12	12	12	12	12	12	12	12	12	14	15	13	11	13	14	14
9	Prema	14	12	12	12	12	12	12	12	12	12	12	15	14	11	13	11	11	15
10	Aminsab	12	14	15	15	15	15	15	15	15	15	12	11	13	14	11	13	11	16
11	Khanderao	11	12	12	12	12	12	12	12	12	12	12	16	14	11	10	13	11	14
12	Yankanna	16	16	18	16	16	16	16	16	16	16	16	18	15	14	18	16	13	14
13	Sunitha	16	12	12	16	16	16	16	16	16	16	16	18	13	11	14	15	11	14
14	Annapurna	14	12	16	16	16	16	16	16	16	16	16	13	11	12	11	10	13	12
15	Shankarlal	14	16	16	16	16	16	16	16	16	16	12	14	12	13	14	11	11	11
16	Keerthi	14	12	12	12	16	16	16	16	16	16	12	14	13	11	11	12	11	13
17	Durgavva	12	12	14	14	14	14	14	14	14	12	12	14	16	13	14	13	15	15
18	Jyothi More	13	12	12	12	12	12	12	12	12	12	12	16	14	17	16	18	14	16
19	Mubarak	15	12	12	12	12	12	12	12	12	15	16	14	15	11	11	13	14	16
20	Rawalappa	13	12	12	12	12	12	12	12	12	12	12	18	14	16	18	17	15	16
21	Rahul	13	12	14	14	14	14	14	14	14	12	12	16	11	14	16	15	13	12
22	Laxmi	14	12	12	12	12	12	12	12	12	12	12	14	16	11	11	13	14	12
23	Rohit	15	12	12	12	18	18	18	18	18	12	16	15	13	14	15	14	15	15
24	Shivaputra	13	12	12	16	16	16	16	16	16	12	12	17	14	13	11	12	13	11
25	Shaila Hukun	d13	11	10	10	10	10	10	10	13	16	15	15	12	11	11	13	11	13
26	Laxmi Iligar	11	12	12	16	16	20	20	20	18	16	13	14	11	12	12	13	11	12
27	Pandu.L	11	12	12	12	16	16	16	16	16	16	12	13	11	11	14	12	10	11
28	Basalingappa	14	12	14	16	16	16	16	16	16	16	15	14	14	16	16	17	13	15
29	Sujatha	11	12	12	12	12	12	12	12	12	12	12	16	17	16	16	18	15	16
30	Rajashree	15	12	12	12	12	12	12	12	12	12	12	19	15	14	17	15	16	15

TEMPERATURE ◦F														
			INTRA OPERATIVE					POST-OPERATIVE						
SL.NO	**NAME**	**PRE-OP**	**0 MIN**	**30 MIN**	**60 MIN**	**90 MIN**	**120 MIN**	**0 MIN**	**10 MIN**	**20 MIN**	**30 MIN**	**60 MIN**	**90 MIN**	**120 MIN**
1	Sudha	98.5	98.3	98	98	98	98	98	98	98	98.2	98.2	98.2	98.2
2	Pavithra	98.6	98.6	98.4	98.1	98	98	98	98.2	98.1	98.2	98.3	98.3	98.3
3	Pragati	98.6	98.6	98.5	98.5	98.5	98.3	98.4	98.5	98.5	98.5	98.5	98.5	98.5
4	Laxmi bai	98.6	98.4	98.1	98	97.9	98	97.9	98.1	98.4	98.4	98.3	98.4	98.4
5	Krishnappa	98.6	98.6	98.4	98.4	98.1	98.1	98.2	98.4	98.4	98.4	98.6	98.4	98.4
6	Sumitra	98.6	98.3	98	98	97.8	97.3	97.4	97.4	98	97.6	98	98.1	98.4
7	Savitha	98.6	98.4	98.1	97.8	97.7	97.6	97.3	97.3	97.2	97.3	97.5	97.5	98
8	Bharat	98.6	98.6	98.1	98	97.4	97.3	97.5	97.5	98	98.3	98.1	98.3	98.4
9	Prema	98.6	97.8	97.8	97.4	97.1	96.4	96.8	96.9	97	97.3	97.4	97.5	97.8
10	Aminsab	98.6	98.2	98.2	97.5	97.7	97.4	97.4	97.4	97.4	97.4	97.5	97.6	97.6
11	Khanderao	98.6	98.6	98.6	98.5	98.4	98.1	98.1	98.2	98.2	98.4	98.4	98.4	98.5
12	Yankanna	98.6	98.4	98.2	98.1	98.1	98	98	98.1	98.1	98.1	98.2	98.3	98.3
13	Sunitha	98.6	98.6	98.4	98.4	98.4	98.4	98.4	98.5	98.5	98.6	98.6	98.6	98.6
14	Annapurna	98.6	98.6	97.9	97.7	97.7	97.6	97.7	97.8	97.8	98.1	98.6	98.6	98.6
15	Shankarlal	98.6	98.4	98.3	98.6	98.4	98.4	98.4	98.4	98.6	98.6	98.7	98.7	98.8
16	Keerthi	98.6	98.5	98.4	98.3	98.3	98.3	98.4	98.4	98.6	98.6	98.7	98.7	98.7
17	Durgavva	98.6	98.6	98.3	98.5	98.2	98	98	98.3	98	98.4	98.1	98.3	98.1
18	Jyothi More	98.6	98.6	98.5	98.5	98.2	98.1	98.3	98	98.3	98.3	98.1	98.4	98.2
19	Mubarak	98.6	98.6	98.3	98.1	98	97.9	98	98	98.1	98.1	98	98.3	98.2
20	Rawalappa	98.6	98.6	98.4	98.4	98.1	98	98	98	98.2	98.5	98.5	98.4	98.5
21	Rahul	98.6	98.6	98.5	98.1	98.1	98.1	98.1	98	98.3	98	98.2	98.5	98.6
22	Laxmi	98.6	98.6	98.3	98.5	98.4	97.8	98	97.6	98.1	98	98.2	98.1	98
23	Rohit	98.6	98.3	98.1	97.6	97.2	96.8	97	97	97.1	97.3	97.4	97.8	97.9
24	Shivaputra	98.6	98.1	97.7	97.6	97.3	96.1	97	97.1	97.2	97.4	97.5	97.9	97.8
25	Shaila Hukund	98.6	98.5	98.1	97.8	97.1	97.2	97.1	97.1	97.1	97.2	97.2	97.4	97.9
26	Laxmi Iligar	98.6	98.6	97.3	96.7	96.3	96.3	96.4	96.8	97.2	97.3	97.6	97.9	97.9
27	Pandu.L	98.6	98.5	97.9	97.7	97.4	97	97.7	97.7	97.3	97.6	97.9	97.9	98
28	Basalingappa	98.6	98.4	98.3	98.1	98.1	98	98.1	98.3	98.3	98.5	98.5	98.5	98.5
29	Sujatha	98.6	98.6	98.3	98.4	98.1	98	97.8	98	98	98	98.2	98.2	98.2
30	Rajashree	98.6	98.4	98.5	98.1	98.1	97.9	98	97.9	97.9	98	97.6	98	97.9

INCIDENCE OF COMPLICATIONS						
SL.NO	**NAME**	**POST-OP SHIVERING**	**PAIN**	**NAUSEA**	**VOMITING**	**USE OF RESCUE ANALGESIA**
1	Sudha	GRADE-04	VAS-04	Present	Absent	YES
2	Pavithra	GRADE-04	VAS-04	Present	Present	YES
3	Pragati	GRADE-01	VAS-03	Present	Present	YES
4	Laxmi bai	GRADE-01	VAS-04	Absent	Absent	YES
5	Krishnappa	GRADE-02	VAS-03	Absent	Absent	YES
6	Sumitra	GRADE-04	VAS-03	Present	Absent	YES
7	Savitha	GRADE-01	VAS-02	Absent	Absent	NO
8	Bharat	GRADE-03	VAS-02	Absent	Absent	YES
9	Prema	GRADE-01	VAS-03	Present	Absent	YES
10	Aminsab	GRADE-01	VAS-03	Absent	Absent	YES
11	Khanderao	GRADE-04	VAS-03	Absent	Absent	YES
12	Yankanna	GRADE-01	VAS-02	Absent	Absent	YES
13	Sunitha	GRADE-01	VAS-02	Absent	Absent	NO
14	Annapurna	GRADE-01	VAS-04	Present	Absent	YES
15	Shankarlal	GRADE-01	VAS-02	Absent	Absent	NO
16	Keerthi	GRADE-01	VAS-02	Absent	Absent	NO
17	Durgavva	GRADE-01	VAS-01	Absent	Absent	NO
18	Jyothi More	GRADE-01	VAS-04	Present	Absent	YES
19	Mubarak	GRADE-03	VAS-02	Absent	Absent	YES
20	Rawalappa	GRADE-04	VAS-02	Absent	Absent	YES
21	Rahul	GRADE-01	VAS-02	Absent	Absent	NO
22	Laxmi	GRADE-01	VAS-02	Absent	Absent	NO
23	Rohit	GRADE-01	VAS-05	Absent	Absent	YES
24	Shivaputra	GRADE-01	VAS-02	Present	Absent	YES
25	Shaila Hukund	GRADE-01	VAS-02	Absent	Absent	NO
26	Laxmi Iligar	GRADE-01	VAS-03	Present	Absent	YES
27	Pandu.L	GRADE-01	VAS-03	Absent	Absent	YES
28	Basalingappa	GRADE-01	VAS-03	Absent	Absent	YES
29	Sujatha	GRADE-03	VAS-04	Present	Present	YES
30	Rajashree	GRADE-02	VAS-02	Present	Absent	NO

GROUP-D

HEART RATE (Beats/minute)																									
									INTRA-OPERATIVE										POST-OPERATIVE						
SL.NO	NAME	SURGERY	AGE (Years)	WEIGHT	ASA	IP.NO	SEX	PRE-OP	5 MIN	15 MIN	25 MIN	35 MIN	45 MIN	55 MIN	75 MIN	95 MIN	115 MIN	120 MIN	0 MIN	10 MIN	20 MIN	30 MIN	60 MIN	90 MIN	120 MIN
1	Smitha	L.C.	55	60 kgs	Grade-2	1089106	Female	112	98	91	83	77	73	74	67	68	59	75	59	55	58	63	61	66	61
2	Jyothi	L.A	22	58 kgs	Grade-1	1089499	Female	96	128	116	108	71	69	61	63	67	66	71	76	63	61	64	61	59	63
3	Bharati	FESS	32	54 kgs	Grade-1	1079545	Female	84	98	96	88	62	56	69	61	67	69	78	76	68	61	62	59	60	62
4	Ravi	L.H.R	34	60 kgs	Grade-1	1077423	Male	78	91	83	62	62	58	54	56	58	61	63	60	54	47	52	49	51	53
5	Mahesh	ORIF	50	70 kgs	Grade-1	1062643	Male	94	86	80	100	73	62	64	61	63	84	98	64	63	61	69	73	78	69
6	Nirmala	Breast L.E.	55	60 kgs	Grade-1	1033137	Female	89	68	70	68	64	66	60	63	64	61	64	65	63	60	62	60	64	62
7	Mallappa	ORIF	41	65 kgs	Grade-1	1082165	Male	78	76	71	68	56	55	57	49	52	51	56	56	51	50	58	63	64	67
8	Paravva	L.C.	43	56 kgs	Grade-1	1048035	Female	88	81	73	94	96	71	62	60	56	57	60	60	61	58	55	56	57	54
9	Sharda	Tonsillectomy	41	50 kgs	Grade-1	1080610	Female	89	74	84	71	68	61	58	57	54	60	63	74	63	60	61	57	59	53
10	Shankarappa	Tonsillar cyst excision	60	64 kgs	Grade-2	1080693	Male	74	71	84	89	66	63	60	61	63	62	70	69	61	63	66	63	61	65
11	Anusuya	Breast L.E.	42	68 kgs	Grade-1	1085543	Female	80	89	86	73	62	59	51	53	50	51	74	70	57	55	54	53	51	53
12	Laxmi	ORIF	25	52 kgs	Grade-1	1089115	Female	88	130	133	112	107	104	88	83	73	78	92	65	64	62	61	61	60	63
13	Kavitha	L.C.	54	62 kgs	Grade-2	1080469	Female	80	83	67	79	83	79	80	83	85	81	89	76	81	77	73	71	72	75
14	Rudrappa	ORIF	50	60 kgs	Grade-2	1086502	Male	80	102	109	81	71	73	67	61	59	52	65	64	60	61	63	60	62	56
15	Vaishali	L.C.	37	55 kgs	Grade-2	1038514	Female	145	138	136	132	99	71	78	61	64	78	84	63	66	61	64	73	68	65
16	Jameela	MRM	45	58 kgs	Grade-2	3021812	Female	89	86	86	86	78	76	75	66	65	70	80	71	69	65	69	64	65	63
17	Indravva	Endonasal DCR	42	61 kgs	Grade-1	1081264	Female	74	93	103	96	70	63	78	69	61	63	67	64	63	60	67	61	56	50
18	Sunil Patil	Left PCNL	48	78 kgs	Grade-2	1095995	Male	91	78	71	92	84	87	69	69	68	69	76	68	65	65	64	61	55	66
19	Manishka	Left PCNL	35	56 kgs	Grade-1	1096093	Female	84	71	74	73	71	74	70	68	72	75	67	76	64	61	59	58	63	55
20	Supriya	Lap.Pyeloplasty	25	66 kgs	Grade-1	1097379	Female	115	102	121	126	114	91	78	71	74	71	78	79	71	74	78	77	75	71
21	Padma	T.R.	46	61 kgs	Grade-1	1089943	Female	120	108	84	81	83	81	78	74	76	78	79	71	68	75	79	67	71	66
22	Rahul	L.H.R.	21	59 kgs	Grade-1	1100777	Male	78	65	61	59	56	61	59	63	65	63	66	59	61	58	55	56	54	55
23	Aditya	L.A.	22	62 kgs	Grade-1	1102639	Male	86	86	81	78	76	75	66	65	70	80	83	91	84	83	81	85	89	87
24	Vasundara	L.A.	30	54 kgs	Grade-1	1059603	Female	98	107	94	93	84	71	76	64	67	61	78	61	59	51	52	55	52	55
25	Hanif	L.A.	29	64 kgs	Grade-1	1101826	Male	84	78	76	86	71	70	72	71	72	69	61	74	71	66	69	71	73	75
26	Shivani	D.L.	19	56 kgs	Grade-1	1059294	Female	98	106	118	97	72	71	59	64	57	56	69	68	56	51	55	56	59	57
27	Pooja	L.H.R.	25	60 kgs	Grade-1	1059551	Female	78	102	91	71	70	61	56	54	52	57	69	69	57	53	56	57	56	59
28	Sujit	L.H.R.	22	70 kgs	Grade-1	1101975	Male	86	105	94	70	71	59	61	57	54	65	71	68	57	54	51	56	57	61
29	Harsha Patil	L.H.R.	31	68 kgs	Grade-2	1099014	Male	100	138	122	118	116	78	71	65	79	69	78	79	67	61	59	67	62	60
30	Kamalavva	Breast L.E.	46	59 kgs	Grade-1	1096786	Female	89	81	99	91	67	61	67	59	55	56	71	77	61	52	57	50	63	66

BLOOD PRESSURE (mm Hg)																		
			INTRA-OPERATIVE															
SL.NO	NAME	PRE-OP	5 MIN	15 MIN	25 MIN	35 MIN	45 MIN	55 MIN	75 MIN	95 MIN	115 MIN	120 MIN	0 MIN	10 MIN	20 MIN	30 MIN	60 MIN	90 MIN	120 MIN
1	Smitha	150/90	157/102	158/113	143/112	124/87	113/92	105/88	113/90	115/93	110/86	146/99	166/92	146/91	141/94	127/86	128/87	134/81	128/81
2	Jyothi	120/80	146/91	130/87	118/62	111/61	116/63	108/59	112/59	110/61	106/59	128/61	128/81	118/80	121/79	111/61	114/63	118/72	116/71
3	Bharati	120/80	160/100	157/101	151/103	133/81	117/62	109/61	103/62	107/64	103/67	113/68	118/79	101/61	107/63	102/60	101/59	103/60	106/58
4	Ravi	130/90	170/110	123/86	144/100	120/81	100/61	99/56	100/60	112/63	118/71	110/70	124/84	111/73	108/68	113/71	103/73	102/64	106/65
5	Mahesh	130/80	120/71	114/80	148/78	108/64	110/61	109/72	123/84	148/78	148/87	141/86	140/80	139/71	143/84	144/78	136/71	134/73	138/71
6	Nirmala	140/80	99/67	99/70	106/66	90/58	92/61	99/66	99/70	95/64	124/69	145/81	127/76	116/69	118/70	119/72	120/74	121/73	120/71
7	Mallappa	160/80	149/78	164/74	133/76	114/68	101/62	130/81	112/61	101/60	108/61	130/81	158/77	149/71	141/73	133/64	134/61	131/63	132/61
8	Paravva	110/90	104/71	118/87	138/89	146/87	99/69	94/63	98/61	89/56	90/58	98/57	97/54	98/59	99/61	96/59	91/57	98/61	91/56
9	Sharda	130/80	150/86	160/81	141/82	140/73	116/67	103/59	109/64	101/57	103/61	108/74	117/78	111/71	109/62	103/61	101/68	103/63	102/61
10	Shankarappa	160/90	140/90	150/96	161/101	173/96	140/81	128/69	133/62	131/68	136/71	145/89	131/87	136/89	129/78	139/90	147/87	155/68	156/91
11	Anusuya	130/80	160/90	151/84	142/73	140/71	143/71	138/74	132/71	130/80	132/70	152/85	150/80	144/85	147/82	147/76	138/71	136/71	132/85
12	Laxmi	120/70	130/100	40/100	136/90	114/87	111/90	104/73	118/84	122/86	110/70	150/90	130/93	119/83	110/76	121/86	119/80	118/72	116/74
13	Kavitha	120/70	165/120	140/114	116/90	105/80	90/60	106/83	103/78	108/71	111/78	114/79	101/68	100/66	104/71	108/69	99/71	101/66	100/61
14	Rudrappa	130/80	150/90	171/94	170/80	168/81	151/84	156/78	150/71	140/78	140/79	156/89	140/80	143/81	144/78	138/81	141/80	131/81	136/85
15	Vaishali	170/90	160/90	163/91	161/89	140/81	113/78	107/67	99/63	94/61	96/65	123/71	100/70	103/71	99/69	107/63	101/69	108/73	101/61
16	Jameela	130/80	150/94	159/91	143/87	126/71	118/73	124/81	127/78	114/69	126/78	134/74	141/80	130/79	126/71	118/73	119/71	114/69	115/74
17	Indravva	130/80	150/84	164/86	143/81	128/74	116/72	138/71	111/68	114/69	119/64	126/69	129/81	124/80	116/71	118/74	111/67	110/59	113/56
18	Sunil Patil	150/90	130/80	131/82	158/94	154/91	130/80	128/71	127/68	120/74	128/71	126/83	130/80	125/71	121/74	128/71	118/69	121/64	109/60
19	Manishka	130/80	110/70	118/73	138/81	139/84	110/71	113/72	112/71	106/67	110/70	121/74	120/81	117/65	116/71	118/74	109/68	111/69	117/71
20	Supriya	130/80	121/78	148/89	151/84	131/74	128/71	129/71	123/74	125/78	128/71	140/84	128/71	126/71	128/74	121/71	122/73	126/71	125/74
21	Padma	136/83	106/74	107/76	109/71	115/79	106/72	119/83	104/77	109/78	104/73	114/82	110/80	107/71	104/72	109/79	109/73	104/76	106/75
22	Rahul	120/80	140/89	121/71	112/64	106/61	104/60	103/62	102/61	110/64	108/67	110/69	110/81	106/76	102/71	102/68	103/68	111/71	1105/67
23	Aditya	140/80	130/80	139/91	145/98	123/83	116/71	111/67	114/72	110/80	116/81	129/87	130/80	123/78	125/69	129/74	132/76	134/78	131/72
24	Vasundara	110/70	138/78	131/72	126/79	121/74	118/67	104/52	109/56	90/51	93/50	113/74	109/59	91/51	90/52	101/54	103/54	109/61	102/54
25	Hanif	140/80	110/80	124/82	140/91	148/92	112/71	113/72	116/71	106/68	101/56	111/69	110/70	104/64	118/67	116/66	117/62	107/68	112/61
26	Shivani	110/70	151/94	167/101	122/71	112/61	107/56	108/57	103/54	108/61	117/67	126/69	120/67	110/62	112/61	108/59	104/58	106/61	108/62
27	Pooja	120/70	148/94	139/91	128/74	110/62	116/61	108/53	101/51	103/52	108/55	126/67	121/68	105/56	103/55	108/57	104/51	108/61	106/58
28	Sujit	130/80	151/102	171/103	128/74	111/60	116/61	105/58	110/57	109/61	128/67	129/69	121/68	106/57	104/51	107/57	103/54	107/61	107/58
29	Harsha patil	120/70	143/89	162/90	145/86	119/71	113/69	109/67	111/65	109/67	103/67	115/71	119/73	109/69	107/62	101/61	103/58	109/65	109/71
30	kamalavva	130/80	165/93	167/91	151/89	138/79	120/69	109/67	115/71	119/78	123/82	131/85	128/82	119/79	113/81	119/76	131/87	133/89	137/88

	RESPIRATORY RATE (Cycles/minute)																	
			INTRA-OPERATIVE										POST-OPERATIVE					
SL.NO	**NAME**	**PRE-OP**	**5 MIN**	**15 MIN**	**25 MIN**	**35 MIN**	**45 MIN**	**55 MIN**	**75 MIN**	**95 MIN**	**115 MIN**	**120 MIN**	**0 MIN**	**10 MIN**	**20 MIN**	**30 MIN**	**60 MIN**	**90 MIN**	**120 MIN**
1.	Smitha	16	12	12	18	18	18	18	18	18	18	18	18	14	16	11	14	13	11
2.	Jyothi	14	12	12	12	12	12	12	12	12	12	12	14	15	11	10	13	16	15
3.	Bharati	16	12	12	12	12	12	12	12	12	12	12	10	11	10	11	11	10	11
4.	Ravi	16	11	11	14	16	16	16	16	16	16	16	13	11	12	11	10	11	12
5.	Mahesh	14	12	12	12	12	12	12	12	12	12	12	14	12	16	15	11	12	13
6.	Nirmala	14	14	14	14	14	14	14	14	14	14	12	12	18	18	16	16	15	16
7.	Mallappa	15	14	14	14	14	14	14	14	14	14	14	18	15	15	14	16	13	14
8.	Paravva	11	12	14	16	16	16	16	16	16	16	14	11	10	11	12	11	12	10
9.	Sharda	15	12	12	11	11	11	11	11	11	11	11	10	11	10	11	11	10	10
10.	Shankarappa	14	12	12	12	12	12	12	12	12	12	12	11	10	13	11	10	11	11
11.	Anusuya	12	12	12	12	12	12	12	12	12	12	12	25	24	26	26	27	25	24
12.	Laxmi	11	14	14	14	14	14	14	14	12	12	12	10	12	10	10	10	10	14
13.	kavitha	12	12	16	16	14	14	14	14	14	14	12	12	10	13	11	10	12	10
14.	Rudrappa	12	12	12	12	12	12	12	12	12	12	12	14	11	16	11	12	14	12
15.	Vaishali	18	12	11	11	11	11	11	11	11	11	20	11	10	13	11	12	11	11
16.	Jameela	14	12	12	12	12	12	12	12	12	12	11	13	10	11	10	10	11	9
17.	Indravva	11	12	12	12	12	12	12	12	12	12	12	11	12	10	10	11	10	10
18.	Sunil Patil	14	16	12	12	12	12	12	12	12	12	12	14	11	12	11	14	13	10
19.	Manishka	13	12	12	12	12	12	12	12	12	12	12	11	8	9	6	8	9	9
20.	Supriya	14	12	12	12	16	18	16	16	16	16	16	11	10	11	11	10	11	12
21.	Padma Hasabe12		12	12	12	12	12	12	12	12	12	12	10	7	11	8	7	10	11
22.	Rahul	14	12	12	12	12	12	12	12	12	12	12	10	11	10	10	10	10	9
23.	Aditya	12	12	12	12	14	14	12	9	12	12	14	14	16	11	13	14	12	11
24.	Vasundara	14	12	12	12	14	14	14	14	14	14	14	10	11	10	12	10	9	11
25.	Hanif	14	12	12	12	16	16	16	16	14	12	12	10	9	10	7	10	11	9
26.	Shivani	12	12	12	14	14	16	16	14	14	14	12	14	11	10	11	7	10	10
27.	Pooja	14	12	12	12	12	12	14	14	14	14	12	11	10	12	11	10	11	13
28.	Sujit	14	12	12	14	14	14	14	14	14	14	12	11	6	10	11	10	12	10
29.	Harsha Patil	13	12	12	12	16	16	16	16	16	12	11	10	6	9	10	8	9	9
30.	Kamalavva	11	12	12	12	12	12	12	12	12	12	13	10	9	8	10	7	8	8

TEMPERATURE °F														
			INTRA-OPERATIVE					POST-OPERATIVE						
SL.NO	**NAME**	**PRE-OP**	**0 MIN**	**30 MIN**	**60 MIN**	**90 MIN**	**120 MIN**	**0 MIN**	**10 MIN**	**20 MIN**	**30 MIN**	**60 MIN**	**90 MIN**	**120 MIN**
1	Smitha	98.6	98.6	98.4	98.3	98.3	98.1	98.1	98.1	98.1	98.4	98.3	98.4	98.5
2	Jyothi	98.6	98.6	98.4	98.2	98.1	98.1	98.1	98.3	98.3	98.5	98.4	98.4	98.4
3	Bharati	98.6	98.6	98.6	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
4	Ravi	98.6	98.6	98.5	98.3	98.3	98.2	98.3	98.3	98.5	98.5	98.5	98.6	98.6
5	Mahesh	98.6	98.4	98.4	98.4	98.3	98.3	98.3	98.2	98.4	98.4	98.4	98.4	98.5
6	Nirmala	98.6	98.3	97.7	97.7	97.6	97.8	97.6	98	98.4	98.4	98.4	98.5	98.4
7	Mallappa	98.6	98.4	98.3	98.2	98.1	98.1	98.1	98.1	98.2	98.2	98.3	98.3	98.2
8	Paravva	98.6	98.5	98.1	97.9	97.9	97.9	97.9	98	98.1	98.4	98.3	98.6	98.6
9	Sharda	98.6	98.6	98.4	98.4	98.2	98.2	98.2	98.4	98.6	98.5	98.5	98.6	98.6
10	Shankarappa	98.6	98.5	98.5	98.4	98.4	98.4	98.5	98.5	98.4	98.5	98.5	98.5	98.5
11	Anusuya	98.6	98.1	98.4	98.3	98.1	98	98	98	98	97.8	98	98.2	98.2
12	Laxmi	98.6	98.6	98.4	98.2	98.3	98.2	98	98.1	98	98.4	98.2	98.3	98.3
13	Kavitha	98.6	98.6	98.5	98.3	98.3	98.3	98.3	98.3	98.5	98.5	98.5	98.5	98.5
14	Rudrappa	98.6	98.6	98.4	98	98	98	98	98	98.1	98.1	98.1	98.2	98.2
15	Vaishali	98.6	98.5	98.5	98.4	98.4	98.4	98.5	98.5	98.5	98.6	98.6	98.6	98.6
16	Jameela	98.6	98.6	98.1	98.1	98	97.7	97.9	97.9	97.7	97.8	98	97.9	97.8
17	Indravva	98.6	98.6	98.4	98.3	98.3	98.1	98.1	98.1	98	98.4	98.5	98.4	98.2
18	Sunil Patil	98.6	98.4	98.1	98	98	98	98	98	98.1	98.1	98.1	98.1	98.1
19	Manishka	98.6	98.6	98.2	98.1	98.1	97.6	97.6	98	98	98	98.1	98.1	98.1
20	Supriya	98.6	98.6	98.3	98.1	98	98	97.9	97.9	97.9	98	98	98	98.1
21	Padma Hasabe	98.6	98.6	98.3	98.1	97.8	98.1	98	98	97.9	98	98	97.9	97.7
22	Rahul	98.6	98.6	98.4	98.2	98.2	98.1	98.1	98	98.4	98.1	98.4	98.4	98.5
23	Aditya	98.6	98.6	98.1	97.8	98.1	97.9	98	98	98.3	98.1	98.3	98.3	98.3
24	Vasundara	98.6	98.6	98.1	98.3	98	98.1	98	98.2	98	98.1	98	98.4	98.3
25	Hanif	98.6	98.6	98.4	98.5	98.2	98.1	98.1	98.4	98.2	98.2	98.4	98.3	98.4
26	Shivani	98.6	98.6	98.2	98	97.8	97.6	98	97.9	98	98	98	98.1	98
27	Pooja	98.6	98.6	98.3	98.1	98.2	98	97.7	98	97.9	98.1	98	98.3	98.1
28	Sujit	98.6	98.5	98.1	98	97.9	98	98	97.9	98	98	98	98.1	98.1
29	Harsha patil	98.6	98.6	98	97.9	97.6	97.7	97.7	97.7	98	98	98	98	98.1
30	Kamalavva	98.6	98.4	98.4	98.4	98.3	98.3	98.2	98.3	98.2	98.4	98.4	98.3	98.4

INCIDENCE OF COMPPLICATIONS						
SL.NO	**NAME**	**POST-OPSHIVERING**	**PAIN**	**NAUSEA**	**VOMITING**	**USE OF RESCUE ANALGESIA**
1	Smitha	Grade-04	VAS-02	Absent	Absent	NO
2	Jyothi	Grade-01	VAS-01	Absent	Absent	NO
3	Bharati	Grade-01	VAS-01	Absent	Absent	NO
4	Ravi	Grade-01	VAS-02	Absent	Absent	YES
5	Mahesh	Grade-01	VAS-03	Absent	Absent	YES
6	Nirmala	Grade-01	VAS-02	Absent	Absent	NO
7	Mallappa	Grade-01	VAS-03	Absent	Absent	YES
8	Paravva	Grade-01	VAS-01	Absent	Absent	NO
9	Sharda	Grade-01	VAS-01	Absent	Absent	NO
10	Shankarappa	Grade-01	VAS-01	Absent	Absent	NO
11	Anusuya	Grade-01	VAS-01	Absent	Absent	NO
12	Laxmi	Grade-01	VAS-01	Absent	Absent	YES
13	Kavitha	Grade-01	VAS-01	Absent	Absent	NO
14	Rudrappa	Grade-04	VAS-03	Absent	Absent	YES
15	Vaishali	Grade-01	VAS-01	Absent	Absent	NO
16	Jameela	Grade-01	VAS-02	Absent	Absent	NO
17	Indravva	Grade-01	VAS-01	Absent	Absent	NO
18	Sunil Patil	Grade-01	VAS-01	Absent	Absent	NO
19	Manishka	Grade-03	VAS-01	Absent	Absent	NO
20	Supriya	Grade-01	VAS-03	Present	Absent	YES
21	Padma Hasabe	Grade-01	VAS-02	Absent	Absent	YES
22	Rahul	Grade-01	VAS-02	Absent	Absent	NO
23	Aditya	Grade-01	VAS-02	Absent	Absent	YES
24	Vasundara	Grade-01	VAS-03	Absent	Absent	YES
25	Hanif	Grade-01	VAS-03	Absent	Absent	YES
26	Shivani	Grade-03	VAS-02	Absent	Absent	NO
27	Pooja	Grade--01	VAS-03	Absent	Absent	YES
28	Sujit	Grade-01	VAS-02	Absent	Absent	NO
29	Harsha patil	Grade-02	VAS-03	Absent	Absent	YES
30	Kamalavva	Grade-01	VAS-02	Absent	Absent	NO