INSTILLATION OF LIGNOCAINE THROUGH THE ENDOTRACHEAL TUBE TO ATTENUATE THE EXTUBATION RESPONSE

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INTRODUCTION

Extubation is often associated with varying degrees of problems. The appropriate time to remove an endotracheal tube is part of the art of anaesthesia that develops with experience. Both intubation and extubation are associated with rise in heart rate and blood pressure, yet often there has been less emphasis on avoiding hemodynamic changes at extubation. These cardiovascular changes occur due to release of catecholamines at extubation, in addition to pain from the surgical site and irritation of the tracheal mucosa by the endotracheal tube.

Coughing is another very common problem encountered at extubation. The mechanism of cough is presumed to be irritant or stretch stimuli in the trachea caused by the endotracheal tube and its cuff. Coughing and the hemodynamic response at extubation can result in potentially dangerous patient movements, hypertension, tachycardia, or other arrhythmias, myocardial ischemia, surgical bleeding, bronchospasm and increase in intracranial pressure and intraocular pressure.

In patients coming for neurosurgical procedures, it is important to avoid factors such as coughing and hypertension at emergence, which are likely to cause raised intracranial pressure and intracranial bleeding. Any increase in intracranial pressure can adversely affect the postoperative outcome.

Awakening and extubation after anaesthesia are associated with hemodynamic arousal lasting 10 to 25 minutes, partially mediated by elevations in catecholamine levels and partially by nociceptive stimuli. Thus both anti-sympathetic (betablockers) and antinociceptive (narcotics, lignocaine) treatment strategies are appropriate to decrease extubation response.

Lignocaine has long been used to modulate the unwanted airway and circulatory reflexes seen in response to emergence and extubation. The administration of lignocaine has been through several routes such as intravenous (IV) injection, endotracheal cuff, or intratracheal (IT) instillation.

In this study we have compared the efficacy of lignocaine administered via the endotracheal tube to lignocaine administered intravenously , and to placebo, in suppressing the extubation response. As a smooth extubation at the end of surgery is vital for a good outcome in neurosurgery, we have done this study in patients undergoing craniotomies.

AIMS AND OBJECTIVES

1. To determine whether intratracheal instillation of lignocaine is effective in attenuating airway & circulatory response to extubation.

2. To determine if the effect of intratracheal route is by absorption from the mucosa or if it has any local mucosal anaesthetizing effect.

3. To determine if awakening from anaesthesia is delayed with the use of lignocaine and to compare the time taken for extubation between the groups where lignocaine is used.

LITERATURE REVIEW

Tracheal extubation at the end of general anaesthesia is often associated with varying degrees of problems. Problems during extubation can vary from mild cough to severe hemodynamic changes which can be catastrophic. Anesthesiologists are increasingly focussing their attention on complications associated with emergence from anesthesia and endotracheal extubation. (1) In fact, a recent study suggested a greater incidence of respiratory complications associated with endotracheal extubation than with endotracheal intubation.(2) Emergence from anaesthesia has respiratory, cardiovascular, metabolic, endocrine, and neurologic consequences. These include coughing, increase in intracranial and intraocular pressures, tachycardia, hypertension, myocardial ischemia, increased surgical bleeding, laryngospasm and bronchospasm. (3)

Common problems encountered at extubation are as follows.

1. Coughing at emergence.

The incidence of coughing at extubation may be as high as 96% as estimated by Gonzalez et al. (4) Coughing is a well recognised phenomenon associated with extubation in almost every patient undergoing general anaesthesia. Kim and Bishop (5) showed a 76.5% incidence of coughing during emergence, regardless of smoking history. Smooth emergence from general anaesthesia with minimal coughing is often considered a hallmark of an experienced anesthesiologist, and clinicians generally attempt to prevent patients from coughing at the end of a procedure. (5)

Asai et al did a prospective study in 1005 patients who underwent general anaesthesia, to assess respiratory complications during intubation and extubation. They proved that the most common respiratory complication during extubation was coughing,

followed by oxygen desaturation and airway obstruction (2).Coughing increases systolic and diastolic blood pressure significantly, as well as intraocular and intracranial pressures. Intraocular pressure can increase upto 30 to 40 mmHg during coughing, causing complications such as vitreous loss in cataract extraction procedures.(6)

A number of techniques have been used to diminish cough during emergence. Administration of intravenous (IV) opioids or intravenous lignocaine before emergence is useful due to the antitussive properties of these drugs, but leads to delayed emergence and can be unpredictable. (7,8,9) Deep extubation can be done but the incidence of other respiratory complications such as airway obstruction, laryngospasm and aspiration after tracheal extubation is greater when the trachea is extubated while the patient is still deeply anaesthetized.(2)

The respiratory tracts , contain many receptors located in the larynx, trachea, carina and bronchi. As patients emerge from general anesthesia, the stimulating effect of positive pressure ventilation on the mechanosensitive receptors of the trachea and larger bronchi may provoke coughing.(10) There are three main types of sensory receptors in the respiratory tract : rapidly acting chemoreceptors with small diameter myelinated fibres, slowly adapting stretch receptors with large diameter myelinated fibres, and polymodal endings of non myelinated nerve fibres. The mechanism of cough is presumed to be irritant or stretch stimuli in the trachea caused by the endotracheal tube (ETT) and the cuff .(11) Rapidly acting receptors are primarily superficial. They are thought to be the irritant receptors involved in the cough reflex .(12) The rapidly acting chemoreceptors and mechanoreceptors located around the circumference of the trachea and the main bronchi are concentrated in the more proximal airways and thus may play

an important role in the cardiovascular responses to mechanical stimulation of those parts of the airways. As most of these airway receptors are located just below the epithelium, it should be possible to block them by topical application or infiltration of local anaesthetics in the area stimulated.

Cough reflex can include bucking, expiration reflex or a true cough. Coughing and bucking are not only aesthetically unpleasant but also can be harmful.(13)

Bucking is a forceful protracted cough which physiologically mimics a valsalva manoeuvre. Unlike a Valsalva maneuver, bucking occurs at variable lung volumes, which are often less than vital capacity.(14) Bucking also results in a decrease in functional residual capacity. Bucking, especially in pediatric patients, can rapidly cause hypoxemia, not only due to the decrease in minute ventilation but also subsequent to the associated loss in lung volume and resultant atelectasis. The persistence of relative hypoxemia after bucking itself resolves illustrates the greater time and difficulty needed to reexpand the lung compared to the ease with which it collapses. (8)

Coughing is a physiological response to protect the airway from aspiration. But coughing at emergence can cause potentially dangerous hemodynamic changes like tachycardia, hypertension, and rise in intra ocular and intra cranial pressures.(7,15,16).It can cause abrupt increase in intracavitary pressures,leading to dehiscence of abdominal wounds. (14)

Coughing can increase intrathoracic pressures and lead to reduced venous return to the right atrium.(17) The sudden increases in intrathoracic pressure are transmitted to both arteries and veins and the transient increase in both cerebral arterial and venous pressure have the potential consequences of edema formation ,bleeding and emergence

from anaesthesia. Coughing decreases coronary perfusion pressure and coronary blood flow as a consequence. (16) Coughing and bucking probably indicate the ability to protect the airway, but the timing of awake extubation remains a matter of clinical judgement.(18)The avoidance of bucking during extubation is one of the hallmarks of a smooth extubation and is an important clinical skill and art.(8,15)

2. Hemodynamic response to extubation.

Emergence from anaesthesia is associated with hemodynamic arousal lasting 10 to 25 minutes, partially mediated by elevations in catecholamine levels and partially by nociceptive stimuli. Most patients are extubated in a light plane of anaesthesia and they manifest an increase in heart rate and blood pressure during extubation which persist into the recovery period. Dyson and colleages showed that in ASA grade 1& 2 patients when extubation was done on eye opening to command, there was a 20% rise in heart and blood pressure, in 70% patients. (19) Although the exact mechanism of these cardiovascular responses is unknown,it is believed to be associated with the release of catecholamines causing increases in heart rate, myocardial contractility and systemic vascular resistance.(20). Post extubation hemodynamic responses are brief and well tolerated by most patients.but they can cause significant clinical problems in susceptible patients, as in hypertensives, neurosurgical and ischemic heart disease patients.

These metabolic responses (increased oxygen consumption,catecholamine secretion) and cardiovascular responses(tachycardia and hypertension)may adversely affect the balance between the myocardial oxygen supply and demand, resulting in myocardial ischemia especially in patients with ischemic heart disease.(21) This can happen even after coronary artery bypass graft surgery.(22) Coriat et al. (17)

demonstrated that patients with coronary artery disease experience significant decreases in ejection fractions (from 55% ± 7% to 45% ± 7%) after extubation. The changes in ejection fraction occurred in the absence of electrocardiographic signs of myocardial ischemia. Wellwood et al.(22) reported that patients with a cardiac index of less than 3.0 L / min/ m-* did demonstrate an ischemic response to the stress of postoperative tracheal extubation after myocardial revascularization. These patients experienced decreases in myocardial lactate extraction, left ventricular compliance, and cardiac performance.

Hypertensive patients may exhibit an exaggerated hypertensive response to awakening and tracheal extubation compared with that seen in normotensive patients. Such hypertensive crises may result in cardiac decompensation, pulmonary oedema or cerebral hemorrhage.(20) Tracheal extubation after caesarean section in parturients with gestational hypertension can cause significant increases of 45 and 20 mm Hg in mean arterial and pulmonary artery pressures, respectively. It was concluded that tracheal extubation and related hemodynamic changes increased the risk of cerebral hemorrhage and pulmonary edema in those parturients.

Hence most practitioners of anaesthesia believe that a premium must be placed on “smooth” emergence, that is, one free of coughing ,straining and hypertension.(18)

3. Trauma to any structure in the upper or lower airway.

Trauma to the larynx and vocal cords is likely after a difficult extubation and it is recommended that laryngoscopy should be always performed immediately after extubation if attempts to remove the endotracheal tube have been forceful and repeated.

4. Airway obstruction.

This can occur at extubation due to laryngospasm, laryngeal edema, vocal cord paralysis or due to tracheal collapse. Laryngospasm is the commonest cause of upper airway obstruction after extubation .This is precipitated by local irritation of vocal cords by secretions or blood, when the plane of anaesthesia is insufficient to prevent larngospasm reflex, but too deep to allow a co-ordinated cough. Laryngeal edema can be supraglottic,retroarytenoid or subglottic edema.This is mostly symptomatic in children.(18)Vocal cord paralysis may occur due to damage to the vagus nerve or its branches after surgeries in the neck, prolonged intubation or even compression by the tracheal cuff.Tracheal collapse may result from prolonged tracheal compression by an enlarged goitre or a thoracic tumour. All these can contribute to hypoxemia and haemodynamic changes.

5. Pulmonary edema.

Pulmonary edema usually occurs within minutes of either development of acute upper airway obstruction or after relief of obstruction.The markedly negative intrathoracic pressure generated during an episode of acute upper airway obstruction is probably the dominant pathophysiological mechanism.(20)

6. Pulmonary aspiration of gastric contents.

This occurs in patients whose protective laryngeal reflexes are obtunded by residual effects of local or general anaesthetic agents.

7. Post operative sore throat.

Sore throat is a frequent complaint in the postoperative period following tracheal intubation, with an incidence of 59-76%. Mechanisms contributing to this include

pharyngeal, tracheal and laryngeal sources. Factors that affect its incidence include area of cuff-trachea contact, use of lignocaine ointment, size of endotracheal tube and the use of succinyl choline. Drying out of mucosal membranes in the trachea following anaesthesia by face mask also contributes to postoperative sore throat. (18)

8. Difficulty in extubation.

This is a dangerous complication but is not commonly encountered. Three basic mechanisms contribute to this dangerous complication: failure to deflate the tracheal tube cuff, an excessively large cuff impinging on the vocal cords, adhesion of the tube to the tracheal wall or because it is transfixed by a suture or wire to an adjacent structure. (20)

EXTUBATION IN NEUROSURGERY PATIENTS AFTER CRANIOTOMIES.

In patients undergoing neurosurgical procedures, it is important to avoid factors such as coughing, bucking and hypertension at the time of emergence which are likely to cause raised intracranial pressure, intracranial bleeding and worsen cerebral edema.

Craniotomy is commonly undertaken for primary and metastatic neoplasms of the brain and other intracranial space occupying lesions with or without raised intracranial pressure (ICP). Post operative outcome of these patients depends on the delicate balance between cerebral blood flow and ICP throughout the perioperative period. Patients with intracranial space occupying lesions after craniotomies will have an abnormal intracranial pressure volume relationship and may develop precipitous increase in intracranial pressure if cerebral venous pressure increases on coughing.(3)

Intracranial compliance is determined by measuring the change in ICP response to a change in the intracranial volume. Normally increases in volume are initially compensated. A point is eventually reached, however at which further increases produce precipitous rises in ICP.(23)Major compensatory mechanisms include

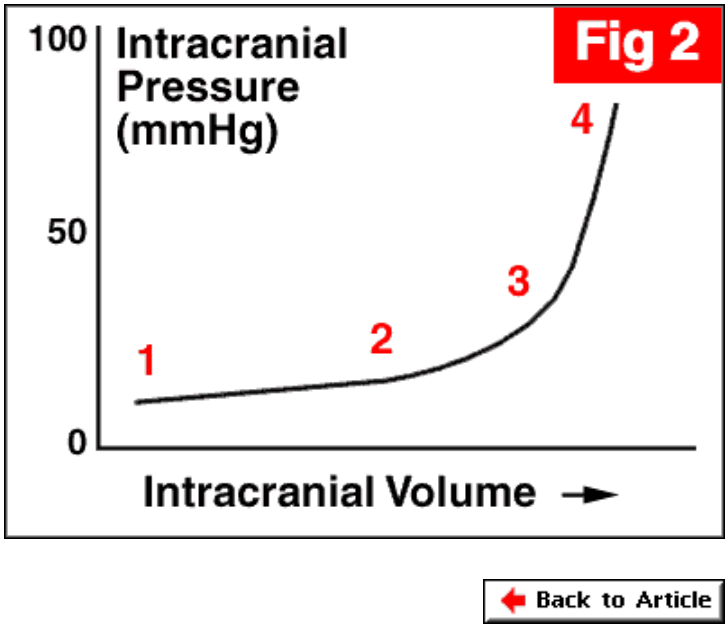
1. Initial displacement of CSF from the cranial to the spinal compartment.

2. Increase in CSF absorption

3. Decrease in CSF production

4. Decrease in total cerebral volume (primarily venous)

(23)As explained above, an increase of intracranial volume is compensated by displacement of C.S.F from the cranium. However, in patients with space occupying lesions, this mechanism maybe insufficient and the ICP may increase dramatically. This can occur even if the initial ICP is normal but the intracranial compliance is decreased. Under such conditions the mechanisms for compensation are already exhausted. Therefore sudden increase in ICP in the perioperative period must be strictly avoided.



1, 2 : compensation phase 3, 4: decompensation phase

Abrupt rise in ICP may result in herniation of the brain or impairment of cerebral perfusion, causing cerebral ischemia. (24)

Sustained increase in ICP may lead to the catastrophic herniation of the brain at one of the four sites.

1. Cingulate gyrus under the falx cerebri.
2. uncinate gyrus through tentorium cerebelli
3. cerebellar tonsils through foramen magnum.
4. beneath a defect in the skull-transcalvarial. (23)

Donegan and Bedford, White et al reported that intracranial pressure increased in comatose patients whose tracheas were suctioned. Both authors hypothesized that coughing after endotracheal suctioning increased ICP by increasing intrathoracic pressure, cerebral venous pressure and cerebral blood volume. (24) It raises intracranial pressure through a direct effect and via an indirect effect by increasing mean blood pressure.(25) Hence it is necessary that patients undergoing neurosurgical procedures should have a smooth extubation, i.e .emergence must be slow and controlled.

The two most important factors affecting the cerebral blood flow and ICP at extubation are the hemodynamic effects and the act of coughing which occur during emergence. Controlling these two parameters during extubation is mandatory to blunt any untoward increase in ICP or CBF which can adversely affect the postoperative outcome.

Constantini S et al proved that in the early post op period, after elective craniotomies, autoregulation is often impaired, with 20% patients developing raised ICP.(26) Gibson et al showed that 91% of patients undergoing craniotomy had high

blood pressure during emergence.(27) In such patients, autoregulation of cerebral blood flow is disturbed and a sudden increase in arterial pressure may lead to increase in both cerebral blood flow and intracranial pressure. Arterial hypertension is also associated with postoperative intracranial hemorrhage.(21)

Ideally, patients recovering from neurosurgery should emerge rapidly from anaesthesia to provide immediate assessment of the neurological outcome following surgery and to provide a baseline for continuing postoperative neurological follow up. (28) Hence,it is of utmost importance that recovery from neuroanesthesia should be smooth and progressive, with no major hemodynamic or metabolic disturbances. It should also be rapid to allow neurological assessment. These two conditions may not be compatible, in all cases.

In the past, a postoperative stabilization period was probably indicated because of perioperative hypothermia, cardiovascular disturbances due to blood loss or the use of controlled hypotension, or cerebral edema due to excessive brain retraction. (21)However, progress achieved in surgical and anesthetic techniques has diminished the indications of delayed awakening.(29)

Indications for late emergence. (28)

1. Obtunded consciousness or inadequate airway control preoperatively;

2. intraoperative catastrophe;

3. significant risk of brain edema, raised ICP, or deranged intracerebral hemo- or homeostasis postoperatively.

Early vs. delayed awakening: pros and cons

Early Awakening	**Delayed Awakening**
Pros	*Pros*
Allows earlier neurologic examination and reintervention	Less risk of hypoxemia and/or hypercarbia
Provides baseline neurological status for subsequent examinations	Better respiratory, hemodynamic control
Less postoperative hypertension, catecholamine burst	Easier to transfer to the ICU
Performed by anesthesiologist who knows patient	Stabilization in same state as during surgery
Surgery/recovery period separated, less costs	’Provides better late hemostasis
Cons	*Cons*
Increased risk of hypoxemia, hypercarbia	Less neurologic monitoring
Respiratory monitoring during transfer to ICU	Associated with more hypertension, catecholamine release bleeding

ICU, intensive care unit.

Risk factors for delayed awakening:

a) long (>6 hours) and extensive surgery (particularly with bleeding),
b) repeat surgery,

c) surgery involving or close to vital brain areas,

d) surgery associated with significant brain ischemia (e.g., long vascular clipping times, extensive retractor pressure).

In patients after craniotomies, extubation criteria must be strictly observed because central drive and airway protection are likely to be impaired after brain surgery, and both hypercapnia and hypoxia can cause additional brain damage. (28)

Aims of emergence after craniotomy are:

a. Maintain intra- or extracranial homeostasis (Mean arterial pressure-Cerebral perfusion pressure-Cerebral blood flow-Intracranial pressure, Cerebral metabolic rate of oxygen $CMRo_2$, Partial pressure of $CO_{2,}$ $_{O2}$, temperature).

b. Avoid factors leading to intracranial bleeding (e.g., coughing, intratracheal suctioning, ventilator fight, rise in blood pressure).

c. The patient should be calm, cooperative, and responsive to verbal commands soon after emergence to allow for neurological status monitoring.

Therefore it would be useful to assess the level of sedation at the time of extubation. Sedation has been assessed using various sedation scores including Modified Ramsay sedation score, Observer's Assessment of Alertness and Sedation Score, etc.

One of the sedation scores used by Berkenbosch ,Fitchter et al (29) used in paediatric intensive care unit which was found to correlate with BiSpectral Index was as follows.

1- Awake, alert, 2-occasionally drowsy, 3- frequently drowsy, 4-Somnolent .

It has been 30 years since John Bonica, the great anesthesia-based pain educator, expressed concern that pain was not well controlled because of the failure of physicians to apply available knowledge. That thought may hold more credence in the area of neurosurgery than in any other area of postoperative pain treatment. The shortcomings in this arena can be attributed to the common belief of clinicians that pain is minimal after intracranial procedures. Because of this controversial notion, many patients are undertreated in the immediate postoperative period.(30)

Other factors, including the need to monitor neurologic and cognitive functions closely, contribute to this problem. This monitoring can be affected adversely if the patient is sedated or obtunded with more potent opioids. This conflict of treatment goals can lead to withholding pain medication and techniques. It has also led to the use of less potent opioids for neurosurgical procedures.. The use of new rapidly acting intravenous agents has led to rapid wake-up and recovery and unfortunately to the increased importance of postoperative pain assessment. With the rapid breakdown of these agents, the patient has no opioid level present and may experience significant pain on awakening.(30)

. It is critical to realize that the treatment of pain in the neurosurgical patient may influence outcomes in a variety of ways. Studies have shown that pain in the postoperative period can adversely influence ICP. Proper pain control may stabilize hemodynamics and blood pressure as well as lower the ICP. Recovery from neurosurgical anesthesia is followed by elevations in body oxygen consumption and

serum catecholamine concentrations.(21) Systemic hypertension during emergence from neurosurgical procedures has been linked to intracranial hemorrhage. Raised blood pressure can cause cerebral hyperemia and increased ICP. Prevention or control of pain is one of the major factors in limiting these adverse systemic effects.

Over the past decade, developments in intravenous opioids, new regional techniques, and local anesthetics have greatly enhanced our abilities to treat this patient group. (30) Preemptive analgesia may lead to the improved stability of the patient throughout the surgical experience. To minimize pain and decrease the stress response and hemodynamic changes, the surgeon and the anesthesiologist must work as a team.(28)

Awakening and extubation after anaesthesia are associated with hemodynamic arousal lasting 10 to 25 minutes, partially mediated by elevations in catecholamine levels and partially by nociceptive stimuli. Thus both anti-sympathetic (betablockers) and antinociceptive (narcotics, lignocaine) treatment strategies are appropriate to decrease extubation response. (28) A technique that would allow patients emerging from anesthesia to tolerate an endotracheal tube, while also affording airway protection with intact supraglottic reflexes, would be desirable in selected groups ,such as patients with ischemic heart disease and raised ICP.(11)

Various stratergies have been employed to blunt the haemodynamic responses , such as tracheal extubation under deeper plane of anaesthesia, exchanging an endotracheal tube for a laryngeal mask prior to emergence, administration of various drugs like lignocaine, esmolol,propofol, labetolol,fentanyl, calcium channel

blockers,dexmedetomidine, nitroglycerin and sodium nitroprusside. Each method has its advantages and disadvantages.

1. Extubation in deep plane of anaesthesia: “Deep” extubation, or the removal of the ETT while the patient is in a deep plane of general anesthesia, has been used to reduce cough at extubation. However, this technique is undesirable in the patient with a difficult airway, gastroesophageal reflux disease, lesions with lower cranial nerve involvement or full stomach. Assessment of the neurologic status after extubation is not possible with this method.

2. Exchange of an endotracheal tube for a laryngeal mask is one of the manoevers tried for a smooth extubation. However, this procedure involves jeopardizing a secure airway, that too in patients who may have coexisting diseases. Hence there is a natural hesitancy to perform this manoever.(1)

3. Coriat et al. (17) reported that a continuous infusion of nitroglycerin (0.4 pg * kg-’ * min-‘1) significantly reversed or eliminated decreases in left ventricular ejection fraction that occurred in patients with mild angina 3 min after extubation.

Direct vasodilators like Sodium nitroprusside and glyceryl trinitrate dilate cerebral vessels, increasing CBF and cerebral blood volume. Due to these unfavourable effects on cerebral hemodynamics, these drugs are not used in blunting hemodynamic responses during extubation.(31)

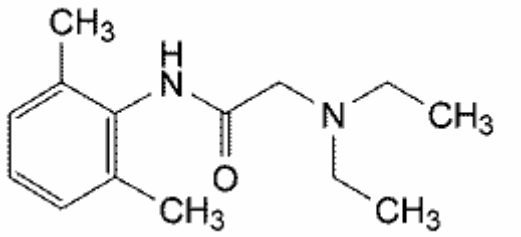
4. Beta blockers like labetolol are effective in preventing hypertension during intubation and emergence from anaesthesia,but has been shown to cause a high incidence of bradycardia in the post operative period.(32)

Esmolol has also been used to attenuate hemodynamic responses to tracheal extubation. Dyson et al.(19) recommended 1.5 mg/kg of IV esmolol as the best dose to control hemodynamic responses to tracheal extubation. Muzzi et al. (32) also found IV esmolol (500 pg/kg loading dose followed by a 50-300pg * kg-' * min-' infusion) and labetolol (0.25 to 2.5 mg/kg) equally effective in treating increases in blood pressure during emergence and recovery from anesthesia after intracranial surgery. Fuhrman et al. (33) compared the effects of esmolol and alfentanil on heart rate and SBP during emergence and extubation in a randomized double-blind investigation of 42 healthy patients having elective surgery. These studies demonstrate that esmolol can be used to control the hemodynamic response to tracheal extubation.

5. The alpha agonist dexmedetomidine, a sedative and analgesic has also been suggested to attenuate airway and circulatory reflexes during extubation when given in a single dose 0.5 micrograms/kg I.V .(34) However, hypotension and bradycardia are common with its use.
6. The use of lignocaine for attenuation of extubation has been widely practiced.

LIGNOCAINE

Structure



Lignocaine is a local anaesthetic with an amide linkage between the lipophilic benezene ring and hydrophilic tertiary amine.

Lidocaine alters depolarization in neurons by blocking the fast voltage gated sodium channels in the cell membrane. With sufficient blockade, the membrane of the presynaptic neuron will not depolarize and so fails to transmit an action potential, leading to its anesthetic effects.

It gets metabolized by microsomal enzymes in the liver. The elimination half life of lidocaine is approximately 1.5–2 hours in most patients. This may be prolonged in patients with hepatic impairment and in congestive heart failure .(35)

Lignocaine has long been used to modulate the unwanted airway and circulatory reflexes seen in response to emergence and extubation. The administration of lignocaine has been through several routes such as intravenous (IV) injection, endotracheal cuff, or intratracheal instillation.(13)

INTRAVENOUS LIGNOCAINE

In a study done in 1963 Steinhaus and Gaskin found that I.V lignocaine(1.1mg/kg) effectively suppressed cough.(36) Poulton and James also found that I.V lignocaine (1.5mg/kg) when compared to saline, produced significant decrease in the number of cough responses.(50).

Wallin et al. (54) evaluated the efficacy of a continuous IV lidocaine infusion in attenuating the hemodynamic response perioperatively. Significant blunting of increases in systolic blood pressure (SBP) and heart rate were observed in patients who received the lidocaine infusion 5 and 10 min after extubation.

I.V lignocaine has been shown to be effective in depressing the cough response and increase in heart rate and blood pressure therefore blocking the raise in ICP during intubation and extubation.(3).I.V lignocaine, when given before endotracheal intubation, prevents arterial hypertension and tachycardia in patients with brain tumors.These actions appear to be mediated through the depression of brain stem neuronal activity.(24)

I.V lignocaine decreases CMRO2 and increases cerebrovascular resistance.Thus, acute lowering of ICP after lignocaine probably reflects reduction in both cerebral blood flow and cerebral blood volume; in a manner similar to that produced by thiobarbiturates. (24) Pretreatment with I.V lignocaine prevents potentially harmful rise in ICP without causing major changes in cardiorespiratory function or neurologic findings. Since arterial pressure was not affected by lignocaine treatment whereas ICP was reduced, cerebral perfusion was improved. Cerebral perfusion pressure= Mean arterial pressure-ICP.

In addition, spontaneous ventilation and respiratory pattern will usually

be preserved after an IV bolus of lidocaine. (38)

However, intravenous lignocaine can prolong the emergence from anaesthesia.(13) Lidocaine inhibits neuronal transmission by its action in stabilizing the neuronal membrane. The central nervous system (CNS) manifestations of this may be excitatory and/or depressant, and the antitussive effect of IV lidocaine might be a result of this. However, at the doses required for this antitussive effect, there may also be other CNS effects.(39) In studies on dogs, Himes et al. were able to demonstrate a decrease of up to 28% in the minimum alveolar concentration of halothane with blood lidocaine levels between 3 and 10 µg/mL. Gonzales et al. (4) showed a significantly longer time to tracheal extubation in the group administered IV lidocaine compared with those administered topical lidocaine or placebo. This may also be attributable to a depressant effect of lidocaine on the CNS. The efficacy of IV lidocaine in suppressing cough appears to be short lived.

Yukioka et al.(40) administered IV lidocaine 1, 3, 5, 7, 10, and 15 minutes before endotracheal intubation and found that the incidence of cough increased gradually from zero percent at 1 minute to 53% at 15 minutes. The effect was consistent with a decrease in serum lidocaine concentrations measured at the respective times.When the effects of IV lidocaine administration on cough suppression were examined, it was found that complete cough suppression on tracheal intubation using IV lidocaine 2 mg/kg 1 minute before intubation required serum lidocaine levels >3 µg/mL.

Studies have shown conflicting conclusions on the efficacy of intravenous lignocaine, which could be partly effect of varying time of injection, i.e differences in the time interval between administration of lignocaine and intubation.(41) Nishino et al.(42), in

their study on IV lidocaine and airway reflexes in anesthetized patients, also reported that suppression of cough reflex occurred at plasma concentrations >3 µg/mL. These studies show that cough suppression using IV lidocaine requires a minimal serum concentration for effect. Bidwai et al reported that plasma lignocaine level between 2.3 to 3 micrograms was needed to suppress cough at extubation.(9)

Therefore, although Intravenous lignocaine has been used for many years to blunt the extubation response,it has different limitations which include :

1. Difficulty in attaining plasma levels to suppress cough completely.Plasma lignocaine levels of 2.3 to 3 micrograms/ml is needed to suppress cough.(40)
2. Short duration of action. It has a short duration of action, 5 to 20 minutes,as it is rapidly eliminated from the blood. This narrow antitussive window makes the optimal timing of administration during emergence very difficult.
3. Systemic sedation is produced, due to which there is delay in emergence..

Due to these limiting factors, the simultaneous goal of cough suppression and full awakening are not achieved with I.V. lignocaine.

ENDOTRACHEAL CUFF LIGNOCAINE

Endotracheal tubes are constructed from polyvinyl chloride .The thin polyvinyl chloride membrane, which constitutes the tube cuff, allows simple diffusion of lidocaine across it and thus cause anaesthesia of the trachea. Fagan et al compared 4% lignocaine with saline and air in the endotracheal cuff in 63 patients undergoing surgery. It was found the incidence of coughing was decreased in the lignocaine group. (11)It was suggested that the cuff could act as a

potential reservoir for a local anaesthetic, allowing diffusion and subsequent anaesthesia of the underlying mucosa. However, a similar study done by T. Venkatesan and G. Korula in 82 neurosurgical patients which compared 4% lignocaine in the cuff with 1.5 mg/kg I.V lignocaine, showed no significant difference in coughing at extubation, in the two groups.(3)The administration of 4% or 10% lignocaine through the ETT cuff may be dangerous should the cuff rupture as a consequence of damage.(13).

ENDOTRACHEAL SPRAYING WITH LIGNOCAINE

Local anaesthetics are rapidly absorbed into the circulation following topical administration to mucous membranes or denuded skin. Absorption is particularly rapid when local anaesthetics are applied to the tracheobronchial tree. Concentrations in the blood after instillation of local anaesthetics into the airway are nearly the same as those following I.V injection.

Peak anaesthetic effect following topical application of lidocaine occurs in 2-5 min and anaesthesia lasts for 30-45 min. Peak plasma concentrations of local anaesthetics depend on the amount injected,the physical charactersistics of the local anaesthetic,whether epinephrine is used,the rate of blood flow to the site of injection, and the surface area exposed to the anaesthetic.[35]

Administration of lignocaine to the airways leads to variable plasma concentrations, depending on mode of delivery and dose.(43)These levels may reflect slow absorption from the respiratory mucosa. Lidocaine, as a weak basic and lipophilic drug, binds avidly to the respiratory mucosa. The absorption characteristics of the

mucosa, epithelial thickness, number of membrane pores, and tissue pH also serve to delay absorption. This intrapulmonary "depot effect" may contribute to the longer than expected effect of lidocaine.(39) Both IV and topical administration of lidocaine before tracheal extubation have been shown to prevent coughing on emergence from general anesthesia (44). As with intravenous administration, the precise mechanism for topical effect is unclear. It may be that the primary sites of action for the two methods of administration are different, i.e., that topical administration is peripherally mediated and IV administration is centrally mediated.

Daelim Jee et al used the administration of 1mg/kg of 2% lignocaine sprayed down the endotracheal tube to attenuate cough reflex.. This study was done on 3 groups of patients, 25 in each group. Group 1 was the control group, group 2 received 1mg/kg of 2% lignocaine intratracheally by injection from a syringe into the endotracheal tube, group 3 received the same dose of 2% lignocaine IV before extubation. The results showed that lignocaine sprayed down the endotracheal tube suppressed the unwanted airway and circulatory reflexes whereas using the same dose IV lignocaine does not.(13) They argued that this dose would not lead to peak plasma concentrations sufficient to suppress the reflexes. Plasma concentrations of lidocaine required to suppress the cough reflex under general anaesthesia and during emergence are reported to be between 2.3 and 3 microgram/ml.[9] Hence they attributed the reflex suppression of endotracheal lignocaine to the mucosa –anaesthetizing effect.(13)

The study done by White et al showed that intratracheal lidocaine was more effective in attenuating the increase in ICP than other modalities like IV opioids,Thiopentone, I.V lignocaine during endotracheal suctioning.(25).

A modified endotracheal tube (ETT), the Laryngotracheal Instillation of Topical Anesthesia (LITA™) tube (Sheridan Catheter Corp, Argyle, NY), has been developed to diminish coughing during emergence from general anesthesia. This modified ETT contains an additional small-bore channel incorporated within the concave surface of the tube. Ten small holes at the distal 13 cm of the tube allow the injected medication to be sprayed both above and below the cuff onto the pharyngeal, laryngeal,and upper tracheal mucosa circumferentially.(45)

Gonzalez et al(11)compared topical and IV administration of lidocaine 100 mg before tracheal extubation using a LITA tube™ (Sheridan Catheter Corp., Argyle, NY), to spray the mucosa both proximal to and distal to the inflated cuff before tracheal extubation and found that laryngotracheal spraying was associated with a significantly reduced incidence of coughing compared to placebo or IV administration. The study showed complete cough suppression in 36% of patients given topical lidocaine via the LITA™ tube as compared to 4% in control group; as well as a 50% decrease in the number of coughs per patient given topical anesthesia compared to control. The difference in efficacy may be the result of different sites of action.

A few reports, most in the Chinese literature, have claimed cough suppression by application of laryngotracheal lidocaine through the LITA™ tube in 60% to 100% patients.(45)However, one of the problems of this method was the fact that the tracheal mucosa in direct contact with the tube cuff was effectively shielded from exposure to the administered lignocaine.(11)Another problem was that lignocaine administration using LITA tube blocked supraglottic reflexes, leading to the risk of aspiration in addition to the increased cost.(13) Diachun et al.(44) used a LITA to administer 2 mg/kg of 4%

lidocaine before tracheal extubation and also showed cough suppression on emergence. The maximum serum lidocaine level generated by topical lidocaine in the study by Diachun was 1.62 micro_gm/mL (mean level 0.43 _microgm/mL), well below the 3 _microgm/mL level required for IV lidocaine to prevent cough. Seventy-five percent of the lidocaine-treated patients were fully awake and following multiple commands without cough. A local effect on the laryngotrachea by spraying the mucosa would not be dependent on serum concentrations nor would they reflect efficacy. After endotracheal administration of lidocaine Diachun et al were able to show efficacy for up to 2 hours. This may be attributable in part to absorption characteristics after endotracheal administration.

Bidwai et al showed that tracheal administration of 60 mg of lignocaine 3-5 minutes prior to extubation and 40 mg of lignocaine at extubation prevented increase in heart rate and blood pressure during and after tracheal extubation. (7) They suggested that as lignocaine blood levels quickly diminish following intravenous or intratracheal administration and topical local anaesthesia of the upper airway only lasts for 20-30 minutes, it is important that the time of lignocaine injection be reasonably close to the time of extubation.

Yoshihiro et al showed that the cardiovascular responses in response to tactile airway stimulation were completely blocked by topical application of lidocaine and partially blocked by intravenous lidocaine. As lidocaine topically applied to the airways was rapidly absorbed from the airways to increase serum concentration levels ,it was suggested that the action of lidocaine was partly due to its systemic effect and mainly due to direct blockade of the mechanoreceptors of the airways.(46)

Prior studies have shown that peak serum lidocaine levels, after topical administration, occur mainly 10 to 30 minutes after application.(47) However, Lin et al. and Wu et al. have obtained 77 to 100% cough suppression using topical lidocaine administered via the LITA™ tube 15 to 60 minutes before extubation.(45)

Prengel et al.(49) measured lidocaine levels after endotracheal and endobronchial administration. After endotracheal administration of lidocaine 2 mg/kg, they observed a biphasic pattern with a peak in blood concentrations occurring immediately after administration and a second peak between 5 and 34 minutes later. Most of the absorption occurred in the second delayed absorption phase, resulting in mean plasma levels of 1.4 µg/mL after 20 minutes.

Yoshihiro et al showed that the cardiovascular responses in response to tactile airway stimulation were completely blocked by topical application of lidocaine and partially blocked by intravenous lidocaine. As lidocaine topically applied to the airways was rapidly absorbed from the airways to increase serum concentration levels,it was probable that the action of lidocaine was partly due to its systemic effect and mainly due to direct blockade of the mechanoreceptors of the airways.(46)

A study done by Groeben and Silvanus showed that the peak plasma concentration of lignocaine following lignocaine inhalation was significantly lower than that following IV administration. Despite this difference, both led to the same attenuation of bronchial hyperactivity in the study.(43)

Not all studies have shown favourable results with the use of endotracheal lignocaine for attenuating extubation response.

A study was done on 40 patients undergoing supratentorial craniotomy by Andrzejowski and Francis to ascertain whether anaesthetizing the larynx with lignocaine would attenuate the extubation response. Lignocaine was instilled via the LITA tube in 20 patients, and saline was given in the other 20 patients.There were no statistically significant differences in hemodynamics or coughing scores between the 2 groups.The authors suggested that this was probably because all the patients in the study were betablocked – premedicated with 1mg/kg propanolol; so that would have attenuated the hemodynamic response.(50)

Kautto et al studied 48 patients scheduled for surgery ; divided them into 3 groups: a control group, a group receiving lignocaine aerosol, and one group receiving viscous lignocaine prior to induction of anaesthesia.Topical anesthesia was shown to attenuate pressor response to intubation but had no effect on the heart rate.(51)

Soltani and Aghadavoudi studied the effect of different lignocaine application methods on postoperative cough. 204 patients were divided into 6 groups. In the first group,10% lignocaine was sprayed (30mg lignocaine) on the distal end of the endotracheal tube and cuff, before intubation. In the 2nd group, the same dose of 10% lignocaine was sprayed on the laryngopharyngeal structures near the inlet of the larynx through a nozzle connected to the spray device during laryngoscopy. In the 3rd group the distal end of the endotracheal tubes and their cuffs were lubricated with 2% lignocaine jelly (containing 50 mg of lignocaine). For the 4th group, 1.5 mg/kg was administered

intravenously at the end of surgery. The 5th group got their endotracheal cuffs prefilled with 8 ml of 2% lignocaine for 90 minutes before intubation. In the 6th group, the distal end of endotracheal tubes and their cuffs were lubricated with normal saline. This study showed that the most efficient techniques to reduce postoperative cough were intracuff lignocaine and intravenous lignocaine. Topical tracheal lignocaine was not recommended as it was not as efficient as the previous methods ,required a special administering device, and measuring the exact dose of lignocaine administered was difficult.(6)

Jacobsen et al compared intravenous(1.5 mg/kg) with laryngotracheal(3mg/kg) lignocaine in patients undergoing bronchoscopy under general anaesthesia and found that IV lignocaine was much more effective in suppressing cough at extubation.However, the plasma levels exceeded the level for toxicity in 5 out of 11 patients in the IV group.(52)

MATERIAL AND METHODS OF STUDY

After obtaining approval from the institutional ethics committee, this study was carried out on 114 neurosurgical patients undergoing craniotomies.

Inclusion criteria:

1. Patients undergoing elective craniotomies in the supine and lateral position with GCS 15/15.
2. Age 18 -65 years inclusive
3. ASA (American Society of Anaesthesiologist) class 1 & 2

Exclusion criteria:

Patients with

1. Sore throat or active URI
2. History of laryngeal or tracheal pathology/surgery.
3. History of asthma or COPD
4. Requirement for postoperative ventilation

Study Design: Prospective Randomized Double Blinded Clinical Trial.

Location: The study was carried out in the Department of Anaesthesia in Christian Medical College and Hospital, Vellore.

Sample size determination:

The sample size was based on the study done by Daelim Jee and SoYoung Park [1] where 3 groups of patients were assessed similarly. The means and standard deviation of number of coughs in the three groups were 10.2 +/-6.0, 4.5 +/-3.7, 7.8+/-4.6. With an alpha error of 5% and power of 80%, the sample size for each group was calculated to be

38. Therefore the total sample size would be 114. Sample size was determined, assuming that the anticipated analysis will be done using analysis of variance (ANOVA).

Patient allocation :

The patients were randomly allocated into one of the 3 groups by block randomization using computer assignment. The study drug was allocated to patients by the pharmacy according to the block randomization done and the nature of the drug was concealed by the pharmacy.

Patients in group 1 received intratracheal lignocaine and intravenous placebo.

Patients in group 2 received intravenous lignocaine and intratracheal placebo.

Patients in group 3 received intravenous and intratracheal placebo (control group).

Methodology

The patients were visited on the evening before the surgery, the study was explained and written informed consent was obtained. Patients were premedicated with Valium 0.15 mg/kg. On the day of surgery, brachial central line and radial arterial line were started in the operating room and monitoring established with E.C.G, intraarterial blood pressure, pulse oximetry, temperature monitor, agent analyzer and neuromuscular monitor.

The patients were induced using Propofol 2mg/kg, Fentanyl 1-2 microgram/kg, along with oxygen/air/isoflurane, and paralyzed using vecuronium 0.15mg/kg. Fentanyl was given upto 5 micrograms/kg intra operatively, the last dose given at or before dural closure. Infiltration was done at the site of skin incision with saline and adrenaline at 5 micrograms/ml. At the time of pin insertion propofol was given to attenuate the response. Vecuronium infusion was started before skin incision, titrated to 2 twitches on the

neuromuscular monitor, and stopped at the start of skin sutures. Paracetamol was given intravenously at a dose of 20mg/kg diluted in saline, early in the course of surgery.

All patients were warmed using a forced-air warming blanket to obtain a central body temperature> 36 degrees at the end of surgery.

Isoflurane was maintained at an end tidal concentration of 1.2 (1 MAC). At dural closure, sevoflurane was started and maintained at end tidal concentration of 2,and discontinued at the time of removal of pins at the end of surgery. After stopping isoflurane, gas flows were increased to 4 litres /minute. After stopping sevoflurane, gas flows were increased to 10 litres per minute. The study drug was given at the time of wound dressing both intratracheally and intravenously at a dose of 1mg/kg.

Neostigmine (0.05mg/kg) and glycopyrrolate (0.02mg/kg) were given for reversal after the removal of pins and Train of four and Double Burst Stimulation checked on the neuromuscular monitor. Pharyngeal suctioning and extubation were done on eye opening to command or when purposeful movements were observed. During this time the patient was not disturbed, other than a repeated verbal request (“open your eyes”).All other stimulation were avoided at emergence.

The tolerance to endotracheal tube at this time was noted and smoothness of extubation graded as follows.

Grade 1: No cough or coughing only during removal of endotracheal tube.

Grade 2: Coughing while breathing regularly.

Grade3: Coughing while not breathing regularly

The number of coughs were also noted.

Coughing and hemodynamic parameters at the time of extubation and the total time taken for extubation were noted in all cases, starting from the time sevoflurane is discontinued. For a period of 5 minutes after extubation, blood pressure and heart rate readings were recorded.

The level of sedation of the patient was noted, immediately after extubation and 10 minutes later. The following sedation score was used.

0 – Patient awake.

1 – Mild (occasionally drowsy)

2 – Moderate (frequently drowsy)

3 –Severe (difficult to arouse)

Blood samples were taken to check the plasma levels of lignocaine, 10 minutes after administration, and at the time of extubation. Blood was centrifuged and the separated plasma stored at -80 degrees, following which plasma levels of lignocaine were assessed using HPLC assay.

Statistical Analyses

All statistical analyses were performed using SPSS (Statistical Package for Social Sciences) for Windows 11.0. The data was presented using descriptive statistics such as mean and standard deviation for continuous variables and frequency and percentage for categorical variables. Association between categorical variables were assessed using chi-square tests with Yates continuity correction. Comparison of continuous outcomes among groups was performed by Analyses of Variance (ANOVA). Continuous outcomes that are not normally distributed or ordered observations are analyzed using Kruskal-Wallis test. A p-value < 0.05 was considered statistically significant.

RESULTS AND ANALYSIS

A total of 114 patients were included in this study. There were 38 patients in each group.

Group A patients received intravenous lignocaine and endotracheal placebo.

Group B patients received intravenous placebo and endotracheal placebo.

Group C patients received intravenous placebo and endotracheal lignocaine.

DEMOGRAPHIC DATA AND INTRA OPERATIVE VARIABLES

The following tables show a comparison of the distribution of patients in the 3 groups according to age, weight, gender.

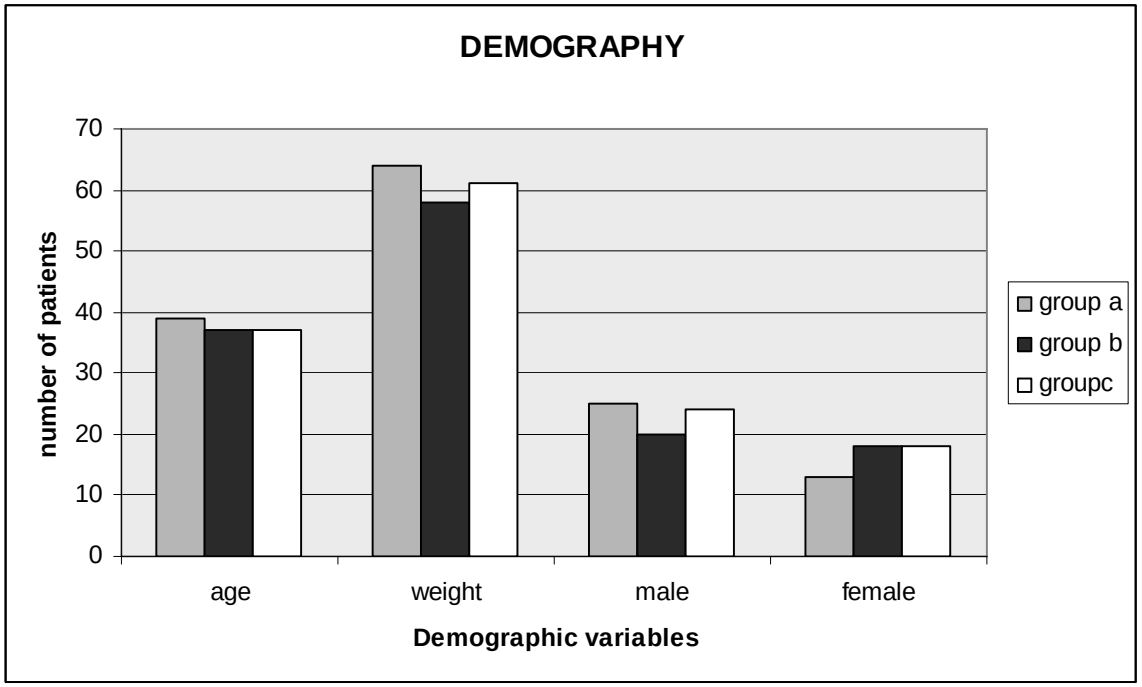
Table 1 : Comparison of the demographic profile between the 3 groups.

PARAMETER	Lignocaine IV	Placebo	Lignocaine IT	P value
AGE (YEARS)	39±12	36±12	37±13	0.656
WEIGHT (KG)	64±12	58±10	61±14	0.104
MALE	25	20	24	0.42
FEMALE	13	18	13	

Patients with a minimum age of 18 years were chosen for this study. The oldest patient in this study was 65 years old. The mean age of patients in group A was 39±12

years, group B was 36±12 years, group C was 37±13 years. There was no significant difference between the 3 groups with respect to age (p value of 0.656).

The mean weight of patients in the groups were 64±12 kg in the 1st group, 58±10 in the 2nd group, 61±14 in the 3rd group. There was no significant difference with p value of 0.104 .The 3 groups were comparable with respect to gender also with a p value of 0.42.



The mean time intervals between the last dose of narcotic (fentanyl) and reversal, as well as the time intervals between the stopping of muscle relaxant

(vecuronium) and reversal were comparable in all 3 groups. The mean duration of surgery was also more or less similar in all groups as shown in table 2.

Table 2: Comparison of mean time intervals between last dose of narcotic, muscle relaxant and reversal & duration of surgery.

PARAMETER (Mean time interval in minutes)	IV Lignocaine	Placebo	Intrathecal Lignocaine	P value
Last dose of narcotic to reversal	64±41	69±37	75±37	0.53
Stopping of vecu - ronium infusion to reversal	18±7	19±10	19±12	0.56
Mean duration of surgery	211±67	216±77	239±77	0.22

Table 3: Comparison between mean time intervals between last dose of each anaesthetic drug and extubation

Mean time intervals (in minutes)	IV Lignocaine	Placebo	IT Lignocaine	P value
Last dose of fentanyl to extubation	80±46	84±37	91±47	0.513

Stopping of vecuronium Infusion to extubation	33±11	35±11	35±13	0.59
Discontinuation of Isoflurane to extubation	67±29	66±14	69±13	0.79
Administration of study drug to extubation	20±9	22±6	21±7	0.69

The time intervals from various events as last dose of fentanyl, stopping of isoflurane, stopping of vecuronium infusion, and administration of the study drug to extubation were comparable in all 3 groups.

GRADE OF COUGHING AT EMERGENCE

Grade 1: No cough or coughing only during removal of endotracheal tube.

Grade 2: Coughing while breathing regularly.

Grade 3: Coughing while not breathing regularly

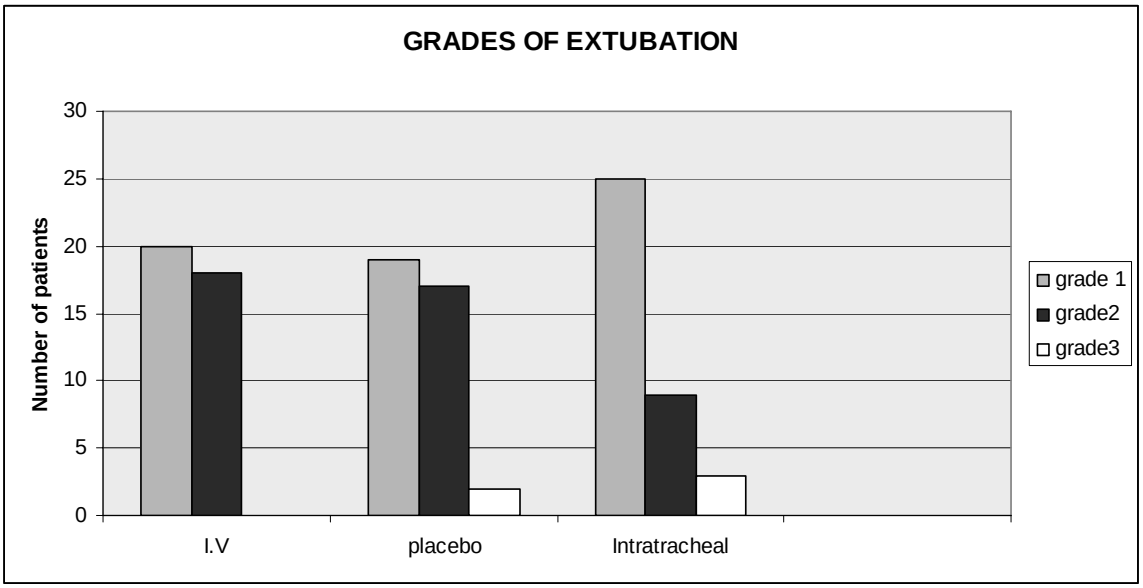
All patients in the IV group had only either grade 1 or 2 cough. Patients in the other groups had grade 3 cough as well.

Even though most patients had only grade 1 cough in the intratracheal group, this difference was found to be not statistically significant (p value of 0.13).

Table 4 : Comparison between grading of extubation between the three groups

GRADE OF COUGH	IV LIGNOCAINE	PLACEBO	IT LIGNOCAINE	P value
GRADE l	20	19	25	
GRADE 2	18	17	9	0.13
GRADE 3	0	2	3	

GRADES OF EXTUBATION IN THE 3 GROUPS



There was no statistically significant difference in the number of coughs at extubation,in the 3 groups.(Chi square value of 2.36).

Table 5: No of coughs in the 3 groups

PARAMETER	LIGNOCAINE IV	PLACEBO	LIGNOCAINE IT	P VALUE
MEAN NO: OF COUGHS	4.7±4.3	4.3±3.3	3.49±3.3	2.36

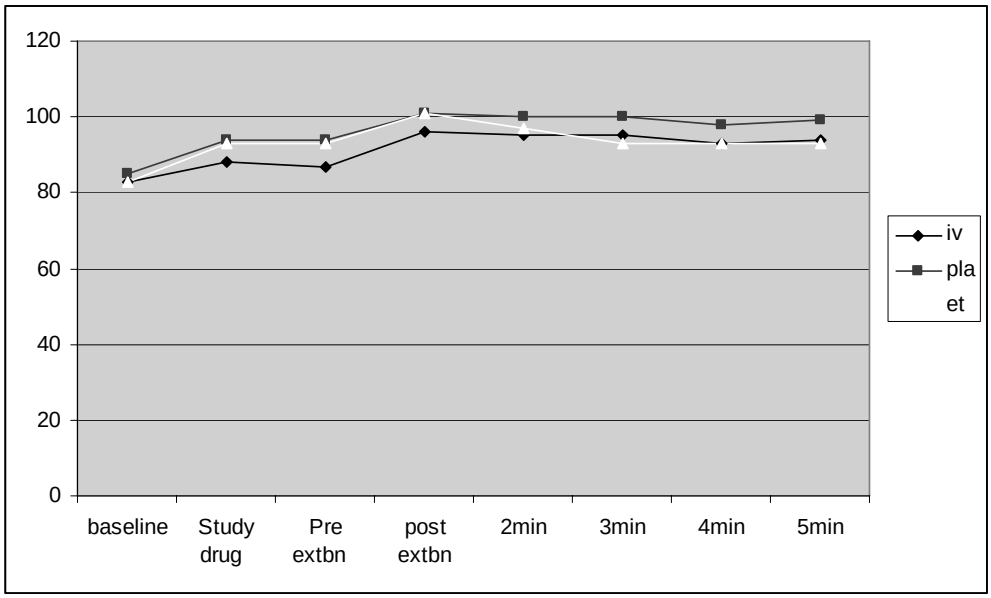
HEMODYNAMIC PARAMETERS.

Table 6: Heart rate measured over a period of 5 mins after extubation compared with baseline and pre-extubation values

GROUP	Baseline	At Study drug	Pre extbn	Post extubation 1 min	2 min	3 min	4 min	5 min
IV	83±10	88±20	87±20	96±20	95±21	95±21	93±19	94±20
PLACEBO	85±10	94±13	94±14	101±14	100±13	100±15	98±15	99±14
IT	83±11	93±15	93±15	101±17	97±18	93±17	93±18	93±19
P value	0.47	0.27	0.20	0.32	0.45	0.24	0.31	0.33

The baseline heart rate was comparable in 3 groups. The arithmetic mean of baseline heart rate IV group was 83±10 ,for placebo 85±10, for ET group 83±11. There were no significant differences in the mean heart rate measured at various time points before and after extubation.

HEART RATE MEASURED OVER A PERIOD OF 5 MINUTES AFTER EXTUBATION COMPARED WITH BASELINE AND PRE EXTUBATION VALUES

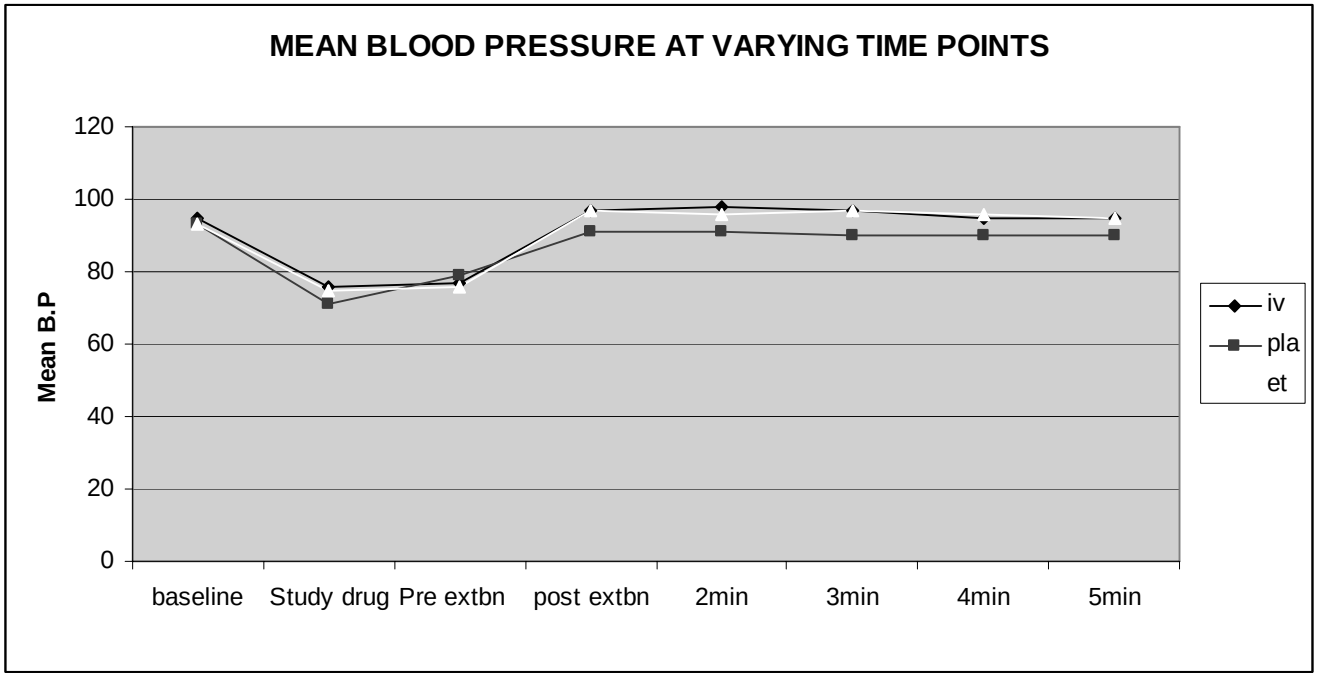


There were no significant differences in the mean blood pressure between the 3 groups.The use of lignocaine either intravenously or intratracheally did not significantly attenuate the cardiovascular responses to extubation. Table 7 shows the mean blood

pressure measured over a period of 5 minutes after extubation compared with baseline and pre-extubation values.

Table 7: Mean blood pressure measured over a period of 5 mins after extubation compared with baseline and pre-extubation values

Group	Baseline	Study drug	Pre extubation	Post extubation 1 min	Post extubation 2 min	Post extubation 3 min	Post extubation 4 min	Post extubation 5 min
IV	95±9	76±12	78±10	97±14	98±15	97±15	95±15	95±15
Placebo	93±10	71±12	79±11	91±16	91±16	90±12	90±13	90±13
IT	93±10	75±12	76±12	97±15	96±15	97±15	96±14	95±14
P Value	0.39	0.23	0.72	0.21	0.12	0.07	0.18	0.17



TOTAL TIME TAKEN FOR EXTUBATION

The total time taken for extubation,i.e the time from discontinuation of sevoflurane to the removal of the endotracheal tube was as follows:

Table 8: Total time taken for extubation

PARAMETER	I.V LIGNOCAINE	PLACEBO	I.T LIGNOCAINE	p value
Time in minutes	17±8.5	18±5.6	17.9±7.7	0.843

There was no significant difference in the total time taken for extubation in the 3 groups. The administration of lignocaine intravenously or endotracheally did not delay awakening in these groups.

SEDATION SCORE

The level of sedation of the patient was noted, immediately after extubation and 10 minutes later. The following sedation score was used.

1 – Patient awake.

2 – Mild (occasionally drowsy)

3 – Moderate (frequently drowsy)

4 –Severe (difficult to arouse)

The sedation scores immediately after extubation and 10 minutes later were not significantly different between groups.This suggests that there is no increase in sedation with the use of lignocaine, either intravenously or intratracheally, as compared to placebo.

Table 9 : Sedation score immediately after extubation.

SEDATION SCORE	I.V LIGNOCAINE	PLACEBO	I.T LIGNOCAINE	p value
1(awake)	3	4	6	0.65
2(mild)	10	8	4	
3 (moderate)	15	4	17	
4(severe)	10	8	10	

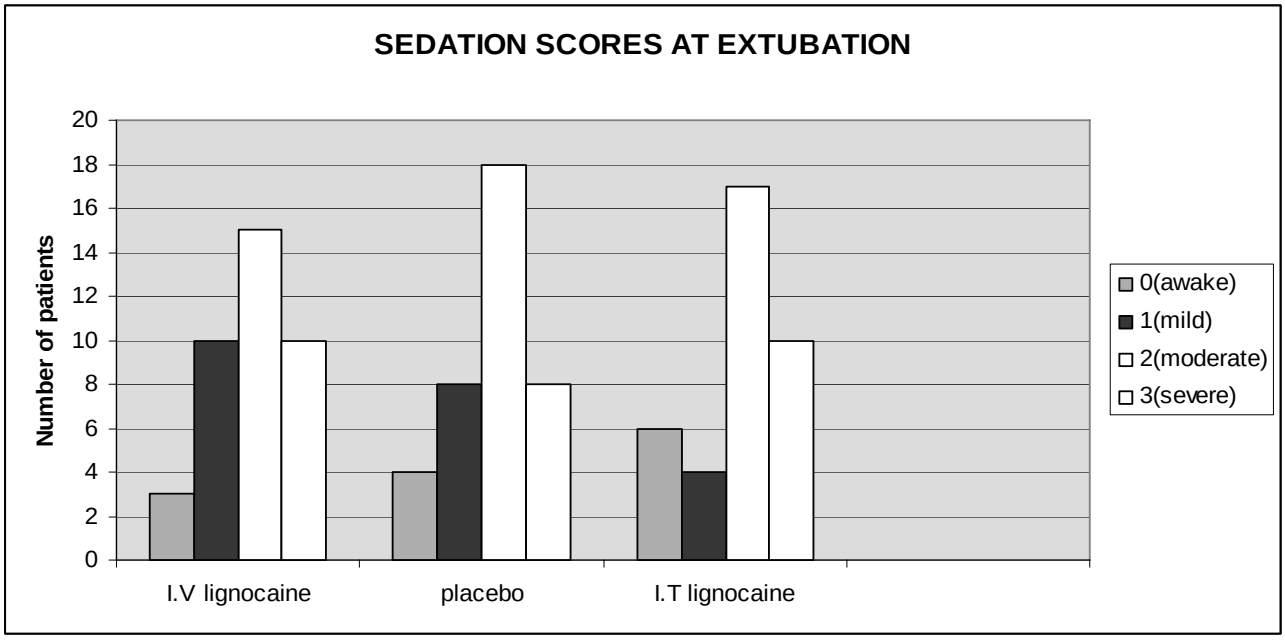


Table 9 : Sedation score 10 minutes after extubation.

SEDATION SCORE	I.V LIGNOCAINE	PLACEBO	I.T LIGNOCAINE	p value
1(awake)	10	10	9	
2(mild)	15	13	14	
3 (moderate)	11	12	10	0.98
4(severe)	2	3	4	

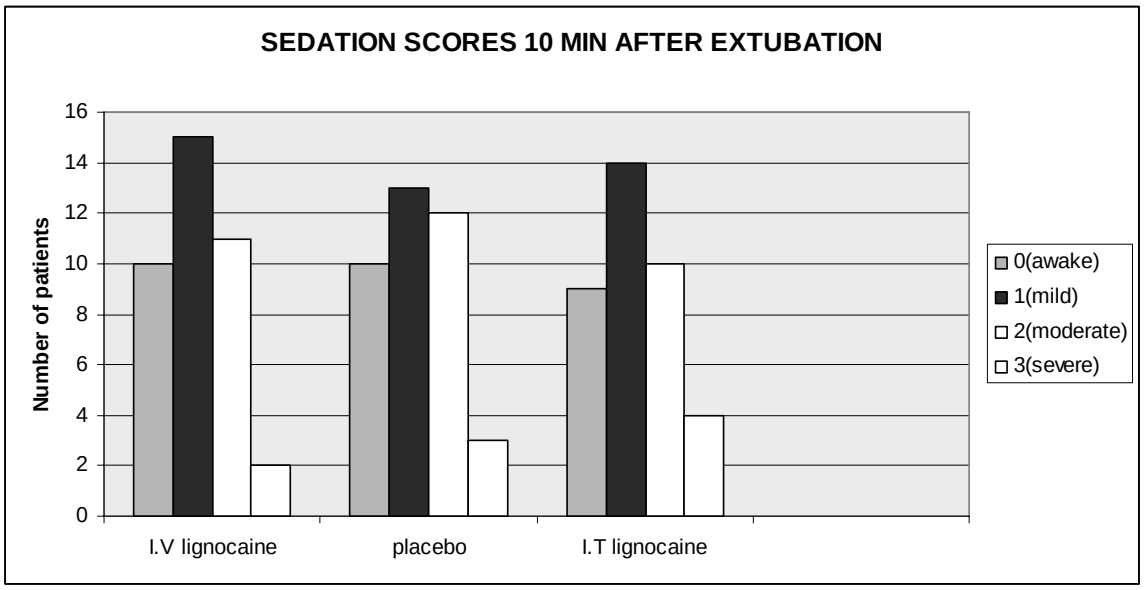
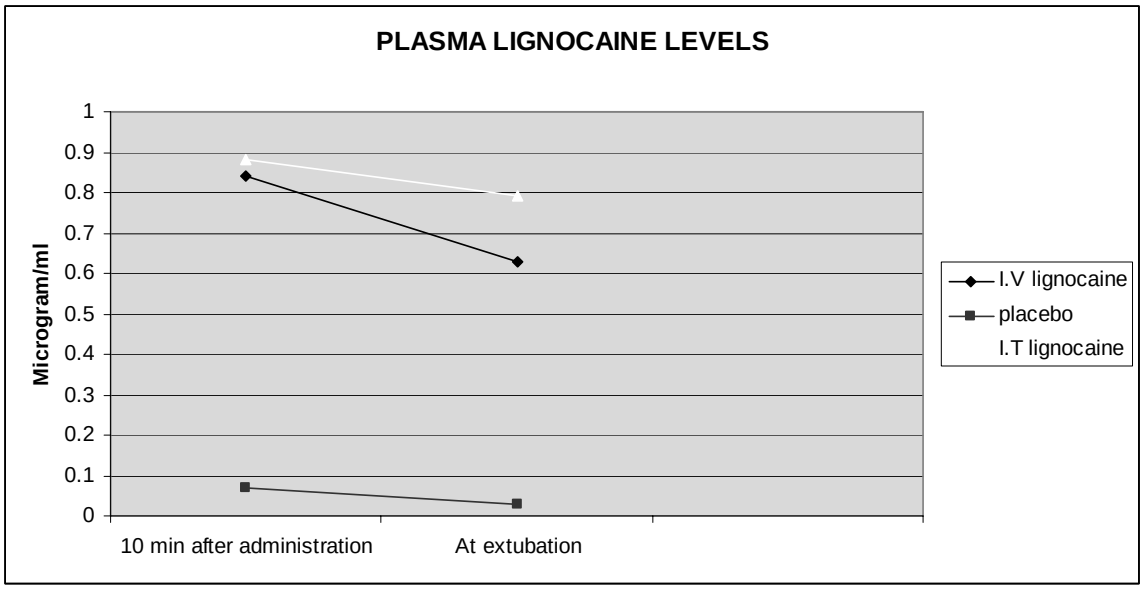


Table 10: Mean Plasma levels of Lignocaine in mcg/ml

Mean Plasma levels (mcg/ml)	Lignocaine I.V	Placebo	Lignocaine IT	P value
AT 10 MIN	0.84+/-0.8	0.07+/-0.3	0.88+/-0.8	<0.001
AT EXTUBATION	0.63+/-0.7	0.03+/-0.3	0.79+/-0.6	< 0.001



The plasma levels of lignocaine were similar in groups given intravenous and intratracheal lignocaine.The mean plasma levels were 0.84 micrograms/ml and 0.63 micrograms/ml for I.V and 0.88 mcg/ml and 0.79mcg/ml for intratracheal, respectively at 10 min after the study drug and at extubation.

Table 11: Maximum Plasma levels of Lignocaine in mcg/ml

Maximum Plasma levels (mcg/ml)	Lignocaine I.V	Lignocaine IT	P value
AT 10 MIN	4.82	4.69	<0.001
AT EXTUBATION	4.25	2.74	< 0.001

The maximum values in the I.V group were 4.82 mcg/ml and 4.25 mcg/ml, and in the intratracheal group were 4.69 mcg/ml, and 2.74 mcg/ml respectively. Very few patients had plasma levels of lignocaine sufficient to attenuate the extubation response - only 3 patients had plasma lignocaine levels greater than 2.3micrograms/ml 10 minutes after the study drug was given, of which two were given I.V lignocaine and one was given intratracheal lignocaine. At the time of extubation, only 2 patients from the intratracheal group and 1 patient from the I.V group had plasma levels higher than 2.3 micrograms/ml.

DISCUSSION

Smooth extubation and suppression of emergence response are extremely important in neurosurgical patients. This randomised double blind study was done to find out if administering lignocaine in a dose of 1 mg/kg through the endotracheal tube would decrease emergence response and if this would have any advantage over the intravenous route in patients undergoing craniotomies.

All patients were comparable with regard to age, body weight and gender. All patients in the study were anaesthetized with a uniform anaesthetic protocol. We maintained anaesthesia with fentanyl, vecuronium infusion, and isoflurane at a concentration of 1 MAC. We chose 1 MAC isoflurane for maintenance in order to prevent awareness especially as nitrous oxide was avoided in the anaesthetic protocol. Using isoflurane with semiclosed system and low flows till pin removal could cause delay in patient awakening and could be a confounding factor in assessing sedation caused by lignocaine. Therefore during dural closure, we discontinued isoflurane and switched over to 1 MAC sevoflurane. Sevoflurane was continued till the end of surgery i.e. till the pins were removed in all patients and so a uniform end point of discontinuation of volatile agent was maintained for all.

We used an infusion of vecuronium with neuromuscular monitoring and aimed at 2 twitches on Train of four stimulation for uniform maintenance of neuromuscular blockade in all patients. The vecuronium infusion was stopped at the start of skin closure and neuromuscular blockade reversed at pin removal. There was no fade obtained with Train of four stimulation or Double Burst Stimulation in any patient before extubation.

We looked at the time intervals between various events during anaesthesia, such as interval between last dose of fentanyl and reversal, stopping of vecuronium infusion and reversal, as well as time from stopping of isoflurane to extubation, etc. The time intervals in all 3 groups were almost identical. This was possible as we followed a standardized anaesthetic protocol in all patients.

Our main objectives of this study were to find out

1. If lignocaine at dose of 1mg/kggiven intratracheally has any suppressive effect on extubation response
2. To try to ascertain the mechanism of action of tracheal instillation (local mucosal anaesthesia/ systemic effect)
3. If lignocaine in the dose used intratracheally or intravenously caused any delay in awakening

The parameters we used were cough response (the number of cough as well as the grade of cough), the hemodynamics and sedation score.

To assess the smoothness of extubation, several studies have assessed the number of coughs at extubation.(6) Jee et al (13) in their study found that the number of coughs were significantly less in the patients given lignocaine via the intratracheal route as compared to intravenous or placebo. Our study showed that the number of coughs were not significantly different in the intravenous or intratracheal route as compared to the placebo group.

We also graded the cough during extubation depending on the time of first appearance of cough as was done in a previous study by T. Venkatesan and G. Korula (3) in neurosurgical patients. A patient who coughs prematurely before attaining regular and

adequate respiration cannot be extubated and is at a greater risk of complications such as intracranial hematoma and raised intracranial pressure. However,there was no difference in the grade of cough in the 3 groups. Our results also show that more than half the number of patients had no cough or coughed only at the time of removal of endotracheal tube (grade 1). Only 5 patients (out of 114) had grade 3 cough. We attribute this to adequate reversal of muscle relaxation before awakening and maintenance of sevoflurane till pin removal with good analgesia (upto 5 micrograms/kg of fentanyl and paracetamol (20mg/kg)

Local anaesthetic, as its name suggests, is taken up by the local nerve endings and is responsible for its local action. We hypothesized that if a significant dose is taken up locally, the amount absorbed would be less with a lower serum concentration in the intratracheal group and hence less side effects. As one of the described drawbacks of using lignocaine is the sedation it causes, we looked for delayed awakening from anaesthesia in the group which received lignocaine intravenously. However we did not find any difference between the groups. The dose of lignocaine we used was 1mg/kg (Astra Zeneca) as was used by Jee et al(13) .Our results did not agree with their result which showed the intratracheal route to be superior to intravenous route and placebo. We found no difference in extubation time between the 3 groups. We measured the plasma lignocaine levels in all the patients. The serum level of lignocaine at 10 minutes after administration of the study drug in the placebo group was 0.07 microgram/ml and in the two lignocaine groups were 0.84 µgm/ml for intravenous(IV) and 0.88 µgm/ml for intratracheal(I.T). Though the level of lignocaine in the IT and IV groups were significantly higher than the placebo group, the serum levels in both groups were much

lower than the reported concentration needed to suppress extubation response. There was no significant fall in plasma levels at the time of extubation also between the two lignocaine groups. The recommended plasma lignocaine level for attenuation of the cough response is >2.3 micrograms/ml. Only 3 out of 114 patients reached this level . Jee et al(13) did not measure plasma levels in their patients.

The sedation score immediately after extubation was uniformly higher than optimal in all the groups. There were 28 patients who had a sedation score of 4 (difficult to arouse) at extubation. This was seen in all the three groups. However at 10 minutes after extubation the number of patients with a sedation score of 4 had come down to 9. We kept the anaesthetic till pin removal as this is the time when the cough usually appears in a lightly anaesthetized patient. No patient including those in the placebo group coughed at this point. Perhaps if we had stopped the anaesthetic at an earlier period, or had used a lower concentration 0.8 MAC which is considered adequate to prevent awareness (53), we may have had a lesser sedation score. The time of administration of the study drug (I.V lignocaine, intratracheal lignocaine or placebo) was at the time of placing the wound dressing .Although there is a difference in the time of peak action with intravenous and intratracheal route, we kept this time of administration in order to ensure blinding of the study. The half life of lignocaine when given intravenous is 8 minutes, but the peak effect after intratracheal administration is at 10 to 30 minutes. (44,46,47) We estimated an approximate time of 10 minutes for extubation from the point of administration of the study drug.. However, our patients could be extubated, only on an average time of 20 minutes after the drug administration. Though the extubation time was prolonged, we estimated the serum level of lignocaine at 10 minutes and at the time

of extubation and found no difference in the IT and IV group. In the tracheal group if the effect was by local action, we would have found a lower sedation score. On the other hand if absorption from the tracheal route is as fast as intravenous, there would be no difference between the groups. There was no difference in the concentration at both time points suggesting a rapid absorption of lignocaine from the tracheal route. In our study, we found that the average sedation score was very similar in all three groups substantiating the fact that lignocaine in that concentration does not cause undue sedation.

In neurosurgical patients a rise in blood pressure and heart rate can cause detrimental rise in intracranial pressure which can adversely affect the postoperative outcome. Hence in our study the hemodynamic response to extubation was assessed by recording the heart rate and blood pressure values at various time points before and after extubation. It was found that the use of lignocaine intratracheally did not significantly attenuate the cardiovascular responses to extubation. We also found that most patients, irrespective of the group to which they belonged, did not have high blood pressure values in response to extubation.

Our study showed that using lignocaine at a dose of 1 mg/kg intravenously and via tracheal instillation 20 minutes prior to extubation, did not have any advantage in suppressing cough response and haemodynamic changes over a carefully given anaesthetic and a slow gradual awakening. What surprised us was the serum level measured with a dose of 1 mg/kg was much lower than the required plasma level for suppression of extubation response.

LIMITATIONS

1. In this study, as per our standardized anaesthetic protocol, we used 1 MAC of volatile anaesthetic for all patients which was discontinued only at the time of pin removal. This may have been too high for us to assess emergence response because many of our patients were sedated at the time of extubation. Studies have suggested that 0.8 MAC of volatile agent is sufficient to prevent awareness during surgery.(52)

2. The mean plasma level of lignocaine obtained was 0.8 micrograms/ml, which was inadequate to suppress extubation response. Probably our time of administration of the study drug was too early or the dose administered was suboptimal. We had chosen this particular dose as per a previous study(13) which showed a significant suppression of airway and circulatory reflexes. Jacobsen et al when using 1.5 mg/kg had found toxic levels of lignocaine in 5 out of 11 patients (51). Prengel et al in their study using intratracheal lignocaine found that there were two peak levels of absorption with this route (48) and we did not want our patients to have a high concentration after extubation when the anaesthetist is not constantly monitoring the patient . The half life of lignocaine is 8 minutes and the duration of action of topical lignocaine lasts up to 30 minutes(34). We chose a time of 10 min to enable blinding of the study. However we could extubate our patients only by about 20 min. Perhaps the concentration after intravenous dose had waned by this time but the action of topical lignocaine should have still been present.

CONCLUSIONS

1. Lignocaine in the dose of 1 mg/kg given intratracheally does not prevent cough or hemodynamic response at emergence if given 20-30 min prior to extubation. Lignocaine in this dose provides poor local anaesthetic effect after tracheal instillation.

2. There was no increase in sedation with the use of lignocaine at a dose of 1 mg/kg when administered 20-30 min before extubation.

3. When volatile agents such as isoflurane and sevoflurane are continued till pin removal with an adequate dose of fentanyl, cough and haemodynamic response to extubation can be suppressed but with higher sedation in neurosurgical patients.

4. Plasma level of 0.8 µgm/ml was not sufficient to suppress cough at extubation.

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PATIENT INFORMATION SHEET

STUDY NO:

TITLE OF THE STUDY:

Instillation of lignocaine down the endotracheal tube to reduce extubation response in comparison with intravenous lignocaine and placebo in neurosurgical patients.

INSTITUTION: Department of Anaesthesia, Christian Medical College and Hospital.

NATURE AND PURPOSE OF THE STUDY:

The purpose of this research project is to assess the efficacy of intratracheal lignocaine in reducing cough at the end of anaesthesia.

You are going to undergo a major neurosurgical procedure. To give you anaesthesia, we will first put you to sleep with intravenous drugs and then insert a tube into your throat through which anaesthetic gases will be given to keep you asleep and unconscious. At the end of the surgery, we will remove the tube from your throat and wake you up. This phase is usually associated with coughing, increase in blood pressure, heart rate and if it occurs can be harmful to the patient following a major procedure. To prevent this, different drugs like intravenous opioids, beta blockers and lignocaine have been investigated without any conclusive evidence supporting one. Intravenous Lignocaine is used for this purpose with beneficial effect but the time taken for the patient to wake up may be delayed. We are doing this study to see if lignocaine given through the tube will hasten your recovery.

If you are willing to take part in the research project, you will be randomly allocated to one of the 3 groups. One group will receive the study drug intratracheally, 2nd group will receive the study drug intravenously, and the 3rd group will receive a placebo drug. The response to the drug will be assessed and recorded. The level of the study drug in the blood will be evaluated. The amount of blood that will be taken from you for this purpose will be very minimal. The day after surgery, you will be interviewed about sore throat.

RISKS OF THE STUDY:

There are no additional risks anticipated from your participation in the study.

EXPECTED DURATION OF INVOLVEMENT:

On the day of surgery and one day post operatively.

BENEFITS OF THE STUDY:

The outcome of the study will help us to know whether intratracheal lignocaine is beneficial in reducing extubation response.

CONFIDENTIALITY:

All personal details identifying you will be kept confidential and only data relevant to the study will be stored and analyzed.

SUBJECT'S INITIALS: SUBJECT'S NAME:

DATE OF BIRTH /AGE:

INFORMED CONSENT FORM

Please initial the correct box:

(i)I confirm that I have read and understood the information sheet dated _____ for the above study and have had the opportunity to ask questions. [ ]

(ii) I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. [ ]

(iii) I understand that the Sponsor of the clinical trial, others working on the Sponsor's behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published. [ ]

(iv) I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s) [ ]

(v) I agree to take part in the above study. [ ]

Signature (or Thumb impression) of the Subject/Legally Acceptable Representative:_____

Date: _____/_____/_____

Signatory's Name: _____

Signature of the Investigator: _____

Date: _____/_____/_____

PATIENT PROFORMA

SERIAL NUMBER

NAME : AGE: HOSPITAL NUMBER:
GENDER : M / F WEIGHT:
UNIT/WARD: ASA GRADE : 1 / 2

SURGERY:
COMORBID ILLNESS:
DATE OF SURGERY:
DURATION OF SURGERY: am /pm TO am/pm

TOTAL DOSE OF FENTANYL:

EVENT	TIME
LAST DOSE OF FENTANYL (at dural closure or earlier)	
STOPPING ISOFLURANE :(at dural closure) & STARTING SEVOFLURANE	
STOPPING VECURONIUM INFUSION (at time of skin suture)	
ADMINISTRATION OF STUDY DRUG (at wound dressing)	
STOPPING SEVOFLURANE (at pin removal)	
ADMINISTRATION OF REVERSAL (after pin removal):	
TIME OF EXTUBATION:	

:

SMOOTHNESS OF EXTUBATION : 1/2/3
Grade 1: no cough or coughing only during removal of endotracheal tube.
Grade 2: coughing while breathing regularly.
Grade3: coughing while not breathing regularly

NUMBER OF COUGHS DURING EXTUBATION:

TIME OF BLOOD SAMPLING:.A-10 min after study drug:
B- At extubation

SEDATION SCORE AT EXTUBATION:
Immediate:
After 10 min:
At transfer:

	Blood pressure Systolic diastolic mean			saturation	Pulse rate
Baseline (in the ward)					
At administration of study drug					
Pre extubation(after pin removal)					
Post extubation 1 minute					
2 minutes					
3 minutes					
4 minutes					
5 minutes					

SERUM LEVEL OF THE STUDY DRUG

Sample A (10 min after study drug)

Sample B (at extubation)

ABBREVIATIONS IN DATA SHEET

T.F.E: Total time taken for extubation (stopping sevoflurane till removal of endotracheal tube)

Grade: Grade of cough at extubation

Sed 0: sedation score at time of extubation
Sed1: sedation score 10 minutes after extubation

B.SBP: Baseline systolic blood pressure
B.DBP: Baseline diastolic blood pressure
B.MBP: Baselinemean blood pressure
B.HR: Baseline heart rate

SD.SBP: Systolic blood pressure at study drug administration
SD.DBP: Diastolic blood pressure at study drug administration
SD.MBP: Mean blood pressure at study drug administration
SD.HR: Heart rate at study drug administration

Pre.SBP : Pre extubation systolic blood pressure
Pre.SBP: Pre extubation diastolic blood pressure
Pre.MBP: Pre extubation Mean blood pressure
Pre HR: Pre extubation heart rate

P1.SBP: Post extubation systolic blood pressure (1 minute after extubation)
P1.DBP: Post extubation diastolic blood pressure (1 minute after extubation)
P1.MBP: Post extubation mean blood pressure (1 minute after extubation)
P1 HR: Post extubation heart rate (1 min)

P2.SBP: Post extubation systolic blood pressure (2 minutes after extubation)
P2.DBP: Post extubation diastolic blood pressure (2 minutes after extubation)
P2.MBP: Post extubation mean blood pressure (2 minutes after extubation)
P2 HR Post extubation heart rate (2 min)

P3.SBP: Post extubation systolic blood pressure (3 minutes after extubation)
P3.DBP: Post extubation diastolic blood pressure (3 minutes after extubation)
P3.MBP: Post extubation mean blood pressure (3 minutes after extubation)
P3 HR: Post extubation heart rate (3 min)

P4.SBP: Post extubation systolic blood pressure (4 minutes after extubation)
P4.DBP: Post extubation diastolic blood pressure (4 minutes after extubation)
P4.MBP: Post extubation mean blood pressure (4 minutes after extubation)
P4 HR: Post extubation heart rate (4 min)

P5.SBP: Post extubation systolic blood pressure (5 minutes after extubation)

P5.DBP: Post extubation systolic blood pressure (5 minutes after extubation)
P5.MBP: Post extubation mean blood pressure (5 minutes after extubation)
P5 HR: Post extubation heart rate (5 min)

Fe-Ex: Time interval from last dose of fentanyl to extubation
Fe-Rev: Time interval from last dose of fentanyl to reversal

Vec-Ex: Time interval from stopping of vecuronium infusion to extubation
Vec-Rev: Time interval from stopping of vecuronium infusion to reversal

Sd-Ex: Time interval from administration of study drug to extubation
Iso-Ex: Time interval from stopping of isoflurane to extubation

Plasma 1: Plasma level of lignocaine 10 min after study drug administration
Plasma 2: Plasma level of lignocaine at extubation

	hosp.no	age	weight	gender	duration	serial no	T.F.E	grade	no: cough	sed 0	sed10	
	192487d	39	86	m	175	2	30	2	5	2		1
	189060d	63	63	f	330	3	26	1	3	2		1
m	196698d	25	51	m	135	4	17	2	10	1		0
s	197050d	19	55	m	310	5	18	2	5	2		1
ri	189448d	43	60	f	270	6	11	1	3	2		1
	178491d	43	60	m	180	7	17	1	2	2		2
a	198598d	48	72	m	191	8	17	2	8	2		2
	191504d	20	40	f	240	9	22	3	10	1		0
ni	166435d	56	66	m	250	10	9	1	4	2		1
ar	193332d	38	59	m	300	11	13	1	1	2		1
	193623d	29	46	m	180	12	26	1	2	2		1
r	201551d	35	48	f	120	13	27	1	0	0		0
e	197921d	43	43	f	230	14	21	1	3	2		2
na	639425c	27	48	f	320	15	17	1	0	0		0
	187186d	43	80	m	185	16	20	2	6	2		2
i	200693b	35	49	f	300	17	7	1	2	2		1
	204773d	31	47	f	180	18	15	1	0	2		1
	199805d	42	60	m	330	19	27	3	10	2		1
	208075d	35	60	f	232	20	7	2	6	2		2
	992038c	39	88	m	180	21	17	1	5	2		1
	204723d	62	60	m	283	22	30	1	0	2		1
	213989d	52	63	m	220	23	22	2	7	1		1
m	158764d	64	51	m	203	24	14	1	3	2		1
	162975d	37	58	m	270	26	31	1	1	2		1
	217753d	18	84	f	335	27	16	1	2	2		2
	188213	36	69	f	290	28	25	3	10	0		0
	159898d	44	75	m	195	29	17	1	3	2		1
	213561d	37	85	m	215	30	48	1	4	2		2
	221015d	18	49	m	156	31	8	2	7	3		2
	223475d	20	63	m	440	32	21	1	2	1		1
	227326d	48	72	m	218	33	27	2	6	2		1
	224955d	43	65	m	90	34	12	1	1	0		0
	219327d	24	66	m	180	35	17	2	8	2		1
	217009d	53	64	f	300	36	21	3	9	2		2
	233592d	56	76	m	90	37	11	1	1	1		0
ge	236628d	41	82	m	240	38	14	2	7	2		1
	206886d	32	82	m	75	39	7	2	10	1		0
												0
	221688d	28	52	f	205	40	14	1	1	0		

B. SBP	B.DBP	B.MBP	B.HR	SD. SBP	SD.DBP	SD.MBP	SD.HR	Pre.SBP	Pre.DBP	Pre.MBP	Pre.HR
110	80	90	80	114	78	90	103	108	71	83	102
140	90	107	80	98	53	66	106	106	61	78	110
106	60	75	90	105	55	71	110	111	60	75	112
130	80	97	80	120	72	88	106	120	71	89	100
120	70	87	88	122	73	92	101	123	70	91	103
130	90	103	78	101	64	78	83	108	62	79	90
130	80	97	82	93	63	75	82	104	69	83	90
110	80	90	80	130	93	106	106	122	84	105	87
140	100	113	84	92	57	70	109	109	63	78	118
140	90	107	92	94	53	67	122	99	53	69	128
134	80	98	120	106	61	71	101	104	51	70	80
108	77	87	79	107	75	90	80	122	87	102	81
110	70	83	100	93	54	70	93	101	57	75	86
100	68	79	98	79	46	60	116	89	54	69	121
130	90	103	80	109	68	84	80	92	55	69	72
126	86	99	83	102	50	69	100	110	51	71	110
110	76	87	83	109	60	76	91	122	64	85	97
104	68	80	78	103	58	71	105	95	52	67	102
120	80	93	86	112	50	74	111	116	50	72	108
140	90	107	72	108	62	78	95	105	60	76	85
110	76	87	78	102	55	70	80	154	74	101	81
110	92	98	96	114	71	89	74	125	78	98	73
150	80	103	64	139	77	104	77	130	68	94	81
		0									
114	68	83	70	89	42	55	84	137	58	82	85
120	90	100	90	124	78	94	106	131	71	88	103
140	90	107	88	121	76	94	97	113	63	81	89
140	90	107	84	100	60	74	82	123	64	89	81
140	90	107	94	108	73	87	88	109	76	90	86
130	90	103	102	103	57	73	133	132	73	93	139
100	70	80	82	114	67	83	119	138	87	102	128
140	80	100	101	120	81	98	95	120	77	95	94
140	80	100	90	120	75	95	78	123	74	94	77
120	80	93	72	108	66	97	89	115	67	82	80
130	90	103	88	91	40	57	80	120	53	74	111
120	90	100	92	115	57	77	77	133	62	86	78
120	90	100	84	122	75	90	103	126	85	108	94
110	60	77	80	117	66	83	109	119	66	86	114
140	80	100	88	92	60	73	106	109	66	87	85

Pre.MBP	Pre.HR	P1SBP	P1DBP	P1MBP	P1HR	P2SBP	P2DBP	P2MBP	P2HR	P3SBP	P3DBP
83	102	131	83	101	102	127	82	98	103	130	82
78	110	122	84	65	110	109	56	68	112	114	68
75	112	120	68	85	133	115	63	80	126	116	62
89	100	137	84	106	89	136	79	102	91	126	72
91	103	125	72	92	102	128	77	97	102	145	92
79	90	147	83	106	102	158	87	111	102	151	81
83	90	156	88	118	87	164	91	122	88	168	92
105	87	137	92	109	103	160	98	119	87	139	97
78	118	124	69	91	126	138	81	101	124	136	80
69	128	131	88	103	128	127	82	98	129	123	80
70	80	116	59	83	108	119	63	86	112	117	61
102	81	166	98	127	89	164	97	124	90	160	96
75	86	122	70	94	94	102	65	82	99	114	70
69	121	120	69	86	119	112	70	107	119	103	68
69	72	115	64	82	90	138	83	106	139	139	84
71	110	112	58	77	112	112	59	78	110	113	59
85	97	115	65	86	104	118	63	85	93	122	61
67	102	158	75	103	106	147	71	97	104	146	73
72	108	154	66	99	112	136	58	87	114	139	59
76	85	127	70	91	90	124	70	90	90	135	82
101	81	178	93	127	92	177	92	124	87	175	90
98	73	144	77	101	79	154	78	104	79	160	77
94	81	132	71	100	82	145	74	106	80	149	75
82	85	141	70	93	80	126	58	80	89	128	58
88	103	164	92	113	121	147	83	107	114	156	86
81	89	135	88	101	107	125	75	98	98	122	70
89	81	122	67	87	75	106	61	77	69	111	59
90	86	132	82	102	89	127	73	94	88	139	81
93	139	140	76	99	137	135	78	101	145	140	80
102	128	134	81	97	130	133	81	97	120	143	84
95	94	147	91	110	91	153	100	118	91	154	99
94	77	145	90	83	75	165	93	126	90	147	87
82	80	143	81	99	94	122	70	88	99	130	69
74	111	152	72	98	112	118	65	84	111	125	65
86	78	200	90	128	90	171	81	116	90	150	77
108	94	123	80	95	99	129	86	105	90	138	86
86	114	137	80	98	121	135	75	95	115	126	73
87	85	115	70	90	102	123	75	95	102	121	72
85	76	165	112	132	82	181	136	140	87	157	107

P3MBP	P3HR	P4SBP	P4DBP	P4MBP	P4HR	P5SBP	P5DBP	P5MBP	P5HR	Fe-Ex	Fe-Rev
100	102	129	79	98	102	129	81	98	103	115	86
87	118	130	68	93	102	116	65	82	115	122	118
79	126	119	64	82	126	114	58	77	128	61	45
93	104	129	75	97	92	125	76	96	90	115	99
124	106	123	78	93	113	129	72	94	114	56	47
106	102	151	81	106	102	145	79	101	102	40	25
124	85	164	89	121	84	163	89	122	84	58	42
105	100	130	87	108	84	129	89	107	92	109	87
99	123	134	77	97	127	136	80	95	122	85	76
98	123	139	80	102	134	131	78	100	131	70	59
84	112	119	59	82	112	123	60	83	110	96	77
123	86	152	96	120	86	150	93	118	85	66	39
89	83	120	69	92	78	118	68	91	76	70	52
82	119	112	69	85	115	106	63	82	117	32	17
103	145	136	80	104	74	134	82	101	72	182	163
79	110	114	60	80	109	116	61	79	108	32	27
84	89	120	60	82	87	117	59	81	82	60	45
97	100	145	72	97	96	140	69	94	95	73	45
89	114	135	58	86	114	137	58	85	113	27	30
101	89	130	71	93	89	130	68	89	88	77	61
124	90	173	88	122	81	170	85	119	81	40	14
106	85	161	79	107	86	160	77	105	86	54	33
108	80	151	75	109	78	149	74	107	76	217	204
81	85	128	58	80	84	132	52	82	82	101	73
111	112	157	81	101	103	154	80	107	118	125	110
90	101	123	70	90	91	133	76	101	81	215	190
76	69	150	63	81	65	117	63	83	83	75	64
102	87	129	73	94	84	125	74	95	81	193	145
102	139	140	77	100	135	147	74	100	132	58	50
104	118	144	87	106	118	137	86	104	118	119	101
124	89	157	96	122	90	149	93	119	89	223	200
104	90	144	82	100	87	149	76	106	89	100	88
88	78	135	76	96	79	130	72	90	98	50	33
86	111	140	67	90	110	143	67	92	109	187	168
107	87	169	78	114	87	170	78	113	86	68	60
107	91	116	79	91	96	107	78	89	95	98	86
93	112	143	76	100	110	137	77	97	112	54	47
90	99	126	67	93	99	125	75	94	102	79	67

Fe-Ex	Fe-Rev	Vec-Ex	Vec-Rev	Sd-Ex	Iso-Ex	Plasma1	plasma2	code
115	86	42	13	33		0.7		A
122	118	47	23	29		0		B
61	45	24	8	22		0.57		A
115	99	30	14	18		0		B
56	47	31	22	15		0		C
40	25	30	15	20		0.308		A
58	42	23	7	19		1.06	0.86	C
109	87	33	11	27		0	0	B
85	76	20	11	15		0.86		A
70	59	29	18	25		1.14	0.68	C
96	77	91	72	27		0.68	0.43	C
66	39	41	14	30		0	0	B
70	52	37	19	22		0	0	B
32	17	37	22	17		0.52	0.39	A
182	163	36	17	3		1.02	0.56	A
32	27	22	17	14	52	0.35	0.31	A
60	45	28	14	20	60	0	0	B
73	45	44	16	31	73	4.692	0.454	C
27	30	19	12	10	57	0	0	B
77	61	27	11	19	77	0.617	0.383	C
40	14	32	6	30	60	0.762	0.664	C
54	33	31	10	24	54	4.82	4.25	A
217	204	27	14	17	52	0.6	1.46	C
101	73	51	23	36	51	0	0	B
125	110	31	16	21	37	0	0	A
215	190	65	40	26	70	0.92	0.74	C
75	64	33	22	21	73	0.25	0.27	B
193	145	68	20	50	87	0.86	0.68	A
58	50	18	11	10	52	0.941	0.857	A
119	101	46	29	22	86	0.517	0.722	C
223	200	43	20	28	99	0.88	0.66	A
100	88	30	18	15	65	0.27	0.26	B
50	33	32	15	20	60	0.63	0.58	C
187	168	40	19	23	58	0	0	B
68	60	28	20	14	68	0.73	0.8	C
98	86	35	23	16	98	0.87	0.71	A
54	47	24	17	11	42	0	0	B
79	67	39	27	17	80	2.2	1.8	C

name	hosp.no	age	weight	gender	duration	serial no	T.F.E	grade	no: cough	sed 0	sed10
radha	238485d	38	77	f		130	41	18	1	1	1
sujith	240963d	52	46	m		260	42	15	2	7	2
anuj	164590d	20	55	m		135	43	19	1	3	1
md.jahangir	231797d	26	72	m		315	44	20	2	7	2
jeyanti	060024b	38	61	f		200	45	15	1	1	2
abha	242263d	28	68	f		165	46	11	2	8	2
rajendra	237869d	38	55	m		247	47	21	2	4	1
dilip	191757d	29	65	m		160	48	15	2	10	1
lakhi	231409d	48	61	f		175	49	21	2	6	3
amarender	247949d	43	52	m		210	50	18	2	10	2
bindu	240557d	22	55	f		210	51	19	2	6	1
karthik	249249d	52	57	m		190	52	24	1	2	1
narendra	237600d	66	58	m		190	53	13	1	1	2
sekhar	243382d	30	85	m		225	54	9	1	3	2
anup	250688d	31	67	m		150	55	11	1	2	2
mathew	252296d	49	65	m		240	56	16	1	0	0
rudha	253409d	36	50	f		240	57	20	1	0	1
tushar	248861d	24	51	m		270	58	18	2	5	2
noyan	257697d	35	52	f		240	59	14	1	0	0
alo mazum	252123d	60	46	f		195	60	21	1	6	0
syed amn	230225d	34	100	m		210	61	12	2	2	3
fatema	231647d	53	65	f		220	62	22	1	3	2
swarup	254245d	37	72	m		202	63	9	1	2	3
saritha	219743d	22	70	f		205	64	21	1	0	2
kamala	258825d	38	50	f		255	65	27	1	0	2
brijendra	240257d	50	60	m		180	66	15	1	2	1
sheik sal	246767d	26	78	m			67	16	2	22	0
sonam	169753d	26	48	f		300	68	14	1	0	2
sah newas	248990d	18	63	m		405	69	38	2	5	3
manju	258936d	40	82	f		110	71	15	2	10	3
rejeya	259846d	51	50	f		320	72	25	1	3	3
kamalika	266602d	22	58	f		260	73	41	1	0	3
syeda	270432d	22	57	f		420	74	25	2	10	2
hridoy	250178d	21	50	m		145	75	24	1	1	3
nasrin	272016d	34	73	f		195	76	13	2	8	3
sisir	270398d	29	60	m		240	77	34	1	0	3
andrews	264919d	50	66	m		150	78	16	1	1	2
rahul	251005d	20	60	m		325	79	24	1	2	3
hazi md	271282d	61	60	m		155	80	17	2	10	3

sed10	B. SBP	B.DBP	B.MBP	B.HR	SD. SBP	SD.DBP	SD.MBP	SD.HR	Pre.SBP	Pre.DBP	Pre.MBP
0	120	80	93	79	85	62	69	73	103	75	85
2	140	90	107	100	92	55	71	81	96	53	71
0	130	80	97	96	96	46	63	109	98	49	66
2	130	80	97	63	98	59	72	70	114	70	85
1	110	80	90	80	115	68	80	104	105	71	78
1	110	70	83	80	82	54	62	85	111	60	73
0	110	80	90	80	85	58	64	74	104	60	78
0	130	80	97	86	113	67	81	87	102	57	72
2	122	90	101	86	102	79	90	92	128	75	96
1	120	86	97	70	91	55	67	64	112	74	92
1	124	76	92	70	92	52	63	95	118	63	79
0	150	80	103	76	100	53	71	80	113	59	79
1	140	80	100	80	96	47	65	64	118	45	73
1	130	90	103	88	99	67	78	82	128	83	97
1	130	80	97	84	97	55	69	104	98	60	73
0	130	90	103	78	94	45	59	84	103	48	63
0	128	94	105	74	72	45	54	80	94	55	70
2	110	80	90	80	96	56	69	120	112	52	72
0	120	70	87	118	109	57	75	91	128	70	91
0	150	90	110	78	121	50	73	90	174	75	107
2	120	80	93	70	100	64	77	82	99	71	83
2	120	80	93	68	74	35	49	75	78	37	52
2	110	70	83	86	130	64	81	62	130	59	80
2	120	80	93	82	97	60	73	86	103	64	78
2	130	90	103	82	107	48	66	63	112	55	74
1	160	100	120	90	84	66	73	93	122	75	94
0	130	80	97	80	120	67	86	69	119	64	82
2	110	70	83	68	120	57	80	87	125	61	86
2	100	70	80	100	102	70	81	122	110	72	85
			0								
3	150	90	110	100	100	44	61	101	108	49	66
3	130	90	103	72	110	76	92	75	100	70	84
2	104	70	81	90	110	68	85	89	112	66	87
1	100	80	87	88	90	60	69	106	100	50	
3	110	70	83	68	96	53	67	77	104	51	66
2	120	80	93	84	100	63	78	72	106	67	83
3	100	70	80	84	96	51	64	110	103	55	69
1	120	70	87	80	97	52	68	92	104	55	71
3	100	70	80	76	96	58	69	110	110	64	76
1	130	80	97	80	84	62	67	66	93	61	66

P1MBP	P1HR	P2SBP	P2DBP	P2MBP	P2HR	P3SBP	P3DBP	P3MBP	P3HR	P4SBP	P4DBP
132	82	181	136	140	87	157	107	128	87	164	110
65	86	120	80	88	87	112	58	81	87	121	61
90	128	119	61	82	116	148	68	92	129	128	66
95	83	132	70	94	70	125	74	94	72	125	78
85	94	122	79	89	92	120	58	61	92	108	62
74	85	113	58	72	82	117	61	76	82	112	57
97	104	120	67	90	94	114	62	84	101	119	67
122	106	130	84	109	111	155	85	113	114	144	87
96	100	131	81	103	100	130	78	100	101	114	65
92	69	127	78	100	61	128	79	101	73	136	71
94	89	124	75	96	88	136	78	101	90	137	91
109	79	144	89	109	80	154	70	102	76	144	74
73	73	104	41	63	73	115	44	68	73	109	43
93	97	120	54	82	96	125	85	99	94	128	87
77	120	105	65	81	119	97	60	72	109	82	51
82	104	114	64	82	106	128	73	91	105	128	73
116	94	149	88	115	94	144	85	112	96	142	81
69	116	109	53	73	90	114	49	73	86	106	57
99	106	140	88	111	102	135	86	107	88	134	87
105	128	178	90	125	125	188	85	127	106	171	83
104	78	117	91	106	79	145	84	110	79	147	86
57	94	87	43	58	95	87	43	58	95	86	43
82	60	116	52	79	65	127	64	86	62	126	64
115	97	140	86	109	95	127	67	94	92	137	80
83	60	113	57	81	56	115	56	80	52	113	54
110	98	141	91	109	97	142	92	110	96	132	95
104	84	153	84	110	75	149	83	105	73	149	85
89	111	115	56	76	100	120	53	76	90	121	47
91	120	130	73	91	84	128	73	89	90	124	74
	120	128	67	85	129	129	66	86	129	128	64
93	89	147	72	99	88	161	73	100	90	147	72
87	81	135	70	91	76	132	67	92	76	132	67
	111	123	62	80	113	122	62	80	118	123	62
	98	120	66	83	98	120	60	80	94	128	68
97	78	118	71	92	77	122	72	94	77	120	74
88	110	120	70	85	108	121	70	85	108	121	70
102	93	133	95	109	92	139	68	93	95	141	68
87	114	124	63	83	88	129	59	84	82	130	62
105	88	136	88	99	84	138	85	97	80	129	81

	P5SBP	P5DBP	P5MBP	P5HR	Fe-Ex	Fe-Rev	Vec-Ex	Vec-Rev	Sd-Ex	Iso-Ex	Plasma1	plasma2
109	130	87	75	58	30	13	19	45	0.64	0.49	A	
61	65	87	88	75	53	40	20	72	0	0	B	
66	87	119	72	54	39	21	26	73	0	0	B	
72	92	72	72	52	31	11	23	71	0.72	0.87	C	
69	72	93	89	75	35	21	19	79	2.59	insufficient	A	
58	72	82	92	83	28	19	17	91	1.4	1.22	C	
64	87	94	71	52	56	37	24	56	0	0	B	
87	108	118	57	42	45	31	20	55	1	0.6	A	
63	82	102	123	104	27	8	23	88	0	0	B	
78	101	77	75	62	28	19	22	76	0.84	0.79	A	
80	99	105	62	46	35	19	25	58	0	0	B	
74	101	74	60	42	30	12	26	57	0.59	0.41	C	
46	71	73	82	69	32	19	21	82	0.54	0.26	A	
83	97	90	179	172	24	17	14	60	0	0	C	
58	71	95	60	52	17	15	12	60	0	0	B	
76	95	103	70	56	25	9	18	65	0	0	A	
79	105	96	65	53	50	38	20	60	0.24	0.27	A	
55	77	103	183	167	43	27	20	58	0.48	0.39	C	
86	108	81	85	75	50	40	16	80	0	0	B	
83	122	95	109	92	39	22	21	99	0.79	0.7	C	
87	110	75	91	80	54	45	16	58	1.94	2.4	C	
42	58	95	36	17	36	17	22	66	0	0	B	
72	90	61	30	25	20	15	14	40	0.75	0.55	A	
84	105	109	71	52	51	32	24	71	0	0	B	
52	77	50	68	42	38	12	28	63	0.88	0.57	C	
98	112	94	121	107	31	17	19	51	0	0	B	
80	107	72	68	53	28	13	23	71	0.7	0.52	A	
44	67	77	75	61	30	16	17	70	0.78	1.1	C	
71	86	106	200	163	57	20	47	200	1.33	1	A	
									0.89	0.76	C	
67	87	126	58	46	31	19	17	58	0	0	B	
67	95	79	70	46	45	21	27	60	1.07	0.71	A	
64	92	73	97	57	51	11	45	92	1.56	0.35	C	
63	81	115	89	74	43	29	30	85	0	0	B	
65	85	87	68	53	46	31	19	65	0.56	0.31	A	
77	97	80	56	46	25	15	18	66	1.05	0.29	A	
65	81	107	91	59	49	17	37	89	0	0	B	
68	92	93	185	174	25	14	16	57	0.57	0.53	C	
61	83	93	66	43	41	18	27	72	0.88	0.61	C	
78	89	79	163	149	31	17	20	52	0	0	B	

selvam	268565d	46	65	m	220	81	7	2	8	3
kamrul	273547d	45	60	m	185	82	13	2	2	3
priyanka	258296d	28	47	f	120	83	18	2	8	2
mofik	267248d	34	60	m	180	84	13	1	3	2
tetru	260852d	41	70	m	330	85	18	1	3	0
piu	269953d	23	50	f	190	86	14	1	3	0
gumni	274252d	52	38	f	90	87	24	1	0	3
dipali	269410d	51	55	f	140	88	15	2	4	2
subas	268936d	50	71	m	180	89	9	1	3	1
rinku	273852d	26	50	f	125	90	15	1	1	2
sitala	274793d	52	45	f	315	91	25	1	0	3
Kumar	272920d	53	77	m	130	92	12	2	7	1
sabithra	271167d	33	55	f	270	93	10	1	1	2
biswajit	277045d	22	47	m	135	94	12	2	4	3
mina saha	279713d	57	67	f	135	95	12	1	0	1
kurien	270109d	30	61	m	270	96	12	1	1	3
poonam	274894d	24	51	f	210	97	7	1	4	3
debtosh	256683d	37	60	m	255	98	15	2	5	3
avijit	025095d	29	71	m	120	99	25	2	10	1
md abdul	274128d	43	65	m	180	100	8	3	10	1
haru gorai	277748d	42	47	m	420	101	14	1	0	3
kaushal	205737d	24	40	m	210	102	17	1	4	2
poonam	274894d	24	52	f	275	103	20	1	1	2
bijoli	282211d	44	55	f	300	104	9	2	6	1
rehana	276773d	53	76	f	240	105	20	2	6	3
binita	281912d	22	36	f	220	106	21	1	1	0
hussain	274343d	50	72	m	285	107	26	1	2	3
jayanta	276458d	47	52	m	310	108	20	2	9	3
harikishan	287284d	21	60	m	225	109	3	2	9	0
madhuri	282778d	38	70	f	300	110	9	1	1	3
tapan	293066d	22	46	m	185	111	19	2	8	1
palani	299209d	60	58	m	200	112	9	2	10	3
manoranj	276932d	34	45	m	105	113	22	1	2	2
samir	196995d	45	70	m	270	114	20	1	1	2
sanjay	300919d	38	65	m	295	115	15	2	3	1
abdul	276991d	38	67	m	185	116	12	2	3	3

name	hosp.no	age	weight	gender	duration	serial no	T.F.E	grade	no: cough	sed 0	sed10

	B.DBP	B.MBP	B.HR	SD. SBP	SD.DBP	SD.MBP	SD.HR	Pre.SBP	Pre.DBP	Pre.MBP	Pre.HR
110	70	83	86	143	76	101	72	134	70	92	76
120	90	100	100	76	49	60	89	102	62	79	94
110	70	83	84	97	61	74	103	101	66	78	105
130	70	90	72	89	46	64	85	97	49	70	83
130	70	90	88	101	61	75	93	116	74	90	109
120	80	93	88	75	49	58	97	82	52	62	98
140	80	100	88	117	60	81	87	120	84	88	87
130	80	97	88	100	47	63	108	130	59	79	112
130	90	103	82	82	46	57	49	94	52	68	53
110	70	83	80	74	53	60	107	86	56	68	101
118	76	90	98	79	48	60	97	118	68	89	102
120	80	93	64	110	64	82	58	114	67	86	57
130	84	99	78	127	63	86	95	130	71	92	90
120	86	97	102	108	54	74	87	107	68	83	90
110	80	90	80	126	63	82	70	130	66	84	85
130	90	103	88	91	58	71	80	100	65	79	80
108	70	83	86	92	46	59	119	94	45	59	107
119	64	82	100	118	65	82	100	123	63	84	104
110	80	90	68	100	58	72	105	99	55	70	105
118	76	90	76	130	64	80	110	132	62	80	113
110	70	83	82	109	67	81	107	104	65	78	108
110	80	90	88	87	42	57	86	86	40	56	87
100	60	73	86	116	68	83	86	130	78	96	89
130	70	90	80	121	63	84	60	115	77	94	68
156	94	115	92	99	59	76	73	114	61	83	91
100	70	80	80	80	51	64	110	94	56	72	106
140	94	109	86	78	45	56	71	83	48	60	71
120	70	87	84	81	43	57	120	116	63	82	125
110	80	90	80	105	67	81	100	116	68	84	94
100	70	80	92	99	63	79	100	113	73	90	103
110	70	83	68	108	68	83	95	130	80	100	82
140	80	100	85	122	62	81	97	102	54	68	86
100	70	80	90	82	43	54	95	76	40	51	94
130	80	97	72	90	38	51	90	94	38	53	93
120	84	96	86	100	51	66	85	105	50	67	78
110	76	83	80	90	66	54	90	86	65	49	88

P1MBP	P1HR	P2SBP	P2DBP	P2MBP	P2HR	P3SBP	P3DBP	P3MBP	P3HR	P4SBP	P4DBP	P4MBP	P4HR
118	117	155	79	105	99	142	70	96	86	145	70		
99	102	127	76	98	102	131	78	100	103	134	88		
84	108	103	69	84	111	103	68	83	110	103	67		
75	108	110	75	85	105	116	85	88	100	102	62		
95	109	123	72	92	103	122	74	93	100	121	70		
83	130	122	61	80	122	118	61	80	123	126	62		
118	93	158	80	117	90	170	84	122	89	167	78		
112	115	148	70	99	112	150	71	98	114	144	69		
97	60	142	70	100	61	142	74	102	61	148	79		
77	116	88	58	70	115	94	58	70	122	96	56		
113	116	154	85	115	115	159	79	114	111	150	78		
114	68	180	94	124	71	179	89	119	66	188	93		
109	110	123	73	94	111	129	75	95	111	127	73		
89	87	113	74	84	87	119	70	88	87	120	70		
115	90	152	82	104	86	150	80	100	87	156	81		
88	88	108	69	86	89	122	77	96	88	122	80		
70	114	103	48	65	111	104	47	64	109	104	45		
86	98	127	61	86	98	127	60	82	99	127	61		
98	111	143	83	100	107	144	82	100	107	151	85		
105	123	162	86	111	130	151	81	102	126	155	83		
108	110	145	79	106	113	146	86	108	104	137	83		
81	114	110	50	68	109	118	52	74	109	110	56		
90	80	120	72	94	82	126	69	92	79	130	72		
97	55	129	72	95	55	126	70	93	54	124	71		
97	99	126	70	95	92	134	71	99	85	139	70		
71	126	90	63	74	129	96	67	76	128	99	68		
79	86	116	62	84	78	112	62	83	74	118	69		
87	126	118	70	92	124	119	69	90	123	122	68		
79	84	112	70	79	84	111	68	78	82	114	69		
101	108	117	74	90	105	112	69	87	100	119	72		
106	98	132	86	107	97	140	85	109	95	161	86		
103	84	165	71	104	86	158	68	99	87	163	70		
85	85	117	64	85	84	127	67	89	80	125	66		
89	102	147	73	98	99	151	73	98	90	151	71		
93	88	134	74	95	90	131	70	91	92	118	67		
53	92	128	90	68	87	126	66	87	87	126	66		

P5SBP	P5DBP	P5MBP	P5HR	Fe-Ex	Fe-Rev	Vec-Ex	Vec-Rev	Sd-Ex	Iso-Ex	Plasma1	plasma2	code			
149	72	99	85	72	66	37	31	14	63	0.704	1.23				
134	80	104	107	79	67	29	17	16	79	0	0				
104	67	84	106	76	59	27	10	21	77	0	0				
105	59	80	95	52	43	24	15	15	47	0.48	0.47				
120	70	90	100	153	126	33	31	23	103	0	0				
120	62	81	127	86	73	35	20	19	85	0.8	0.82				
171	73	111	76	52	30	37	15	29	72	0.64	0.44				
138	65	92	115	163	154	52	41	18	68	0	0				
150	79	108	64	65	56	30	21	17	60	0.85	0.66				
95	57	71	122	41	29	21	9	19	41	0	0				
147	76	106	109	113	89	33	9	27	83	0.66	0				
185	92	122	63	71	59	21	9	15	76	0.67	0.57				
122	72	91	112	75	66	45	36	15	45	0	0				
122	74	96	88	47	36	22	11	13	47	0.33	0.59				
155	78	101	119	53	41	23	11	17	53	1.209	1.043				
118	78	95	89	92	80	27	15	17	92	0	0				
105	46	64	110	39	32	24	17	10	49	0.76	0.75				
131	61	83	100	56	41	31	16	18	56	0	0				
130	72	90	106	71	46	38	13	28	70	0.47	0.34				
149	79	102	125	55	48	19	12	13	59	0	0				
137	87	105	111	69	56	24	11	15	69	0.73	0.56				
118	54	77	112	72	55	30	13	20	72	0	0				
132	75	98	78	64	48	56	40	28	64	0	0				
123	69	91	54	53	49	23	19	10	53	1.16	1.1				
141	71	101	82	70	51	40	21	23	60	1.06	0.76				
97	62	74	128	85	55	42	22	21	80	0.38	1.1				
115	62	84	73	57	38	31	12	26	55	0.77	0.38				
127	65	89	120	66	49	26	9	21	60	0.13	0.14				
120	69	80	84	46	44	37	35	7	61	interferenc	2.74				
121	74	92	101	84	79	19	14	11	84	0.82	1.39				
151	89	115	94	38	22	30	14	22	62	0	0				
162	68	99	89	51	43	20	12	9	51	0.67	0.59				
125	125	64	87	53	30	36	13	26	53	0.57	0.45				
145	67	91	88	125	106	34	15	25	60	0.86	0.63				
127	68	91	87	42	28	32	18	19	62	2.13	0.28				
126	68	90	87	71	61	17	7	14	68	0	0				

name	hosp.no	age	weight	gender	duration	serial no	T.F.E	grade
mohan	192487d	39	86	m	175	2	30	2
shivmani	189060d	63	63	f	330	3	26	1
pavan kum	196698d	25	51	m	135	4	17	2
mohd.nes	197050d	19	55	m	310	5	18	2
sukla lehri	189448d	43	60	f	270	6	11	1
basudev	178491d	43	60	m	180	7	17	1
sadere ala	198598d	48	72	m	191	8	17	2
rahamath	191504d	20	40	f	240	9	22	3
subramani	166435d	56	66	m	250	10	9	1
mazumdar	193332d	38	59	m	300	11	13	1
soumitra	193623d	29	46	m	180	12	26	1
sadhana r	201551d	35	48	f	120	13	27	1
dropadi de	197921d	43	43	f	230	14	21	1
vengaiama	639425c	27	48	f	320	15	17	1
tarapada	187186d	43	80	m	185	16	20	2
sitara bibi	200693b	35	49	f	300	17	7	1
aparna das	204773d	31	47	f	180	18	15	1
samit k	199805d	42	60	m	330	19	27	3
soma.m	208075d	35	60	f	232	20	7	2
ashok	992038c	39	88	m	180	21	17	1
sankar	204723d	62	60	m	283	22	30	1
sultan	213989d	52	63	m	220	23	22	2
arumugam	158764d	64	51	m	203	24	14	1
amir ali	162975d	37	58	m	270	26	31	1
nabanita	217753d	18	84	f	335	27	16	1
snigdha	188213	36	69	f	290	28	25	3
yusuf	159898d	44	75	m	195	29	17	1
surjeet	213561d	37	85	m	215	30	48	1
pritwish	221015d	18	49	m	156	31	8	2
jayantha	223475d	20	63	m	440	32	21	1
mohd ali	227326d	48	72	m	218	33	27	2
mustafa	224955d	43	65	m	90	34	12	1
ananta das	219327d	24	66	m	180	35	17	2
anju sil	217009d	53	64	f	300	36	21	3
manik lal	233592d	56	76	m	90	37	11	1
roy george	236628d	41	82	m	240	38	14	2
amit	206886d	32	82	m	75	39	7	2
kousalya	221688d	28	52	f	205	40	14	1
radha	238485d	38	77	f	130	41	18	1
sujith	240963d	52	46	m	260	42	15	2
anuj	164590d	20	55	m	135	43	19	1
md.jahangi	231797d	26	72	m	315	44	20	2
jeyanti	060024b	38	61	f	200	45	15	1
abha	242263d	28	68	f	165	46	11	2
rajendra	237869d	38	55	m	247	47	21	2
dilip	191757d	29	65	m	160	48	15	2
lakhi	231409d	48	61	f	175	49	21	2
amarender	247949d	43	52	m	210	50	18	2
bindu	240557d	22	55	f	210	51	19	2

karthik	249249d	52	57	m	190	52	24	1
narendra	237600d	66	58	m	190	53	13	1
sekhar	243382d	30	85	m	225	54	9	1
anup	250688d	31	67	m	150	55	11	1
mathew	252296d	49	65	m	240	56	16	1
rudha	253409d	36	50	f	240	57	20	1
tushar	248861d	24	51	m	270	58	18	2
noyan	257697d	35	52	f	240	59	14	1
alo mazum	252123d	60	46	f	195	60	21	1
syed amn	230225d	34	100	m	210	61	12	2
fatema	231647d	53	65	f	220	62	22	1
swarup	254245d	37	72	m	202	63	9	1
saritha	219743d	22	70	f	205	64	21	1
kamala	258825d	38	50	f	255	65	27	1
brijendra	240257d	50	60	m	180	66	15	1
sheik sal	246767d	26	78	m		67	16	2
sonam	169753d	26	48	f	300	68	14	1
sah newas	248990d	18	63	m	405	69	38	2
manju	258936d	40	82	f	110	71	15	2
rejeya	259846d	51	50	f	320	72	25	1
kamalika	266602d	22	58	f	260	73	41	1
syeda	270432d	22	57	f	420	74	25	2
hridoy	250178d	21	50	m	145	75	24	1
nasrin	272016d	34	73	f	195	76	13	2
sisir	270398d	29	60	m	240	77	34	1
andrews	264919d	50	66	m	150	78	16	1
rahul	251005d	20	60	m	325	79	24	1
hazi md	271282d	61	60	m	155	80	17	2
selvam	268565d	46	65	m	220	81	7	2
kamrul	273547d	45	60	m	185	82	13	2
priyanka	258296d	28	47	f	120	83	18	2
mofik	267248d	34	60	m	180	84	13	1
tetru	260852d	41	70	m	330	85	18	1
piu	269953d	23	50	f	190	86	14	1
gumni	274252d	52	38	f	90	87	24	1
dipali	269410d	51	55	f	140	88	15	2
subas	268936d	50	71	m	180	89	9	1
rinku	273852d	26	50	f	125	90	15	1
sitala	274793d	52	45	f	315	91	25	1
Kumar	272920d	53	77	m	130	92	12	2
sabithra	271167d	33	55	f	270	93	10	1
biswajit	277045d	22	47	m	135	94	12	2
mina saha	279713d	57	67	f	135	95	12	1
kurien	270109d	30	61	m	270	96	12	1
poonam	274894d	24	51	f	210	97	7	1
debtosh	256683d	37	60	m	255	98	15	2
avijit	025095d	29	71	m	120	99	25	2
md abdul	274128d	43	65	m	180	100	8	3
haru gorai	277748d	42	47	m	420	101	14	1
kaushal	205737d	24	40	m	210	102	17	1

poonam	274894d	24	52	f	275	103	20	1
bijoli	282211d	44	55	f	300	104	9	2
rehana	276773d	53	76	f	240	105	20	2
binita	281912d	22	36	f	220	106	21	1
hussain	274343d	50	72	m	285	107	26	1
jayanta	276458d	47	52	m	310	108	20	2
harikishan	287284d	21	60	m	225	109	3	2
madhuri	282778d	38	70	f	300	110	9	1
tapan	293066d	22	46	m	185	111	19	2
palani	299209d	60	58	m	200	112	9	2
manoranj	276932d	34	45	m	105	113	22	1
samir	196995d	45	70	m	270	114	20	1
sanjay	300919d	38	65	m	295	115	15	2
abdul	276991d	38	67	m	185	116	12	2

no: cough	sed 0	sed10	B. SBP	B.DBP	B.MBP	B.HR	SD. SBP	SD.DBP
5	2	1	110	80	90	80	114	78
3	2	1	140	90	107	80	98	53
10	1	0	106	60	75	90	105	55
5	2	1	130	80	97	80	120	72
3	2	1	120	70	87	88	122	73
2	2	2	130	90	103	78	101	64
8	2	2	130	80	97	82	93	63
10	1	0	110	80	90	80	130	93
4	2	1	140	100	113	84	92	57
1	2	1	140	90	107	92	94	53
2	2	1	134	80	98	120	106	61
0	0	0	108	77	87	79	107	75
3	2	2	110	70	83	100	93	54
0	0	0	100	68	79	98	79	46
6	2	2	130	90	103	80	109	68
2	2	1	126	86	99	83	102	50
0	2	1	110	76	87	83	109	60
10	2	1	104	68	80	78	103	58
6	2	2	120	80	93	86	112	50
5	2	1	140	90	107	72	108	62
0	2	1	110	76	87	78	102	55
7	1	1	110	92	98	96	114	71
3	2	1	150	80	103	64	139	77
					0			
1	2	1	114	68	83	70	89	42
2	2	2	120	90	100	90	124	78
10	0	0	140	90	107	88	121	76
3	2	1	140	90	107	84	100	60
4	2	2	140	90	107	94	108	73
7	3	2	130	90	103	102	103	57
2	1	1	100	70	80	82	114	67
6	2	1	140	80	100	101	120	81
1	0	0	140	80	100	90	120	75
8	2	1	120	80	93	72	108	66
9	2	2	130	90	103	88	91	40
1	1	0	120	90	100	92	115	57
7	2	1	120	90	100	84	122	75
10	1	0	110	60	77	80	117	66
1	0	0	140	80	100	88	92	60
1	1	0	120	80	93	79	85	62
7	2	2	140	90	107	100	92	55
3	1	0	130	80	97	96	96	46
7	2	2	130	80	97	63	98	59
1	2	1	110	80	90	80	115	68
8	2	1	110	70	83	80	82	54
4	1	0	110	80	90	80	85	58
10	1	0	130	80	97	86	113	67
6	3	2	122	90	101	86	102	79
10	2	1	120	86	97	70	91	55
6	1	1	124	76	92	70	92	52

2	1	0	150	80	103	76	100	53
1	2	1	140	80	100	80	96	47
3	2	1	130	90	103	88	99	67
2	2	1	130	80	97	84	97	55
0	0	0	130	90	103	78	94	45
0	1	0	128	94	105	74	72	45
5	2	2	110	80	90	80	96	56
0	0	0	120	70	87	118	109	57
6	0	0	150	90	110	78	121	50
2	3	2	120	80	93	70	100	64
3	2	2	120	80	93	68	74	35
2	3	2	110	70	83	86	130	64
0	2	2	120	80	93	82	97	60
0	2	2	130	90	103	82	107	48
2	1	1	160	100	120	90	84	66
22	0	0	130	80	97	80	120	67
0	2	2	110	70	83	68	120	57
5	3	2	100	70	80	100	102	70
					0			
10	3	3	150	90	110	100	100	44
3	3	3	130	90	103	72	110	76
0	3	2	104	70	81	90	110	68
10	2	1	100	80	87	88	90	60
1	3	3	110	70	83	68	96	53
8	3	2	120	80	93	84	100	63
0	3	3	100	70	80	84	96	51
1	2	1	120	70	87	80	97	52
2	3	3	100	70	80	76	96	58
10	3	1	130	80	97	80	84	62
8	3	2	110	70	83	86	143	76
2	3	2	120	90	100	100	76	49
8	2	1	110	70	83	84	97	61
3	2	2	130	70	90	72	89	46
3	0	0	130	70	90	88	101	61
3	0	0	120	80	93	88	75	49
0	3	3	140	80	100	88	117	60
4	2	2	130	80	97	88	100	47
3	1	1	130	90	103	82	82	46
1	2	2	110	70	83	80	74	53
0	3	3	118	76	90	98	79	48
7	1	0	120	80	93	64	110	64
1	2	1	130	84	99	78	127	63
4	3	1	120	86	97	102	108	54
0	1	0	110	80	90	80	126	63
1	3	1	130	90	103	88	91	58
4	3	1	108	70	83	86	92	46
5	3	2	119	64	82	100	118	65
10	1	1	110	80	90	68	100	58
10	1	1	118	76	90	76	130	64
0	3	2	110	70	83	82	109	67
4	2	1	110	80	90	88	87	42

1	2	2	100	60	73	86	116	68
6	1	0	130	70	90	80	121	63
6	3	1	156	94	115	92	99	59
1	0	0	100	70	80	80	80	51
2	3	3	140	94	109	86	78	45
9	3	3	120	70	87	84	81	43
9	0	0	110	80	90	80	105	67
1	3	2	100	70	80	92	99	63
8	1	0	110	70	83	68	108	68
10	3	2	140	80	100	85	122	62
2	2	1	100	70	80	90	82	43
1	2	0	130	80	97	72	90	38
3	1	0	120	84	96	86	100	51
3	3	2	110	76	83	80	90	66

SD.MBP	SD.HR	Pre.SBP	Pre.DBP	Pre.MBP	Pre.HR	P1SBP	P1DBP	P1MBP
90	103	108	71	83	102	131	83	101
66	106	106	61	78	110	122	84	65
71	110	111	60	75	112	120	68	85
88	106	120	71	89	100	137	84	106
92	101	123	70	91	103	125	72	92
78	83	108	62	79	90	147	83	106
75	82	104	69	83	90	156	88	118
106	106	122	84	105	87	137	92	109
70	109	109	63	78	118	124	69	91
67	122	99	53	69	128	131	88	103
71	101	104	51	70	80	116	59	83
90	80	122	87	102	81	166	98	127
70	93	101	57	75	86	122	70	94
60	116	89	54	69	121	120	69	86
84	80	92	55	69	72	115	64	82
69	100	110	51	71	110	112	58	77
76	91	122	64	85	97	115	65	86
71	105	95	52	67	102	158	75	103
74	111	116	50	72	108	154	66	99
78	95	105	60	76	85	127	70	91
70	80	154	74	101	81	178	93	127
89	74	125	78	98	73	144	77	101
104	77	130	68	94	81	132	71	100
55	84	137	58	82	85	141	70	93
94	106	131	71	88	103	164	92	113
94	97	113	63	81	89	135	88	101
74	82	123	64	89	81	122	67	87
87	88	109	76	90	86	132	82	102
73	133	132	73	93	139	140	76	99
83	119	138	87	102	128	134	81	97
98	95	120	77	95	94	147	91	110
95	78	123	74	94	77	145	90	83
97	89	115	67	82	80	143	81	99
57	80	120	53	74	111	152	72	98
77	77	133	62	86	78	200	90	128
90	103	126	85	108	94	123	80	95
83	109	119	66	86	114	137	80	98
73	106	109	66	87	85	115	70	90
69	73	103	75	85	76	165	112	132
71	81	96	53	71	82	94	45	65
63	109	98	49	66	107	141	69	90
72	70	114	70	85	75	127	80	95
80	104	105	71	78	106	124	75	85
62	85	111	60	73	87	101	62	74
64	74	104	60	78	73	125	78	97
81	87	102	57	72	82	156	97	122
90	92	128	75	96	94	128	73	96
67	64	112	74	92	63	104	77	92
63	95	118	63	79	86	119	70	94

71	80	113	59	79	76	149	80	109
65	64	118	45	73	71	123	46	73
78	82	128	83	97	90	128	82	93
69	104	98	60	73	105	104	62	77
59	84	103	48	63	89	119	62	82
54	80	94	55	70	80	150	91	116
69	120	112	52	72	97	91	59	69
75	91	128	70	91	76	131	76	99
73	90	174	75	107	125	143	85	105
77	82	99	71	83	78	135	85	104
49	75	78	37	52	78	83	40	57
81	62	130	59	80	58	128	62	82
73	86	103	64	78	81	154	96	115
66	63	112	55	74	74	114	60	83
73	93	122	75	94	90	136	89	110
86	69	119	64	82	67	144	80	104
80	87	125	61	86	91	136	66	89
81	122	110	72	85	106	134	75	91
61	101	108	49	66	105	130	70	
92	75	100	70	84	68	148	64	93
85	89	112	66	87	96	129	65	87
69	106	100	50		110	106	56	
67	77	104	51	66	63	136	75	
78	72	106	67	83	62	127	76	97
64	110	103	55	69	103	126	72	88
68	92	104	55	71	92	158	72	102
69	110	110	64	76	102	121	72	87
67	66	93	61	66	68	144	93	105
101	72	134	70	92	76	166	89	118
60	89	102	62	79	94	128	75	99
74	103	101	66	78	105	107	67	84
64	85	97	49	70	83	107	57	75
75	93	116	74	90	109	124	77	95
58	97	82	52	62	98	123	64	83
81	87	120	84	88	87	164	82	118
63	108	130	59	79	112	166	85	112
57	49	94	52	68	53	132	69	97
60	107	86	56	68	101	101	64	77
60	97	118	68	89	102	152	84	113
82	58	114	67	86	57	167	85	114
86	95	130	71	92	90	144	90	109
74	87	107	68	83	90	127	84	89
82	70	130	66	84	85	167	89	115
71	80	100	65	79	80	111	71	88
59	119	94	45	59	107	108	53	70
82	100	123	63	84	104	128	66	86
72	105	99	55	70	105	145	76	98
80	110	132	62	80	113	153	82	105
81	107	104	65	78	108	144	89	108
57	86	86	40	56	87	116	60	81

83	86	130	78	96	89	116	69	90
84	60	115	77	94	68	130	73	97
76	73	114	61	83	91	128	72	97
64	110	94	56	72	106	96	60	71
56	71	83	48	60	71	109	59	79
57	120	116	63	82	125	108	70	87
81	100	116	68	84	94	112	70	79
79	100	113	73	90	103	132	84	101
83	95	130	80	100	82	134	83	106
81	97	102	54	68	86	158	72	103
54	95	76	40	51	94	117	64	85
51	90	94	38	53	93	141	67	89
66	85	105	50	67	78	130	76	93
54	90	86	65	49	88	101	69	53

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P1HR	P2SBP	P2DBP	P2MBP	P2HR	P3SBP	P3DBP	P3MBP	P3HR
102	127	82	98	103	130	82	100	102
110	109	56	68	112	114	68	87	118
133	115	63	80	126	116	62	79	126
89	136	79	102	91	126	72	93	104
102	128	77	97	102	145	92	124	106
102	158	87	111	102	151	81	106	102
87	164	91	122	88	168	92	124	85
103	160	98	119	87	139	97	105	100
126	138	81	101	124	136	80	99	123
128	127	82	98	129	123	80	98	123
108	119	63	86	112	117	61	84	112
89	164	97	124	90	160	96	123	86
94	102	65	82	99	114	70	89	83
119	112	70	107	119	103	68	82	119
90	138	83	106	139	139	84	103	145
112	112	59	78	110	113	59	79	110
104	118	63	85	93	122	61	84	89
106	147	71	97	104	146	73	97	100
112	136	58	87	114	139	59	89	114
90	124	70	90	90	135	82	101	89
92	177	92	124	87	175	90	124	90
79	154	78	104	79	160	77	106	85
82	145	74	106	80	149	75	108	80
80	126	58	80	89	128	58	81	85
121	147	83	107	114	156	86	111	112
107	125	75	98	98	122	70	90	101
75	106	61	77	69	111	59	76	69
89	127	73	94	88	139	81	102	87
137	135	78	101	145	140	80	102	139
130	133	81	97	120	143	84	104	118
91	153	100	118	91	154	99	124	89
75	165	93	126	90	147	87	104	90
94	122	70	88	99	130	69	88	78
112	118	65	84	111	125	65	86	111
90	171	81	116	90	150	77	107	87
99	129	86	105	90	138	86	107	91
121	135	75	95	115	126	73	93	112
102	123	75	95	102	121	72	90	99
82	181	136	140	87	157	107	128	87
86	120	80	88	87	112	58	81	87
128	119	61	82	116	148	68	92	129
83	132	70	94	70	125	74	94	72
94	122	79	89	92	120	58	61	92
85	113	58	72	82	117	61	76	82
104	120	67	90	94	114	62	84	101
106	130	84	109	111	155	85	113	114
100	131	81	103	100	130	78	100	101
69	127	78	100	61	128	79	101	73
89	124	75	96	88	136	78	101	90

79	144	89	109	80	154	70	102	76
73	104	41	63	73	115	44	68	73
97	120	54	82	96	125	85	99	94
120	105	65	81	119	97	60	72	109
104	114	64	82	106	128	73	91	105
94	149	88	115	94	144	85	112	96
116	109	53	73	90	114	49	73	86
106	140	88	111	102	135	86	107	88
128	178	90	125	125	188	85	127	106
78	117	91	106	79	145	84	110	79
94	87	43	58	95	87	43	58	95
60	116	52	79	65	127	64	86	62
97	140	86	109	95	127	67	94	92
60	113	57	81	56	115	56	80	52
98	141	91	109	97	142	92	110	96
84	153	84	110	75	149	83	105	73
111	115	56	76	100	120	53	76	90
120	130	73	91	84	128	73	89	90
120	128	67	85	129	129	66	86	129
89	147	72	99	88	161	73	100	90
81	135	70	91	76	132	67	92	76
111	123	62	80	113	122	62	80	118
98	120	66	83	98	120	60	80	94
78	118	71	92	77	122	72	94	77
110	120	70	85	108	121	70	85	108
93	133	95	109	92	139	68	93	95
114	124	63	83	88	129	59	84	82
88	136	88	99	84	138	85	97	80
117	155	79	105	99	142	70	96	86
102	127	76	98	102	131	78	100	103
108	103	69	84	111	103	68	83	110
108	110	75	85	105	116	85	88	100
109	123	72	92	103	122	74	93	100
130	122	61	80	122	118	61	80	123
93	158	80	117	90	170	84	122	89
115	148	70	99	112	150	71	98	114
60	142	70	100	61	142	74	102	61
116	88	58	70	115	94	58	70	122
116	154	85	115	115	159	79	114	111
68	180	94	124	71	179	89	119	66
110	123	73	94	111	129	75	95	111
87	113	74	84	87	119	70	88	87
90	152	82	104	86	150	80	100	87
88	108	69	86	89	122	77	96	88
114	103	48	65	111	104	47	64	109
98	127	61	86	98	127	60	82	99
111	143	83	100	107	144	82	100	107
123	162	86	111	130	151	81	102	126
110	145	79	106	113	146	86	108	104
114	110	50	68	109	118	52	74	109

80	120	72	94	82	126	69	92	79
55	129	72	95	55	126	70	93	54
99	126	70	95	92	134	71	99	85
126	90	63	74	129	96	67	76	128
86	116	62	84	78	112	62	83	74
126	118	70	92	124	119	69	90	123
84	112	70	79	84	111	68	78	82
108	117	74	90	105	112	69	87	100
98	132	86	107	97	140	85	109	95
84	165	71	104	86	158	68	99	87
85	117	64	85	84	127	67	89	80
102	147	73	98	99	151	73	98	90
88	134	74	95	90	131	70	91	92
92	128	90	68	87	126	66	87	87

P4SBP	P4DBP	P4MBP	P4HR	P5SBP	P5DBP	P5MBP	P5HR	Fe-Ex
129	79	98	102	129	81	98	103	115
130	68	93	102	116	65	82	115	122
119	64	82	126	114	58	77	128	61
129	75	97	92	125	76	96	90	115
123	78	93	113	129	72	94	114	56
151	81	106	102	145	79	101	102	40
164	89	121	84	163	89	122	84	58
130	87	108	84	129	89	107	92	109
134	77	97	127	136	80	95	122	85
139	80	102	134	131	78	100	131	70
119	59	82	112	123	60	83	110	96
152	96	120	86	150	93	118	85	66
120	69	92	78	118	68	91	76	70
112	69	85	115	106	63	82	117	32
136	80	104	74	134	82	101	72	182
114	60	80	109	116	61	79	108	32
120	60	82	87	117	59	81	82	60
145	72	97	96	140	69	94	95	73
135	58	86	114	137	58	85	113	27
130	71	93	89	130	68	89	88	77
173	88	122	81	170	85	119	81	40
161	79	107	86	160	77	105	86	54
151	75	109	78	149	74	107	76	217
128	58	80	84	132	52	82	82	101
157	81	101	103	154	80	107	118	125
123	70	90	91	133	76	101	81	215
150	63	81	65	117	63	83	83	75
129	73	94	84	125	74	95	81	193
140	77	100	135	147	74	100	132	58
144	87	106	118	137	86	104	118	119
157	96	122	90	149	93	119	89	223
144	82	100	87	149	76	106	89	100
135	76	96	79	130	72	90	98	50
140	67	90	110	143	67	92	109	187
169	78	114	87	170	78	113	86	68
116	79	91	96	107	78	89	95	98
143	76	100	110	137	77	97	112	54
126	67	93	99	125	75	94	102	79
164	110	132	87	163	109	130	87	75
121	61	84	86	118	61	65	87	88
128	66	87	107	136	66	87	119	72
125	78	95	72	126	72	92	72	72
108	62	74	93	98	69	72	93	89
112	57	75	81	106	58	72	82	92
119	67	88	103	119	64	87	94	71
144	87	110	113	145	87	108	118	57
114	65	86	102	110	63	82	102	123
136	71	98	74	126	78	101	77	75
137	91	111	96	123	80	99	105	62

144	74	101	77	144	74	101	74	60
109	43	66	73	116	46	71	73	82
128	87	107	98	128	83	97	90	179
82	51	65	125	90	58	71	95	60
128	73	92	105	130	76	95	103	70
142	81	108	97	140	79	105	96	65
106	57	71	86	114	55	77	103	183
134	87	107	83	133	86	108	81	85
171	83	114	111	187	83	122	95	109
147	86	111	80	144	87	110	75	91
86	43	58	95	87	42	58	95	36
126	64	85	59	130	72	90	61	30
137	80	101	97	147	84	105	109	71
113	54	78	51	115	52	77	50	68
132	95	111	94	138	98	112	94	121
149	85	110	73	152	80	107	72	68
121	47	72	86	116	44	67	77	75
124	74	90	101	123	71	86	106	200

128	64	84	128	133	67	87	126	58
147	72	67	80	147	67	95	79	70
132	67	92	73	134	64	92	73	97
123	62	80	115	124	63	81	115	89
128	68	82	88	132	65	85	87	68
120	74	94	77	119	77	97	80	56
121	70	85	109	117	65	81	107	91
141	68	92	94	142	68	92	93	185
130	62	84	78	128	61	83	93	66
129	81	92	80	129	78	89	79	163
145	70	96	86	149	72	99	85	72
134	88	108	104	134	80	104	107	79
103	67	84	110	104	67	84	106	76
102	62	78	98	105	59	80	95	52
121	70	91	101	120	70	90	100	153
126	62	82	126	120	62	81	127	86
167	78	116	84	171	73	111	76	52
144	69	96	114	138	65	92	115	163
148	79	109	60	150	79	108	64	65
96	56	71	124	95	57	71	122	41
150	78	109	110	147	76	106	109	113
188	93	122	65	185	92	122	63	71
127	73	93	111	122	72	91	112	75
120	70	90	86	122	74	96	88	47
156	81	103	98	155	78	101	119	53
122	80	98	87	118	78	95	89	92
104	45	63	109	105	46	64	110	39
127	61	81	97	131	61	83	100	56
151	85	90	106	130	72	90	106	71
155	83	106	125	149	79	102	125	55
137	83	103	106	137	87	105	111	69
110	56	76	110	118	54	77	112	72

130	72	94	78	132	75	98	78	64
124	71	92	56	123	69	91	54	53
139	70	100	80	141	71	101	82	70
99	68	79	126	97	62	74	128	85
118	69	90	74	115	62	84	73	57
122	68	90	123	127	65	89	120	66
114	69	79	83	120	69	80	84	46
119	72	90	101	121	74	92	101	84
161	86	113	92	151	89	115	94	38
163	70	101	88	162	68	99	89	51
125	66	88	80	125	125	64	87	53
151	71	97	91	145	67	91	88	125
118	67	85	94	127	68	91	87	42
126	66	87	87	126	68	90	87	71

Fe-Rev	Vec-Ex	Vec-Rev	Sd-Ex	Iso-Ex	Plasma1	plasma2	code
86	42	13	33		0.7		A
118	47	23	29		0		B
45	24	8	22		0.57		A
99	30	14	18		0		B
47	31	22	15		0		C
25	30	15	20		0.308		A
42	23	7	19		1.06	0.86	C
87	33	11	27		0	0	B
76	20	11	15		0.86		A
59	29	18	25		1.14	0.68	C
77	91	72	27		0.68	0.43	C
39	41	14	30		0	0	B
52	37	19	22		0	0	B
17	37	22	17		0.52	0.39	A
163	36	17	3		1.02	0.56	A
27	22	17	14	52	0.35	0.31	A
45	28	14	20	60	0	0	B
45	44	16	31	73	4.692	0.454	C
30	19	12	10	57	0	0	B
61	27	11	19	77	0.617	0.383	C
14	32	6	30	60	0.762	0.664	C
33	31	10	24	54	4.82	4.25	A
204	27	14	17	52	0.6	1.46	C
73	51	23	36	51	0	0	B
110	31	16	21	37	0	0	A
190	65	40	26	70	0.92	0.74	C
64	33	22	21	73	0.25	0.27	B
145	68	20	50	87	0.86	0.68	A
50	18	11	10	52	0.941	0.857	A
101	46	29	22	86	0.517	0.722	C
200	43	20	28	99	0.88	0.66	A
88	30	18	15	65	0.27	0.26	B
33	32	15	20	60	0.63	0.58	C
168	40	19	23	58	0	0	B
60	28	20	14	68	0.73	0.8	C
86	35	23	16	98	0.87	0.71	A
47	24	17	11	42	0	0	B
67	39	27	17	80	2.2	1.8	C
58	30	13	19	45	0.64	0.49	A
75	53	40	20	72	0	0	B
54	39	21	26	73	0	0	B
52	31	11	23	71	0.72	0.87	C
75	35	21	19	79	2.59	insufficient	A
83	28	19	17	91	1.4	1.22	C
52	56	37	24	56	0	0	B
42	45	31	20	55	1	0.6	A
104	27	8	23	88	0	0	B
62	28	19	22	76	0.84	0.79	A
46	35	19	25	58	0	0	B

42	30	12	26	57	0.59	0.41	C
69	32	19	21	82	0.54	0.26	A
172	24	17	14	60	0	0	C
52	17	15	12	60	0	0	B
56	25	9	18	65	0	0	A
53	50	38	20	60	0.24	0.27	A
167	43	27	20	58	0.48	0.39	C
75	50	40	16	80	0	0	B
92	39	22	21	99	0.79	0.7	C
80	54	45	16	58	1.94	2.4	C
17	36	17	22	66	0	0	B
25	20	15	14	40	0.75	0.55	A
52	51	32	24	71	0	0	B
42	38	12	28	63	0.88	0.57	C
107	31	17	19	51	0	0	B
53	28	13	23	71	0.7	0.52	A
61	30	16	17	70	0.78	1.1	C
163	57	20	47	200	1.33	1	A
					0.89	0.76	C
46	31	19	17	58	0	0	B
46	45	21	27	60	1.07	0.71	A
57	51	11	45	92	1.56	0.35	C
74	43	29	30	85	0	0	B
53	46	31	19	65	0.56	0.31	A
46	25	15	18	66	1.05	0.29	A
59	49	17	37	89	0	0	B
174	25	14	16	57	0.57	0.53	C
43	41	18	27	72	0.88	0.61	C
149	31	17	20	52	0	0	B
66	37	31	14	63	0.704	1.23	C
67	29	17	16	79	0	0	A
59	27	10	21	77	0	0	B
43	24	15	15	47	0.48	0.47	A
126	33	31	23	103	0	0	B
73	35	20	19	85	0.8	0.82	C
30	37	15	29	72	0.64	0.44	C
154	52	41	18	68	0	0	B
56	30	21	17	60	0.85	0.66	A
29	21	9	19	41	0	0	B
89	33	9	27	83	0.66	0	C
59	21	9	15	76	0.67	0.57	A
66	45	36	15	45	0	0	A
36	22	11	13	47	0.33	0.59	C
41	23	11	17	53	1.209	1.043	A
80	27	15	17	92	0	0	B
32	24	17	10	49	0.76	0.75	A
41	31	16	18	56	0	0	B
46	38	13	28	70	0.47	0.34	A
48	19	12	13	59	0	0	C
56	24	11	15	69	0.73	0.56	C
55	30	13	20	72	0	0	B

48	56	40	28	64	0	0	B
49	23	19	10	53	1.16	1.1	A
51	40	21	23	60	1.06	0.76	A
55	42	22	21	80	0.38	1.1	C
38	31	12	26	55	0.77	0.38	C
49	26	9	21	60	0.13	0.14	B
44	37	35	7	61	interferenc	2.74	C
79	19	14	11	84	0.82	1.39	C
22	30	14	22	62	0	0	B
43	20	12	9	51	0.67	0.59	A
30	36	13	26	53	0.57	0.45	A
106	34	15	25	60	0.86	0.63	C
28	32	18	19	62	2.13	0.28	B
61	17	7	14	68	0	0	B