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A Prospective Randomized Study of Percutaneous Tracheostomy versus Surgical Tracheostomy

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Abstract

Aim: Aim of study was to compare Percutaneous Tracheostomy (PT) and Surgical Tracheostomy (ST) both for complications, duration of procedure ,cost and easy of doing it. Objective of our study was to find out time taken to heal tracheal stoma. *Method:* 100 of Tracheostomy patients were randomly divided in to two groups (n =50 for both groups) with confidence level of 95%. Two consultants allocated 25 patients of each group for to do procedure. Procedure-related variables (length of skin incision, duration, difficulty), early complications like 'bleeding & trauma, pneumothorax, pneumomediastinum, subcutaneous emphysema, loss of airway', vitals, economic aspects were evaluated by the operating consultant. Procedure related (up to14 days) complications like local infection, haematoma & bleeding, trachea-innominate fistula, tracheo-esophageal fistula, were evaluated daily by consultant blinded to the technique used. Air leak closure/healing and long-term complications like cosmetic deformity, tracheal stenosis, tracheomalacia, delayed stomal healing were evaluated 3 months after decannulation by another consultant blinded to the surgical technique. *Results:* PT had more incidence of minor perioperative complications and ST had more long-term complications, statistical significance between two groups was absent. Time taken to perform PT and tissue trauma with PT were lesser than ST Group. Vitals were better maintained with PT Group. Air leak closure after decannulation was earlier in PT group and aesthetically, scar was smaller with PT group. *Conclusion*: PT was preferrable because of lesser duration of procedure, smaller incision with comparable complication rate and faster stomal healing.

Keywords: Complications; Cost; Healing; Percutaneous Tracheostomy; Randomized Trial; Surgical Tracheostomy.

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Introduction

Tracheostomy is one of the most frequent surgical procedures carried out in ICU [1]. Seldinger-based insertion method of PT was developed by Ciaglia and Colleagues [2] in 1985 Trachea is nearly cylindrical & flattened posteriorly, D shaped in cross section with incomplete cartilaginous rings anteriorly and laterally, a straight membranous wall posteriorly. Trachea measures about 11 cm in length and is chondromembranous. It starts from the inferior part of the larynx (cricoid cartilage) in the neck, opposite the C6 vertebrae up to intervertebral disk between T4-5 vertebrae in the thorax, where it divides into the right and left bronchi [3].

In early 20th century Chevalier Jackson introduced clear guidelines which made tracheotomy safer and

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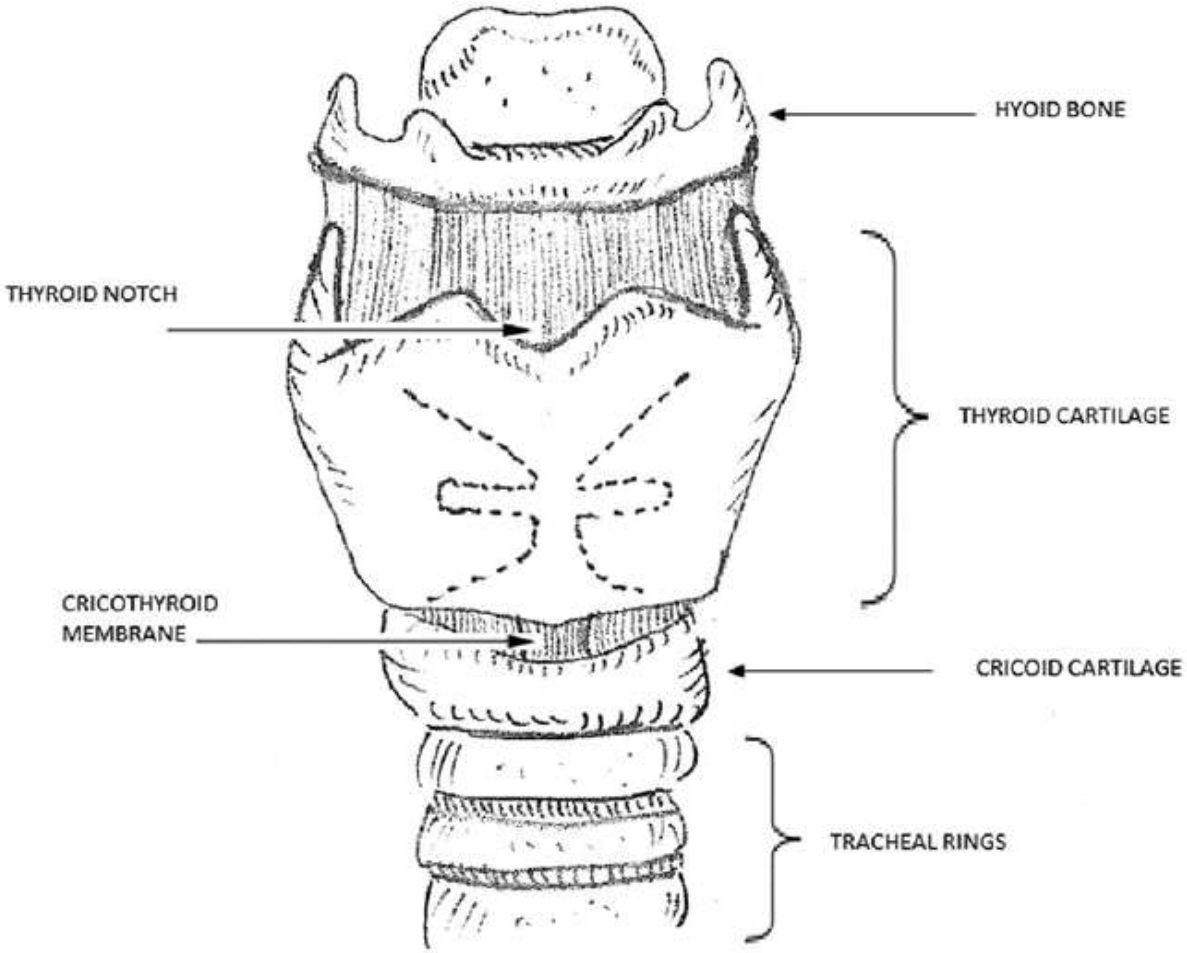

Photograph 1:

viable procedure. With advances in technology and increasing interest in minimally invasive procedures variations of the open tracheostomy have evolved over the last half a century [4].

Though Tracheostomy is safer, it is not without risk. Morbidity for Tracheostomy ranges from 4% to 10%, mortality is less than 1% [5]. Better material and high volume-low pressure cuff in Tracheostomy Tube (TT) has resulted in lower morbidity. PT was invented to reduce morbidity and mortality .

There are two popular techniques of PT-One with series of dilators and second with Guidewire Dilating Forceps which we choosed.

PT can be done blindly or by Bronchoscope which is technically difficult and causes interruption in ventilation. But reduced trauma to trachea and oesophagus by using Bronchoscope out-weights potential risks. Aim of our study is to find out which of PT and ST is better than other.

Methods

Study was carried out in ICU and SICU with written informed consent with approval of hospital Ethical Committee.

Patient Selection

Patients who needed mechanical ventilation for cardiac, respiratory, neurological dysfunction for prolonged period, usually after seven to ten days of intubation on elective basis and who were not going to be extubated in another seven days atleast were included in study. Patients who needed mechanical ventilation due to acute respiratory distress and needed airway access in urgency but intubation was not feasible eg. supraglottic or glottic neoplasm, laryngeal trauma or stenosis, midface fractures were included in study.

Patients whose relatives were unwilling to give consent were excluded from study. Patients having local infection, history of irradiation of neck or short neck, obesity, distortion of anatomy of neck by hematoma, tumour, previous neck surgery, high innominate artery, severe coagulopathy, hemodynamic instability, poor prognosis were also excluded from study. Children below 12 years of age were also excluded from study. Situation where airway access was emergency & endotracheal intubation was feasible and of choice, was also barred from study.

For elective procedure , patients were kept NBM as per protocol (no Ryle's Tube feeding). Parameters to be monitored were ECG, SpO_2, Blood Pressure, Capnography during the procedure.

In both ST and PT, patient's shoulders elevated by shoulder rolls with head extension thus elevating the larynx and exposing more of the upper trachea. Skin from chin to below clavicle was made sterile by antiseptic solution and drapes were placed [6]. Antibiotic cover usually given before 30 to 60 minutes prior to planned procedure and given immediately in emergency situation .

ST usually done in Operation Theatre under General Anaesthesia and can also be done in ICU under Local Anaesthesia (lidocaine) with Sedation. After infiltrating vasoconstrictor (adrenaline 1:100000), skin over the 2nd tracheal ring identified, a vertical incision about 3 cm in length required caudally. Care was taken for to avoid cutting deeper tissue of thyroid isthmus and large neck veins. Sharp dissection was carried out to cut subcutaneous tissue and platysma muscle. Bleeding was controlled by hemostasis, ties and electrocautery. Blunt dissection parallel to the long axis of trachea was carried out up to trachea with retracting strap muscles laterally. If thyroid gland lies superior to the 3rd ring of trachea, it was retracted superiorly. Isthmus retracted cephalad and rarely divided with a tie. Once trachea was reached after dissecting pretracheal fascia, ring was lifted with tracheal hook and two circumferential sutures were placed around the third tracheal ring bi-laterally. The portion of the trachea between second and fourth tracheal ring cut with traction by laterally placed sutures, leaving behind a hole in the anterior tracheal wall. Tracheostomy Tube (TT) inserted through hole with giving counter traction to trachea with sutures. Sutures kept in place to assist re-insertion in case of accidental removal of TT. TT was secured by sutures and tapes around neck

For PT , after giving position ,vertical skin incision was made without sharp dissection beyond the skin incision. Endotracheal tube (if intubated) was withdrawn enough to place the cuff at the level of the glottis. A specially designed catheter with needle inside, attached to fluid filled syringe was inserted vertically in to trachea through incision usually between second and third tracheal ring with constantly negative pressure on syringe plunger. Position in to trachea was confirmed by air withdrawn in to syringe and by bronchoscope, both. Bronchoscope was not used in cases where primary pathology involved larynx. Needle was withdrawn keeping catheter inside the trachea. Guide wire was inserted downward in to trachea through catheter. Catheter was removed. Dilator was used to dilate the tract over the guide-wire. Dilator was removed and then sharp tipped specially designed dilating forcep was passed over the guide-wire inside trachea, it was spread to create path up to tracheal stoma. Forcep was removed keeping guide-wire in situ. A TT was placed over guide-wire through the passage created. Placement of the tube was confirmed again by visualizing the tracheo-bronchial tree by endoscope through tube. TT was secured to the skin with sutures and tape.

Data was analyzed using Graphpad quick-cals software. *P* value was reported at the 95% confidence interval and *P* value < 0.05 was considered significant.

Photograph 2:

Photograph 3:

Results

PT group had 33 males and 17 females , while ST group had 35 males and 15 females.

ST group had 49 patients who were on ventilator with ETT and 1 patient of laryngeal pathology. PT group had 48 patients who were on ventilator with ETT and 2 patients of Emergency Tracheostomy with laryngeal pathology and facial trauma.

One patient of PT group was converted in to ST and that patient had taken longer time for executing Tracheostomy.

Average length of skin incision in ST group was 3 cm, while PT group had skin incision of around 2 cm which was quite smaller.

In corporate hospitals cost of ST is anywhere between Rs 15000 to 20000 and higher ,while cost of PT was around 12000 Rs. Use of operation theatre, anaesthetists, man power rendered ST costlier in corporate hospitals.

PT was more easier to perform than ST, as per our experience. Preprocedural preparation was less with PT. Less man power needed in PT group.

Both the group had maintained vitals, but PT group had less incidence of fluctuations. Eight patients of ST group had rise in pulse and blood pressure above 20% of baseline, while two patients of PT group had rise in pulse and blood pressure above 20% of baseline. One patient of PT group had desaturation while doing Bronchoscopy .

We observed bleeding in both the Group was of minor type and could be easily handled. In one patient of PT Group, patient had developed hematoma around the Tracheostomy site, which was self limiting and did not alter outcome .

Three patients of each Group had developed local cellulitis at stomal site, which responded to antibiotics. Four patients of ST Group and five patients of PT Group had developed Pneumonia over period of time, which was difficult to ascribe to the procedure as it could be due to varied etiology. In one patient of PT group, while we were advancing the needle with negative aspiration, we aspirated blood before entering in to trachea , may be due to accidentally traversing the vessel probably the artery. We abandoned the procedure and converted in to ST.

Table 1: Indication for Tracheostomy

Group	Prolonged Mechanical Ventilation	Emergency Tracheostomy
ST	49	1
PT	48	2

Table 2: Average Time Taken for Procedure (From Skin incision to insertion of TT, in minutes)

Group	Average Time
ST	21.8
PT	12.2

Table 3: Comparison of Complications

Early Complications	Group ST	Group PT	P value
Bleeding	8	7	P value 0.6531
Hematoma	0	1	
Pneumothorax	0	0	
Pneumomediastinum	0	0	
Subcutaneous - Emphysema	1	4	
Respiratory	0	1	
Infection Of Stoma	3	3	
TO Fistula	0	0	
Tracheo-innominate Fistula	0	0	
Failed attempt	0	1	
Late Complications			P value 0.1682
Tracheal Stenosis	1	0	
Tracheomalacia	0	0	
Cosmetic Deformity	2	1	
Delayed Healing	1	0	

A patient of PT group had pulled out TT due to his aggressive behaviour, which was reinserted with help of fibreoptic bronchoscope.

After decannulation and in patients who were still hospitalised, we had found air leak stopped average on 8th day in ST group, while in PT group air leak stopped on 6th day after decannulation. Wound healing was also faster in PT group.

Only eleven patients had turned up for follow up . So it was difficult for us to get accurate data of long term complications from selected patient population. Out of seven patients of ST Group who had come for follow up, one patient had tracheal stenosis causing stridor on exertion and two patients complained about unesthetic scar and one patient had delayed stomal healing. Patient of delayed stomal healing was given surgical treatment for closure of stoma . Three patients of ST group had complained about depression at stomal site after healing. Out of four patients of PT Group who had come for follow up, one patient had complained of keloid formation .

Discussion

We had chosen dilation technique using forceps in Seldinger fashion for PT ,though many reports suggested that technique with serial dilators was used more commonly [7] without any proven advantage over forcep technique .In our study , we had converted endotracheal intubation in to tracheostomy as mode of airway access on individual basis usually after seven to ten days of endotracheal intubation and mechanical ventilation. Angus DC had shown that Tracheostomy should be instituted after around 10 days of initiation of mechanical ventilation by endotracheal intubation [8].

A patient who has an upper airway obstruction with can not be intubated - can not be ventilated condition, must have an immediate artificial airway [9]. There are several case reports of successful PT in an emergency situation [10] .

When Tracheostomy performed in Obese patients, it can lead to massive bleeding and loss of airway, so We had excluded Obese patients from our study though few reports have shown safety .

Though PT found to be more safe and provided tight fit of the tract around cannula causing compression of small bleeding vessels, we had excluded patients with coagulation abnormalities from our study. Though a study by Veelo DP suggested that mild coagulation disorders (PT <20 seconds, Platelet count between 40-100.10^9 /litre, use of aspirin-clopidogrel) are no longer contraindications for the PT [11].

In our study, average time taken to perform PT was considerably lower than time taken to perform ST. A study by Farahanchi had similar observation [12].

In our study, PT group had smaller skin incision than ST group. A study by Claudin Gysin had similar results [13].

The cost was low because there were no operating room charges or anaesthetists fees [14]. The consultant's fee for tracheostomy was obviously lower with PT. The shorter operating time needed for PT was a cost advantage when done at the bedside. PT done using disposable kits under bronchoscopic guidance. In government run hospitals, PT more expensive than open surgical tracheostomy when both were done at the bedside [15]. While in corporate hospitals cost of ST is higher than the cost of PT.

Scheduling and preparation time for PT was lesser than ST. Assistant is always needed in ST group for retraction and keeping surgical field clear of blood. It was easier to perform PT than ST because lesser resources needed.

In our study, both group had almost comparable complications without any statistical significance. Vitals were maintained in both the Groups but PT Group had less fluctuations ST needed infiltration of lidocaine with vasoconstrictor, which might have resulted in rise in pulse and blood pressure. Four patients of PT group had mild subcutaneous emphysema around stomal opening, because ventilation was again initiated after confirmation of needle placement by bronchoscope.

As Tracheostomy patients are critically ill and many of them do not survive. This made it difficult to study its long term complications. One patient of ST Group had developed tracheal stenosis with more than 50% reduction in diameter by granulation tissue, he was sent to higher centre for further management. Scott K Epstein had recommended Tracheal Stenting for such cases [16] . We did not observe other long term complications of tracheostomy like tracheomalacia or tracheoinnominate artery fistula due to lack of follow up, but C A Grant had published a case report of trachea-innominate artery fistula following PT [17]. Incidence of cosmetic deformity was less and patient's acceptance in follow up was more for PT. A study by Kevin M Higgins showed that PT produced less scarring [18].

Though incidence of infection of stoma was same, PT was found to be better for cardiac surgery

patients who may develop mediastinitis with TT, initial reports suggested PT a better option for such cases [19].

There were reports of lower rates of acute complications under endoscopic guidance. However, there was no adequate data showing that endoscopic-guided tracheostomy was superior to the 'blind' one [20]. But for safety we preferred to confirm PT placement by bronchoscopy. Fibreoptic bronchoscope also proved helpful in case of accidental removal of TT. In one patient of PT group, there was accidental removal of TT on third day by aggressive patient . But it was immediately diagnosed. We immediately covered opening in the neck and started mask ventilation. SpO_2 went down to 91% from 98%. Fibreoptic bronchoscope was used to reinsert TT through immature stomal passage. Patient had mild subcutaneous emphysema for two days . As per Peggy A Seidman, maturation of stoma usually takes 5 days [21], before that reinsertion of TT is usually difficult .

One patient of ST group needed surgical closure due to persistent stoma, incidence of it varies between 4-8% as per various reports.

Conclusion

PT was done quickly with almost same early complication rate as ST with quicker healing and lesser long term complications.

References

1. Zetouni A, Kost K. Tracheostomy-a retrospective review of 281 cases. J Otolaryngoly 1994 Jan;23(3):61–66.
2. Bisanth Batuwitage, Stephen Webber, Alastair Glossop. Percutaneous Tracheostomy. Continuing Education in Anaesthesia, Critical Care and Pain-Oxford Journals 2014 March;34(3):1-5.
3. William A Johnson. Tracheostomy Tube Change. Medscape Journal Update: 2015.
4. Michael Omidi. Percutaneous Tracheostomy. Medscape 2016:110-118.
5. Heffner JE . Tracheostomy Application and Timing . Clinical Chest Med 2003 June;24(2):389-98.
6. Charles G Durbin Jr. Technique of Performing Tracheostomy. Journal of respiratory care 2005 May; 50(4):488-496.
7. Angel LF, Simpson CB. Comparison of surgical and percutaneous dilational tracheostomy. Clinical Chest Med 2003;24:423-9.
8. Angus DC. When should a mechanically ventilated patient undergo tracheostomy?. JAMA 2013 Dec; 309(20):2163-64.
9. Practice guidelines for management of the difficult airway: an updated report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway. Anesthesiology USA , Lippincott Williams & Wilkins. 2003;98(5):1269-77.
10. Ben-Nun A, Altman E, Best LA. Emergency percutaneous tracheostomy in trauma patients: an early experience. Ann Thorac Surg 2004 July; 77(3):1045-47.
11. Veelo DP, Vlaar AP, Dongelmans DA. Correction of subclinical coagulation disorders before percutaneous dilatational tracheotomy. Blood Transfusion 2012;10(2):213-20.
12. Farahanchi. Comparison of Percutaneous Tracheostomy and Surgical Tracheostomy. Scientific Journal of Hamadan University of Medical Sciences 2010 Nov; 17(2):17-23.
13. Claudin Gysin, Pavel Dulguerov, Thomas Perneger. Percutaneous versus Surgical Tracheostomy. Annals of Surgery 1999 Jan;230(5):708.
14. Irawan Susanto. Comparing percutaneous tracheostomy with open surgical tracheostomy. BMJ 2002 Jan ;22(4): 324:3-4.
15. Irawan Susanto. Comparing percutaneous tracheostomy with open surgical tracheostomy. BMJ 2002 Jan;22(4) 324:3-4.
16. Scott K Epstein . Late Complications of Tracheostomy. Resp Care 2005 Mar;50(4):542-549.
17. C A Grant, G Dempsey, J Harrison. Tracheo-innominate artery fistula after percutaneous tracheostomy: three case reports and a clinical review.British Journal of Anaesthesia 2006 Sep;96(1):127-31.
18. Kevin M Higgins. Meta-analysis –Comparison of Open versus Percutaneous Tracheostomy. The Laryngoscope. 2007 May;117(1):447-54.
19. Patel NC, Deane J, Scawn N. Reduction in tracheostomy-associated risk of mediastinitis by routine use of percutaneous tracheostomy. Ann Thorac Surg 2002 Jan;73(6):2033.
20. Sirak Petros. Percutaneous Tracheostomy. Journal of Critical Care 1999Aug;3(2):5-10.
21. Peggy A Seidman, Elizabeth H Sinz. Tracheostomy Management-A multidisciplinary approach. Springer 2006.p.76-77.

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To Compare and Evaluate Hemodynamic Effect of Propofol and Etofol as Induction Agents in Elective Surgeries

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Abstract

Introduction: Various intravenous induction agents like propofol, ketamine and etomidate are available now a day to the anaesthetist but they also cause attenuation of axis leading to a decrease in heart rate and blood pressure. To achieve haemodynamic stability during induction is one of the major challenge and goal of the anaesthetist. *Aims and objectives:* To evaluate the hemodynamic effect of propofol and etofol as induction agents in elective surgeries under general anaesthesia . *Material and Methodology:* Sixty (60) ASA grade I and II patients of age group (18-60 years) were divided randomly into two study groups of thirty patients each, as follows:

Group I-Propofol 2 mg/kg was given intravenously as induction agent

Group II-Etofol (0.15mg/kg etomidate and 1mg/kg propofol) was given intravenously as induction agent.

Results: In group II (Etofol) lesser fall in haemodynamic parameters at induction and upto 60 minutes ($p>0.05$)of induction as compared to group I (Propofol). *Conclusion:* Etofol is more haemodynamically stable than propofol alone during induction.

Keywords: Propofol; Etomidate; Etofol; Haemodynamic; Induction.

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Introduction

During induction the anaesthesiologist is mainly concerned with attenuating the stress response and maintaining haemodynamic stability. The concentration of catecholamines like adrenaline and noradrenaline are increased in response to the stimulus of laryngoscopy and intubation [1]. Laryngoscopy and intubation produces the stress response which leads to haemodynamic changes especially in patients with various risk factors like hypertension and ischaemic heart disease [2]. A wide range of intravenous induction agents is now available to the anaesthetist like ketamine, thiopentone, etomidate, propofol and etofol. They are used to lower the stress response to laryngoscopy and intubation and to maintain better hemodynamic stability at the time of induction and during surgery. Inductionagentshave side effects like vasodilation, myoclonic seizures, nausea, vomiting and attenuation of Autonomic Nervous System thereby decreasing blood pressure. Each intravenous anaesthetic induction agent affects hemodynamic changes differently. Propofol a non opioid,non barbiturate is a sedative agent which has a rapid

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onset and short duration of action with adverse effects like hypotension and injection pain [3,4]. It also leads to bradycardia by increasing the production and release of nitrous oxide [5]. Etomidate is a potent ,short acting anaesthetic which causes minimal histamine release and produces stable haemodynamics.But most common side effects with this drug are pain on injection, excitatory events and myoclonus [6]. The use of etofol as an induction agent are rare and studies which compare propofol and etofol as induction agent are also very few.

Aims and Objectives

To evaluate and compare the efficacy of propofol and admixture of propofol and etomidate (etofol) as induction agent in maintaining haemodynamic stability in elective surgery under general anesthesia.

Material and Methods

This prospective randomised double blind study was conducted in the Department of Anaesthesiology at our centre in India, after approval from the Ethical Committee on 60 patients of 18 to 60 years age, of either sex, of ASA grade I and II posted for elective surgeries lasting for approximately 2 hrs under general anesthesia. Patient having cardiac disease, hypertension, respiratory disease, cereberovascular disease, Mallampati grade III-IV, epilepsy and pregnancy were not included in the study. All patients were kept fasting for 8 hours prior to surgery and an informed consent was taken from the patients. In the operation theatre standard anaesthesia monitors were attatched. An 18 G intravenous cannula was secured and I/V fluid was started. Injection Midazolam 0.025 mg/kg i/v and Injection Nalbuphine 0.1mg/kg i/v were given as premedication. Patients were randomly divided in two groups and randomization was done by computer generated random number tables. Considering 95% of confidence interval and power of the test as 80%, sample size was calculated as 30 in each group. Group I received injection Propofol 2mg/kg i/v and group II injection Etofol (0.15mg/kg etomidate and 1mg/kg propofol) i/v for induction. All study drugs were prepared by the anaesthesiologist who was blinded to the details of the study. Injection Rocuronium 1.2mg/mg i/v was given as muscle relaxant. Laryngoscopy and endotracheal intubation was done by an experienced anaesthesiologist and duration of laryngoscopy was kept to less than 10 seconds. Proper placement of ETT was confirmed by capnography and bilateral auscultation of the chest. Anaesthesia was maintained with Isoflurane 1%-1.5% and equal mixture of Oxygen-Nitrous Oxide. Injection Rocuronium was given as intermittent boluses as and when required. The various haemodynamic parameters like heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure were measured before induction, at induction (i.e 0 minute) and at 1,2,5,10,20,30 and 60 minutes after induction by an anaesthesiologist who was blinded to the study.

Statistical Analysis

Data was analysed by computer software package SSPS version 20.0 for windows. Categorial data like gender was presented as number. Age, weight, heart rate and blood pressure as Mean ± Standard Deviation (S.D). Inter group comparison of blood pressure and heart rate was done using ANOVA. p value of <0.05 was considered to be statistically significant.

Results

The two groups were comparable in terms of age,weight and sex. (Table 1). The mean heart rate (H.R) atbaseline was 81.5±12.3 beats per minute in group I and in group II it was 81.2±11.8 which were comparable to each other and statistically non significant. The heart rate in group I decreased to 69.2±10.5 and in group II to 74.4±9.1 at 1 minute post induction.This difference was statistically significant ($p<0.05$). Statistically non significant difference was observed at 0 min and from 2 min till 60 minutes of induction (p-value >0.05) (Table 2). The mean systolic blood pressure (SBP) at baseline in Group I was 137.9±4.3, in group II it was 134.8±9.1 which were comparable to each other and statistically non significant (p value=0.122). Statistically significant fall in SBP was observed in group I at 0 minute (at time of induction) and at 1min, 2min, 5min,10min, 30min and 60 minutes of induction (p-value=0.000). In group I versus group II a significant fall in SBP at 0 min,1 min, 2 min, 5min, 10min, 30 min, and 60 minutes of induction (p value 0.000). (Table 3). The mean diastolic blood pressure (DBP) at baseline in Group I was 87.4±4.0, in group II it was 88.1±3.3 which were comparable to each other and statistically non significant (p value=0.539). Statistically significant fall in SBP was observed in group I versus group II at 0 minute, 1min, 2min, 5min, 10min, 30min and 60 minutes of induction (p-value=0.00) (Table 4). The baseline mean bloodpressure (MBP) in Group I was 104.3±3.9,and in group II it was 103.6±4.4 which were comparable to each other and statistically non

significant (p value=0.504). Statistically significant fall in MBP was observed in group I versus group II at 0 min, 1min, 2min, 5min, 10min, 30min and 60 minutes of induction. (p-value=0.000) (Table 5).

Discussion

General anesthetic induction agents cause hypotension via cardio vascular depression and suppression of the autonomic nervous system. On the other hand laryngoscopy and endotracheal

Table 1: Comparison of Demographic variables of patients in both the groups

Variables	Group I	Group II	P value	Statistical significance
Age (years)	37.62±9.06	37.60±9.64	0.265	NS
Gender (male/female)	20/10	18/12	0.279	NS
Weight (kg)	58.2±1.6	58.1±1.8	0.900	NS

Table 2: Comparison of Heart Rate between both the groups

Time	Group I (n=30)	Group II (n=30)	P value	Statistical Significance
Baseline	81.5±12.3	81.2±11.8	0.910	NS
O minute	73.0±11.4	75.8±9.2	0.273	NS
1 minute	69.2±10.5	74.4±9.1	0.035	S
2 minute	79.0±8.5	78.7±8.3	0.887	NS
5 minute	76.5±9.0	76.5±7.8	1.000	NS
10 minute	75.2±10.2	75.5±7.6	0.898	NS
30 minute	74.5±10.3	74.9±7.4	0.871	NS
60 minute	74.6±9.7	74.3±7.5	0.899	NS

Table 3: Comparison of Systolic Blood Pressure (SBP) between both the groups

Time	Group I (n=30)	Group II (n=30)	P value	Statistical Significance
Baseline	137±4.3	134.8±9.1	0.122	NS
O minute	102.2±8.1	126.4±10.1	0.000	S
1 minute	94.2±9.4	122.3±10.7	0.000	S
2 minute	94.8±7.4	128.8±5.6	0.000	S
5 minute	95.7±6.4	124.7±6.3	0.000	S
10 minute	96.7±6.5	125.0±6.5	0.000	S
30 minute	98.5±5.3	126.8±8.8	0.000	S
60 minute	99.6±5.5	125.8±7.0	0.000	S

Table 4: Comparison of Diastolic Blood Pressure (DBP) between both the groups

Time	Group I (n=30)	Group II (n=30)	P value	Statistical Significance
Baseline	87.4±4.0	88.1±3.3	0.539s	NS
O minute	58.1±6.2	81.4±5.4	0.000	S
1 minute	56.2±5.7	76.2±7.2	0.000	S
2 minute	57.7±5.5	81.0±5.2	0.000	S
5 minute	57.0±4.6	80.8±4.8	0.000	S
10 minute	56.5±4.2	80.0±4.7	0.000	S
30 minute	58.5±5.1	79.5±5.2	0.000	S
60 minute	58.0±4.4	81.3.±6.0	0.000	S

Table 5: Comparison of Mean Blood Pressure (MBP) between both the groups

Time	Group I (n=30)	Group II (n=30)	P value	Statistical Significance
Baseline	104.3±3.9	103.6±4.4	0.504	NS
O minute	72.4±6.4	97.3±5.6	0.000ss	S
1 minute	68.4±6.3	92.1±7.4	0.000	S
2 minute	69.6±5.1	97.4±4.4	0.000	S
5 minute	69.5±4.7	96.1±4.5	0.000	S
10 minute	69.6±4.1	95.7±3.5	0.000	S
30 minute	70.9±4.7	95.6±5.4	0.000	S
60 minute	71.6±3.8	96.0±4.7	0.000	S

intubation produces a vasopressor response like increase in the blood pressure and heart rate. Various attempts have been made to over come and attenuate hemodynamic instability during induction, larynoscopy, and intubation. In many studies induction agents, either alone or in combination have been used to achieve minimum cardiovascular effects. Now a days Propofol is preferred as an induction agent. Etomidate is used because it is haemodynamically stable intravenous induction agent. Recently Hacettepe University, reported that etofol which is a combination of etomidate and propofol can be used as an induction agent.

In our study there was a statistically significant fall in heart rate at 1 minute in group I versus group II. Propofol causes bradycardia due to release of nitrous oxide. In 2012 Pandey AK et al. did a study to compare the haemodynamic effects of propfol and etomidate at induction and also compared the serum cortisol levels in patients undergoing coronary artery bypass graft surgery. Patients were allocated randomly to receive either propofol or etomidate for induction and anaesthesia was maintained in both the groups with sevoflurane, vecuronium and fentanyl upto a total dose of 20μgm/kg.They found that etomidate is more haemodynamically stable in terms of heart rate, systolic blood pressur and diastolic blood pressure than propfol at induction,The serum cortisol levels in the propofol group increased more than two times and in the etomidate group decreaed to fifty percent on weaning from cardiopulmonary bypass [7]. In 2014 Supriya A et aldid a study comparing propofol and etomidate in patients undergoing general anaesthesia and found that patients who received etomidate showed little change in mean arterial pressure and heart rate in comparison to those who received propofol from the baseline value ($p>0.05$) [8]. Hosseinzadeh H et al. (2013) did a study comparing the effects of propofol, etomidate and etofol as a induction agents on haemodynamic stability after LMA insertion in elective surgeries on 90 patients of ASA grade I and II. In group P (propfol 2.5mg/kg), Group E (Etomidate 0.3mg/kg) and Group P+E (propfol 1mg/kg plus etomidate 0.2mg/kg). Heart rate, systolic blood pressure, diastolic blood pressure were measured before induction and 30 seconds after induction and found that there was a significant fall in systolic blood pressure in group1 (Propofol) in comparison to group II (Etomidate) and group III (Etofol) (p-value < 0.05). They found etomidate plus propfol as an effective alternative to profol and etomidate for facilitating LMA insertion with the added advantage lack of cardiovascular depression [9]

In our study statistically significant decrease ($p<0.05$) SBP, DBP, MBP in propofol group at induction and upto 60 minutes as compared to Etofolgroup. Propofol is used in dose of 1-2.5mg/kg. Etomidate is an imidazole ester used as an induction agent in dose of 0.3mg/kg. It causes less cardiovascular depression than propofol and a small reduction in cardiac output and blood pressure. But has adverse effects like myoclonus and adrenal suppression. The combination of propofol and etomidate helps to balance the decrease in haemodynamic variables caused by propofol alone as etomidate is more haemodynamically stable and the dose of propofol required is also less. Meena et al. (2016) compared the efficacy of three different anaesthesia induction agents (Propofol ,Etomidate and Propfol and Etomidate) in haemodynamic stability during induction and following endotracheal intubation in elective surgery. The patients were randomly placed into three groups.GroupI was induced with Propofol (2.5 mg/kg), Group II with Etomidate (0.3mg/kg) and Group III with Propofol 1mg/kg plus Etomidate 0.2mg/kg. There was significant fall in systolic blood pressure in group I (Propofol) as compared to group II (Etomidate) and group III (Etofol). Etofol was haemodynamically more stable as compared to propofol or etomidate alone at 1 minute of induction [10] Findings of our study are comparable with the studies of Hosseinzadeh H et al and Meena et al. OzgurYagan et al. in 2015did a study on 90 patients which were randomly divided into three groups of 30 patients each.Group P received propofol 2.5mg/kg, group E received Etomidate 0.3mg/kg and group PE received Propofol 1.5mg/kg plus etomidate 0.15mg/kg as induction agents and compared the various haemodynamic parameters and found etomidate propofol combination can be better alternative to either propofol and etomidate [11]. Findings of our study are comparable with OzgurYagan et al. Finding of our study are consistent with the study of Criado A et al in which significant reduction in stroke volume, cardiac output and MBP was found at various time intervals [12]. Moller et al. in their study on 48 patients used propofol or etomidate for induction of general anaesthesia and compared the MAP, cardiac index (CI) and systemic vascular resistance (SVR). The MAP was significantly higher in the etomidate group as compared to propofol group after induction [13]. The findings of our study are also consistent to the studies of Moller et al.

Etofol use as an induction agent is limited because it has to be prepared by combining propfol and etomidate and a readymade solution of etofol is not

available for use in patients . We did not measure the plasma cortisol levels and adrenal corticotropin levels in our study which was a limiting factor in our study.

Summary and Conclusion

The combination of propofol and etomidate (Etofol) has better hemodynamic stability than propofol alone. Thus Etofol can be preferred over propofol alone for induction of anaesthesia .

References

1. Russel W J, Morris RG, Frewin D B et al. Changes in plasma catecholamine concentrations during endotracheal intubation. Br J Anaesth 1981;53:837-9.
2. Montes FR, Giraldo JC, BetancurLA, Rincon JD, Rincon JE, et al. Endotracheal intubation with a light wand or a laryngoscope results in similar haemodynamic variations in patients with coronary artery disease.Can J Anaesth 2003;50:824-28.
3. Schaub E, Kern C, Landau R. Pain on injection: A double blind comparison of propofol with lidocainepre treatment versus propofol formulated with long and medium chain triglycerides. Anesth Analg 2004;99:1699-702.
4. Canbay O, Celebi N, Arun O, Karagoz AH, Saricaodlu F, Ozgen S. Efficacy of intravenous acetaminophen and lidocaine on propofol injection pain.Br J Anaesthesia 2008;100:95-8.
5. Rizny KL, Fija A, Kowska M, Przesmycki K. Effects of thiopental and propofol on heart rate variability during fentanyl based induction of genereal anaesthesia. Pharmacol Rep 2005;57;128-34.
6. Giese JL, Stockham RJ, Stanley TH, Pace NL, Nelissen RH. Etomidate versus thiopental for induction of general anaesthesia. Anesth Analg 1985;64:871-6.
7. Pandey AK, Makhija N, Chauhan S, Das S, Kiran U, Bisoi AK, Lakshmy R. The effects of etomidate and propofol induction on hemodynamicsandendocrine response in patients undergoing coronary artery bypass graftsurgery on cardiopulmonary bypass. World journal of cardiovascular surgery. 2012;2:48-53.
8. Supriya A, Vipin KG, Shashikala C, Vijay M, Birbalbrij, Alok K. A comparative study between propofol andetomidate in patients under general anesthesia. Rev Bras Anestesiol. 2016;66(3):237-41.
9. Hosseinzadeh H, Golzari SE, Torabi E, Dehdilani M. Hemodynamic changes following anesthesia induction and LMA insertion with propofol, etomidate, and propofol + etomidate. J Cardiovasc Thorac Res. 2013;5(3):109-12.
10. Meena K, Meena R, Nayak SS, Prakash S, Kumar A. A comparative study of effect of propofol, etomidate and propofol plus etomidate induction on hemodynamic response to endotracheal intubation: A RCT. J AnesthClin Res 2016;7:622. doi: 10.4172/2155-6148.1000622.
11. Ozgur Y, Nilay T, Ahmet K, Volgan H, Bulent SY. Haemodynamic responses to tracheal intubation using propofol, etomidate and etomidate propofol combination in anaesthesia induction.JCardiovac Thorac Res 2015;7(4):134-40.
12. Criado A, Maseda J, Navarro E, Avello F. Induction of anaesthesia with etomidate, hemodynamic study of 36 patients. Br J Anaesth. 1980;52(8):603-637.
13. Möller Petrun AI, Kamenik M. Bispectral index-guided induction of general anaesthesia in patients undergoing major abdominal surgery using propofol or etomidate: a double-blind, randomized, clinical trial. Br J Anaesth. 2013;110(3):388-96.