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RESEARCH ARTICLE

EVALUATION OF POSTOPERATIVE AIRWAY RELATED ADVERSE EFFECTS BY USING INTRACUFF DEXAMETHASONE VERSUS INTRACUFF ALKALINISED LIGNOCAINE – RANDOMISED DOUBLE BLIND CONTROLLED STUDY

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Abstract

Background Securing airway with ETT is the gold standard for General anesthesia(GA).This method confers the protection of airway from aspiration of gastric contents and facilitates positive pressure ventilation. However, post-intubation airway-related adverse effects are known to be caused by endotracheal intubation like postoperative coughing on the tube, restlessness, hoarseness and sore throat. Therefore this study was undertaken to reduce post intubation complications.

ObjectiveThestudy was conducted to compare intracuff dexamethasone and intracuff alkalinised lignocaine with respect to postoperative cough, hoarseness and sore throat scores.

Methods A randomized double blind study was conducted in 200 patients of ASA I,II,III and age between 18 to 60 yrs undergoing surgeries under GA for more than 2 hours, Patients who need nasogastric tube or throat pack were excluded from study. A computer generated randomisation with double blind technique was used to distribute them into Group L and Group D 100 each. In Group L, ETT cuff was inflated with 2ml of 2% lignocaine +2-3ml of 7.5% Sodium bicarbonate and in Group D cuff was inflated with 2ml of dexamethasone + 2-3ml of Normal saline. Intracuff pressure was monitored throughout the surgery and was maintained below 28 cm H_2O. **Results**The severity of cough and hoarseness was found higher in group D at 2 hours which was statistically significant ($P< 0.05$). However, there was no significant difference at 8hrs,16hrs and 24hrs in both the groups.

Conclusion We conclude that post operative airway related adverse effects are less when cuff was inflated with alkalinized lignocaine as compared to dexamethasone as liquid media.

Introduction:-

General anaesthesia is one of the anaesthetic techniques used for major elective surgeries. Securing the airway with an endotracheal tube is the definitive method that confers protection of the airway from aspiration of gastric content

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and facilitatespositive pressure ventilation. However, some post-intubation airway-related adverse effects are known to be caused by endotracheal intubation like postoperative coughing on the tube, restlessness, hoarseness, and sore throat [(1)]. Post intubation sore throat is said to occur in about 14.5-50% of cases [(2)]. Severity of post-intubation sore throat highly correlated with cuff pressure and cuff design. Pertaining to this high pressure low volume cuff causes more tracheal erosions than low pressure high volume cuff tube [(3)].

Previous studies have shown a linear correlation in severity of these symptoms due to high cuff pressure.Nitrous oxide used for maintenance of anaesthesiadiffuses through the cuff membrane and causes increase in the intracuff pressure, which may lead to mucosal damage especially in longer duration surgeries. It was postulated that post-intubation airway-related adverse effects were due to changes in the tracheal mucosa that occurred as early as 12 minutes after cuff inflation and chronic damage may result within the same period if the cuff pressure increases more than 40cm H_2O [(4)]. The capillary perfusion pressure of tracheal mucosa is around 20 cm H_2O therefore the cuff pressure has to be maintained between 20- 25 cm H_2O to avoid airway related complications. To reduce this increase in cuff pressure because of the diffusion of N2O, alternative media have been tried for cuff inflation instead of air.

Various studies have been done on reducing postoperative airway related complications by using intracuff lignocaine HCL, alkalinized lignocaine and air which have concluded that soda bicarbonate increases the diffusion of lignocaine therefore causes less irritation [(5)]. The incidence of sore throat was decreased in alkalinized lignocaine group compared to the lignocaine group upto 24 hours post-extubation. Cough and restlessness decreased in alkalinized lignocaine group compared to the lignocaine group. This shows that using intracuff alkalinized lignocaine is an effective adjunct to ET intubation as compared to plain lignocaine[(6)].

In other studies, intracuff dexamethasone has been used to compare post-extubation reactions compared with intracuff saline and lidocaine. They found that the incidence of cough decreases with lignocaine and also found that dexamethasone reduces the severity of cough. In the past even topical steroids have been used they found that it was decreasing the incidence of sore throat from 55 % to 10%. Topical and systemic steroids have also been shown to decrease[(7)].However to avoid systemic side effects of steroids we decided to do a comparative study between intracuff alkalinized lignocaine and intracuff dexamethasone [(8)].Veryfew studies have compared intra-cuff lignocaine with dexamethasone, hence we have designed our study to compare these two agents[(9)].

Materials And Method:-

A detailed Pre-anesthetic check-up of all the patients posted for surgery under generalanesthesia wasdonebeforesurgeryasper proforma. All patients were kept nil by mouth as per the NPO guidelines for more than 6 hoursprior. Ethical committee approval was taken (BVDUMC/IEC/75) and CTRI registration(CTRI/2021/05/033489) wasdonebefore thestudy. Written informed consent was taken by the patients after explaining the procedure intheirlanguagewhich waswell understoodbythem. Total patients included in our study was 200 and they were distributed as shown in consort (Figure 1).

The sample size has been derived by the given formula considering with inclusion and exclusion criteria.
$2(Z\alpha/2 + Z1-\beta)2 \times (SD)2 / d2$
α = Type I error, β = Type II error, 1-β = Power of test
SD = Standard deviation, d = difference between Group D and Group L

Methodology:-

The patientswere allocatedinto one of thetwo groups-GroupLandGroupD

GROUP L:The Endotracheal tube cuff was inflated with 2ml of 2% lignocaine + 2-3ml of 7.5% Sodabicarbonate,
GROUPD:TheEndotrachealtubecuffwasinflatedwith2ml(8mg)ofdexamethasone+2-3mlofNormalsaline

A double-blinded technique was used. The principal investigator and patient wereblinded about the drug used for inflation and unaware of the group allocations. At theendof the studydrugusedwasrevealedbyaguide and statisticalanalysiswasdone.
The standardprotocolofGeneralAnaesthesia with nitrous oxide wasusedinbothgroups by using ETT portex of high volume and through the procedure intracuff pressure was maintained between 20- 28 cm H2O.

BeforeinductionofanesthesiatheIVlinewassecuredandmultiparameterswhichincludeETCO2,BloodPressure,Pulse Rate,andSpO2were recordedineachpatient. Scores used as follows

Sore throat : Nil – 0, Mild- 1, Moderate- 2, Severe – 3
Cough : Nil – 0, Mild- 1, Moderate- 2, Severe – 3
Hoarseness: Nil – 0, Mild- 1, Moderate- 2, Severe – 3
All these scores were recorded postoperatively at 0 hr, 2hr, 8hr, 16hr and 24 hours

Statistical analysis

The entire data were statistically analyzed using a statistical package for social sciences(SPSS version 22.0, IBM Corporation, USA) for MS windows. The inter-group statistical comparison of the distribution of categorical variables is tested using the chi- square test or Fisher exact probability test. All results are shown in tabular as well as graphical format to visualize the statistically significant difference more clearly. In the entire study, the p values less than 0.05 are considered to be statistically significant.

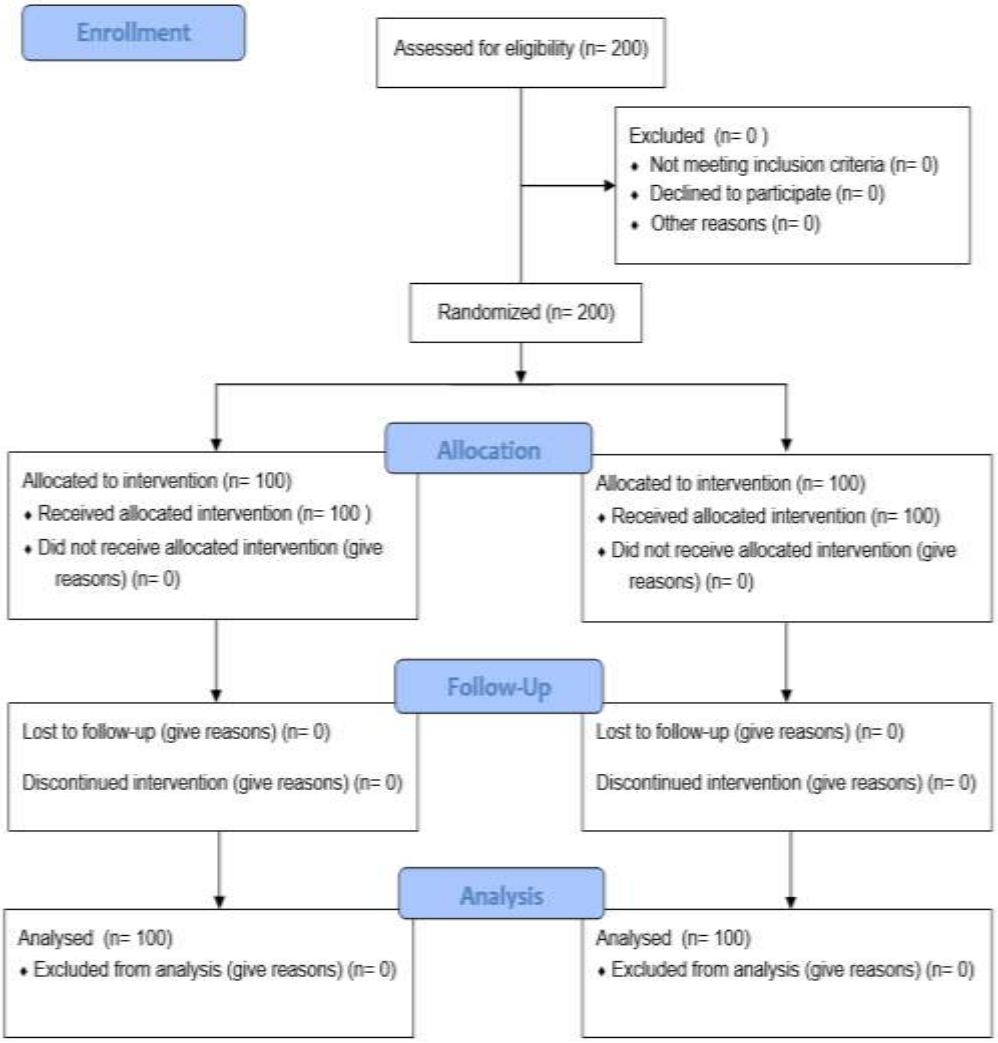


Figure1:-Consort flow diagram of patients included in the study.

Results:-

After statistical analysis we found that the Demographic data like age, sex and duration of surgery were comparable has no significant difference between the two groups as shown.

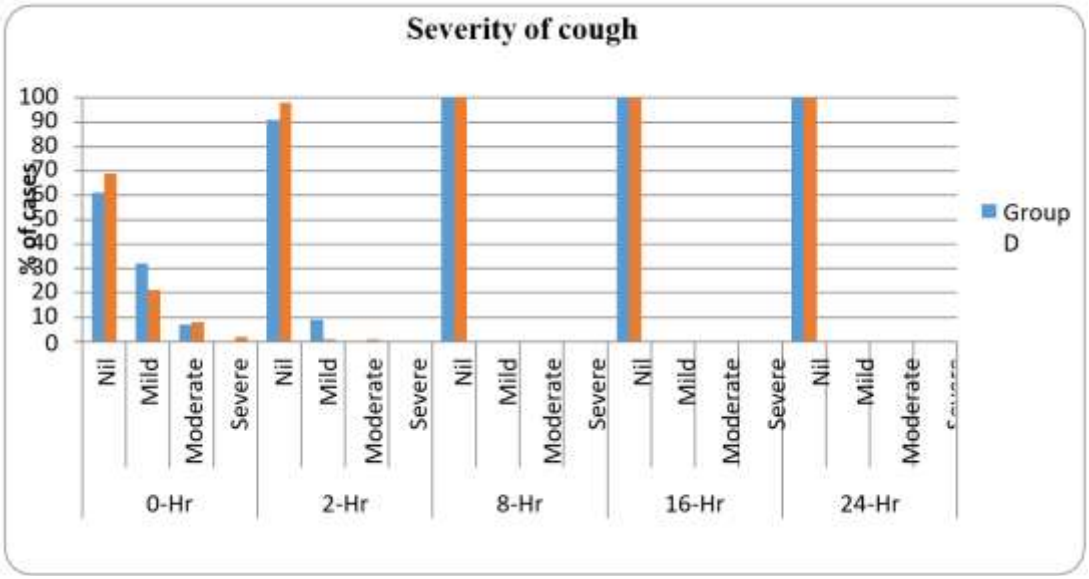
Table1:- Demographic parameters.

Parameter	Group L	Group D	p
Age(yrs)	38.38+13.03	40.60+15.01	0.265

Sex (M:F)	45:55	56:44	0.157

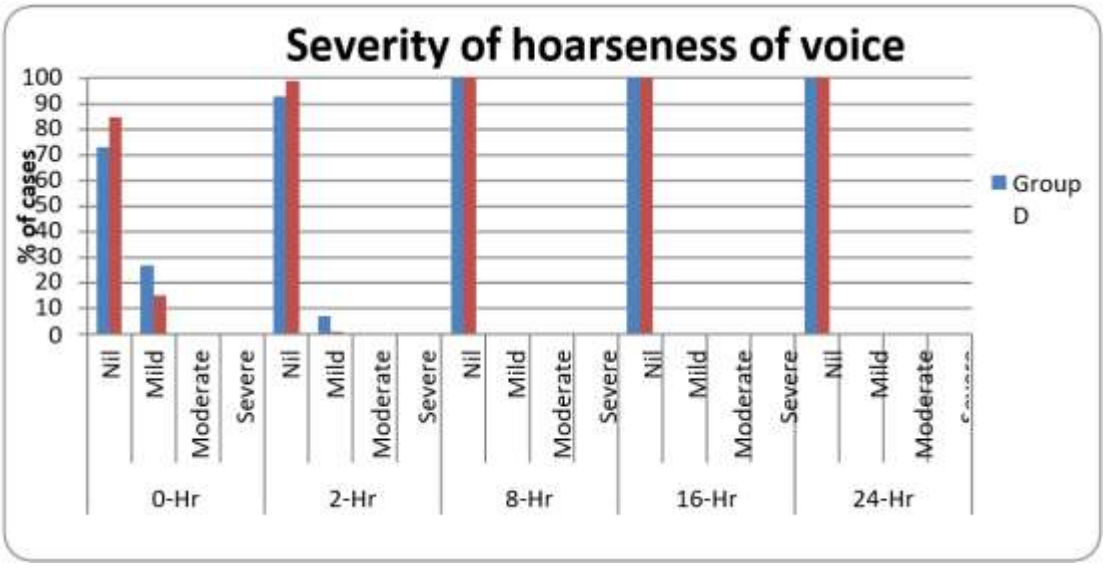
The base line hemodynamic parameters, SpO2 and ETCO2 were also comparable in both groups also we found there is no significant difference (P > 0.05). As we inflated the cuff with the liquid media, we did not find any significant difference in intracuff pressure in both the study groups through out the procedure.

The cough score at 0hr was relatively higher in Group D compared to Group L which was statistically significant (P = 0.020) and at 2hours was higher in Group D than Group L and the difference was also statistically significant (P = 0.022).



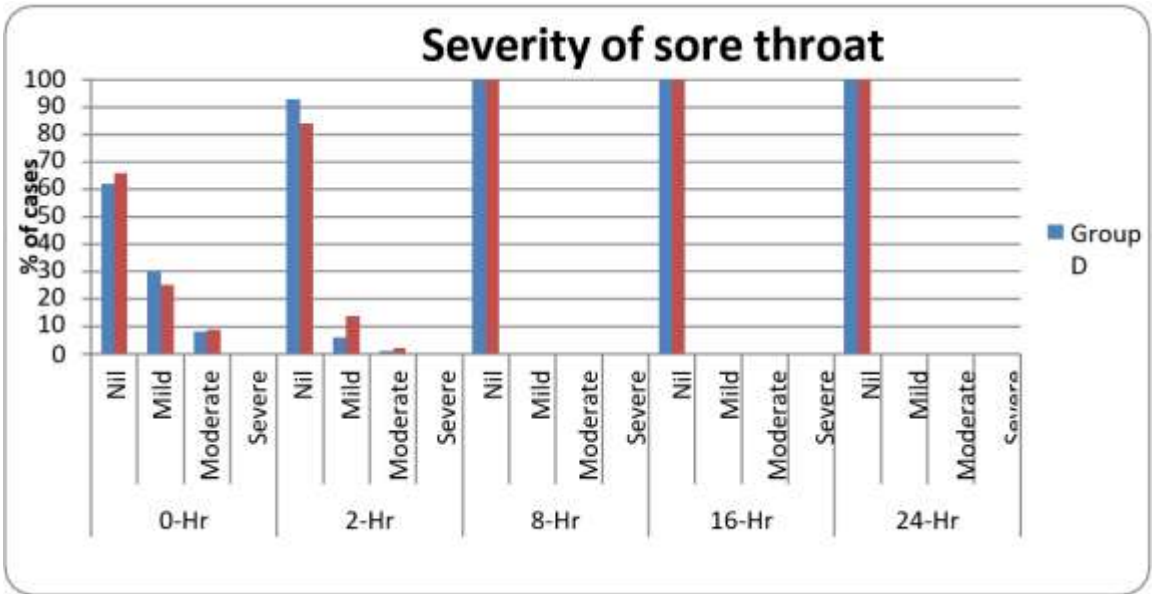
Graph 1;- Inter-group distribution of severity of the cough.

The hoarseness of voice score at 0hr was higher in Group D compared to Group L which was statistically significant (P = 0.037) and at 2 hours was higher in group D than Group L which was also statistically significant (P = 0.030) as shown.



Graph 2:- Inter-group distribution of severity of hoarseness of voice.

The sore throat score at 0hr was relatively higher in Group DcomparedtoGroupL,butitisstatisticallynonsignificant(P = 0.727) and at2 hoursthe incidence of mild & moderate sore throatwassignificantly higherinGroupLcomparedtoGroupD(P = 0.046) as shown.



Graph3:-Inter-group distribution of severity of the sore throat.

Theseverityofcough,hoarseness ofvoice and sore throat at 8 hours, 16 hours and 24 hours did not differ significantly betweenthe two studygroups(P = 0.999)

Discussion:-

Endotracheal intubation, though a gold standard of airway management it is not without adverse effects. Post intubation incidence of sore throat is about 14.5-50% [(2)]. It is mainlydue to mechanical or chemical stimuli by the ETT (endotracheal tube) cuff which can trigger and activate sensory receptors in the respiratory tract.Previous studies have been shown that by using high volume and low pressure cuff of endotracheal tubes is associated with decreased incidence of adverse effects.

Armstrong et al, concluded that whilemaintaining anaesthesia with N2O intracuff pressure increases because it diffuses into air filled space more rapidly especially in long-duration surgeries. It was found that by using liquid media to inflate the ETT cuff nitrous oxide dissolves within the liquid media and volume remains the same [(10)].

Soares et al, observed that intracuff ligocaine diffuses through the cuff and blocks tracheal sensory receptors. It acts mainly by preventing the excitement of sensory C fibers resulting in decrease of the postoperative airway related adverse effects [(11)]. Similarly Fagan et al, established that intracuff lignocaine diffuses through the cuff membrane causing anesthesia of tracheal mucosa in contact with the cuff. This helps in reducing emergence phenomena during extubation[(12)].

At the same time Gonzalez et al, showed that use of modified ET tube along with intracuff lidocaine acts as a shielding effect to the tracheal mucosa [(13)].

Sumathi et al, used betamethasone gel and lignocaine jelly applied over tracheal tube to reduce post extubation adverse effects. They found that application of betamethasone gel decreases severity of air way related adverse effects. However they could not monitor intracuff pressure. In our study we have monitored intracuff pressure throughout the surgical procedure and it was maintained between 22- 28 cm H2O [(14)].

When we compared dexamethasone with alkalinized lignocaine, we found that postoperative sore throat score in immediate post extubation did not differ significantly (P = 0.727). However at 2 hours we found there was significant difference between 2 groups (P = 0.046) and it was found better in dexamethasone group as shown in Graph 3.

Sunil Rajan et al, in their study compared intracuff instillation of dexamethasone and normal saline. They observed thatin dexamethasone group there was significant decrease in severity in cough and hoarseness of voice as compared to normal saline. This could be of due to the fact that intracuff dexamethasone has anti-inflammatory activity which inhibits the leucocyte migration, maintaining the cell membrane integrity and reducing fibroblast proliferation[15].

Similarly in our study we observed that severity of cough and hoarseness of voice at extubation and at 2 hours was less in alkalinized lignocaine group as compared to dexamethasone group ($P < 0.05$) (Graph 1 and 2). This shows that alkalinized lignocaine diffuses through the ETT cuff membrane and acts on the tracheal mucosa and reduces the postoperative airway related adverse effects. The only limitation of our study is we can not comment on how much volume of fluid diffused through cuff as we have not measured or kept record of inflation and deflation of intracuff fluid.

Conclusion:-

Weconcludethat intracuff alkalinized lignocaine is more effective in reducing theseverityofcoughand hoarsenessofvoiceas comparedto intracuff dexamethasone.

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