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ORIGINAL ARTICLE

Comparison of Cuffed vs. Uncuffed Endotracheal Intubation efficacy in Cleft Palate Surgery procedure in children

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ABSTRACT

Background: From several decades, in case of pediatric oral surgeries, Uncuffed endotracheal tubes are preferred due to insufficient availability of evidences,
Aim: To compare morbidity post-operatively after using uncuffed and cuffed endotracheal tubes in case of children undergoing surgery of cleft lip-palate.
Methods: This study was carried out on children aging from 3 to 10 years. About 40 candidates participated and divided into two groups according to the list generated via computer. The comparison was made between sore throat, extubation stridor, regaining of normal voice and first oral intake postoperatively between two members of groups.
Results: In case of uncuffed group of candidates, the sore throat was evident more P value > 0.005 as compared to members belonging to cuffed group postoperatively . In case of cuffed members, regaining normal voice and first oral intake was earlier significantly as compared to members belonging to uncuffed.
Conclusion: Cuffed Et depicted lesser prevalence of sore throat as compared to members belonging to uncuffed , after following standard protocols .Moreover, regaining of normal voice as well as first oral intake was also earlier in case of uncuffed group as compared to cuffed group postoperatively.
Keywords: Cleft palate, cuffed, postoperative morbidity, preformed tracheal, uncuffed

INTRODUCTION

The discussion has been made from several decades with respect to use of uncuffed or cuffed endotracheal tube in kids who were younger than 8 years old. Many case researchers depicted numerous drawbacks of UETT for example increased tube exchange rate, inappropriate selection of size, aspiration chances of secretions orally, gas leakage, blood and tissue debris, difficult low flow anesthesia, operation theatre pollution, improper monitoring of end-tidal CO2 (EtCO2), and accidental extubation during head manipulation, tube tip dislodgement, ventilatory parameter and lung function[4,6]. Throat pack were provided in order to avoid such complications but these packs might increase pack linked to sore throat (POST)[7]. These problems can be solved by the use of cuffed tube. Beside numerous corns of cuffed tube it is still not appreciated in case of pediatric surgeries due to the risk factor that it might cause injury to mucosal airways. From Recent imaging research point of view, by aid of low cuff pressure (≤15 cm H2O), cuffed tube can seal the airways effectively without harming. So, it can be concluded that cuffed endotracheal tubes (CETTs) can be used in case of pediatric surgeries by carefully accessing the cuff pressure.

With respect to research by Sathyamoorthy et al, all ETT types have potency to cause airway damage. The risk factors such as coexisting morbidity, previous intubation, etc., may contribute in causing airway scarring and edema. Due to lack of any substantial sub mucosal layer, the vocal folds and rigid cricoid ring are specifically targeted to damage[6]. Weiss et al. 2009 discovered in case of cuffed tube, low rate of tube exchange as compared to uncuffed tube in children below 5 years of age. The comparison was made in between both groups with respect to postextubation stridor[11]. The significance of CETT can be appreciated in case of oral surgeries such as, cleft lip-palate where the incidence of aspiration is more evident as compared to other oral procedures[3]. So, in this case research, we have made comparison of morbidity postoperatively due to uncuffed versus cuffed tube in case of surgeries of cleft lip and palate in pediatric population.

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MATERIALS AND METHODS

From February to December 2019 a randomized controlled study was done after approval from IRB on children who were planned to be operated under general anesthesia for cleft palate after getting informed consent via guardians. All kids who were undergoing this surgical procedure were hospitalized one day earlier before final surge was planned. Each candidate underwent into assessment with respect to anesthetic fitness preoperatively. The physical status 1 and 2 were chosen for candidates via Anesthesiologists. Exclusion of candidates were made based on additional congenital pathologies, high infection risk post operatively and aspiration issues. All the candidates under going into surgical procedure were divided into 2 groups with respect to computer-generated list.

The size of sample was estimated with respect to reported prevalence of POST of 20% and 40% in cuffed and UETT[8]. About 20 candidates were needed in each group in order to get 90% power of the case study and approximately 5% error (type I).Due to the respiratory issues of some patients, exclusion of one candidate was made from each participating group. From analysis point of view final comparison was carried out between uncuffed group consisting of 20 candidates with of cuffed tube group consisting of 20 candidates.

Anaesthesia was induced by inhaling standardized sevoflurane in 100% oxygen. 22-gauge cannula was used in order to have access intravenously .In every candidate, heat rate and ventilation was accessed via aid of stethoscope. Perioperative monitoring with respect to heart rate, SpO2, electrocardiogram noninvasive blood pressure, core temperature and EtCO2 was analyzed continually. On achieving a specific depth of anesthesia, face mask ventilation was carried out. By the help of injection atracurium, paralysis was achieved. By the aid of direct laryngoscopy via oral route tracheal intubation was performed without using stylets and bougies.

In case of our case research, Preformed CETT, with low-pressure cuffs, high volume, and preformed UETT were utilized. Selection of size of tube was made on the basis of Motoyama formula (ID [mm] = [age in year/4] +3.5) in case of CETT in kids who were having age of 2 years or greater than that whereas

selection of tube size in case of UETT was made with respect to Modified Cole's formula (ID [mm] = [age in year/4] + 4.0). Using the standardized guide line, Tube insertion was carried out. Assessment of lungs was carried out for bilateral breath sounds equally.

Depending upon air leakage, tracheal tube with respect to proper sizes were selected. After intubation, air leak pressures were tested via positioning the patient in neutral and spine position. Air leak that is audible had to be there at the mouth of patient at ≤20 cm H2O positive inflation pressure in case of UETTs where as in case of CETTs with the fully cuff deflated with respect to the measurements by Motoyama et al. [15] The size of tracheal tube was selected as enough if the leak pressure (airway pressure required to form an air leak around the tube of trachea with the cuff) was ≤20 cm H2O and if the sealing pressure measured ≤20 cm H2O. The next smaller level of UETT or CETT was opted if there was higher leak pressure (>20 cm H2O) and CETT was altered to same UETT size or smaller by 0.5 of CETT. Alteration of CETT to next level was made to another larger size if a sealing pressure was greater than 20 cm H2O required in order to stop leakage. When alternating an UETT to another size smaller which caused higher degree of leakage of air , a gauze that is sterile and water-soaked throat pack or CETT was considered . In both the groups, for 4 candidates there was alteration of tube was opted because of issues related to size as well as high leak pressure.

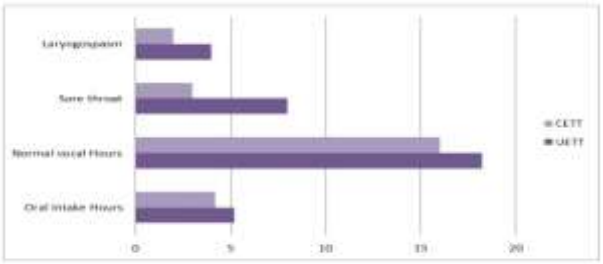
After making it certain that no oversized tube was being inserted in members of both groups, the sealing efficacy was checked via means of mechanical ventilation in all the candidates. In case of CETTs, the inflation of cuff was done via aid of cuff pressure manometer (Portex). Limitation of Cuff pressure was carried out to be 20cm H2O via a pressure release valve. The least pressure with respect to sealing was estimated under steady-state ventilation standard along with maintenance during the surgical procedure. This was carried out via slowly reduction in the cuff pressure till audible leak sound heard at the mouth of patient and after that there was increase in the pressure till there is absence of leakage. Sealing quality as well as least cuff pressure needed to provide adequate seal was noted. Moreover, anesthetic technique, course of intubation, intubation time, use of throat pack and leak pressure was observed. Because of sharing airways, there was increased chances at any time of inadvertent extubation and tube occlusion. Any untoward effects Intraoperatively such as decreased level of oxygen, endobronchial intubation accidentally, or extubation were all noted. For the extension of neck, there was frequent usage of a head ring and a roll beneath shoulders. Using the standardized protocols, after having intravenous access, general anesthesia was given via using N_2O:O_2 = 2:1, sevoflurane (4%), injection glycopyrrolate, injection atracurium, injection ondansetron and injection dexamethasone before intubation. For Intraoperative analgesia, injection fentanyl, paracetamol infusion was administered. For Postoperative analgesia regular doses of diclofenac suppository and paracetamol were administered depending upon weight of body of candidate.

RESULTS

After selection of 40 candidates for operation of cleft palate and lip with respect to specified conditions, CETT was opted in case of 20 candidates (50%) where UETT was opted for the rest. Baseline characteristics are depicted in Tables 1. Outcome measurements of candidates are shown in Graph 1. The stridor and postextubation laryngospasm were observed in case of 5% and 10% and in cuffed and uncuffed groups candidates. The noteworthy statistical differences were seen among both groups (P = 0.11). But, in case of uncuffed candidates, sore throat was noted at significantly higher rates (29%) when compared from cuffed candidates (11%) variety (P = 0.005)more over . Mean oral intake time was noteworthy higher(5.2 h) in case of uncuffed candidates as compared with cuffed ones (4.21 h) (P = 0.0002).Regaining of normal vocals was also observed late in case of uncuffed candidates (18.23 h) as compared to cuffed ones(16.01 h) (P = 0.009).

Surgery	CETT	UETT	*P*
Bilateral Cleft Palate	12.2	9.9	0.422
Unilateral Cleft Palate	48.4	36.4	
Unilateral Cleft Lip	27.1	24.3	
Unilateral Cleft Lip & Palate	19.2	29.8	
ASA Classification 1	78.2	89.1	0.183
ASA Classification 2	15.3	6.4	

Table 1 Difference between both groups



Graph 1 Oral Intake, Normal Voice, Sore Throat and Laryngospasm

DISCUSSION

In case of surgical cleft palate and lip procedures, management with respect to airway is crucial since airway passage is shared among anesthesiologists and surgeons. There is greater incidence of occlusion of tube via mouth gag, inadvertent extubation and aspirations specially in case of surgery of palate where here is not provision of pharyngeal pack . Preformed RAE ETT is ideal to be considered due to improved fitting in case of mouth gag and makes easier fixation of tube. Uncuffed preformed tracheal tubes hold more chances for inadvertent endobronchial intubation when compared with cuffed preformed tracheal tubes.

In case of our research study, we have performed comparison in uncuffed and cuffed RAE tube in case of cleft palate and lip operations. The general old trend that was in practice was the use of uncuffed ETT in case of pediatric surgery in children that were 8 years or below since there was belief traditionally that cuff could cause injury directly to air passage and could increase chances of respiratory complications post operatively. There are numerous case researches available that have proven the fact that cuffed tube has many pros like intubation with ease, lessen tube exchange rate time and cost saving, less injurious and traumatizing and decrease usage of expensive volatile anesthetics. There is also decreased gases and volatile anesthetics levels observed in the operation theater, and therefore, a lower degree of pollutants related to environment[14]. Moreover, CETT aid in better capnography and lung function monitoring. Moreover, there is also decrease incidence of infection as well aspiration.

Post operatively, one of the leading cause of trauma is tracheal intubation to the mucosa airway that leads to morbidity. Patients' sex, age, larger size of tracheal tube, intracuff pressure and throat pack are one of the most leading cause with respect to POST. The sore throat prevalence after tracheal intubation, lies between 18.2% to 54%. In case of our research study, the sore throat prevalence was greater in case of candidates belonging to uncuffed group (32.4%) as compared to candidates belonging to cuffed (8.2%) and moreover , value of P value was noteworthy statistically. By making comparison between age, sex, size of tracheal tube, the sore throat linked to pharyngeal pack might be thought as susceptible cause of causing trauma locally, resulting in aseptic inflammation of mucosa of pharynx[19]. The results of our case study matches with the case study via Calder et al., who discovered that children are more prone to POST by usage of UETTs[17]. They also recommend use of cuff pressure as well since

with CETT there is always chance of CP along with the prevalence of POST. Moreover from studies by Loeser et al we also found noteworthy greater prevalence of sore throat with uncuffed tubes as compared to cuffed tubes patients, even when the patients inhaled humidified a well as warmed gases.

First oral intake time as well as gaining again the normal vocals was much delayed in cause of candidates belonging to the uncuffed grpup when comparison was made with cuffed candidates in our case research . This might be linked with higher prevalence of complaining of sore throat in that group of candidates.

There are some shortcomings of our case research as well. In this case research, we had small gate of accessing variations with respect to ethno-racial morbidity postoperatively. Candidates having age below than 3 years were excluded from our research. Many measurements such as cuff positions, tube exchange rate, tube tip dislodgement, ventilator parameters and intubation attempts, etc. remain inconsiderable in this case research. Postoperative follow-up particularly long term were essential in order to ensure safety of ET tube variety. It is therefore necessary to develop metacentric case reseach along with bigger size of sample with long-term follow-up to prove the cuffed ET tube superiority over uncuffed ET tube. The use of postextubation stridor was limited due to fear of subglottic, laryngeal a tracheal injury with respect to usage of ETT. The postextubation stridor diagnosis was subjective. Assessment with respect to objective methods is not yet evaluated fully.

CONCLUSION

The use of cuffed ETT in case of pediatric patients is not justified fully up to the mark. After taking precautions such as selection of tube size properly, cuff pressure monitoring and postextubation respiratory care, cuffed ETT can be utilized with safety just as uncuffed tube. With respect to air way morbidity, Cuffed ETTs were tolerated better by less POST incidences , along with early intake orally by patient with early normal voice regaining after the surgical procedure in case of cleft lip-palate operations in children in case of our set up .

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