

# NASOTRACHEAL INTUBATION WITH PARKER FLEX-TIP VERSUS PREFORMED NASAL ENDOTRACHEAL TUBES FOR CHILDREN UNDERGOING ADENOTONSILLECTOMY

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**Abstract:** The design of the endotracheal tube might be an important factor in the incidence of injurious complications during nasotracheal intubation.

**Aim of the work:** Primary aim: to compare the parker flex tip (PFT) and the preformed nasal (PNT) tubes regarding the ease of insertion during nasotracheal intubation in children undergoing adenotonsillectomy. Secondary aim: to verify the incidence of traumatic complications of both types of tubes during nasotracheal intubation in children undergoing adenotonsillectomy.

**Patients and methods:** 100 patients aged between 4 and 10 years ASA physical status I-II scheduled for adenotonsillectomy were divided into two groups; Group PFT: Patients were nasally intubated using the parker flex-tip endotracheal tube, Group PNT: Patients were nasally intubated using the preformed nasal tube. Ease of insertion of the ETT, degree of trauma and the time of intubation was measured.

**Results:** ETT was easily inserted without any resistance in 24% of patients of the PFT group versus 12% of patients in the PNT group. ETT could not be passed through the right or left nostrils in 20% of patients of the PNT group relative to only 4% of patients of the PFT group. Incidence of trauma to the nasal mucosa was significantly higher in patients of the PNT group than patients of the PFT group. Duration of intubation was statistically significantly longer among patients of the PNT group than patients of the PFT group.

**Conclusions:** It seems that the flexible tapered tip of the PFT tube has led to easier insertion through the nasal passages as well as less trauma to the nasal mucosa in children having nasopharyngeal pathology in the form of adenoids. At the same time, the duration of intubation was less in the PFT group relative to the control group in spite of the more familiarity of the investigator with the standard portex tube.

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This report describes human research. IRB contact information: Ethics Committee of the Alexandria Main University Hospitals, 16/6/2011, IRB NO: 00007555-FWA NO:00015712. This study was conducted with written informed consent from the study subjects.

## Introduction

Adenotonsillectomy is a very common surgical procedure done all over the world. In spite of the relative easiness of the procedure, it does have its risk and challenges to both the surgeon and the anesthesiologist<sup>1</sup>. The main anesthetic consideration is to provide a good surgical field in spite of the shared airway by the surgeon and the anesthesiologist<sup>2</sup>. The oral route is the usual way of placement of the endotracheal tube (ETT). The oral ETT has the advantage of avoiding any trauma to the nasopharyngeal area especially with the enlarged adenoids<sup>3</sup>. Unfortunately, the oral ETT may hinder the surgical access as well as being liable to misplacement during the surgical maneuver. Hence, the nasal route is advantageous avoiding such complications. However, the adenoids may be an obstacle to the passage of the ETT through the nose and several studies have been conducted for avoiding traumatic injury to the adenoids by the passage of the nasotracheal tube<sup>4</sup>. The design of the ETT might be an important etiologic factor in such complications. Recently, Parker Medical (Bridgewater, Conn) introduced the Parker Flex-Tip (PFT) tube. It has a unique design with a flexible, curved, centered, tapered distal tip that may help avoid injury to the nasopharyngeal structures during its passage to the vocal cords<sup>5</sup>.

**The primary aim of this study was** to compare the Parker Flex-Tip and the preformed nasal (PNT) tubes regarding the ease of insertion during nasotracheal intubation in children undergoing adenotonsillectomy. **A secondary aim was** to verify the incidence of traumatic complications of both types of tubes during nasotracheal intubation in children undergoing adenotonsillectomy.

## Methods

The study protocol was reviewed and approved by the Ethics Committee of the Alexandria Main University Hospitals. A written informed consent was obtained from the parents for participation of their child in the study.

This prospective, randomized, study was carried out at the university hospital day case surgery unit. One hundred patients aged between 4 and 10 years

ASA physical status I-II who were scheduled for adenotonsillectomy, were considered for the study. Exclusion criteria included contraindications to nasotracheal intubation such as coagulopathy, known or suspected CSF leak and anticipated difficult intubation in the form of known congenital airway anomalies.

Complete history was obtained from the parents. All patients were subjected to thorough examination and routine laboratory investigations. Patients were randomly assigned for nasal intubation using the Parker Flex-Tip endotracheal tube (Group PFT) or the performed nasal endotracheal tube (Group PNT) using a computer-generated program.

All patients were premedicated 30 minutes before the procedure by midazolam nasal drops 0.1 mg.kg<sup>-1</sup> and xylometazoline nasal drops (one drop each nostril). After admission to the operative theatre, all patients were monitored by continuous electrocardiography, heart rate, pulse oximetry, non-invasive arterial blood pressure, end-tidal capnography and transrectal temperature probe. An intravenous line was inserted after induction with 8% sevoflurane in 100% oxygen for 90 seconds using an appropriate sized facemask via a primed pediatric circle system. Fentanyl 1µg.kg<sup>-1</sup> and atracurium were given for facilitation of intubation. The proper sized ETT was chosen for each group and its tip was lubricated by a lubricating gel.

After full muscle relaxation, gentle insertion of the tube was tried in the right nostril first till it entered the oropharynx. By using the suitable Magill forceps and suitable sized laryngoscope, advancement of the ETT was carried out under direct vision until it entered the larynx to its final position. If the tube did not pass in the right nostril, the left one was tried. Anesthesia was maintained till the end of the surgery.

## The ease of insertion of the tube through the nose was scored as

*A-Ease of insertion of the tube through the nose:*

1: no resistance is felt when advancing the tube till it passes to the oropharynx. 2: some resistance is felt when advancing the tube till it passes to the

*Table 1*  
Demographic data. Data is presented as mean ± standard deviation or as a number

	Group PFT (n = 50)	Group PNT (n = 50)	P-value
Age (years)	5 ± 2.03 5 ± 2.0.	4.5 ± 2.4	0.465
Male/Female	25/25	26/24	0.611
Weight (kg)	19 ± 6.9	18 ± 5.98 12-29	0.456

*Table 2*  
Scoring of the ease of insertion of the endotracheal tube through the nose

Grades	Group PFT (n = 50)		Group PNT (n = 50)		p-value
	Number	%	Number	%	
1:No resistance	12	24	6	12	0.026
2:Some resistance	21	42	16	32	0.09
3:didn't pass through right nostril	15	30	18	36	0.22
4:didn't pass through right or left nostril	2	4	10	20	0.013

*Table 3*  
Trauma of the endotracheal tube to the nasal mucosa

Grading	Group PFT (n = 50)		Group PNT (n = 50)		P
	Number	%	Number	%	
1-No blood on the tube	15	30	8	16	0.039
2-Traces of blood on the tube	16	32	14	28	0.112
3-Some blood in the oropharynx	15	30	22	44	0.041
4- Some fleshy parts in the tube	4	8	6	12	0.266

oropharynx.3: tube can't pass through the right nostril in spite of some force used., and 4: tube can't pass through the right or the left nostril and the tube will be put orally.

Also the degree of trauma, if any, by the passage of the ETT through the nose was assessed by the presence/amount of blood noticed in the oropharynx by laryngoscopy and was scored as 1: No blood is noted on the tube or oropharynx; 2: Trace of blood is noted on the tube; 3: Some blood is seen trickling in the oropharynx; and 4: Some fleshy parts is seen in the tube.

This was done through inspection of the tip of the ETT and the oropharynx during laryngoscopy after its passage through the nose and nasopharynx.

Time of intubation which was defined as the time interval between passage of the ETT through the right nostril till confirmation of its position by the capnogram, was determined in both groups.

**Sample size calculation:** It was done using Med Calc statistical software. A minimum sample size of 100 patients divided into two equal groups was determined to achieve a 20% difference in the ease of insertion of the endotracheal tube with a standard type I and type II error ( $\alpha$  0.05,  $\beta$  0.2). The power of the study was 90.0%.

**Data Analysis:** Data were analyzed by using SPSS software (Statistical package for social science for personal computers) using Student t and chi-square testes, data were expressed as mean  $\pm$  SD, and  $P \leq 0.05$  was considered significant.

## Results

There were no statistically significant differences between the two groups in regards to demographic data (Table 1) No resistance to insertion of the tube was higher in the PFT group as compared to the PNT group (Table 2). Also, the failure to pass the tube through the right or left nostril was higher in the Group PNT as compared to the Group PFT (Table 2).. On inspection of the ETT after insertion during laryngoscopy, no blood noticed on the ETT was statistically significantly higher in the PFT group (30%) compared to the PNT group (16%). Also, presence of blood in the oropharynx

was significantly higher in the PNT group (44%) compared to the PFT Group (30%) (Table 3). Duration of intubation was significantly longer in patients of the PNT group ( $42 \pm 7.11$  sec) versus patients of the PFT group ( $34 \pm 6.01$  sec).

## Discussion

**The findings of the current study suggest** that the flexible tapered tip of the PFT tube can result in easier insertion through the nasal passages as well as in less trauma to the nasal mucosa in children having nasopharyngeal pathology in the form of adenoids. Also, the duration of intubation can be decreased in the PFT group compared to the PNT group despite of the more familiarity of the investigators with the standard PNT tubes.

Several previous studies have investigated the different factors that may contribute to trauma to the nasal mucosa during tracheal intubation, of which the tracheal tube tip design was a prominent factor. Several authors described in previous studies the design of the PFT tube and how such design could improve the nasal intubating conditions. Yet, most of these studies have been done in patients with healthy nasal passages where patients with nasal pathologies were excluded from such studies. In their study comparing the PFT tube with the standard tube for nasotracheal intubation in oral surgery in adults using the fiberscope, Prior et al<sup>5</sup> demonstrated that the PFT tubes glide over the nasal mucosa and tracheal rings rather than wedges and bruises against the involved mucosa leading to less trauma, less bleeding and less postoperative complications like sore throat. Higuera et al<sup>6</sup> failed to pass a standard ETT over a nasally inserted fiberscope in a case of difficult intubation and replaced it in a second attempt with a PFT tube that passed easily over the fiberscope and suggested that the PFT tube may be helpful in awake fiberoptic nasotracheal intubation. Sanuki et al<sup>7</sup> hypothesized in their manikin study of airway scope assisted nasotracheal intubation that the PFT tube may be superior over the standard ETT as its tip is less liable to impinge around the vocal cords during passage over the airway scope. Sugiyama et al<sup>8</sup> examined the effect of bevel orientation and bending of the tube tip

by a stylet on the easiness of nasal tube passage and the incidence of epistaxis. They demonstrated that the styleted tip with the bevel facing posteriorly of the PFT tube improved the circumstances of intubation together with decreasing the degree of epistaxis relative to the standard portex ETT. On the other hand, Turkstra et al<sup>9</sup> found that there was no difference between the standard Mallinckrodt endotracheal tube and the PFT tube regarding postoperative sore throat after nasal intubation. However, the sizes of the endotracheal tubes used ranged from 7 to 8.5 which are considered large relative to the nasal passages in addition to the use of a stylet in a higher percentage in the PFT group. In addition to the nasal route, Radesic et al<sup>10</sup> compared the PFT tube with the standard ETT during oral intubation in adults using the glidescope. They reported that the posteriorly facing bevel together with the flexible tip of the PFT allowed better visualization during video laryngoscopy, reduced the time needed for endotracheal intubation and decreased the number of redirections needed before insertion of the ETT. Similar results were also obtained by Kristensen et al<sup>11</sup>

and So et al<sup>12</sup> during orotracheal intubation using the fiberoptic and conventional laryngoscopy respectively. They also attributed these results to the gentle sliding movement of the PFT tube over the anatomical structures of the airway.

Preference of the nasal route of intubation in cases of adenotonsillectomy in our institution has led to more efforts and studies to improve the outcome in such cases regarding trauma to the upper airway, and to our knowledge, the present study may be the first to examine the PFT tube in children with unhealthy nasopharyngeal anatomy. However, the present study has certain limitations. Blindness could not be achieved since the type of the tube could not be hidden from the investigator. Also, some of the postoperative complications expected from the procedure of intubation such as sore throat or change in the tone of voice could not be assessed since adenotonsillectomy surgery itself may lead to the same postoperative complications.

**Conflicts of interest:** None declared by the authors

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<sup>\*</sup> Train-of-four  
<sup>†</sup> Post tetanic counts  
<sup>‡</sup> Second twitch

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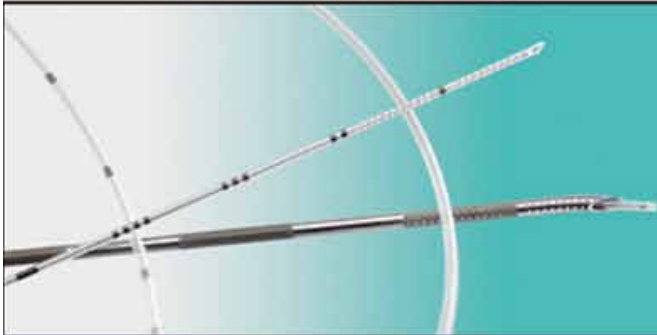
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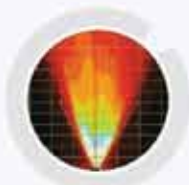
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