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A COMPARATIVE STUDY ON LATE AND EARLY COMPLICATIONS OF PEDIATRIC TRACHEOTOMY

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Abstract:
Objectives: *The aim of this research work was to provide a comparison of early & late complications associated with tracheotomy in the patients of pediatric age on the basis of surgical methods.*
Methodology: *In this research work, we retrospectively investigated the comparison between the characteristics of demography, techniques of surgeries from clinical files of pediatrics and associated complications developed after surgical intervention.*
Results: *Total 152 patients out of 273 were present with development of complications after application of tracheotomy. Among total patients, 75 patients were present with complications of early stage and 77 patients were present with late complications. Results gathered about early complications displayed an important difference between bleeding & skin incision and accidental de-cannulation; sub-cutaneous emphysema and tracheal incision; duration of surgery & accidental de-cannulation and issues of ventilation/tube; skill level of surgeon and bleeding. Results obtained for late complications stated an important difference between time of intubation and stomal tracheal granulation; stomal infection and tracheal incision; skill level of surgeon and stomal tracheal granulation.*
Conclusions: *In tracheotomy on pediatrics, skin incision & tracheal incision, experience of surgeon, time of tracheotomy and duration of intubation are much significant for the development of early as well late complications associated with this technique.*
Keywords: *Incision, Intervention, Ventilation, Bleeding, Cannulation, Tracheal, Emphysema, Tracheotomy, Pediatrics.*

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INTRODUCTION:

Tracheotomy is very old procedure and it started before Christ and it is life-saving procedure. PT (Pediatric Tracheotomy) is much technically complicate and difficult as compared to the tracheotomy of adults due to the possibility of the congenital abnormalities, anatomical size with limitation, fatty and short neck and nearness of many important organs [1, 2]. There have been many important alterations in the surgery of Pediatric Tracheotomy over last thirty years about indications. In recent days, high utilization of antibiotics, advancement in intubation procedures, rise in the number of patients getting intensive care have reduced the number of tracheotomies carried out because of infections of upper respiratory tract like epiglottitis and laryngo-trachea bronchitis and enhanced the number of tracheotomies performed because of prolonged intubation. There are multi-factor reasons for the complication's development in Pediatric Tracheotomy which include experience of tracheotomy, intubation time, and preferred technique of surgery and skill level of surgeon [3-9].

The objective of this research work was to provide a comparison of the findings of early & late complications which developed because of gender, age, intubation time, surgical indication, experience of surgery and preferred technique of surgery among pediatrics who underwent Pediatric Tracheotomy in the last five years in Pediatric ICU (Intensive Care Unit) at Allied / DHQ Hospital Faisalabad.

METHODOLOGY:

In this research work, we included the children who underwent pediatric tracheotomy under GA (General Anesthesia) Pediatric ICU at Allied / DHQ Hospital Faisalabad from June 2014 to December 2019. Characteristics of demography of the patients, age of the patients, gender, and indications were gathered from the records of their medical files. Some other information collected from the data of the patients included indications as time of intubation (0 to 21 days and greater than twenty one days), surgeon's experience (0 to 5 years and greater than five years), time of surgery (less than thirty minutes and greater than thirty minutes) and preferences in surgery as skin incision & tracheal incision, were provided with comparison to early & late complications.

SPSS V.23 was in use for the statistical analysis of the collected information. We utilized the Kruskal Wallis test to evaluate the association between independent variables of this research work and complications (early & late). The evaluation of the findings was carried out with a ninety five percent CI (Confidence Interval) and P value of less than 0.050 was considered as significant. Ethical committee of the institute gave the permission to conduct this research work.

RESULTS:

273 patients underwent Pediatric Tracheotomy in the duration of this research work. The range of the age of the patients was from 1 month to 24 months with an average age of total 40.470 ± 53.420 months. Median age of the patients was 13 months. 134 (49.08%) children were present with less than one year of age; 118 (43.20%) children were male and 158 (56.80%) children were girls. Most common indication was prolonged intubation in 191 (69.96%), whereas second most common indication was airway obstruction with 82 (30.040%) patients. the average time of intubation was 17.310 ± 8.780 days. When we evaluated the time of intubation, 166 (60.80%) patients were intubated for lower than twenty-one days and 107 (39.20%) patients were intubated for twenty-one or more days.

Among 273 tracheotomies, 152 (55.680%) patients were present with complications. Early complications were present in 27.47% (n: 75) in 1st week and late complications in 28.21% (n: 77) after completion of seven days. Table-1 is providing the data about the complication's distribution and sub-groups.

Table-I: Complications of Pediatric Tracheotomy

Early and Late Tracheotomy Complications	Patients(n)	%
Early Postoperative	75/273	27.47
Bleeding	26	9.52
Accidental decannulation	21	7.69
Tube/ventilation problem	14	5.13
Subcutaneous emphysema	9	3.3
Pneumothorax	5	1.83
Late Postoperative	77/273	28.2
Tube/ventilation problem	19	6.96
Accidental decannulation	17	6.23
Stomal-tracheal granulation	12	4.4
Stomal infection	11	4.03
Bleeding	8	2,93
Subglottic stenosis	7	2.56
Tracheocutaneous fistula	3	1.1

In this current research work, we did not find any significant association between indications of Pediatric Tracheotomy and early & complications (Table-2). But there was an important association between the pediatrics intubated for twenty-one or more days and late complication (P<0.000).

Table-II: Comparison of Features Related to Patient, Surgeon and Technique with Early and Late Complications

		Features related to patient, surgeon and technique					
		Indications	Intubation Time	Skin incision	Tracheal incision	Surgical time	Surgeon's skill level
Early Complications	Bleeding	0.089	0.706	0.020*	0.843	0.218	0.000*
	Subcutaneous emphysema	0.574	1	0.954	0.025*	0.256	0.162
	Accidental decannulation	0.814	1	0.001*	0.074	0.000*	0.072
	Tube/ventilation problem	0.226	0.638	0.837	0.059	0.008*	0.056
	Pneumothorax	0.847	0.44	0.239	1	0.313	0.364
Late Complications	Bleeding	1	0.071	0.137	0.462	0.271	0.071
	Accidental decannulation	0.409	0.785	0.258	1	0.977	0.785
	Tube/ventilation problem	0.836	0.6	0.64	0.262	0.604	0.165
	Stomal infection	0.329	0.341	0.456	0.040*	0.162	1
	Stomal-tracheal granulation	0.282	0.000*	0.701	0.382	0.382	0.037*
	Tracheocutaneous fistula	1	0.082	0.243	0.243	0.596	0.082
	Subglottic stenosis	1	0.693	1	1	0.699	0.693

*p<0.05. (Kruskal Wallis test).

Mean duration of surgery was 27.840±6.490 minutes. When we compared the early complications and duration of surgery, we found a significant association between the patients with less than thirty minutes of

surgery and accidental de-cannulation (P<0.000) and among the patients with greater than thirty minutes of surgery time and problems of ventilation/tube (P<0.008).

We also noted that there were 59.30% (n: 162) vertical skin incisions created by surgeons and horizontal were 40.70% (n: 111). When we compared the preferences of skin incision and complications at earlier stage, we found an important relation between bleeding and horizontal incision (P<0.020), between accidental de-cannulation and vertical incision (P<0.001). We also discovered that there were 58.60% (n: 160) vertical tracheal incisions by the surgeons and horizontal were 41.40% (n: 113).

When we compared the preferences of tracheal incision and complications at earlier stage, we found a significant association between sub-cutaneous emphysema and horizontal incision (P<0.025) and between stomal infection and horizontal incision (P<0.040). In this research work, average surgeon's experience was 9.780 ± 6.860 years. When we compared the early complications and surgeon's experience, we found an important relationship between surgeons having 5 years or less experience and bleeding (P<0.000). For late complications, we found a strong relation between surgeons with five years or less experience and stomal-tracheal granulation (P<.0370).

DISCUSSION:

In this research work, we retrospectively reviewed Pediatric Tracheotomy performed on 273 pediatrics in the duration of this research work. Literature on Pediatric Tracheotomy and its associated complications stresses the distribution of age of the pediatrics especially those having less than one year of age. Range of its percentage is from 4.0% to 78.0% [3-9]. The range of age of the children mentioned in this research work with gender distribution is similar with many other research works [10]. Two other research works stated the early complications as 19.0% and 22.0% and late complication as 510% and 77.0% [9, 11]. Review of the literature stated two main indications to be obstruction of the upper airway and prolonged intubation [5, 12, and 13].

In this current research work, most common indication was prolonged intubation with 69.960% and 2nd was the obstruction of airway with 30.04%. We found no important association between the tracheotomy's indications and complications (early & late) in this research work. There are recommendations that wait at least for 10 to 14 days to ensure that pulmonary support or mechanical ventilation is continuous before the requirement for [14]. Standard time for tracheotomy was 24.30 ±11.10 minutes as stated by Oliver [15]. In this current research work, the average time was 27.840 ± 6.490 minutes. This current research work and literature present in this particular field support the conventional use of the vertical incision of skin particularly in the children having less than one year of age in other young age groups [12-16]. It was proposed that there was more likely occurrence of bleeding in the patients having horizontal skin incision, because of no ability for the extension of the horizontal incision up and down [18-19].

In this current research work, 58.60% (n: 160) tracheal incisions were vertical and 41.40% (n: 113) incisions were horizontal. There are many publications which shows that there are some advantages of horizontal incision over vertical incision in terms of collapse of trachea [20]. The average experience of the professionals handling Pediatric Tracheotomy in this research work was 9.780 ± 6.860 years. The range of the experience of the surgeons was from 2 to 26 years. Experience lack can be cause of bleeding in early complications. This particular condition may be related with the inappropriate control of bleeding or careless dissection in the duration of surgical intervention. Improper selection of cannula pressure on trachea by cannula can lead to the stomal granulation which may be an outcome of the experience lack.

CONCLUSION:

Recently, there is increase in the prevalence of the indications of long intubation in pediatric tracheotomy. Short duration of intubation and requirement for mechanical ventilator can decrease the complications related with characteristics of surgical management. Sub-cutaneous emphysema, bleeding and pneumothorax are the abnormalities when can be secured with the experience of surgeon. Intensive care can prevent the complications like accidental de-cannulation and problems of ventilation/tube.

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