



Acute Post-Tracheostomy Clinical Decompensations in Infants—Are There Predictive Markers?

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INTRODUCTION

- Due to more younger and sicker neonates surviving, a growing number of infants are requiring prolonged ventilation. The need for prolonged ventilation typically requires a tracheostomy.
- While a majority tolerate this procedure well, some infants demonstrate acute deterioration following tracheostomy. There is little published literature on the etiology or frequency of acute complications occurring in infants undergoing tracheostomy placement.

OBJECTIVES

- The objectives of our study were to:
 - Define the population of infants who require tracheostomy
 - Identify acute post tracheostomy clinical decompensations
 - Seek predictive markers associated with acute post tracheostomy clinical decompensations

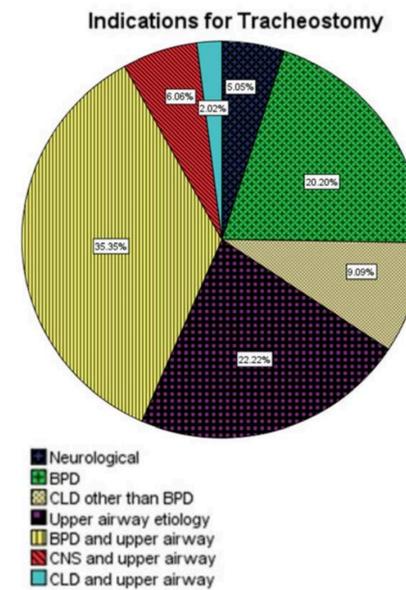
METHODS

- We analyzed almost eight years of retrospective de-identified clinical data provided by the Infant Pulmonary Disorders Data Repository at Children's Mercy Kansas City. Infants were classified as either having or not having acute post tracheostomy clinical decompensation, defined as requiring any of the following within 72 hours of tracheostomy placement:
 - Escalation in ventilator support
 - Initiation of iNO
 - Induced paralysis
 - Initiation of vasopressor medications
- Statistical analysis was performed using SAS version 9.4 and SPSS version 20
 - Paired t-test for changes in pre/post tracheostomy markers
 - Chi-squared test (categorical variables) and Mann-Whitney U test (continuous variables) for bivariate analysis of risk factors

RESULTS

100 infants underwent tracheostomy during our study time

Patient Demographics		
Birth and referral		
	Median	Range or %
Postmenstrual age (PMA), weeks	28 1/7	23-41 1/7
<36 week PMA, n	69	69%
Birthweight, g	966	349-4480
Length, cm	36	24-54.6
Head circumference, cm	26.75	19-38
Wt/L ratio	30.8	14-93
Gender, female, n	51	51%
Age at admission, days	44	0-164
Referral		
-transferred < 24hrs of life	24	24%
-3 level NICU	65	65%
-other	4	4%
Growth Parameter at time of Tracheostomy		
weight, g	3251	1170-7880
length, cm	50	38-71.9
head circumference, cm	35	27-44
Wt/L ratio	69	26-121
Age at time of tracheostomy, days	104	0-231
Median PMA at time of tracheostomy, weeks	44	29-64
Outcomes		
acute decompensation following tracheostomy, n	34	34%
PMA at d/c, weeks	58 3/7	43-155
Patient days in hospital	140	20-816
Death prior to discharge, n	12	12%



34% of infants developed acute post tracheostomy clinical decompensation

Changes in respiratory status pre/post tracheostomy			
	Pre-tracheostomy	Post-tracheostomy	p-value
Acute post-tracheostomy clinical decompensation			
MAP	17.1	18.4	0.017 [^]
PEEP	9.8	10.6	0.013 [^]
PIP	29.4	32	0.042 [^]
FiO2	47	63	0.001 [^]
pCO2	56.7	72.4	0.001 [^]
RSS	8.3	12.1	0.001 [^]
No acute post-tracheostomy clinical decompensation			
MAP	14.5	16	0.003 [^]
PEEP	7.5	7.7	NS
PIP	25.5	27.2	NS
FiO2	44.7	44.5	NS
pCO2	55.6	62.8	0.002 [^]
RSS	7.3	7.4	NS

paired student t-test was used to compare pre/post tracheostomy respiratory measures
[^] p < 0.05

RESULTS

Pre-tracheostomy findings of higher airway pressure and PH occur in the acute post tracheostomy clinical decompensation

Trach Demographics			
	No decompensation	Acute decompensation	p-value
Age in days at time of tracheostomy	94 (8-231)	109 (0-217)	NS
PMA, weeks	43 1/7 (29-64)	45 6/7 (31-60)	NS
Tracheostomy prior to 40 week PMA, n	24 (37%)	10 (29%)	NS
Tracheostomy prior to 120 days of age, n	44 (68%)	18 (53%)	NS
weight, grams	3235 (1265-7880)	3290 (1170-6430)	NS
length, cm	50 (38-71.9)	50 (40-66.5)	NS
Wt/Ht ratio	66 (32-121)	72 (26-107)	NS
Head circumference, cm	34.75 (27.5-44)	37 (24-42)	NS
Pre-tracheostomy respiratory data and echocardiogram			
	No decompensation	Acute decompensation	p-value
Mean Airway Pressure (MAP)	14 (6-38)	17 (8-28)	0.01 [^]
Peak Inspiratory Pressure (PIP)	24.5 (11-72)	38 (14-55)	NS
Positive end expiratory pressure (PEEP)	7 (4-16)	10(5-16)	0.003 [^]
fiO2 max	40 (21-100)	48 (21-100)	NS
pCO2 max	52 (38-101)	57.5 (46-90)	NS
respiratory severity score (RSS)	5 (1-27)	8.2 (2-25)	NS
Echocardiogram findings of pulmonary hypertension or ventricular dysfunction within 30 days prior to Tracheostomy	6 (13%)	15 (50%)	0.002 [^]
Outcomes data post tracheostomy			
	No decompensation	Acute decompensation	p-value
Death prior to discharge, n	4 (6%)	8 (24%)	0.002 [^]
PMA, weeks at discharge	56 5/7 (43-155)	60 5/7 (43 1/7-94 1/7)	NS
Patient days in hospital	133 (20-816)	160 (83-386)	NS

[^] indicates p ≤ 0.05

SUMMARY

- Most infants (66%) tolerated the tracheostomy procedure without acute clinical decompensation
- Infants requiring higher PEEP, MAP, or who had echocardiogram findings revealing PH or left ventricular dysfunction prior to tracheostomy had an increased rate of decompensation
- Birth weight, gestational age, and timing of tracheostomy were not significantly associated with decompensation
- The infants with acute post tracheostomy clinical decompensations had a higher rate of death before discharge

LIMITATIONS

- Retrospective nature shows association, not causality
- Study occurred in a single center, low overall number of patients
- Not all infants received pre-tracheostomy echocardiograms