

EFFECT OF DURATION OF INTUBATION ON POST INTUBATION LARYNGEAL CHANGES IN CHILDREN

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Summary

Introduction. The post intubation complications of the larynx very rare occur in children and they are connected to many factors. We divide the post intubation complications into early and late complications.

It can cicatrized leading to stenosis of subglottic area and in a posterior commissure of the larynx. The endoscopic examination of the changes during prolonged intubation allows us to evaluate the progression of the lesions. The incidence of chronic changes usually is connected with performing tracheotomy in a child in order to keep the patency of the respiratory tract.

Aim. The purpose of the study was an analysis of intubated children who had undergone post intubation complications and a definition the dependence of duration of intubation upon an occurrence of the complications.

Material and methods. A group of 92 children with post intubation complications was analysed. The post intubation complications were the reason of performing a tracheotomy in these children. In each child endoscopic assessment of the larynx and trachea in a general anesthesia was carried out. The duration of the intubation was analysed in each of the examined child.

Results. Tracheostomy due to post intubation complication unable physiological breathing was performed in 92 children. A duration of intubation ranged from 10 to 120 days. Post intubation lesions were related to the duration of intubation. As longer the time of the intubation was, the more serious was the character of changes. More serious changes were observed in premature born children.

Conclusions. Duration of intubation is the major risk factor of the occurrence of post intubation lesions. Prematurely born children who underwent prolonged intubation have worse prognosis. The character of the changes is connected to duration of intubation.

Keywords: intubation duration, post intubation complications, laryngeal stenosis in children

INTRODUCTION

The post intubation complications of the larynx very rare occur in children and they are connected to many factors. The complications could be temporal or they could permanently change the anatomical conditions of the larynx. We divide the post intubation complications into early and late complications. The early complications of the mucosa are nonspecific such as congestion and edema with inflammatory infiltration. The edema of the soft tissue could involve laryngeal vestibule, vocal cords or could localize in subglottic area of the larynx. The continuation of intubation could lead to ulceration and granulation of the mucosa. The ulceration usually occur in posterior part of the larynx, in medial part of the arytenoid, cricoarytenoid joints and anterior part of the cricothyroid membrane. The deep ulceration of perichondrium and cartilage is replaced by late complications such as scars, causing stenosis of the larynx. Granulation tissue often forms in a posterior commissure and subglottic area of the larynx. Occasionally it can cicatrized leading to stenosis of subglottic area and in a posterior commissure of

the larynx. The endoscopic examination of the changes during prolonged intubation allows us to evaluate the progression of the lesions. The deep ulceration of wide surface of the posterior part of the glottis and subglottic area are the major risk factor of the chronic larynx changes occurrences and scars, destructing the larynx (1-3). In such cases the decision to carry out tracheotomy should be taken. The chronic post intubation lesions include cicatrix and post intubation granuloma. The scars could occur at any level of the larynx, but predominantly the subglottic area and commissure posterior are predisposition to such changes. The incidence of chronic changes usually is connected with performing tracheotomy in a child in order to keep the patency of the respiratory tract.

AIM

The purpose of the study was an analysis of intubated children who had undergone post intubation complications and a definition the dependence of duration of intubation upon an occurrence of the complications.

MATERIAL AND METHODS

The study involved a group of 92 children, who developed post intubation complications of the larynx during an intubation. The tracheotomy was performed for the reason of upper respiratory patency impairment. The larynx endoscopic examination revealed the presence of post intubation changes such as edema, ulceration and scars. The analysis of a group was made regarding the duration of the intubation.

RESULTS

The analysis of duration of intubation and of developmental age of the child at the day of birth, turned out to be interesting. Among all the examined children a division was made to the children who were born on time and the children who were prematurely born. The mean time of intubation of children, who were born on time, was 24.6 days, in comparison to the mean time of intubation of prematurely born children, which was more than twice longer and it was 54.8 days. In examined group of children, prematurely born children required a longer intubation in comparison to children who were born on time.

The precise specification of duration of all patients intubation shows table 1.

Sixteen children were intubated for a period of 30-40 days, which makes 17.39% of all patients. The second large group consists of 15 children, who were intubated for a period of 10-20 days (16.3%). Prolonged intubations over 100 days were sporadic in examined group of patients.

Table 1. Duration of intubation (in days).

Days	n	%
$0 \leq x < 10$	12	13.04
$10 \leq x < 20$	15	16.30
$20 \leq x < 30$	9	9.78
$30 \leq x < 40$	16	17.39
$40 \leq x < 50$	10	10.87
$50 \leq x < 60$	3	3.26
$60 \leq x < 70$	9	9.78
$70 \leq x < 80$	4	4.35
$80 \leq x < 90$	2	2.17
$90 \leq x < 100$	9	9.78
$100 \leq x < 110$	1	1.09
$110 \leq x < 120$	1	1.09
$120 \leq x < 130$	1	1.09

n – the amount of patients

In cases of 65 children out of 92 examined patients, early post intubation changes such as edema and ulcerations were diagnosed.

The mean intubation time in children who had subglottic edema found during the endoscopic examination, was considerably shorter than in the remaining children, with early post intubation changes. The mean intubation time for the other children was 57.2 days. An edema occurs in case of children, whose duration of intubation was much shorter than the remaining children.

The connection between occurrence of the edema and duration of intubation shows table 2.

The ulcerations of the larynx often results in secondary scarring and we observed them in 29 children from a group of 65 children. In the group of children with ulceration of the larynx the mean time of intubations was 61.7 days and it was the longest among the children with early post intubations complications.

The connection between occurrence of ulcerations and duration of intubation shows table 3.

DISCUSSION

To define the duration of intubation in correlation to occurrence of early post intubation changes such as edema and ulceration turned out to be a quite major clinical investigation. Carrying out the evaluation of connection between the ulceration, which results in a serious stenosis of the larynx and the duration of intubation, we found out that in a group of children with ulceration of the larynx, the mean time of intubation was the longest and it was 61.7 days. The difference is major, because in a group of children who had diagnosed other early complications, the mean duration

Table 2. Edema and duration of intubation (in days).

Data	Amount of patients	Median	Average time of intubation
Absence of edema	35	59.0	57.2
Edema	30	35.5	42.3
Total	65	45.0	50.3

Table 3. Ulcerations and duration of intubation (in days).

Data	Amount of patients	Median	Average time of intubation
Absence of edema	36	35.5	41.2
Viceration	29	60.0	61.7
Total	65	45.0	50.3

of the intubation was 41.2 days. So, the ulceration of subglottic area of the larynx is strongly connected to the longer intubation duration. Many authors emphasize the connection between the duration of intubation and post intubation larynx lesions (4-6). Sato carried out the examination of a group of 44 infants with low birth weight (lower than 1000 g) and of duration of intubation, which ranged from 10 minutes to 138 days, evaluating histological larynx changes, which occur after the intubation. He did not find statistically any correlations between lower birth weight and the ulceration profoundness. But, in all cases in which the intubation lasted longer than 8 days, the changes in perichondrium were observed. On the contrary, he found the major connection between the duration of intubation and ulceration size. As an intubation lasts longer, the ulceration was more deep and more extensive (7). The post intubation complication may occur independently to duration of intubation, but according to Meneghini, prolonged intubation is an additional risk factor (8). Gould accomplished precise measurement and histologic evaluation of the post intubation larynx lesions in cases of 75 newborn children who developed distant post intubations complications. The duration of intubation ranged from a few hours to 300 days, the birth age ranged from 22 to 40 pregnancy week. He found that the larynx ulcerations begin to occur just after a few days, but increases rapidly after 10th day of intubation, with its maximum after 30th day of intubation (9). The duration of intubation makes a lot of difference in larynx ulceration formation, which is compatible with the results of our examination.

Whited pointed out, that duration of intubation is essential as far as the amount of larynx post intubation complication is concerned. He carried out the investigation on 200 patients whose intubation lasted from 2 to 24 days. The amount of post intubation complications increased from 2% in case of patients with short period intubation up to 14% in cases who were intubated longer than 10 days (10). Sudance carried out a study over the grade of larynx stenosis and duration of intubation

on the animal model (dogs). He found out, that in all animals intubated longer than 14 days the 40-50% stenosis of the lumen of subglottic area of the larynx occurred, due to scar tissue formation. On the contrary Jones did not find any correlation between the intubation duration and the birth age (11). In presented by the author work, the group of children, with major post intubation lesions such as ulceration, was characterized by the longest intubation duration.

CONCLUSIONS

Duration of intubation is the major risk factor of post intubation changes development. The children prematurely born who were undergone prolonged intubation have worse prognosis. The type of post intubation larynx lesions is connected to duration of intubation. The major lesions such as ulceration occur in children whose intubation duration is longer.

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