

Duration of Intubation After Gastric Pull up Operation in Young Children

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Background: Gastric pull up is performed in patients with esophageal atresia (EA) and caustic injuries. In general, elective gastric pull up is performed when patients weigh above 10 kg. Obesity can cause respiratory compromises and lengthen duration of hospitalization and children may have poor general condition.

Objectives: Our goal was to investigate whether patients who weighed less than 10 kg had better clinical status after gastric pull up operation compared to those who were more than 10 kg.

Patients and Methods: We retrospectively reviewed the records of 90 patients who underwent gastric pull up due to esophageal atresia in Mofid Children Hospital, Tehran, Iran. Clinicopathological features of children were studied according to their weights on the operation day.

Results: The mean age was 5 ± 2 years in patients who were above 10 kg and 3 ± 1 years in those less than 10 kg. Patients who were less than 10 kg had shorter duration of intubation, compared to the children who were above 10 kg ($P < 0.05$).

Conclusions: Elective gastric pull up can be performed for children who are not above 10 kg. In such settings, the risk of respiratory infections and other complications would be significantly reduced because of shorter duration of intubation.

Keywords: Children; Esophageal Atresia; Intubation

1. Background

Esophageal replacement in childhood is one of the major surgical challenges and is undertaken mainly for benign conditions. Esophageal atresia (EA) and caustic injuries are usual indications for esophageal replacement. Gastric transposition (gastric pull up), colon transposition and gastric tube are used for esophageal replacement (1, 2). The neo-esophagus should allow normal oral feeding, absence of refluxes and be able to function well for the lifetime of patient (2). EA can cause severe complications for children, such as infection, tracheomalacia and esophageal strictures (3). EA is the most common indication for gastric transposition. However, esophageal stenting has gained prominence during the recent years. Preservation of native esophagus is desirable and can be achieved in most cases. However, some patients with long gap esophageal atresia would require esophageal replacement. In addition, a number of those patients managed with primary repair would require an esophageal substitution as a result of complications of the primary procedure or development of refractory gastroesophageal reflux, persistent stricture, and/or esophageal dysfunction. In those patients, preservation of esophagus may be futile. The gastric pull up establishes effective gastrointestinal continuity with few long-term complications (4-6). Currently, gastric pull up is performed when

a patient is over 10 Kg. In such conditions, patients may have obesity and other important complications, like long time intubation, which is the potential risk factor of ventilator-associated pneumonia (VAP). Of note, VAP is a leading cause of morbidity and mortality.

2. Objectives

The goal of this study was to evaluate whether elective gastric pull up is safe in children less than 10 kg. We hypothesized that early operation of such patients could reduce the likelihood of VAP and other complications.

3. Patients and Methods

We retrospectively reviewed the records of 90 patients who underwent gastric transposition for esophageal reconstruction between 2005 and 2013 regarding demographics, initial esophageal disease, previous treatment and specifics of the gastric transposition procedure, complications and follow-up. The exclusion criteria were as follows: inflammatory conditions, respiratory diseases, advanced hepatic or renal disease and malignant neoplastic diseases. None of the patients had other gastrointestinal diseases. The local ethical committee approved the study.

3.1. Data Analysis

Data are reported as mean \pm SD or numbers (percentage). Categorical variables were compared using one-way analysis of variance. Means were compared by Wilcoxon signed rank test. Differences at the level of $P < 0.05$ were considered statistically significant. All analyses were performed using SPSS 16.0 (IBM, US).

4. Results

4.1. Clinical Characteristics

Baseline characteristics of patients are shown in Table 1. From a total of 90 patients, 38 patients weighed less than 10 kg and 52 patients above 10 kg. No significant difference was observed in clinical characteristics of the study subjects.

4.2. Duration of Intubation

As shown in Table 2, patients above 10 kg significantly had longer duration of intubation compared to those who were thinner ($P < 0.05$).

Table 1. Clinical Characteristics of the Study Subjects ^a

Characteristic	Below 10 kg (n = 38)	Above 10 kg (n = 52)	P Value
Age, y	5 \pm 2	3 \pm 1	0.06
Males	63	54	0.07
Concomitant disorders			
Cardiorespiratory	22	18	0.5
Renal	19	18	0.1
Neuromuscular	13	7	0.6

^a Data are shown as % or Mean \pm SD.

Table 2. Duration of Intubation in the Study Subjects ^a

Group	Sample Size	Duration of Intubation, Day
Below 10 kg	38	4 \pm 2 ^b
Above 10 kg	52	8 \pm 1

^a Data are shown as number or Mean \pm SD.

^b $P < 0.05$.

5. Discussion

Stomach replacement has advantages of having a single anastomosis in the neck or mediastinum; a very good blood supply and replacing the whole length of the esophagus with a low risk of leak and stricture. Oral feedings and appropriate weight gain are achieved in most children, if successful (7-9). In this approach, the stomach occupies a large space in the chest of small children and has a potential for causing significant respiratory compromise and possibly VAP. It could also be a source of recurrent aspirations from gastroesophageal reflux

(10). As we showed, obese children had longer duration of intubation. It may last for 10 up to 15 days. Interestingly, most of children less than 10 kg extubated after one day and few cases extubated after the operation. This is more important in children who have concurrent cardio-respiratory disease, neuromuscular disorders or renal failure. Other conditions like duration of operation, use of immunosuppressive and H2 blockers, poor health status of the oral cavity, surgical traumas, NG (Nasogastric) tube and sedation can potentially increase the risk of VAP (11). Corrosive ingestion results in substantial penetrating injury. Esophageal strictures are reported in up to 40% of patients with corrosive injury. Perforation rates are high for corrosive strictures. Ingestion of corrosives is a world-wide problem, especially in developing countries (12). Long-term follow-up of children underwent gastric pull up is essential because of gradual changes in the function of graft, strictures at the anastomosis and unknown risks of the Barrett's esophagus (13, 14). In the current study, three patients died because of esophageal rupture and following sepsis. In conclusion, our results showed that elective gastric pull up could be performed for children who are not above 10 kg. In such settings, the risk of VAP and other compromises would be significantly reduced; however, long-term follow up is mandatory.

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