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LETTER TO THE EDITOR

The effect of gestational age on short- and long-term complications following primary esophageal atresia repair

Dear Editor,

Esophageal Atresia (EA) is a rare congenital anomaly with an incidence of 1.2 to 4.5 per 10,000 live births.[1] It is frequently associated with comorbidities which pose significant challenges in the perioperative period.[2] Although notable progress in treatment options and survival has been made during the past decades, patients with esophageal atresia still encounter long-term complications that severely impact their quality of life. The majority relate to gastrointestinal and respiratory problems which result in multiple hospital admissions as well as diagnostic and therapeutic interventions.[2–4] Prematurity, among other factors, may affect overall long-term outcomes following successful esophageal atresia repair.[5] This current study hence investigated the impact of gestational age on gastroesophageal and respiratory complications during the first 5 years of life.

We conducted a retrospective chart review including all patients who underwent primary surgical repair at Montreal Children's Hospital between 2005 and 2023, using a predefined paper-based Case Report Form (CRF). The study was approved by the hospital research ethics board (MP-CHU-HSJ-08-003). Prematurity was defined as babies born alive before 37 weeks of pregnancy. Outcomes included patient demographics, medical and surgical history, and ongoing clinical care relating to gastrointestinal and respiratory complications (Table 1). All data were transferred into an electronic REDCap database. Differences between preterm and full-term births were examined using independent *t*-tests or Mann-Whitney *U* test for continuous data and Chi-Squared tests or Fischer exact tests for binomial data. We examined the relationship between gestational age and the incidence of gastrointestinal and respiratory complications using the Chi-Square test and logistic regression. Clinically relevant variables were added to the model to adjust for potential confounding.

A total of 137 patients (39.4% females with a mean Gestational Age (GA) of 37.2 ± 3.2 weeks and a mean birth weight of 2679 ± 708 g) underwent esophageal atresia repair and were included in this analysis. The anatomical variations stratified according to the EA Gross classification included Type A = 3%, Type B = 1.6%, Type C = 82.2%, Type D = 4.8% and Type E = 8%.[6] A VACTERL association was observed in 17 patients (27%) and CHARGE syndrome in one patient (1.6%). Congenital anomalies affected vertebral (23%), anorectal (9.5%), cardiac (45.2%), renal (27.9%), skeletal (11.1%), respiratory (8.6%), digestive (54.7%), and other (20.7%) systems. Preterm patients more frequently required gavage feeding (54.5% vs. 14.8%, OR = 6.67 [1.33 to 33.33], $p = 0.019$) and had stenosis (72.7% vs. 37.0%, OR = 4.55 [0.97 to 20], $p = 0.046$), but were prescribed anti-H2 less frequently (18.2% vs. 77.8%, OR = 0.063 [0.011 to 0.38], $p = 0.001$).

The incidence of respiratory complications was higher in the full-term patient population (respiratory deteriorations 57.7% vs. 33.3%, abnormal respiratory symptoms 84.6% vs. 66.7%, and abnormal auscultation 73.1% vs. 46.7%), with the exception of exertional dyspnea which was higher in the preterm population (13.3% vs. 7.7%). None of the results reached statistical significance.

Our demographic study population closely aligns with previous reports. The use of anti-H2 blocker therapy was significantly higher in full-term patients, while the number of cases of gavage feeding, and stenosis was higher in the premature population. These findings suggest that a subgroup of gastrointestinal complications may be related to gestational age. Future prospective studies should explore additional factors and underlying mechanisms. No association between gestational age and respiratory complications during the first 5 years of life was observed. The study has several limitations, including small sample size, missing data, and variability in reporting of outcomes. Study limitations are attributed to the retrospective data collection in a single institution, and potentially to evolution over time in surgical techniques and perioperative approaches. These results and limitations suggest that the establishment of international defined core outcomes and cross boarder collaboration is essential to advance research in rare disease populations such as EA.

Progress in the treatment of esophageal atresia has been made using an ever-increasing collaborative network. While limited surgical outcome databases have been established for some time, successful large anesthesia outcome networks have only been established more recently in pediatric anesthesia — with the APRICOT and NECTARINE leading examples.[7,8] Close collaborations between surgical and pediatric anesthesia networks will permit evaluation of an "esophageal bundle" strategy,[9] including multidisciplinary perioperative outcomes and long-term follow-up.

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Table 1 Collected information of all patients who underwent esophageal atresia repair at the Montreal Children's Hospital between 2005 and 2023.

Demographic data	Sex, date and place of birth, gestational age, birth weight, Apgar score, date of admission to hospital, date of surgery
Prenatal data	Intrauterine growth delay Date of diagnosis of esophageal and/or tracheoesophageal fistula Multiple pregnancy In Vitro Fertilization
Additional anomalies	Skeletal, anorectal, cardiac, renal, limb, gastrointestinal, respiratory, other
Type of esophageal atresia	Gross classification
Syndromes	Vacterl, charge, Other
Gastrointestinal outcomes	Medications during first 5 years of life: proton pump inhibitors; cisapride; domperidone; H2 receptor blocking agents; Need for gavage feeding Esophageal pathology (esophagitis, barret's esophagus, Stenosis, Hiatal hernia, esophageal diverticulum); Stomach and duodenal pathology (ectopic pancreas, microgastria) and abnormal histology (peptic esophagitis, eosinophilic esophagitis, dilatation required)
Respiratory outcomes	Medications during first 5 years of life (antibiotics, per so steroids, inhalational steroids, ventolin) Deteriorations; admission to hospital (intensive care unit, emergency, ward); Diagnostics (pneumonia, bronchitis, sinusitis, asthma attack); abnormal respiratory symptoms (coughing, morning cough, night-time cough, grumbling breathing, grumbling (eating), wheezing, respond to ventolin); exertional dyspnea; continuous dosing aerosol (corticosteroids, without long-acting beta agonists, With long-acting beta agonists, other inhaler) and abnormal auscultation (rhonchi, crackles, wheezing)

Declaration of competing interest

The authors declare no conflicts of interest.

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