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Comparing characteristics and outcomes in infants with prenatal and postnatal diagnosis of esophageal atresia

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ABSTRACT

Background: Previous studies of infants with esophageal atresia (EA) suggest those diagnosed prenatally have worse outcomes because of a higher incidence of associated anomalies. The purpose of this study was to compare characteristics and outcomes of infants with EA diagnosed after fetal center evaluation to those diagnosed postnatally.

Methods: The records of all neonates treated for EA at our institution from 2002–2012 were reviewed. Infants with a prenatal diagnosis of EA were compared with those postnatally diagnosed using chi-square and Student *t*-test as appropriate.

Results: Of 91 patients treated with EA during the study period, 15 (16%) were diagnosed prenatally at our fetal center. Although those prenatally diagnosed had a higher incidence of pure EA and polyhydramnios, the gestational age and birth weight in that group were similar to those diagnosed postnatally. There were no differences in outcomes between groups with regard to the incidence of major cardiac anomalies, surgical complications, hospital length of stay, and survival.

Conclusions: Treatment at a tertiary care center provides excellent outcomes for all infants with EA, despite an 80% frequency of concurrent anomalies. Prenatal diagnosis of EA and attentive obstetric management of polyhydramnios decrease the risk for prematurity and prematurity-associated morbidity.

1. Introduction

Prenatal diagnosis and fetal management of infants with esophageal atresia (EA) and possible tracheoesophageal fistula (TEF) have evolved as imaging, and perinatal care has improved. Theoretically, prenatal diagnosis improves patient management by ensuring delivery at a tertiary care hospital with immediate access to neonatal surgical services, by early

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detection of associated anomalies that may impact outcome, and by preparing the parents for a possible protracted neonatal stay [1]. Advances in ultrasound technology and the use of fetal magnetic resonance imaging (MRI) have improved prenatal diagnostic capabilities [1,2]; yet, the rate of prenatal diagnosis for EA continues to range from 12%–74% [3–6]. On fetal imaging, EA is suspected with combined ultrasonographic findings of an absent stomach bubble and polyhydramnios, although the positive predictive value of these findings remains low [7]. The use of fetal MRI can improve the predictive value significantly by improved characterization of the fetal esophagus and detection of an upper pouch sign, which is dependent on active fetal swallowing [2,7].

Whether prenatal diagnosis results in improved patient outcomes compared with those infants diagnosed postnatally remains unclear, as the literature on this topic is sparse and conflicting. Further confounding the issue is the hypothesis that the two patient groups may be fundamentally different, as those infants that have associated anomalies that decrease survival are more likely to be diagnosed prenatally compared with those with isolated EA and/or TEF in which the ultrasonographic abnormalities may be subtle. One study found that patients with a prenatal diagnosis had decreased survival, as this group had a higher rate of associated anomalies, a known predictor of increased mortality in EA and/or TEF [5]. Another study found improved survival in the prenatally diagnosed group [6]. We hypothesized that the prenatally diagnosed patients referred to our fetal center would have a higher rate of associated anomalies than those diagnosed postnatally. We also hypothesized that the group diagnosed prenatally in our fetal center would have similar survival and outcomes to those diagnosed after birth.

2. Methods

2.1. *Fetal center management*

At the Texas Children's Hospital Fetal Center, all patients referred for suspected EA undergo a multidisciplinary evaluation. If ultrasonographic findings are convincingly suspicious for EA (absent stomach bubble, polyhydramnios, and esophageal pouch sign), a fetal MRI and fetal echocardiography are obtained to confirm the diagnosis and evaluate for associated anomalies. In addition to the initial consultations with maternal fetal medicine and pediatric surgery, cardiology, cardiac surgery, and genetic consultation are obtained as needed.

2.2. *Study design*

After approval by the Institutional Review Board of Baylor College of Medicine (H-32260), all patients born with EA and/or TEF treated at our institution from January 2002–December 2012 were identified by *International Classification of Diseases, Ninth Revision* code. Patients who received initial surgery at another center but had subsequent treatment at our facility were not included. Patients with prenatally suspected EA with subsequently terminated pregnancies were also excluded. Patients who received prenatal care at an outside facility and for which a prenatal diagnosis of EA could not be confirmed were categorized in the postnatal diagnosis group.

A retrospective chart review was performed. Patient characteristics and surgical outcomes of the patients who received a prenatal diagnosis of EA and/or TEF and treated at the Texas Children's Fetal Center were compared with those who were diagnosed with EA and/or TEF after birth. The primary outcome was survival. Secondary outcomes included the type of anomaly, the incidence of other congenital abnormalities, surgical complication rates (including anastomotic leak, recurrent fistula, pneumothorax requiring intervention, infection, and reoperation), hospital length of stay, time to full feeds, time of mechanical ventilation, and duration of oxygen requirement. Neonates with EA and/or TEF are treated in a standardized fashion in our institution with early surgical repair once stabilized. Those with EA and no TEF usually will undergo gastrostomy with delayed primary esophageal repair at 2–4 mo based on radiologic demonstration of less than one vertebral body distance between the proximal esophagus and distal esophagus. Statistical analysis included chi-square for categorical variables and Student *t*-test for continuous variables.

3. Results

3.1. *Patient characteristics*

We identified 15 patients with a confirmed prenatal diagnosis of EA and 76 with a postnatal diagnosis. All except one (93%) prenatally diagnosed patient were born at our institution compared with 26% of infants postnatally diagnosed. The rates of polyhydramnios were higher in the prenatally diagnosed group (Table 1). Patients with pure EA had a higher rate of polyhydramnios (100%) compared to those with a fistula (45%). Pregnancies were otherwise reported as being uncomplicated, except for a 12% rate of gestational diabetes mellitus in the postnatally diagnosed patients. Patients in each group were born at similar mean gestational ages, with similar mean birth weights (Table 1). There was a significantly higher incidence of pure EA in the prenatally diagnosed group (47% *versus* 11%; $P = 0.003$) and conversely a lower incidence of EA with

Table 1 – Patient characteristics and demographics.

	Prenatal diagnosis, $n = 15$ (%)	Postnatal diagnosis, $n = 76$ (%)	P value
Male	8 (53)	36 (47)	0.78
Prenatal care	15 (100)	69 (89)	0.59
Polyhydramnios	14/15 (93)	38/69 (55)	**0.007**
GA at birth (wk)	36.5 ± 2.3	35.8 ± 3.0	0.35
Preterm birth (GA < 38 wk)	9 (60)	50 (66)	0.77
Birth weight (g)	2390 ± 474	2347 ± 787	0.84
Pure EA (type A)	7 (47)	8 (11)	**0.003**
EA with TEF (types B, C, and D)	8 (53)	66 (88)	**0.003**
Other anomalies	12 (80)	54 (82)	1.0
VACTERL association	4 (27)	26 (34)	0.77
Major cardiac anomalies	10 (67)	46 (61)	0.78

GA = gestational age.