

Survival after fetoscopic tracheal occlusion for congenital diaphragmatic hernia: The importance of the care setting



OBJECTIVE

Fetoscopic tracheal occlusion (FETO) is an experimental prenatal treatment intended to reduce mortality due to respiratory failure that is found in severe congenital diaphragmatic hernia (CDH).

In the US all CDH programs that employ FETO have standardized pediatric care paths that include extracorporeal membrane oxygenation (ECMO). We sought to compare US-FETO outcomes to healthcare settings where ECMO is not uniformly available.

BACKGROUND

Infants with congenital diaphragmatic hernia (CDH) are at risk for lethal pulmonary disease as a developmental consequence of prenatal lung compression from herniated abdominal contents. Even in high volume CDH management centers infant survival is related to the availability of extracorporeal membrane oxygenation (ECMO), (Snoek et al).

In the US fetoscopic tracheal occlusion (FETO) is an experimental prenatal treatment, performed in a protocol based setting for severe CDH (observed to expected lung/head ratio (O/E-LHR<30%)). The combination of standardized prenatal and pediatric carepaths that include ECMO availability could impact outcome.

METHODS

Infant outcome after FETO from two US-based feasibility studies (NCT:02710968 and NCT: 00881660) were aggregated. Similar data were extracted from all published non-US FETO series identified in a PubMed search. Gestational age (GA) at FETO, balloon removal and delivery, length of occlusion as well as side of hernia, observed to expected lung to head ratio (O/E LHR), delivery details and neonatal and infant survival were compared between UA and non-US healthcare settings.

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RESULTS

FETO outcome from 23 CDH infants from the US were compared to 71 reported in six studies from Europe and Brazil. Baseline characteristics and CDH severity were similar between cohorts (table). In the US FETO and balloon removal occurred one week later respectively ($p < 0.05$). Balloon removal was achieved prenatally by fetoscopy more frequently in the US cases ($p < 0.05$). Remaining procedure details were similar.

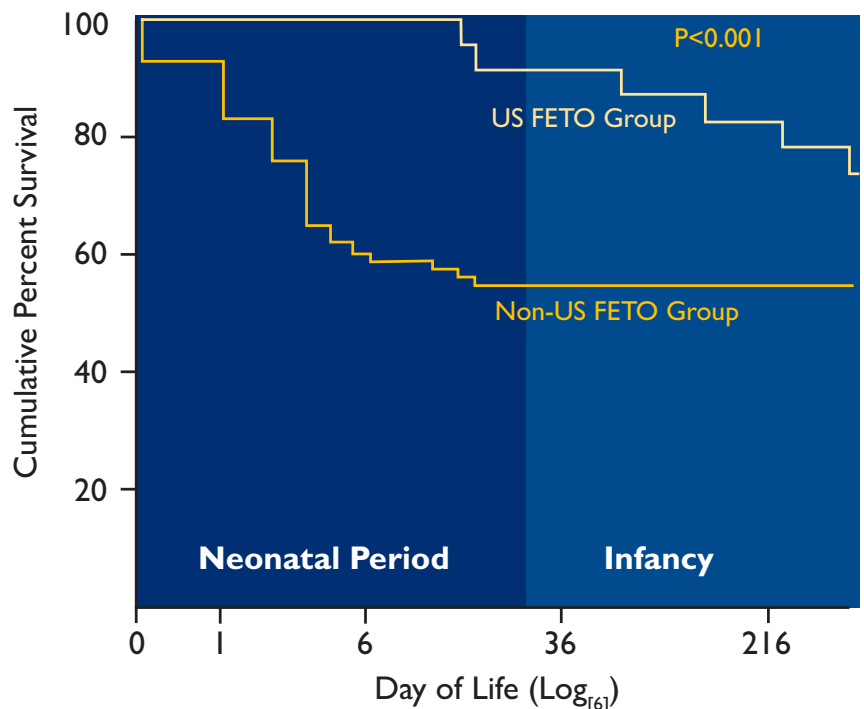
Following balloon removal there were differences in the rate of preterm birth < 34 weeks (21/71 vs 2/21) and delivery gestational age (35 vs 36+1 weeks gestation; both $p < 0.05$) in the two care settings.

	US-Cohort N=23		Non US-Cohort N=71		P-Value
CDH side					
Left	21	(91%)	60	(84%)	NS
Right	2	(9%)	11	(16%)	
FETO Details					
Pre-FETO O/E LHR	22%	(11-30%)	21%	(16-29%)	NS
Gestational age at FETO	28+5	(25+6-29+6)	27+5	(25+5-33+1)	0.033
FETO procedure (minutes)	12	(4-110)	15	(3-54)	NS
FETO reversal GA	33+6	(31+3-35+1)	33+1	(26+5-38+3)	0.023
Days of tracheal occlusion	35	(17-46)	35	(5-89)	NS
Balloon removal technique					
Fetoscopy	13	(57%)	48	(68%)	0.012
Sono guided needle	9	(39%)	7	(10%)	
EXIT	1	(5%)	11	(16%)	
Postnatal	0	-	5	(7%)	
Obstetric complications					
PPROM	6	(26%)	22	(35%)	NS
Gestational age at birth	36+1	(32+6-39+6)	35	(26+5-38+6)	0.012
Delivery < 34 weeks	2	(9%)	21	(33%)	< 0.05
Survival					
Neonatal survival	21	(91%)	39	(55%)	0.004
Infant survival	18	(78%)	39	(55%)	0.047
Day of life at death	95	(15-4+3)	2	(0-16)	< 0.0001

Neonatal survival was higher in the US cohort due to higher mortality in the first week of life in a non-US setting ($p < 0.0001$). Infant survival was also higher but did not reach statistical significance (figure below). Among all significantly divergent variables logistic regression identified the healthcare setting as the primary determinant of neonatal death (r^2 0.28, $B = -2.772$, $p < 0.004$).

CONCLUSIONS

Survival after FETO for severe CDH is significantly dependent on the care setting suggesting that immediate postnatal therapies such as ECMO are complementary to overcome the pulmonary impacts of severe CDH. Our findings indicate that randomized trials of FETO for CDH must be powered based on outcomes that are specific for the healthcare setting where the therapy is intended to be used.



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