



Prédiction fonctionnalité cardiaque néonatale chez les fœtus avec HDC Etude prospective multicentrique

Journée Annuelle FIMATHO – 3 juin 2025



ORIGINAL ARTICLE

Ventricular Dysfunction Is a Critical Determinant of Mortality in Congenital Diaphragmatic Hernia

Neil Patel¹, Pamela A. Lally², Florian Kipfmueller³, Anna Claudia Massolo⁴, Matias Luco⁵, Krisa P. Van Meurs⁶, Kevin P. Lally², and Matthew T. Harting²; for the Congenital Diaphragmatic Hernia Study Group

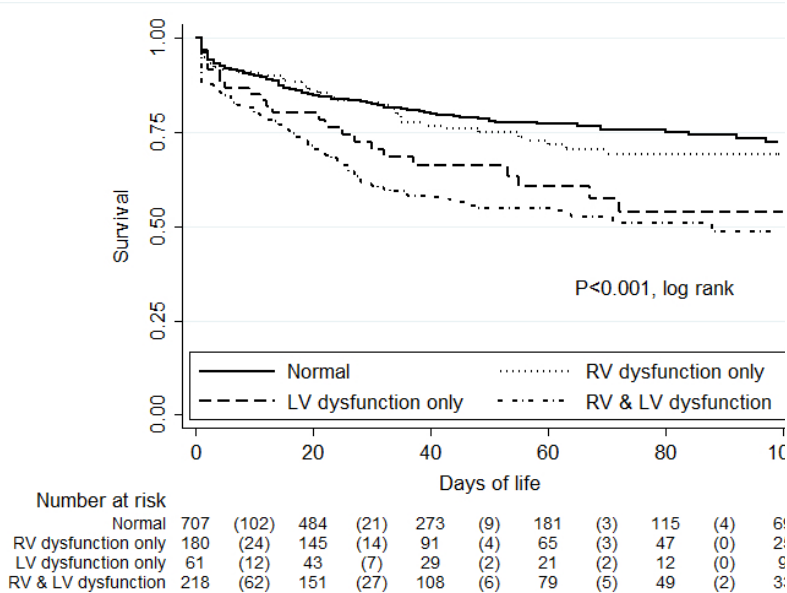


Figure 2: Kaplan-Meier 100-day survival curves by cardiac function group

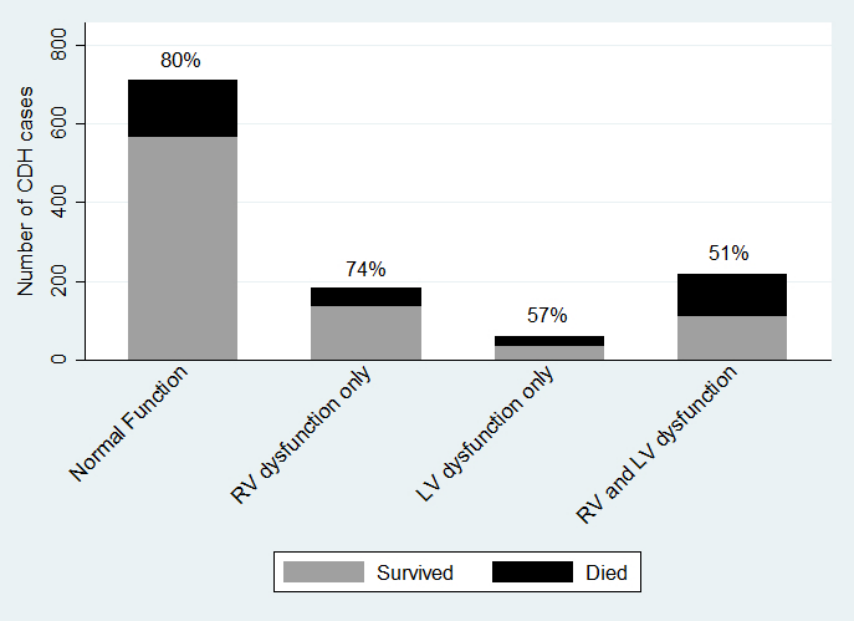


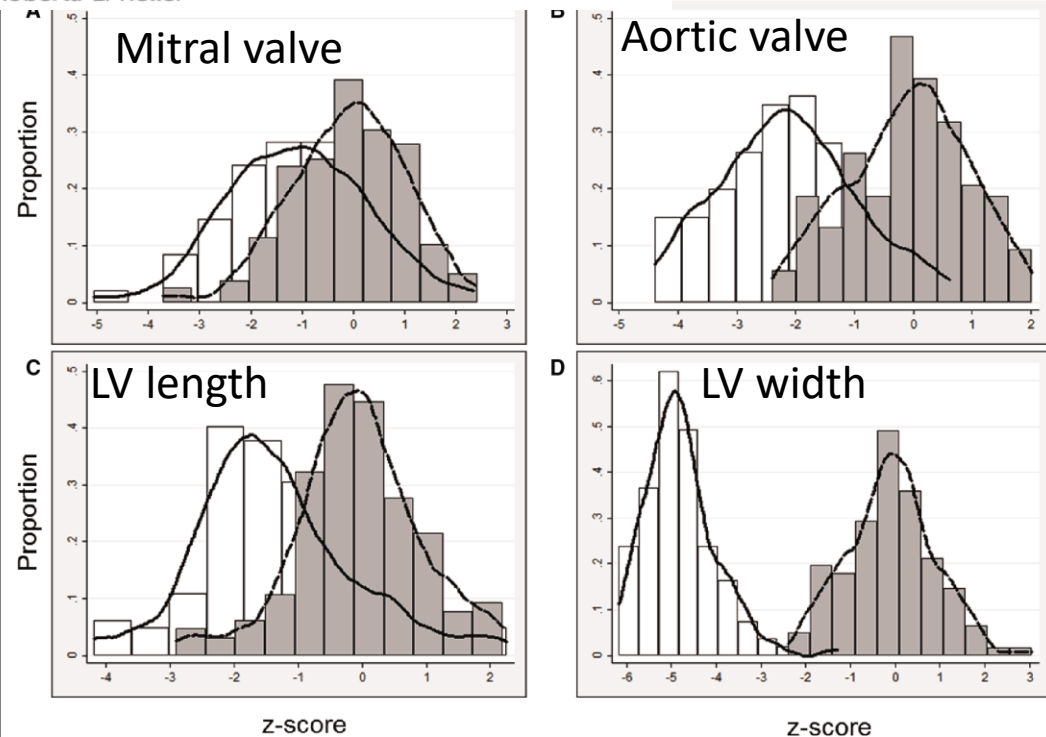
Figure 3: Cardiac function and outcome on early (a) and follow-up (b) echocardiogram: Figure 3a: Cardiac function on early echocardiogram and survival to discharge

Background – Fetal cardiac hypoplasia

Expected small left heart size in the presence of congenital diaphragmatic hernia: Fetal values and Z-scores for infants confirmed to have no heart disease postnatally

Anita J. Moon-Grady^{1,2*}, Francesca A. Byrne³, Leslie A. Lusk⁴ and Roberta L. Keller^{2,5}

N = 142



Does fetal LV hypoplasia impact postnatal prognosis?

Patel 2017

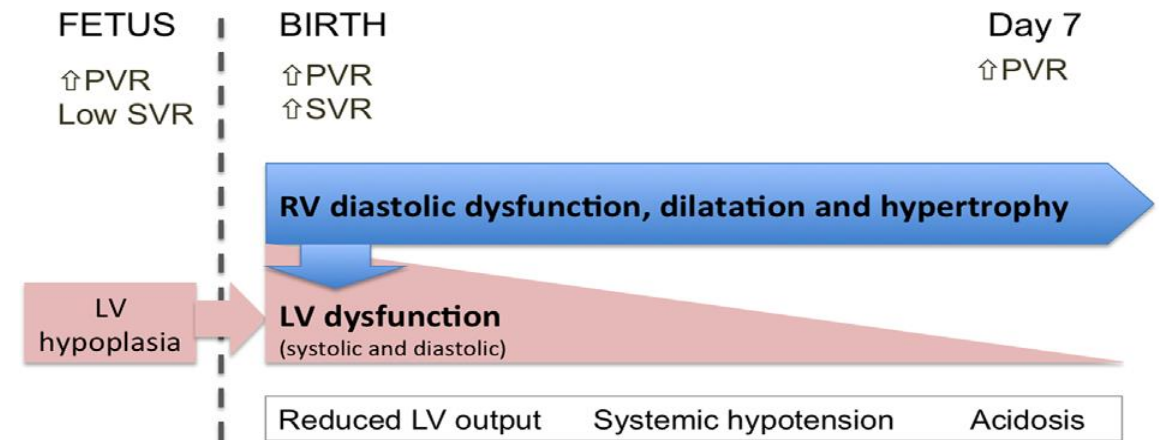


Fig. 1. Pathophysiology of early cardiac dysfunction in CDH. *Abbreviations:* PVR, pulmonary vascular resistance; SVR systemic vascular resistance; RV, right ventricle; LV, left ventricle.

Background - Fetal cardiac dysfunction

NO EVIDENCE FOR FETAL SYTOLIC DYSFUNCTION

- ✓ No altered visual systolic function or decreased ejection fraction
- ✓ ecreased left ventricular output, RV output normal
- ✓ No cardiac dysfunction by speckle tracking

Van Mieghem et al. 2009 (n=27)
Byrne et al. 2015 (n=188)

DeKoninck et al. 2011

EVIDENCE FOR FETAL DIASTOLIC DYSFUNCTION

- ✓ Altered E/A ratio and TDI values
- ✓ Altered TDI values

(n=28)
Cruz Lemini 2018 (n=31)

None of these studies investigated fetal cardiac (dys)function in relation to postnatal outcomes

EVIDENCE FOR POSTNATAL DIASTOLIC DYSFUNCTION

- ✓ In CHD= worse global function
- ✓ MPI/altered TDI = association with neonatal PAHT
- ✓ MPI index decreased after Feto
- ✓ No change in functional parameters after FETO

Kaya 2019 (n=28)
Cruz Lemini 2018 (n=31)

Van Mieghem et al; 2009 (n=27)
Degenhardt et al. (n=8)

Background – Feto-neonatal transition

Fetus

Small fetal left ventricle

No systolic dysfunction,
probably diastolic dysfunction

Neonate

RV dilatation and hypertrophy

LV pre –and afterload variations

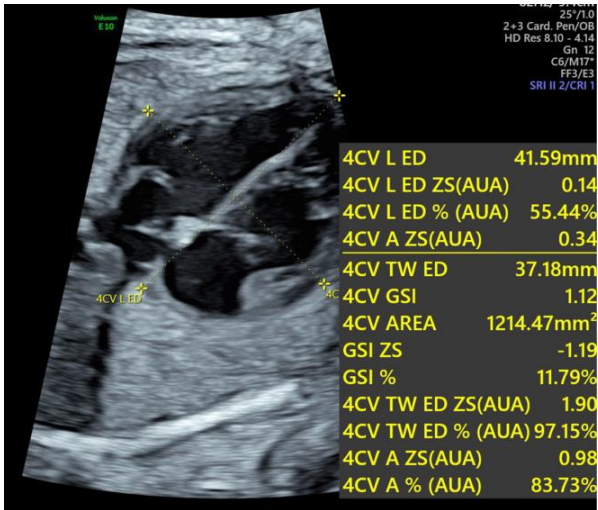
Ventricular interdependance

RV +/- LV dysfunction

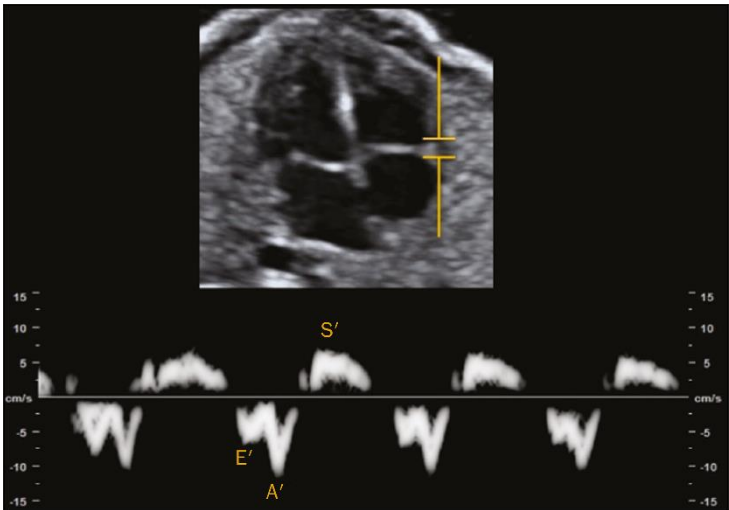
Is it possible to predict cardiac postnatal dysfunction?

Background – Fetal cardiac evaluation

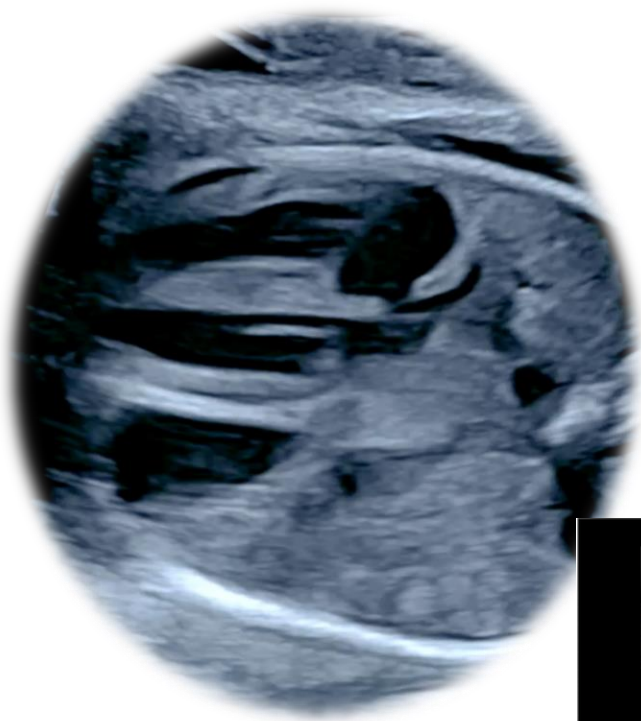
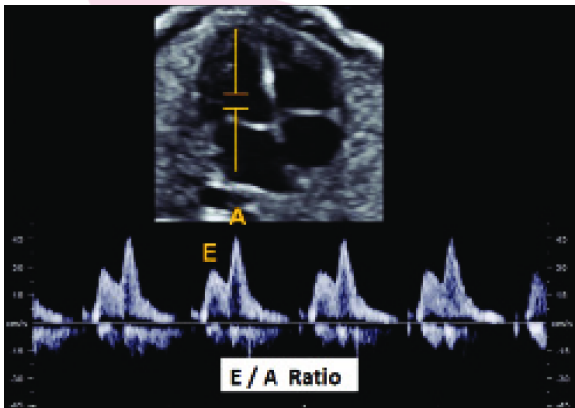
Morphology



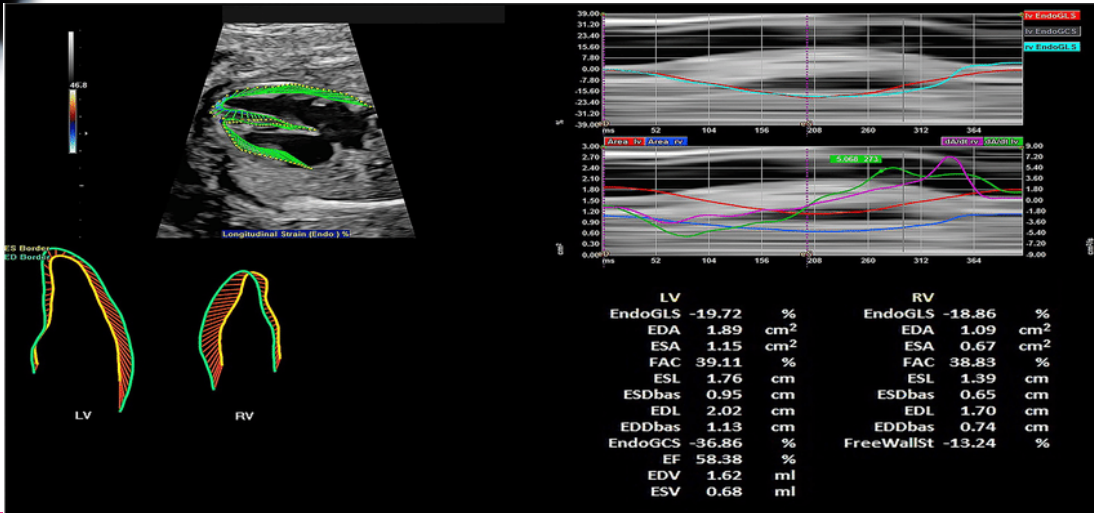
Tissue Doppler



Conventional Doppler



Speckle-tracking echocardiography



RESEARCH ARTICLES | JANUARY 09 2024

Abnormal Shape and Size of the Cardiac Ventricles Are Associated with a Higher Risk of Neonatal Death in Fetuses with Isolated Left Congenital Diaphragmatic Hernia

Subject Area:  Women's and Children's Health

Erin S. Huntley  ; Edgar Hernandez-Andrade ; Ramesha Papani Jimmy Espinoza; Eleazar Soto; Suzanne M. Lopez; Matthew T. Harting



cardiac function, and severe adverse outcomes were estimated. **Results:** Fifty fetuses were included, and seventeen (34%) had severe adverse neonatal outcomes (11 ND and 6 survivors with CDH-PH). At first evaluation, the prevalence of a small left ventricle was 34% (17/50) with a higher prevalence among neonates presenting severe adverse outcomes (58.8 [10/17] vs. 21.2% [7/33]; $p = 0.01$; OR, 5.03 [1.4–19.1; $p = 0.01$]) and among those presenting with neonatal mortality (8/11 [72.7] vs. 9/39 [23.0%]; $p = 0.03$; OR, 8.9 [1.9–40.7; $p = 0.005$]). No differences in cardiac function or strain were noted between fetuses with or without severe adverse outcomes. Within 3 weeks of delivery, the prevalence of small left ventricle was higher (19/34; 55.8%) with a more globular shape (reduced transverse/longitudinal ratio). A globular right ventricle was significantly associated with ND or survival with CDH-PH (OR, 14.2 [1.5–138.3]; $p = 0.02$). **Conclusion:** Fetuses with isolated CDH at risk of perinatal death or survival with CDH-PH had a higher prevalence of a small left ventricle and abnormal shape of the right ventricle.

Aim and design of the study



To identify foetal cardiac parameters able to predict neonatal cardiac dysfunction and prognosis in isolated congenital diaphragmatic hernia

Prospective observational multicentric study on 30 fetuses with isolated congenital diaphragmatic hernia



**Hôpital
Antoine-Béclère
AP-HP**



**Centre Hospitalier Régional
Universitaire de Lille**

Methods

Inclusion criteria

- Isolated congenital diaphragmatic hernia
- Genetic testing available
 - Singleton pregnancy
 - Age > 18 years
 - Informed consent

Exclusion criteria

- Any major morphological anomaly other than congenital diaphragmatic hernia
 - Genetic anomaly

Methods

FOETAL EVALUATION



Fetal ultrasound evaluation
by expert in fetal medicine



Fetal echocardiography by
specialised pediatric
cardiologist

Ultrasound will be performed at 24 weeks

If FETO will be performed a second evaluation will be performed at the
time of SMAR-TO deflation

NEONATAL EVALUATION



**Serial functional
echocardiography** by
specialised pediatric
cardiologist

Ultrasound will be performed at D1, D7 and D30

Perspectives

- To identify foetal echocardiographic parameters which correlate with neonatal prognosis
- To generate a prognostic model
- To allow a better comprehension of hemodynamic alterations during foetal life in CDH













