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Lung biopsies in infants and children in critical care situation

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Introduction

Lung biopsy is considered as the gold standard for the diagnosis of diffuse lung diseases, however, its indication has to be balanced with its invasiveness.

The present study aims at evaluating the diagnostic yield and the safety of lung biopsy in critically ill patients hospitalized in pediatric intensive care unit (ICU).

Methods

Type of study

- Observational
- Retrospective (1995 - 2022)
- Monocentric
- Legal issue: local ethics committee gave his authorization (n° 2226380)

Inclusion criteria

- Patients who underwent a lung biopsy in the ICU
- Between 1995 and 2022

Exclusion criteria

- Biopsies performed in the operating room
- Post-mortem biopsies
- Autopsies
- No available data

Results

A total of 31 patients were included

Table 1: Characteristics of the patients

Main clinical characteristics	N	%, SD, [Q1-Q3]
Sex ratio boys/girls	20/11	1.82
Premature birth (< 35 WG)*	5	18.5 %
Post-term birth (> 39 WG)*	7	25.9 %
Neonatal respiratory distress*	23	85.2 %
Median age at lung biopsy	18	[11.5 – 62.5]

Medical condition at the time of the biopsy

Mean duration of ICU hospitalization	19.3	24.9
Patients under non-invasive ventilation	0	0 %
Patients under invasive ventilation	31	100 %
Mean duration of invasive ventilation	16.2	22.9
Patients under ECMO	22	70.9 %
Mean duration of ECMO	10.5	6.6
Veno-arterial ECMO	15	48 %
Pulmonary hypertension**	26	89.7 %
Coagulation impairment @	8	42.1 %

Diagnosis work-up

Chest radiography #	25	100 %
CT-scan \$	13	50 %
Median age at CT-scan	43	[22.25 – 50.25]
Bronchoalveolar lavage	5	-
Median age at BAL	25	[17 - 1233]
chILD NGS panel	23	74.2 %
PHT NGS panel	8	34.8 %

Age and durations are expressed in days.

* out of 27 patients with available data; ** out of 29 patients with available data; @ out of 19 patients with available data; # out of 25 patients with available data; \$ out of 26 patients with available data;

Results

Diagnostic yield

The lung biopsy allowed a diagnosis in 81% of the patients.

Diffuse developmental disorders of the lung represented 15 (49%) patients, mostly alveolar capillary dysplasia, followed by surfactant disorders in 5 (16%) patients.

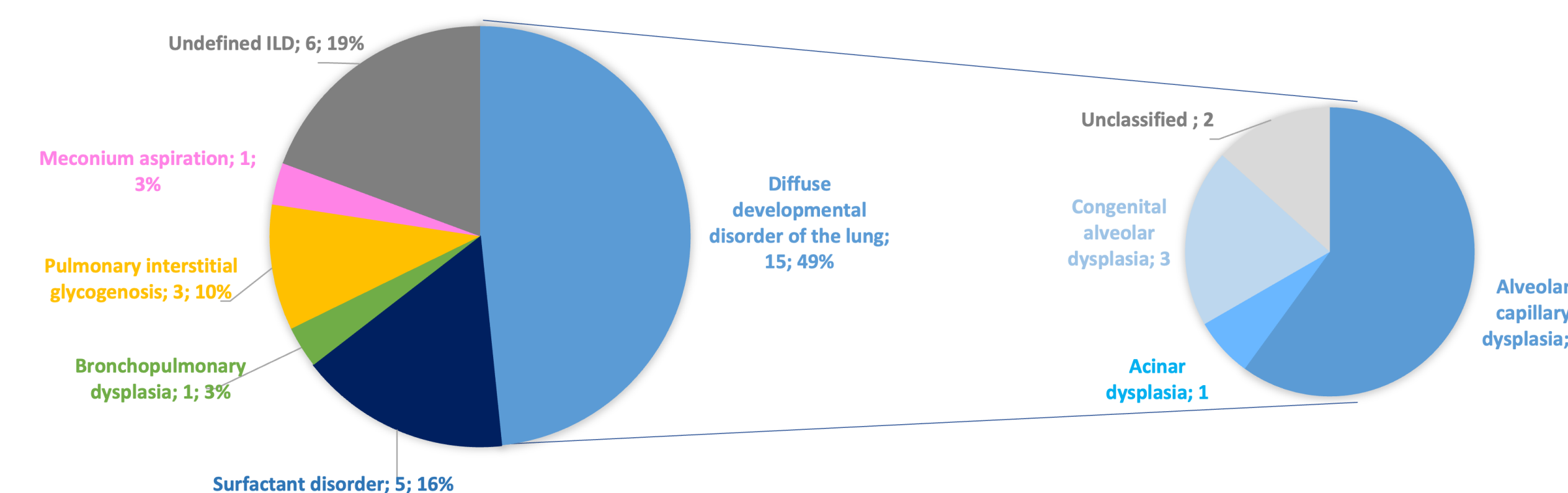


Figure 1: Repartition of the diagnoses

Diagnostic reliability decreased with age (95%, 71% and 0% in newborns, 1 month to 2 years and > 2 years, respectively).

Discussion and conclusion

In critical situations, both lung biopsy and genetic analyses should be performed. Lung biopsy is a reliable exploration in neonates in critical situation in whom a diffuse developmental disorder of the lung is suspected. In fatal forms, the biopsy was mostly followed by withdrawing life-sustaining supports. The study includes only a limited number of children over 2 years-old. However, in this age group, the risk of the procedure seemed important while its diagnostic yield was low.

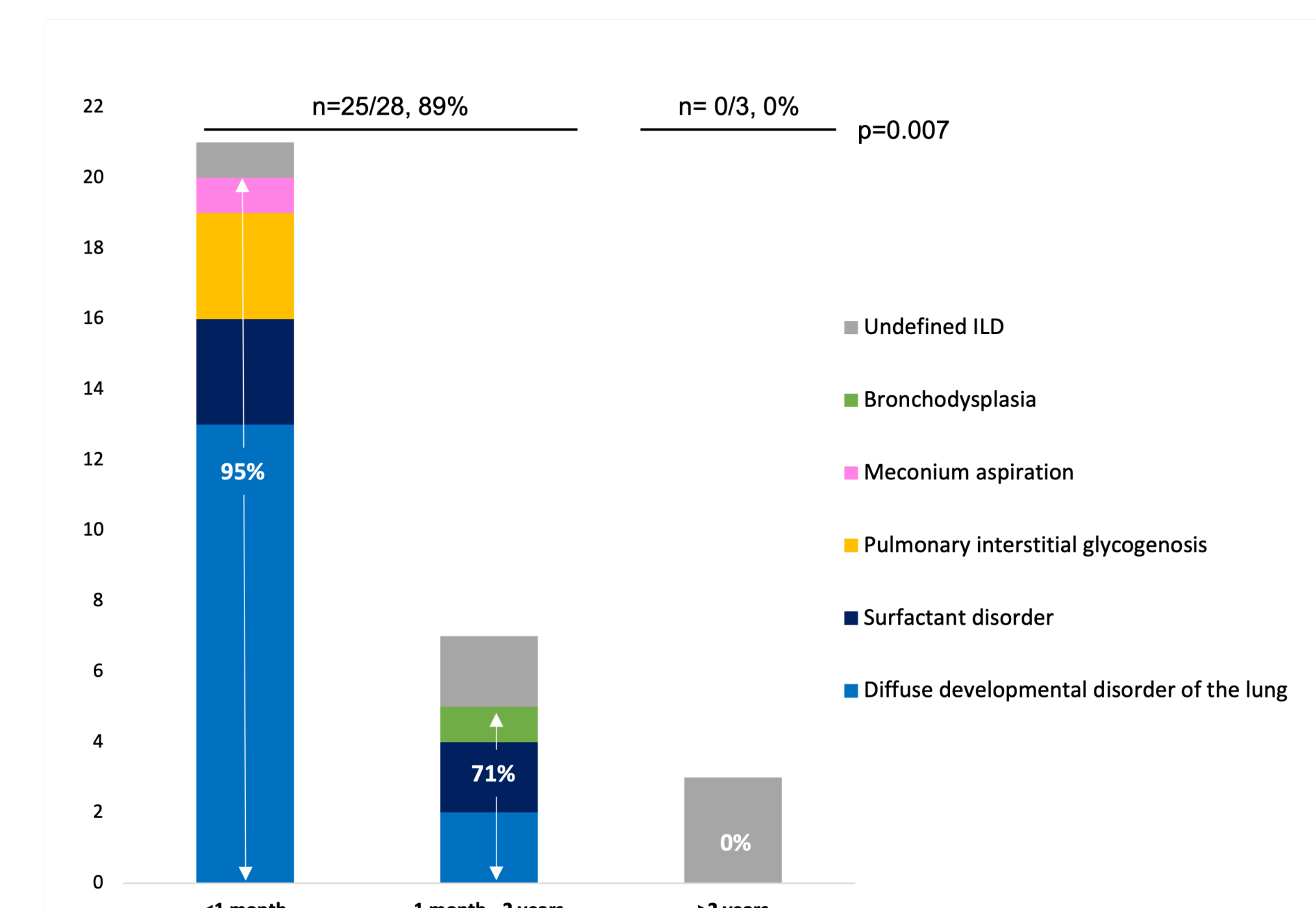


Figure 2: Reliability and repartition of the diagnoses by age at the lung biopsy

Table 2: Histologic diagnosis and correlation with the molecular defect

Histologic diagnosis	Number of patients	Gene (number of patients)
Diffuse developmental disorder	4	SFTPB (bi-allelic) (1) NKX2-1 (heterozygous) (1) FOXF1 (heterozygous) (2)
Surfactant disorder	4	ABCA3 (bi-allelic) (3) TBX4 (bi-allelic) (1)
Unclassified ILD	1	SFTPB (bi-allelic) (1)

Complications occurred in 9 (29%) patients including 8 under ECMO with massive hemorrhages in 7 cases.

