## Bronchoalveolar lavage as systematic approach for early diagnosis of lung infiltrates in patients with hematologic malignancies

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## INTRODUCTION METHODS The best diagnostic approach of lung infiltrates (LI) remains to be established. A proper diagnostic approach at LI seems to be particularly relevant in neutropenic patients and/or in patients with an unfavorable clinical response to broad-spectrum antibiotics. To date,

there is not a general consensus regarding the diagnostic panel to apply in hematologic patients undergoing bronchoscopy with bronchoalveolar lavage (BAL) for LI. The aim of this study is to evaluate the efficacy and the feasibility of BAL as systematic diagnostic approach at LI in hematologic patients, focusing on its role to diagnose invasive pulmonary aspergillosis (IPA). same diagnostic work-up including blood-swabs cultures, serum GM (in three consecutive checks), serum beta-D-glucan, serum PCR for CMV.

BAL fluid was studied by bacterial and fungal cultures, GM and PCR for S. pneumoniae, L. pneumophila, C. pneumoniae, M. pneumoniae, B. pertussis, B. parapertussis, H. influenziae, respiratory viruses (including CMV), P. jiroveci, M. tuberculosis complex, Nocardia spp., L. monocitogenes and Aspergillus spp.

## RESULTS

From April 2013 to October 2016, 769 patients were consecutively admitted in our ward. Out of these 769 patients, 85 had LI and 47 of them underwent BAL (total amount: 51 procedures).

Table 1. Clinical features at bronchoscopy with procedures).	BAL (51	Table 2. Microbiological features of 51 procedures.		
Features	No. (%)	Diagnostic tool	No.	Positive Aspergillus PCR on BAL
Lat diagnosis 10 (20%) Cases of probable IPA 12 cases according to EORTC/MSG criteria; 19 cases considering Aspergillus PCR as indirect mycological criterion				
Acute myeloid leukemia (AML)	8	Positive BAL cultural examination	2	2
Acute lymphoblastic leukemia (ALL)	2	Positive serum GM <sup>a</sup>	2	2
LI requiring hospitalization because of concomitant	41 (80%)	Positive serum beta-D-glucan <sup>b</sup>	4	3
febrile neutropenia and/or respiratory distress not		Positive BAL GM <sup>c</sup>	12	11
responding to broad-spectrum antibiotics		Nogative cultural examinations, serum tests and RAL CM	7	7
Lymphoma <sup>a</sup>	19	Treatment change driven by DAL results	/	10
Myeloma <sup>b</sup>	8	Treatment change driven by BAL results		18
AML	7	Voriconazole		17
ALL <sup>a</sup>	5	Liposomal amphotericin		1
Severe aplastic anemia <sup>e</sup>	2	Clinical outcome		
Radiologic findings		Cured		17
Well-circumscribed consolidation with or without halo sign	18 (35%)	Dead		2
Cavity or air crescent sign	7 (14%)	Microbiological LL characterization		-
Not well-circumscribed consolidation	10 (20%)	Querall exces with microbiological identification <sup>d</sup>		22 (650()
Ground-glass opacity	5 (10%)	Overall cases with microbiological identification		33 (05%)
Micronodules	5 (10%)	Probable IPA (according to EORIC/MSG criteria)		12
Tree in bud	6 (11%)	Probable IPA (considering Aspergillus PCR on BAL as indirect mycological	l criterion)	19
Respiratory parameters	25 (400()	P. jiroveci		6
Normal – Mild respiratory distress (pO2 $\geq$ 70)	25 (49%)	K. pneumoniae		5
Soucra respiratory distress (p02-60-69)	11 (22%)	S. pneumoniae		3
Modian APACHE II scoring (range)	15 (29%)	CMV		2
Median days between LL detection and bronchoscopy (range)	3(1-13)	Others (S aureus H influenziae S maltophilia P aeruainosa MDR)		5
ANC < 500/mcL at LL detection	20 (39%)	Treatment change driven by RAL results		25/22 (76%)
ANC $< 100/mcL$ for $>7$ days at LL detection	12 (23%)	Consult areas with out mismobiological identification		25/35 (70%)
PLT < 50.000/mcL at bronchoscopy	19 (37%)	Overall cases without microbiological identification		18 (35%)
PLT < 20.000/mcL at bronchoscopy	12 (23%)	Empiric treatment change post-BAL negative results		1/18 (5%)
Antifungal treatment at bronchoscopy	(,,,,	Clinical outcome		
None	33 (65%)	33 cases with microbiological identification		
Primary antifungal prophylaxis	3 (6%)	Cured		30 (91%)
Fluconazole	2	Dead		3 (9%)
Liposomal amphotericin	1	18 cases without microbiological identification		
Secondary antifungal prophylaxis	1 (2%)	Cured		16 (80%)
Voriconazole	1	Dead		2 (110()
Empirical antifungal therapy	14 (27%)	Dead		2 (11%)
Liposomal amphotericin	14	$\geq$ G3 adverse events post-BAL <sup>*</sup>		1 (2%)

## CONCLUSIONS

BAL seems a safe and effective approach for an early diagnosis of LI in hematologic patients. The assessment of a broad diagnostic panel allowed the detection of a putative agent in 65% of cases. Assessment of *Aspergillus* by PCR on BAL proved useful for probable IPA diagnosis. On the basis of these data, we planned and coordinated an on-going multicenter prospective study involving 22 Italian Hematology institutions participating in the SEIFEM (Epidemiologic Surveillance of Infections in Hematological Malignancies) group. Up until now, a total of 204 patients were included into the study.





