

# Protracted bacterial bronchitis: bronchial aspirate versus bronchoalveolar lavage findings: a single-centre retrospective study

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## ABSTRACT

Retrospective chart review of 133 children who underwent bronchoscopy because of possible protracted bacterial bronchitis to compare the results of bronchial aspirates with those of bronchoalveolar lavage (BAL). When comparing BAL and bronchial aspirate in 70 patients where both samples were available, the result was comparable in 46 cases (65%). If only bronchial aspirates would have been available, seven patients (10%) would have been overtreated, four children (6%) undertreated and three (4%) would have received a different treatment. Although, BAL and bronchial aspirate are comparable in the majority of cases, differences exist with an impact on treatment decision, underlying the uncertainties in the pathophysiology of protracted bacterial bronchitis.

Protracted bacterial bronchitis is defined as the presence of chronic wet cough, absence of other causes of productive cough and the cough resolves following a 2-week course of an appropriate antibiotic.<sup>1</sup> If the patient fails to respond or the protracted bacterial bronchitis is recurrent, bronchoscopy with bronchoalveolar lavage (BAL) is performed to firmly support the diagnosis of protracted bacterial bronchitis. Organisms most commonly cultured are *Haemophilus influenzae*, *Moraxella catarrhalis*, *Streptococcus pneumoniae* and *Staphylococcus aureus*.<sup>2 3</sup> The aim of this study was to compare BAL and bronchial aspirate to investigate if bronchial aspirate would yield similar results, since the exact pathophysiology is not well understood.<sup>4</sup> Furthermore, BAL is not always well tolerated. Bronchial aspirate, on the other hand, is easy to collect and well tolerated, but is not performed on a specific site and is easily contaminated by upper airway secretions.

Single-centre retrospective review of children with possible protracted bacterial bronchitis who underwent bronchoscopy between January 2012 and March 2016. Bronchial aspirates collected by suctioning secretions from the lower airways during bronchoscopy were

sent for microbiological culture. BAL was performed by wedging the tip of the bronchoscope into a lobar bronchus, instilling and aspirating three aliquots of 1 mm/kilogram of 0.9% saline. BAL was carried out in the most-affected area or in the right middle lobe in case of very diffuse abnormalities, it is the preferred site because this area offers better fluid recovery. The first sample was sent for microbiological analysis.<sup>5</sup>

One hundred and thirty-three out of a total of 655 bronchoscopies were performed because of possible protracted bacterial bronchitis. Median age was 3 years, ranging from 2 months to 17 years. Both bronchial aspirate and BAL were collected in 70 children (53%). In these samples, median neutrophil count was 8%, with a range from no neutrophils to 97%, and 40% of our samples (n=28) had a neutrophil count of 25% or higher. Of all cultures performed, 70% yielded positive, most commonly *Haemophilus influenzae* (35%), *Streptococcus pneumoniae* (31%) and *Moraxella catarrhalis* (20%). More than one bacterium was cultured in one-third of the cultures. When comparing the microbiology results of bronchial aspirates and BAL, cultures had the same result in 46 out of 70 patients (65%). Results of BAL and bronchial aspirate were different in four children regarding bacterium and susceptibility so that treatment options differed (6%). In the remaining 20 out of 70 patients, BAL and bronchial aspirate cultures isolated the same bacteria, but one of them grew an additional pathogen (28%). Bronchial aspirates showed a higher number of bacterial species than BAL in 13 patients (19%) and vice versa in seven patients (10%). These differences had therapeutic consequences in half of these 20 patients (14%). These results are summarised in [table 1](#). In other words, if only microbiology results of bronchial aspirates were available,



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**Table 1** Comparison of microbiological results of bronchial aspirates versus bronchoalveolar lavage analyses

	Identical results in bronchoalveolar lavage and bronchial aspirate	Identification of more bacterial species in bronchial aspirate versus bronchoalveolar lavage	Identification of more bacterial species in bronchoalveolar lavage versus bronchial aspirate	Identification of another bacterial species in bronchoalveolar lavage or aspirate with impact on antibiotic selection
Number of patients (%) out of 70 patients	46 (65%)	13 (19%)	7 (10%)	4 (6%)

seven children would be overtreated (10%), four children undertreated (6%) and three children would have received a different treatment (4%).

Although BAL is a safe procedure, it may cause hypoxaemia. Serious complications, including pneumothorax, bleeding and cardiac arrest are rare. Self-limiting complications as fever, cough, wheezing and pulmonary infiltrates are more common.<sup>6</sup> Both BAL and bronchial aspirate cultures yielded the same results in the majority (66%) of patients. In a small subset of patients (10 out of 20 patients), there were differences that would influence the choice of treatment. Therefore, in our opinion, BAL remains the gold standard for microbiology sampling. However, bronchial aspirates can replace BAL if a lavage is not tolerated by the patient, as culture results were the same in the majority of cases. The differences in culture results also demonstrate the uncertainty about the exact pathophysiology of protracted bacterial bronchitis in children. To the best of our knowledge, there are no other studies comparing bronchial aspirates with BAL. However, a recent study showed that the bacterial infection can differ across all lung lobes.<sup>7</sup> Future studies should also assess microbiological analysis from the second, third or pooled BAL samples. This highlights several uncertainties in the diagnosis of protracted bacterial bronchitis. Should a child with a positive aspirate but a negative BAL be excluded from a short-term or long-term antibiotic course? This remains to be demonstrated by further diagnostic and interventional trials.

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