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Scientific letter

Flexible Bronchoscopy as the First-Line Strategy for Extraction of Tracheobronchial Foreign Bodies

Broncoscopia flexible como estrategia de primera línea para la extracción de cuerpos extraños traqueobronquiales

Dear Editor,

Foreign body (FB) aspiration into the airways is uncommon in adults,[1,2] generally secondary to impaired airway protection mechanisms[3] or to aspiration during dental procedures, sneezing or coughing.[2,3]

Whether flexible fiberoptic bronchoscopy (FFB) or rigid bronchoscopy (RB) should be performed is not consensual. Our team uses a "single approach" in most cases, converting a diagnostic FFB into a therapeutic one by recovering the FB with the flexible bronchoscope. We aim to evaluate the efficacy, safety, and predisposing factors to failure of FFB in retrieving inhaled FB. We received approval from our local Ethics Committee.

Between 1997 and 2019, we performed 9140 FFBs. FFB was the first choice for retrieval of FBs in 95 patients (64.2% males). Choking (34, 35.8%), chronic cough (14; 14.7%), and respiratory infections, either recurrent (12; 12.6%), acute (11; 11.6%) or non-resolving pneumonia (7; 7.4%) were the main clinical presentations. Twenty-eight (56%) patients had acute aspiration, i.e., within 1 week of the procedure, and 22 (44%) had chronic aspiration (>1 week). No time data was available in 45 patients. Acute aspiration presented mainly with choking (23/28 [82.1%]; $p < .01$) and chronic aspiration with chronic cough (7/22 [31.5%]; $p < .01$) and recurrent pneumonia (5/22 [22.7%]; $p < .01$). Most FBs were lodged in the right bronchial tree (52; 54.7%), mainly in the right lower lobe (35; 36.8%). FBs were lodged in the left bronchial tree in 30 patients (31.8%), bilaterally in 8 (8.4%), and in the trachea in 5 (5.3%). The segmental bronchi were involved in 37.3% of cases. FBs lodged in distal airways were more prevalent in chronic than in acute patients (13/22 [59.1%] *vs.* 13/28 [46.4%]; $p = .042$). Most FBs were organic (72; 82.8%), mostly seeds (26.3%) and bones (25.3%). Inorganic material was found in 15 patients (17.2%). No data on the nature of FBs was available in 8 patients. The location and time of accommodation did not differ regarding the nature of the FB (respectively, $p = .307$ and $p = .155$).

FFB successfully removed the FB at first attempt in 79 patients (83.2%). Sixteen (16.8%) required a second procedure: 11 underwent a second FFB and 5 RB. The second FFB was successful in all patients but one who later underwent RB. All RBs were successful in removing the FB. FFB had an overall success rate of 93.7%. Although most RB were required due to round FB or exuberant granulation tissue, the proportion of successful FFB was similar in all FB types, acute versus chronic aspiration, patient gender, and lodging site (respectively, $p = .226$, $p = .439$, $p = .129$, and $p = .719$) – Table 1.

We encountered few complications (6; 6.3%): self-limited hemorrhage (2), mild hemorrhage (2), mild desaturation (1), and complex cardiac arrhythmia (1). The latter occurred in an intensive care patient and was the only case that required early interruption of FFB.

The debate over whether FFB or RB should be the method of choice for removing FBs is still relevant. RB is undoubtedly the preferred technique in children. In adults, FFB has progressively gained importance.[2,4–8] Our results are in line with previous works.[1–3,9,10] A systematic review reported a success rate of 89.6% and concluded that FFB avoided the need for RB in approximately 90% of cases.[1] Our limited number of complications is also in accordance with the literature.[1,9]

There is no official definition for acute or chronic aspiration. We adopted Fang et al. terminology, labeling aspirations that occur within 1 week of the procedure as acute and those that last more than a week as chronic.[10] Although no time data was described in 45 patients, thus limiting our analysis, our results were as expected: most acute cases were referred from the emergency room and most chronic from outpatient clinics or general wards; chronic aspiration had an higher proportion of FB distally lodged, choking was more common in acute aspiration, and chronic cough and recurrent pneumonia in chronic aspiration. Given the larger airway caliber in adults, inhaled FBs tend to lodge distally in the tracheobronchial tree.[4] We found that 37.3% of the FBs were located in segmental bronchi. Lodging so distally leads to a more insidious clinical appearance or even a complete resolution of symptoms,[2,4] which may explain the late removal in several cases.

FFB has several advantages over RB, as it is a relatively safe, easy, and widely available procedure.[3,9,11] FFB can be performed on an outpatient basis and avoids general anesthesia.[1,11] Furthermore, FBs lodged distally in the airways are not easily accessed by RB.[1,3] FFB allows for immediate conversion of a diagnostic procedure into a therapeutic one, avoiding more invasive techniques.[3] Since FB aspiration is often not suspected in adults, FFB's adaptability becomes particularly relevant.

RB should be considered in unstable patients, as it offers a wider working channel and better ventilation control.[2,3,11] RB also plays a role in cases in which FFB cannot be therapeutic. In our series, after FFB failure, 6 patients underwent successful RB.

Our experience showed that the nature and location of the FB, time between aspiration and removal, and gender do not seem to affect the removal success with the flexible bronchoscope. Previous attempts to remove the FB may be associated with FFB failure.[1,11] In these situations, RB should be considered. Importantly, respiratory endoscopy units in which FFB is the first choice for removal of FBs should also have the technical and logistical ability to appropriately perform RBs,[3] as FFB and RB are complementary techniques.

The retrospective and mainly descriptive design of our study presents some limitations which we attempted to minimize by

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Table 1
Comparison between the result of the therapeutic flexible bronchoscopy.

	Successful (*n*)	Unsuccessful (*n*)	*p*-Value[¥]
Gender			.119
Male	48	13	
Female	13	3	
Nature of foreign body[†]			.226
Organic	63	9	
Inorganic	11	4	
Time elapsed between aspiration and flexible bronchoscopy[§]			.439
Acute	22	6	
Chronic	20	2	
Foreign body location			.719
Right bronchial tree	43	9	
Left bronchial tree	24	6	
Bilateral	8	1	
Trachea	5	0	

Note:
[†] In 8 patients the characteristics of the foreign body were not described.
[§] In 45 patients the time elapsed between aspiration and flexible bronchoscopy was not described.
[¥] Pearson's chi-square or Fisher's exact test were used whenever reasonable.

considering a large period of analysis and a sizeable sample. Nevertheless, it highlights the value of FFB in FB removal, avoiding a more time- and resource-consuming second invasive procedure that requires general anesthesia.

In conclusion, FFB is a safe and effective procedure for the extraction of inhaled FB and can be considered as the first invasive diagnostic and therapeutic technique. Gender, nature of the FB, time elapsed between aspiration and procedure, and FB localization do not seem to promote complications and affect the outcome.

Authors' contribution

Each of the authors of the article has contributed substantially to the elaboration of the manuscript.

Informed consent

The authors confirm that written consent has been obtained from all patients.

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Conflicts of interest

Nothing to declare.

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