

SAFETY OF DIAGNOSTIC BRONCHOSCOPY IN PATIENTS WITH PULMONARY HYPERTENSION

Dr Shitrit David
Pulmonary Department
Meir Medical Center

BACKGROUND

- ◉ Flexible bronchoscopy (FB) is one of the most common invasive procedures performed by pulmonologists
- ◉ Typically performed under topical anesthesia and conscious sedation, the procedure is considered to be safe, effective and well tolerated in patients with a wide variety of pulmonary diseases.
- ◉ Complications associated with the procedure are rare and studies have estimated an incidence of 0.5-4 %

RISK FACTORS FOR COMPLICATIONS IN BRONCHOSCOPY

- ⦿ Pre-existent hypoxemia
- ⦿ Use of mechanical ventilation
- ⦿ Uremia
- ⦿ Profound thrombocytopenia
- ⦿ Coagulopathy
- ⦿ Pulmonary hypertension (PH)

FB AND PULMONARY HYPERTENSION

- Studies have shown that patients with PH are at increased risk for adverse hemodynamic events after non-cardiac surgery.
- The risk appears to be highest among patients with severe PH .

Ramakrishna G. et al.

Impact of pulmonary hypertension on the outcomes of noncardiac surgery: predictors of perioperative morbidity and mortality.

J Am Coll Cardiol 2005

FB AND PULMONARY HYPERTENSION

- ◉ FB has been shown to affect central hemodynamics, including a significant increase in pulmonary capillary wedge pressure
- ◉ Furthermore, an acute pulmonary hypertensive response has been described in mechanically ventilated patients undergoing FB

Lundgren R. et al.

Hemodynamic effects of flexible fiberoptic bronchoscopy performed under topical anesthesia.

Chest 1982.

Bein T, et al.

Right ventricular function and plasma atrial natriuretic peptide levels during fiberbronchoscopic alveolar lavage in critically ill, mechanically ventilated patients.

Chest 1995.

- It is unknown if these hemodynamic alterations result in clinically significant adverse events.

OBJECTIVE

- To assess the safety of FB in patients with PH and to study the occurrence of complications associated with different diagnostic bronchoscopic procedures.

MATERIALS AND METHODS

- The study was approved by the institutional review board.
- A prospective review of all patients who underwent bronchoscopy between August 2009 and May 2010.
- A prospective review of all medical data and bronchoscopy reports was performed to investigate the occurrence of complications.

ECHOCARDIOGRAM-PH DIAGNOSIS

- ◉ All the patients underwent Doppler echocardiogram in the same day of the bronchoscopy.
- ◉ The diagnosis of PH defined as (1) mean PAP (mPAP) >25 mm Hg or (2) right ventricular systolic pressure (RVSP) >40 mm Hg estimated by Doppler echocardiography.
- ◉ PAP calculated as the sum of tricuspid regurgitation gradient and estimated right atrial pressure, provided there is no increase in pulmonic valve flow velocity.
Maximal tricuspid regurgitation velocity (taken from all available views) measured by continuous wave Doppler echocardiography to evaluate the pressure gradient from the right ventricle to the right atrium.
- ◉ Right atrial pressure estimated on the basis of inferior vena cava (IVC) size and inspiratory collapse

OUTCOME MEASURES

- ◉ The primary outcome was the incidence of complications after FB.
- ◉ Complications were defined as:
 - ◉ Hypoxemia ($SpO_2 < 90\%$ and need of supplemental oxygen within 30 min of completed procedure)
 - ◉ Hypotension (mean arterial pressure < 60 mm Hg or systolic blood pressure < 90 mm Hg for more than 5 min and/or need for administration of intravenous solution or vasopressors)
 - ◉ Cardiac dysrhythmias (new onset of arrhythmia or worsening of underlying arrhythmia that caused hemodynamic instability or required urgent intervention).
- ◉ Bleeding: The amount of bleeding was estimated as:
 - no bleeding - minimal bleeding that does not require suctioning
 - mild bleeding - the need to continually suction the airways
 - moderate bleeding - the need to wedge FB in the segment involved;
 - severe bleeding - the need for additional interventions.

PROCEDURAL CONDUCT

- All procedures performed in the OR or in the bronchoscopy suite of the Pulmonary Department in Meir Medical center.
- FB performed by a training pulmonary physician that was blinded to the echocardiographic findings.
- Oxygen administered to all patients to ensure $SpO_2 > 90\%$ prior to the introduction of the bronchoscope.
- Continuous pulse oximetry, electrocardiogram and noninvasive blood pressure monitoring obtained throughout the procedure.
- Sedation achieved using midazolam.
- Topical anesthesia obtained using 2% lidocaine.

DATA COLLECTION

- Data collected from all patients including baseline characteristics of age, sex, medications and electrocardiogram.
- Blood tests including blood count, indication for bronchoscopy, duration and bronchoscopic procedures.
- All echocardiogram findings were collected by physicians that were blinded to the bronchoscpoic details.

TABLE 1: CLINICAL CHARACTERISTICS OF THE STUDY POPULATION

Paramters		
Age	60±18	
Gender (M:F)	45:54	
NYHA classes		
I	25(25%)	
II	25(25%)	
III	34(33%)	
IV	15(14%)	
Mean D-dimer level,mg %	806±500	
Severity of PH,mmHg		
Mild(40-50)	16	43±15
Moderate(51-60)	3	55±14
Severe (>60)	4	85±19

TABLE 2: SUMMARY OF BRONCOSCOPIES PARAMETERS

Parameter	No PH (n=76)	PH (n=23)
<i>Indications</i>		
Pulmonary infiltrates	21 (27%)	9 (39)*
Hemoptysis	7 (9%)	1 (4)
Lung mass	31 (41%)	4 (17)*
Suspected ILD (included sarcoidosis)	13 (17%)	6 (26)
Atelectasis	3 (4%)	0 (0)
Others	3 (4%)	3 (13)
Duration of FB, mins	21±7	20±8
Midazolam, mg	4.4±2.3	2.9±1.4*
<i>Procedures</i>		
BAL/washings	55 (72)	17 (75)
Brushing	26 (35)	12(50)
TBB	41(54)	9 (38)
TBNA	2 (3)	1 (4)
Hypoxemia	14 (18)	12 (52)*
Bleeding	13 (17)	2 (9)

PARAMETRS DURING FB

	No PH	PH	P value
SO ₂ before FB	95±4	94±4	NS
SO ₂ lowest	92±5	91±5	NS
SO ₂ at the end	95±2	94±4	NS
HR before	88±12	92±16	NS
HR during	99±23	98±27	NS
HR at the end	95±19	98±24	NS
BP before	135/75	137/87	0.02
BP during	145/87	155/92	NS
BP at the end	137/81	140/88	NS

COMPLICATIONSS

- ◉ 50% of the patients in the PH group developed hypoxemia
- ◉ No hypotension was noted
- ◉ One patient developed no hemodynamically significant dysrhythmias (SVT).
- ◉ There were no deaths attributable to the procedure.
- ◉ All the patients who underwent FB in the bronchoscopy suite were discharged approximately 2-5 h after the procedure was finished.
- ◉ None required hospitalization or transfer to an intensive care unit.

CONCLUSIONS

- FB can be performed safely in patients with mild to moderate PH.
- Transbronchial biopsies are not associated with worsening hypoxemia or an increased risk of hemorrhage.
- Hypoxemia are more common in patients with PH, however without any other complications.

