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Research · January 2015

DOI: 10.13140/RG.2.2.11751.37281

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Evaluation of laboratory examination of Bronchial Wash Versus Sputum Examination in Diagnosing Lung Diseases

Saad M. Mehaidi* Essam M. Abdullah* Belal M. Taha* Suzan Abdul Karim
*** College of Medicine – Al-anbar University**
**** Al-Ramadi Technical Hospital**
Received: 12/12/2009 Accepted:6/5/2010

Abstract: Sputum study and bronchial wash study are considered two of the most common well known classic diagnostic tools in detecting various lung diseases among the wide and continuously expanding diagnostic procedures for detection of lung pathology.Sputum study still play a rule in diagnosis of lung diseases but the sensitivity of the sample is highly depended on the procedure of collection and the co-operation of the patient, the type and the site of lung lesion.Fiber optic bronchoscopy is another option providing both direct visualization of the trachea-bronchial tree and the bronchial wash collected by the fiber optic bronchoscopy provides important information for detection of various lung diseases. the study was conducted in ramadi teaching general hospital. This is a comparison prospective study of 45 consecutive patients whom underwent both sputum collection and bronchoscopy for bronchial wash collection and comparing the results of the patients which showed that among the 45 patients 33 patients had inconclusive or negative sputum studies while 12 patients had positive sputum study in comparison with bronchial wash which give positive results in 41 patients. This study confirms that the sensitivity of bronchial wash is much higher than bronchial wash is much higher than the sputum study in diagnosing lung diseases and the higher sensitivity usually associated with abnormal chest x-ray.the study confirms the importance of these tools for rapid diagnosis of a disease with starting immediate therapy, economic value in reducing time-admission period in the hospital with high necessity to support a staff well trained on bronchoscopy to ensure rapid and accurate diagnoses of chest diseases.

Key words : laboratory examination , Bronchial Wash , Sputum Examination , Lung Diseases

Introduction

Endoscopy is a procedure used to visualize the internal organs by passing an instrument through a natural or artificial orifice (1).

Bronchoscopy endoscopic procedure provides direct access to the tracheo-bronchial tree and plays an essential role in the diagnosis and treatment of patients with chest problems (2).

Fiber-optic bronchoscopy:- are flexible bronchoscopes that composed of fiber optic bundles which provides both illumination and visualization pathways. Small channel with diameter (1-3) mm traverse the fiber optic scope through which suction, cathters, brush and biopsy can be taken for chemical , cytological, bacteriological, viral , protozoal and histopath-logical examination(3,4,5).

Diagnostic indication of bronchoscopes (1, 5, 6, and 7):-

1-persistant coughs.
2-hemoptysis.
3-wheeze or bronchial obstruction.
4-abnormal thoracic radiography.
5-suspected bronchogenic carcinoma.
6-airway obstruction.

Cytology of normal epithelial cells:-

Squamous cells usually oral in origin ,see mixture of intermediate and anucleus embedded in uniformely thin cynophilic cytoplasm.superficial cells have pycnotic nuclei with orangeophilic cytoplasm .

Ciliated bronchial columinar cells characterized by columonar or prismatic shape ending in a tail,the nucleus is oriented toward the tail and show finely granular chromatin with one or more nucleoli.

Macrophage cells recognized by eccentrics position of the nucleus with abundant foamy cytoplasm.

Squamous cells carcinoma:usually single cells,marked cellular pleomorphizm,bizarrecytoplasmic shape of

almost infinite variety may occur,classic form such as caudate or tadpole,fiber or spindle and third type cells are seen,Nucleus enlarge and marked hyperchromasia with tendency to pyknosis (8).

Nucleus\cytoplasmic ratio may range from high to very low owing to marked variability in the amount of the cytoplasm produced by these cells(7).

Keratinization of the cytoplasm is indicated by intense hyaline appearance with either bright orangeophilic staining or deep cynophilia,ectoendoplasmic ringing or herxhiemer spirals as descriped by

frostare another striking featureof abnormal keratinization in the cytoplasm(9).

Adenocarcinoma appear as single cells and cells cluster,the chromatin in well differentiated type is finely granular to powdery in appearance , nuclei large round to oval with varying degree of nuclear membrane abnormality with centrally placed macro nucleoli(10).

The vacuole may be multiple and small imparting delicate foamy appearance of the cytoplasm or may be large causing indentation and marinating of the nucleus(11,12,13).

Small cell undifferentiated carcinoma may be sub classified into oat cell type,intermediate cell and combined cell types(small cell ca in combination with Squamous cell carcinoma ,large cell or adenocarcinamo)(14,15).

The individual cell of oat cell vary from approximately one and half to two times the size of lymphocyte, it is round to oval and centrally placed nucleus with uniform bit deeply staining chromatin pattern and very high nucleo-cytoplasmic ratio, nucleoli are occasionally visible but are generally inconspicuous. a most characteristic presentation is nuclear molding and irregularity of nuclear outline because this tumor highly prone to necrosis the cellular specimen frequently reflects this with cells exhibiting karyopyknosis , disintegration of the cytoplasm and formation of cyanophlic masses of necrotic debris (16,17).

Cells with intermediate type appear larger nuclei with larger rim of cytoplasm and in occasion conspicuous nucleoli.

Materials and Methods

This is a prospective study which was carried on 45 consecutive patients. the whole work were done in al-ramadi teaching hospital ,college of medicine ,department of thoracic and vascular surgery from December 2008-june 2009.a total number of 45patients (30 males and 15 females) were included in the study.

Sputum samples were taken as fresh samples which produced as early morning samples(E.M.S),we instruct the patients to give sputum not saliva and encouraging them to extract the sample by deep cough and pre-samples mucolytic agents sometimes had been used.

The collected samples brought immediately to the laboratory without any fixation, at first the sample examined grossly for any tissue fragments and blood tinged areas then the smear taken from this areas and other randomly sampled areas fixed immediately in 95% ethyl alcohol then staining the smear by traditional papanicolaou stain.

Bronchial e taken by fiber optic bronchoscope after fully pre-procedure preparation including fasting over night and full assessment of general status of the patient and especially cardio-pulmonary state ,the bronchoscopic procedure done in the out-patient department under local anesthesia using plane lidocain gel for the nasal passage lubrication and local anesthesia and lidocaine solution2% to anesthetized the naso-pharyngeal passages .

Direct visualization of naso-pharyngo-trachio-bronchial tract is done carefully without distress the patient and bronchial wash collected to sterile sample collector ,the bronchial wash is centefuged in the laboratory and the smear is prepared from the cell bottom of the centrifuged sample then fixed immediately in 95%ethyl alcohol and stained by traditional papanicolaou stain.

Direct examination for AFB stain to exclude pulmonary TB and culture and sensitivity for bacterial study were done for the samples of both sputum and bronchial wash for all the patients.

Results:

Age Distribution

The patients of this study vary in their age group from 18 years old to 80 years old and the peak age group were ranged from (41-60 years).

Table(1): Age Distribution

AGE	No. of patient	Percentage
Less-20	2	4.4
21-40	6	13.3
41-60	24	53.3
61-above	13	29
Total	45	100

Table(2): Radiological Findings

Radiological finding	No. of patient	Percentage
Opacity	22	49
Hilar shadow	10	22.2
Cystic lesion	4	9
Round Shadow	3	6.6
Collapsed lung	3	6.6
Normal x-ray	3	6.6
Total	45	100

Normal and abnormal direct bronchoscopical findings:-

The following categorized results were achieved from 45 patients whom underwent fiber optic bronchoscopy:-

Twenty nine patients (64.44%) had abnormal bronchoscopical findings.

sixteen patients (35.55%) had normal bronchoscopical findings.

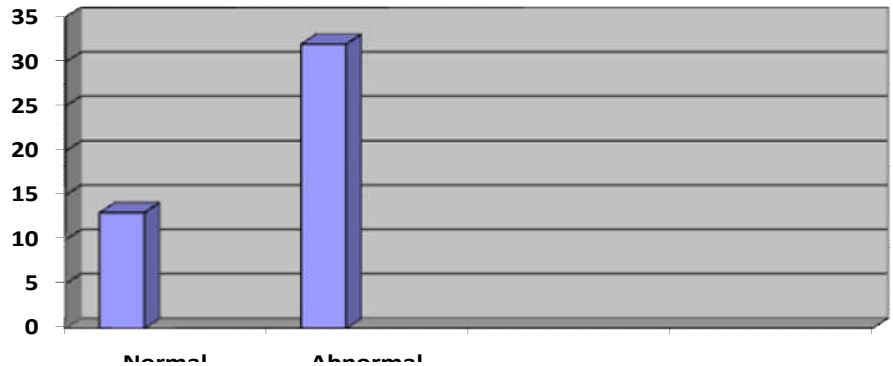

fig.(1)distribution of patients according to bronchoscopical findings.

Pathological Findings:The type of bronchoscopic findings were varied from fungating tumor mass in 30 patients(67 %) which represents the peak incidence in this study to only a paralyzed vocal cords which represent only one case (2%).The findings can be categorized in the following table:-

Table(3) Pathological Findings

Pathology	No. of patient	Percentage
Fungating mass	18	62
Bronchiectatic changes	7	24
Abnormal mucosa	4	14
TOTAL	29	

Laboratory Findings: From the all forty five patients whom underwent the procedure of fiber optic bronchoscopy bronchial wash were taken and sent for cytology, bacterial C/S and AFB studies. The results of Sputum studies can be classified as shown in the table(4)The results of bronchial wash studies can be classified as shown in the table(5)The lab. results of Sputum studies of patients with abnormal x-ray(42) can be classified as shown in the table (6)

Table (4):- laboratory results of sputum examination

Lab. Finding	No. of Patient	Percentage
SCC	4	9
Adenocarcinoma	2	4.5
Monilial infection	1	2.1
AFB	0	0
Mixed infection	4	9
Negative	33	73.3
A typical cells	1	2.1
Total	45	

Table(5) laboratory results of bronchial wash

Lab. Finding	No. of Patient	Percentage
SCC	15	33.3
Adenocarcinoma	5	11.1
Keratinized SCC	2	4.4
AFB	0	0
Mixed inflammation	8	17.7
Negative	4	9
Aot Cell Ca	5	11.1
A typical cells	6	13.3
Total	45	

Table(6) Sputum Results of Abnormal X-ray

Lab. Finding	No. of Patient	Percentage
SCC	2	4.8
Adenocarcinoma	1	2.4
Monilial infection	1	2.4
AFB	0	0
Mixed infection	3	7.1
Negative	33	78.5
A typical cells	2	4.7
Total	42	

Table(7):-bronchial wash results of abnormal x-ray

Lab. Finding	No. of Patient	Percentage
SCC	15	35.7
Adenocarcinoma	5	11.9
Keratinized SCC	2	4.7
AFB	0	0
Mixed inflammation	6	14.3
Negative	4	9.6
Aot Cell Ca	5	11.9
A typical cells	5	11.9
Total	42	

Table(8):Comparison of the resulted data:-

Lab finding	Wash (n=45)		Sputum (n=45)		P-value
	No	%	No	%	
SCC	15	33.3	4	8.8	<0.05
Adenocarcinoma	5	11.1	2	4.4	<0.05
Mixed infection	8	17.7	4	8.8	<0.05
Atypical cells	6	13.3	1	2.2	<0.05
AFB	0	-	0	-	-
Negative	4	8.8	33	73.3	-
Oat cell ca	5	11.1	0	0	-
Keratinized scc	2	4.4	-	-	-
Monilial infection	0	0	1	2.2	-

Test = chi-square
P-value < **0.05** significant
P-value > **0.05** not significant

Table(9):Total final results of 45 patients :-

Type of study	No. of patient with +ve Results	Percentage
Sputum study	12	26.6%
Bronchial wash study	41	91.1%

Discussion

Sputum samples were taken as fresh samples which produced as early morning samples(E.M.S),we instruct the patients to give sputum not saliva and encouraged them to extract the sample by deep cough and pre-samples mucolytic agents Fiber optic bronchoscope is a safe procedure and it is an accepted out-patient procedure, and patients do not require hospitalization (18) The

development of instrumentation for brushing, biopsy and drainage purposes had enhanced the technique for diagnosis and management of pulmonary conditions.

Bronchoscopy is procedure used to visualized the trachea-bronchial tree and take samples for laboratory studies,fiberoptic bronchoscopy has revolutionized the respiratory medicine and become the most common single advanced diagnostic technique for the chest disorders.

Bronchial wash that collected by the bronchoscopy is valuable in diagnosing lung diseases and can give the diagnosis in many lung diseases especially when definitive masses or lesion cannot be found or detected.

This is a comparison study includes forty five patients whom underwent sputum and bronchial wash laboratory examination at same laboratory team and all patients were preoccupied to give proper sputum samples and some of them took pre-samples mucolytic agents to encourage them to give proper samples.

The laboratory studies of those 45 patients yield informative (positive) results in only 12 patients 33 patients had negative sputum results, while bronchial wash laboratory studies gave informative (positive)results 41 patients and only 4 patients had negative bronchial wash laboratory studies and need more sophisticated diagnostic studies.

This study showed that the bronchial wash laboratory studies is more sensitive and accurate in diagnosing the lung diseases even in the presence of normal chest radiography.

Conclusion& Recommendations

1-bronchial wash collected by bronchscopy is very valuable for laboratory examination in diagnosing of various lung diseases.

2- fiber optic bronchoscopy is safe procedure and it becomes out-patient procedure.

3-decrease the in-patient hospital stay waiting successive sputum sampling to confirm or rule-out lung diseases.

4-sputum examination is less effective in diagnosing lung diseases even when collected properly and carries high false negative results.

5-bronchial wash examination has better time and cost effect in reaching the diagnosis and establishing the treatment.

6-training the doctors and distribution the bronchscopical instruments in the hospital will give more accurate diagnosis of the lung disorders and will decrease the dependence of less sensitive sputum laboratory studies.

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تقييم الفحص ألمختبري للقشع مقارنة بفحص سائل غسول القصبات الهوائية في تشخيص أمراض الرئة في مستشفى الرمادي التعليمي.

سعد مخلف مهيدي عصام محمد عبد الله بلال ماجد طه سوزان عبد الكريم

E.mail: scianb@yahoo.com

الخلاصة

يعتبر الفحص ألمختبري للقشع وكذلك فحص سائل غسول القصبات الهوائية المستخرج عن طريق تنظير القصبات الليفي أحدا أهم الفحوصات المختبرية المستخدمة في تشخيص أمراض الجهاز التنفسي شيوعا وبالرغم من تعدد وتنوع الطرق التشخيصية بقي هذان الفحصان يلعبان دورا أساسيا في تشخيص أمراض الجهاز التنفسي.يستخدم فحص القشع على نطاق أوسع ولسهولة اخذ العينة أصبح مفضلا على فحص سائل غسل القصبات المأخوذ عن طريق الناظور.أجريت هذه الدراسة في مستشفى الرمادي التعليمي شعبة جراحة الصدر وشملت ٤٥ مريضا أخذت لجميع المرضى عينات من القشع وتم تعريف المرضى بكيفية إعطاء القشع وليس اللعاب وتم إعطاء بعض المرضى الأدوية المقشعة لزيادة جودة العينة وتم إجراء تنظير القصبات باستخدام ناضور القصبات الليفي المرن وجريت على جميع العينات الفحوص المختبرية والتي شملت فحص التدرن وزراعة العينة لكشف نوع البكتريا والفحص الخلوي للكشف عن الخلايا السرطانية ، بينت الدراسة إن فحص القشع لم يبين نوع أو سبب المرض إلا في ١٢ مريضا وبقيت ٣٣ حالة مرضية غير معروفة بينما أظهرت فحوص السائل المستخرج من غسل القصبات عن طريق ناضور القصبات المرن تحت التخدير الموضعي أسباب وأعراض المرض في ٤١ مريضا.أثبتت نتائج هذه الدراسة أن هناك جدوى أكيدة على الصعيد العلمي في سرعة تحديد المرض وسرعة البدء في العلاج وجدوى اقتصادية في تقليل فترة الرقود في المستشفى وأكدت على ضرورة توفير كوادر لها إلمام بتنظير القصبات كونه أكثر سرعه ودقة في تشخيص الأمراض الصدرية.