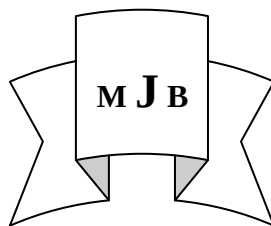


Effect of Therapeutic Thoracocentesis on Short Term Peripheral Oxygen Saturation and other Hemodynamics, in Al-Najaf

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Abstract

Background: Pleural effusion often causes abnormal pulmonary gas exchange. Thoracentesis is commonly used to relieve dyspnea in patient with pleural effusion, but its effect upon arterial oxygenation is varied and poorly understood.

Aim of study: To determine the effect of therapeutic thoracentesis on arterial O₂ saturation and other hemodynamics.

Patients and methods: We studied thirty patients (20 men and 10 women) mean age 44.5 year with unilateral pleural effusion of varied causes. The diagnosis of pleural effusion was depend on clinical and radiological bases. Patients with large pleural effusion were included in this study.

At the time of investigation, all patients were clinically stable and each patient was informed about the possible side effect of the Procedure .

Results: This study reveals that the arterial O₂ saturation was significantly decreased after thoracentesis . The pulse rate was significantly decreased after thoracentesis .

But no significant changes were found in either blood pressure or respiratory rate .

Conclusion: There was a significant reduction in arterial O₂ saturation after thoracentesis .

There was significant reduction in pulse rate after thoracentesis .

while there was no change in blood pressure and respiratory rate .

Key words: thoracentesis, O₂ saturation, plural effusion, dyspnea.

List of abbreviations

DBP = Diastolic blood pressure

PE = Pleural effusion

PR = Pulse rate

RPE = Re expansion pulmonary edema

RR = Respiratory rate

SBP= systolic blood pressure

الخلاصة

استسقاء الجنب غالبا ما يسبب اعتلال تبادل غازات الرئة ، إن سحب ذلك الاستسقاء يستخدم بصورة شائعة لإزالة ضيق التنفس الناتج عن استسقاء الجنب ، ولكن تأثير ذلك السحب على أوكسجين الدم متغير وغير مفهوم .

الغرض من الدراسة هو لتحديد تأثير عملية سحب الاستسقاء على نسبة إشباع الأوكسجين الشرياني وبعض الفعاليات الحيوية .

تضمنت الدراسة ثلاثين مريضا (عشرون رجلا وعشرة نساء) معدل أعمارهم ٤٤.٥ سنة والذي يعانون من استسقاء الجنب أحادي الجانب ، والمتسبب عن مختلف الأمراض ، إن تشخيص ذلك الاستسقاء مبني على أسس سريرية وإشعاعية .

هذه الدراسة بينت إن نسبة إشباع الأوكسجين الشرياني انخفض بصورة مهمة بثلاثي المرضى ، وارتفع بصورة مهمة بثلاث من المرضى ، كما بينت الدراسة انخفاض مهم في سرعة النبض الشرياني بعد عملية السحب ، ولا يوجد تأثير لعملية السحب على كل من ضغط الدم وسرعة التنفس .

استنتجنا من هذه الدراسة بان تأثير عملية سحب استسقاء الجنب على نسبة إشباع الأوكسجين الشرياني كانت مختلفة ، وهذا الاختلاف ربما نتج عن اختلاف أسباب الاستسقاء ، وكذلك فان سرعة النبض الشرياني انخفضت بصورة ملحوظة ، ولا تغيير في كل من ضغط الدم ومعدل التنفس.

Introduction

Pleural effusion is an excess fluid that accumulate in the pleural cavity[1-4]. Pleural effusion commonly complicates many and its manifestations may alter or over shadow those of the underlying disorders [5]. Excessive amount of such fluid can impair breathing by limiting the expansion of the lungs during inhalation [2].

Pleural effusion is a common clinical problem that frequently causes dyspnea and abnormal arterial oxygenation, however, the mechanisms underlying this effect remain unsettled [6].

Most patients with pleural effusion undergo thoracentesis in attempt to delineate the etiology of the fluid collection or to relieve symptoms [4,7].

Therapeutic thoracentesis involve removing an amount of fluid (no more than 1000 to 1500 mL at one time because edema may occur in the reexpanded underlying lung) [8]. Reexpansion pulmonary edema (RPE) were reported after the removal of 1000mL and 1200mL [9]. The drainage of pleural effusion by thoracentesis is very effective in relieving dyspnea, but its effect upon arterial oxygenation is variable, these contrasting findings have been explained on the basis of the presence or absence of concomitant underlying lung parenchymal disease, nature and chronicity of the pleural effusion , and or difference in the technique used to drain it , timing of drainage, or volume drained [6].

Because measurement of PaO₂ requires arterial puncture it is not ideal either for office use or for routine or frequent measurement in inpatient setting. Additionally, Because it provides intermittent rather than continuous data about patients oxygenation, it is not ideal for close monitoring of unstable patient[4].

Pulse oximetry allows non invasive continuous assessment of oxygen saturation (SaO₂) in patient that requires monitoring in order to assess hypoxemia and its response to therapy [10-12]. Pulse oximetry accurately measure SaO₂ value above 80% in persons with adequate peripheral arterial flow. Nevertheless, the accuracy, ease, and low expense of pulse oximetry makes it a useful substitute for analysis of PaO₂ in many situations [8].

Several studies have revealed the role of pulse oximetry in early detection of hypoxemia [13- 16].

Several studies have investigated the effect of thoracentesis on arterial oxygenation, and shows either significant improvement [17, 18, 5] or deterioration [19, 20, 6] .

Aim of Study

To determine the effect of therapeutic thoracentesis on arterial O₂ saturation and other hemodynamics.

Patients and Methods

This study was conducted in Assader teaching hospital in Al Najaf city over a period of twelve months, from October 2009 to October 2010 .

The study group included thirty patient with unilateral pleural effusion of varied causes, the underlying diseases were : pneumonia (9 cases), pulmonary tuberculosis (5cases) ,cardiac failure (8 cases) , bronchial carcinoma (3 cases) , un diagnosed (5 cases) .

The diagnosis of pleural effusion was depend on clinical and radiological bases, only the patients with large pleural effusion were included in this study.

A large pleural effusion was defined as obliteration of more than half of the hemidiaphragm. At the time of investigation, all patient were clinically stable and each patient was informed about possible side effect of procedure.

Patients with hemodynamic instability (blood pressure < 90 / 60 mmHg), sever respiratory insufficiency ($\text{PaO}_2 < 50$ mmHg), small effusion, homeostatic abnormality (prolong bleeding time + prothrombin time), reduction in peripheral blood flow were excluded from the study.

Also there were some limitations which include: Bright overhead lights may cause the oximeter to be in accurate , nail varnish may cause falsely low reading , shivering may cause difficulties in picking up an adequate signal pulse oximeter and discrepancy between $\text{SaO}_2 + \text{PaO}_2$.

Pre-thoracentesis assessment

All patients were examined in an upright seated position and all patients were breathing room air , the blood samples were obtained while the patient was seated and were analyzed for arterial blood O_2 (paO_2) , blood pressure was checked , using mercurial sphygmomanometer, arterial O_2

saturation was measured by using pulse oximeter , pulse rate and respiratory rate also were measured while the patient was seated.

Thoracentesis procedure

Therapeutic thoracentesis was started and pleural effusion was aspirated slowly. A 18 – gauge metallic needle was inserted through the eighth or ninth intercostal space while the patient was seated, fluid removal was terminated when one of the following events occurred; when no more fluid could be removed , pain, excessive cough , vasovagal event, shortness of breath, excessive bleeding at the entry site.

Post – thoracentesis assessment:

Arterial O_2 saturation, blood pressure, pulse rate and respiratory rate were repeated 5 minute after procedure.

There were no post-thoracentesis complication such as dyspnea, chest wall pain, pneumothorax that could interfere with assessment .

Statistical analysis

Arterial O_2 saturation, blood pressure, pulse rate and respiratory rate were compared before and after thoracentesis.

Analysis of the data was done using spss-10 program. A correlation test was used to assess statistically significance of the difference between the results, p-values less than 0.05 were considered significant.

Results

Thirty patients were included in this study, 10 of them were female (33, 33 %) and 20 were male (66 , 66 %) , ranging in age between 20 – 60 years (mean age 44.5 years) .

Average pleural aspirate 1258.3 ml as shown in table 1.

Table 1 The demographic and clinical characteristics of patient

Patient characteristic		Result
Age\year (Mean± SD)		44.5 ±9.6
Sex	Male	20 (66.66 %)
	Female	10 (33.33 %)
Amount of pleural fluid aspirate\ml (Mean ±SD)		1258.3±95.6

This study reveals that there was significant reduction in SaO₂ after thoracentesis (p-value=0.047) as shown in table 2.

The pulse rate was significantly decreased after thoracentesis (p-value=0.0001) as shown in table 2.

But no significant changes were found in either blood pressure(p-value=0.2) or respiratory rate (p-value=0.3) as shown in table 2.

Table 2 The SaO₂, Pulse rate , blood pressure and respiratory rate before and after thoracentesis .

	Pre- thoracentesis	Pos- thoracentesis	p. value
SaO ₂ %	92.5 ± 3.1	90.1±4.6	0.047
PR breath / min	98.5± 8.9	90.4 ±9.6	< 0.0001
SBP mmHg	133.6± 14.3	132.8 ±16.1	0.2
DBP mmHg	82.5 ± 7.5	81.8 ±8.8	0.2
RR / min	26.9 ± 4.3	26.5 ±4.6	0.3

Discussion

Many previous studies report the effect of thoracentesis on PaO₂ , PR , RR and BP. Depending on available data , there is no study which link the changes in O₂ saturation and thoracentesis , in this study we tried to elucidate such relation ship .

In this study, we found a significant reduction in arterial O₂ saturation after thoracentesis, this can be attributed to aberration of ventilation perfusion relation ship which result in intrapulmonary shunt [6,9].

Hypoxemia that follows thoracentesis may be caused by frank pulmonary edema [20]. Additionally, it has been suggested that the pulmonary capillaries might be some how damaged by long term alveolar collapse , and the application of

negative intrapleural pressure might stretch endothelial pores, leading to an increased permeability pulmonary edema [22].

Our result was in agreement with the result of Brandstetter RD et al [20], Karetsky MS et al [19].

Our results were inconsistent with the results of Lee MW et al [17], and mark DA et al [5] that reveal improvement in arterial O₂ saturation after thoracentesis, and this deference can be attributed to some previously collapsed non ventilated but perfused alveoli may open, thus reducing the anatomical shunt [18].

In some patients with pleural effusion, the diaphragm pushed down and flattened with in inspiration (paradoxical movement of diaphragm), as the fluid withdrawn, the diaphragm

resumes its normal arch, diaphragmatic respiratory excursion is greatly increase and respiration becomes more efficient [5].

In this study, the PR was found to be significantly decreased after thoracentesis and this can be attributed to vasovagal reaction with thoracentesis [7].

Our results were concomitant with the result of Phillip WJ et al [7], and inconcomitant with the result of Mark DA et al [5], who found no changes in PR after thoracentesis.

In this study there were no significant effect of thoracentesis on BP and RR, this was possibly due to that most of the patients were haemodynamically stable at the start of study [21].

Regarding blood pressure our results were in a good relation with the results Mark DA et al [5], Ahmed SH et al [23] and Falah A D, Hasan S [21].

Regarding respiratory rate our result were in concomitant with the result of Ahmed SH et al [23], who found a decrease in RR after thoracentesis.

Conclusion and Recommendation

There were a significant deterioration in SaO_2 after thoracentesis.

There was a significant reduction in pulse rate after thoracentesis, while there were no change in blood pressure and respiratory rate.

We recommend that the pleural effusion should be drained under close monitoring of SaO_2 and pulse rate to avoid serious complications like under estimated hypoxia or bradycardia.

Further studies are needed to determine whether these changes lead to an improvement or deterioration in patients outcome.

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