The value of the thyroid function assessment in patients with respiratory failure

Thesis

Submitted for partial fulfillment of MSC degree in
chest diseases

By
Menna Allah Helmy Mohammed Abdel Gawad
M.B.B.Ch, Faculty of Medicine
Cairo University

Supervisors

Prof. Esmat Ali Abdel Naby
Professor of chest diseases
Faculty of Medicine
Cairo University

Dr. Samah Selim Abdel Naiem
Lecturer of chest diseases
Faculty of Medicine
Cairo University

Dr. Mona Mohsen Abdel Salam
Lecturer of chemical pathology
Faculty of Medicine
Cairo University

Faculty of Medicine
Cairo University

2013

بسم الله الرحمن الرحيم

اقرأ باسم ربك الذي خلق ۞ خلق الإنسان من علق ۞
إقرأ وربك الأكرم ۞ الذي علم بالقلم ۞ علم الإنسان
مالم يعلم ۞

صدق الله العظيم

﴿سورة العلق الآيات ١-٥﴾

Contents

Acknowledgment

I would like to declare my deepest gratefulness and appreciation to **Professor Dr. Esmat Ali Abdel Naby,** *Professor of Chest Diseases, Faculty of Medicine - Cairo University for her valuable advice, continuous support, supreme guidance and supervision with her utmost kind encouragement. Words fail to express my feelings of respect towards her.*

I wish to express my deepest thanks and appreciation to **Dr. Samah Selim Abdel Naiem,** *lecturer of chest diseases Faculty of Medicine - Cairo University, who spend a lot of time in directing me, for her kind revision, support and great supervision throughout this work.*

I actually carry a special thankful attitude to **Dr. Mona Mohsen Abdel Salam,** *lecturer of Chemical pathology Faculty of Medicine - Cairo University, for her remarkable guidance, she helped me to prepare this work.*

I am deeply indebted to all my professors in the Chest Diseases Department, faculty of medicine, Cairo University, for their constructive guidance, effective help and cooperation

Also I wish to express my great thanks to my family, my friends and my colleagues for their great support.

ABSTRACT

Background: During critical illness, changes in the level of circulating hormones are a common phenomenon; these alterations are correlated with the severity of morbidity and the outcome of patients in intensive care unit (ICU) and it was found that thyroid dysfunction is associated with the mortality of patients admitted to the ICU.These alterations in thyroid hormone levels are referred to as "non thyroidal illness syndrome" (NTIS) , which is characterized by low serum levels of free and total triiodothyronine (T3) accompanied by normal or low levels of thyroxine (T4) and thyroid-stimulating hormone (TSH).Also C-reactive protein (CRP) as a measure of overall systemic inflammation is strongly and independently associated with respiratory impairment**,** it appears to be major determinant of hospitalization and death risk whatever the end-stage respiratory disease

Methods: The following are studied in 40 Patients in the RICU with acute or acute on top of chronic respiratory failure due to pulmonary disorders and subjected to mechanical ventilation whether invasive or non-invasive: Clinical history and physical examination, APACHE II score, arterial blood gases, Serum level of hs CRP, Serum level of Free T3, Free T4, TSH on admission and on discharge, Plain chest x ray and ECG.

Results*:* SerumT3 level was low in 15 patients (37.5%) on admission. No significance difference between level of thyroid hormone with oxygenation parameters, APACHE II score, and duration of mechanical ventilation, ICU stay and serum CRP level. There is significant positive correlation between CRP and APACHE II score on discharge. No significant difference between survivors and non-survivors as regard CRP, thyroid hormones. The age was the only predictors of mortality among the study population.

Conclusions: This study further supports the presence of thyroid hormone changes among patients with acute respiratory failure due to pulmonary diseases. However this change neither correlated to APACHE II score nor CRP level. Also the changes of the level of thyroid hormones did not significantly correlated with type, duration of mechanical ventilation or length of ICU stay and even did not predict mortality.

Key words: Thyroid hormones, Respiratory failure, CRP.

LIST OF ABBREVIATIONS

ABG: arterial blood gases.

APACHE II: acute Physiological and Chronic Health Evaluation.

APPS: acute phase proteins.

ARDS: acute respiratory distress syndrome.

ARF: acute respiratory failure.

BAL:bronchalveolar lavage.

BMI: body mass index.

BMR:basal metabolic rate.

BNP: B type of naturetic protein.

C: complement system.

CRP: C-Reactive protein.

$C_a O_2$: arterial oxygen content.

CBC: complete blood count.

$C_C O_2$: capillary oxygen content.

CNS: central nervous system.

CO: cardiac output.

COPD: chronic obstructive pulmonary disease.

CT: computed Tomography.

$C_v O_2$: mixed venous oxygen content.

DIT: di-iodotyrosines.

ECG: electrocardiography.

EIT:electrical bioimpedence tomography.

EELV: End-expiratory lung volume.

EPOV: European Predictors of Outcome from Ventilation.

ETI: endotracheal intubation.

ETMV: endotracheal mechanical ventilation.

ETT: Endotracheal tube.

EVLW: extravascular lung water.

FEF25-75%: forced expiratory flow 25–75%.

FEV_1: forced expiratory volume in 1 second.

$F_I O_2$: fractional concentration of oxygen in inspired gas.

f T3:free T3.

f T4:free T4.

f T4I: free T4 index.

FVC: forced vital capacity.

GI: gastrointestinal.

GIT: gastrointestinal tract.

$H_2O_{2:}$ hydrogen peroxide.

Hs-CRP: high sensitive C-Reactive protein.

I-131: radioactive iodine.

IAP:intra-abdominal pressure.

IC: Inspiratory capacity.

ICS: inhaled corticosteroid.

ICU: intensive care unit.

IL: interleukin.

IMV: invasive mechanical ventilation.

K: constant (0.863).

LBP: lipopolysaccharide binding protein.

LDL: low density lipoprotein.

MIT:mono-iodotyrosines

MV: mechanical ventilation.

6MWT: 6 minute walk test.

NIV: non invasive ventilation.

NPPV: noninvasive positive pressure ventilation.

NTIS: non thyroidal illness syndrome.

NT-proBNP:N-terminal prohormone of BNP.

OHS: obesity–hypoventilation syndrome.

OSA: obstructive sleep apnea.

$P_A CO_2$: alveolar PCO_2.

$P_a CO_2$: arterial carbon dioxide tension.

$P_A O_2$: alveolar PO_2.

$P_a O_2$: arterial oxygen tension.

PAV: proportional assist ventilation.

Paw: airway Pressure.

Paw (t): the inspiratory pressure provided by the ventilator.

P_B: barometric pressure.

PEEP: intrinsic positive end-expiratory pressure.

PFTs: pulmonary functions tests.

$PH_2 O$: water vapor pressure at 37°C.

Pmax: maximal (peak) pressure.

Pplat: plateau pressure.

PSV: pressure-support ventilation.

PVO_2: mixed venous oxygen tension.

P/V curve: Pressure volume curve.

Q_S/Q_T: the shunt fraction.

R: respiratory exchange ratio.

REF: resting energy expenditure.

RICU: respiratory Intensive Care Unit.

r T3: revers T3.

RV: right ventricle.

RV:residual volume.

Sa, O2: arterial oxygen saturation.

SAP: serum amyloid P component.

SBT: spontenous breathing trial.

$SPO_{2:}$ capillary oxygen saturation.

SV, O2: mixed (centeral) venous oxygen saturatution.

T3: L- thyroxine.

T4: L- triiodothyronin.

TBG: thyroxine binding globulin

T-cells: T- lymphocytes.

TLC: total lung capacity.

TLR-2: toll like receptor.

TNF: tumor necrosis factor.

TSH:thyroid stimulating hormone.

TRH: thyrotropin-releasing hormone

UK: United Kingdom.

US:United States.

V/Q: ventilation/perfusion ratio.

V_A: alveolar ventilation.

VAP: ventilation-acquired pneumonia.

VCO_2: carbon dioxide ventilation.

VLDL: very low density lipoprotein.

VO_2: oxygen ventilation.

VT: tidal volume.

WOB: work of breathing.

LIST OF TABLES