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ORIGINAL ARTICLE

Pleural carnal attrition: Sarcopenia and protein catabolism in malignant pleural effusion

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KEYWORDS

Sarcopenia;
Hypoalbuminemia;
Muscle ultrasound;
Lymphoma;
Mesothelioma;
Adenocarcinoma

Abstract *Background:* Pleural malignancies disturb normal ways of protein metabolism deferring imbalance of backside markers in body tissues and fluids and see the sights of muscle and protein derangement.

Purpose: The aim of this work to study markers of protein depletion and muscle catabolism in cases with malignant pleural effusion.

Patients and methods: Thirty patients with malignant pleural effusions not under chemotherapy were studied regarding markers of muscle and protein derangement (plasma albumin & potassium levels and creatinine height index) and radiological signs (the presence of pleural thickness by computed tomography (CT) of chest and muscle wasting by skeletal muscle ultrasound) plus thoracoscopic findings (plaques and adhesions).

Results: Metastatic adenocarcinoma accounted for a higher percentage in smoking 66%, aging (59.06 ± 13.04) and duration of illness (13.13 ± 4.85) than other pleural malignancies. In the same way metastatic adenocarcinoma showed the major type in hypoalbuminemia, hypokalemia and CT pleural thickening than other malignancies (11.11%, 72.22% and 77.76% in that order). However, malignant lymphoma was prevalent in echographic features of muscle wasting, pleural plaques and pleural adhesions (66.7% for each marker). Lastly, squamous cell carcinoma prevailed in creatinine highest index than the previous three tumors (75%). Nevertheless, there were no statistical significant differences between the four diagnosed malignancies except for pleural plaques that were significant ($p = 0.03$).

Conclusion: Pleural malignancy can enhance the body decomposition in particular muscular components and hastens protein catabolism with the help of feasible laboratory and radiological markers.

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Introduction

Malignant pleural effusions are common clinical dilemma in patients with neoplastic disease. In one postmortem series, malignant effusions were found in 15% of patients who passed away with malignancies [1]. Every now and then, there has been an increasing recognition of the clinical importance of patients' general health and in specific; muscle mass catabolism as part of the cancer cachexia syndrome, and its impact has been evaluated in a wide range of malignancies including pleuropulmonary, breast, gastrointestinal, hepatocellular and colorectal cancers [2–6]. The term sarcopenia is characterized by a triad of progressive loss of skeletal muscle mass, muscle strength and physical performance [7]. This loss of muscle mass is not necessarily linked with significant or sudden weight loss. There are several mechanisms that may be involved in the onset and evolution of sarcopenia, among them are, protein synthesis, proteolysis, neuromuscular integrity and muscle fat content. Recognizing these mechanisms and their underlying causes is expected to facilitate the design of intervention trials that target one or further underlying mechanisms [8]. Interest in sarcopenia as a poor prognostic marker in cancer is rising; in various populations with cancer sarcopenia is associated with poorer performance status, [2] reduced overall survival [9,10] and increased risk of chemotherapy toxicities [3,5]. The hallmark of sarcopenia is low muscle mass, more specifically an appendicular skeletal muscle mass [11]. While many different techniques have been used to measure muscle mass and strength, a few have been included into routine assessment of the cancer population. The current gold standards are CT Computed tomography, magnetic resonance imaging MRI and dual-energy X-ray absorptiometry (DEXA) scans. CT and MRI allow precise discrimination between fat and other soft tissue including muscle and are therefore investigations of choice [12]. Muscle ultrasound is a convenient technique to visualize normal and pathological muscle tissues as it is non-invasive and real-time [13]. More indirect techniques for measuring muscle mass comprise bioelectrical impedance analysis which is non-invasive but less accurate compared with DEXA. It includes a measure of organ mass other than skeletal muscle in addition it is easily performed in clinical settings [14]. Measurements of mid-upper arm circumference and arm muscle area using skin fold thickness methods have also been used [15], although these assessments are less accurate and they exists considerable inter-observer and intra-observer variability. Measurements of muscle strength in the literature have mainly centered around handgrip strength (HGS) and quadriceps strength, although in non-cancer elderly patients, functional assessments such as the Short Physical Performance Battery and sit-to-stand tests [16,17] have been shown to correlate with adverse outcomes. If the loss of muscle mass and strength have significant clinical suggestion for patients with cancer, then standardized, validated diagnostic thresholds are clearly needed. The aim of this work was to study the markers of protein depletion and muscle catabolism in cases with malignant pleural effusion.

Patients and methods

A prospective clinical study was conducted on thirty patients proved to have malignant pleural effusions with medical thoracoscopy on admission to Chest medicine department Mansoura University Hospitals during the period from June 2014 to August 2015. They did not receive chemotherapy yet, they were studied for markers of muscle and protein depletion. Anthropometric measurements were excluded due to the subjective variability, plus age-related changes in fat deposits and loss of skin elasticity contribute to errors of estimation in older people. Age of the patient and duration of illness (in months) were considered. They underwent the subsequent laboratory investigations (plasma albumin& potassium levels, creatinine height index; CHI = (24 h urine creatinine × 100)/(expected 24 h urine creatinine for height).

Creatinine height index – consider Protein depletion = if the patient CHI < 80%.

Hypokalemia = if the patient plasma level < 3.5 mEq/L.

Hypoalbuminemia = if the patient plasma level < 2.5 g/dL [18].

Also, radiological signs as presence of pleural thickness on computed chest tomography (CT chest) as defined by Downer et al., as [19] thickening of pleura, more than 5 mm with combined area of involvement more than 25% of chest wall if bilateral and 50% involvement if unilateral may be focal or diffuse. and signs of muscle wasting with the help of skeletal muscle ultrasound and thoracoscopic findings of plaques and adhesions that define the state of body anabolism and deposition of fibrin and elastin.

Exclusion criteria:

(1) Extreme of age >65 years and <18 years.
(2) Debilitating diseases (chronic liver and renal failure, uncontrolled DM, blood diseases, known other malignancy).
(3) Neuromuscular diseases (Duchene disease, myopathy, myasthenia, motor neuron disease and poliomyelitis).
(4) Diseases and drugs causing hypokalemia (dieuretics, digitalis, chronic diarrhea, Cushing disease and renal failure).
(5) Diseases and drugs causing Hypoalbuminemia (liver cirrhosis, protein losing nephropathy and protein losing enteropathy).

Procedures

Methods

Prethoracoscopy assessment

For each patient, the following were reviewed: (1) detailed medical history, (2) investigations done to reach the final diagnosis including; chest radiographs and chest-CTs, and medical thoracoscopic pleural biopsy.

Thoracoscopy procedure

Thoracoscopic maneuver was done under local anesthesia with spontaneous breathing and light sedation (midazolam, fentanyl) by an experienced pulmonologist in the endoscopy room. Patients were located in lateral decubitus position, with the implicated side raised upward. After skin sterilization, small skin incision was done with blunt dissection to enter the pleural space between the third and sixth intercostal space, along the midaxillary line. A rigid thoracoscope