Thoracic Multidedector CT Findings in Hemodialysis Patients

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ABSTRACT

Aim: *Uremia is often associated with a large array of thoracic complications. Radiological examinations have great importance in diagnosis of thoracic diseases. The main focus of this retrospective study was to document the multidedector computed tomography (MDCT) findings involving thoracic complications in hemodialysis patients.*

Method: *Twenty-nine hemodialysis patients who had one or more of the following complaints; dyspnea, cough, malaise, weight loss, fever were included undergone MDCT in this study.*

Result: *The MDCT and chest x-ray findings in our patients were as follows; cardiomegaly (13 vs. 12), ground-glass opacity (10 vs 0), pleural effusion (10 vs 9), parenchymal infiltration (9 vs. 2), scarring-fibrosis (9 vs. 3), pleural thickening (6 vs. 3), mediastinal and/or hilar lymphadenopathy (6 vs 0),'tree in bud' appearance (5 vs. 0) atelectasis (4 vs. 0) , and emphysema (1 vs. 0) respectively .*

Conclusion: *Our findings suggest that MDCT revealed many pathologic findings that chest x-ray could not detect.*

Key words: *Hemodialysis, uremia, MDCT, thorax complication*

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Hemodiyaliz Hastalarında Multidedektör BT Akciğer Bulguları

Amaç: *Üremik hastalarda akciğer ile ilgili bir çok komplikasyonlar görülmektedir. Bu hastalarda radiyolojik görüntüleme çok önemlidir. Bu retrospektif çalışmada amacımız hemodiyaliz hastalarında multi dedektör bilgisayarlı tomografi (MDBT) bulgularını ortaya koymaktır.*

Metod: *Öksürük, balgam, ateş, zayıflama, iştahsızlık,gibi semptomlardan biri veya birkaçı nedeniyle MDBT çekilen yirmi dokuz hemodiyaliz tedavisi altındaki hastanın sonuçları değerlendirilmeye alındı.Bu hastaların tamamında MDBT çekilmeden göggüs grafileri çekilmişti.*

Bulgular: *Hastalardaki MDBT bulguları aşağıdaki gibi sıralanmıştır; kardiyomegali (n:13, %45), buzlu cam görünümü (n:10, %34), plevral effuzyon (n:10, %34), parenkimal infiltrasyon (n:9, %31), scar-fibroz (n:9, %31), plevral kalınlaşma (n:6, %21), mediastinal ve/veya hiler lenfadenopati (n:6, %21),budanmış ağaç görünümü (n:5, %17) atelektazi (n:4, %14) ve amfizem (n:1, %3).*

Sonuç: *Yaptığımız bu çalışma, gögüs grafisi ile gösterilemeyen bir çok patolojik bulgunun MDBT ile gösterilebildiğini ortaya koymuştur.*

Anahtar kelimeler: *Hemodiyaliz, üremi, MDCT, toraks komplikasyonu*

INTRODUCTION

The incidence of end stage renal failure is increasing worldwide.There are approximately 300.000 on hemodialysis (HD) in the USA and 26.000 patients with end stage renal disease (ESRD) in Turkey (1,2). The ongoing progresses of dialytic techniques and renal transplantation have improved the prognosis in terminal uremic patients. Uremia has some negative effects on all parts of human body including a large array of thoracic complications (3). Radiologic examinations have great importance in diagnosis of thoracic diseases, in addition to chest x-ray and computed tomography (CT), new and more precise modalities such as multidedector CT (MDCT) was begun to use for this purpose. The sensitivity of chest X-ray, is known to be low; therefore, the very sensitive high-resolution CT (HRCT) became the gold standard and will probably be replaced by thin-section MDCT in the near future. The introduction of MDCT has considerably modified the diagnostic approach of pulmonary diseases and its accuracy has progressively improved in parallel to the improvement of CT technology over the past 10 years (4-6). We review the main thoracic findings in hemodialysis patients with pulmonary complaints from the radiological point of view.

MATERIALS AND METHODS

Twenty-nine HD patients (13 woman, 16 men; mean age 44±17, age range 21-64, years) who had one or more of the following complaints; dyspnea, cough, malaise, weight loss, fever, and profuse perspiration were underwent MDCT between March 2003 and March 2004. All patients were referred to MDCT examination by the pulmonologist.

The mean duration on dialysis was 36±8 months. Their diagnoses were chronic glomerulonephritis (n:7, 24%), diabetes mellitus (n:6, 21%) hypertensive nephropathy (n:5, 17%), obstructive uropathy (n:1, 3%), polycystic kidney disease (n:1, 3%), and unknown (n:9, 31%). HD were performed for 4 hours three times per week by using double-needle technique, native arteriovenous fistulas were used, dialysate was acetate (n:5, 27.9%) or bicarbonate (n:24, 72.1%) buffers, and unfractionated heparin or low molecular weight heparin was used for anticoagulation. The average dialysis dose (Kt/V) was 1.23±0.20 (Daugirdas formula)7. Hypertension was present in 5 patients (17%).

MDCT examinations were performed just after a HD session of four hours in all patients in order to prevent volume overload, which may cause misleading images. In our practice we use multidetector (four) CT scanner (Somatom Sensation 4 unit, Siemens, Erlanger, Germany). Scanning parameters of MDCT examinations were as follows; slice width 7 mm, collimation 2,5 mm, scan time 10,8 sec, Kv 120, Mas 90, feed/rotation 15 mm. The scans were obtained during full inspiration with the patient in the supine position. We scanned from the apices of the lungs in the caudal direction. Definitions of pathologic findings on images; ground-glass opacity (GGO) is characterized by areas of hazy increased attenuation of the lung with preservation of bronchial and vascular margins; Cardiomegaly was indicated by a cardiothrocic index above 50%. “Tree in-bud’’ apperence is a branching linear structure with more than a pious brancing site.

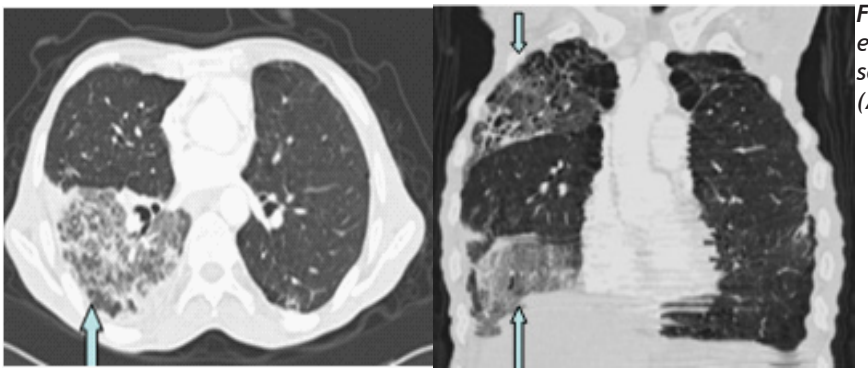

Figure 1 A-B: *MDCT scan shows extensive honeycombing, indicating severe irreversible fibrosis in axial (A) and coronal planes (B).*

RESULTS

Chest x-ray revealed cardiomegaly (n=12), pleural effusion (n=9), pulmonary fibrosis (n=3), pleural thickening (n=3) and parenchymal infiltration (n=2). Our MDCT findings were as follows; cardiomegaly (n=13, 44%), parenchymal infiltration (n=9, 31%) (Fig 1 A-B) parenchymal scarring-fibrosis (n=9, 31%) (Fig 2 A-B), ground glass opacity (n=10, 34%) (Fig 3 A-C), pleural effusion (n=10, 34%) pleural thickening (n=6, 21%), mediastinal and/or hilar lymphadenopathy (n=6, 21%), atelectasis (n=4, 14%) and emphysema (n=1, 3%) Cardiomegaly (n=13) was the most common MDCT finding in our patients. The eight of the patients with cardiomegaly were under 30 years of age. The other common MDCT finding was parenchymal scarring-fibrosis located in apical segments of lungs (2 patients). Pleural effusion (n:10, 34%) which was bilateral in 6 cases and unilateral in remaining was detected. In addition, accompanied pleural thickening and parenchymal infiltration was seen in 7 and 2 patients, respectively. Segmental or subsegmental atelectasis was observed in 4 (14%) and "tree in bud'' appearance was observed in 5 (21%) patients. Mediastinal or hilar lymphadenopathy were other common findings in our patients (n=6, 21%),and tuberculosis was the etiologic factor in 3 patients. The uremic pericardial effusion was detected in 3 (10%) patients.

DISCUSSION

No organ in the chest is spared from the negative effects of uremia. The dialytic treatment itself is also associated with some thoracic complications. The thoracic complications of uremia are mainly related to a poor management of the fluid balance (3). The MDCT is more sensitive than CT, but it is not routinely used. The MDCT may reveal in multiple planes, along with the thickening of the septa and subpleural edema, areas of ground-glass density, thickening of centrilobular structures and dilatation of vessels, particularly the lobular veins (8).

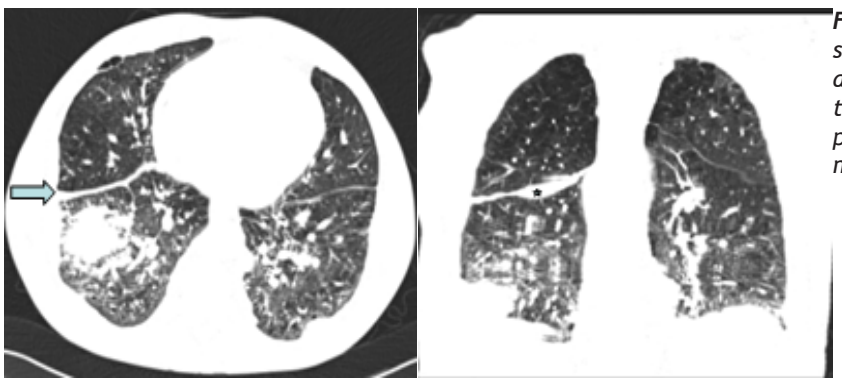

Figure 2 A-B: *MDCT scan shows a few scattered thickened interlobular septa and very faint pattern of mosaic attenuation with axial (A) and coronal planes (B). Note thickened septa is more evident on coronal plane (star).*

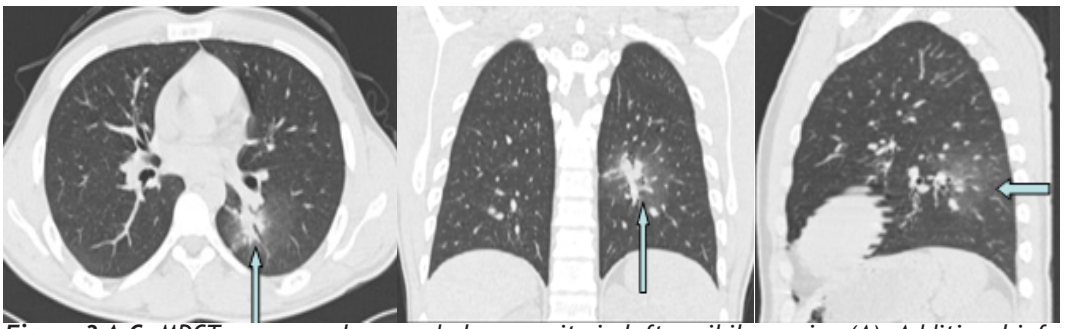

Figure 3 A-C: *MDCT scan reveals ground-glass opacity in left perihiler region (A). Additional information about localization and distribution of infiltrative region can be obtained by coronal (B) and sagittal reconstructed images.*

Coşkun e al reported their CT findings of HD patients. We observed the pleural effusion frequency less than Coşkun's results (34% vs 60%). Hypertension prevelance of 17% in our series representing a good blood pressure control of the patients. This may cause a relatively lower pleural effusion frequency for our series. Coşkun et al. did not report blood pressure control of their series (9). Ground-glass opacity can reflect minimal thickening of the septal or alveolar interstitium, thickening of alveolar walls, or the presense of cells or fluid filling the alveolar spaces. It can represent active disease such as pulmonary edema, pneumonia, or diffuse alveolar damage (10,11). Ground-glass opacity was detected in 10 patients [34%], the prevalence of which was in accordance with previous report. Also all MDCT examinations in our patients were performed after a HD sesion in order to prevent the effect of volume over-load characteristically develops during interdialytic period and reaches its, maximum before HD session (9).

Pulmonary scarring-fibrosis was seen in 9 (31 %) patients in our study. This result was 8% in Coşkun et al's study. We thought that this difference in frequency might be related to higher sensitivity of MDCT, causative factor was tuberculosis in 3 patients and volume overload in the remaining 6 patients. These factors are main causes of fibrosis for our cases. Fibrosis can result in reticular, nodular or stellate opacities on radiographs or MDCT, associated with volume loss in affected lung and architectural distorsion. It may remain stable over months or years or show progression (9,12). We detected uremic pericarditis in 3 patients. Uremic pericarditis was disappeared after intense hemodialysis treatment cllinicially and echocardiographically.

In this study MDCT revealed many pathologic findings that chest x-ray could not detected. The plain chest X-ray is less sensitive than other methods such as CT and MDCT. MDCT is a recently introduced modality and very few studies exist in the literature. The head to head comparison of the HRCT and MDCT in terms of thoracic findings in uremic patients is not possible due to ethic reasons in humans but MDCT is technically a more sophisticated and precise modality and may be more useful in diagnosing thoracic pathologies.

In conclusion for uremic patients with pulmonary complaints, when the high percentage of positive pathologic findings such as ground glass opacitiy, fibrosis and mediastinal-hilar lymphadenopathy which were difficult to detect with plain x-rays, were considered it seems more precise techniques such as MDCT should be used for this purpose. Studies are need to establish whether the novel more sophistical MDCT is more useful than the single detector computed tomography in the diagnosis of thoracic pathology .

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