Visualization Of A Bronchial Carcinoma With Its Soft Tissue And Bone Metastasis Using Tc99m–Tetrofosmin

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✔ Az diferansiye epidermoid karsinomalı bir hastada tümörün yanısıra yumuşak doku ve kemik metastazlarında artmış 1,2-bis[bis(2-ethoxyethyl) phospino] ethane (Tc-99m Tetrofosmin) akümülasyonu olduğu gösterilmiştir. 740 MBq (20 mCi) Tc-99m Tetrofosmin intravenöz yoldan enjekte edildikten sonra 30 dakikalık dinamik, 30-35. ve 85-90. dakikalarda statik görüntüler elde edilmiş, maksimum konsantrasyon pikine her üç lezyonda da ilk iki dakika içerisinde ulaşılmıştır. Enjeksiyon sonrası 30-35. ve 85-90 cı dakikalarda tümör, kemik ve yumuşak doku metaztazlarında lezyon/kontralateral normal doku tutulum oranları 1.62, 1.41, 3.11 ve 1.43, 1.22,1.80 olarak saptanmıştır. Tc-99m Tetrofosmin'in tümörün yanısıra metastazlarında da akümüle olması, bu ajan ile tümör görüntüleme alanında yapılacak daha ileri çalışmaların gerekliliğini desteklemektir.

Anahtar Kelimeler: Tc–99 m Tetrofosmin–Bronş kanseri – Akciğer tümörü metastazı

✔ Increased uptake of 1,2-bis[bis(2-ethoxyethyl) phospino] ethane (Tc-99m tetrofosmin) in tumor as well as its soft tissue and bone metastasis was demonstrated in a patient with poorly differentiated squamous cell carcinoma of the lung. 740 MBq (20 mCi) of Tc-99m tetrofosmin was injected intravenously. Following an initial dynamic acquisition of 30 minutes, static images were obtained at 30-35 and 85-90 minutes post injection (p.i.). Time to peak concentration in all three lesions was achieved within the first two minutes. Lesion to contralateral normal tissue uptake ratios of tumor, bone and soft tissue metastasis at 30-35 minutes and at 85-90 minutes p.i. were 1.62, 1.41, 3.11 and 1.43, 1.22, 1.80 respectively. We conclude that accumulation of Tc-99m tetrofosmin in tumor and metastasis at once is an encouraging finding and justifies further investigations using this agent in the domain of tumor imaging.

Key Words: Tc-99m Tetrofosmin-Bronchial Carcinoma-Lung Tumor Metastasis

1,2-bis [bis (2-ethoxyethyl) phospino] ethane (Tc-99m tetrofosmin) is a recently developed diphosphine for myocardial perfusion imaging. It belongs to a new class of Tc-99m labeled lipophilic cations, which employ a diphosphine ligand[1]. The reported comparative studies up to date communicate high accuracy in the detection of coronary artery disease, similar to Tl-201[2,3]. Accumulation of the myocardial perfusion agents Tl-201 and Tc-99m-MIBI in tumor tissue and in metastasis has been reported by various authors[4-9]. Recently, uptake of Tc-99m tetrofosmin in malignant tissues has also been described[10,11,12]. We report a case of Tc-99m tetrofosmin uptake in a squamous cell carcinoma of the lung as well as in its soft tissue and bone metastasis.

CASE REPORT

A 50-year-old female was admitted to hospital with back and shoulder pain. Chest x–ray (Fig. 1A) and computed tomography revealed a 6x6.5 cm lesion in the inferior lobe of the right lung. A poorly differentiated squamous cell carcinoma was diagnosed by the following bronchoscopic biopsy. The Tc-99m-MDP scan detected multiple bone metastasis, which were localized most intensively in the left shoulder joint region

(Fig.1B). Moderately active lesions of smaller size were visualized in the left humerus, several costae and vetebral column. The CT exploration of the left soulder region located 6x8 cm solid mass above the acromioclavicular joint (Fig. 2). Histopathological examination of the biopsy specimen diagnosed soft tissue metastasis.

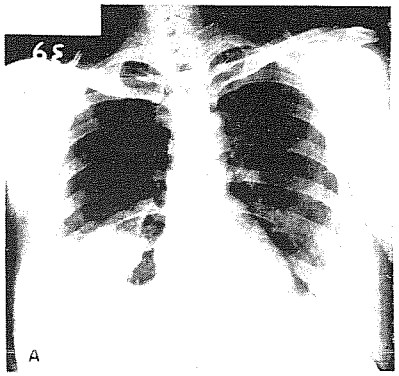

Fig. 1a: Chest X-Ray showing the lung lesion in the inferior lobe of the right lung.

Fig. 1b: Tc99m-Bone scintigraphy-posterior view with multiple metastasis.

One week after the bone scan, Tc-99m tetrofosmin study was performed. Following the intravenous injection of 740 MBq (20 mCi) of the tracer, two dynamic acquisitions (60x1 second frames followed by 30x1 minute frames) were performed. Anterior static images at 30-35 and 85-90 minutes were obtained. Besides the increased tracer accumulation in the lung tumor, localized increased uptake in soft tissue and bone metastasis of the left shoulder was observed (Fig. 3). By assigning ROI's over the tumor, bone and soft tissue metastasis as well as over the corresponding contralateral normal uptake sites, the time to peak concentration, Tc-99m tetrofosmin washout rate at 30 minutes post injection and lesion/contralateral normal uptake ratios at 30-35 as 85-90 minutes were calculated for all three sites (Table 1 and Table 2).

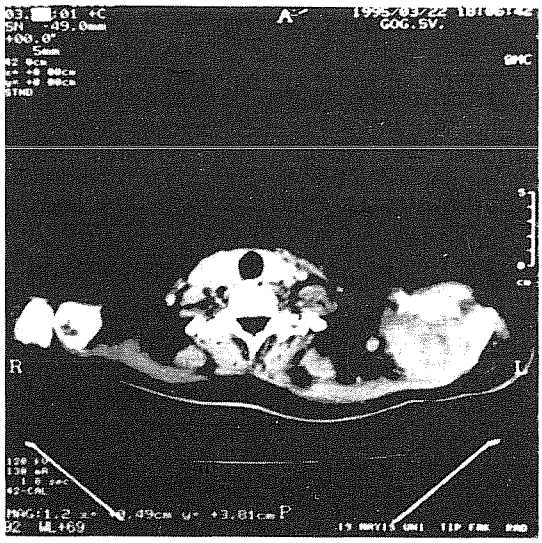

Fig. 2: Computed tomographic image showing the soft tissue metastasis above the left shoulder joint.

Table 1: Tc99m-Tetrofosmin kinetics in tumor and metastasis

	Time to peak concentration	Washout rate at 30min. post inj.
Tumor	40 seconds	27%
Bone metastasis	2 minutes	21%
Soft tissue Metastasis	1 minute	24%

Table 2: Lesion/Contralateral normal tissue uptake ratios of Tc99m-Tetrofosmin

	30 - 35 minutes	85 - 90 minutes
Tumor/CNL	1.60	1.43
Bone met./CNB	1.41	1.22
Soft T. met./CNST	3.11	1.80

*CNL = Contralateral normal lung,
CNB = Contralateral normal bone,
CNST = Contralateral normal soft tissue.

Fig. 3: 30-35 min. anterior Tc99m-Tetrofosmin image with increased accumulation in the tumor of the right lung (arrow 1) as well as in the soft tissue (arrow 2) and bone metastasis (arrow 3) of the left shoulder.

DISCUSSION

Tc-99m tetrofosmin is a recent and promising myocardial perfusion agent. The well known advantages of Tc-99m labeling and the yet reported accuracy similar to Tl-201 announce a new challenger for the other technetium tracers MIBI and Teboroxime[2,3]. Uptake of myocardical perfusion tracers Tl-201 and Tc99m-MIBI in malignant lesions was a subject of investigation in the recent years[4,5,6]. Accumulation of these two tracers in metastatic tissue has been reported as well[7,8,9]. Tc-99m tetrofosmin uptake in brain tumors has been reported by Soricelli et al.[10] and accumulation in malignant lung tumors has been first documented by our department[11]. Recently, a case of metastasis detection in differentiated thyroid carcinoma has been reported [12]. In this present case, simultaneous visualization of a lung tumor as well as its soft tissue and bone metastasis was an encouraging finding. It was observed that only the bone metastasis showing the most intensive MDP uptake could be visualized using Tc-99m tetrofosmin. The time to peak concentrations within the first two minutes indicate a relation between the increased accumulation of Tc-99m tetrofosmin and increased blood flow in malignant tisues. Tumor uptake mechanism of Tc-99m Tetrofosmin and clinical usefulness of this agent in lung tumor imaging remains to be researched.

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