

Superiority of Tc-99m MAG3 to Tc-99m DTPA in treating a patient with mild renal artery stenosis

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A 22-year-old female patient with severe hypertension underwent both Technetium-99m diethylenetriaminepentaacetate and Technetium-99m mercaptoacetyltriglycine basal and captopril renal scintigraphy. While no significant change was seen with Tc-99m DTPA, there was left sided parenchymal retention of captopril Tc-99m MAG3 suggesting renal artery stenosis which was confirmed by angiography.

Key words: renal artery stenosis, Tc-99m MAG3, Tc-99m DTPA

INTRODUCTION

AFTER THE FIRST DESCRIPTION of the effect of captopril intervention on renography by Majd et al.¹ in 1983, captopril renography has been established as a useful diagnostic test for renovascular hypertension. Although both tubular and glomerular tracers have been used in this test, no direct comparison of the agents has been described clearly. So far no tracer has emerged as definitely superior, but because of the better imaging properties and high signal to noise ratio in poor functioning kidneys, Technetium-99m mercaptoacetyltriglycine (Tc-99m MAG3)² and Technetium-99m ethylenedicycysteine (Tc-99m EC), a new tubular agent,³ are favored. We report a case of renovascular hypertension on which both Technetium-99m diethylenetriaminepentaacetate (Tc-99m DTPA) and Tc-99m MAG3 have been used but the diagnosis of renal artery stenosis (RAS) was made by the latter and confirmed by angiography.

CASE REPORT

A 22-year-old female patient was admitted for evaluation of headache and severe hypertension which was barely

controlled with anti-hypertensive medication. Her kidney function tests, abdominal ultrasonography (US) and routine blood tests were within normal limits. The patient was referred to the nuclear medicine department for scintigraphic evaluation of renovascular hypertension.

Tc-99m DTPA Scintigraphy:

Basal scintigraphy was performed after the patient was hydrated with 500 ml of water starting 30 minutes before the procedure. The patient was injected with 370 MBq Tc-99m DTPA and 40 mg furosemide simultaneously. Dynamic images were recorded every second for 1 minute and at every 15 sec for 20 minutes in conjunction with 2 minute static images. No significant finding was observed with this scintigraphy. Captopril renal scintigraphy was performed 1 hour after the oral administration of 50 mg captopril. Oral hydration was maintained in the same manner as basal scintigraphy. Blood pressure (BP) was monitored every 20 minutes after captopril administration. The patient's BP went from 140/90 down to 90/50 indicating response to medication. Hydration and data acquisition after Tc-99m DTPA injection were performed under the same conditions with baseline scintigraphy. In captopril scintigraphy both kidneys showed bilateral minimal stasis which was interpreted as a nonspecific finding and not indicative of renal artery stenosis.

Because renovascular hypertension was strongly suspected clinically, and though mild but segmental stenosis was seen on angiography it was decided to repeat the renal scintigraphy with a tubular agent.

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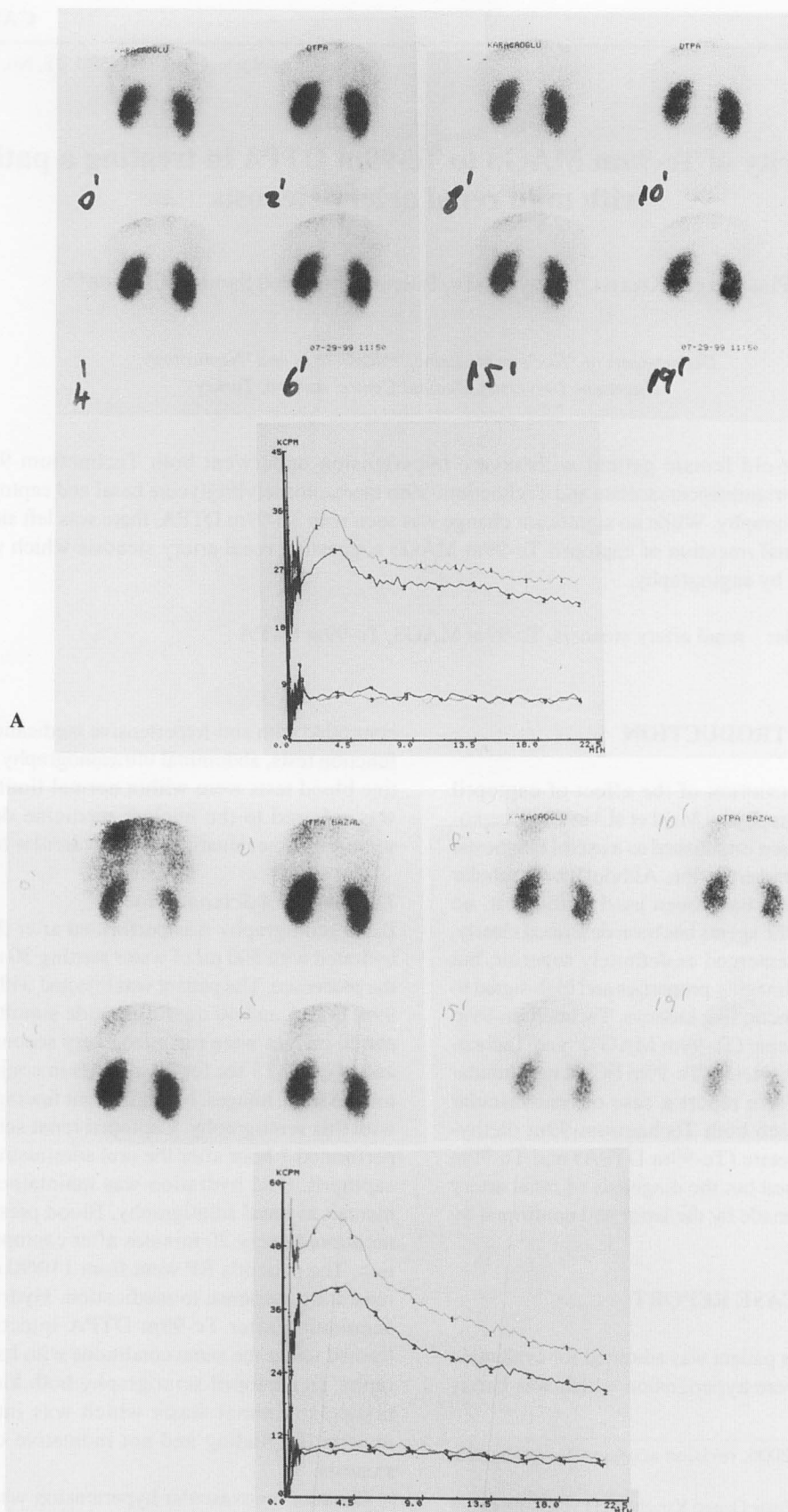


Fig. 1 No finding indicating renal artery stenosis was observed on captopril scintigraphy (A). The bilateral cortical retention was thought to be due to the significant hypotension following captopril administration. Basal Tc-99m DTPA scintigraphy (B) was normal.

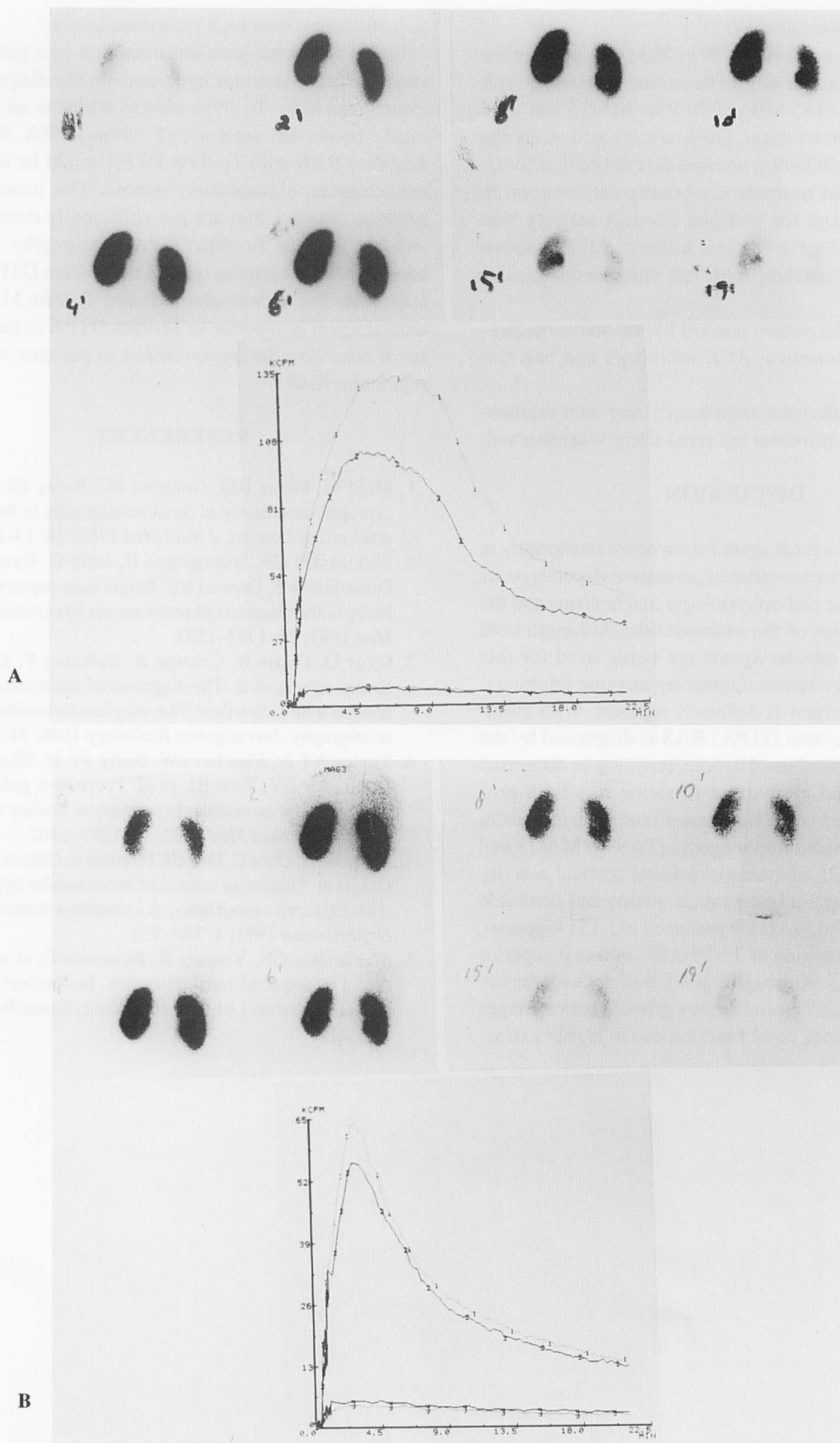


Fig. 2 Prominent cortical retention on the left side of the Tc-99m MAG3 captopril scintigraphy (A) which was highly suggestive for the renal artery stenosis which was later confirmed by renal angiography. Bilateral symmetric functions were observed on the Tc-99m MAG3 basal scintigraphy (B).

Tc-99m MAG3 Scintigraphy:

Basal and post-captopril Tc-99m MAG3 studies were performed in the same way as described previously with the exception that 185 MBq of Tc-99m MAG3 was used as the radiopharmaceutical. On post-captopril study the renogram of the left kidney showed delayed peak activity. Visually there was prominent parenchymal retention in the left kidney and the residual cortical activity was calculated as 30% for the left kidney. All the above findings were consistent with left sided renovascular hypertension.⁴

In all studies the patient was off hypertensive medication including diuretics, ACE inhibitors and calcium canal blockers.

The patient underwent angiography and mild segmental stenosis in the proximal left renal artery was observed.

DISCUSSION

Determination of a renal agent for captopril renography in the diagnosis of renovascular hypertension depends on its ability to show the pathophysiologic mechanisms and the imaging properties of the radionuclide. Although both glomerular and tubular agents are being used for this purpose with angiotensin converting enzyme inhibitors, no tracer has emerged as definitely superior. With glomerular agents (Tc-99m DTPA) RAS is diagnosed by the findings of decreased renal uptake, resulting in decreased split function and glomerular filtration rate with prolonged transit time and a suppressed renogram curve. On the other hand, with tubular agents (Tc-99m MAG3 and Tc-99m EC, I-131 hippuran), residual cortical activity increases.⁵ Because of better image quality and favorable dosimetry, Tc-99m MAG3 is preferred to I-131 hippuran, but the easy preparation of Tc-99m EC makes it superior to Tc-99m MAG3. Although it is not well defined, the use of tubular agents is favored as they provide better images in patients with poor renal function due to higher extrac-

tion efficiency with high creatinine levels.⁶

In this report we have observed that, in a patient with suspected renovascular hypertension the diagnosis was clearly made by Tc-99m MAG3 whereas an undetermined result was seen with Tc-99m DTPA. Failure to diagnose RAS with Tc-99m DTPA might be due to the mild character of renal artery stenosis. This stenosis might produce changes that are not sufficiently detectable to indicate RAS on Tc-99m DTPA scintigraphy. It is also known that the imaging quality of Tc-99m DTPA is less favorable. The authors conclude that Tc-99m MAG3 as a tubular agent is superior to Tc-99m DTPA in the diagnosis of renovascular hypertension in patients with mild segmental RAS.

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