

가

$^{99m}\text{Tc}$ -DTPA

: 6

$^{99m}\text{Tc}$ -DTPA 30

Levovist™ (SH U 508A; Schering AG, Berlin, Germany)

3 3

$^{99m}\text{Tc}$ -DTPA ( $T_{\text{peak}}$ )

:  $^{99m}\text{Tc}$ -DTPA  $T_{\text{peak}}$  16.2 ,

39.6 , 23.7 , 46.2 .  $^{99m}\text{Tc}$ -DTPA  $T_{\text{peak}}$

(  $=0.8209, p=0.0001$ ).

$T_{\text{peak}}$  35 가 가 (

=90%, =95%).

:  $^{99m}\text{Tc}$ -DTPA  $T_{\text{peak}}$  35 .

가

가 (1-3).

$^{99m}\text{Tc}$ -DTPA

$^{99m}\text{Tc}$ -DTPA가

$^{99m}\text{Tc}$ -DTPA 가

(4-6). 가 가 ,

(10). 가

$^{99m}\text{Tc}$ -DTPA

1  
2  
3  
4

30, 17, 13, 25-69 (40),  $^{99m}\text{Tc}$ -DTPA,  $^{99m}\text{Tc}$ -DTPA 8-10 mCi (Vertex™ V60; ADAC Laboratories, Milpitas, CA, U.S.A.), 90, 3 (counts, CTS)

LogiQ 700 Expert Series (GE Medical Systems, Milwaukee, Wisconsin, U.S.A.) 2-4 MHz, 가 가, Levovist™ (SH U 508A; Schering AG, Berlin, Germany) 4.0 g 400 mg/ml

(Coded Harmonic Angio US), 3 가, (triggering method) 3, 0.7-0.8 (Mechanical Index, MI), (gain) 62-70%, (dynamic range) 66-72 dB, 가

QuantiCon (GE Medical System, Milwaukee, Wisconsin, U.S.A.) QuantiCon,  $^{99m}\text{Tc}$ -DTPA (time-intensity curve) 가

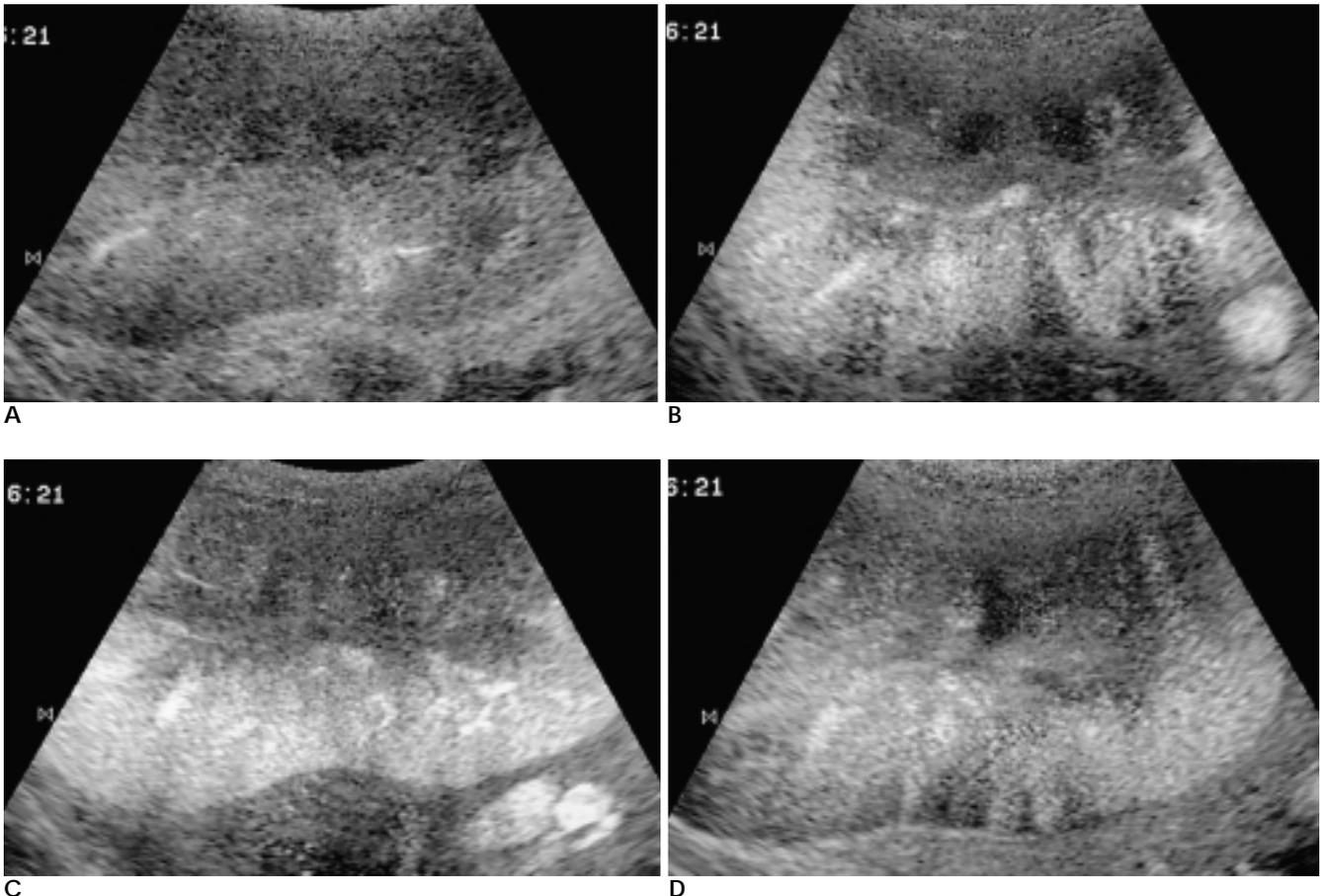


Fig. 1. Renal perfusion image using harmonic US with microbubble contrast agent in normal transplanted kidney. A. Axial US before injection of the contrast agent shows normal transplanted kidney. B-D. Serial renal perfusion image using harmonic US with microbubble contrast agent images obtained (B) 9 seconds, (C) 21 seconds, and (D) 42 seconds after injection show normal parenchymal perfusion.  $T_{peak}$  is measured as 21 seconds.

$(T_{peak})$   
 $T_{peak}$  - 가 Pearson ' 가 90% 95% 가  
 s correlation coefficient  
 $p = 0.05$  가  
 $T_{peak}$   
 ROC(receiver operating charac-  
 teristic)  $^{99m}Tc$ -DTPA  $T_{peak}$  (11)  
 가 가

35  
 가  
 (Fig. 4).  
 가  
 Schmiel (12)  
 Sehgal

$^{99m}Tc$ -DTPA 30  
 17  
 13 3 10  
 $^{99m}Tc$ -DTPA 7 5  
 $T_{peak}$   
 15 10  $T_{peak}$   
 $^{99m}Tc$ -DTPA  $T_{peak}$  12 -  
 36 ( 16.2 ), 18 - 51 ( 39.6 )  
 $T_{peak}$  12 - 37 ( 23.7 ) (Fig. 1),  
 30 - 60 ( 46.2 ) (Fig. 2)  $^{99m}Tc$ -  
 DTPA  
 $T_{peak}$  0.8209  
 ( $p=0.0001$ ) (Fig. 3).  
 , ROC  
 $T_{peak}$

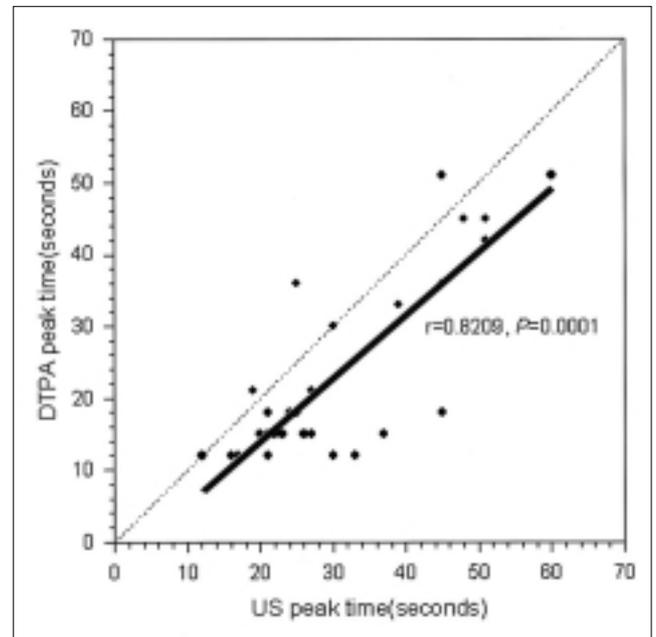


Fig. 3. The correlation curve of  $T_{peak}$  between  $^{99m}Tc$ -DTPA renal perfusion image and renal perfusion image using harmonic US with microbubble contrast agent.

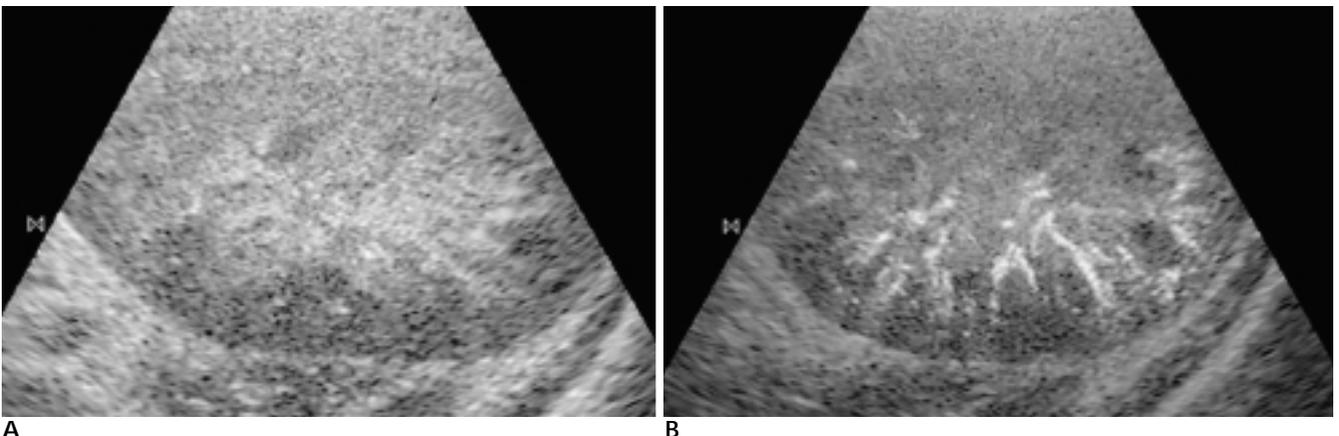


Fig. 2. Renal perfusion image using harmonic US with microbubble contrast agent in acute rejection.  
 A. Axial US before injection of the contrast agent shows normal transplanted kidney.  
 B. Renal perfusion image using harmonic US with microbubble contrast agent images obtained 48 seconds after injection shows weak parenchymal enhancement.  $T_{peak}$  is measured as 51 seconds.

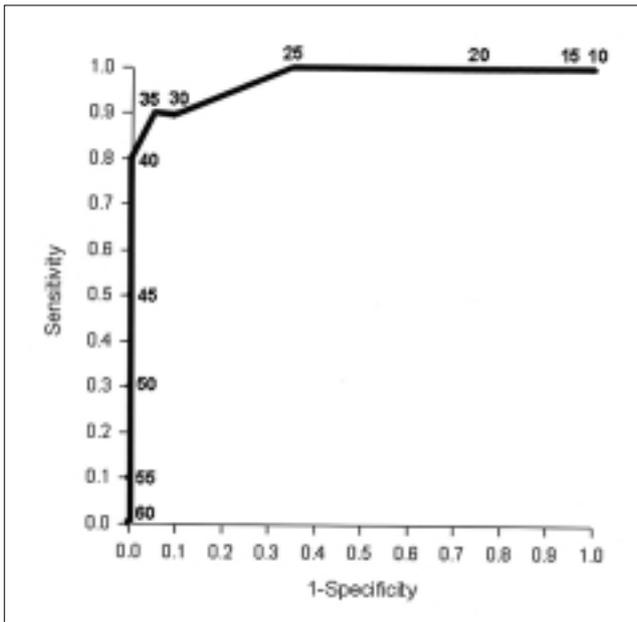


Fig. 4. ROC curve for the threshold of in renal perfusion image using harmonic US with microbubble contrast agent. The  $T_{peak}$  at 35 seconds predicts normal perfusion with 90% of sensitivity and 95% of specificity.

(9).  
 (Coded Harmonic Angio US)

Otsuki (10)

(7, 8),

(13). 75%  
 $^{99m}Tc$ -

DTPA 30,  $T_{peak}$

35 가 90% 95% 가

$T_{peak}$  12 - 37 ( 23.7 ),  
 30 - 60 ( 46.2 )  $^{99m}Tc$ - DTPA

$T_{peak}$  , 0.8209

$^{99m}Tc$ - DTPA

10 6 , 2  
 , 1

$T_{peak}$  46.2

가 가  
 가 가

(14). 3  
 $^{99m}Tc$ - DTPA

가 가  
 가 가

$^{99m}Tc$ - DTPA

가 가

$^{99m}Tc$ - DTPA

$T_{peak}$  35

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  14. , , , . <sup>99m</sup>Tc-DTPA : 가. 2003;48:181-187

## Renal Perfusion Image Using Harmonic Ultrasound with Microbubble Contrast Agent: Preliminary Study<sup>1</sup>

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**Purpose:** To compare, in terms of their feasibility and normal range, <sup>99m</sup>Tc-DTPA renal perfusion imaging and renal perfusion imaging using harmonic ultrasound (US) with a microbubble contrast agent for the evaluation of renal perfusion after renal transplantation.

**Materials and Methods:** During a six-month period, thirty patients who had received a renal transplant underwent both <sup>99m</sup>Tc-DTPA renal perfusion imaging and renal perfusion imaging using harmonic US with a microbubble contrast agent. Sonographic renal perfusion images were obtained before and after a bolus injection of the microbubble contrast agent Levovist<sup>TM</sup> (SH U 508A; Schering AG, Berlin, Germany) every 3 seconds for 3 minutes. Sonographic renal perfusion images were converted into a renal perfusion curve by a computer program and T<sub>peak</sub> of the curve thus obtained was compared with that of the <sup>99m</sup>Tc-DTPA curve.

**Results:** Average T<sub>peak</sub> of the <sup>99m</sup>Tc-DTPA renal perfusion curve was 16.2 seconds in the normal group and 39.6 seconds in the delayed perfusion group, while average T<sub>peak</sub> of the sonographic renal perfusion curve was 23.7 seconds and 46.2 seconds, respectively. T<sub>peak</sub> of the sonographic renal perfusion curve showed a good correlation with that of the <sup>99m</sup>Tc-DTPA curve (correlation coefficient= 0.8209; *p*= 0.0001). The cut-off value of T<sub>peak</sub> of the sonographic renal perfusion curve was 35 seconds (sensitivity= 90%, specificity= 95%).

**Conclusion:** In patients who have received a renal transplant, the findings of renal perfusion imaging using harmonic US with a microbubble contrast agent show close correlation with those of <sup>99m</sup>Tc-DTPA renal perfusion imaging. The optimal cut-off value of T<sub>peak</sub> of the sonographic renal perfusion curve was 35 seconds.

**Index words :** Kidney, perfusion  
Kidney, transplantation  
Kidney, US

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