

:  
 : 47 95 -  
 2 가 , 가  
 Foley , 1m  
 10%  
 (Levovist; Schering, Berlin, Germany)  
 가  
 : 95 - 87 (91.6%) 가  
 가 가  
 12 가 75 20  
 가 8  
 8 , 2  
 가 6 가  
 66.7%,  
 97.4%, 85.7%, 92.6%  
 :  
 가 , 가  
 ,  
 (vesicoureteral reflux) tography) 가  
 (1). (voiding cystourethrography) raphy) SH U 508A (Levovist, Schering, Berlin, Germany)  
 가  
 (1 - 3). (radionuclide cys -

:

가 47 95 Foley (aseptic) 1 m

가

가

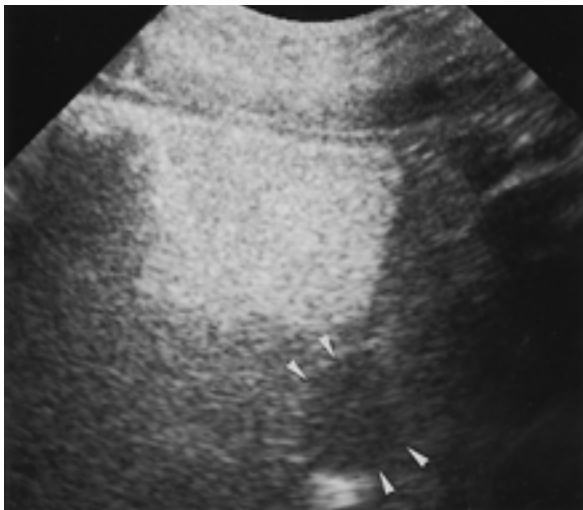
25 ( : 7 - 7 ) , 4 가 31  
(66%) , 가 31, 16

ATL HDI 3000 (Advanced Technology (Levovist) 10%  
Laboratories, Bothell, Washington) , 7 - 3 MHz 0.1% Levovist 99.9%  
12 - 5 MHz (palmitic acid)

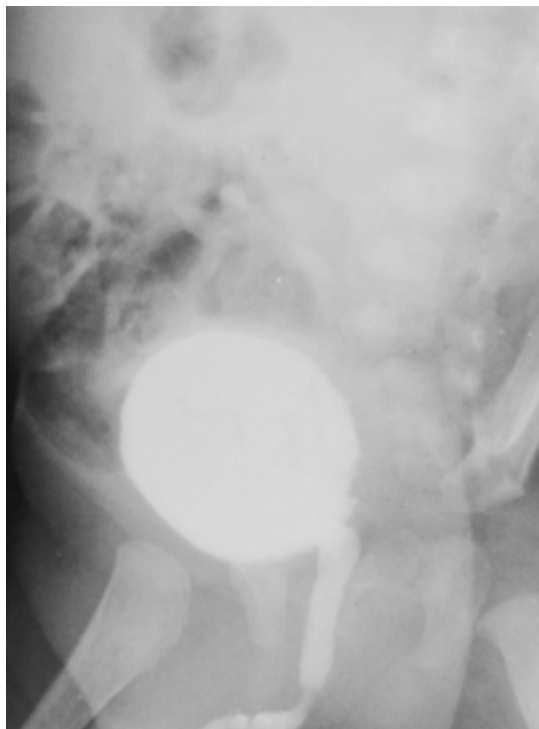
2 가 , ( , 2 - 8  $\mu$ m). Levovist 2가 99% 8  $\mu$ m  
가 , 2.5 g 4 g (vial)  
가 300 mg/ml 7 ml 11 ml  
7 - 10 2



A



B

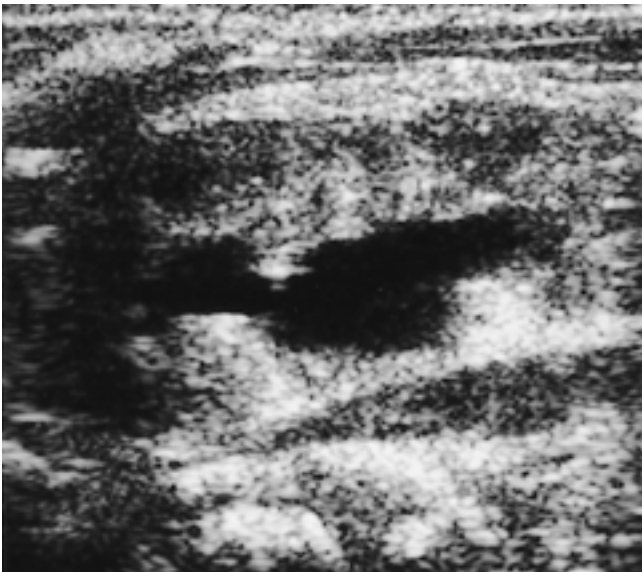


C

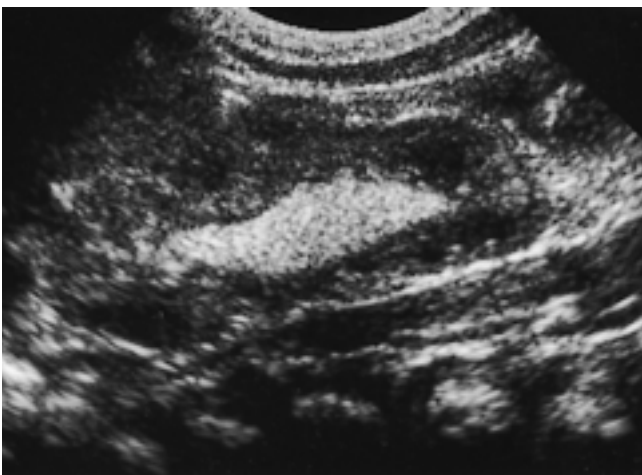
**Fig. 1.** A representative case among 75 negative concordant kidney-ureter units. Transverse sonograms of the bladder before (A) and after (B) the administration of Levovist into the bladder illustrate that the bladder changes from echofree to echogenic but the dilated left distal ureter (arrowheads) remains echofree.

**C.** Corresponding voiding cystourethrogram shows no evidence of vesicoureteral reflux.

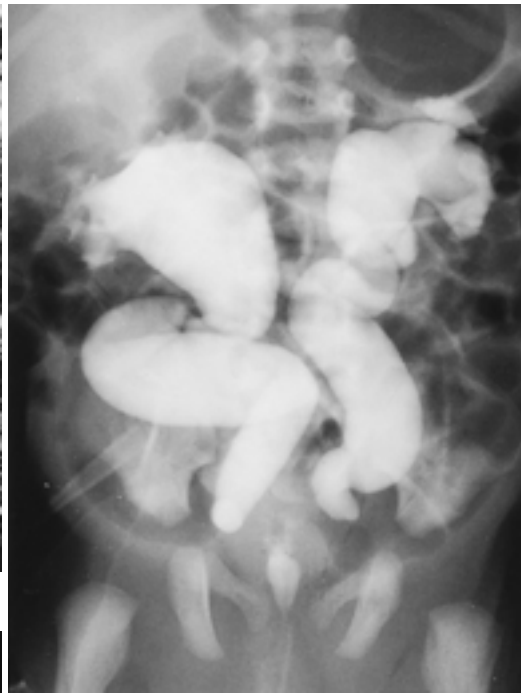
가 가 가 95  
- 75  
20 (Fig. 1) (Table 1). 20 -  
가 가 가 8  
가 가 12  
(Fig. 2) (Table 1).  
8 , 2  
가 (Fig. 3), 6  
가 (Fig. 4)  
(Table 1). 87 - (91.6%, 87/95)  
가 (Table 1).



A



B



C

**Fig. 2.** A representative case among 12 positive concordant kidney-ureter units. Longitudinal sonograms of the right kidney before (A) and after (B) the administration of the echo enhancer into the bladder illustrate reflux of microbubbles into the dilated pelvis and calyces of the right kidney.

**C.** Corresponding voiding cystourethrogram shows grade V reflux of both urinary tracts.

97.4%, 85.7%, 66.7%, 92.6%

가

가

(4) 가 . 1976 Tremewan

(4, 5).

(6 - 9).

(10 - 14).

Levovist

**Table 1.** Results of Contast-Enhanced Voiding Ultrasonography and Radiographic Voiding Cystourethrography in Detection of Vesicoureteral Reflux

Ultrasonography*	Voiding Cystourethrography		
	No Reflux	Reflux	Total
No Reflux	75	6	81
Reflux	2	12	14
Total	77	18	95

Note. - Data are the number of kidney-ureter units. With voiding cystourethrography as the reference method, contrast-enhanced voiding ultrasonography had a sensitivity of 66.7%, a specificity of 97.4%, a positive predictive value of 85.7%, and a negative predictive value of 92.6% in the detection of vesicoureteral reflux.

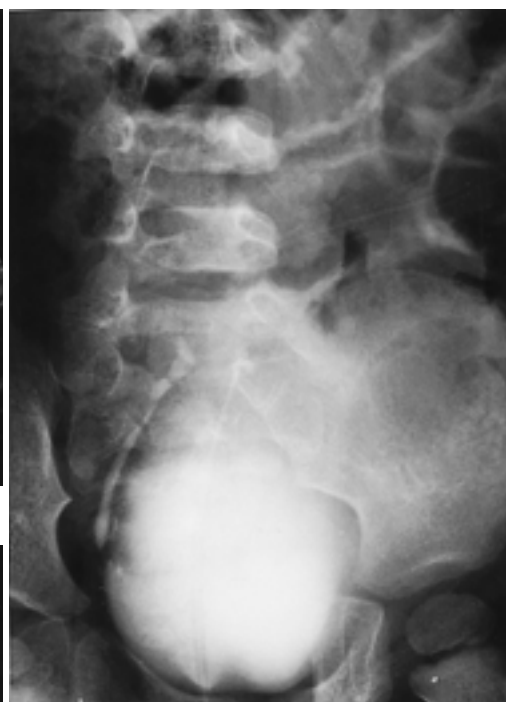
\* Ultrasonography: contrast-enhanced voiding ultrasonography.



A



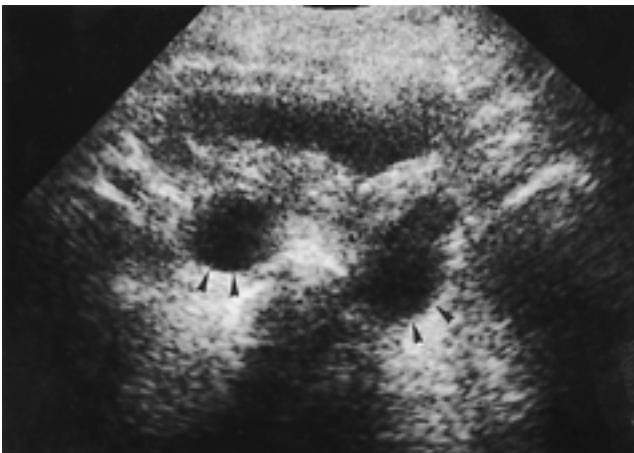
B



C

**Fig. 3.** A discordant case in which vesicoureteral reflux is detected only in contrast-enhanced voiding sonogram. Longitudinal sonograms of the left kidney before (A) and after (B) the administration of the echo enhancer into the bladder illustrate reflux of microbubbles into the dilated pelvis and calyces of the left kidney.

C. Corresponding voiding cystourethrogram shows no reflux in the left kidney-ureter unit. On the other hand, grade I reflux is observed at the right kidney-ureter unit.



A



B



C

**Fig. 4.** A discordant case in which vesicoureteral reflux is detected only in voiding cystourethrogram. Transverse sonograms of the bladder before (A) and after (B) the administration of the echo enhancer into the bladder illustrate that the bladder changes from echo-free to echogenic but the dilated both distal ureters (arrow-heads) remain echo-free.

**C.** Corresponding voiding cystourethrogram shows grade I reflux of the left kidney-ureter unit.

가 (Fig. 3).

가 91.6% (87/95)

66.7%

97.4%, 85.7%, 92.6%

Levovist (15 - 18).

92 - 92.9%

가

91.7 - 100%

97%

86 -

가 (18).

가

가 (retro - vesical)

가

가 , Levovist

(false positive)

(16).

(16, 18),

(vesicoureteral junction)

(true positive)

가가 가 . 가

가가 .

가 , 가 .

(16) 5가 .

가 , 가

가 , 가

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## Vesicoureteral Reflux in Children: Comparison of Contrast - Enhanced Voiding Ultrasonography with Radiographic Voiding Cystourethrography - Preliminary Report<sup>1</sup>

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**Purpose:** To compare the usefulness of contrast-enhanced voiding ultrasonography(US) with that of radiographic voiding cystourethrography(VCUG) for the diagnosis of vesicoureteral reflux(VUR) in children.

**Materials and Methods:** Ninety-five kidney-ureter units of 47 patients referred for investigation of VUR underwent contrast-enhanced voiding US followed by radiographic VCUG. After baseline US examination of the urinary tract, residual urine in the bladder was drained through an inserted Foley catheter and the bladder was gravity filled at a height of 1 m with normal saline. A galactose-based, microbubble-containing echo-enhancing agent (Levovist; Schering, Berlin, Germany) was then administered. The amount of this was approximately 10% of bladder capacity, and VUR was diagnosed when microbubbles appeared in the ureter or pelvocalyceal system. Using radiographic VCUG as a reference point, the accuracy with which contrast-enhanced voiding US detected VUR was calculated.

**Results:** In 87 of 95 kidney-ureter units (91.6%), the two methods showed similar results regarding the diagnosis or exclusion of VUR, which was detected by both in 12 units, but by neither in 75. VUR was shown to occur in a total of 20 units, but in eight of these by one method only. In two units, VUR detected by contrast-enhanced voiding US was not demonstrated by radiographic VCUG; in six units, the reverse was true. In the detection of VUR, contrast-enhanced voiding US showed a sensitivity of 66.7%, a specificity of 97.4%, a positive predictive value of 85.7%, and a negative predictive value of 92.6%.

**Conclusion:** Contrast-enhanced voiding US is highly specific and has high positive and negative predictive values; its sensitivity, however, is not sufficiently high. The modality appears to be a useful diagnostic tool for the detection of VUR without exposure to ionizing radiation, though to be certain of its value, more experience of its use is first required.

**Index words :** Bladder, US  
Ultrasound (US), contrast media  
Ureter, reflux  
Ureter, US  
Voiding cystourethrography

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