

# CT (Reyon Iopamidol 300 Iversion 320) 가

1,2 1,2 1,2

Reyon Iopamidol 300 Iversion 320 CT, Ultravist 300  
Optiray 320  
: 60 가 10 6 Reyon  
Iopamidol 300 Ultravist 300 IVU Iversion 320  
Optiray 320  
Reyon Iopamidol 300, Ultravist 300, Iversion 320, Optiray 320 CT  
IVU  
CT (Hounsfield unit, HU)  
가  
: IVU 가  
CT Ultravist 300  
Reyon Iopamidol 300 가  
(p=0.034) Optiray 320  
Iversion 320 (p=0.041)  
가  
: Reyon Iopamidol 300 Iversion 320 IVU, CT  
가

(1-4).

가  
가 가 tri- 가  
iodobenzen 가  
(blood brain barri-  
er) (osmotic  
hypervolemia),  
(1, 3-8).  
1972 metrizamide (Amipaque  
, Winthrop-Breon, New York, U.S.A.), 1977 iopamidol  
(Isovue , Bracco, Italy) iopromide (Ultravist , Schering  
AG, Berlin, Germany), ioversol (Optiray , Mallinckrodt  
Medical, St. Louis, U.S.A.), ioxaglate (Hexabrix , Guerbet,  
Aulnay-sous-Bois, France)가

300mOsm/kg H<sub>2</sub>O  
(1500-2200mOsm/kg H<sub>2</sub>O)  
600-700mOsm/kg H<sub>2</sub>O  
(06-99-012)  
1999 10 4 2000 1 14

CT  
 1/3 가 tridol (Xenetix , Guerbet, Aulnay-sous-Bois, France)  
 가 (3, 5, 9)  
 (3-11).  
 iopromide (Ultravist , Schering AG, Berlin, Germany), 가  
 ioversol (Optiray , Mallinckrodt Medical, St. Louis, MO), io-  
 hexol (Omni-paque , Winthrop-Breon, New York, U.S.A.), iobi- 8000 ml



A

B

Fig. 1. Intravenous urography in a normal rabbit.

A, B. Intravenous urography images obtained 5 minutes (A) and 30 minutes (B) after injection of Reyon Iopamidol 300 clearly depict renal parenchyma, calyces, ureters, and bladder.

C, D. On intravenous urography images obtained 5 minutes (C) and 30 minutes (D) after injection of Ultravist 300, both renal parenchyma, calyces, ureters, and bladder are also clearly demonstrated.



C

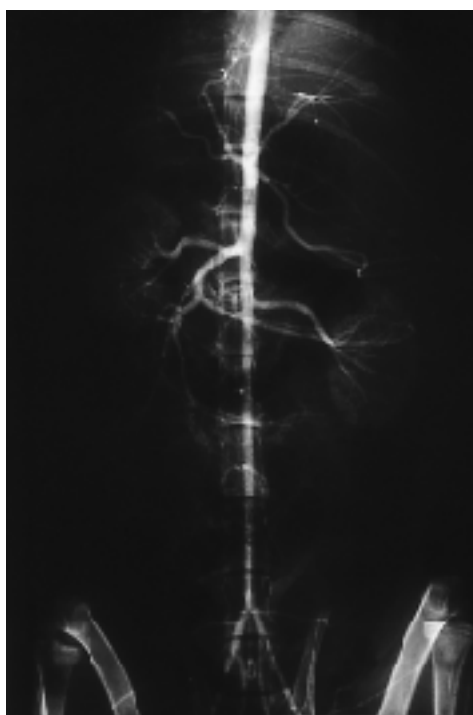


D

triiodobenzene benzene  
 hydroxyl groups  
 Iopamidol  
 L-5-(2-hydroxypropiony-  
 lamino)-2,4,6-triiodisophthalic acid bis-(2-hydroxy-1-hydrox-  
 ymethyl) diamide  
 Iversion 320 ioversol 0.678g/ml  
 trimethamine 3.6mg/ml e-  
 datate calcium disodium 0.2mg/ml pH  
 ioversol  
 807.1  
 LD50  
 32% /  
 iohexalate iopromidol 가  
 (12-14). 700 mOsm/kgH<sub>2</sub>O  
 Optiray 320  
 5.9 cps 702 mOsm/kgH<sub>2</sub>O 5.8 cps  
 가 300mgI/ml 320mgI/ml 가  
 Reyon Iopamidol 300  
 Iversion 320 가 Ultravist 300  
 Optiray 320  
 Reyon Iopamidol 300 iopamidol 0.612 g/ml  
 trimethamine 1.0 mg/ml  
 edatate calcium disodium 3.9mg/ml pH  
 (hydrochloric acid) (mol-  
 ecular weight) 777.09, 614 mOsm/ kg H<sub>2</sub>O ,  
 30% /  
 614 mOsm/kgH<sub>2</sub>O 4.9cps  
 Ultravist 300 610 mOsm/kgH<sub>2</sub>O 4.6cps  
 1.5-3 kg 가 (New Zealand white rabbit) 60  
 10 6  
 가 3 Reyon Iopamidol 300  
 Ultravist 300 IVU 1 , 가  
 7 Iversion 320 Optiray 320  
 2  
 , Reyon Iopamidol 300, Ultravist 300, Iversion 320, Optiray  
 320 CT 3, 4, 5, 6



A



B

Fig. 2. Abdominal aortography in a normal rabbit.

A, B. Abdominal aortography images using Iversion 320 (A) and Optiray 320 (B) in a same rabbit clearly demonstrate major arteries from the abdominal aorta including celiac trunk, hepatic artery, gastroduodenal artery, splenic artery, superior mesenteric artery, and both renal arteries.

CT  
가 10ml가 가  
5, 15, 30  
IVU  
300  
Reyon Iopamidol  
가 3 가  
가 ketamine hydrochloride  
(Ketalar; Yuhan Yanghang, Seoul, Korea) 10mg/kg xylazine  
hydrochloride (Rumpun; Bayer Korea, Seoul, Korea) 50mg/kg  
22-gauge  
가  
(femoral artery)  
22-G  
J  
3-F 11 12  
(Iversion 320 Optiray 320) 600  
(Reyon Iopamidol 300 Ultravist 300) 600 mgI/kg mgI/kg 15 ml

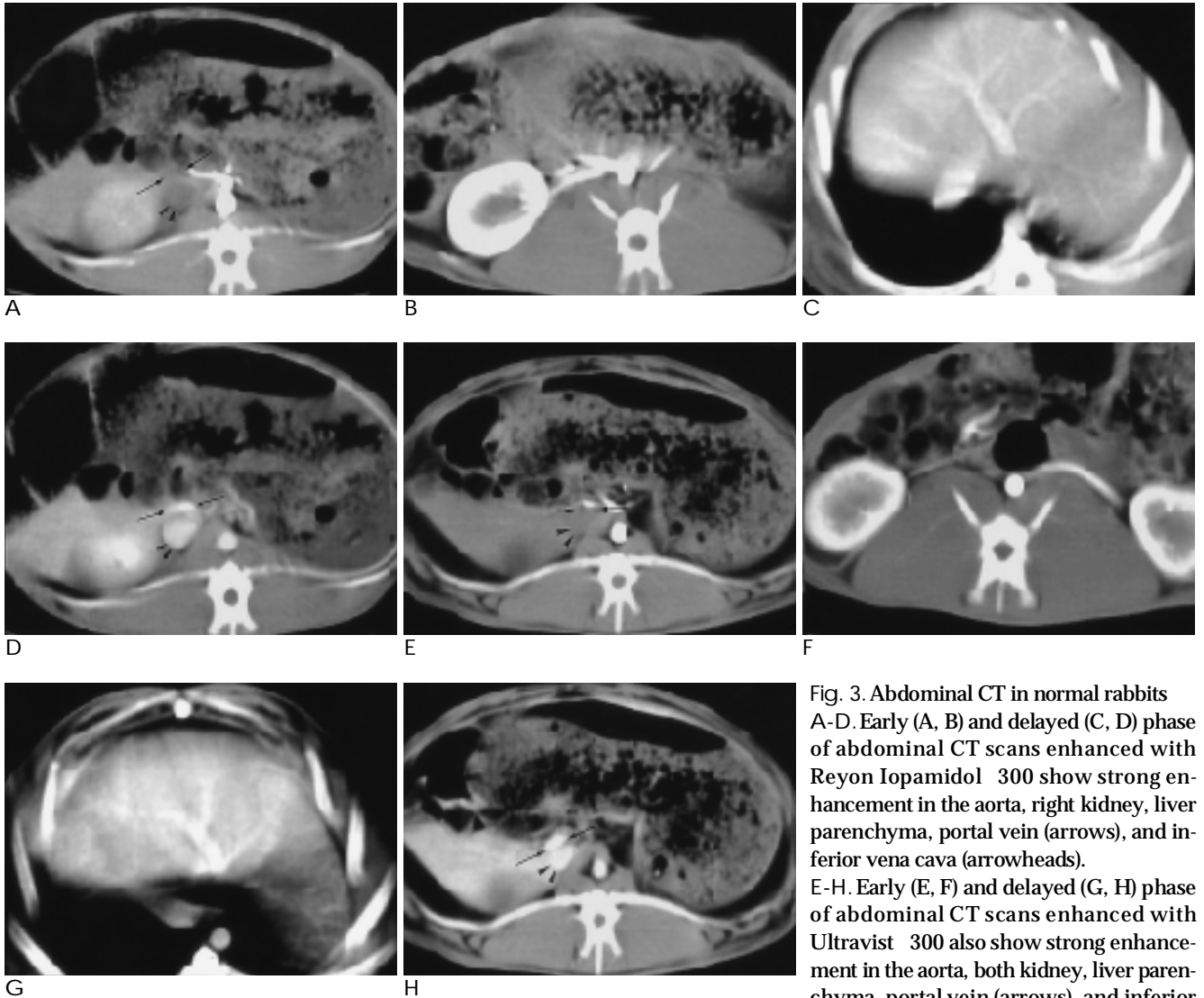


Fig. 3. Abdominal CT in normal rabbits  
A-D. Early (A, B) and delayed (C, D) phase of abdominal CT scans enhanced with Reyon Iopamidol 300 show strong enhancement in the aorta, right kidney, liver parenchyma, portal vein (arrows), and inferior vena cava (arrowheads).  
E-H. Early (E, F) and delayed (G, H) phase of abdominal CT scans enhanced with Ultravist 300 also show strong enhancement in the aorta, both kidney, liver parenchyma, portal vein (arrows), and inferior vena cava (arrowheads) similar to A-D.

4ml 10ml 5ml/sec 2 1ml 5 30  
 10-mm  
 Iversion 320  
 가 7 가 10 Optiray  
 320 가 5  
 , 15 , 30  
 CT 30  
 3 가  
 CT Highspeed system (General Electric Medical Systems, Milwaukee, WI, U.S.A.) 3 , 가 1 , 3 1  
 2  
 10-mm  
 (collimation), 1:1 (pitch), 120kV, 200 mAs 가  
 600 mgI/kg (celiac trunk), (common hepatic artery),  
 10ml 1ml/sec (right hepatic artery), (left hepatic artery),

Table 1. Qualitative Evaluation of Renal Parenchyme, Calyces, Pelvis, Ureter, and Bladder in Intravenous Urography: Comparison between Reyon Iopamidol 300 and Ultravist 300 (n= 10)

			Reyon Iopamidol *			Ultravist †			p-value‡
			3 §	2	1	3	2	1	
5 min	Right	Parenchyme	9 ¶	1	0	9	1	0	1
		Calyx	2	4	4	4	2	4	0.516
		Pelvis	5	4	1	6	3	1	0.739
		Ureter	3	6	1	4	5	1	0.564
	Left	Parenchyme	9	1	0	9	1	0	1
		Calyx	4	0	3	4	3	3	0.453
		Pelvis	7	3	0	8	2	0	0.705
		Ureter	7	3	0	6	2	2	0.317
15 min	Right	Parenchyme	9	1	0	9	1	0	1
		Calyx	1	5	4	4	2	4	0.417
		Pelvis	2	7	1	3	6	1	0.317
		Ureter	3	6	1	3	5	2	0.655
	Left	Parenchyme	9	1	0	8	1	1	0.157
		Calyx	2	1	7	4	2	4	0.129
		Pelvis	2	7	1	6	3	1	0.157
		Ureter	4	4	2	3	4	3	0.317
30 min	Right	Parenchyme	10	0	0	9	1	0	0.317
		Calyx	3	1	6	5	0	5	0.579
		Pelvis	3	7	0	3	5	2	0.45
		Ureter	3	3	4	3	5	2	0.589
	Left	Parenchyme	9	1	0	8	2	0	0.317
		Calyx	2	1	7	4	1	5	0.194
		Pelvis	5	3	2	7	2	1	0.45
		Ureter	5	3	2	4	3	3	0.603
		Bladder	10	0	0	8	2	0	0.157

IVU: intravenous urography

\*: IVU with Reyon Iopamidol 300

† : IVU with Ultravist 300

‡ : Wilcoxon signed rank test (p< 0.05, statistically significant)

§ : Qualitative evaluation of IVU- 3: good, 2: fair, 1: poor

: 5min, 15min, 30min-delayed image after contrast administration

¶ : number of rabbits

CT  
(gastroduodenal artery), (superior  
me-senteric artery), (renal artery)  
3 가  
가 가  
1 , 5  
3 ,  
1 3 2  
CT 가 가  
가 , , , CT  
가 Wilcoxon  
5 30 1-8 mm<sup>2</sup> signed rank test  
(region of interest, ROI) CT  
ROI가  
CT 가 Mann-Whitney U test

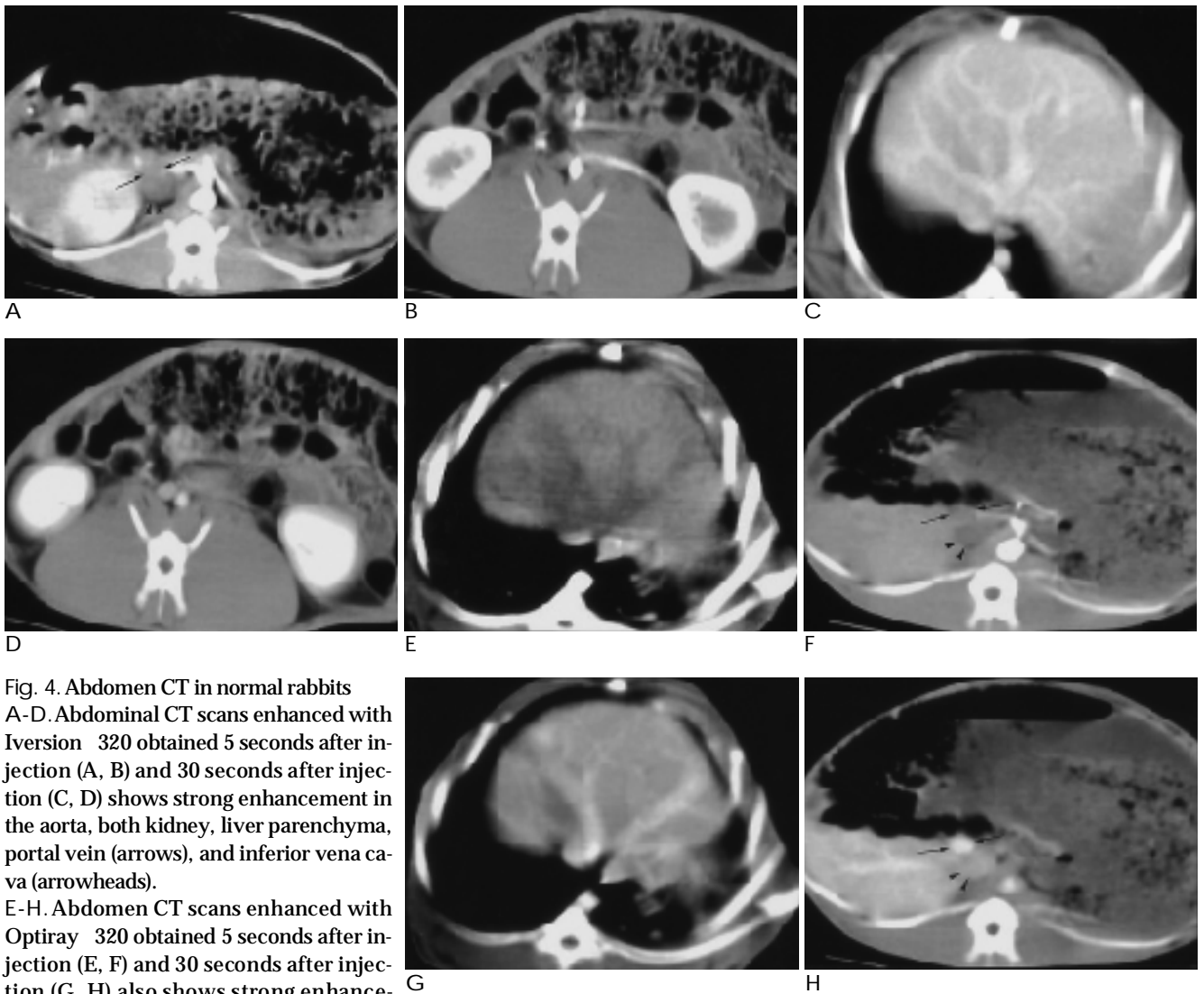


Fig. 4. Abdomen CT in normal rabbits  
A-D. Abdominal CT scans enhanced with Iversen 320 obtained 5 seconds after injection (A, B) and 30 seconds after injection (C, D) shows strong enhancement in the aorta, both kidney, liver parenchyma, portal vein (arrows), and inferior vena cava (arrowheads).  
E-H. Abdomen CT scans enhanced with Optiray 320 obtained 5 seconds after injection (E, F) and 30 seconds after injection (G, H) also shows strong enhancement in intraabdominal organs and vessels similar to A-D except aortic enhancement during the delayed phase (portal vein: arrows, inferior vena cava: arrowheads).

. P 0.05

가

가

0.05

가

Optiray 320

Iversion 320

가 3      가

1.00) (Fig. 2).

Reyon Iopamidol 300, Ultravist 300, Iversion 320, Optiray

320 가 가 10

Table 1

Reyon Iopamidol 300

Ultravist 300

C-

IVU

2

(Ultravist 300 Optiray

(Fig. 1).

320

CT

1

)

Table 2. CT Enhancement Value of Several Areas in Normal Rabbits Using Reyon Iopamidol 300 (n= 10) and Ultravist 300 (n= 9).

	Early phase*						
	Aorta	IVC	PV	Liver	RK	LK	Aortic peak†
Iopamidol	695.7 ± 186.3 <sup>‡</sup>	56.3 ± 73.7	31.1 ± 41.1	4.9 ± 6.2	247.1 ± 76.6	284.6 ± 57.6	817.3 ± 250.9
Ultravist <sup>§</sup>	591.4 ± 292.8	51.3 ± 103.5	50.5 ± 83.8	9.2 ± 11.3	174.3 ± 113.8	222.7 ± 118.3	872.9 ± 322.9
P-value	0.624	0.507	0.838	0.671	0.102	0.327	0.369
	Delayed phase**						
	Aorta	IVC	PV	Liver	RK	LK	
Iopamidol	135.1 ± 26.4	109.3 ± 17.1	154.9 ± 23.3	78.4 ± 18.9	273.1 ± 72.2	309.6 ± 90.0	
Ultravist	155.0 ± 35.9	124.4 ± 26.3	175.2 ± 47.6	88.7 ± 28.8	241.2 ± 144.9	260.9 ± 139.0	
P-value	0.086	0.06	0.034	0.142	0.221	0.221	

IVC: inferior vena cava, PV: portal vein, RK: right kidney, LK: left kidney

\*: Difference between HU of precontrast and early phase that are obtained with ROI facility in each area

† : Maximum enhancement value of abdominal aorta at early phase

‡ : Spiral CT with Reyon Iopamidol 300

§ : Spiral CT with Ultravist 300

: Mann-Whitney U test ( $p < 0.05$ , statistically significant)

<sup>†</sup>: Mean value  $\pm$  standard deviation

\*\*: Difference between HU of precontrast and delayed phase that are obtained with ROI facility in each area

Table 3. CT Enhancement Value of Several Areas in Iversion 320 (n= 10) and Optiray 320 (n= 9).

	Early phase*						
	Aorta	IVC	PV	Liver	RK	LK	Aortic peak <sup>†</sup>
Iversion <sup>‡</sup>	650.1 ± 101.5 <sup>§</sup>	17.3 ± 30.1	16.9 ± 15.7	5.0 ± 6.5	163.6 ± 83.5	203.9 ± 86.5	650.1 ± 101.5
Optiray <sup>§</sup>	730.2 ± 132.3	3.9 ± 7.5	15.6 ± 12.5	2.0 ± 3.1	145.1 ± 71.5	209.4 ± 82.8	730.2 ± 132.3
P-value	0.935	0.315	0.775	0.317	0.514	0.935	0.327
	Delayed phase**						
	Aorta	IVC	PV	Liver	RK	LK	
Iversion	114.5 ± 26.1	111.8 ± 33.4	144.7 ± 29.9	68.8 ± 24.7	201.1 ± 122.2	205.1 ± 127.1	
Optiray	137.7 ± 22.2	115.7 ± 38.8	158.8 ± 55.3	71.9 ± 16.6	179.4 ± 71.2	194.5 ± 82.4	
P-value	0.041	0.567	0.514	0.806	0.87	0.87	

IVC: inferior vena cava, PV: portal vein, RK: right kidney, LK: left kidney

\*: Difference between HU of precontrast and early phase that are obtained with ROI facility in each area

† : Maximum enhancement value of abdominal aorta at early phase

‡ : Spiral CT with Iversion 320

§ : Spiral CT with Optiray 320

: Mann-Whitney U test ( $p < 0.05$ , statistically significant)<sup>†</sup>: Mean value  $\pm$  standard deviation

\*\*: Difference between HU of precontrast and delayed phase that are obtained with ROI facility in each area

: , CT  
 . Reyon Iopamidol 300  
 Ultravist 300 Table 2 ,  
 Iversion 320 Optiray 320 Table 3  
 . Reyon Iopamidol 300 Ultravist 300  
 CT

Ultravist 300  
 (175.2 ± 47.6) Reyon Iopamidol 300  
 (154.9 ± 23.3) 가  
 (p = 0.034). Iversion 320 Optiray 320 CT

Optiray 320 (137.7 ± 22.2)  
 Iversion 320 (114.5 ± 26.1)  
 가 (p = 0.041).  
 가 3 IVU,  
 , CT 가 3  
 가

IVU Reyon Iopamidol 300 Ultra-vist  
 300 가 가  
 가  
 Iversion 320 Optiray 320  
 Reyon Iopamidol 300 Ultravist 300 CT

가 Reyon Iopamidol 300  
 , Iversion 320 Optiray 320  
 CT

가 Iversion 320  
 가  
 (15),

가  
 가  
 가

가 , , ,  
 가 가  
 가 , , , ,  
 가 가가  
 가  
 가 가  
 Reyon

Iopamidol 300 Iversion 320  
 가 가  
 Reyon Iopamidol 300 Iversion 320 IVU,  
 , CT 가  
 가

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J Korean Radiol Soc 2000;42:541-549

## Usefulness of Non-ionic, Low Osmolar Contrast Agent (Reyon Iopamidol 300 and Iversion 320) for IVU (Intravenous Urography), Angiography and CT : An Experimental Study in Normal Rabbits<sup>1</sup>

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**Purpose :** To compare the diagnostic efficacy of domestically synthesized contrast materials (Reyon Iopamidol 300 and Iversion 320) used for IVU, CT, and abdominal angiography in normal rabbits with that of previously used products (Ultravist 300 and Optiray 320).

**Materials and Methods :** A total of 60 rabbits were divided into six groups of ten. In the first group, IVU was performed using Reyon Iopamidol 300 and Ultravist 300, while in the second, abdominal angiography involved the use of Iversion 320 and Optiray 320. For three-phase spiral CT, Reyon Iopamidol 300 was used for group 3, Ultravist 300 for group 4, Iversion 320 for group 5, and Optiray 320 for group 6. The degree of contrast enhancement seen on aortography and IVU was evaluated subjectively by two radiologists who reached a consensus while unaware of the names of the contrast materials. On CT, attenuation expressed in Hounsfield Units (HU) was measured using the regions of interest (ROIs) facility in each anatomic region during the early and delayed phases. Adverse events including death occurred during the investigation.

**Results :** There were no significant differences in the degree of contrast enhancement between Reyon Iopamidol 300 and Ultravist 300, as used for IVU, and between Iversion 320 and Optiray 320, as used for angiography. With two exceptions, abdominal CT revealed no significant differences in the degree of contrast enhancement of most anatomic structure. The exceptions were greater enhancement of the portal vein with Ultravist 300 than with Reyon Iopamidol 300 during the delayed phase, and greater enhancement of the aorta with Optiray 320 than with Iversion 320 during the delayed phase. In no rabbit was adverse reaction observed.

**Conclusion :** For IVU, angiography and abdominal CT in normal rabbits, Reyon Iopamidol 300 and Iversion 320 provide contrast enhancement comparable to that provided by Ultravist 300 and Optiray 320. In order to evaluate the diagnostic efficacy of these new agents in diseased tissue and in human subjects, further studies are needed.

**Index words :** Animals

Contrast media, experimental studies

Contrast media, comparative studies

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(2)

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USA.  
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