

# 16 (16 Multidetector-row Helical CT) :

1

2 . 3

MDCT  
: 14  
MDCT  
가  
triphenyltetrazolium chloride(TTC)  
MDCT  
: 14 9  
MDCT  
MDCT  
TTC  
kappa 0.882,  
TTC 0.439  
MDCT  
MDCT  
MDCT

MR  
가 (1, 2), SPECT  
(6).  
1980  
CT (8 - 10), CT  
(Thallium)  
(<sup>201</sup>Tl - Single photon emission  
tomography; SPECT) (3 - 5), SPECT  
MR  
MDCT 16 MDCT 4 MDCT  
MR  
MR  
MR  
MR

1  
2  
3

2005 11 8

2006 4 13

MDCT

가

(11, 12), MDCT

가

16 MDCT

가

hydrochloride xylazine hydrochloride

MDCT (Sensation 16, Siemens, Erlangen, Germany)

MDCT

( R - R

R 400 ms)

가 MDCT

(collimation) 0.75 mm,

1

mm, (increment) 0.5 mm

Iohexol (300 mg I/mL, Omnipaque, Amersham, Ireland) 10

cc, 10 cc,

1, 6, 2, 10

1

3.0 - 4.7 kg 16

Ketamin hydrochloride

가

(Ketara; Yuhan Yanghang, Seoul, Korea) 35 mg/kg

, 6

Xylazine hydrochloride (Rompun; Bayer Korea, Seoul, Korea) 5 mg/kg

, 1 6

(Royal Delta - 77, Royal

Medical Co. Seoul, Korea)

Isoflurane (Forane,

Choongwae, Seoul, Korea) 2% MAC 2 L/min

MDCT 24

5 mm, 6 - 8

2%

triphenyltetrazolium chloride (TTC)

37

10 (13),

hematoxylin - eosin Masson

s trichrome

MDCT

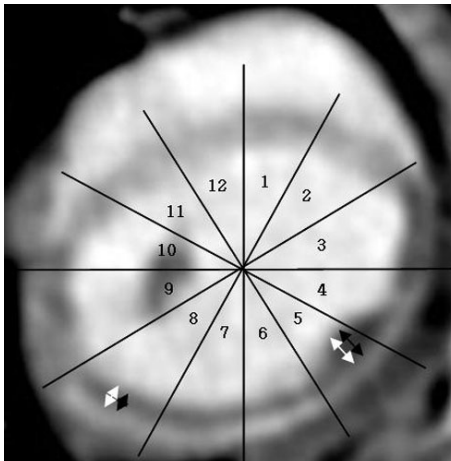
MDCT

2

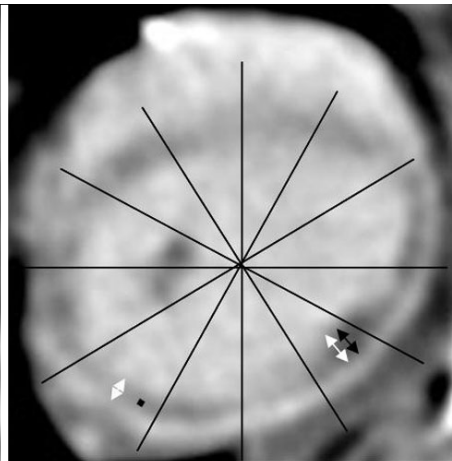
14

5 - 28

, ketamine



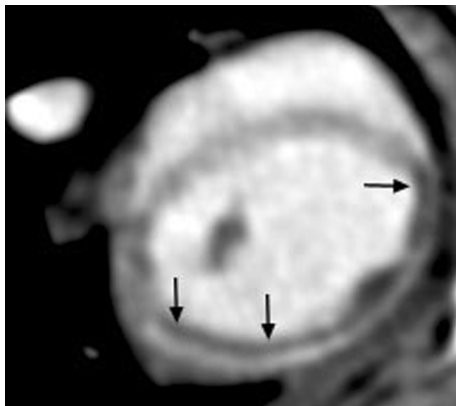
A



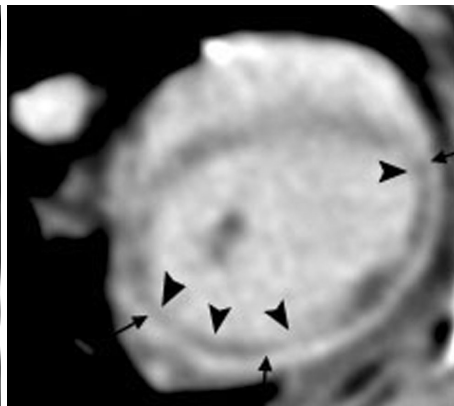
B

**Fig. 1.** Twelve equal circumferential segments were analyzed in each transverse section in each rabbit for the evaluation of transmural extent of the myocardial infarction. Scoring of myocardial infarct, which was the ratio of the low-attenuation area (black arrows in segment 5) over the wall thickness (white arrows in segment 5), was exemplified on early (A) and delay (B) phase of MDCT. The scores of segment 12 and 1 on early and late phase were 0. The score of segment 5 on early phase was 4 and that on delay phase was 4, although the low-attenuation area became smaller on delay phase. The score of segment 8 on early phase was 3 and that on late phase was 1 on late phase. Wall thickness of segment 8 on early and late phase was marked with white arrows and low-attenuation area of segment 8 on early phase was marked with a black arrow and a black square respectively.

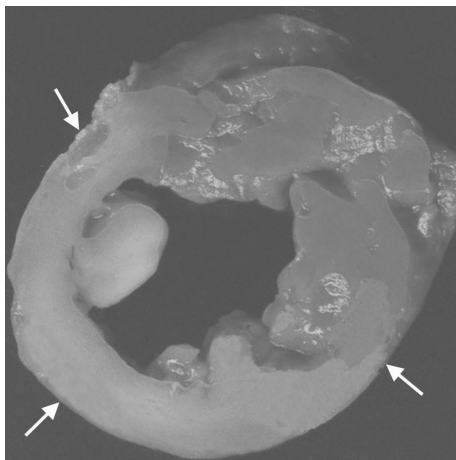
MDCT  
TTC  
MDCT  
가  
12  
6  
TTC  
Sciences, version 10.0 for Windows). Kappa 0.75  
(excellent), 0.4 - 0.75  
(fair to good),  $p$  0.05  
가  
MDCT  
TTC  
12  
0,  
1 - 25% 1, 26 - 50% 2, 51 -  
75% 3, 76 - 100% 4 5  
MDCT  
가  
MDCT  
TTC  
(Fig. 1).  
TTC  
9  
14  
5  
TTC  
9  
648 206 (31.8%)  
Kappa  
MDCT  
TTC  
(Statistical Package for the Social



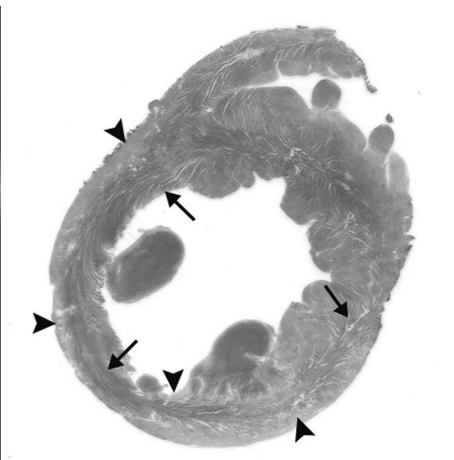
A



B



C



D

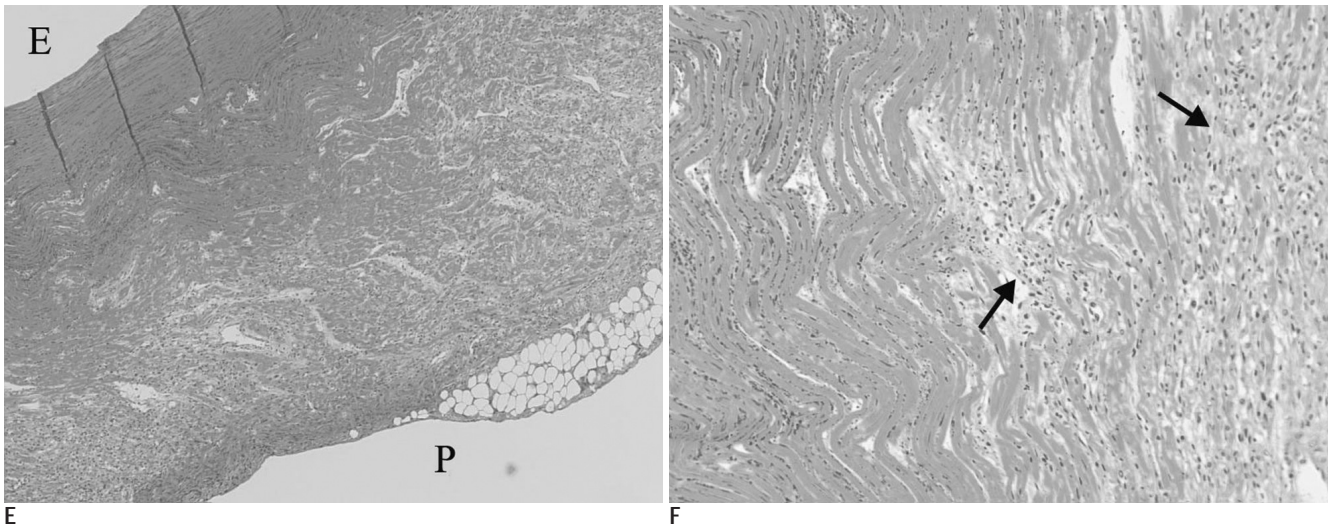
**Fig. 2.** Contrast-enhanced MDCT (A and B), TTC-stained specimen (C), Masson's trichrome-stained specimen (D), and microscopic examination (E and F) of a rabbit with acute myocardial infarction.

**A.** Early phase scan obtained 1 minute after contrast injection shows the myocardial infarction as a low-attenuation area in the left circumflex artery-dependent myocardium (arrows).

**B.** Delay phase scan (6 minutes after contrast injection) shows the myocardial infarction as a low-attenuation area with rim-like enhancement along the endocardial (arrowheads) and pericardial (arrows) sides of the myocardium.

**C.** TTC-stained myocardium at the same level with A and B shows a non-stained area in the left circumflex artery-dependent myocardium corresponding to the low-attenuation area on early phase CT (arrows).

**D.** Masson's trichrome-stained myocardium at the same level with A and B shows infarcted myocardium as dark red (arrows) and rim-like fibrosis and granulation tissue along the endocardial and pericardial sides as light blue (arrowheads) which are corresponding to a low attenuation area and rim-like enhancement each other on delay phase CT scans.



MDCT

383

648

1,033

TTC

MDCT

(hematoxylin - eosin)

TTC

가

(Fig. 2A, B).

MDCT

TTC

F). TTC

Masson's (trichrome)

(collagen)

MDCT

14

9

(Fig. 2C).

McNemar

$p = 1.000$

Masson's trichrome

collagen

MDCT

TTC

가

kappa

1.0

(Fig. 2D).

Masson's trichrome

eosin

collagen

MDCT

TTC

(Fig. 3), 1)

가, TTC

kappa

0.882

(excellent)

$p <$

TTC

0.001

가 TTC

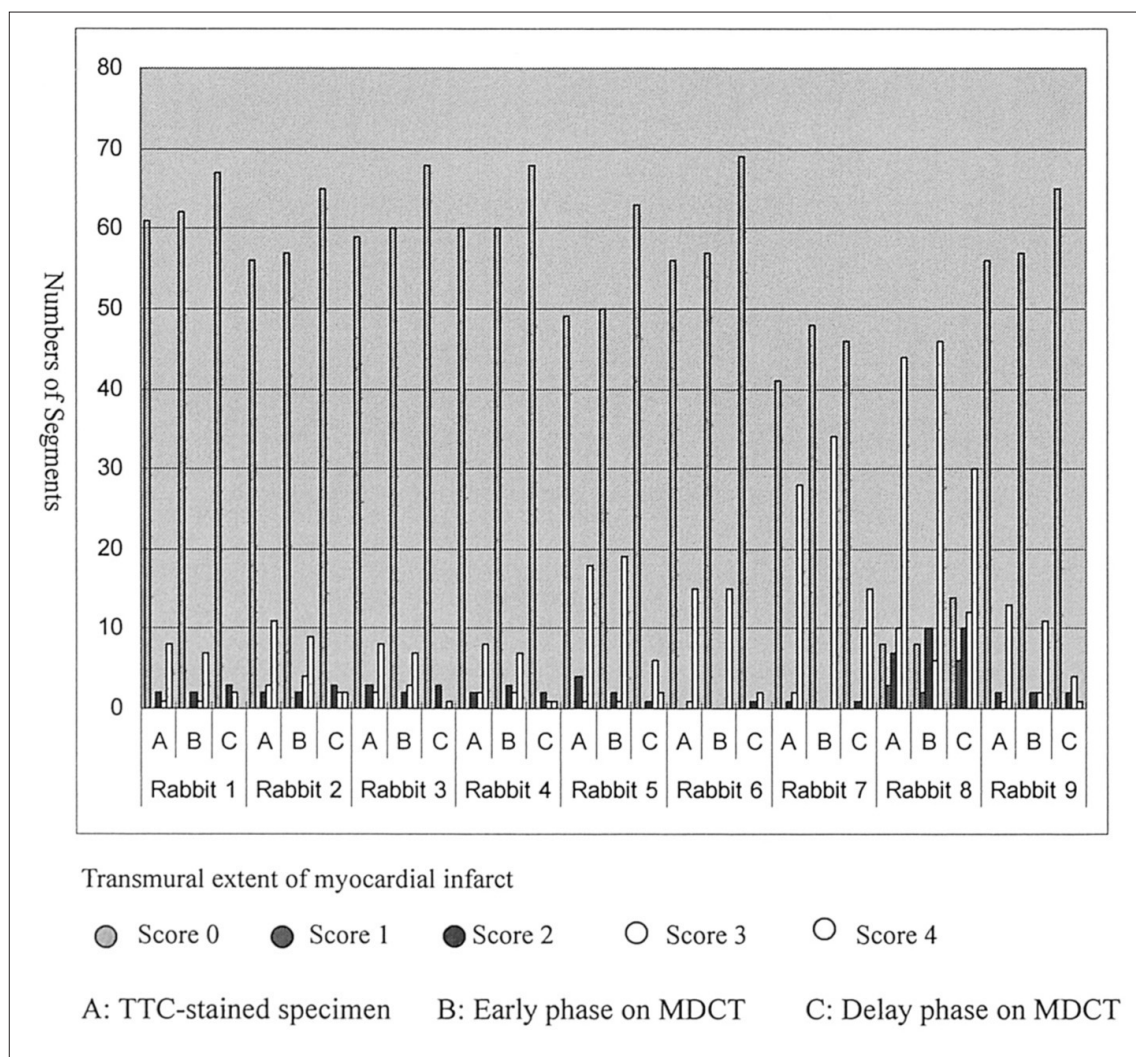
0.439

(fair to good)

$p$

0.000

MDCT



**Fig. 3.** Distribution of scores for transmurality of infarcted myocardium on TTC-stained specimen and MDCT in rabbits  
Score 0: No infarct, Score 1: infarct of 1 - 25 percent of the tissue in each segment, Score 2: infarct of 26 - 50 percent of the tissue, Score 3: infarct of 51 - 75 percent of the tissue, Score 4: infarct of 76 - 100 percent of the tissue  
TTC: triphenyltetrazolium chloride  
MDCT: 16 Multidetector-row helical computed tomography

MR 91%

98%

가

(6).

가

50%

가

90%

98%

가

가

SPECT

76%

90%

(6, 14).

SPECT

(3 - 5),

가

(6).

MR

가

가

가

Judd (15)

MR

(attenuation artifacts)

가

(6, 7).

가

(no flow)

: 16 (16 Multidetector - row Helical CT)  
 2 가 , 15 (motion artifact)  
 , 가 MR  
 , TTC  
 , TTC MDCT 가  
 12% 가 , (11, 12),  
 가 CT , 50  
 (15). , 3  
 MR MR  
 , 가  
 TTC 16 MDCT  
 MR 가 (partial  
 volume averaging effect) (2, 16). ,  
 , 가 가  
 (microvasculature) 가 ,  
 가 가 , MDCT  
 , TTC  
 MR (occlusion)  
 MR MDCT  
 (collateral 가 MR  
 vessels) 가 (2, 15 - 17). , MR  
 MR 가 TTC  
 MR  
 가가 ,  
 MR 가 가  
 MR 가  
 (18, 19). 4 - 12  
 , 가 , 24 - 72 가  
 , , 3 - 7  
 (macrophages)  
 CT 12 - 54  
 1980 , 40 - 50 ,  
 , 16  
 (8 - 10). ,  
 CT 4 20 가  
 가 , CT 가  
 , 가 MDCT 가  
 . 16  
 MDCT 가 CT 가



가 . CT  
,  
가 가  
(20, 21),  
가  
가 . MDCT  
,  
MDCT  
,  
가  
MR  
MR  
가 (Gadopentetate dimeglumine)  
가  
CT  
가 . CT  
MR  
가  
MDCT  
MR  
가 , CT  
,  
가 가  
가  
16 MDCT  
,

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## Occlusive Acute Myocardial Infarct on 16 Multidetector-row Helical CT: An Experimental Study in Rabbits<sup>1</sup>

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**Purpose:** We wanted to evaluate the findings and diagnostic accuracy of MDCT for diagnosing occlusive acute myocardial infarction in rabbits.

**Materials and Methods:** Myocardial infarction was induced in 14 rabbits. MDCT was performed in the early and delay phases at 1 minute and 6 minutes, respectively, after intravenous contrast injection. The rabbits were sacrificed after scanning. The cardiac specimens were sliced and then stained with triphenyltetrazolium chloride (TTC). The agreement in the transmural extent of infarction between the MDCT scans and the TTC-stained specimens were analyzed by using kappa values.

**Results:** Acute myocardial infarction was found in 9 of 14 rabbits on the TTC-stained specimens and MDCT. The infarcted myocardium was demonstrated as a low-attenuation area on the early phase and as a central low-attenuation area with rim-like enhancement along the endocardial and pericardial sides of the myocardial wall on the delay phase. There was excellent agreement in the scores of the transmural extent of myocardial infarction between the TTC-stained specimens and the early phase scan (kappa value = 0.882,  $p = 0.000$ ), and there was fair to good agreement between the TTC-stained specimens and the delay phase scan (kappa value = 0.439,  $p = 0.000$ ). Microscopic examination of the cardiac specimens revealed necrosis of myocardial cells in the central portion and granulation tissue along the endocardial and pericardial sides of the necrotic myocardium.

**Conclusion:** 16 slice MDCT scan was useful for the diagnosis of acute myocardial infarction. The early phase scan was more accurate than the delay phase scan for evaluating the transmural extent of myocardial infarction. Histopathologic examination suggested that the low-attenuation area on the delay phase might correspond to necrotic myocardium and the enhanced area might correspond to granulation tissue.

**Index words :** Myocardium, infarction

Heart, CT

Computed tomography (CT), helical

Heart, experimental studies

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