

가

1

.

: 가

((type A) (type B)

M, 3 : Niti - D) 가 가 가 (4 Niti - 2

가

(type A vs B)

t - test

: 2

59(type A: 23, type B: 36)

type A가 $29.09 \pm 10.82\%$, type B가 $13.80 \pm 6.94\%$ ($p < 0.0001$)

type A가 $138.38 \pm 10.84\%$, type B가

$87.58 \pm 7.36\%$ ($p = 0.0002$)

:

가

가

가

가

가 25 - 30 kg 7

(fenestrated)

가 (1 - 5).

가

1).

(type A)

(type B)가

(Fig.

가 0.006

가

가

12

2006 10 17 , 2008 3 17

mm 8 cm 가 (Niti - M, Niti - D;
(bend)
(cell) 552
pitch 3.478 mm (Fig. 2).
(type A: type B)
Niti - M 1:4, Niti - D 1:1
(Fig. 2).

12 1 - 2
20 - 30
(Atropine Sulfate Injection,
) 0.02 mg/kg
Ketamin hydrochloride (50 , , ,
) 5 mg/kg Xylazine hydrochloride(
) 1 mg/kg
Tiletamine Zolazepam (50,
) 0.15 mL/kg
Cefazoline(
) 1 g 가
7 - 8 mm Macintosh

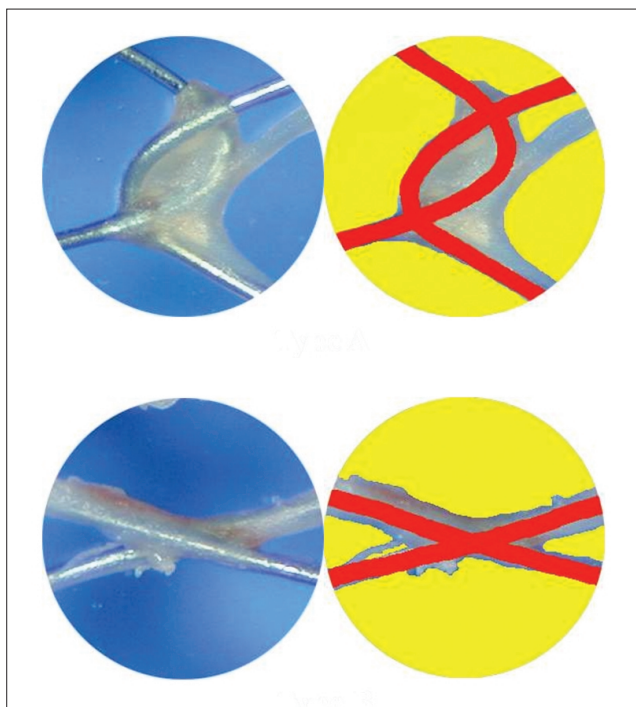


Fig. 1. Magnification views of neointimal hyperplasia in the region of wire intersection. Type A (interlacing wire type) showed more neointimal hyperplasia than type B (crossing wire type). Yellow color means area of patent cell; Red color means area of stent-wire.

가
16 - 18 cm
1:1 1:2 가 enflurane(
250 mL, ,) 1.5 - 2.0%
L/min 1 250 - 300 mL

가 ()
18G , 8 - 8.5 F sheath(Cook,
Bloomington, U.S.A.) . Sheath
2000 IU (Heparin , ,)
. Sheath 7 F catheter
T12 - L2 (Ultravist 370;
Schering, Germany) 2:1 ,
20 mL 2
12
mm, 가 8 cm Niti - M(Niti - D)
가 ()

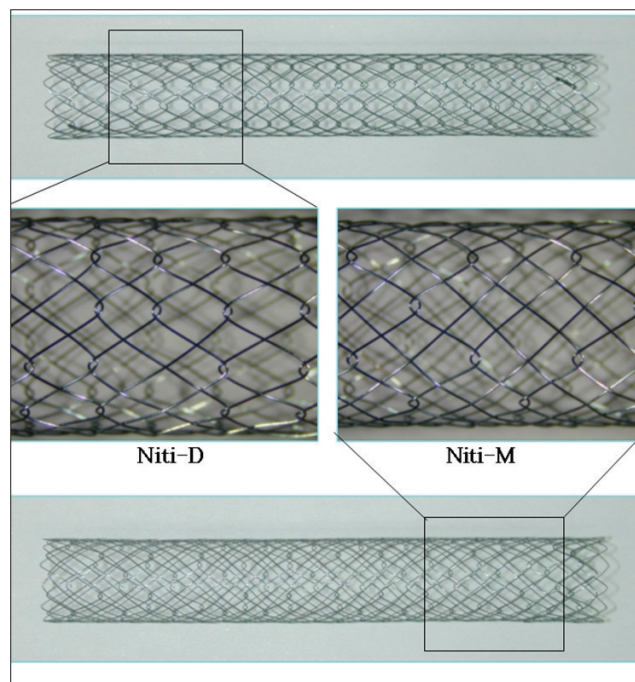


Fig. 2. Two different kinds [Niti-D and Niti-M (Taewoong Medical, Seoul, Korea)] of self-expanding nitinol stents used in this experiment. Both Niti-D and Niti-M have the same nominal specification: 0.006-inch wire, 12 mm in diameter and 8 cm in length, 12 in number of bend, 3.478 mm in pith, 552 in cell number. However, the ratio of type A (interlacing wire type) and B (crossing wire type) wire intersection in Niti-D and Niti-M stent was 1:1 and 1:4, respectively.

10 mL, 25 mL

(Fig. 3A).

sheath

7/0 Prolene

1 1 g

arterial sheath

1,000 mL

10,000 IU 1 mg Epinephrine Injection(

300

4 Niti - M 3 mmHg 3,000 - 4,000 mL

Niti - D 7

가 2 cm , 10

2

3 - 4 cm

sheath (Nikon, Tokyo, Japan)

(Fig. 3B). 3

가 (postmortem aortic contraction) 10% 300 mmHg 1 가

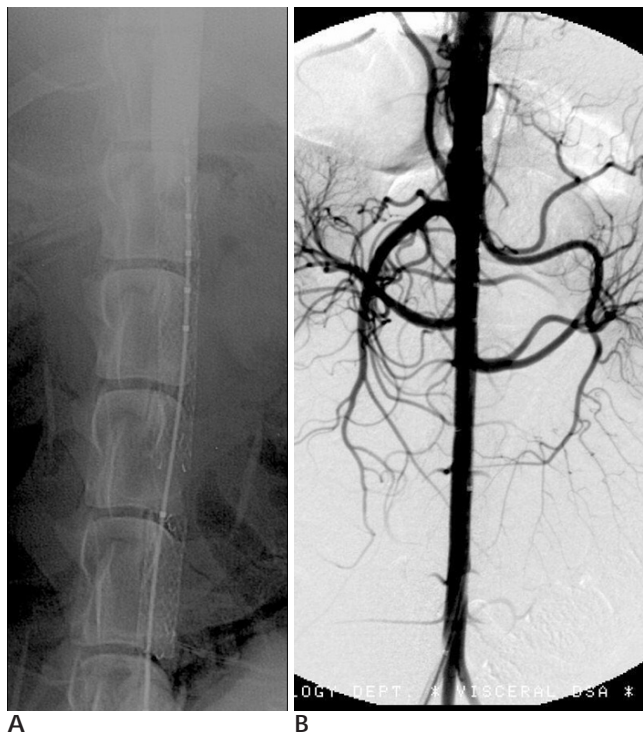


Fig. 3. The stent deployment and follow-up angiography in a dog.

A. The stent was deployed from the supraceliac aorta to the infrarenal aorta to cover the origin of celiac artery, superior mesenteric artery and both renal arteries.

B. Anteroposterior aortogram obtained 2 months after stent deployment before sacrifice of the experimental animal shows widely patent branch vessels.

가

(Olympus, Tokyo, Japan)

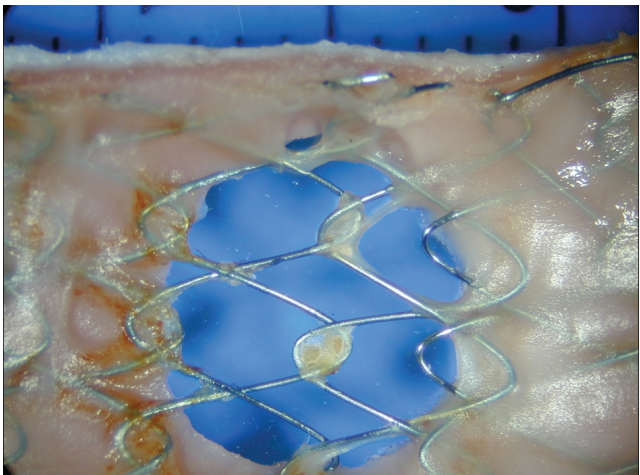


Fig. 4. Close-up view of the inner surface of individual branch ostia using stereoscopic microscopy.

: 가
 (Fig. 4).
 type A B
 Adobe photoshop software
 v.6.0 (6 , 7 , 9 .
 2.41 mm)
 (area %) type A가 23 , type B가 36
 (area %) (Fig. 5).
 59 (Table 1).
 Adobe photoshop software
 Table 2 (area %)
 type A가 29.09 ± 10.82%, type B가 13.80 ± 6.94%
 (p < 0.0001).
 (area %)
 type A가 138.38 ± 10.84%, type B가 87.58 ± 7.36%
 (p = 0.0002).
 Area ratio of intimal hyperplasia(%)= (Area of drawn
 circle - Area of patent cell - Area of stent wire) / Area
 of drawn circle×100
 type A type B
 가 (type)
 (intimal hyperplasia) 가
 t - test p p 0.05
 , SPSS software
 package (version 10.0; SPSS, Chicago, IL) .
 (suprarenal fixation)

Table 1. Distribution of Wire Intersection Types in 7 Dogs

	Type A	Type B
Celiac trunk (n = 6)		
Niti-M	5	7
Niti-D	2	3
SMA (n = 7)		
Niti-M	4	1
Niti-D	5	7
Renal artery (n = 9)		
Niti-M	2	5
Niti-D	8	1
Total	23	36

SMA: superior mesenteric artery

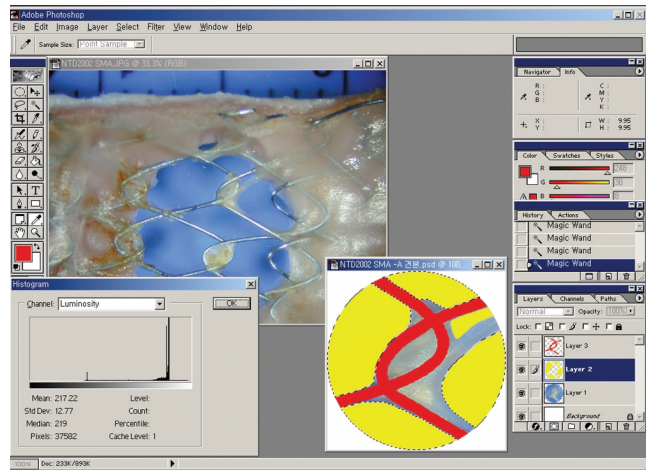


Fig. 5. The method to measure the area percentage of neointimal hyperplasia. Using Adobe Photoshop software, it is possible to calculate the pixel count of the entire circle, the area of neointimal hyperplasia, and the area of stent-wire.

Table 2. Area Ratios of Intimal Hyperplasia Per the Circle Area (2.41 mm in Diameter) as a Basic Unit for Measurement with Central Position of Wire Intersection, and the Area of Stent-Wire

	Intimal hyperplasia vs area of drawn circle (mean ± SD)	Intimal hyperplasia vs stent-wire area (mean ± SD)
Type A (n = 23)	29.09 ± 10.82%	138.38 ± 10.84%
Type B (n = 36)	13.8 ± 6.94%	87.58 ± 7.36%
p-value	< 0.0001	0.0002

Note - The area of drawn circle of 2.41 mm diameter was located at the wire intersection portion.

- (1). 가 가
- (5). (9) 24
(Wallstent, Palmaz stent, Memotherm stent)
6 - 15 , (Strut)
(organized collagen matrix) 가
matrix (: Wallstent)
Memotherm 13
12 , Palmaz 9 1 (; acellular matrix)가
6 .
- (2) 가
가 가
(4) 가
Fishman (2) 153 167
57 가 66
6
- Pan (3)
62 8 ± 5 7% , strut
12% . Duda 가
- (1) 14
7 가 가 3 - 14 mm
가 가
가 (proximal) bare 가
10.1 가
가 가
가 가
가 가
- Whitbread (6) 6 , 12 mm
14 mm Wallstent 6 가
가 가 type A type B 가
- Desgrange (7) Strecker 11 2
1 가 18
1 , 6 , 11 가 가
strut 43 가
± 30% (, 0 - 84%)
strut
(type B) (type A)
- Desgrange (8) 8
fenestrated Palmaz stent 5
가
38 ± 5% , creatinine
가
1 - 2

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The Influence of Stent Design on Neointimal Hyperplasia of an Aortic Stent Covering the Visceral Arterial Ostia: An Experimental Study in Dogs Using a Self-expandable Nitinol Stent¹

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Purpose: To assess the influence of stent design [interlacing (type A) vs. crossing method (type B)] on neointimal hyperplasia using a self-expandable nitinol stent, which crosses the side branches of the abdominal aorta.

Materials and Methods: In seven mongrel dogs, nitinol stents with type A and B intersections were placed in the abdominal aorta across the main branches: 4 Niti-Ms and 3 Niti-Ds. Two months after the stent placement, a DSA was performed for a stent patency evaluation, followed by the extraction of the aortas. The degree of neointimal formation along the wire was evaluated by calculating the area ratio of intimal hyperplasia (type A vs. B). A Student's t-test was employed to investigate the differences in the neointimal hyperplasia between blood types A and B.

Results: The total number of wire intersections overlain at the ostia branch ostia was 23 for type A and 36 for type B. The area ratio of the neointimal hyperplasia, for a given area, was $29.09 \pm 10.82\%$ (type A) and $13.80 \pm 6.94\%$ (type B) ($p < 0.0001$). Furthermore, the area ratios of the neointimal hyperplasia per area of stent-wire in the given area were $138.38 \pm 10.84\%$ (type A), $87.58 \pm 7.36\%$ (type B) ($p = 0.0002$).

Conclusion: In conclusion the interlacing pattern vs. the crossing pattern showed a higher level of neointimal formation than the crossing pattern.

Index words : Animals

Aorta, abdominal

Stents

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