



: ,
 : 가 68
 가 48 , 가 11 ,
 가 9 .
 . Kaplan - Meier method , (Fontaine
 stage), ,
 Cox - proportional hazard model . 1 73 (23.8) .
 : 68 16 (23.5%) . 1 95.4%, 6
 93.2%, 1 80.1%, 2 73.2%, 3 68.9% , 5 62% .
 3 (p=0.04), , , ,
 6.5
 (p=0.02).

: 가
 :
 angioplasty, PTA (percutaneous transluminal . 1997
 Bosch (10) 1
 (1). 60 - 96%, 4 41 - 87%
 가
 (2 - 5). 1969 Dotter (6)
 가
 , PTA 가
 (2, 7 - 15). 가
 PTA
 PTA
 (8, 16).

1
 2

1994 8 2002 6
가 68
66 , 2
64.3 (46 - 82)
Fontaine
(Fontaine stage II) 48 , (stage III) 11 , 27 , 30
(stage IV) 9 (Table 1). 1
5 25
46 (67.6%) 가 , 38
(55.9%), 24 (14 , 7 ,
3 , 35.3%), 23 (33.8%), 7
(10.3%)
Multistar T.O.P. (Siemens,
Erlangen, Germany) DSA . 43
, 24
1
(Radifocus, Terumo, Tokyo, Japan) 43
, 25
3,000 - 5,000 IU
40,000 U
1) 30%
2) 가 3)
, 1 73 23.8 3
, 6 , 1 , 2 , 3 , 5 Fontaine stage
(325 mg/) , Ticlid (500
mg, bid) 3
1)
30% 2)
PSVR (peak systolic velocity

ratio) 2.5

68 Kaplan - Meier
(Fontaine stage), 2) , 3) 1)
, Cox -
proportional hazard model
28 (41.2%), 22
(32.3%), 가 11
(26.5%) . Society of Cardiovascular and
Interventional Radiology (SCVIR) (17)
category I 9 (13.2%), category II 8 (11.8%), catego -
ry III 24 (35.3%), category IV 27 (39.7%) (Table
2). 7.3 cm . 60
, 8
68 86 103
Wallstent (Boston Scientific
Corp. Watertown, Mass., U. S. A.) 85 , Hanaro stent
(M.I.Tech, Seoul, Korea) 16 , Memotherm (Angiomed,
Kairlsruhe, Germany) 2
2 (66/68, 97.1%)

Table 1. Clinical Stages According to Fontaine Classification

Symptoms	Fontaine stage	No. of patients(%)
Intermittent claudication (able to walk a distance > 200 m)	Stage IIa	27 (39.7%)
(able to walk a distance < 200 m)	Stage IIb	21 (30.9%)
Resting pain	Stage III	11 (16.2%)
Gangrene	Stage IV	9 (13.2%)

Table 2. SCVIR Lesion Classification

Category	Definition
I	Stenoses < 3 cm long that are concentric and noncalcified
II	Stenoses 3 - 5 cm long, or eccentric or calcified stenosis < 3 cm long
III	Stenoses 5 - 10 cm long or chronic occlusions < 5 cm long
IV	Stenoses greater than 10 cm long, or chronic occlusions greater than 5 cm long, extensive bilateral aortoiliac atherosclerotic disease, stenosis in patients with abdominal aortic aneurysm or other lesions requiring aortic or iliac surgery

SCVIR : Society of Cardiovascular and Interventional Radiology (Reference 17)

68 16 (23.5%) 6.5
 Kaplan - Meier 1 (p < 0.01).
 95.4%, 6 93.2%, 1 80.1%, 2 73.2%, 3 68.9%
 , 5 62.0% (Fig. 1, Table 3). (Table 4).
 16 Cox - proportional hazard model

(Fontaine stage)

PTA
 3
 (p < 0.04).
 (elastic recoil)
 (7, 9). Bosch (18)
 PTA

Table 3. Primary Cumulative Patency Rate for 68 Patients

Follow-up Period	Patency Rate \pm SE
1 month	95.4 \pm 0.26
6 months	93.2 \pm 0.33
1 year	80.1 \pm 0.59
2 years	73.2 \pm 0.75
3 years	68.9 \pm 0.82
5 years	62.0 \pm 0.98

SE : Standard error

PTA 가
 (2, 7, 8, 16). Ring (5) 10
 PTA 2
 PTA

Table 4. Factors Related to Recurrence in Recurred 16 patients

Factors Related to Recurrence			No. of Patients		Cox-proportional hazard model	
			Total (n = 68)	Recurred (n = 16)		
Fontaine stage	Claudication	Stage IIa	27	4	p = 0.38	not significant
		Stage IIb	21	7		
	Resting pain	Stage III	11	3		
	Gangrene	Stage IV	9	2		
Risk factors	Heart diseases	CHD	14	5	p < 0.05	higher 3.2 times
		Arrhythmia	7	3		
		VHD	3	1		
		Total	24	9		
	Smoking		46	12	p = 0.42	not significant
	Hypertension		38	6		
	DM		23	5		
	CVD		7	0		
Anatomical factors	Location	CIA	28	3	p < 0.01	EIA > CIA higher 6.5 times
		EIA	22	7		
		Both	18	6		
	Length *(SCVIR)	I	9	3	p = 0.83	not significant
		II	8	3		
		III	24	4		
		IV	27	6		
	Collaterals	Good	60	14	p = 0.81	
		Poor	8	2		

CHD : Coronary heart disease

VHD : Valvular heart disease

CIA : Common iliac artery

EIA : External iliac artery

* SCVIR lesion classification

(remodeling)가

1987 Sigwart (15) (2, 7, 8, 16).

Rubinstein (20) 25
 , Vorwerk (16) 103
 1 87% 3 81%, 5 54%

. 1997 Bosch (10)
 1 60 - 96%, 4

Long (13) 1 85.3%, 2 66.2%, 41 - 87%
 3 44.1% , Henry (3) 1 94%, 2 91% 110
 3 86% 4 86% , Sapoval (19) 211 10
 1 73%, 2 51.4% 66%, 10 46%
 38

. 2002 Schurmann (21)
 1 92%, 3 76%, 5
 2001 (22)
 1

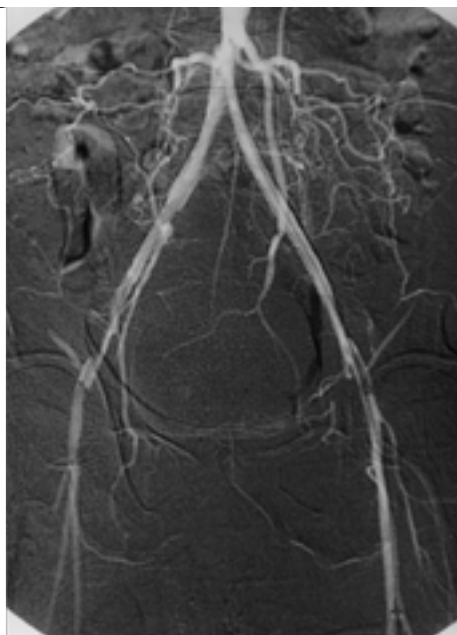
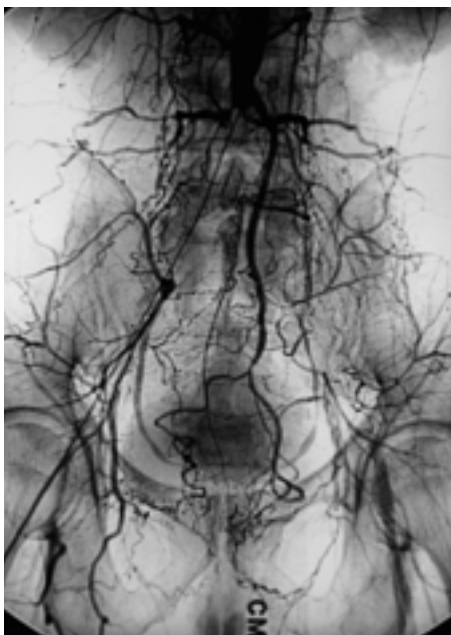


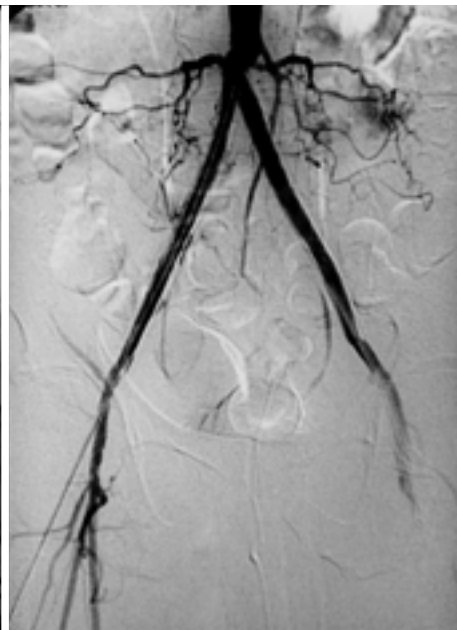
Fig. 1. 64-year-old man with both leg claudication (Fontaine stage IIb), had coronary heart disease and diabetes.

A. Angiogram depicts bilateral complete occlusion of common iliac arteries with rich collaterals.

B. Immediate angiogram obtained after two primary stent implantation via both femoral arteries reveals complete patency of previous occluded segments and opacification of both femoral arteries.

C. Follow-up angiogram demonstrates reocclusion in right common iliac artery stent.

D. After infusion of 150,000 U urokinase, patency is restored in right common iliac artery stent.



90.7%, 2 86.6%, 4 86.6%

가 (scissoring effect) (27)

가 가

(2, 12).

가

Duprat (23)

120%

, Gunther (2)

가

Long (24)

. Bosch (15)

Henry

(3)

가

가

. Strecker

(8)

(,),

(4 cm),

4

(,)

가

가

가 4 cm

(6.5)

. Strecker (8)

5 cm (n=51/68) 가

Strecker (8)

4 cm (n=199/289)가

3.2

가 ,

. Lugmayr

(25)

(2, 7, 9, 16, 21, 26),

1. Zeitler E, Richter EI, Roth FJ, Schoop W. Results of percutaneous transluminal angioplasty. *Radiology* 1983;146:57-60
2. Gunther RW, Vorwerk D, Bohndorf K, Peters I, el-Din A, Messmer B. Iliac and femoral artery stenoses and occlusions: treatment with intravascular stents. *Radiology* 1989;172:725-730
3. Henry M, Amor M, Ethevenot G, et al. Palmaz stent placement in iliac and femoropopliteal arteries: primary and secondary patency in 310 patients with 2-4 years follow-up. *Radiology* 1995;197:167-174
4. Johnston KW, Rae M, Hogg-Johnston SA. Five-year results of a prospective study of percutaneous transluminal angioplasty. *Ann Surg* 1987;206:403-413
5. Ring EJ, Freiman DB, McLean GK, Schwarz W. Percutaneous recanalization of common iliac artery occlusions: an unacceptable complication rate? *AJR Am J Roentgenol* 1982;139:587-589
6. Dotter CT. Transluminally placed coilspring endarterial tube grafts. Long-term patency in canine popliteal artery. *Invest Radiol* 1969;4:329-332
7. Palmaz JC, Richter GM, Noeldge G, et al. Intraluminal stents in atherosclerotic iliac artery stenosis: preliminary report of a multicenter study. *Radiology* 1988;168:727-731
8. Strecker EP, Boos IB, Hagen B. Flexible tantalum stents for the treatment of iliac artery lesions: long-term patency, complications, and risk factors. *Radiology* 1996;199:641-647
9. Gunther RW, Vorwerk D, Antonucci F, et al. Iliac artery stenosis or obstruction after unsuccessful balloon angioplasty: treatment with a self-expandable stent. *AJR Am J Roentgenol* 1991;156:389-392
10. Bosch JL, Hunink MG. Meta-analysis of the results of percutaneous transluminal angioplasty and stent placement for aortoiliac occlusive disease. *Radiology* 1997;204:87-96
11. Hausegger KA, Lammer J, Hagen B, et al. Iliac artery stenting: clinical experience with the Palmaz stent, Wallstent, and Strecker stent. *Acta Radiol* 1992;33:292-296
12. Kichikawa K, Uchida H, Yoshioka T, et al. Iliac artery stenosis and occlusion: preliminary results of treatment with Gianturco expandable metallic stents. *Radiology* 1990;177:799-802
13. Long AL, Page PE, Raynaud AC, et al. Percutaneous iliac artery stent: angiographic long-term follow-up. *Radiology* 1991;180:771-778
14. Martin EC, Katzen BT, Benenati JF, et al. Multicenter trial of the

- Wallstent in the iliac and femoral arteries. *J Vasc Interv Radiol* 1995;6:843-849
15. Sigwart U, Puel J, Mirkovitch V, Joffre F, Kappenberg L. Intravascular stents to prevent occlusion and restenosis after transluminal angioplasty. *N Engl J Med* 1987;316:701-706
 16. Vorwerk D, Guenther RW, Schurmann K, Wendt G, Peters I. Primary stent placement for chronic iliac artery occlusion: follow-up results in 103 patients. *Radiology* 1995;194:745-749
 17. Guidelines for percutaneous transluminal angioplasty. Standards of Practice Committee of the Society of Cardiovascular and Interventional Radiology. *Radiology* 1990;177:619-626
 18. Bosch JL, Tetteroo E, Mali WP, Hunink MG. Iliac arterial occlusive disease: cost-effectiveness analysis of stent placement versus percutaneous transluminal angiography. Dutch Iliac Stent Trial Study Group. *Radiology* 1998;208: 641-648
 19. Sapoval MR, Long AL, Pagny JY, et al. Outcome of percutaneous intervention in iliac artery stents. *Radiology* 1996;198:481-486
 20. Rubinstein ZJ, Morag B, Peer A, Bass A, Schneiderman J. Percutaneous transluminal recanalization of common iliac artery occlusions. *Cardiovasc Intervent Radiol* 1987;10:16-20
 21. Schurmann K, Mahnken A, Meyer J, et al. Long-term results 10 years after iliac arterial stent placement. *Radiology* 2002;224:731-738
 22. Sohn MJ, Sung K-B, Shin BS, et al. Percutaneous intravascular metallic stent placement in chronic iliac artery stenoses. *J Korean Radiol Soc* 2001;45:255-261
 23. Duprat G Jr, Wright KC, Charnsangavej C, Wallace S, Gianturco C. Self-expanding metallic stents for small vessels: an experimental evaluation. *Radiology* 1987;162:469-472
 24. Long AL, Sapoval MR, Beyssen BM, et al. Strecker stent implantation in iliac arteries: patency and predictive factors for long-term success. *Radiology* 1995;194:739-744
 25. Lugmayr HF, Holzer H, Kastner M, Riedelsberger H, Auterith A. Treatment of complex arteriosclerosis lesions with Nitinol stents in the superficial femoral and popliteal arteries: a midterm follow-up. *Radiology* 2002;222:37-43
 26. Lammer J, Dake MD, Bleyn J, et al. Peripheral arterial obstruction: prospective study of treatment with a transluminally placed self-expanding stent-graft. *Radiology* 2000;217:95-104
 27. Vitek JJ, Roubin GS, Al-Mubarek N, New G, Iyer SS. Carotid artery stenting: technical considerations *AJNR Am J Neuroradiol* 2000;21:1736-1743

Metallic Stent Implantation in Patients with Iliac Artery Occlusion: Long-term Patency Rate and Factors Related to Recurrence¹

Seok Kyun Chung, M.D., Jae Kyu Kim, M.D., Woong Yoon, M.D., Jeong Kim, M.D.,
Jin Gyoong Park, M.D., Heoung Keun Kang, M.D., Soo Jin-Na Choi, M.D.

¹Department of Diagnostic Radiology, Chonnam National University Hospital, School of Medicine

²Department of Surgery, Chonnam National University Hospital, School of Medicine

Purpose: To determine the long-term patency rate in 68 patients with iliac artery occlusion who underwent metallic stent implantation, and to analyze the factors related to recurrence.

Materials and Methods: Sixty-eight patients with occlusive disease of the iliac artery underwent implantation of a self-expandable metallic stent. The clinical symptoms were intermittent claudication ($n=48$), resting pain ($n=11$), and gangrene ($n=9$). Stent patency was determined by follow-up angiography and color Doppler imaging, and the cumulative patency rate using the Kaplan-Meier method. Cox's proportional hazard model was used to analyse recurrence-related factors involving clinical symptoms (Fontaine stage), risk factors, and anatomical factors such as lesion location, length, and the development of collaterals. The duration of follow-up varied from 1 day to 73 months (mean, 23.8 months).

Results: Arterial occlusion recurred in 16 of 68 patients (23.5%), and the cumulative patency rate was as follows: 95.4% at one month, 93.2% at six months, 80.1% at one year, 73.2% at two years, 68.9% at three years, and 62% at five years. According to a statistical analysis of risk factors, the recurrence ($p=0.04$) than in those without it, but in patients who smoked, hypertension, DM, and previous cerebrovascular disease were not statistically significant. With regard to anatomical factors, the recurrent rate for lesions involving the external iliac artery was 6.5 times higher ($p=0.02$) than for those involving the common iliac artery. Variations in the Fontaine stage were not statistically significant indicators of recurrence.

Conclusion: The recurrence rate after implantation of an iliac artery stent is higher in patients with heart disease than in those without it, and higher for occlusive lesions involving the external iliac artery than for those of the common iliac artery.

Index words : Arteries, iliac
Arteries, obstruction
Arteries, grafts and prosthesis
Percutaneous recanalization

Address reprint requests to : Jae Kyu Kim, M.D., Department of Diagnostic Radiology, Chonnam National University Hospital, School of Medicine
8 Hak-dong, Dong-gu, Gwang-ju 501-757, Korea.
Tel. 82-62-220-5743 Fax. 82-62-226-4380 E-mail: kjkrad@chonnam.ac.kr