



1

2 . 3

:

: 2002 9 2005 3 가
 207 , 288 74
 133 20 79 (51) .
 Grade(Gr.) 0 가 5 , Gr.
 I 가 3 가 , Gr. II
 가 , Gr. III
 , Gr. IV 가

:

Gr. 0, 42 , Gr. I, 68 , Gr. II, 23 , Gr. III, 104
 , Gr. IV, 51 , Gr. 0, 98 , Gr. I, 60 , Gr. II, 38 ,
 Gr. III, 36 , Gr. IV, 56 Gr. 0, 2 , Gr. I, 9 , Gr.
 II, 3 , Gr. III, 85 , Gr. IV, 44 , Gr. 0, 3 , Gr.
 I, 4 , Gr. II, 4 , Gr. III, 23 , Gr. IV, 37 . Gr. III
 76.5%

:

30-70 10-40% (Hand-held Doppler)
 가 가 가 (1). (2, 3).
 가 가
 가 가 가
 가 가

(Trendelenburg test)
 (2)

1
 2
 3

2003 2002 9 2005 3
 2006 1 24 2006 4 25 207 ,

(Kruskal - Willis one - way ANOVA test)

20 - 79 (: 51) , 74:133
 . 207 175 ,
 , , 32

63 ATL HDI 5000 (Advanced Technology Laboratories, Bothell, WA, U.S.A.) Sequoia (Acuson, Mountain View, CA, U.S.A.) 5 - 10 MHz

(great saphenous vein; GSV)
 (small saphenous vein; SSV)
 1/3 (perforating vein)

(artifact) 가
 (6.4 cm/sec)
 20 60

5 . Grade (Gr.) 0
 가 , Gr. I
 0.5 3 가 , Gr. II
 , Gr. III

Gr. III 가 (Table 1).
 Grade grade
 SPSS windows 10.1
 (grading system)

288 Gr. 0, 42 , Gr. I, 68 , Gr. II, 23 , Gr. III, 104 , Gr. IV, 51 ,
 Gr. 0, 98 , Gr. I, 60 , Gr. II, 40 , Gr. III, 34 , Gr. IV, 56 가
 가 17 (Gr. I, 1 , Gr. II, 2 , Gr. III, 9 , Gr. IV, 5) , 2
 Gr. III 가 . 40
 가 103 ,
 29 .
 Gr. III 12
 Gr. 0, 42 2 , Gr. I, 68 , 9 , Gr. II, 23 3 , Gr. III, 104 85 , Gr. IV, 51 44 (Table 2),
 Gr. 0, 98 3 , Gr. I, 60 4 , Gr. II, 38 4 , Gr. III, 36 21 , Gr. IV, 56 37 (Table 3). Gr. III , 2 4 (1 - , Gr. III, 1 -

Table 2. Distribution of Operated and Non-operated Veins by Grading System in Great Saphenous Vein

Grade	No. of veins (%)	No. of operated veins (%)	No. of non-operated veins (%)
Gr. 0	42 (14.6)	2 (1.4)	40 (27.6)
Gr. I	68 (23.6)	9 (6.3)	59 (40.7)
Gr. II	23 (8.0)	3 (2.1)	20 (13.8)
Gr. III	104 (36.1)	85 (59.4)	19 (13.1)
Gr. IV	51 (17.7)	44 (30.8)	7 (4.8)
Total	288 (100)	143 (100)	145 (100)

Table 3. Distribution of Operated and Non-operated Veins by Grading System in Small Saphenous Vein

Grade	No. of veins (%)	No. of operated veins (%)	No. of non-operated veins (%)
Gr. 0	98 (34)	3 (4.3)	95 (43.4)
Gr. I	60 (20.8)	4 (5.8)	56 (25.6)
Gr. II	38 (13)	4 (5.8)	34 (16)
Gr. III	36 (12.5)	21 (30.4)	15 (6.8)
Gr. IV	56 (19)	37 (54)	19 (8.7)
Total	288 (100)	69 (100)	219 (100)

Table 1. Grading System of Primary Varicose Vein

Grade	Definition
0	No reflux
I	Only early reflux in Valsalva maneuver within three seconds
II	Continuous reflux without venous dilatation in Valsalva maneuver
III	Continuous reflux with venous dilatation in Valsalva maneuver
IV	Reflux at resting state.

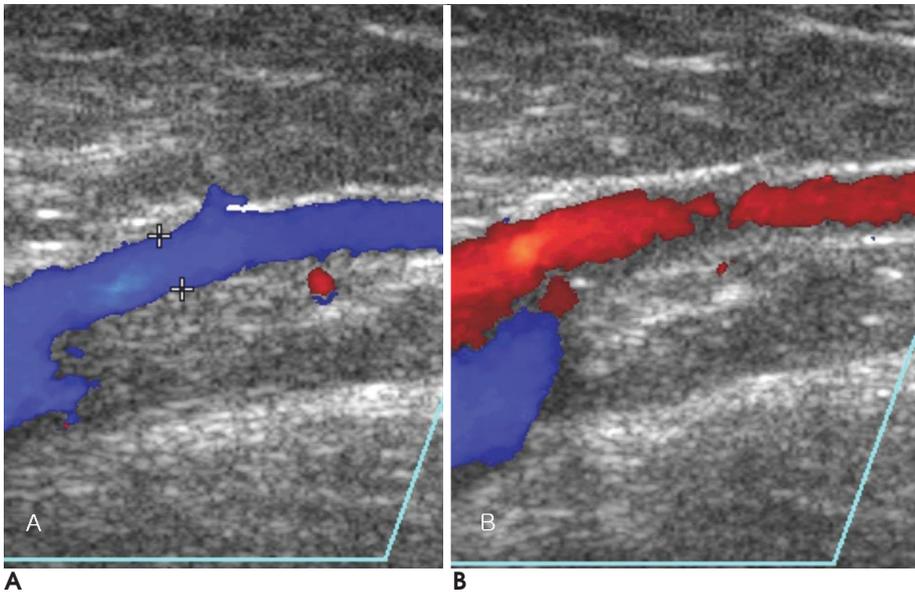


Fig. 1. Grade II reflux : **A.** Color Doppler image of great saphenous vein in resting state. **B.** Color Doppler image with Valsalva maneuver show continuous reflux without dilatation in great saphenous vein.

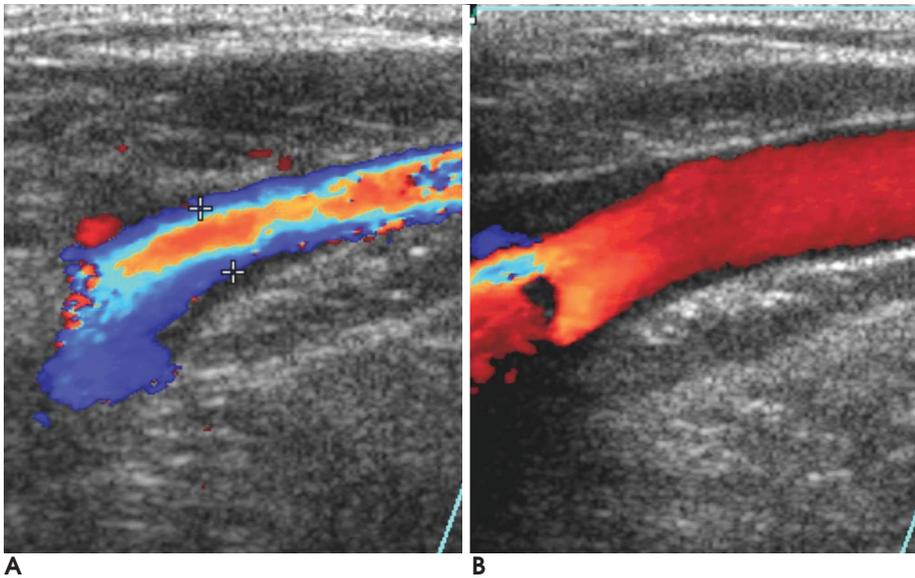


Fig. 2. Grade III reflux : a. Color Doppler image of great saphenous vein in resting state. b. Color Doppler image with Valsalva maneuver show continuous reflux with dilatation in great saphenous vein.

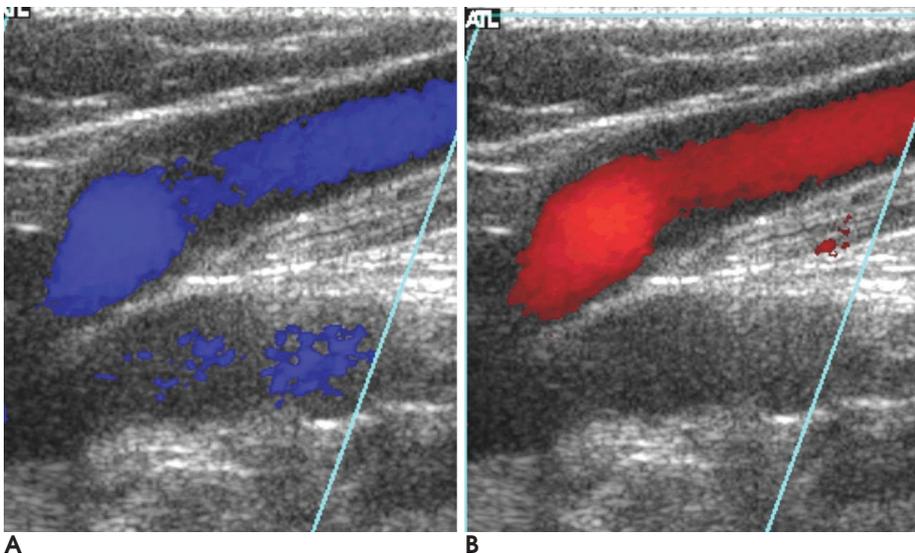


Fig. 3. Grade IV reflux : a. Color Doppler image of small saphenous vein in resting state. b. The reflux is detected at resting state in small saphenous vein.

Gr. IV, Gr. IV) 0.03, Gr. I 0.07, Gr. II 0.11, Gr. III
 0.58, Gr. IV 0.56 Gr. III
 (Table 3)
 (p-value < 0.01) (Table 5).

가 1, 3, 가 Gr. IV
 가 1
 (stripping of varicose vein),
 (high ligation of great saphenous vein or small saphenous vein)
 (endovascular sclerotherapy),
 (TIPP: Transiluminated powered phlebectomy), (Radiofrequency treatment; VNUS closure technique), (EVLT: endovascular laser treatment)
 Gr. 0 5
 1 가 4
 Gr. I 가
 Gr. II 5
 grade가 가
 가 Gr. III 가
 Gr. 0 0.05, Gr. I 0.13, Gr. II 0.13, Gr. III 0.82, Gr. IV 0.86 Gr. III
 (p-value < 0.01)
 (Table 4). Gr. 0

가, 가, 가, 가
 가 (1). 1.5:1
 3:1 가 (4)
 (1.77:1)
 95% 가
 0.5 (5).
 (1).
 (saphenofe - moral junction)
 가
 20% (6).
 (16).

Table 4. Result of Kruskal-Willis Test by GSV Grading System

Grade	No. of patients	Mean rank	Chi-square	p-value
Gr. 0	42	79.86	151.903	<0.01
Gr. I	68	92.06		
Gr. II	23	91.78		
Gr. III	104	190.69		
Gr. IV	51	197.23		
Total	288			

Table 5. Results of Kruskal-Willis Test by SSV Grading System

Grade	No. of patients	Mean rank	Chi-square	p-value
Gr. 0	98	114.41	114.566	<0.01
Gr. I	60	119.60		
Gr. II	38	125.16		
Gr. III	36	194.00		
Gr. IV	56	205.14		
Total	288			

, Jeanneret (13)

(Common femoral vein)

(30%)

가

가 Jeanneret

가

(14)

10

가 가

(13 -

15).

가

(14, 15).

가

가

Grade III 가

77.14%

93.06%

1. Golledge J., Quigley FG. Pathogenesis of varicose veins. *Eur J Vasc Endovasc Surg* 2003;25:319-324
 2. Jutle, RS., Cadle I., Cross, KS. Preoperative assessment of primary varicose veins: a duplex study of venous incompetence. *Eur J Vasc Endovasc Surg* 2001;21:370-373

3. Rautio T., Perala J., Biancari F., Wiik H, Ohtonen P., Haukipuro K., et al. Accuracy of Hand-held Doppler in planning the operation for primary varicose veins. *Eur J Vasc Endovasc Surg* 2002;24:450-455
 4. Callam MJ. Epidemiology of varicose veins. *Br J Surg* 1994;81:167-173
 5. Labropoulos N, Giannoukas AD, Delis K, Mansour MA, Kang SS, Nicolaidis AN, et al. Where does venous reflux start? *J Vasc Surg* 1997;26:736-742
 6. London JM, Nash R. ABC of arterial and venous disease. Varicose vein. *BMJ* 2000;320:1391-1394
 7. Benabou JE, Molnar LJ, Cerri GG. Duplex sonographic evaluation of the sapheno-femoral venous junction in patients with recurrent varicose veins after surgical treatment. *J Clin Ultrasound* 1998;26:401-404
 8. Wills V, Moyland D, Chambers J. The use of routine duplex scanning in the assessment of varicose veins. *Aust N Z J Surg* 1998;68:41-44
 9. Daher A, Jones V, Silva AF. The role of popliteal vein incompetence in the diagnosis of saphenous-popliteal reflux using continuous wave Doppler. *Eur J Vasc Endovasc Surg* 2001;21:350-352
 10. Wong JK, Duncan JL, Nichols DM. Whole-leg duplex mapping for varicose veins: observations on patterns of reflux in recurrent and primary legs, with clinical correlation. *Eur J Vasc Endovasc Surg* 2003;25:267-275
 11. Yamamoto N, Unno N, Mitsuoka H, Saito T, Miki K, Ishimaru K, et al. Preoperative and intraoperative evaluation of diameter-reflux relationship of calf perforating veins in patients with primary varicose vein. *J Vasc Surg* 2002;36:1225-1230
 12. Jiang P, van Rij AM, Christie R, Hill G, Solomon C, Thomson I. Recurrent varicose veins: patterns of reflux and clinical severity. *Cardiovasc Surg* 1999; 7:332-339
 13. Jeanneret C, Labs KH, Aschwanden M, Bollinger A, Hoffmann U, Jager K. Physiological reflux and venous diameter change in the proximal lower limb veins during a standardised Valsalva manoeuvre. *Eur J Vasc Endovasc Surg* 1999;17:398-403
 14. 2003;2:34-38
 15. Cooper DG, Stephen CS, Barder GE, Hollingsworth SJ. Primary varicose veins: the sapheno-femoral junction, distribution of varicosities and patterns of incompetence. *Eur J Vasc Endovasc Surg* 2003;25:53-59
 16. 2001;45:465-70

The Usefulness of Venous Color Doppler with Valsalva Maneuver for Varicose Vein¹

Yong Hoon Kim, M.D., Ji Yoon Ryoo, M.D.², Je Hoon Park, M.D.³, Soon Joo Cha, M.D.,
Yoon Joon Hwang, M.D., Jung Wook Seo, M.D., Su Young Kim, M.D.,
Yoon Hee Han, M.D., Ji Young Lee, M.D., Gham Hur, M.D.

¹Department of Radiology, Ilsan Paik Hospital, College of Medicine, Inje University

²Department of Chest Surgery, Ilsan Paik Hospital, College of Medicine, Inje University

³Department of Surgery, Ilsan Paik Hospital, College of Medicine, Inje University

Purpose: We wanted to evaluate the usefulness of venous color Doppler with performing a Valsalva maneuver for classifying primary varicose vein of the lower extremity.

Materials and Methods: From September 2002 to March 2005, 207 patients and 288 extremities that were clinically suggestive of primary varicose vein in the lower extremity underwent venous color Doppler with performing a Valsalva maneuver. The patients included 133 women and 74 men aged between 20 - 79 years (mean age: 51 year). Color Doppler study was performed in the great and small saphenous veins. We used a 5 point grading system, Grade (Gr.) 0 was no evidence of reflux, Gr. I was early reflux within 3 seconds after the Valsalva maneuver, Gr. II was continuous reflux without dilatation during the Valsalva maneuver, Gr. III was continuous reflux with dilatation during the Valsalva maneuver and Gr. IV was reflux at a resting state. To find a relationship between the rate of operation and the grading system, we retrospectively reviewed the patient's medical records and the grading system.

Results: In the great saphenous vein, Gr. 0 was noted in 42 cases, Gr. I was noted in 68 cases, Gr. II was noted in 23 cases, Gr. III was noted in 104 cases and Gr. IV was noted in 51 cases. In the small saphenous vein, Gr. 0 was noted in 98 cases, Gr. I was noted in 60 cases, Gr. II was noted in 38 cases, Gr. III was noted in 36 cases and Gr. IV was noted 56 cases. Among these cases, 2 cases of Gr. 0, 9 cases of Gr. I, 3 cases of Gr. II, 85 cases of Gr. III and 44 cases of Gr. IV of the great saphenous vein were operated on. 3 cases of Gr. 0, 4 cases of Gr. I, 4 cases of Gr. II, 23 cases of Gr. III and 37 cases of Gr. IV of the small saphenous vein were also operated on. Consequently, the operation rate was 76.5% in the severe cases over Gr. III.

Conclusion: Color Doppler with performing a Valsalva maneuver and our new grading system is a useful method to determine the rate of operation for the patients suffering with primary varicose vein.

Index words : Varicose vein
Ultrasound (US), doppler studies

Address reprint requests to : Yong Hoon Kim, M.D., Department of Radiology, Ilsan Paik Hospital,
2240, Daehwa-dong, Ilsanseo-gu, Goyang-si, Gyeonggi-do 411-706, Korea
Tel. 82-31-910-7395 Fax. 82-31-910-7369 E-mail: yhkim@ilsanpaik.ac.kr