



:
 : 31 (23 , 8)
 (< 3 cm, 3 cm), (, ,), (, ,),
 (, ,)
 Factor VIII (Maximum Micro - Vessel Density;
 Max - MVD) . MVD 가
 χ^2 - test
 : Max - MVD 가 Max - MVD 가 가
 가 Max - MVD 가
 ($p < 0.05$). Max - MVD
 Max -
 MVD 가 가 . Max - MVD
 Max - MVD 가 가
 ($p < 0.05$).
 : 가
 Max - MVD 가 .
 , 가 .
 ,
 (Maximum Micro - Vessel Density; factor VIII Max - MVD
 Max - MVD) , factor VIII .
 MVD
 (1 - 4).
 .
 가 31
 (5). 8 (6 , 1 , 1),
 40 μ m 가 23 (18 , 2 , 2 ,
 (6). 가, 1) .
 , MVD Logiq 700(GE Medical Systems,
 Milwaukee, U.S.A.) 9 MHz(5 - 10 MHz linear transduc-
 er) 가 .

1
 2

(amount), (morphology), (pattern)
 3 cm 11 31 3 cm 20
 1 cm (none), 3
 (mild), 3
 (marked) (lin -
 ear), 가 (branching), (disordered)
 , 가
 (periph -
 eral), (central), 가
 가

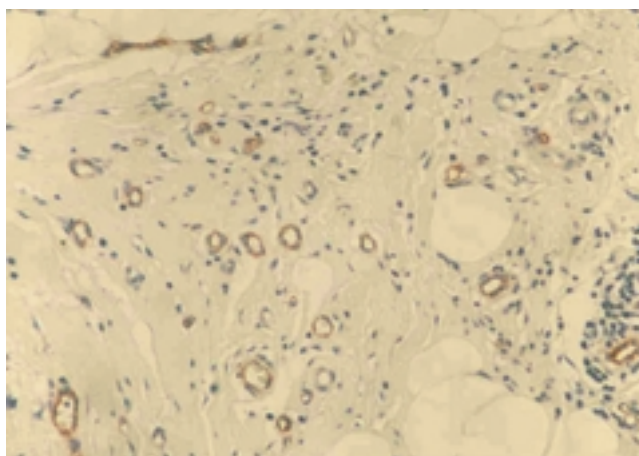


Fig. 1. Photomicrograph shows multiple microvessels (arrows), which are immunostained for factor VIII-related antigen ($\times 200$).

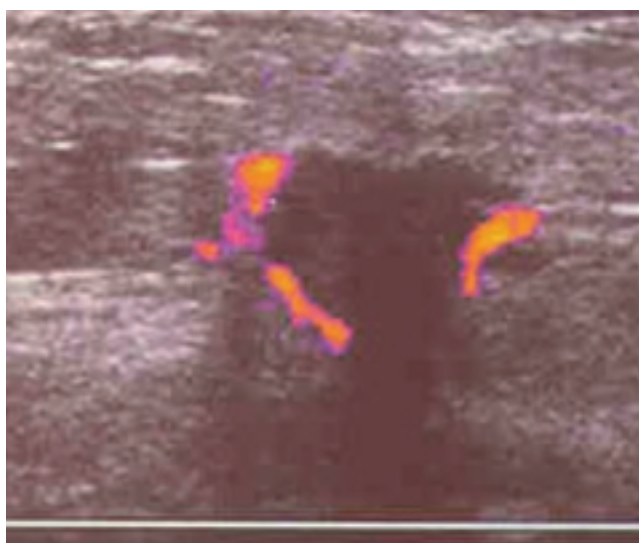


Fig. 2. A 39-years-old female with fibroadenoma. PDU shows linear shape and peripheral distribution of Doppler signals. The Max-MVD of the lesion was 28.

(penetrating)
 (5).
 Max - MVD Factor VIII
 ($\times 200$)
 가
 가 Max - MVD 가
 Max - MVD
 가 20 (Fig. 1).
 Max - MVD
 Epi Info ver -

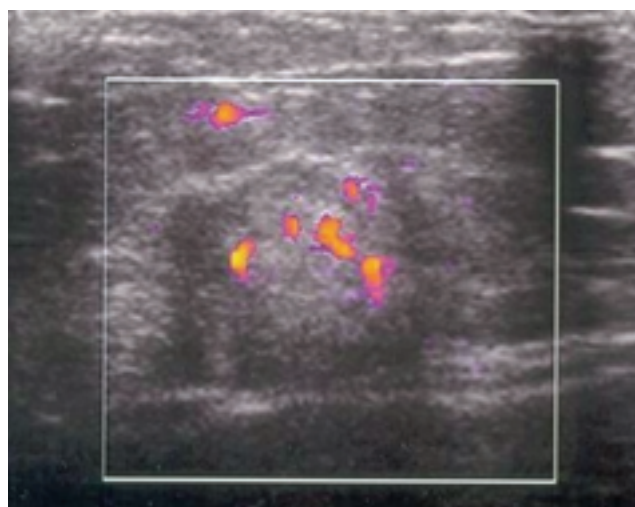


Fig. 3. A 47-years-old female with medullary carcinoma. PDU shows dot and linear shape and mainly central type of Doppler signals. The Max-MVD of the lesion was 15.

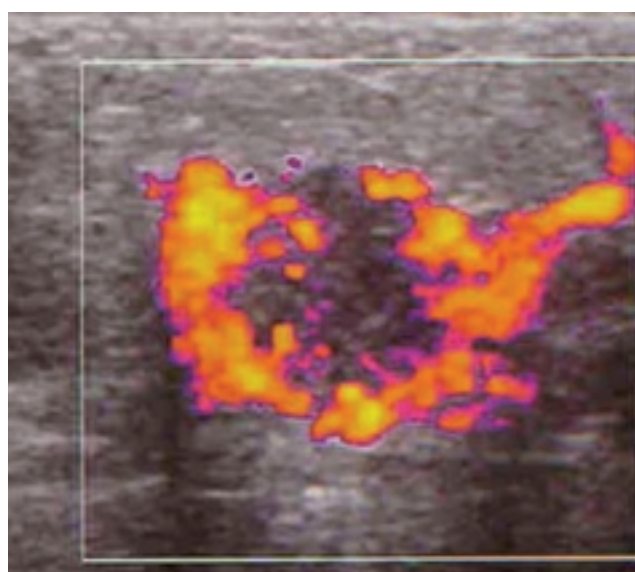


Fig. 4. A 45-years-old female with invasive ductal carcinoma. PDU shows irregular tangled and branching shape and centrally penetrating type of Doppler signals. The Max-MVD of the lesion was 32.

sion 4.0 Chi-square test 95%

Max - MVD 20 31
 2 , 11 13 (42%) , 20
 가 6 , 12 18 (58%)

Max - MVD
 3 cm 4 2 Max - MVD가 20
 , 3 cm 4 가 20
 가 Max - MVD 가 가
 3 cm 16 11 20
 , 3 cm 7 1 20
 Max - MVD , Max -
 MVD 가 가 ($p=0.55$) (Table 1).
 Max - MVD

Max - MVD 가 31 가
 4 20 ,
 14 9 20 Max - MVD
 가 Max - MVD가 가
 , ($p < 0.05$) (Table 2).
 Max - MVD

가 8 2
 (25%), 23 11 (48%) . Max -
 MVD가 20 가 13 9 (70%),

Table 1. Correlation between Size and Maximum Microvessel Density of Solid Breast Lesions

Size	Benign		Malignant		Total	
	MVD [†]		MVD		MVD	
	< 20	20	< 20	20	< 20	20
< 3 cm	2	2	5	11	7(54%)	13(73%)
3 cm	0	4	6	1	6(46%)	5(27%)
Total	2	6	11	12	13(100%)	18(100%)

[†]MVD: Micro-Vessel Density

Table 2. Correlation between Amount of Vascular Signals on Power Doppler Ultrasonography and Maximum Microvessel Density of Solid Breast Lesions (* $p < 0.05$)

Amount	Benign		Malignant		*Total	
	MVD [†]		MVD		MVD	
	< 20	20	< 20	20	< 20	20
None	2	0	2	0	4(31%)	0
Mild	0	4	4	5	4(31%)	9(50%)
Marked	0	2	5	7	5(38%)	9(50%)
Total	2	6	11	12	13(100%)	18(100%)

[†]MVD: Micro-Vessel Density

4 (30%), 20 18
 9 (50%), 9 (50%)
 Max - MVD 가
 ($p=0.55$) (Table 3) (Fig. 2 - 4).
 Max - MVD
 가 4 20
 Max - MVD
 10 5 , 17 13 가 20 Max - MVD
 , Max - MVD
 가 가 ($p < 0.05$) (Table 4) (Fig. 2 - 4).
 ,
 (2, 7 - 9).
 , 2 mm
 ,
 가
 (1, 2, 4, 7, 10, 11).
 가

Table 3. Correlation between Morphology of Vascular Signals on Power Doppler Ultrasonography and Maximum Microvessel Density of Solid Breast Lesions

Pattern	Benign		Malignant		Total	
	MVD [†]		MVD		MVD	
	< 20	20	< 20	20	< 20	20
None/Linear	2	4	7	5	9(70%)	9(50%)
Branching	0	1	2	3	2(15%)	4(23%)
Disordered	0	1	2	4	2(15%)	5(27%)
Total	2	6	11	12	13(100%)	18(100%)

[†]MVD: Micro-Vessel Density

Table 4. Correlation between the Pattern of Vascular Signals on Power Doppler Ultrasonography and Maximum Microvessel Density of Solid Breast Lesions(* $p < 0.05$)

Pattern	Benign		Malignant		*Total	
	MVD [†]		MVD		MVD	
	< 20	20	< 20	20	< 20	20
None/Peripheral	2	0	2	0	4(31%)	0
Central	0	3	5	2	5(38%)	5(27%)
Penetrating	0	3	4	10	4(31%)	13(73%)
Total	2	6	11	12	13(100%)	18(100%)

[†]MVD: Micro-Vessel Density

가

(12, 13), 가 MVD (5, 22, 가

(14 - 16). 가

(T1 가 (17). Weidner (1, 7)

Lassau (18) MVD (vessels > 100 microm) MVD 가

가 MVD

MVD

MVD

가

가

(1, 7)

(19) MVD

, Color Harmonic

가

(20). 가, 가

MVD

가 (14). MVD

가, 가 (18, 21),

가

Lamer (21) MVD 가 MVD

(5, 22 - 24). Weind (25)

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Correlation of Power Doppler Ultrasonographic Findings and Histopathologic Maximum Microvessel Density of Solid Breast Masses¹

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Purpose: To compare the power Doppler ultrasonographic (PDUS) findings of angiogenesis occurring in solid breast with the histopathologic findings.

Materials and Methods: Thirty-one cases of pathologically proven solid breast lesions (eight benign, 23 malignant) were retrospectively reviewed, focusing on tumor size (< 3 cm, ≥ 3 cm), the amount (none, mild, marked), morphology (none/linear, branching, disordered) and pattern (none/peripheral, central, penetrating), as demonstrated by power Doppler ultrasonography. We compared the PDUS findings with microscopic micro-vessel density (Max-MVD, the number of micro-vessels revealed at pathologic examination after factor-VIII staining). Statistical significance was determined using the χ^2 -test.

Results: Max-MVD tended to increase according to tumor size, but the relationship was not statistically significant. In solid breast lesions there was close correlation between the observed increase in the intensity of Doppler signals and increased Max-MVD ($p < 0.05$). Morphologically, branching and disordered vessels were more often seen in malignant lesions, though the relationship between this finding and increased Max-MVD was not statistically significant. Penetrating and central Doppler signals were more frequent in malignant lesions and showed close correlation with increased Max-MVD ($p < 0.05$).

Conclusion: The increased intensity of Doppler signals and the central and penetrating pattern of solid breast lesions seen at power Doppler sonography were closely related with increases in Max-MVD.

Index words : Breast neoplasms
Ultrasound (US), Doppler studies
Angiogenesis

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