Dorsal Growth of Breast Cancer May Correlate with the Prognosis

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Summary. We studied whether the growth of breast cancer as shown by ultrasonography (US) relates to prognosis. A total of 193 patients who had a single mass on US and had undergone radical operation between January 1992 and December 1997 were studied. The tumors on US were classified the direction of backward or forward growth. Internal type was defined as the tumors within the mammary glands; ventral type was tumors that grew upward toward the subcutaneous tissue; dorsal type was masses that grew downward toward the retromammary space; and mixed type was masses that grew in both subcutaneous tissues and retromammary spaces. The ventral type was seen in 106 cases, mixed type in 66 cases, internal type in 12 cases, and backward type in 9 cases. Disease-free survival rate (DFS) and overall survival rate (OS) (10 years) of these types were 100%/100% (internal type), 79%/86% (ventral type), 68%/76% (mixed type), and 39%/67% (dorsal type). We concluded that breast cancer tends to grow ventrally rather than dorsally and that the dorsal type showed poorer prognosis than the other types.

Key words. Breast cancer, Growth pattern, Prognosis, Ultrasonography

Introduction

The invasion of breast cancer differs between the areas of tumor. For example, all lymph node metastases are different. We usually evaluate horizontal growth of breast cancer and classify five areas of A, B, C, D, and E. However, we do not yet know classification by growing of backward or forward. Therefore, the purpose of this study was to evaluate breast cancer on ultrasonography (US), to classify the direction of backward or forward growth, and to demonstrate whether this classification correlate with the prognosis (Fig. 1).

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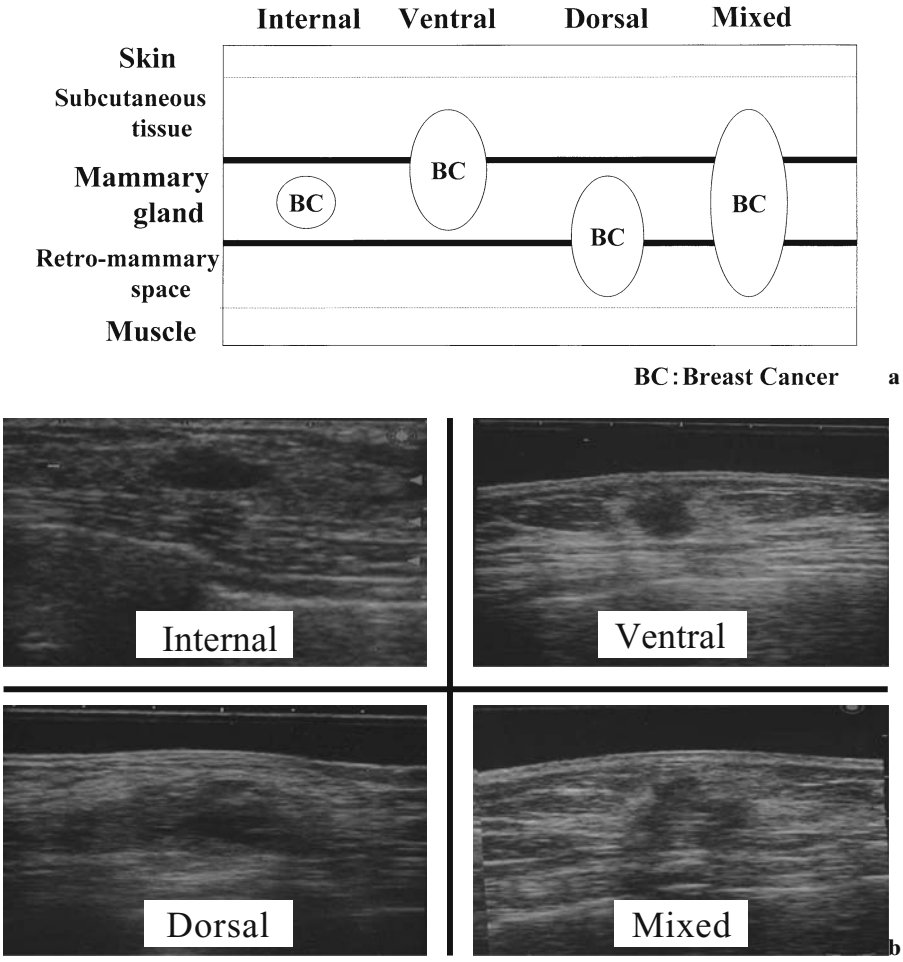

Fig. 1. The four categories of breast cancer by ultrasonography (US)

Results

All patients were Japanese women. A summary of the 193 cases is shown in Table 1. The mean tumor size of mixed type was 28.1 mm, 25.5 mm in dorsal type, 20.5 mm in ventral type, and 18.8 mm in internal type. The mixed type was significantly larger than the other three categories ($P < 0.01$, χ^2 test).

The frequency of the four categories is shown in Fig. 2. The ventral type (55%) was found in more than half of the 193 cases studied, followed by mixed type, which occurred in 34% of the cases. Internal type and dorsal type were found in 6% and 5% of the cases, respectively.

Table 1. Summary of the 193 cases

	Internal	Ventral	Dorsal	Mixed	Totals
Area of tumor					
A	2	26	4	23	55 cases
B	0	7	1	2	10 cases
C	9	54	3	27	93 cases
D	1	16	1	12	30 cases
E	0	3	0	2	5 cases
Mean tumor size	18.8	20.5	25.5	28.1	23.2 mm
Pathological stage					
Stage I	6	45	3	18	72 cases
Stage II	6	58	5	42	111 cases
Stage III	0	3	1	6	10 cases

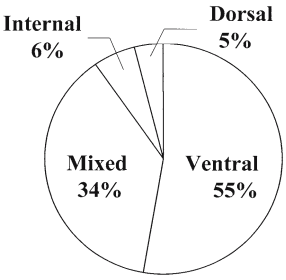

Fig. 2. The frequency of the four categories

Table 2. The rate of lymph node metastases, only T1 and T2 ($n = 187$)

	T		
Category	T1	T2	Total
Internal	25%	0%	17%
Ventral	25%	40%	31%
Dorsal	0%	33%	22%
Mixed	31%	46%	39%

Two patients of no dissection of lymph node and four patients of T3 excluded

Table 2 shows the rate of lymph node metastases. Among the four categories, mixed type, at 24 of 61 cases (39%), showed the most metastases, followed by ventral type at 33 of 105 cases (31%), dorsal type at 2 of 9 cases (22%), and internal type at 2 of 12 cases (17%). As the size of the tumor increases, the density of the lymph node metastases also increases.

The cumulative 10-year disease-free survival rate is shown in Fig. 3. Internal type had 10 years disease-free survival rate at 100%, ventral type at 79.9%, mixed type at 67.7%, and dorsal type at 39.5%. The greatest difference was between ventral type and dorsal type ($P < 0.05$). The cumulative 10-year overall survival rates are shown in

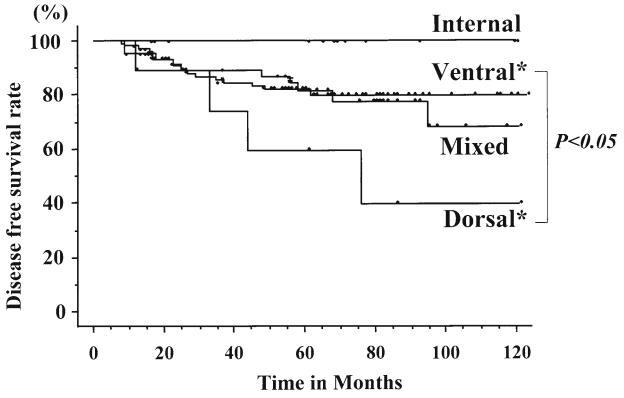

Fig. 3. The 10-year disease-free survival rate for the four types

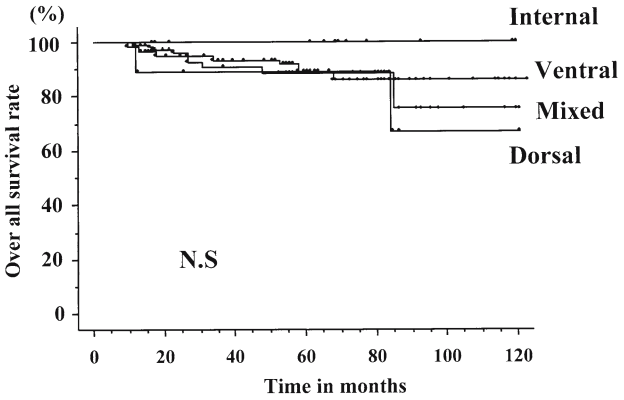

Fig. 4. The 10-year overall survival rate

Fig. 4. At the time of the present study, there was no significant difference among these.

The other data were statistically analyzed by the χ^2 test, using the Stat View software package (SAS Institute, Cary, NC, USA). All results were considered statistically significant at a *P* value less than 0.05.

Discussion

We usually evaluate horizontal growth of breast cancer and classify five areas as A, B, C, D, and E. However, we do not know how to classify by the direction of growth. Therefore, the purpose of this study was to evaluate breast cancer on US, to classify the direction of backward or forward growth, and to demonstrate whether this classification correlates with the prognosis. Breast cancer tends to grow ventrally rather

than dorsally. The reason for growth was considered as into the cancer itself or the surrounding stroma. The invasion of breast cancer accompanies reactive changes in the surrounding stroma [1, 2]. These stromal changes are best known as desmoplasia. Breast cancer lumps include these reactive changes. Histological studies have revealed that these reactive changes are composed of a proliferation of myofibroblasts [3, 4], collagen synthesis (type 3 and 5), and angiogenesis [1, 2, 5]. These growth patterns may differ as to the point that these changes turn to the ventral or dorsal direction.

The mean size of the mixed type was 28.1 mm, and the mixed type was significantly larger than the other three categories ($P < 0.01$, χ^2 test). If breast cancer grew above a definite size, ventral type or dorsal type might become mixed type.

Next, we studied the reference between the classification of the four categories and prognosis. Dorsal type had 10 years disease-free survival rate at 39.5% and ventral type at 79.9%. The biggest difference was between ventral type and dorsal type ($P < 0.05$).

We studied the relationship with lymph node metastases for that reason. Among the four categories, however, mixed type at 39% showed the most metastases, followed by ventral type at (31%), dorsal type at (22%), and internal type at (17%). The lymph node metastases of dorsal type tended to occur less often than the others (N.S., χ^2 test). Therefore, this study did not show the relationship between the poor prognosis of dorsal type and lymph node metastases. We consider that the other reason for the poor prognosis of dorsal type may be metastasis by blood, because there are many blood vessels from the pectoral major to mammary glands.

Nakano et al. [6] reported the importance of the retromammary space. The retromammary space is a collection of very loose connective tissue. If dye is placed in the retromammary space, the dye immediately spreads in all directions by capillary action and reaches the lymph nodes. They reported that the relationship between lymph node involvement and retromammary space was statistically significant. The dorsal type grew in the retromammary space and had a poorer prognosis than the ventral type. However, the role of the anatomy, pathology, and function of the retromammary space is not known.

Conclusion

This study showed that breast cancer tends to grow ventrally rather than dorsally. Also, there is a tendency that the dorsal type showed a poorer prognosis than the others. The cause for poorer prognosis of dorsal type should be resolved.

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