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Original Article

Squamous cell carcinoma of the breast: particularity and clinical management

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Abstract: Objective: The clinical behavior and prognosis of breast squamous cell carcinoma (SCC) have not been fully characterized; this study aimed to further explore these issues. Methods: Twenty-three patients were identified as having primary SCC (PSCC) or metaplastic SCC (MSCC). Their clinicopathological features, diagnoses, treatment schemes, and outcomes were retrospectively analyzed. Results: The differential diagnosis of breast SCC was established through a pathological examination rather than through the clinical manifestation or imageological examination. Similar to the situation in invasive ductal carcinoma, surgical management, chemotherapy and radiotherapy were frequently integrated into the comprehensive treatment plan for breast SCC. In addition, the content of the squamous component does not appear to significantly affect the overall survival (OS) of breast SCC patients (P = 0.345, PSCC *vs.* MSCC). Although the axillary lymph nodes (P = 0.033), clinical stage (P = 0.037) and the feasibility of a modified radical operation (P = 0.021) were significant predictors of patients' OS, these factors largely reflected the clinical stage of the tumors. Conclusions: Breast SCC is aggressive with some uniqueness requiring individualized, comprehensive therapy, but the identification of "pure" breast SCC appears unimportant. Patients' therapeutic options and prognoses were primarily determined by the clinical stage itself rather than the proportion of the squamous component.

Keywords: Squamous cell carcinoma, breast malignant tumor, clinicopathology, prognosis, therapeutic options

Introduction

Breast cancer is the most frequent malignant tumor in women, while squamous cell carcinoma (SCC) is a very common histological type of malignant human tumor. Nevertheless, breast SCC is relatively rare. Due to its relative rarity, there are still no universally accepted standards for its definite diagnosis, appropriate treatment and accurate prognosis, resulting in difficulty and confusion in clinical practice.

Breast SCC may be classified as primary squamous cell carcinoma (PSCC) or metaplastic squamous cell carcinoma (MSCC), with 100% and 50% of the malignant cells showing squamous respectively [1]. However, these criteria are not so strict in practice, as cases where more than 90% of the neoplasm has squamous morphology have been widely accepted as breast PSCC [2-4]. One benefit to clarifying the classification of breast PSCC is that its clinical behavior may be different from that of typical infiltrating duct carcinoma. Its characteristics have often been described to include rapid growth, a central cystic-necrotic component, lack of hormone and human epidermal growth factor receptor-2 (HER2) receptor expression, good response to platinum and poor prognosis among others [1, 5]. In addition, the non-uniform diagnostic criteria of breast PSCC combined with its rarity would make the determination of its real incidence difficult. In some early studies, the incidence even fluctuated between 0.06 and 2% [6-10]. In spite of this, some researchers still believe that the identification of "pure" cases of breast SCC is clinically unimportant [11]. Thus, some aspects of managing breast SCC remain controversial.

We retrospectively reviewed the clinical, imageological, and clinicopathological features of 23 patients with breast PSCC or MSCC. Their management strategies, particularity, prognos-

Table 1. Clinical manifestation of 23 patients with breast PSCC or MSCC

Items	Number of patients
Gender	
Male	0
Female	23
Age	
≥ 50	7
< 50	16
Menses	
Premenopausal	14
Postmenopausal	9
Involved side	
Right	10
Left	13
Clinical manifestation	
Lump	20
Skin redness	4
Tumor related history	3
Crater nipple	2
Ruptured tumor	1
Ultrasound findings	
Low echo mass	20
With fluid sonolucent area	10
Percentage of SCC	
≥ 90	12
> 50, < 90	11
Survival status	
Survival	12
Die	9
Lost	2

tic factors and clinical management are discussed.

Patients and methods

Clinical data

The *surgical pathology database* and the *follow-up system* in our hospital were searched for cases from January 2000 to December 2014 using the key words "squamous cell carcinoma" and "breast". Cases with a SCC component comprising 50 to 100 percent of the tumor tissue were included. Cases were excluded if representative material was not available for review and follow-up, or if there was a clinical history of SCC at another body site, including the skin on the breast and the nipple. According to Japanese diagnostic criteria [1], 23 cases were identified as PSCC or MSCC of the breast. The diagnosis of PSCC or MSCC was independently made and confirmed by two breast pathologists in our institution. Their demographic data, clinicopathologic, treatment, and outcome, including age, sex, tumor size, clinical presentation and TNM stage were retrospectively reviewed. The expression status of estrogen receptors (ERs), progesterone receptors (PRs), HER2, P53, and epidermal growth factor receptors (EGFR) were determined with immunohistochemical (IHC) analysis. Positive nuclear staining of 10% or more of the tumor cells was considered as ER or PR positivity. HER2 scoring was performed according to the manufacturer's instructions (Hercep test; Dako, Carpinteria, CA, USA), and a score of 3+ was considered positive. Cases with amplification of HER2 with fluorescence in situ hybridization (FISH) were also considered positive.

Follow-up

All patients had been periodically followed-up from diagnosis to recurrence, metastasis or death. The status of follow-up (including evidence of locoregional recurrence, distant metastasis, and/or death) was recorded using the electronic medical follow-up system. The intervals for the first two years, during next three years and five years later were 3-months, 6-months and 12-months, respectively. The content of each review included a physical examination, computed tomography (CT) scan of the chest or conventional chest X-ray, ultrasonic examination of the liver as well as the mammary glands and lymphatic drainage area, and serum tumor marker detection. In addition, data on the therapeutic effects and prognosis were mainly collected monthly through letters, telephone or outpatient review. Overall survival (OS) was defined as the interval between the day of first diagnosis and death or final follow-up.

Statistical analysis

The statistical analysis was performed using IBM SPSS Statistics 19.0. The x^2 test was used to assess categorical variables, while the Student's independent *t*-test was used to compare continuous variables. Cumulative survival analysis was performed using the Kaplan-Meier method and the log-rank test was used for sin-

Table 2. Diagnostic accuracy for 23 patients with breast PSCC or MSCC

Diagnostic techniques	n	Diagnostic reports			
		Benign	Breast cancer	Breast SCC	Accuracy for breast SCC (percentage)
Ultrasonography	23	3	20	0	0
Mammography	14	2	12	0	0
CT-scan	10	0	10	0	0
Magnetic resonance imaging (MRI)	1	0	1	0	0
Fine-needle aspiration (FNA)	13	1	12	2	15.38
Core-needle biopsy (CNB)	2	0	2	2	100
Vacuum-assisted core biopsy (VACB)	1	0	1	1	100
Open surgical biopsy (OSB)	7	0	7	7	100

n, the number of patients who once received corresponding diagnostic techniques.

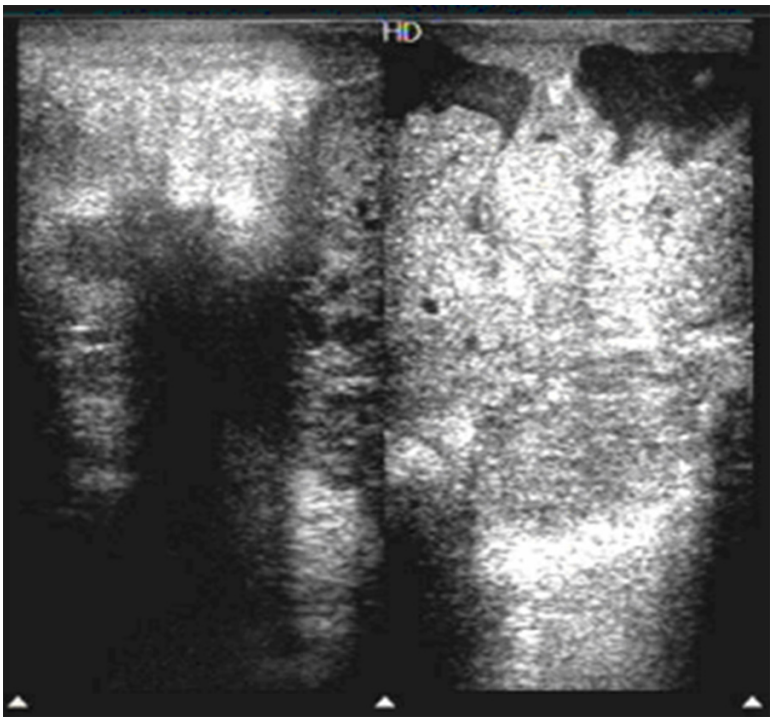

Figure 1. Ultrasonographic features of breast squamous cell carcinoma. The ultrasonography showed a low echo mass, with lesions of cystic and fluid sonolucent areas.

gle-factor analysis. All *P* values were two-tailed, and $P < 0.05$ was considered significant.

Results

The basic clinical characteristics of patients

The clinical characteristics of 23 patients' were reviewed (**Table 1**). They were all women, with mean age of 46.48 years and a median age of 48 (ranging from 30 to 64) years. There was no significant bias of the lesion occurring in either the right or left breast (10 *vs.* 13). Their medical histories revealed that one patient's father died of lung adenocarcinoma, one patient's mother had breast fibroadenoma, one patient with heterochronous bilateral breast cancer had left breast SCC as a second primary tumor, and no patients had a history of squamous carcinoma of any other site. The initial symptom of most patients (86.96%, 20/23) was a breast lump without other discomfort, while other clinical manifestations included skin redness in four patients, cratered nipple in two, and a ruptured tumor in one patient. According to the final diagnosis, 12 patients had PSCC and 11 had MSCC (**Table 1**).

Differential diagnosis of breast SCC

Patients underwent imageological and pathological examinations, but the former made no contribution to the differential diagnosis of breast SCC (**Table 2**). The final diagnosis of breast SCC was mainly confirmed through a histopathological examination (**Table 2**). Interestingly, ultrasonography showed a low echo mass in 20 patients, of who 10 had tumors with typical lesions consisting of cystic and fluid sonolucent areas (**Figure 1**). The original diameter of the tumors ranged from 2 cm to 10 cm (5.7±4.2 cm) and multifocal breast cancer was found in three patients (8.7%). The positive axillary lymph node was confirmed in 13 patients (56.5%), while distant metastasis was found in three patients, in the lymphoglan-

Table 3. Survival analysis of 23 patients with breast PSCC or MSCC

Items	No. of patients	5-Year OS (%)	Mean OS		*P*
			Months	95% CI	
Age (years)					
≥ 50	7	0.4	59.2	19.4-99.0	0.581
< 50	16	0.47	77.4	45.1-109.7	
Menopausal status					
Premenopausal	14	48.4	75.8	44.0-107.6	0.683
Postmenopausal	9	38.9	49.9	24.7-75.2	
Lateral					
Left	13	43.8	59.9	29.2-90.7	0.569
Right	10	43.8	77.7	40.8-114.6	
Pure SCC					
Yes	12	41.3	47.4	25.6-69.2	0.345
No	11	50.0	81.5	46.3-116.7	
Axillary lymph nodes					
Positive	13	33.2	43.6	21.5-65.7	0.033
Negative	10	76.2	110.8	76.6-145.1	
M stage					
M0	18	55.5	87.5	55.8-119.3	0.136
M1	5	20.0	43.8	13.2-74.4	
T stage					
T2	13	51.9	85.4	50.6-120.3	0.164
T3/T4	8	31.3	48.5	16.8-81.2	
Clinical stage					
Early	13	64.0	99.86	63.5-136.2	0.037
Advanced	10	25.0	43.60	18.0-69.2	
Cancer embolus					
Yes	4	75.0	67.5	32.7-102.3	0.786
No	19	41.1	69.3	42.3-96.4	
Modified radical operation					
Yes	13	55.6	94.48	55.7-133.3	0.021
No	10	30.0	44.00	17.1-70.9	
Radiotherapy					
Yes	9	31.3	52.8	25.0-80.7	0.368
No	14	54.4	85.2	49.8-120.7	
Chemotherapy					
Yes	20	45.2	65.3	43.0-87.5	0.645
No	3	33.3	56.3	0-123.0	
Hormonal therapy					
Yes	5	25	49.7	18.7-80.6	0.549
No	18	53.5	78.6	47.7-109.5	

OS, overall survival.

dulae supraclaviculares (n = 2) and sternum (n = 1). Lymphatic and vascular invasion was seen in four patients. The molecular phenotype of most patients (69.57%) was triple-negative breast cancer (TNBC), while ER, PR and HER2 positive expression were detected in 4, 2 and 2 patients, respectively. Positive EGFR was seen in all patients, whereas p53 was positive in most patients (73.9%).

Comprehensive treatment of breast SCC

All patients underwent multidisciplinary consultation before clinical treatment, and the outline of the therapeutic strategy is shown in **Table 3**. In the comprehensive treatment plan, the overwhelming majority of the patients (86.96%, 20/23) received surgical management, including standard modified radical mastectomy (n = 13), radical resection of their breast cancer (n = 2), palliative mastectomy (n = 1), or sentinel lymph node dissection (n = 2). Four patients received local resection of a breast lump (n = 3) or irrelevant modified radical mastectomy (n = 1) at primary hospitals. Two patients were not suitable for surgery, while another patient with a huge tumor abandoned all anti-tumor treatments.

According to the recommendation given at consultation, 20 of 23 patients received one to six cycles of chemotherapy, while three patients refused treatment. Preoperative chemotherapy was performed in seven patients with locally advanced breast cancer. The most common chemotherapy regimens included CMF, CEF, TAC and AC-T (n = 4 per group), while four other patients received TC, TF, CVF or AF chemotherapy regimens. Nine patients with features of positive axillary lymph nodes, lymphatic and vascular invasion, skin or chest wall invasion, and (or)

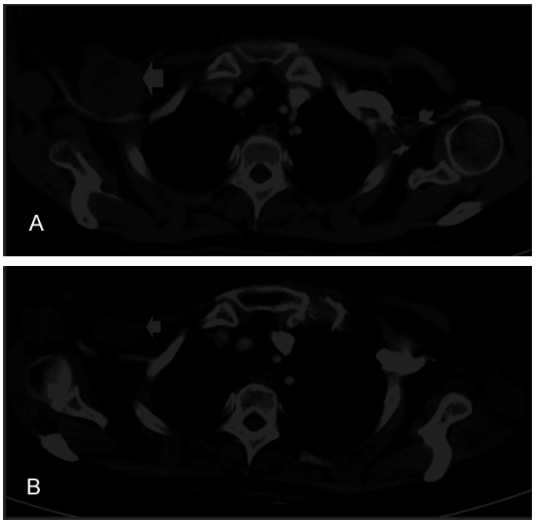

Figure 2. Patient's chest computed tomography scan images, showing the recurrent lesions of breast squamous cell carcinoma on the anterior of the right armpit: (A) the recurrent lesion 12 months after surgical treatment and during chemotherapy; (B) the recurrent lesion was partially controlled 6 months after intensity modulated radiation therapy combined with intravenous chemotherapy. The red arrows show the position of recurrent lesions.

tumors > 5 cm received radiotherapy, while seven appropriate patients refused therapy. One patient's measurable recurrent lesion was once partially controlled with concurrent chemoradiotherapy (**Figure 2**), but the recrudescent mass increased again four months later. She finally received palliative resection of the lesion plus a latissimus dorsi muscle flap transfer at another hospital. Five patients with positive ER/PR expression received adjuvant hormonal therapy, but the two HER2 positive patients refused anti-HER2 targeted therapy.

Outcome and prognosis of breast SCC

The average follow-up was 43 months (range 5-139). The mean OS was 71 months [standard error (S.E.) = 13] with 44.1% of patients surviving after 5 years, and the median survival time was 50 months (S.E. = 14). At the follow-up endpoint of December 31, 2014, 12 patients were still alive, 9 had died of tumor progression, and 2 had been lost after 24 months follow-up. During the follow-up, 3 patients had locoregional relapse, 2 patients presented with distant metastasis (bone or lung), and in 2 patients, local control of their tumors was not achieved, ultimately resulting in their death. To date, 9 of the 12 patients alive are disease-free. One patient who had received breast-conserving surgery (BCS) twice suffered from local recurrence in another hospital and finally underwent a modified radical mastectomy in our center. Another patient was hospitalized 20 times after standardized comprehensive treatment because of repeated recurrence and rescue treatments.

Contrary to our expectations, the content of the squamous component did not significantly affect the OS of patients with breast SCC (P = 0.345, PSCC *vs.* MSCC) in this study (**Table 3**; **Figure 3A**). Further univariate analysis indicated that axillary lymph node status (P = 0.033, positive *vs.* negative), clinical stage (P = 0.037, early *vs.* advanced), and the feasibility of a modified radical operation (P = 0.021, yes *vs.* no) were significant predictors of OS (**Table 3**; **Figure 3B-D**). In addition, survival was not associated with age (P = 0.581), menopausal status (P = 0.683), lateral (P = 0.569), M stage (P = 0.136), T stage (P = 0.164), cancer embolus (P = 0.786) (**Table 3**), or nonsurgical adjuvant therapy (data not shown).

Discussion

Breast SCC is a rare histological type of malignant tumor in the mammary gland whose reported incidence (PSCC) has fluctuated between 0.06 and 2% [6-10]. Thus, most literature on breast SCC is still limited to isolated case reports or small case series. This case study mainly focused on the differential diagnosis, local control, systemic treatment and prognosis of this rare disease.

The definite diagnosis of breast SCC is not easy. Based on our data, the typical clinical manifestation, including a palpable masses (100%, 20/20), low echo mass (100%, 20/20), and cystic with fluid sonolucent area (50%, 10/20), is not sufficient to establish a diagnosis of breast SCC. Other imageological examinations, including mammography, CT and magnetic resonance imaging, also made no contribution to the differential diagnosis. Although the independent diagnostic value of fine needle aspiration cytology has long been realized [12], its accuracy was still low (15.38%, 2/13) in our practice. The diagnosis of breast SCC in our cases was mainly established by CBN, OSB, and vacuum-assisted core biopsy or mastecto-

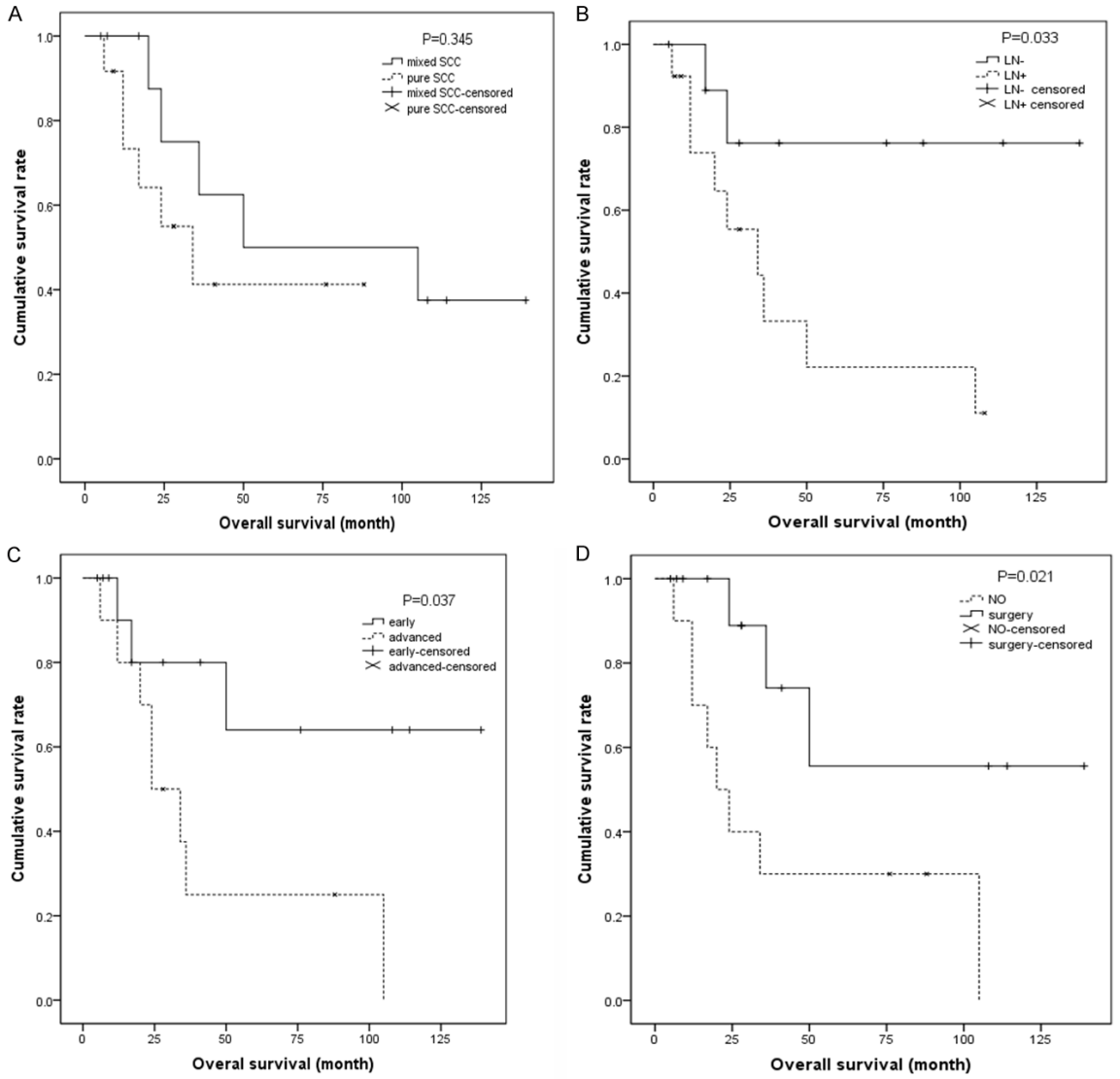

Figure 3. Comparative analysis of single factors affecting the overall survival rate of patients with breast squamous cell carcinoma (SCC): (A) grouped by the percentage of the SCC component; (B) grouped by the tumor metastasis status of the axillary lymph nodes; (C) grouped by clinical stage; and (D) grouped by surgical stage.

my specimens (91.3%, 21/23). To determine the nature of breast lesions, extensive sampling is necessary. Thus, it seems that the clinical manifestation and medical imaging examination cannot determine the final diagnosis of breast SCC, while histopathologic diagnosis remains the gold standard.

As for local control, many researchers agree that surgery is one of the most effective treatments for breast SCC [13]. Consistent with this, most of our patients received surgical treatment, especially modified radical mastectomy. Although BCS plus radiation therapy (RT) was performed and has even been reported to achieve high local control [14, 15], our present data do not support this view. For one thing, one of our patients did receive BCS in another hospital, but the tumor quickly relapsed locally twice. In addition, a modified radical mastectomy became her final choice in our hospital. For another patient, breast SCC seemed to be less sensitive to RT. One of our patients with a measurable recurrent lesion (**Figure 2A**) received six months of concurrent chemoradiotherapy, but the mass was only partially controlled (**Figure 2B**). These data, at least in part, indicate that the radiosensitivity of breast SCC is

still uncertain. We therefore recommend conservatively choosing treatment modalities and performing BCS when necessary.

Chemotherapy may be another effective therapy for breast SCC. Most of our patients (20/23) received postoperative chemotherapy, while 7 of them (7/20) received preoperative chemotherapy. The regimens mainly included CMF, CEF, TAC, AC-T (n = 4 of each), TC, TF, CVF and AF (n = 1 of each), which actually to some extent reflected the randomness in different cases. Only one patient with recurrent lesions underwent an NP regimen. Breast SCC is reported to respond well to platinum-based chemotherapy [16, 17]. Inconsistent with this, our 7 patients receiving preoperative chemotherapy without a platinum agent also obtained acceptable effects (PR). Besides, Kashiwagi et al. reported a successful case of breast SCC treated with eribulin [18]. These reports and our data might suggest the chemosensitivity of breast SCC to common regimens. Breast SCC was usually hormone receptor- and HER2/neu-negative, but EGFR was frequently overexpressed [19, 20]. Consistent with this, most of our patients (69.57%, 16/23) were confirmed as having triple-negative breast cancer, while EGFR expression was positive in all patients. Therefore, endocrine therapy and anti-HER2 targeted therapy were not typically utilized. Importantly, the over-expression of EGFR implies the possibility of anti-EGFR targeted therapy with gefitinib or cetuximab, the treatment or chemoprevention of breast SCC with vitamin D3 [21], and the potential indication for using platinum-based chemotherapy [22].

The prognosis of breast SCC has not been consistent. Most researchers believe that breast SCC has a poorer prognosis than invasive ductal carcinoma [19, 23, 24]. Some authors hold the view that breast SCC has a prognosis similar to that of invasive ductal carcinoma [6, 11, 25], or at least that the treatment does not differ from that of other common histological types of breast cancer [26]. Others even suggest that breast SCC has an indolent clinical course and has a relatively good prognosis [27]. Our survival analysis showed that the OS of PSCC did not significantly differ from MSCC, which partly implied that the content of SCC in the tumor tissue did not seem so important. In other words, the cellular content of SCC in breast tissue may not be a crucial factor for the patients' prognosis. Meanwhile, the axillary lymph nodes, clinical stage, and the feasibility of modified radical surgery were significant predictors of OS, indicating that the stage of the disease itself might determine the prognosis rather than the size of the squamous component. This is subtly in line with the viewpoint that the identification of "pure" cases of breast SCC may be clinically unimportant [11].

In summary, breast SCC is a rare histological type of breast malignant tumor. It did show some uniqueness when compared with common breast cancer, such as difficult preoperative diagnosis, easy local relapse, insensitivity to radiotherapy, response to none of the platinum-based chemotherapies, conservative selection for BCS and so on. However, its therapeutic options can be expediently borrowed from those of common breast cancer. In addition, the prognosis for PSCC and MSCC are not significantly different. These data support the view that it is not necessary to deliberately distinguish the histopathological subtype of breast SCC in clinical practice.

However, the present retrospective research failed to compare breast SCC with common breast cancer. The relative rarity of cases also complicated this study. To thoroughly answer these questions about breast SCC, further research is needed.

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Disclosure of conflict of interest

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References

[1] Honda M, Saji S, Horiguchi S, Suzuki E, Aruga T, Horiguchi K, Kitagawa D, Sekine S, Funata N, Toi M, Kuroi K. Clinicopathological analysis of ten patients with metaplastic squamous cell

carcinoma of the breast. Surg Today 2011; 41: 328-32.
[2] Reis-Filho JS, Lakhani SR, Gobbi H, et al. Metaplastic carcinoma. In: Lakhani SR, Ellis IO, Schnitt SJ, et al, editors. WHO Classification of Tumours of the Breast. 4th edition. Lyon, France: IARC; 2012. pp. 48-52.
[3] Rosen PP. Squamous carcinoma Rosen's Breast Pathology. 3rd edition. Philadelphia, PA: Lippincott Williams & Wilkins; 2009. pp. 506-24.
[4] Porzio R, Cordini C, Orsi N, Brigati F, Paties CT, Cavanna L. Primary squamous cell carcinoma of the breast after cured bilateral breast cancer. In Vivo 2014; 28: 1155-8.
[5] Gupta N, Vashisht R, Nimbran V, Gupta R, Dhingra N, Bhutani A. Primary squamous cell carcinoma of the breast: Case report and management decisions. J Can Res Ther 2012; 8: 323-5.
[6] Wrighston W, Edwards MJ, McMasters KM. Primary squamous cell carcinoma of the breast presenting as a breast abscess. Am Surg 1999; 65: 1153-5.
[7] Campana YJ, Vilcoq JR, Vielh P, Vielh P, Schlienger P, Mathieu G, Fourquet A. [Primary epidermoid carcinoma of the breast. Clinical, histopathologic and prognostic study of 14 patients]. Bull Cancer 1992; 79: 675-9.
[8] Toikkonen S. Primary squamous cell carcinoma of the breast. Cancer 1981; 48: 1629-32.
[9] Wargotz ES, Norris HJ. Metaplastic carcinomas of the breast. Cancer 1990; 65: 272-6.
[10] Van Hoeven KH, Drudis T, Cranor ML, Erlandson RA, Rosen PP. Low-grade adenosquamous carcinoma of the breast. A clinocopathologic study of 32 cases with ultrastructural analysis. Am J Surg Pathol 1993; 17: 248-58.
[11] Stevenson JT, Graham DJ, Khiyami A, Mansour EG. Squamous cell carcinoma of the breast: a clinical approach. Ann Surg Oncol 1996; 3: 367-74.
[12] Lazarevic B, Katatikarn V, Marks RA. Primary squamous-cell carcinoma of the breast. Diagnosis by fine needle aspiration cytology. Acta Cytol 1984; 28: 321-4.
[13] Menes T, Schachter J, Morgenstern S, Fenig E, Lurie H, Gutman H. Primary squamous cell carcinoma (SqCC) of the breast. Am J Clin Oncol 2003; 26: 571-3.
[14] Rokutanda N, Iino Y, Yokoe T, Maemura M, Horiguchi J, Takei H, Koibuchi Y, Iijima K, Oyama T, Morishita Y. Primary squamous cell carcinoma of the breast during lactation: a case report. Jpn J Clin Oncol 2000; 30: 279-82.
[15] Carbone S, Lobo Alvarez R, Lamacchia A, Almenar Gil A, Martin Hernandez R, Lopez Guerra JL, Marsiglia H. Primary squamous cell carcinoma of the breast: A rare case report. Rep Pract Oncol Radiother 2012; 17: 363-6.
[16] Bhatt L, Fernando I. Primary squamous cell carcinoma of the breast: achieving long-term control with cisplatin-based chemotherapy. Clin Breast Cancer 2009; 9: 187-8.
[17] Tsung SH. Primary pure squamous cell carcinoma of the breast might be sensitive to Cisplatin-based chemotherapy. Case Rep Oncol 2012; 5: 561-5.
[18] Kashiwagi S, Okuno T, Ishihara S, Ishii M, Asano Y, Watanabe M, Morisaki T, Aomatsu N, Noda S, Kawajiri H, Nakano T, Kawakami N, Mitsukawa Y, Takashima T, Onoda N, Ishikawa T, Hirakawa K. [Effectiveness of eribulin chemotherapy for squamous cell carcinoma of the breast]. Gan To Kagaku Ryoho 2013; 40: 2369-71.
[19] Hennessy BT, Krishnamurthy S, Giordano S, Buchholz TA, Kau SW, Duan Z, Valero V, Hortobagyi GN. Squamous cell carcinoma of the breast. J Clin Oncol 2005; 23: 7827-35.
[20] Kimura F, Iwaya K, Kawaguchi T, Kaise H, Yamada K, Mukai K, Matsubara O, Ikeda N, Kohno N. Epidermal growth factor-dependent enhancement of invasiveness of squamous cell carcinoma of the breast. Cancer Sci 2010; 101: 1133-40.
[21] Akutsu N, Bastien Y, Lin R, Mader S, White JH. Amphiregulin is a vitamin D3 target gene in squamous cell and breast carcinoma. Biochem Biophys Res Commun 2001; 281: 1051-6.
[22] Wang J, Zhang X, He J, Yang M, Tang J, Li X, Tang H, Xie X. Co-expression of EGFR and CK5/6 in primary squamous cell carcinoma of the breast. Med Oncol 2014; 31: 172.
[23] Behranwala KA, Nasiri N, Abdullah N, Trott PA, Gui GP. Squamous cell carcinoma of the breast: clinico-pathologic implications and outcome. Eur J Surg Oncol 2003; 29: 386-9.
[24] Grabowski J, Saltzstein SL, Sadler G, Blair S. Squamous cell carcinoma of the breast: a review of 177 cases. Am Surg 2009; 75: 914-7.
[25] Azzopardi JG, Ahmed A, Millis RR. Problems in Breast Pathology. Philadelphia: WB Saunders; 1979. pp. 297-300.
[26] Badge SA, Gangane NM, Shivkumar VB, Sharma SM. Primary squamous cell carcinoma of the breast. Int J Appl Basic Med Res 2014; 4: 53-5.
[27] Cardoso F, Leal C, Meira A, Azevedo R, Mauricio MJ, Leal da Silva JM, Lopes C, Pinto Ferreira E. Squamous cell carcinoma of the breast. Breast 2000; 9: 315-9.