Invasive ductal carcinoma within borderline phyllodes tumor with lymph node metastases: A case report and review of the literature

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Abstract. Phyllodes tumor (PT) is a rare type of biphasic fibroepithelial neoplasm that may coexist with a breast tumor in rare cases. In the current study, a 52-year-old female presented with a left breast lump. Mammography and sonographic examination results suggested a diagnosis of malignant tumor. Histological analysis revealed a borderline PT with invasive ductal carcinoma (IDC) within the tumor. Due to the presence of a single micrometastasis in three of the sentinel lymph nodes, the patient underwent modified radical mastectomy. The excised tumor contained triple negative breast cancer; therefore, postoperative treatment included six cycles of chemotherapy and 25 cycles of radiotherapy. The patient exhibited no recurrence and no metastatic disease at the 23-month follow-up examination. Thus, the present study discussed the case of a female patient that presented with IDC within borderline PT and reviewed the literature on this rare type of neoplasm. Various types of breast carcinoma have been identified to coexist with PT in different masses; however, no standard therapeutic regimen has been established for the coexistence of PT and breast cancer in the same mass. The present study indicates that determination of an appropriate treatment strategy predominantly depends on the characteristics of the individual breast tumor.

Introduction

Phyllodes tumor (PT) is a rare type of biphasic fibroepithelial neoplasm that accounts for <1% of all breast tumors and represents 2-3% of fibroepithelial neoplasms (1,2) with a peak age of incidence of 45-49 years (3,4). According to the standards set by the World Health Organization (WHO), PTs may be classified as benign, borderline or malignant based on the degree of stromal cell atypia, mitotic status, degree of stromal overgrowth,

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tumor necrosis and appearance of tumor margins (5). PTs are predominantly benign with only ~10% identified as malignant. The majority of malignant transformation of PTs typically occurs in the stromal compartment and rarely in the epithelial compartment. Breast carcinoma within PT accounts for 1-2% of all PTs (6). Surgery is considered the standard treatment for PT (7). Invasive ductal carcinomas (IDC) of the breast accounts for 80% of all breast cancers, and these tumors demonstrate a worse survival rate than invasive lobular carcinoma (8), with overall 5-year survival rates of 84.1 and 85.6%, respectively (9). An IDC that is incidentally found within a borderline PT has been reported only once before in the literature (10). The current study presents a case of IDC within a borderline PT, and reviews 32 cases of breast carcinoma within a PT that have been reported in the literature.

Case report

In July 2012, a 52-year-old female presented to the Department of Breast Surgery, First Hospital of Jilin University (Changchun, China) with a firm, palpable, irregularly-shaped lump with an ill-defined margin in the outer upper quadrant of the left breast. The lump, which was originally identified by the patient 6 months previously, had increased in size from 1.5x1.0 cm at presentation to 2.5x2.0 cm after 3 months. Physical examination revealed that the tumor did not adhere to or invade the overlying skin or the thoracic wall. Enlarged axillary lymph nodes were not identified upon physical examination. Mammography imaging revealed a high-density mass with a diameter of 2.5 cm and an irregular margin (Fig. 1), and sonographic examination demonstrated a partially ill-defined hypoechoic mass with a diameter of 2.1 cm (Fig. 2). A core needle biopsy revealed borderline or malignant PT with a breast carcinoma component.

The diagnosis was determined by analysis of the core needle biopsy, as follows. The tumor was well-circumscribed and 3.0x2.5x1.2 cm in size, according to macroscopic examination. The mitotic count in the most active area was 2-4 mitoses per 10 high-powered fields. Based on an increase in the number of mitotic figures and according to the WHO 2003 grading system (11), the tumor was classified as a borderline PT. IDC was also observed in a focal area of spindle cells (Fig. 3). The results of MaxVision™



Figure 1. Mammography image revealing a high-density mass with an irregular margin and a diameter of 2.5 cm in the outer upper quadrant of the left breast. The mass was determined as grade 4, according to the Breast Imaging Reporting and Data System classification.



Figure 2. Sonographic examination revealing an irregular, partially ill-defined, hypoechoic mass with a diameter of 2.1 cm. The mass was diagnosed as grade 4B, according to the Breast Imaging Reporting and Data System classification.

immunohistochemical staining (Fuzhou Maixin Biotechnology Development Co., Ltd., Fuzhou, China) of the IDC cells were as follows: Estrogen receptor negative; progesterone receptor negative; HER-2 negative; Ki-67 index, 30%; cytokeratin (CK) 5/6 positive; vimentin positive; and pan-CK positive (Fig. 4).

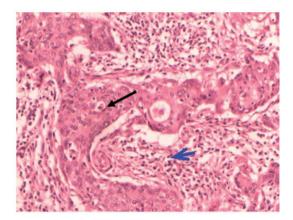


Figure 3. Invasive ductal carcinoma (black arrow) detected within a region of spindle cells (blue arrow) in the phyllodes tumor (hematoxylin and eosin stain; magnification, x100).

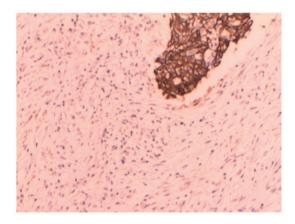


Figure 4. Immunohistochemical staining of the invasive ductal carcinoma, revealing positive pan-cytokeratin expression (stain, hematoxylin and eosin; magnification, x100).

Considering the diagnosis of IDC within a borderline PT, a simple mastectomy and sentinel lymph node biopsy (SLNB) were performed on July 10, 2012. Intraoperative frozen pathological analysis of 3 of the sentinel lymph nodes (SLNs) identified one micrometastasis. An axillary lymph node dissection and subsequent pathological examination did not reveal metastasis in any of the 18 nodes tested. The patient underwent six cycles of chemotherapy cycled every 21 days, consisting of 75 mg/m² paclitaxel, 75 mg/m² pirarubicin and 500 mg/m² cyclophosphamide, all administered on day 1. In addition, the patient underwent seven weeks of radiotherapy (25 cycles at 5,000 cGy; 200 cGy, each treatment). The tumor did not recur and no metastasis was observed during the first 23 months subsequent to treatment.

Discussion

PT may coexist with breast cancer in three situations. It may coexist in the bilateral breast, for example with IDC in one breast and a malignant PT in the other breast (12). PT has also been detected in the ipsilateral breast, such as IDC in the upper outer quadrant of the left breast and malignant PT in the lower outer quadrant of the left breast (13). Finally, PT may coexist with breast cancer in the same mass, as occurred in the current

Table I. Occurrence of breast carcinoma within PT.

No. First andror (Ref.) Fig. App. Diameter, cm Type NA A Anne, cm NA Anne, cm NA <th< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th>Щ</th><th>PT</th><th>Breast carcinoma</th><th>cinoma</th><th></th><th></th><th>Hollow</th></th<>							Щ	PT	Breast carcinoma	cinoma			Hollow
Leong et al (26) Leong et al (24) Leong et al (25) Leong et al	No.	First author (Ref.)	Year	Age, years	Surgery	AxDs	Type	Diameter, cm	Type	Diameter, cm	LNI, n	Survival status	time, months
Lenge et al (2,0) 1980 51 MX (+) Benign 40 TTC NA (+) Alive Clobe Bengle et al (14) 1983 55 LoEx (+) Benign 35 DCS NA NA NA Clobe Bengle et al (12) 1983 55 LoEx (+) Benign 190 DCS NA NA Alive Grove et al (23) 1984 41 MX (+) Benign 40 LCIS Focal NA Alive Kenidate et al (13) 1984 47 MX (+) Benign 40 LCIS NA Alive Kenidate et al (15) 1988 47 MX (+) Benign 170 LCIS NA Alive Kenidate et al (15) 2003 47 MX (+) Benign 170 LCIS NA Alive Kenidate et al (15) 2003 47 MX (+) Benign 170 LCIS NA	-	Leong et al (26)	1980	49	LoEx	-	Benign	6.0	TCIS	NA		NA	NA
Cobe Beuglet et al (14) 1983 55 LoER (+) Benign 35 DCIS+LCIS NA NA NA Cobe Beuglet et al (14) 1983 60 LoER (+) Benign 30 DCIS 0 (+) Alive Grove et al (27) 1984 41 MX (+) Benign 150 DCIS (-) (+) Alive Vand et al (28) 1985 71 MX (+) Benign 150 DCIS (-) Alive Kendear et al (28) 1987 71 MX (+) Benign 150 DCIS (-) Alive Kodima et al (35) 2004 60 NA NA Benign 13 DCIS (-) Alive Kodima et al (35) 2004 60 NA NA Benign 13 DCIS (-) Alive Kodima et al (35) 2004 60 NA NA Benign 13 DCIS NA Alive	2	Leong et al (26)	1980	51	MX	+	Benign	4.0	ITC	NA		Alive	21
Cobe Bauglet et al (14) 1883 60 Lok (+) Benign 3.0 IDC NA NA Crobe Bauglet et al (123) 1884 7.1 MX (+) Benign 5.0 IDC Fo-all NA Alive Ishika et al (123) 1884 4.1 MX (+) Benign 5.0 ICS Fo-all NA Alive Kulkade et al (234) 1886 4.7 MX (+) Benign 1.0 DCIS Fo-all NA Alive Kulkade et al (34) 1888 4.7 MX (+) Benign 1.0 DCIS Fo-all NA Alive Kodima et al (34) 2004 26 Lok Benign 1.0 DCIS Fo-all NA Alive Randosse ct al (31) 2004 26 Lok 1.0 Benign 1.0 DCIS NA Alive Randosse ct al (31) 201 2.0 1.0 Benign 1.0 DCIS + LCIS	3	Cole-Beuglet et al (14)	1983	55	LoEx	(-)	Benign	3.5	DCIS + LCIS	NA		NA	NA
Growe et al (27) 1986 71 MX (+) Benign 56 DCIS 2.0 (+) Alive Bail Grow et al (23) 1984 41 MX (+) Benign 56 IDC Focal NA Alive Ward et al (13) 1986 55 MX (+) Benign 10 ICIS Focal (+) Alive Kundsen et al (13) 1988 47 MX (+) Benign 170 LCIS Focal (+) Alive Kodama et al (39) 1987 47 MX (+) Benign 170 LCIS Focal (+) Alive Randass et al (39) 2004 26 LoEx (+) Benign 150 DCIS NA Alive No et al (34) 2006 69 NX (+) Benign 150 DCIS NA Alive No et al (24) 2011 48 MX (+) Benign 150 DCIS	4	Cole-Beuglet et al (14)	1983	09	LoEx	(-)	Benign	3.0	IDC	NA		NA	NA
bilds et al (10) 1984 41 MX (+) Benign 56 DDC Feeal NA Alive Kundsen et al (15) 1986 57 MX (+) Benign 10 DCIS+LCIS Freeal NA Alive Koundsen et al (15) 1988 47 MX (+) Benign 130 DCIS NA Alive Kodama et al (20) 2003 2004 26 LoEx (+) Benign 130 DCIS NA Alive Roundlass et al (14) 2006 80 NA NA AN Alive NA Alive Roundlass et al (14) 2006 80 NA NA Benign 15 DCIS NA Alive Shinke et al (15) 2011 49 LoEx (+) Benign 15 DCIS NA Alive Shinke et al (23) 2011 49 LoEx (+) Benign 15 DCIS NA Alive	5	Grove <i>et al</i> (27)	1986	71	MX	+	Benign	19.0	DCIS	2.0		Alive	4
Wand et al (28) 1586 555 MX (4) LCIS Feat NA NA Yannach et al (128) 1987 71 MX (+) Benign 10 DCIS+LCIS Multi-focal (-) Alive Yannache et al (30) 2003 47 MX (+) Benign 170 LCIS Feat NA Alive Rodinna et al (30) 2004 26 LoEx (+) Benign 13 DCIS+LCC NA Alive Ramignetia et al (13) 2006 54 MX (+) Benign 150 DCIS NA Alive Nimagnetia et al (13) 2011 49 LoEx (+) Benign 150 DCIS NA Alive Niva et al (23) 2011 49 LoEx (+) Benign 150 DCIS NA Alive Niva et al (32) 2011 49 LoEx (+) Benign 150 DCIS NA Alive <t< td=""><td>9</td><td>Ishida et al (10)</td><td>1984</td><td>41</td><td>MX</td><td>-</td><td>Benign</td><td>5.6</td><td>IDC</td><td>Focal</td><td></td><td>Alive</td><td>30</td></t<>	9	Ishida et al (10)	1984	41	MX	-	Benign	5.6	IDC	Focal		Alive	30
Knudsen et al (15) 1987 71 MX (+) Benign 70 DCIS+LCIS Multi-focal (+) Alive Kondam et al (30) 1033 47 MX (+) Benign 130 DDC NA Alive Kodam et al (30) 2004 26 LoEx (+) Benign 130 DCIS+DC NA Alive Randass et al (31) 2004 26 LoEx (+) Benign 33 DCIS+DC NA Alive No et al (23) 2011 53 LoEx (+) Benign 35 DCIS NA Alive Nintal et al (17) 2011 49 LoEx (+) Benign 35 DCIS NA Alive No et al (23) 2011 49 LoEx (+) Benign 48 LCIS+LC NA Alive No et al (23) 2011 40 NX NA (+) Benign 48 LCIS+LC NA Alive	7	Ward <i>et al</i> (28)	1986	55	MX	NA	Benign	4.0	LCIS	Focal		NA	NA
Yasammat et al (29) 1988 47 MX (+) Benign 130 IDC NA (+) Alive Roadman et al (30) 2003 47 MX (+) Benign 130 IDC NA Alive Randlas et al (31) 2004 26 Lofx (+) Benign 130 DCIS NA Alive No et al (13) 2001 200 6 NA NA Benign 150 DCIS NA Alive No et al (123) 2011 49 Lofx (+) Benign 150 DCIS NA Alive No et al (123) 2011 49 Lofx (+) Benign 48 LCIS+ILC 0.2 NA Alive No et al (123) 2011 49 Lofx (+) Benign 48 LCIS+ILC 0.2 NA NA Ruo et al (123) 2011 45 Lofx (+) Benign 48 LCIS+ILC 0.2 NA<	∞	Knudsen et al (15)	1987	71	MX	+	Benign	7.0	DCIS + LCIS	Multi-focal		Alive	9
Kodama et al (30) 2003 47 MX (+) Benign 17.0 LCIS Focal NA Alive Parificat et al (13) 2004 26 LOEX (+) Benign 3.3 DCIS+DC NA Alive Namaguchi et al (13) 2006 54 MX (+) Benign 15.0 DCIS NA Alive Nixanguchi et al (13) 2008 54 MX (+) Benign 15.0 DCIS NA Alive Nixanguchi et al (13) 2011 49 LOEX (+) Benign 15.0 DCIS NA Alive Nixanguchi et al (13) 2011 49 LOEX (+) Benign 15.0 DCIS NA Alive Nixanguchi et al (13) 201 40 MX (+) Benign 15.0 DCIS NA Alive Nixanguchi et al (13) 201 40 MX (+) Benign 15.0 DCIS NA Alive <	6	Yasumura et al (29)	1988	47	MX	+	Benign	13.0	IDC	NA		Alive	99
Parfit et al (16) 2004 26 LoEx (+) Benign 3.3 DCIS+IDC NA (+)4/13 Alive Ramdass et al (31) 2006 69 NA NA Benign NA NA NA Alive Yamagest et al (31) 2006 69 NA NA Benign 3.5 DCIS Pocal NA Alive Nic et al (33) 2011 49 LoEx (-) Benign 4.8 LCIS+ILC 0.2 NA Alive No et al (19) 2010 26 MX SLNB Borderline 4.8 LCIS+ILC 0.2 NA Alive No cet al (19) 2010 25 MX 5.1 Borderline 6.5 ITC+LCIS 2.4 (-) NA No cet al (19) 2011 5.2 MX (-) Borderline 6.5 ITC+LCIS 2.4 (-) NA Presente case 2014 5.2 MX (-) Malignant 1	10	Kodama et al (30)	2003	47	MX	-	Benign	17.0	LCIS	Focal		Alive	108
Ramidase et al (31) 2006 69 NA NA Benign NA SCC NA NA NA Ye magachi et al (11) 2008 54 MX () Benign 15.0 DCIS 6.0 NA Alive Nic and (23) 2011 53 LoEx () Benign 4.8 LCIS+ILC 0.2 NA Alive Shiriah et al (17) 2011 49 LoEx () Borderline 1.0 0.5 NA NA Alive Deodhar et al (32) 2011 53 LoEx SLNB Borderline 1.0 DCIS NA NA Quinlan-Davidson et al (18) 2014 52 MX () Borderline 1.0 DCIS NA NA All contracts et al (33) 1975 MX () Malignant 4.0 DCIS 7.1 NA All contracts et al (34) 1984 57 MX () Malignant 1.0 DCIS 7.0	11	Parfitt et al (16)	2004	26	LoEx	+	Benign	3.3	DCIS + IDC	NA		Alive	36
Yamaguchi et al (1) 2008 54 MX (+) Benign 15.0 DCIS Focal NA Alive Nine et al (33) 2011 49 LoEx (+) Benign 4.5 LCIS+HLC 0.5 NA Alive Docothar et al (131) 2011 49 LoEx (+) Borderline 1.00 DCIS 6.5 NA NA Ruo et al (134) 2010 26 MX SLNB Borderline 1.00 DCIS 7.0 NA	12	Ramdass et al (31)	2006	69	NA	NA	Benign	NA	SCC	NA	NA	NA	NA
Nive et al (23) 2011 53 LoEx (+) Benign 3.5 DCIS NA Alive Sliriah et al (177) 2011 49 LoEx (+) Benign 4.8 LCIS+ILC 0.2 NA NA December et al (32) 197 5.1 LoEx SLNB Borderline 14.0 DCIS Focal (+) NA Quinlan-Davidson et al (13) 2011 5.2 MX (+) Borderline 6.5 ITC+LCIS 2.4 (+) NA Present case 2014 5.2 MX (+) Borderline 6.5 ITC+LCIS 2.4 (+) NA Persent case 2014 5.2 MX (+) Borderline 6.5 ITC+LCIS 2.4 (+) Alive Persent case 2014 5.2 MX (+) Malignant 4.0 IDC 5.4 (+) NA Klaura ablen et al (25) 1984 5.7 MX (+) Malignan	13	Yamaguchi et al (1)	2008	54	MX	-	Benign	15.0	DCIS	Focal	NA	Alive	12
Shirah et al (17) 2011 49 LoEx () Benign 48 LCIS+ILC 0.2 NA NA Boedbar et al (32) 1977 51 LoEx () Borderline 14.0 DCIS Focal NA NA Quinlan-Davidson et al (18) 2010 26 MX () Borderline 6.5 ITC+LCIS 2.4 () Alive Quinlan-Davidson et al (18) 2011 5.2 MX () Borderline 6.5 ITC+LCIS 2.4 () Alive Present case 2014 5.2 MX () Malignant 6.0 DCIS Focal ()/1/21 Alive Seemayer et al (34) 1984 5.7 MX () Malignant 1.0 DCIS Focal ()/1/21 Alive Hunger et al (34) 1992 4.7 MX () Malignant 1.0 DCIS Focal () Alive Schawickearth et al (24) 1992 4.7 <td>14</td> <td>Nio <i>et al</i> (23)</td> <td>2011</td> <td>53</td> <td>LoEx</td> <td>-</td> <td>Benign</td> <td>3.5</td> <td>DCIS</td> <td>0.5</td> <td>NA</td> <td>Alive</td> <td>24</td>	14	Nio <i>et al</i> (23)	2011	53	LoEx	-	Benign	3.5	DCIS	0.5	NA	Alive	24
Boodhar et al (32) 1997 51 LoEx (+) Borderline 140 DCIS Focal NA NA Kuo et al (19) 2010 26 MX SLNB Borderline 100 LDC 2.5 ITC Alive Present case 2011 5.3 LoEx SLNB Borderline 10.0 LDC 7.2 ITC Alive Present case 2011 5.3 LoEx SLNB Borderline 10.0 LDC Focal (+) Alive Seemayer et al (33) 1975 2.7 MX (+) Malignant 4.0 DCIS Focal (+) NA Hunger et al (34) 1984 5.7 MX (+) Malignant 1.0 DCIS NA (-) NA Schwickerath et al (73) 1997 4.7 MX (+) Malignant 2.0 DCIS NA (-) NA Nishimura et al (25) 2001 4.7 MX (+)	15	Shirah et al (17)	2011	49	LoEx		Benign	4.8	LCIS + ILC	0.2	NA	NA	NA
Kuo et al (19) 26 MX SLNB Borderline 100 DC 25 ITC Alive Quinfian-Davidson et al (18) 2011 53 Loëx SLNB Borderline 65 ITC+LCIS 2.4 (.) NA Present case 2014 52 MX (.) Malignant 40 DC Focal (.) NA Klausner et al (34) 1984 57 MX (.) Malignant 40 DC Focal (.) NA Hunger et al (35) 1984 57 MX (.) Malignant 155 SCC NA (.) NA Schwickerath et al (35) 1992 47 MX (.) Malignant 155 SCC NA (.) NA Padmanabhan et al (35) 1997 47 MX (.) Malignant 155 SCC NA (.) NA Nobic et al (25) 2001 39 MX (.) Malignant 1	16	Deodhar et al (32)	1997	51	LoEx	-	Borderline	14.0	DCIS	Focal	NA	NA	NA
Quinlan-Davidson et al (18) 2011 53 LoEx SLNB Borderline 6.5 ITC+LCIS 2.4 (·) NA Present case 2014 52 MX (·) Malignant 6.0 DCIS Focal (·) NA Seemayer et al (34) 1975 27 MX (·) Malignant 6.0 DCIS Focal (·) NA Hugerer et al (34) 1984 57 MX (·) Malignant 1.5 SCC NA (·) NA Hugerer et al (34) 1992 47 MX (·) Malignant 1.5 CCIS NA (·) NA Schwickerath et al (3) 1992 47 MX (·) Malignant 1.5 LCIS Focal (·) NA Padmanabhan et al (24) 1998 80 LoEx (·) Malignant 1.5 LCIS NA NA NA Nishimura et al (25) 2001 39 MX (·)	17	Kuo <i>et al</i> (19)	2010	26	MX	SLNB	Borderline	10.0	IDC	2.5	ITC	Alive	15
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Seemayer et al (33) 1975 27 MX (+) Malignant 6.0 DCIS Focal NA NA Klausner et al (34) 1983 60 MX (+) Malignant 4.0 IDC Focal (-) NA Hunger et al (34) 1984 57 MX (+) Malignant 15.5 SCC NA (-) NA Schwickerath et al (35) 1992 47 MX (+) Malignant 2.0 DCIS NA (-) NA Padmanabhan et al (24) 1998 80 LoEx (+) Malignant 10.5 DCIS NA NA NA Alive NA NA NA Malignant 10.5 DCIS NA	19	Present case	2014	52	MX	+	Borderline	3.0	IDC	Focal	(+)1/21	Alive	23
Klausner et al (34) 1983 60 MX (+) Malignant at al (35) 10C Focal (+) NA Hunger et al (35) 1984 57 MX (+) Malignant 15.5 SCC NA (-) NA Schwickerath et al (35) 1992 47 MX (+) Malignant 2.0 DCIS NA (-) NA Padmanabhan et al (24) 1998 80 LoEx (-) Malignant 10.5 DCIS NA NA NA Nishimura et al (24) 2001 39 MX (-) Malignant 10.5 DCIS NA NA NA Lim et al (25) 2005 45 MX (-) Malignant 12.0 DCIS NA NA NA Nomura et al (37) 2006 75 MX (-) Malignant 2.0 DCIS NA NA Alive Sugie et al (20) 2010 70 MX (-) Malignant	20	Seemayer et al (33)	1975	27	MX	-	Malignant	0.9	DCIS	Focal	NA	NA	NA
Hunger et al (35) 1984 57 MX (+) Malignant 15.5 SCC NA (-) NA Schwickerath et al (7) 1992 47 MX (+) Malignant 2.0 DCIS NA (-) NA Padmanabhan et al (24) 1997 47 MX (+) Malignant 7.5 LCIS Focal (-) Alive Nishimura et al (24) 1998 80 LoEx (-) Malignant 10.5 DCIS NA NA NA Albe et al (36) 2001 39 MX (-) Malignant 12.0 DCIS NA NA NA Nomura et al (35) 2005 45 MX (-) Malignant 12.0 DCIS NA NA Alive Sugie et al (20) 2007 54 MX (+) Malignant 2.0 NA (+) Malic Macher-Goeppinger et al (21) 2010 43 LoEx (+) Malignant	21	Klausner et al (34)	1983	09	MX	+	Malignant	4.0	IDC	Focal	(-)	NA	NA
Schwickerath et al (7) 1992 47 MX (+) Malignant Malignant 2.0 DCIS NA (-) NA langmant Padmanabhan et al (24) 1997 47 MX (+) Malignant 7.5 LCIS Focal (-) Alive Nishimura et al (24) 1998 80 LoEx (-) Malignant 10.5 DCIS NA NA Deceased Alo et al (36) 2001 39 MX (-) Malignant 12.0 DCIS NA NA Deceased Nomura et al (37) 2006 75 MX (-) Malignant 2.0 DCIS NA Alive Korula et al (20) 2007 54 MX (+) Malignant 2.10 DCIS NA (+) Deceased Korula et al (21) 2008 51 MX (+) Malignant 2.10 DCIS NA (+) NA Abdul Aziz et al (6) 2010 43 LOEx (+) <td>22</td> <td>Hunger et al (35)</td> <td>1984</td> <td>57</td> <td>MX</td> <td>+</td> <td>Malignant</td> <td>15.5</td> <td>SCC</td> <td>NA</td> <td>(-)</td> <td>NA</td> <td>NA</td>	22	Hunger et al (35)	1984	57	MX	+	Malignant	15.5	SCC	NA	(-)	NA	NA
Padmanabhan et al (24) 1997 47 MX (+) Malignant of al (24) 7.5 LCIS Focal (-) (-) Alive Nishimura et al (24) 1998 80 LoEx (-) Malignant 10.5 DCIS NA NA NA Alo et al (36) 2001 39 MX (-) Malignant 12.0 DCIS NA NA NA Lim et al (25) 2005 45 MX (-) Malignant 12.0 DCIS NA NA Alive Nomura et al (37) 2006 54 MX (-) Malignant 21.0 DCIS NA Alive Korula et al (20) 2008 51 MX (+) Malignant 21.0 DCIS NA (+) NA Abdul Aziz et al (6) 2010 43 LoEx (-) Malignant 10.0 1CC 6.0 (-) Alive Choi et al (22) 2012 43 (+) Malignant 10.	23	Schwickerath et al (7)	1992	47	MX	+	Malignant	2.0	DCIS	NA	(-)	NA	NA
Nishimura et al (24) 1998 80 LoEx (-) Malignant 10.5 DCIS NA NA DCIS NA NA NA Alo et al (36) 2001 39 MX (-) Malignant 12.0 DCIS NA NA NA Lim et al (35) 2005 75 MX (-) Malignant 3.5 DCIS NA Alive Sugie et al (20) 2007 54 MX (+) Malignant 8.0 SCC NA (-) Deceased Korula et al (21) 2008 51 MX (+) Malignant 21.0 DCIS NA (+) Na Abdul Aziz et al (6) 2010 43 LoEx (-) Malignant 3.5 ITC+ DCIS (-) NA Alive Choi et al (22) 2012 43 LoEx (-) Malignant 3.5 ITC+ DCIS (-) NA Alive	24	Padmanabhan et al (2)	1997	47	MX	+	Malignant	7.5	TCIS	Focal	(-)	Alive	9
Alò et al (36) 2001 39 MX NA Malignant 9.0 DCIS NA NA NA Lim et al (25) 2005 45 MX (-) Malignant 12.0 DCIS NA Alive Nomura et al (37) 2006 75 MX (+) Malignant 8.0 SCC NA (-) Deceased Korula et al (21) 2008 51 MX (+) Malignant 21.0 DCIS NA (+) Alive Macher-Goeppinger et al (38) 2010 70 MX (+) Malignant 6.0 IDC 2.5 (-) NA Abdul Aziz et al (6) 2010 43 LoEx (-) Malignant 10.0 ICC 6.0 NA Alive	25	Nishimura <i>et al</i> (24)	1998	80	LoEx	-	Malignant	10.5	DCIS	NA	NA	Deceased	3
Lim et al (25) 2005 45 MX (-) Malignant Malignant 12.0 DCIS NA NA Deceased Nomura et al (37) 2006 75 MX (+) Malignant 8.0 SCC NA (-) Deceased Sugie et al (20) 2007 54 MX (+) Malignant 21.0 DCIS NA (+) Deceased Korula et al (21) 2008 51 MX (+) Malignant 6.0 IDC 7.2 Alive Abdul Aziz et al (6) 2010 43 LoEx (-) Malignant 10.0 ICC 6.0 (-) Alive	26	Alò <i>et al</i> (36)	2001	39	MX	NA	Malignant	0.6	DCIS	NA	NA	NA	NA
Nomura et al (37) 2006 75 MX (-) Malignant 3.5 DCIS NA Alive Sugie et al (20) 2007 54 MX (+) Malignant 8.0 SCC NA (-) Deceased Korula et al (21) 2008 51 MX (+) Malignant 21.0 DCIS NA (+) Alive Macher-Goeppinger et al (38) 2010 70 MX (+) Malignant 6.0 IDC 2.5 (-) NA Abdul Aziz et al (6) 2010 43 LoEx (+) Malignant 10.0 ICC 6.0 (-) Alive	27	$\operatorname{Lim} et al (25)$	2005	45	MX	(-)	Malignant	12.0	DCIS	9.0	NA	Deceased	108
Sugie et al (20) 2007 54 MX (+) Malignant Malignant 8.0 SCC NA (-) Deceased Korula et al (21) 2008 51 MX (+) Malignant 21.0 DCIS NA (+)2/12 Alive Macher-Goeppinger et al (38) 2010 70 MX (+) Malignant 6.0 IDC 2.5 (-) NA Abdul Aziz et al (6) 2010 43 LoEx (+) Malignant 10.0 ICC 6.0 (-) Alive	28	Nomura $et al (37)$	2006	75	MX	-	Malignant	3.5	DCIS	NA	NA	Alive	32
Korula et al (21) 2008 51 MX (+) Malignant Macher-Goeppinger et al (38) DCIS NA (+)2/12 Alive Macher-Goeppinger et al (38) 2010 70 MX (+) Malignant 6.0 IDC 2.5 (-) NA Abdul Aziz et al (6) 2010 43 LoEx (-) Malignant 10.0 ICC 6.0 (-) Alive	29	Sugie et al (20)	2007	54	MX	+	Malignant	8.0	SCC	NA	<u>-</u>)	Deceased	40
Macher-Goeppinger et al (38) 2010 70 MX (+) Malignant 6.0 IDC 2.5 (-) NA Abdul Aziz et al (6) 2010 43 LoEx (-) Malignant 3.5 ITC + DCIS 0.2 NA Alive Choi et al (22) 2012 62 MX (+) Malignant 10.0 ICC 6.0 (-) Alive	30	Korula $et al (21)$	2008	51	MX	+	Malignant	21.0	DCIS	NA	(+)2/12	Alive	11
Abdul Aziz et al (6) 2010 43 LoEx (-) Malignant 3.5 ITC + DCIS 0.2 NA Alive Choi et al (22) 2012 62 MX (+) Malignant 10.0 ICC 6.0 (-) Alive	31	Macher-Goeppinger et al (38)	2010	70	MX	+	Malignant	0.9	IDC	2.5	<u>-</u>)	NA	NA
2012 62 MX (+) Malignant 10.0 ICC 6.0 (-) Alive	32	Abdul Aziz et al (6)	2010	43	LoEx	-	Malignant	3.5	ITC + DCIS	0.2	NA	Alive	12
	33	Choi <i>et al</i> (22)	2012	62	MX	+	Malignant	10.0	CC	0.9	(-)	Alive	24

AXDs, axillary dissection; DCIS, ductal carcinoma in situ; ICC, invasive cribriform carcinoma; IDC, invasive ductal carcinoma; ILC, invasive lobular carcinoma; ITC, invasive tubular carcinoma; LCIS, lobular carcinoma in situ; LNI, lymph node involvement; LoEx, local excision; MX, mastectomy; NA, not available; PT, phyllodes tumor; Ref., reference; SCC, squamous cell carcinoma.

case. Breast carcinoma arising within PT is extremely rare. A literature search of the PubMed database (www.pubmed.com) was performed using the following search terms: 'breast cancer with phyllodes tumor' and 'coexistence of breast cancer and phyllodes tumor'. A total of 1,593 studies were retrieved. Using the following criteria, it was determined that <40 cases of breast carcinoma arising within PT have previously been reported in the literature (Table I) (1,2,7,8,10,11,14-38). Inclusion criteria: i) published between 1974 and 2013; ii) English language; and iii) PT coexisting with breast cancer in the same tumor. Exclusion criteria: i) PT and breast cancer coexisting in the bilateral breast; ii) PT and breast cancer coexisting in the ipsilateral breast in different tumors; iii) no detailed pathological results; and iv) only the abstract available in English, full-text in a different language. The age of the patients with a coexistent breast carcinoma and PT ranged between 26 and 80 years, with a median age of 52 years. The reported breast carcinoma subtypes included in situ and invasive lobular and ductal (no specific type) carcinoma, invasive tubular carcinoma, squamous cell carcinoma and invasive cribriform carcinoma. Malignant epithelial elements were reported in all types of PT. Breast carcinoma was most commonly reported in malignant (n=14) and benign (n=15) PTs, but rarely in borderline PTs (n=4, including the present case). Of the three cases of borderline PTs reported (excluding the present case), Kuo et al presented the case of a patient with a painless mass in the left breast, which had been present for 4 years. Following rapid growth of the tumor, the patient was diagnosed with invasive ductal carcinoma arising within a phyllodes tumor with isolated tumor cells identified in the sentinel lymph node (19). Mastectomy and sentinel lymph node biopsy were performed followed by hormonal therapy (goserelin acetate and tamoxifen), adjuvant chemotherapy (5-fluorouracil, epirubicin and cyclophosphamide) and reconstructive surgery. No tumor recurrence was reported during the 15 month follow-up period. Quinlan-Davidson et al (18) reported the case of a patient with a painless mass in the right breast that had been present for several years. Following two years of rapid growth of the mass the patient was diagnosed with borderline phyllodes tumor with an incidental invasive tubular carcinoma and lobular carcinoma in situ component. An excisional biopsy was performed and subsequently the patient underwent a re-excision for margin safety and a sentinel lymph node biopsy, which revealed that all three sentinel lymph nodes were negative for malignancy. In addition, Deodhar et al (32) reported a case of borderline phyllodes tumor with a ductal carcinoma in situ (DCIS) component. However, the outcome of the patient was not reported. Coexisting breast carcinoma within PTs more commonly demonstrated a ductal phenotype (IDC, n=7; DCIS, n=15) compared with a lobular phenotype (ILC, n=1; lobular carcinoma in situ, n=7). A pure carcinoma in situ element was identified in 17 cases and was determined to be invasive in the other 16 cases. In addition, 6 cases were found to possess two types of malignant epithelial elements (6,14-18). The PT size was not described in one case and the mean diameter of the tumor was 7.9±5.3 cm. Yamaguchi et al (1) reported 7 cases of DCIS in PTs with a mean tumor size of 11.9 cm (15). Nio et al (23) reported that the mean diameter of breast carcinoma within PTs was 8.0 cm (14). The carcinoma size of the present case could not be measured.

In the previously reported literature, 10 cases were treated with local excision and 23 cases were treated with mastectomy. Of the 16 cases that received axillary surgery, three cases exhibited axillary lymph node metastasis and one possessed an isolated tumor cell in the SLN. As there is no standard adjuvant treatment strategy for this type of disease, a variety of systemic therapies were applied to the various cases. In total, 6 cases received chemotherapy with various regimens (16,19-23), 5 cases received radiotherapy (13,16,18,20), and 4 cases received endocrine therapy, 3 of which received tamoxifen (1,16,21) and 1 received tamoxifen and goserelin (19). Patient outcomes were described in 19 cases. The follow-up time was between 3 and 108 months. In total, 16 patients were alive at the end of last follow-up. Distance metastasis occurred in the lung in 2 cases at 3 and 32 months subsequent to surgery, respectively (20,24). Similar to the current case, Kuo et al (19) and Parfitt et al (16) reported the combination of surgery, chemotherapy and radiotherapy for patients with lymph node metastasis who present breast carcinoma within PT. In addition, 3 cases succumbed to the disease, 3, 40 and 108 months subsequent to surgery, respectively (20,24,25) (Table I).

In summary, the present study reports a rare case of IDC within a borderline PT. The imaging experiments performed lacked specificity. Instead, histology and immunohistochemistry are the golden standard for diagnosing this type of disease. The combination treatment of surgery, chemotherapy and radiotherapy was effective in the current case. Various types of breast carcinoma have been identified to coexist with PT in different masses; however, no standard therapeutic regimen has been established for the coexistence of PT and breast cancer in the same mass. The determination of an appropriate treatment strategy predominantly depends on the characteristics of the individual breast tumor, such as the hormone receptor status, HER-2 status and axillary lymph node metastasis status. Thus, future cases should undergo detailed analysis of tumor characteristics with reference to the molecular subtype and clinical pathological characteristics in order to select the optimal treatment strategy for breast cancer within phyllodes tumors.

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