

# Mammographic and Ultrasonographic Findings of Invasive Ductal Carcinoma of Breast at Surin Hospital

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## ABSTRACT

**Objective :** To review mammographic and ultrasonographic findings of invasive ductal carcinoma (IDC) of breasts at Surin Hospital.

**Research design :** Descriptive retrospective study

**Setting :** Surin hospital

**Materials and methods :** Total of 80 pathologically proven cases of invasive ductal carcinoma during January 1st 2009 to December 31st 2010 were retrospectively reviewed for mammographic and ultrasonographic features.

**Result :** Seventy one masses in 70 patients have been detected in 80 mammography. There are 2 masses in one patient. The others, 10 patients, revealed no mass lesions on mammography; 5 patients were asymmetrical density and 5 patients were normal. However, adjunctive ultrasonography could demonstrate these lesions. The most common mammographic findings of invasive ductal carcinoma of breast cancer were abnormal mass with irregular shape (84.5%). The most common margin of masses on mammography was spiculated margin (36.6%) followed by indistinct (ill-defined) margin (32.4%). Malignant microcalcifications were found in 38 patients (47.5%) and the most common type of microcalcification was mixed type (47.3%). Mammography was better than ultrasonography in depicting microcalcifications. (38 versus 22 patients). Axillary lymphadenopathy was demonstrated in 20 patients (25 %). Ultrasonography was better than mammography in detection of masses, especially in dense breast parenchyma on mammogram. 81 masses have been demonstrated by ultrasonography. The most common ultrasonographic appearance of invasive ductal carcinoma (IDC) of breast cancer was irregular shape (78.7%) and angulated margin (69.1%). Low echogenicity was the most common echo presentation of IDC (86.4%). Most frequent posterior attenuation on ultrasonography was posterior shadowing (29.6%) followed by posterior enhancement (28.4%).

**Conclusion :** The most common malignant mammographic feature are irregular shape (84.5%) and spiculated margin (36.6%). Multiple suggestive malignant signs such as malignant microcalcifications, axillary lymphadenopathy and skin thickening should be used to improved confidence of diagnosis. Most common ultrasonographic features of IDC are irregular mass and angular margin. The most common posterior attenuation of IDC is posterior shadowing (29.6%). Adjunctive ultrasonography is suggested to increase confidence of diagnosis.

**Key words :** mammographic, ultrasonographic findings, invasive ductal carcinoma

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## ลักษณะภาพถ่ายทางรังสีและอัลตราซาวน์ของมะเร็งเต้านมชนิด Invasive Ductal Carcinoma ในโรงพยาบาลสุรินทร์

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### บทคัดย่อ

**วัตถุประสงค์ :** เพื่อศึกษาลักษณะทางรังสีวิทยาจากการตรวจแมมโมแกรมและอัลตราซาวน์ของผู้ป่วยมะเร็งเต้านมชนิด Invasive ductal carcinoma

**สถานที่ศึกษา :** โรงพยาบาลสุรินทร์

**รูปแบบการวิจัย :** การวิจัยเชิงพรรณนา แบบย้อนหลัง

**วิธีการศึกษา :** ทำการศึกษาย้อนหลังในผู้ป่วยมะเร็งเต้านมชนิด Invasive ductal carcinoma ที่ได้รับการตรวจแมมโมแกรม และอัลตราซาวน์ จำนวน 80 ราย ตั้งแต่ 1 มกราคม 2552 – 31 ธันวาคม 2553 โดยผู้ป่วยทุกรายมีผลทางพยาธิวิทยายืนยันว่าเป็นมะเร็งเต้านมชนิด Invasive ductal carcinoma

**ผลการศึกษา :** จากการศึกษาผู้ป่วยมะเร็งเต้านมชนิด Invasive ductal carcinoma ที่ได้รับการตรวจ แมมโมแกรม และอัลตราซาวน์ จำนวน 80 ราย พบรอยโรคโดยแมมโมแกรมจำนวน 71 รอยโรคจากผู้ป่วยจำนวน 70 ราย ในจำนวนผู้ป่วย 10 รายที่ไม่พบรอยโรคโดยแมมโมแกรมพบว่ามีผู้ป่วย 5 รายมีผลแมมโมแกรมปกติ ส่วนที่เหลืออีก 5 ราย ผลการตรวจแมมโมแกรมแสดงแค่การไม่สมมาตร (asymmetrical density) ของเนื้อเต้านมทั้งสองข้าง ลักษณะรูปร่างของมะเร็งเต้านมชนิด Invasive ductal carcinoma ที่พบมากที่สุดจากการตรวจด้วยเครื่องแมมโมแกรมได้แก่ ก้อนที่มีรูปร่างผิดปกติไม่สม่ำเสมอ (irregular shape) (84.5%) ลักษณะขอบเขตของมะเร็งเต้านมชนิด Invasive ductal carcinoma ที่พบมากที่สุดจากการตรวจด้วยเครื่องแมมโม-แกรมได้แก่ ลักษณะที่เป็นหนามแหลม (spiculated margin) (36.6%) รองลงมาได้แก่ก้อนที่มีขอบเขตไม่ชัดเจน แยกจากเนื้อเยื่อข้างเคียงได้ยาก (indistinct or ill-defined margin) (32.4%) พบหินปูนร่วมกับก้อนมะเร็ง ในผู้ป่วย 38 ราย (47.5%) ส่วนมากเป็นชนิดผสมทั้งแบบ granular และ linear, (47.3%) ภาพแมมโมแกรมมีความไวในการตรวจพบหินปูนที่เกิดจากมะเร็งได้ดีกว่าการตรวจด้วยเครื่องอัลตราซาวน์ ในการศึกษาครั้งนี้ตรวจพบว่าการแพร่กระจายของมะเร็งเต้านมชนิด Invasive ductal carcinoma ไปยังต่อมน้ำเหลืองที่รักแร้จำนวน 20 ราย (25%) สำหรับการตรวจเต้านมด้วยเครื่องอัลตราซาวน์ พบว่ามีความไวในการตรวจหาก้อนมะเร็งได้ดีกว่าการตรวจด้วยเครื่องแมมโมแกรม โดยเฉพาะเต้านมที่มีความหนาแน่นของเนื้อเต้านมสูง การตรวจด้วยเครื่องอัลตราซาวน์สามารถพบก้อนมะเร็งได้ 81 ก้อน จากผู้ป่วยทั้งหมด 80 ราย ลักษณะรูปร่างของมะเร็งเต้านมชนิด Invasive ductal carcinoma ที่พบมากที่สุดจากการตรวจด้วยเครื่องอัลตราซาวน์ได้แก่ ก้อนที่มีรูปร่างผิดปกติไม่สม่ำเสมอ (irregular shape) (78.7%) และ ขอบไม่เรียบมีลักษณะเป็นหนามแหลม (angulated margin) (69.1%) ลักษณะภายในก้อนที่พบมากที่สุดจากการตรวจด้วยเครื่อง อัลตราซาวน์ ได้แก่ แบบ low echo และพบเงาหลังรอยโรค (posterior shadowing) 29.6% ส่วน posterior enhancement พบ 28.4%.

**สรุป :** ลักษณะของมะเร็งเต้านมชนิด Invasive ductal carcinoma ที่พบมากที่สุดจากการตรวจด้วยเครื่องแมมโมแกรมได้แก่ ก้อนที่มีรูปร่างผิดปกติไม่สม่ำเสมอ (irregular shape) (84.5%) และลักษณะที่เป็นหนามแหลม (spiculated margin) (36.6%) ส่วนลักษณะรูปร่างของมะเร็งเต้านมชนิด Invasive ductal carcinoma ที่พบมากที่สุดจากการตรวจด้วยเครื่องอัลตราซาวน์ ได้แก่ ก้อนที่มีรูปร่างผิดปกติไม่สม่ำเสมอ (irregular shape) (78.7%) และขอบไม่เรียบมีลักษณะเป็นหนามแหลม (angulated margin) (69.1%) การใช้เครื่องอัลตราซาวน์ตรวจเต้านมร่วมกับการตรวจเครื่องแมมโมแกรมและการตรวจพบลักษณะของมะเร็งเต้านมชนิด Invasive ductal carcinoma อื่นๆ ได้แก่ การพบหินปูนในก้อนมะเร็ง, พบต่อมน้ำเหลืองที่รักแร้โต, พบผิวหนังของเต้านมหนาขึ้น หรือ พบการดึงรั้งของหัวนมจากการตรวจเครื่องแมมโมแกรม ทำให้การวินิจฉัยมะเร็งเต้านมมีความแม่นยำมากขึ้น

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## INTRODUCTION

Breast cancer is the most prevalent cancer among women in the world and one of leading cause of death owing to cancer throughout the world nowadays.<sup>1</sup> The actual cause of breast cancer is not definitely known, probably due to multiple factors.<sup>2</sup> The risk of cancer increases with age.<sup>2</sup> However, the incidence of breast cancer is increasing in younger women and the incidence of breast cancer of women in all ages is rising.<sup>2</sup>

For Thailand, breast cancer is the first most common cancer in female and second cause of death in women today. The number of new cases of breast cancer has been increased by 20.9 per 100,000 women, approximately.<sup>3</sup> The most common pathological type of breast cancer is invasive ductal carcinoma, range from 84-93.1%.<sup>3</sup>

Successful treatment is increased by early and accurate diagnosis. Mammography is the acceptable imaging modality for screening and diagnosis of breast cancer. The sensitivity of mammography is range from 63% to 98% and decreased to 30-48% in dense breast.<sup>4</sup> Ultrasonography is a well established adjunctive imaging modality for mammography to diagnosis of breast cancer with increased diagnostic accuracy of breast cancer detection.<sup>4-7</sup> An abnormal mass on mammography was reported in 50% of carcinomas with less than 10-mm. diameter and 88% of those greater than 10-mm. diameter.<sup>8</sup> Spiculated masses on mammog-

raphy were reported in up to 84% of breast cancer.<sup>9</sup> Nevertheless, in 1969, Gershon-Cohen J et al study revealed up to 60% of malignant lesions showed no classical breast cancer sign.<sup>10</sup>

## MATERIALS AND METHODS

This research is a retrospective descriptive study of total 80 pathologically proven cases of invasive ductal carcinoma during January 1st 2009 - December 31st 2010. Mammography was performed with dedicated equipment (Selenia™ Full Field Digital Mammography - LORAD, a Hologic Company). Standard craniocaudal and mediolateral oblique views were routinely obtained and additional views such as magnification view were also obtained for better delineation of a mass or microcalcifications. Findings of mammography were interpreted for malignant appearance of breast cancer including soft tissue abnormality with mass or without mass, asymmetric density, architectural distortion, nipple retraction or skin thickening. For mass lesions, characteristics of the masses were reviewed such as shape, margin, presence or absence of microcalcifications, type of microcalcifications, and associated findings such as axillary lymphadenopathy, skin thickening and nipple retraction. All of findings were reviewed via the same definition according to ACR BIRADS Lexicon.<sup>11</sup> The criteria suggestive of axillary lymph nodes metastasis were enlarged axillary

lymph node(s) more than 2 cm., round or irregular shape, increased lymph node density with absence of radiolucent hilar fat.<sup>12,13,</sup>

After mammography had been performed, all patients were sent to breast ultrasonography using high frequency (10 MHz) linear transducers (Aloka ProSound SSD 4000SV). Assessment of sizes and characteristics of mass such as margin, echogenicity, attenuation, halo, depth/width ratio and calcification<sup>14</sup> was performed and retrospectively reviewed all images by radiologists of Surin Hospital.

## RESULT

In this study, there were 80 women with pathological proved invasive ductal carcinoma of the breast and there was 1 patient who had lesions in both breasts. All 80 women underwent mammography and ultrasonography. There ages ranged from 32 to 77 years (mean 54 years). Site and side of lesions were revealed in Table 1. Sizes of lesions ranged from subcentimeters to more than 5 cm. were shown in Table 2.

## MAMMOGRAPHIC FINDINGS

Eighty mammography were reviewed, 71 masses were found in 70 patients. One patient had 2 masses in one mammography. In 10 patients, (12.5%) the mammography revealed no mass on mammography. Of these 10 patients, 5 were asymmetrical density and the others were normal.

Of these 71 masses on mammography, 60 (84.5%) were irregular shape and 11 (15.5%) were round shape. Margins of these masses were spiculated (Fig. 1) in 26 lesions (36.6%), indistinct margin in 23 lesions (32.4%), and the least frequent margin such as circumscribed, microlobulated and indistinct as shown in Table 3.

Microcalcifications in lesions were demonstrated on 38 patients. Most common type of microcalcifications are mixed type of microcalcifications, 18 lesions (47.3%) follow by 12 granular type lesions (31.5%) and 8 linear type lesions (21.0%).

Associated findings such as skin thickening, nipple retraction and axillary lymphadenopathy were detected in 20, 8, 20 mammograms respectively.

## ULTRASONOGRAPHIC FINDINGS

Ultrasound images were available in all 80 patients. One patient had bilateral breast masses. Ultrasonographic findings of masses were reviewed for size, depth/width ratio, shape, margin, echogenicity and attenuation.

Most common shape and margin of these lesions were irregular shape and angular margin, 63 (78.7%) and 56 (69.1%), respectively. Margins of lesion were shown in Table 4.

According to the depth/width ratio, 21 lesions (25.9%) of all tumor masses had an increased ratio representing taller than width appearance. In 70 lesions (86.4%)



revealed low echogenicity, 5 lesions showed very low echogenicity with posterior shadowing and the others were mixed solid and cystic echo. Attenuation patterns of all lesions were shown in Table 5. In detection

of microcalcifications by ultrasonography, we depicted 22 lesions having small hyper-echogenic spots with acoustic shadow suggestive of microcalcifications. All of them were demonstrated on mammography.

**Table 1** Sites of lesions

Site	Right	Left	Total
Upper outer	13	15	28 (39.4%)
Mid outer	3	7	10 (14.0)
Lower outer	1	1	2 (2.8)
Mid lower	1	0	1 (1.4%)
Lower inner	6	5	11 (15.5%)
Mid inner	2	1	3 (4.2%)
Upper inner	5	4	9 (12.7%)
Mid upper	2	2	4 (5.6%)
Central	2	1	3 (4.2%)
Total	35	36	71 (100%)

**Table 2** Sizes of lesions\*

Sizes of tumor	Number
<1cm.	9 (11.1%)
1-2 cm.	38 (46.9%)
2-5 cm.	28 (34.6%)
>5 cm.	6 (7.4%)
Total	81 (100%)

\*Sizes of the lesions come from Ultrasonographic measurement in maximal diameter.

Table 3 Margin of mammographic appearance of lesions

Mammographic Margin	Number
Circumscribed (Well-defined)	2 (2.8%)
Indistinct (ill-defined)	23 (32.4%)
Obscured	7 (9.8%)
Spiculated	26 (36.6%)
Microlobulated	13 (18.3%)
<b>Total</b>	<b>71 (100%)</b>

Table 4 Margin of ultrasonographic appearance of lesion

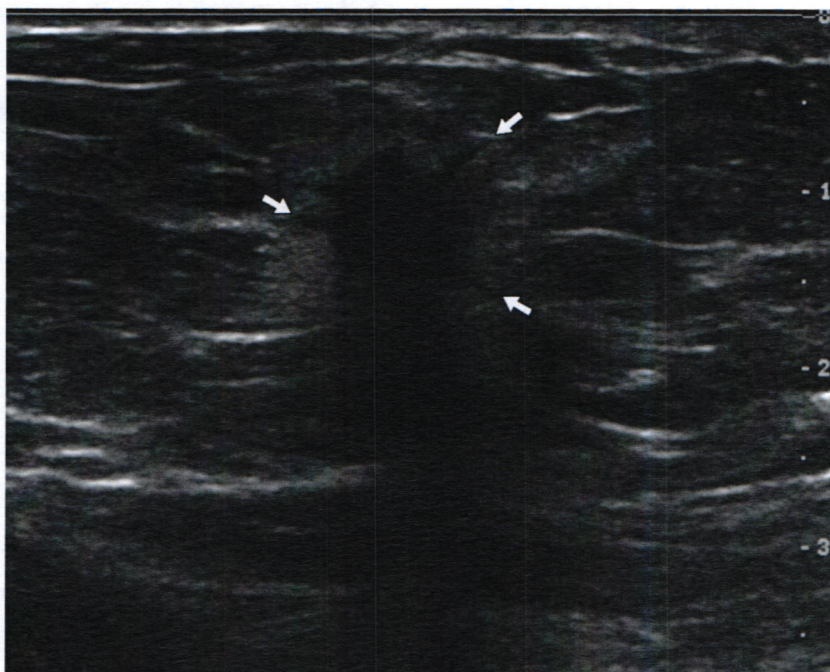
Ultrasonographic Margin	Number
Angulated	56 (69.1%)
Microlobulated	11 (13.6%)
Well circumscribed	5 (6.2%)
Poorly defined	9 (11.1%)
<b>Total</b>	<b>81 (100%)</b>

Table 5 Posterior attenuation of ultrasonographic lesions

Posterior attenuation	Number
Posterior enhancement	23 (28.4%)
Shadowing	24 (29.6%)
Mixed distal effect	12 (14.8%)
No distal effect	22 (27.2%)
<b>Total</b>	<b>81 (100%)</b>



**Fig.1** Mammography left MLO view showed spiculated mass at upper left breast region.



**Fig.2** Ultrasonography of right breast mass (arrows) revealed irregular shape, angular margin, taller than wide with posterior shadowing.



## DISCUSSION

The role of mammography and ultrasonography in imaging of breast cancer has been accepted for several years. The classical appearance of the breast cancer on mammography such as speculated mass was also accepted.<sup>8</sup> In this study the classical spiculated appearance of the breast cancer was found in 26 lesions (36.6%). However, well circumscribed margin lesions, mostly indicate benignancy were detected in 2 lesions (2.8%). But the other secondary signs<sup>10</sup> of malignancy such as microcalcification, skin thickening and additional ultrasounds of these 2 lesions were also detected, which helps for diagnosis for malignant lesion. The most common mammographic finding of malignant breast cancer in this study was irregular shape, 60 lesions (84.5%). According to previous study on Lamb et al study on 2000<sup>15</sup> the classic spiculated margin of the malignant lesions on mammography tend to be low histological grade tumor.

Malignant microcalcifications were also observed in 38 patients from mammography and only 22 patients from ultrasonography. All these 22 patients were also detected microcalcifications on mammograms. As we know that mammography is more sensitive to detected microcalcification.<sup>16</sup>

Malignant appearances of axillary lymph nodes were demonstrated from 20 mammograms. However, on pathological

reports, there were axillary lymph node metastases in 46 patients. Mammography could not detected axillary lymphadenopathy in 26 cases. To explain this, there were 6 patients' positive nodal metastases only in apical lymph nodes that could not be detected on mammogram, 5 patients pathological report revealed only evidence of lymphatic vessel invasion and the other, 15 patients, abnormal findings of axillary lymph nodes could not be detected by mammography possibly owing to small size of nodal metastasis or micro-metastases.

Ultrasonography has been accepted as a cheap and safety imaging modality helping for diagnosis of breast cancer especially in young or Asia patient with dense parenchyma of breast.<sup>14,16-18</sup> Stavros A T, et al in 1995<sup>14</sup> revealed that spiculation, angular margin and low echogenicity are reliable malignant sonographic findings. Similar to this study, angular margin (69.1%) and low echogenicity (86.4%) of the masses were the most common sonographic findings. In this study, 21 lesions (25.9%) showed taller than wide appearances. This sign is low sensitivity but high positive predictive value.<sup>14</sup> The width-AP dimension ratio more than 1.4 seem to be benignity criteria.<sup>16</sup> However in this study, 27 lesions (33.3%) had width-AP dimension more than 1.4, then this sign seem to be less.

Posterior shadowing is one of malignant sign on ultrasonography.<sup>14</sup> Several previous studies<sup>15,19</sup> revealed posterior



shadowing more likely to represent low or intermediate histological grade of tumor and posterior acoustic enhancement of mass more likely found to be high histological grade tumor.

## CONCLUSION

The most common malignant features of invasive ductal carcinoma of the breasts are spiculated margin (36.6%) and irregular shape (84.5%). Some of invasive ductal carcinoma of the breast can show benign features. The secondary signs of malignancy such as malignant microcalcification, axillary lymphadenopathy, skin thickening, architectural distortion and nipple retraction should be use to increase of the confidence of diagnosis. Additional ultrasonography of breasts is recommended to increase the confidence of diagnosis too. The most common malignant ultrasonographic features of breast cancer such as irregular shape, angular margin, posterior shadowing and posterior acoustic enhancement are detected. For axillary lymphadenopathy evaluation, mammography and ultrasonography still have limitation for metastatic lymph nodes locating high level, small sizes of nodes or micro-metastases.

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