INFLITRATING LOBULAR CARCINOMA, PART 2: MRI Morphology and Kinetics

A sinister and stealthy marauder, infiltrating lobular carcinoma (ILC) can potentially elude detection due to its pathologic appearance. As reviewed in the last issue of *The WCC Note*, the shape of ILC at pathology varies. It ranges from tumors with irregular margins; to those displaying diffuse invasion with cells infiltrating single file or loosely associated; to variants with large groups of cells. The particular pattern influences the MRI appearance of ILC; infiltrating lobular carcinoma may look mass like and possibly explosive, but can look crawling and very subtle. Understanding this spectrum can help keep ILC from avoiding discovery.

**What are the MRI appearances of infiltrating lobular carcinoma?**

In our experience, ILC has presented on breast MRI as:

1. An irregular mass or masses with early intense enhancement, often followed by plateau kinetic
2. An irregular mass or masses with lower grade early enhancement followed by progressive/persistent enhancement over time
3. Nonmass type lesion(s) with lower grade early enhancement followed by progressive/persistent enhancement over time
4. Very rarely as an irregular mass with a nearly avascular appearance

The following image sets portray representative examples of ILC, shown with their mammogram and ultrasound, if performed.

**Case 1 – Pathology: ILC**

Mammogram: MLO view

Mammogram: CC view shows irregular density (arrow)

Mammogram: CC spot compression showing density with architectural distortion (arrow)

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**Case 1 (Continued) – Pathology: ILC**

MRI: First post contrast subtraction showing mass with intense enhancement (arrow)

**Case 2 – Pathology: Left 11 o’clock and 4 o’clock ILC, grade 2 of 3**

Mammogram: Left MLO view

Mammogram: Left CC view

Mammogram: Left MLO spot compression showed irregular 1.5 cm spiculated mass with calcifications (arrow)

MRI: spot compression showed 1.5 cm spiculated mass with calcifications (arrow)

Ultrasound showing 11 o’clock irregular shadowing lesion (arrow)

MRI shows upper inner middle depth irregular intensely enhancing lesion on first post contrast subtraction (arrow)

MRI shows a lower outer second intensely enhancing lesion (arrow)

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Case 3 – Pathology: ILC

Mammogram: MLO view shows area of palpable concern (arrow)

Mammogram: CC view shows area of palpable concern (arrow)

MRI shows triangular area of intense enhancement inner breast (arrow)

MRI shows an additional area of early intense lower inner enhancement (arrow)

Case 4 – Pathology: ILC, grade 2

Mammogram: MLO view with upper asymmetric density

Mammogram: CC view with central asymmetric density

Ultrasound with 12 o’clock irregular shadowing mass (arrows)

MRI shows residual early intensely enhancing mass at posterior margin of biopsy cavity (arrows)

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Case 5 – Pathology: ILC moderately differentiated

Mammogram: Right MLO view with large area of architectural distortion retroareolar, spanning 9-11 o’clock

Mammogram: Right CC view with large area of architectural distortion retroareolar, spanning 9-11 o’clock

MRI: Right sagittal T2 weighted image shows ill defined architectural distortion

MRI: Right early post contrast subtraction with lower grade initial nonmass type enhancement

MRI: Right intermediate time frame post contrast subtraction with persistent/progressive nonmass type enhancement

MRI: Right later time frame post contrast subtraction with persistent/progressive nonmass type enhancement (arrow)

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**Case 6** – Pathology: ILC, low grade

![Mammogram: left MLO with posterior density](image1)

![Ultrasound with 1 o'clock posterior irregular shadowing lesion](image2)

![MRI: T2 weighting, showing posterior upper outer asymmetric density](image3)

**Case 7** – Pathology: Left breast 7 o’clock, 2 o’clock and retroareolar biopsies: invasive lobular carcinoma, moderate differentiation, Nottingham score 8/9, and nuclear grade 2/3. Components of lobular carcinoma in situ. ER/PR positive, HER-2/neu negative.

![Mammogram: left MLO view shows multifocal irregular masses](image4)

![Mammogram: left CC spot compression shows multifocal spiculated masses](image5)

![Ultrasound: left 7 o'clock hypoechoic irregular mass](image6)

![Ultrasound: left 3 o'clock hypoechoic irregular mass](image7)

![MRIs showing left multiple irregular masses with plateau dynamic curve, interconnecting enhancing strands, feeding vessel signs, nipple retraction, compatible with her known multifocal, multicentric carcinoma](image8)
What MRI enhancement kinetics can occur with infiltrating lobular carcinoma?

To review, in our experience ILC has demonstrated a gamut of kinetics. While the enhancement may appear intense on the early post contrast data sets, some ILC tumors show low grade early enhancement that peaks later and therefore becomes more conspicuous on the later post contrast images. The delayed orthogonal plane images may be of particular help in that setting.

We have seen the kinetics to be:

1. Early intense, often with plateau over time
2. Early low grade intensity with persistent/progressive increase over time
3. Hypovascular (very rare)

Lopez and Basset summarize the kinetics as tending to show delayed maximal enhancement with washout in only a minority. (1, 2)

What do other authors report as MRI patterns of ILC?

1. Authors report ILC presents on MRI as (1, 2, 3, 4, 5):
   a. A solitary irregular or angular mass with spiculated or ill-defined margins, most frequently,
   b. A dominant lesion with surrounding multiple enhancing foci,
   c. Multiple small enhancing foci with interconnecting enhancing strands or non contiguous clusters,
   d. Regional enhancement and architectural distortion,
   e. Regional, focal, or multifocal heterogeneous enhancement,
   f. Enhancing septa without dominant tumor focus,
   g. And with normal findings.

2. Levi and et al from Emilia, Italy (6) reported 21 patients with ILC. They reported the MRI appearances as:
   a. Solitary mass with irregular margins (n=8);
   b. Mass with smooth margins (n=5);
   c. Multiple small enhancing foci with interconnecting enhancing strands (n=4);
   d. Dominant lesion surrounded by small foci (n=3);
   e. One MR examination was negative.

What are the mammogram appearances of ILC?

1. According to a 2009 review of ILC in Radiographics, Lopez and Bassett report:
   a. ILC typically presents as a mass with an opacity that equals or is less than normal fibroglandular tissue. (1)
   b. It is commonly not seen on either the craniocaudal view (CC) or mediolateral oblique (MLO), though it is seen more often on the CC than the MLO.
   c. The authors summarize the literature regarding the mammographic sensitivity of ILC detection, noting it to be from 57% to 81%, with higher false-negative rates than other invasive cancers due to the difficulty of its mammographic detection.
   d. ILC is often a mass with spiculated or ill-defined margins. Rarely, it can present as a round and circumscribed mass.
   e. Microcalcifications associate with ILC much less frequently than with invasive ductal carcinoma.

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2. A retrospective review of 59 ILC and 59 infiltrating ductal carcinoma (IDC) mammograms in the United Kingdom found:
   a. ILC appeared significantly different on the MLO compared to the CC view, while IDC did not.
   b. ILC and IDC appeared as spiculated masses more often on the CC than the MLO view.
   c. On the MLO view, 41% of ILC appeared as architectural distortions or asymmetric densities.
   d. ILC was often associated with the main glandular density (97%) rather than being isolated (3%)
   e. The CC view was optimal for visualizing ILC as a spiculated mass.
   f. Since ILC is often with the main glandular density, optimizing its visualization is critical. (7)
3. A study of 94 ILC lesions on mammography found:
   a. 60% masses, of which 71% were irregular and spiculated, 21% were asymmetric densities or calcifications (8)
4. In a 1992 report of 455 pure ILC cases, they showed the following features:
   a. Spiculated 28%
   b. Architectural distortion 18%
   c. Round 1%
   d. Microcalcification 24%
   e. Skin retraction 25%
   f. Nipple retraction 26%
   g. Malignancy not diagnosed 57% (9)

**What is the sensitivity of imaging to detect ILC?**

1. A retrospective study of ILC in 26 women with 28 biopsy proven invasive lobular carcinomas yielded the following sensitivities: mammography 79%, sonography 68%, MRI 83% (12 patients had an MRI exam), and breast-specific gamma imaging (BSGI) 93% (10)
2. The sensitivity of BSGI was 79% for ILC according to the Department of Nuclear Medicine at the Mayo Clinic. (11)
3. MRI was reported as more accurate for ILC tumor size than mammography (12) and can decrease the surgical re-excision rate without increasing the rate of mastectomies, according to authors from The Netherlands. (13)

**Conclusion:** ILC often appears on MRI as an irregular/spiculated mass or masses, often with plateau kinetic but enhancement can be low grade persistent or, very rarely, negligible. Other patterns include multiple enhancing foci that may have interconnecting strands; nonmass type enhancement; and, reportedly, masses with smoother margins. Careful correlation of the MRI with the mammogram, ultrasound, and any physical exam area of suspicion helps avoid overlooking lesions with subtle to negligible increased vascularity.
Enhancement

Conclusion

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In our experience, ILC has presented on breast MRI as:

1. Malignancy diagnosed 73% (10)
2. Malignancy not diagnosed 57% (9)
3. Spiculated 28%
4. 60% masses, of which 71% were irregular and spiculated, 21% were asymmetric
5. Hypovascular (very rare)
6. Dominant lesion surrounded by small foci (n=3);
7.Irregular masses
8. Hypervascular 4%
9. Hypervascular and circumscribed mass.
10. Irregular 1.5 cm spiculated mass
11. Irregular intensely enhancing lesion
12. Very rarely as an irregular mass with a nearly avascular appearance

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