Breast Pathology - Newer Trends Beyond 'Pink' and 'Blue'…

Dr Sulakshana M S, MD

Consultant Pathologist

Sri Shankara Cancer Hospital & Research Centre

Table 1. Major changes within the new classification of tumours of the breast

Topic	Status in WHO 2012	Change in WHO 2019
Mitotic counts	Expressed per 10 HPFs	Given per mm^2
Carcinoma with medullary features	Separate entity	Now regarded as TIL-rich IBC-NST
Oncocytic, lipid-rich, glycogen-rich clear cell, sebaceous, pleomorphic, melanotic, oncocytic and choriocarcinomatous carcinomas, carcinoma with osteoclast-like giant stromal giant cells	Separate entities	Now regarded as rare variants of carcinoma NST
Inflammatory, bilateral and non-synchronous breast carcinomas	Separate entities	Now recognised as distinct clinical presentations rather than special subtypes
Lobular carcinoma *in situ*	Classic, pleomorphic types	Classic, pleomorphic and florid types
Neuroendocrine neoplasms	–	True primary neuroendocrine neoplasms are typed as NET, SCNEC, or LCNEC
Neuroendocrine differentiation	–	Overridden by morphological tumour type (NST, mucinous, solid papillary)
Well-differentiated liposarcoma in phyllodes tumours	Histological criterion of malignancy by itself	No longer a histological criterion of malignancy by itself
Mucinous cystadenocarcinoma	Not recognised	Recognised as a new entity
Breast tumour resembling the tall cell variant of papillary thyroid carcinoma; solid papillary carcinoma with reverse polarity	–	Now grouped as tall cell carcinoma with reversed polarity
Periductal stromal tumour	Separate fibroepithelial entity	Variant of phyllodes tumour
Mesenchymal tumours, haematolymphoid tumours, and genetic tumour syndromes	–	Covered in dedicated chapters

IBC-NST, invasive breast carcinoma no special type; HPF, high-power field; LCNEC, large-cell neuroendocrine carcinoma; NET, neuroendocrine tumour; NST, no special type; SCNEC, small-cell neuroendocrine carcinoma; TIL, tumour-infiltrating lymphocyte; WHO, World Health Organization.

Protocol for the Examination of Resection Specimens from Patients with Invasive Carcinoma of the Breast (CAP June 2021; Version: 4.5.0.0):

- **Procedure:**
- **Specimen laterality:**
- **Tumour site:**
- **Histologic type:**
- **Histologic grade:**
- **Tumour size:**
- **Tumour focality:**
- **Ductal Carcinoma in situ:**
- **Skin:**
- **Nipple:**
- **Skeletal muscle:**
- **Lymphovascular invasion:**
- **Treatment effect in the breast:**
- **Margins:**

  Distance from invasive carcinoma to closest margin:
- **Regional lymph nodes:**
- **PATHOLOGIC STAGE CLASSIFICATION (pTNM, AJCC 8th Edition):**

‘Nottingham’ grade

Table 2.06 Semiqualitative method for assessing histological grade in breast tumours {585}

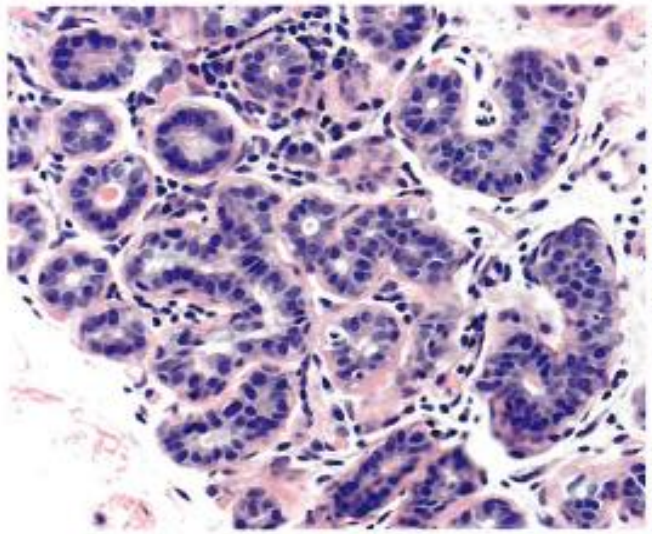
Feature	Score
Tubule and gland formation	
Majority of tumour (> 75%)	1
Moderate degree (10–75%)	2
Little or none (< 10%)	3
Nuclear pleomorphism	
Small, regular, uniform cells	1
Moderate increase in size and variability	2
Marked variation	3
Mitotic count	
Dependent on microscope field area[a]	1–3

Total score	Final grading
Add the scores for gland formation, nuclear polymorphism, and mitotic count:	
3–5	Grade 1
6 or 7	Grade 2
8 or 9	Grade 3

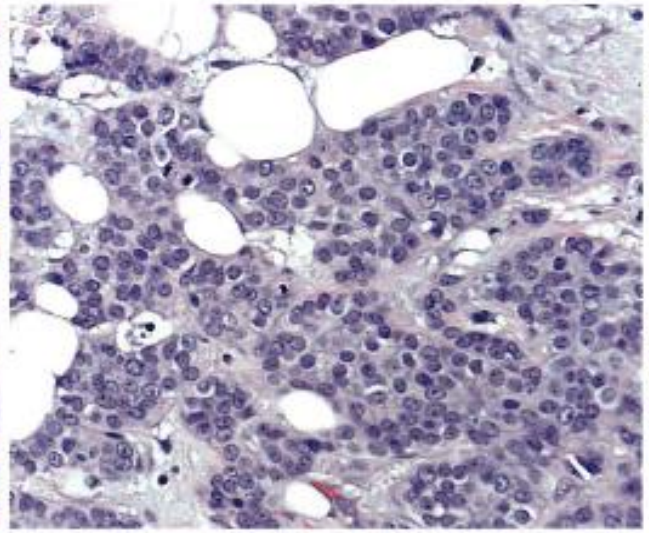
0.65	0.332	≤ 12	13–24	≥ 25

Nottingham Grading Examples: Nuclear Pleomorphism

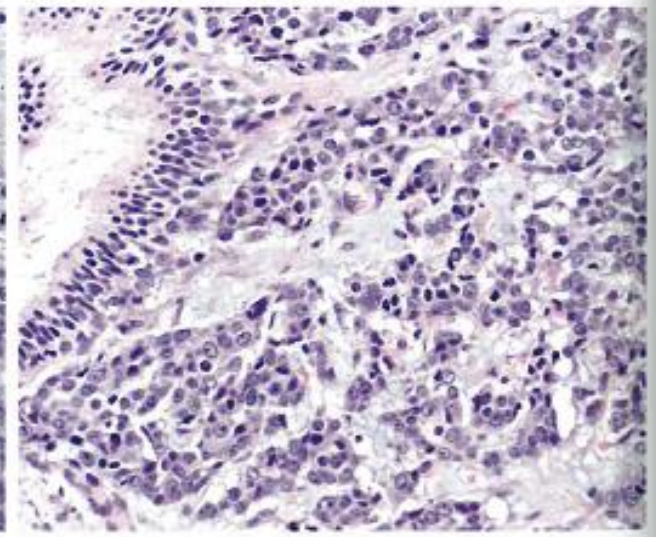
Normal



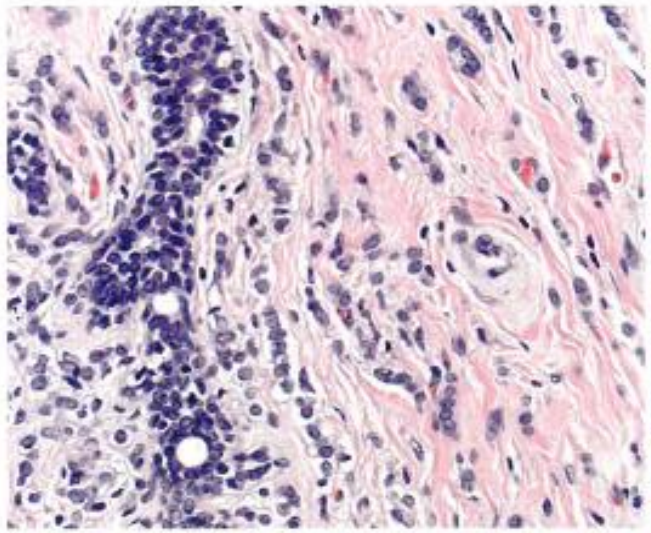
Moderate increase in size + variability = Score of 2



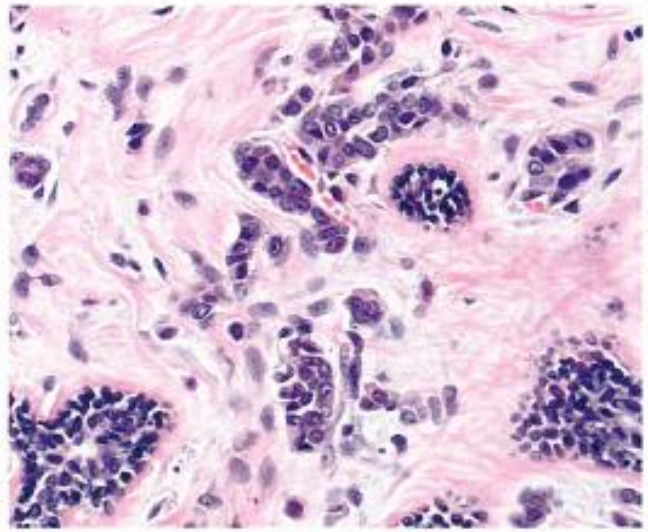
Marked variation = Score of 3



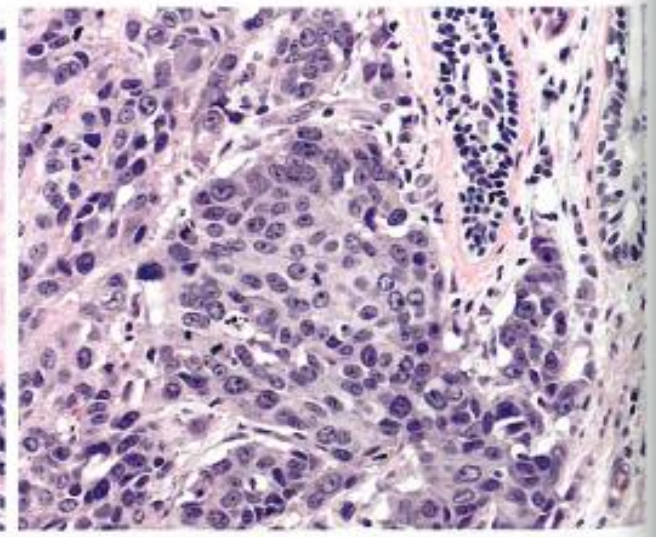
Small, regular uniform = Score of 1



Moderate increase in size + variability = Score of 2



Marked variation = Score of 3

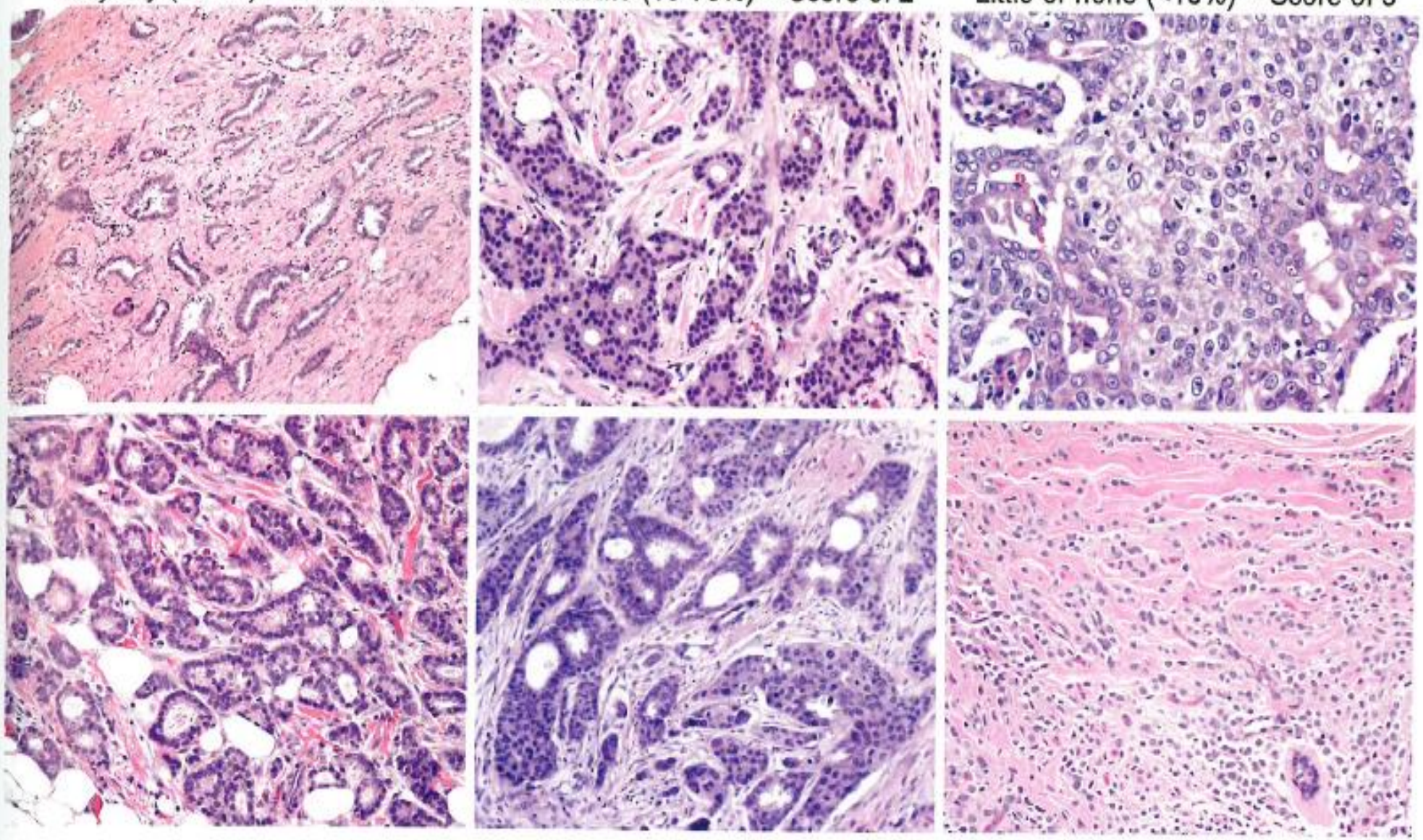


Nottingham Grading Examples: Tubule Formation

Majority (>75%) = Score of 1

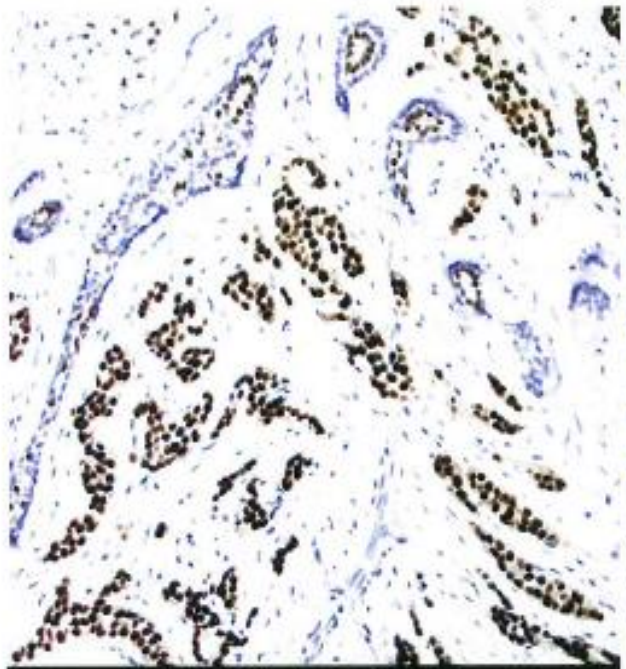
Moderate (10-75%) = Score of 2

Little or none (<10%) = Score of 3

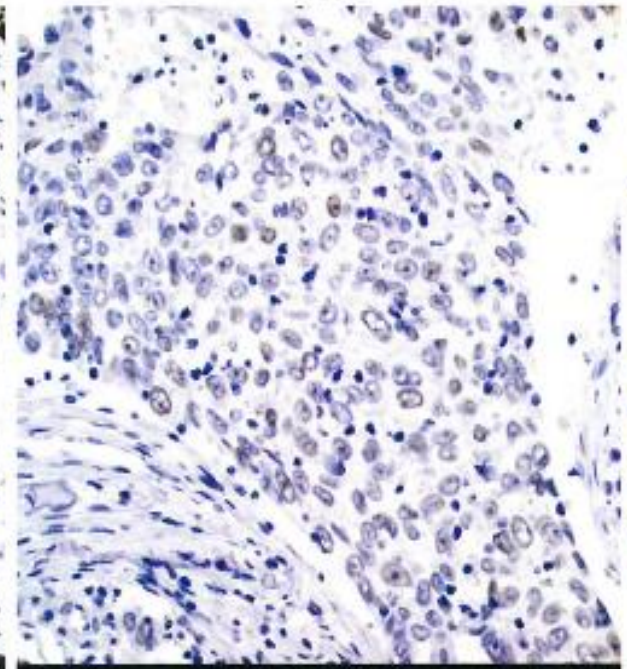


Hormone receptor staining interpretation (ER and PR)

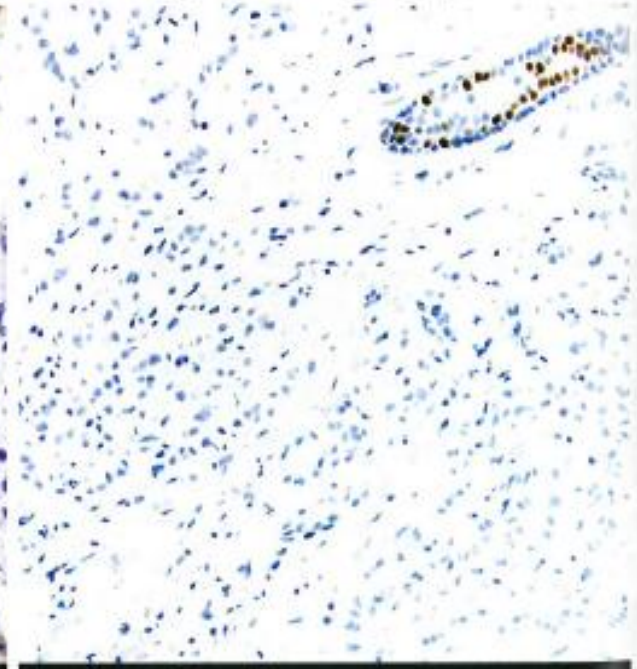
Evaluate overall percentage of cancer in sample with nuclear staining and intensity of stain



Example of a cancer with uniform strong staining



Example of a cancer with weak focal staining



Example of a cancer with no staining and a positive internal control

If ≥ 1% of cells stain

Interpretation: **Positive***

(include % and intensity in report)

*Report as low positive if 1–10% of cells stain

If < 1% or 0% of cells stain

Interpretation: **Negative**

(note whether result was < 1% or 0%)

Allred score for estrogen and progesterone receptor evaluation

% POSITIVE CELLS	SCORE	STAINING	INTENSITY	TOTAL SCORE
0	0	None	0	
<1	1	MILD	1	
1-10	2	MODERATE	2	
11-33	3	INTENSE	3	
34-66	4			
67-100	5			

Updated recommendation: Optimal algorithm for ER/PR testing and Interpretation

Positive for ER or PR	≥ 1% of tumour cell nuclei are immunoreactive. Both average intensity and extent of staining are reported.
Low positive ER (not PR)	If 1%–10% of tumor cell nuclei are immunoreactive, the sample should be reported as ER Low Positive
Negative for ER or PR	<1% of tumour cell nuclei are immunoreactive in the presence of evidence that the sample can express ER or PR (positive intrinsic controls are seen).
Uninterpretable for ER or PR	If finding that no tumour nuclei are immunoreactive and that internal epithelial elements present in the sample or separately submitted from the same sample lack any nuclear staining.

ASCO, CAP ER/PgR Testing in Breast Cancer Guideline Update—Allison et al 2020

HER2: HER2 is a member of a family of growth factor receptors – also including EGFR (HER1), ERBB3 (HER3), and ERBB4 (HER4) – that regulate normal cell proliferation, development, and survival. HER2 is located on the cell surface at low levels in normal breast epithelium. In 10–20% of IBCs, the *ERBB2* (*HER2*) gene is amplified, resulting in overexpression of the HER2 protein at the cell surface. This protein overexpression can then result in the promotion of more-aggressive cancer biology due to increases in cancer proliferation, cell motility, and angiogenesis. There are a number of HER2-targeted therapies available today, some of which are used in combination with the first (and still standard) anti-HER2 biologic therapy, trastuzumab (Herceptin) {1564A,1627}. HER2 testing is required on any new IBC-NST, because positive cases can be treated with HER2-targeted therapies in addition to chemotherapy, with significant increases in survival. HER2 protein overexpression can be assessed using immunohistochemistry, or *ERBB2* amplification can be identified by in situ hybridization. Detailed

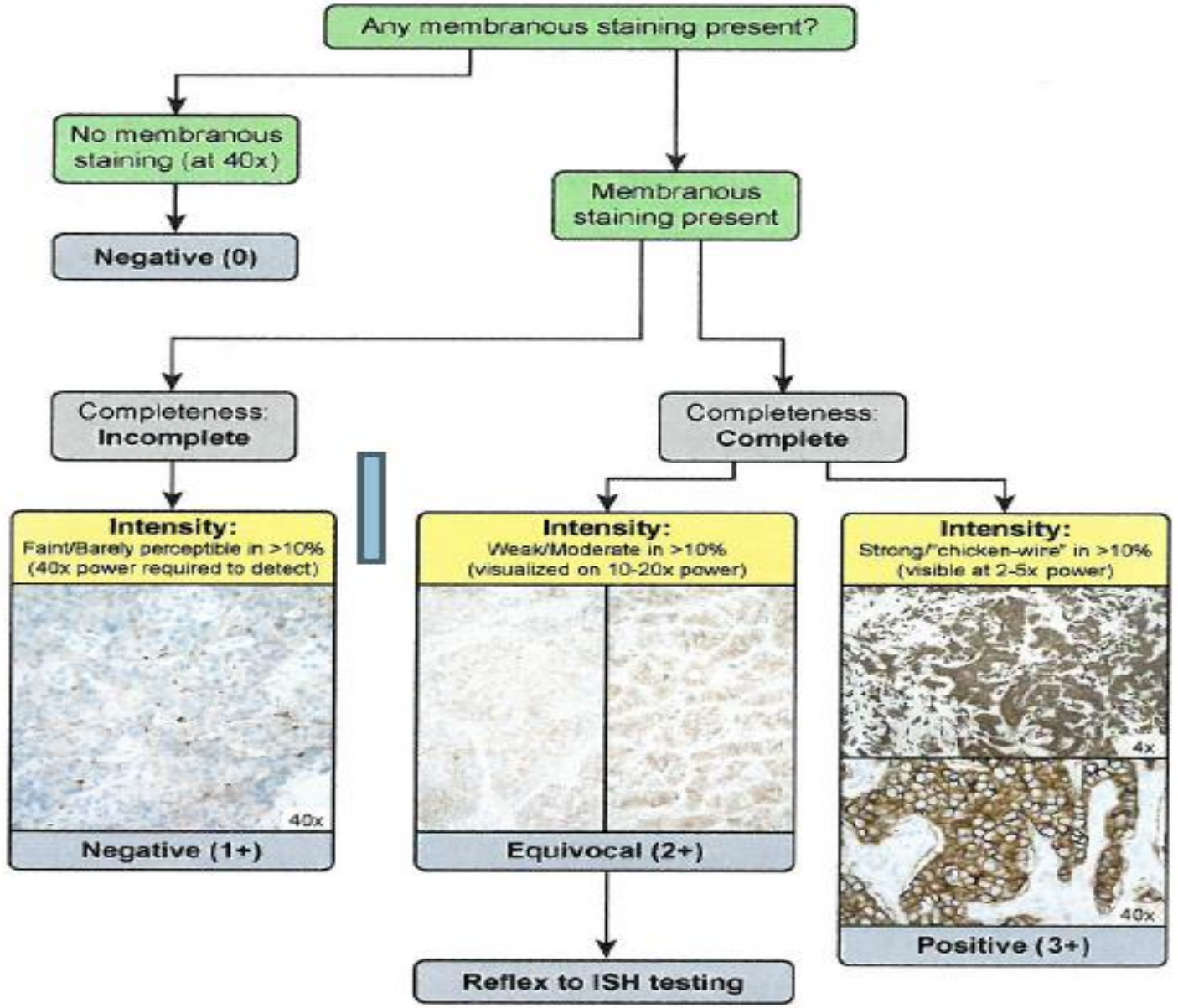


Fig. 2.81 Algorithm for interpreting ERBB2 (HER2) immunohistochemical staining in invasive breast carcinoma. ISH, in situ hybridization.

- HER2 FISH testing can be performed using a dual- or single-probe technique on formalin-fixed paraffin-embedded tissue specimens
- Both dual- and single-probe assays use a fluorescent-labeled DNA probe to detect the HER2 gene, with the dual-probe assays using a second probe to centromere of chromosome 17 (CEP17)
- Intended as form of internal control, the CEP17 probe is then compared to the number of HER2 signals per cell and the results reported as an HER2:CEP17 ratio as well as the absolute HER2 and CEP17 per cell counts
- Single-probe assays use only an HER2 gene probe, and only the HER2 copy number is reported

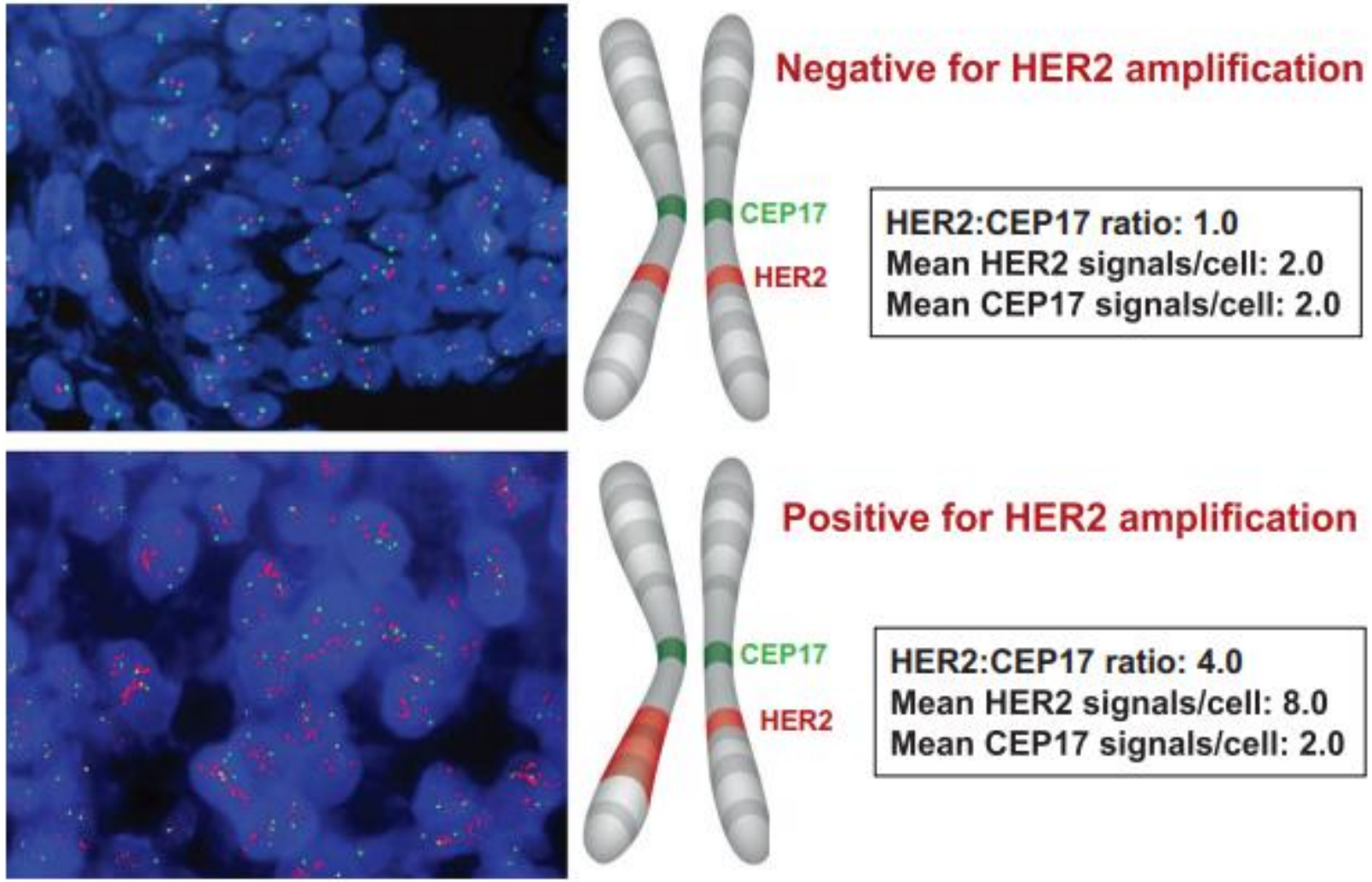
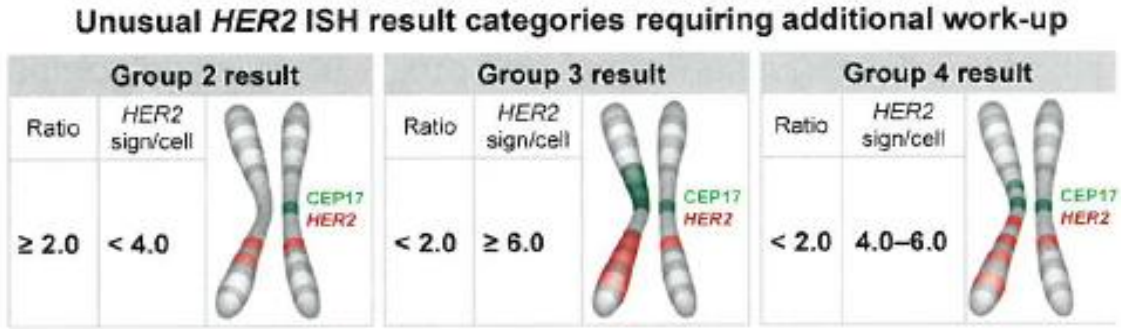
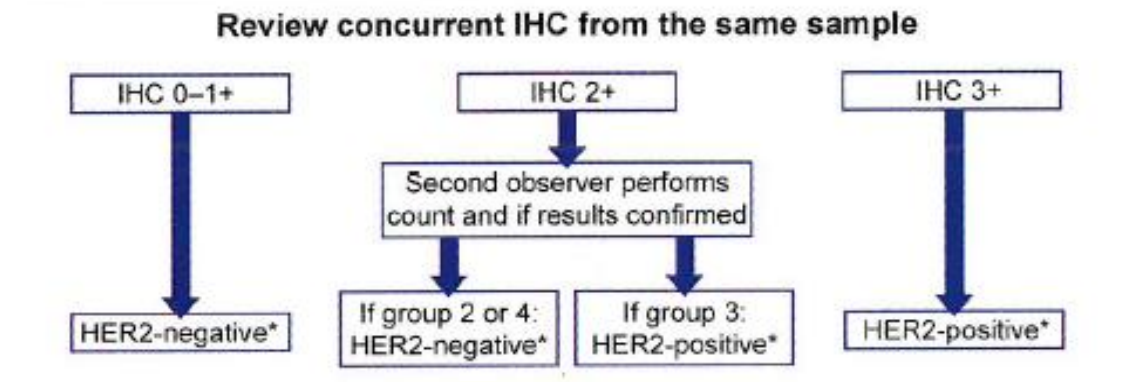


FIGURE 21.1 Example of *HER2* FISH testing. The red fluorescent probe is hybridized to the *HER2* gene, located on chromosome 17. The green fluorescent probe is hybridized with DNA in the centromeric region of chromosome 17 (*CEP17*) and is intended to serve as an internal control. In the *HER2*-negative example (upper panels), there are two copies of both *HER2* and the *CEP17* genes per cell (normal). In the *HER2*-amplified example (lower panels), there are many more copies of the *HER2* gene present, causing both high mean *HER2* signals per cell and an *HER2:CEP17* ratio greater than 2.0.

Dual probe ERBB2/Her2 ISH test interpretation





Box 2.01 The clinicopathological surrogate definitions of early invasive breast carcinoma subtypes adopted by the 13th St. Gallen International Breast Cancer Conference (2013) Expert Panel, based on immunohistochemical measurements of ER, PR, ERBB2 (HER2), and Ki-67 with in situ hybridization confirmation where appropriate {745}

Luminal A–like
- ER: positive
- PR: positive
- HER2: negative
- Ki-67 proliferation index: low

Luminal B–like (HER2-negative)
- ER: positive
- HER2: negative
- At least one of the following:
  - Ki-67 proliferation index: high
  - PR: negative or low

Luminal B–like (HER2-positive)
- ER: positive
- HER2: overexpressed or amplified
- Ki-67 proliferation index: any
- PR: any

HER2-positive (non-luminal)
- HER2: overexpressed or amplified
- ER: absent
- PR: absent

Triple-negative
- ER: absent
- PR: absent
- HER2: negative

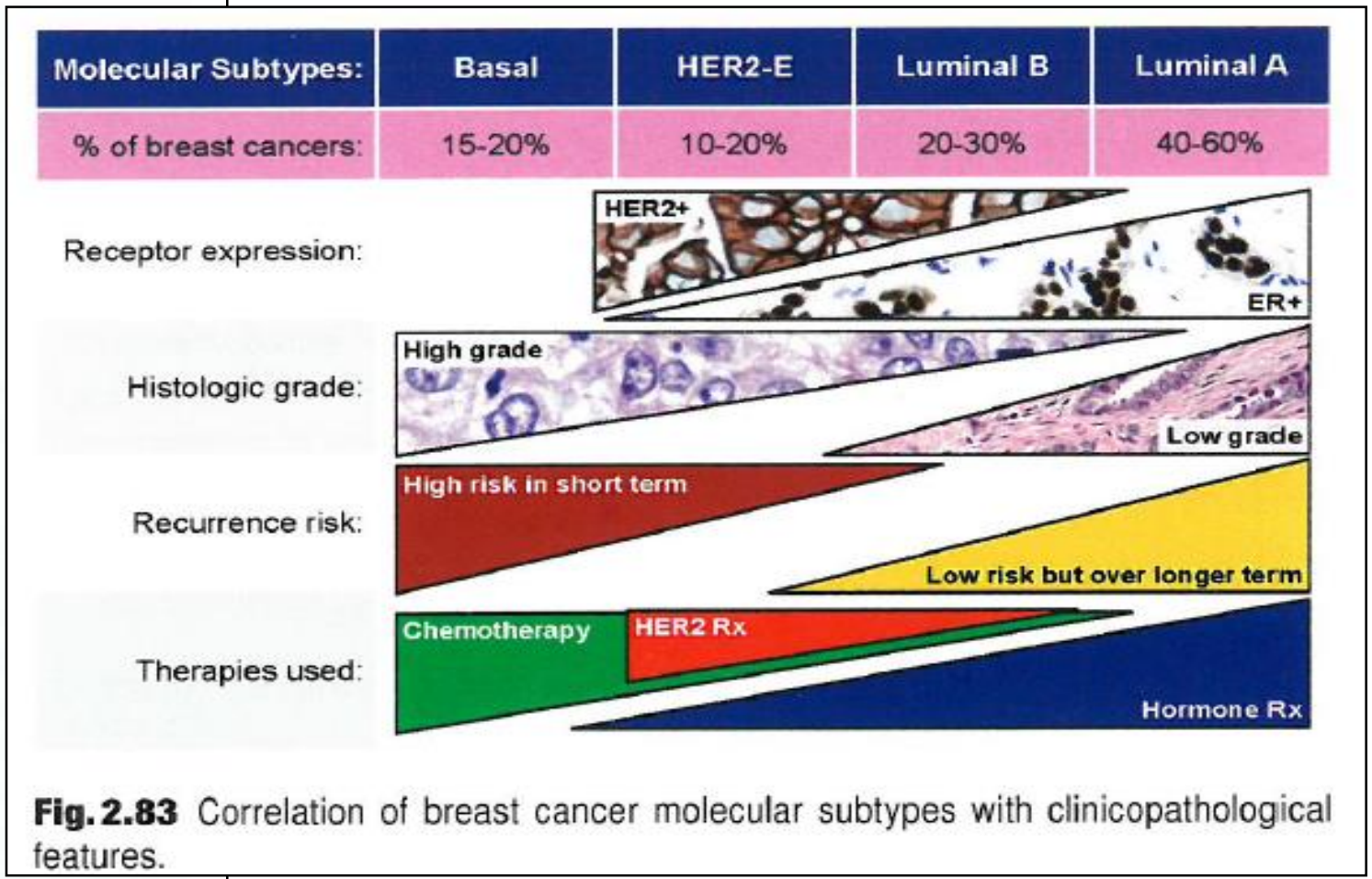


Fig. 2.83 Correlation of breast cancer molecular subtypes with clinicopathological features.

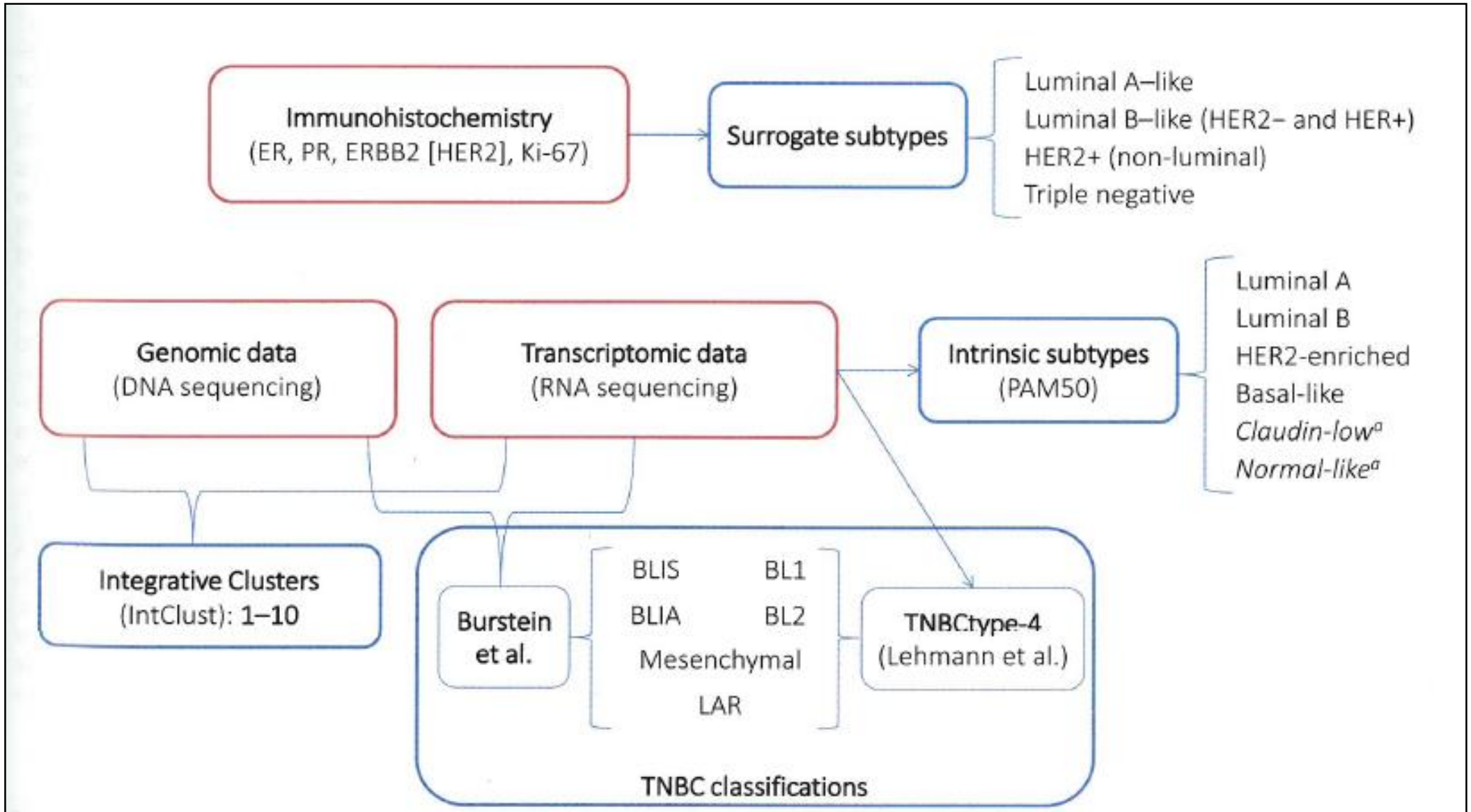


Fig. 2.88 Classification of breast cancer of no special type (NST). BL1, basal-like 1; BL2, basal-like 2; BLIA, basal-like immune-activated; BLIS, basal-like immunosuppressed; LAR, luminal androgen receptor; TNBC, triple-negative breast cancer. [a]Not included in the PAM50 signature's classification.

Lehmann et al

(Gene expression data)

- **BLIA: Basal Like Immune Activated**

Upregulation of immune/cytokine genes, activated STAT pathway, *CDK1*^{ampl}

- **BLIS: Basal like Immune Supressed**

Downregulation of immune/cytokine, expression of SOX transcription factors, *FGFR2*^{ampl}

- **LAR: Luminal Androgen Receptor**

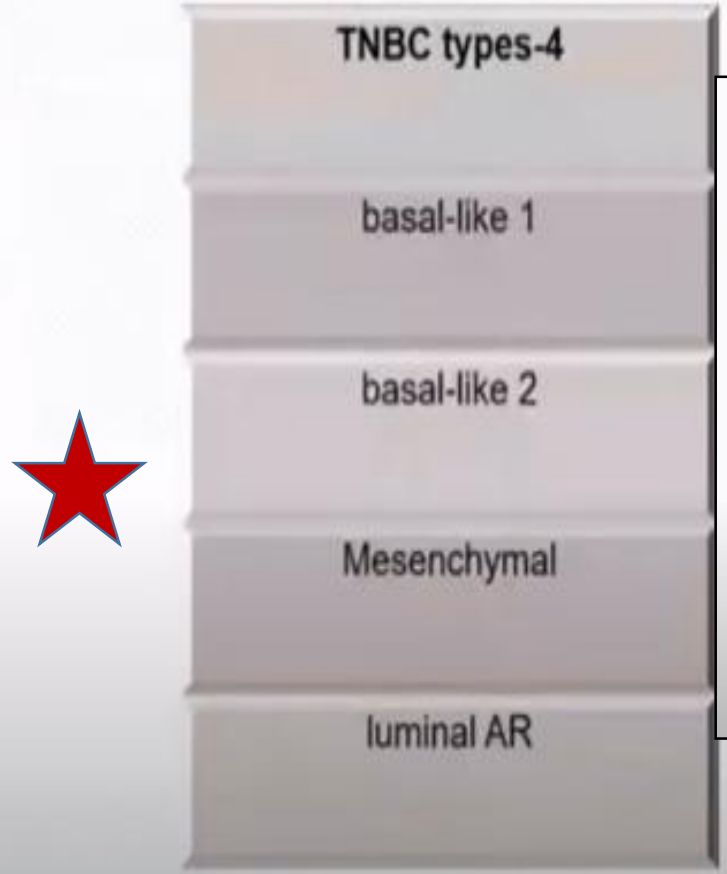
AR, ESR1, ERBB4, FOXA1, *CCND1*^{ampl}

- **MES: Mesenchymal like**

Low cell cycle, DNA damage, hereditary BC, IGF1, PDGFR, claudin^{low}, *EGFR*^{ampl}

Burstein et al

(Combined RNA & DNA profiling analyses)



Histological features of Basal-Like Cancers (By GEP):

- Histologic grade 3 (100%)
- Solid architecture (No tubule formation)
- Pushing border
- Stromal lymphocytic infiltrate
- High mitotic rate
- Geographic zones of necrosis
- Medullary-like features
- Little or no associated DCIS

Additional prognostic/predictive markers

1. Ki67:

- Preliminary, inexpensive, but non-predictive marker of proliferation
- *Ki67 is not universally used or officially recommended, due to a lack of international consensus about scoring and cut-off values, and potential lack of reproducibility*
- A threshold of 14% or 15% has been proposed for helping to discriminate between cases likely to correlate with the more aggressive luminal B molecular subtype (Ki67 >14/15%) versus the less aggressive luminal A subtype (Ki67 <14/15%)
- Correlate with grade, ER and Her2 status for prognostication, and potential chemotherapy benefit

DOI: 10.1093/jnci/djr393
Advance Access publication on September 29, 2011.

COMMENTARY

Assessment of Ki67 in Breast Cancer: Recommendations from the International Ki67 in Breast Cancer Working Group

Mitch Dowsett, Torsten O. Nielsen, Roger A'Hern, John Bartlett, R. Charles Coombes, Jack Cuzick, Matthew Ellis, N. Lynn Henry, Judith C. Hugh, Tracy Lively, Lisa McShane, Soon Paik, Frederique Penault-Llorca, Ljudmila Prudkin, Meredith Regan, Janine Salter, Christos Sotiriou, Ian E. Smith, Giuseppe Viale, Jo Anne Zujewski, Daniel F. Hayes

Manuscript received March 14, 2011; revised September 1, 2011; accepted September 2, 2011.

Correspondence to: Mitch Dowsett, BSc, PhD, Department of Biochemistry, Royal Marsden Hospital and Breakthrough Breast Cancer Centre, Fulham Rd, London SW3 6JJ, UK (e-mail: mitch.dowsett@icr.ac.uk).

Box 1. Recommendations for Ki67 assessment in breast cancer

Preanalytical

- Core-cut biopsies and whole sections from excision biopsies are acceptable specimens; when comparative scores are to be made, it is preferable to use the same type for both samples (eg, in presurgical studies).
- TMAs are acceptable for clinical trial evaluation or epidemiological studies of Ki67.
- Fixation in neutral buffered formalin should follow the same guidelines as published for steroid receptors (39,40).
- Once prepared, tissue sections should not be stored at room temperature for longer than 14 days. Results after longer storage must be viewed with caution.

Analytical

- Known positive and negative controls should be included in all batches; positive nuclei of nonmalignant cells and with mitotic figures provide evidence of the quality of an individual section.
- Antigen retrieval procedures are required. The best evidence supports the use of heat-induced retrieval most frequently by microwave processing.
- The MIB1 antibody is currently endorsed for Ki67.

Interpretation and scoring

- In full sections, at least three high-power (×40 objective) fields should be selected to represent the spectrum of staining seen on initial overview of the whole section.
- For the purpose of prognostic evaluation, the invasive edge of the tumor should be scored.
- If pharmacodynamic comparisons must be between core cuts and sections from the excision, assessment of the latter should be across the whole tumor.
- If there are clear hot spots, data from these should be included in the overall score.
- Only nuclear staining is considered positive. Staining intensity is not relevant.
- Scoring should involve the counting of at least 500 malignant invasive cells (and preferably at least 1000 cells) unless a protocol clearly states reasons for fewer being acceptable.
- Image analysis methods for Ki67 remain to be proven for use in clinical practice.

Data handling

- The Ki67 score or index should be expressed as the percentage of positively staining cells among the total number of invasive cells in the area scored.
- Statistical analysis should take account of the log-normal distribution generally followed by Ki67 measurement.
- The most appropriate endpoint in comparative studies of treatment efficacy or response is the percentage suppression of Ki67-positive cells.
- The most appropriate endpoint for assessing residual risk of recurrence is the on-treatment proportion of Ki67-positive cells.
- Cut points for prognosis, prediction, and monitoring should only be applied if the results from local practice have been validated against those in studies that have defined the cutoff for the intended use of the Ki67 result.

2. AR:

- AR expression by IHC and high AR mRNA levels by pooled gene analysis are associated with improved disease free survival and better overall survival in patients with early stage breast cancer
- Data on AR as a predictor of response to hormone/androgen-targeted therapies are currently limited and still under investigation
- Not currently performed as standard practice
- May be requested in certain clinical settings (eg. triple negative)
- Targeted therapies available
- Tumours with apocrine differentiation

Sentinel lymph nodes

- First lymph node in a lymph node bed to receive lymphatic drainage and metastasis from a tumor
- Preoperative axillary ultrasound or standard breast MRI helps surgeon to determine the involvement of axillary lymph nodes
- Methylene blue dye or radioactive colloid is injected around tumour to identify the draining sentinel lymph node at the time of surgery
- Intraoperative frozen section or intraoperative imprint cytology can be performed on the sentinel lymph node to determine need for axillary lymph node dissection at the time of surgery
- Each node thinly sliced along the long axis of the node at 2mm, and all slices submitted for microscopic examination

- When the number of nodes removed is < 6 nodes - AJCC "sn" modifier is used
- Usually sentinel lymph node is in level I but may be at level II or level III; rarely intramammary, interpectoral (Rotter) or internal mammary node
- Frozen section has 60% sensitivity and almost 100% specificity
- If SLN are negative, other axillary nodes are negative in > 95% of cases and axillary recurrence rate is only 0.3% at median 34 months
- Considered a suitable replacement for axillary dissection for staging / diagnosis in T1 and T2 tumors, with reduced morbidity because fewer lymph nodes are removed

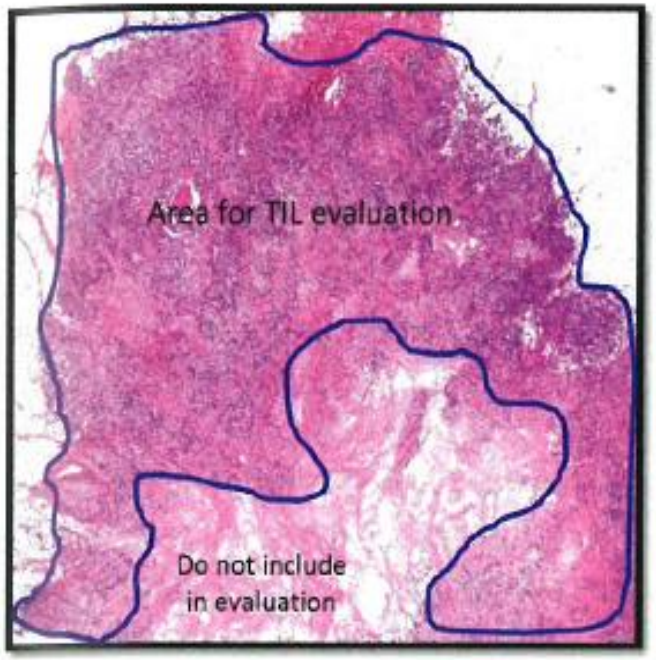
Tumour infiltrating lymphocytes – 'TILs'

- Mononucleate lymphoid cells infiltrating the tumour and its stroma
- Reflect the host immune response against the tumour cells
- *High number of TILs are associated with better outcome and better response to neoadjuvant therapy in triple negative and Her2 positive breast carcinomas*
- Strong prognostic value in improving estimates of distant disease free survival and overall survival in early stage TNBC treated with standard adjuvant/neoadjuvant chemotherapy
- Clinical utility for treatment allocation is under investigation
- International consensus scoring recommendations for quantifying TILs

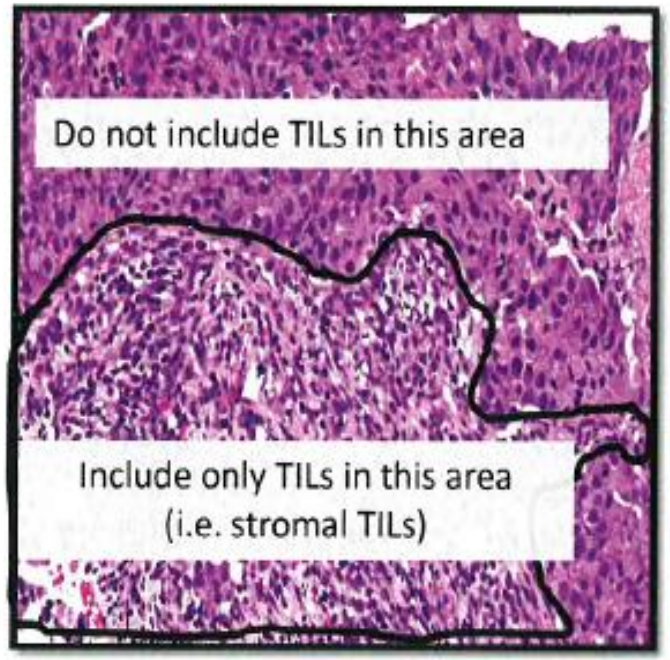
Evaluation of tumour-infiltrating lymphocytes (TILs)

Step 1: Define the area for evaluation

Large areas of central necrosis or fibrosis are not included in the evaluation.

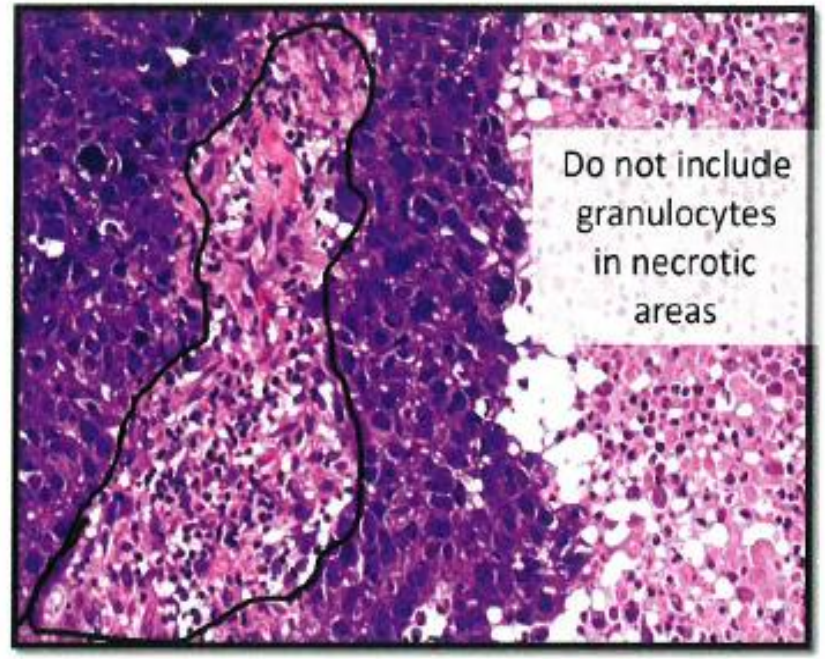


Step 2: Focus only on stromal TILs



Step 3: Determine the type of inflammatory infiltrate

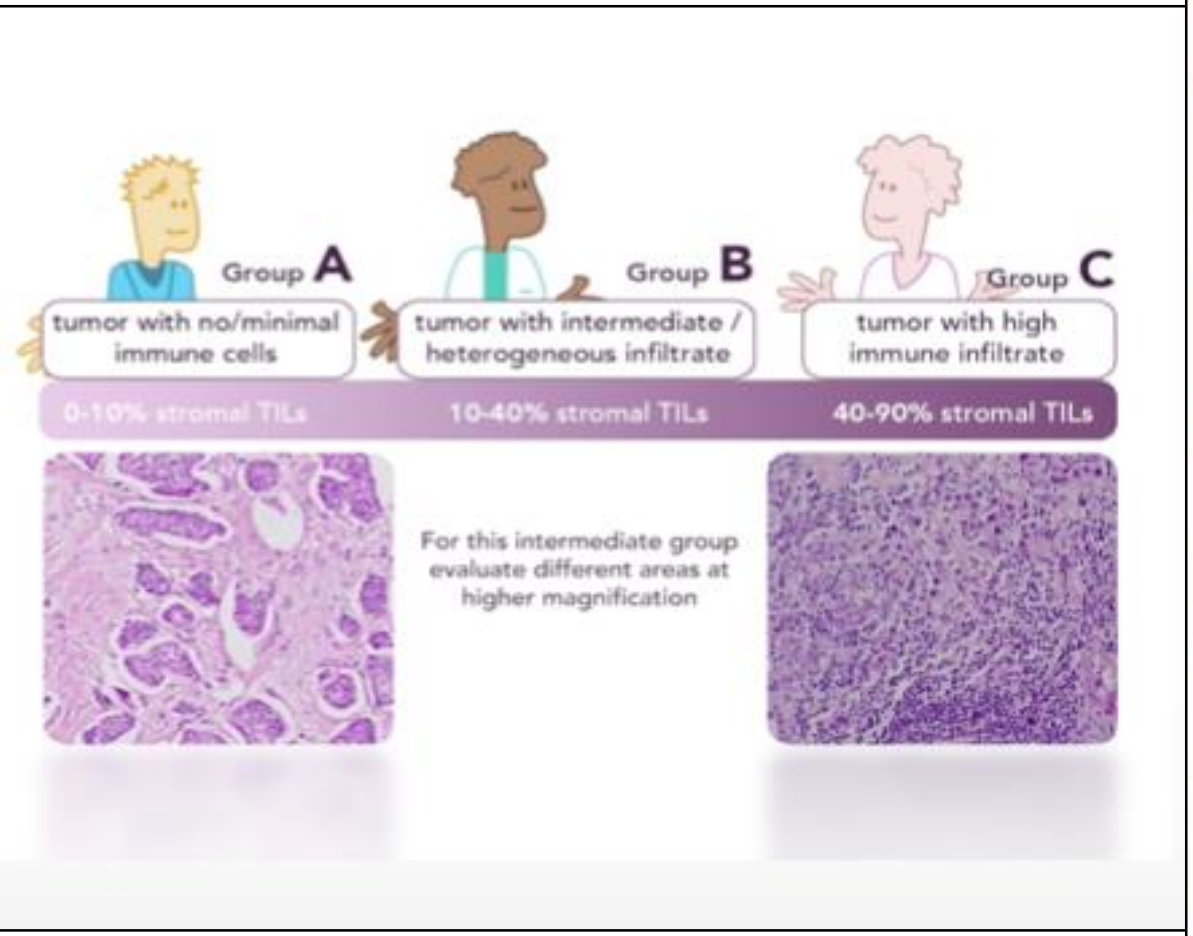
Include only mononuclear infiltrate (lymphocytes and plasma cells).



Steps 4 & 5: Assess and report the percentage of the stromal area involved by TILs

Report the average of the stromal area; do not focus on hotspots.

www.tilsinbreastcancer.org



BC subtype	Luminal A	Luminal B	HER2-positive	Triple-negative
% of breast cancers	50%	25%	15%	10%
Phenotype [a]	ER+PR+	ER+PR+	HER2+	ER-PR-HER2-
Related molecular intrinsic subtype	**Luminal A** 90% ER+ 89% PR+ 14% HER2+	**Luminal B** 98% ER+ 82% PR+ 24% HER2+	**HER2-enriched** 38% ER+ 20% PR+ 72% HER2+	**Basal-like** 8% ER+ 7% PR+ 7% HER2+
Proliferation (GEPs)				
Prognosis		Good	Poor	
Prognosis value of TIL (at diagnosis)				
Treatment		Endocrine therapy	Anti-HER2 mAb Chemotherapy	

Markers relevant to immune-checkpoint therapy (PDL1 testing)

Clinical trial evidence regarding immune-checkpoint blockade therapies in a variety of tumour types (including breast tumours) is rapidly evolving. Monoclonal antibodies targeting the PD1/PDL1 pathway or CTLA-4 are thought to function by removing the inhibition of the antitumour immune response [1598]. Data from the phase III IMpassion130 clinical trial have shown that immunohistochemical PDL1 expression on > 1% of immune cells in metastatic TNBC is predictive of improvements in progression-free survival and overall survival when first-line atezolizumab is added to protein-bound paclitaxel (nab-paclitaxel) [1859]. The use of approved and validated antibodies and their corresponding organ-specific scoring systems is recommended if testing is performed. However, the field is rapidly evolving and other biomarkers may emerge that prove to be important for prediction of response to checkpoint inhibitors.

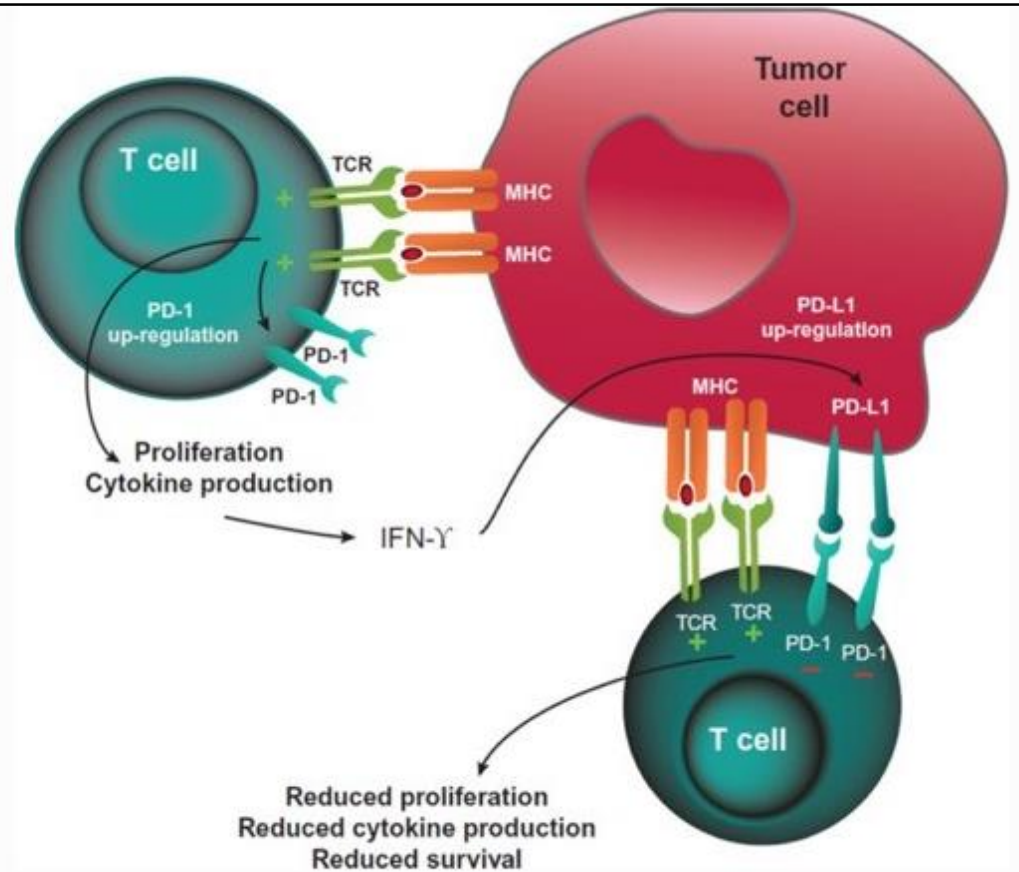


Figure 4 – PD-1 mediated inhibition of T cells.

VENTANA PD-L1 (SP142) Assay for TNBC

- Immunohistochemical assay utilizing an anti-PD-L1 rabbit monoclonal primary antibody to recognize the PD-L1 protein
- Co-developed by Roche/Ventana Medical Systems, to identify patients with locally advanced or metastatic triple-negative breast carcinoma (TNBC) who are most likely to respond to treatment with TECENTRIQ® (Atezolizumab)
- PD-L1 is a transmembrane protein that downregulates immune responses through binding to its two receptors programmed death-1 (PD-1) and B7.1 – 'immune escape'
- Expression of PD-L1 on tumor cells/immune cells leads to lower activity of CD8+ T-cells

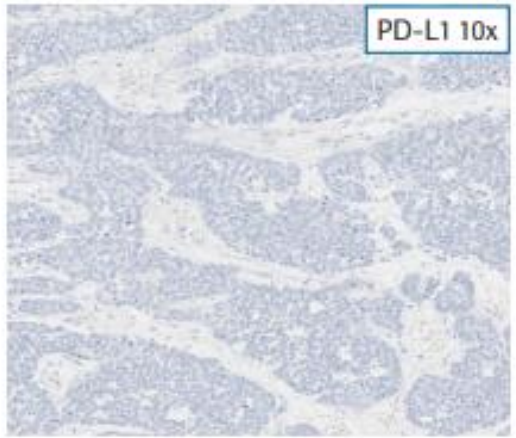
Table 1: VENTANA PD-L1 (SP142) Assay Scoring Algorithm for Triple-Negative Breast Carcinoma

Criteria/Characteristics	PD-L1 Expression
Absence of any discernible PD-L1 staining OR Presence of discernible PD-L1 staining of any intensity in tumor-infiltrating immune cells covering < 1% of tumor area occupied by tumor cells, associated intratumoral, and contiguous peritumoral stroma	< 1% IC
Presence of discernible PD-L1 staining of any intensity in tumor-infiltrating immune cells covering ≥ 1% of tumor area occupied by tumor cells, associated intratumoral, and contiguous peritumoral stroma	≥ 1% IC

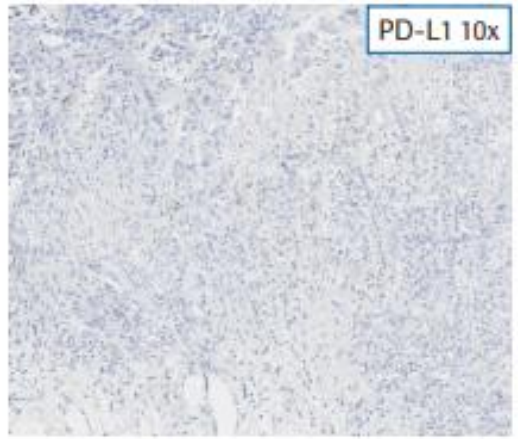
Table 2: Tumor-infiltrating Immune Cell (IC) Interpretation Criteria

Attributes	Descriptions
Type of cells showing staining	Lymphocytes, macrophages, dendritic cells, and granulocytes
Type of cells included in scoring	Lymphocytes, macrophages, dendritic cells, and granulocytes
Pattern	Aggregates in stroma, single cells dispersed among tumor cells with punctate, linear or circumferential staining
Denominator for scoring	Tumor area

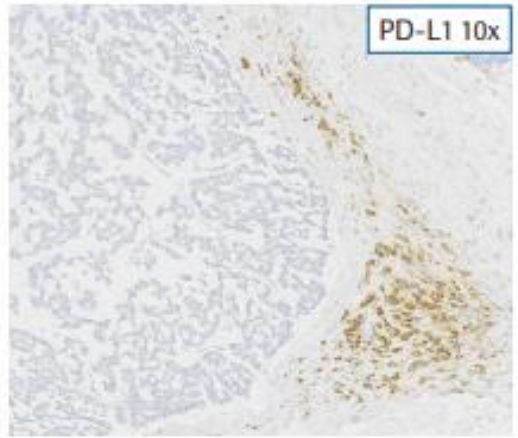
PD-L1 Expression < 1% IC



No Staining

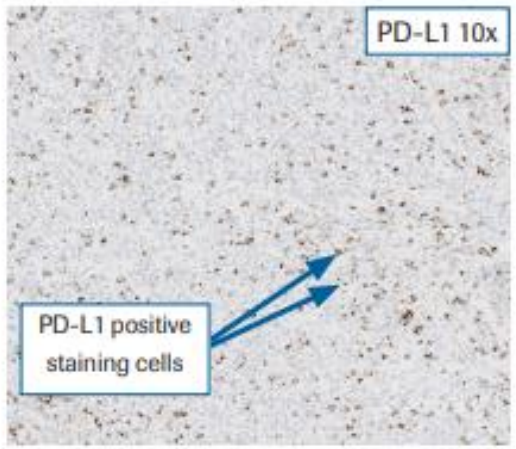


Light speckling and rare IC staining

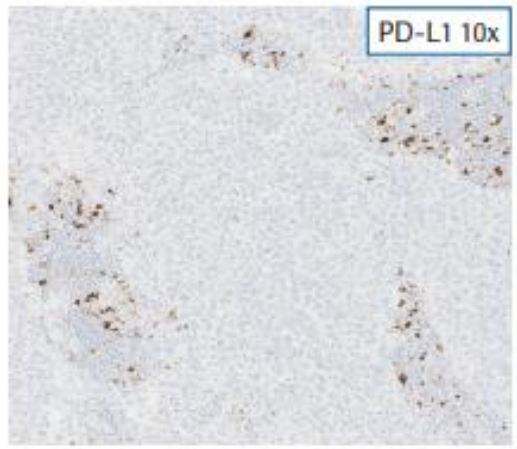


Hemosiderin pigment with no IC staining

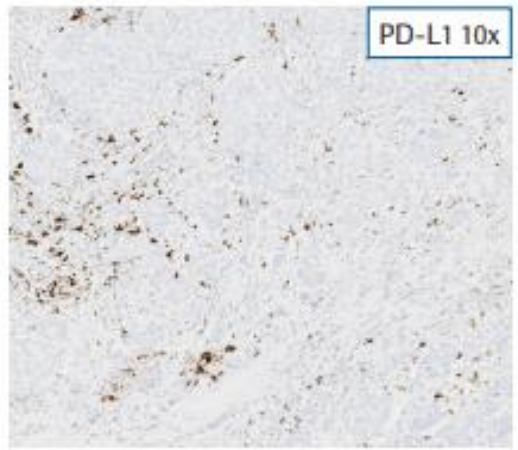
PD-L1 Expression ≥ 1% IC



Single-cell spread staining



Predominantly aggregate staining



Aggregate and single-cell spread staining

Assessment of response to neoadjuvant therapy

- Achievement of pathological complete response after neoadjuvant therapy is highly prognostic for Her2 positive and triple negative breast cancers
- The residual cancer burden index categorizes patients with breast cancer into four groups (RCB 0–III) based on level of residual disease after neoadjuvant therapy and several other factors as assessed by pathologists
- The index has a log-linear relationship with event-free survival at 5 and 10 years
- *I-SPY Clinical Trials Consortium, involving 12 institutions or clinical trials and encompassing 5,160 patients*

Dr. W. Fraser Symmans MD, Professor and Director of Research Operations in Pathology at The University of Texas MD Anderson Cancer Center, Houston

Detailed Pathology Methods for Using Residual Cancer Burden

Residual cancer burden (RCB) is estimated from routine pathologic sections of the primary breast tumor site and the regional lymph nodes after the completion of neoadjuvant therapy. Six variables are included in a calculation formula. The calculated RCB index value can also be categorized as one of four RCB classes. The calculation formula and detailed description can be found at a dedicated Web site: http://www.mdanderson.org/breastcancer_RCB.

*Values must be entered into all fields for the calculation results to be accurate.

(1) Primary Tumor Bed

Primary Tumor Bed Area: _____ (mm) X _____ (mm)

Overall Cancer Cellularity (as percentage of area): _____ (%)

Percentage of Cancer That Is *in situ* Disease: _____ (%)

(2) Lymph Nodes

Number of Positive Lymph Nodes: _____

Diameter of Largest Metastasis: _____ (mm)

Reset Calculate

Residual Cancer Burden: _____

Residual Cancer Burden Class: _____

Residual cancer burden risk class	Definition	Cut-off	Estimated percentage of relapse-free survival of patients treated with T/FAC, % (95% confidence interval)*	
			5-year	10-year
RCB-0	No traces of residual disease (complete pathologic response)	RCB = 0	Overall: 92 (86, 96) TNBC: 94 (84, 98); HR+/HER2−: 88 (72, 95); HER2+: 94 (80, 99)	Overall: 86 (78, 91) TNBC: 86 (73, 93); HR+/HER2−: 83 (63, 93); HER2+: 88 (72, 96)
RCB-I	Minimal residual disease	≤1.36	Overall: 94 (88, 97) TNBC: 89 (73, 96); HR+/HER2−: 100; HER2+: 89 (61, 97)	Overall: 85 (75, 91) TNBC: 81 (63, 93); HR+/HER2−: 97 (81, 100); HER2+: 63 (35, 82)
RCB-II	Moderate residual disease	>1.36	Overall: 80 (76, 84) TNBC: 62 (50, 72); HR+/HER2−: 87 (82, 90); HER2+: 62 (42, 76)	Overall: 68 (62, 73) TNBC: 55 (43, 66) HR+/HER2−: 74 (67, 80); HER2+: 44 (26, 61)
RCB-III	Extensive residual disease	>3.28	Overall: 58 (50, 65) TNBC: 26 (14, 41); HR+/HER2−: 70 (60, 77); HER2+: 47 (23, 68)	Overall: 46 (37, 54) TNBC: 23 (12, 37); HR+/HER2−: 52 (40, 63); HER2+: 47 (23, 68)

HER2, human epidermal growth factor 2; HR, hormone receptor; RCB, residual cancer burden; TNBC, triple negative breast cancer.

* Data from Symmans *et al.* [87] for patients treated with paclitaxel followed by fluorouracil, doxorubicin and cyclophosphamide (T/FAC)

OncoStem CanAssist Breast

- Combines five prognostically relevant biomarkers and three clinicopathological parameters to arrive at the probability of distant recurrence within five years from diagnosis
- Developed using machine learning-based technique
- Algorithm produces a risk score ranging from 0-100. A cut-off of 15.5 is applied to stratify patients into either low-risk (score ≤15.5) or high-risk (score >15.5)

The patients must meet the below criteria to take CanAssist Breast :

- Patients with early-stage, invasive breast cancer
- Patients with hormone receptor-positive ("ER+ and/or PR+") and HER2- negative disease
- Lymph node-negative or up to 3 lymph node-positive
- Patients should not have gone through neoadjuvant chemotherapy

This test is not applicable for patients who are diagnosed with DCIS (Ductal Carcinoma In-Situ)

SAMPLE DESCRIPTION

Received X block/s bearing number XXXX/YY , along with histopathology & IHC report. Clinico-pathologic parameters mentioned below have been extracted from patient's histopathology & IHC report. Pathological TNM staging represented as per AJCC guidelines.

Diagnosis: Invasive Carcinoma of Right Breast.

Tumor Size: 3x2x1 cms. Pathological Stage: pT2N0 Grade: 2

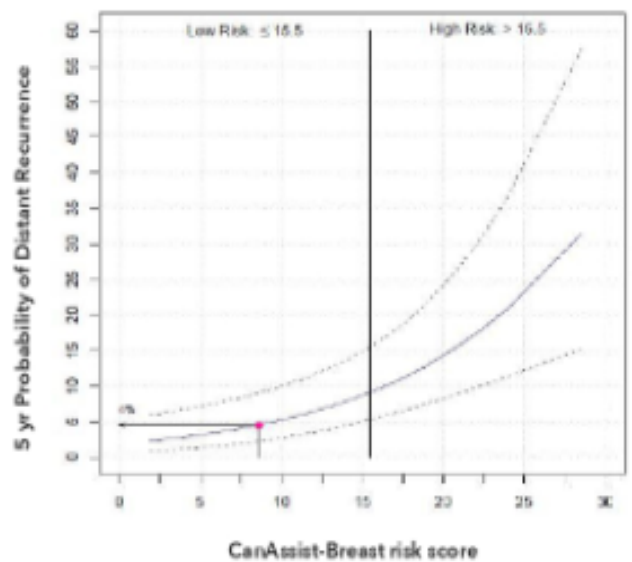
Receptor Status: ER: Positive PR: Positive HER2/neu: Negative by FISH

Patient referred for prognostic assessment by CanAssist-Breast Test to aid treatment planning.

CANASSIST-BREAST TEST RESULT

CanAssist-Breast Risk Score is 8.6 : Low Risk of Recurrence

CANASSIST-BREAST TEST : 5 YEAR PROBABILITY OF DISTANT RECURRENCE



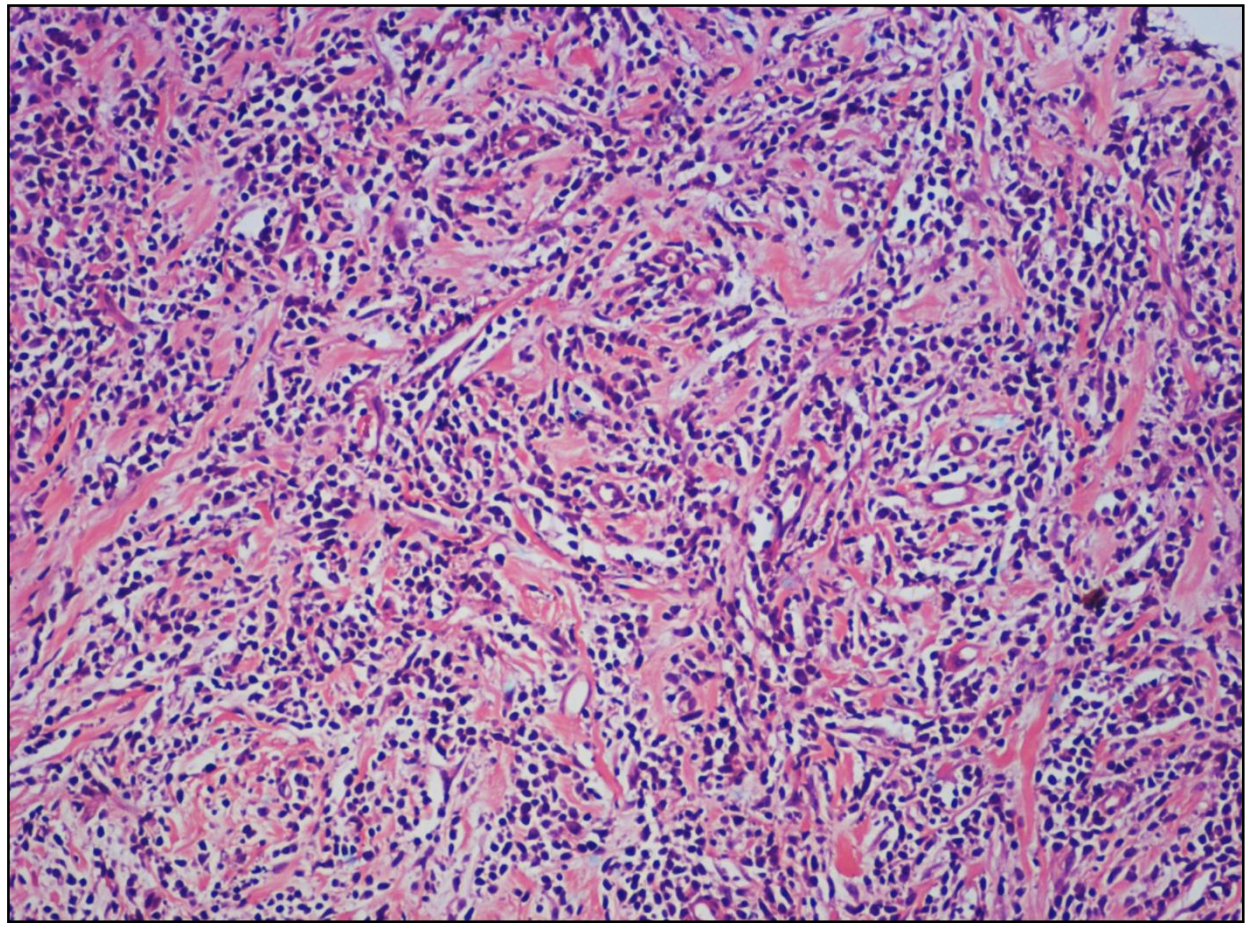
5 -Year Risk of Distant Recurrence With Hormone Therapy Alone

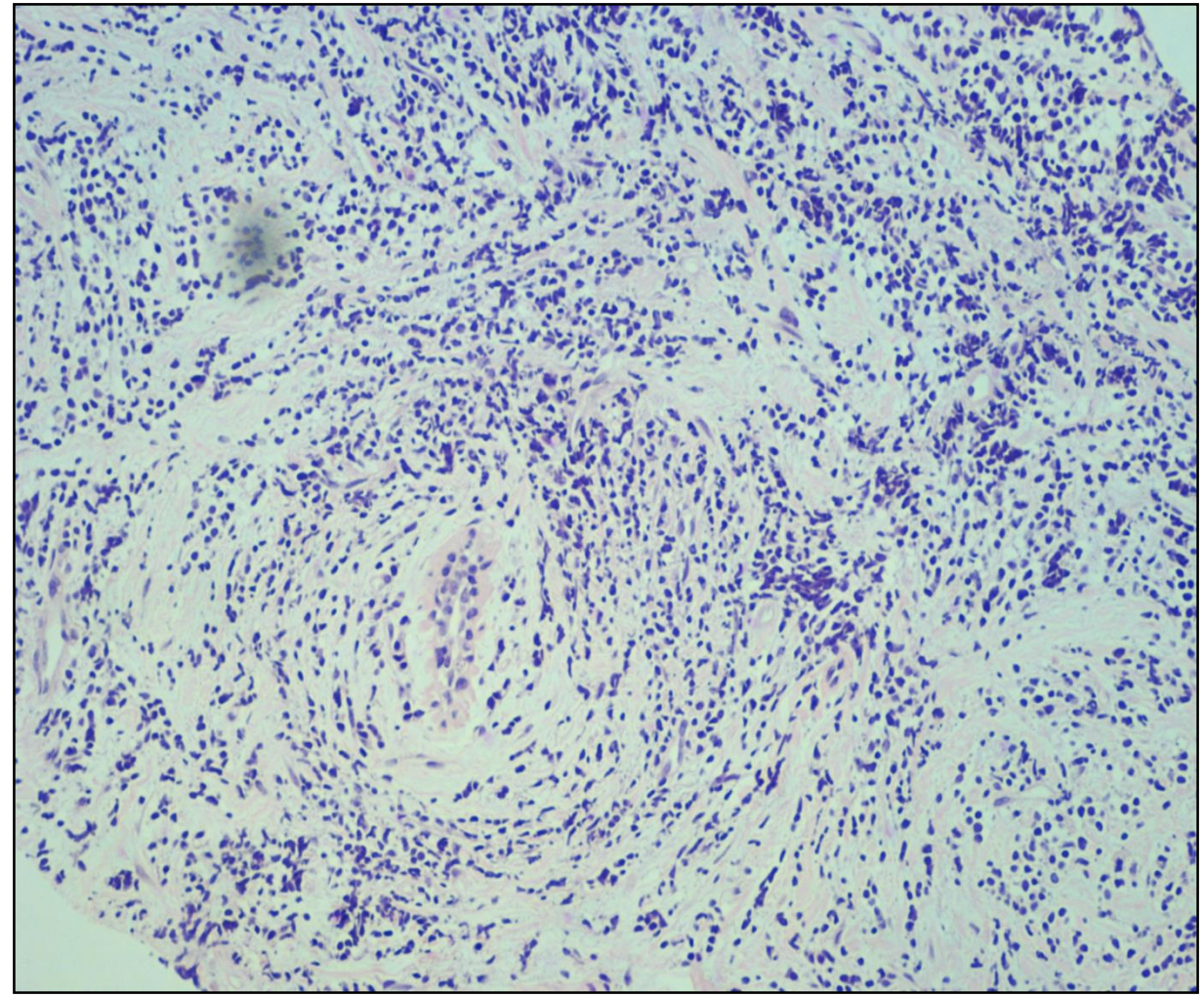
4%

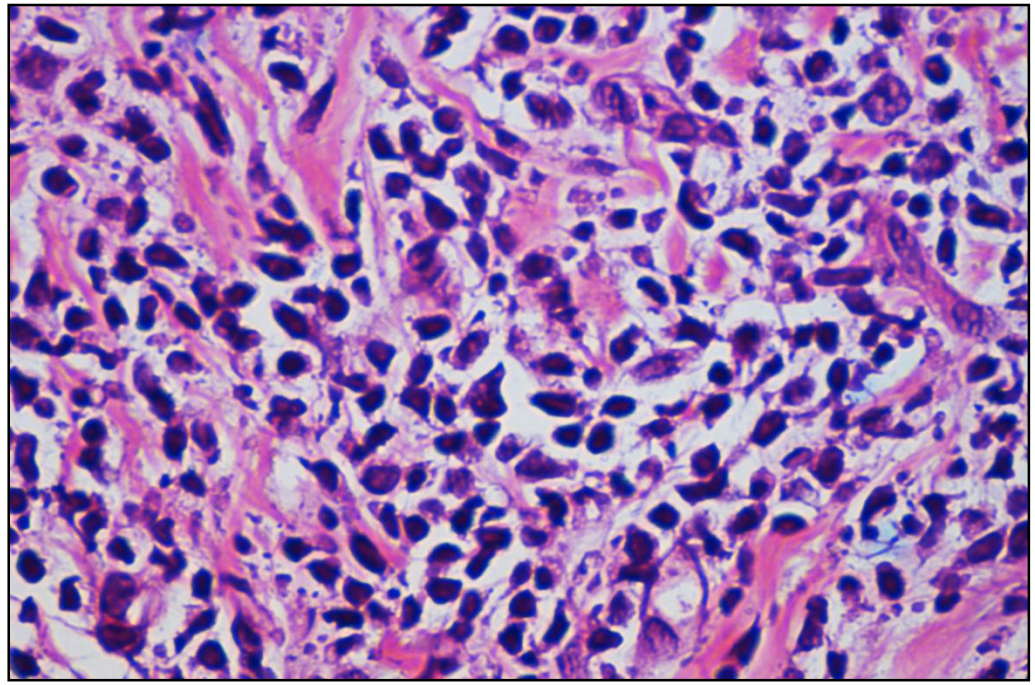
Risk of distant recurrence derived from 800+ samples validation study[2] is represented in the graph.

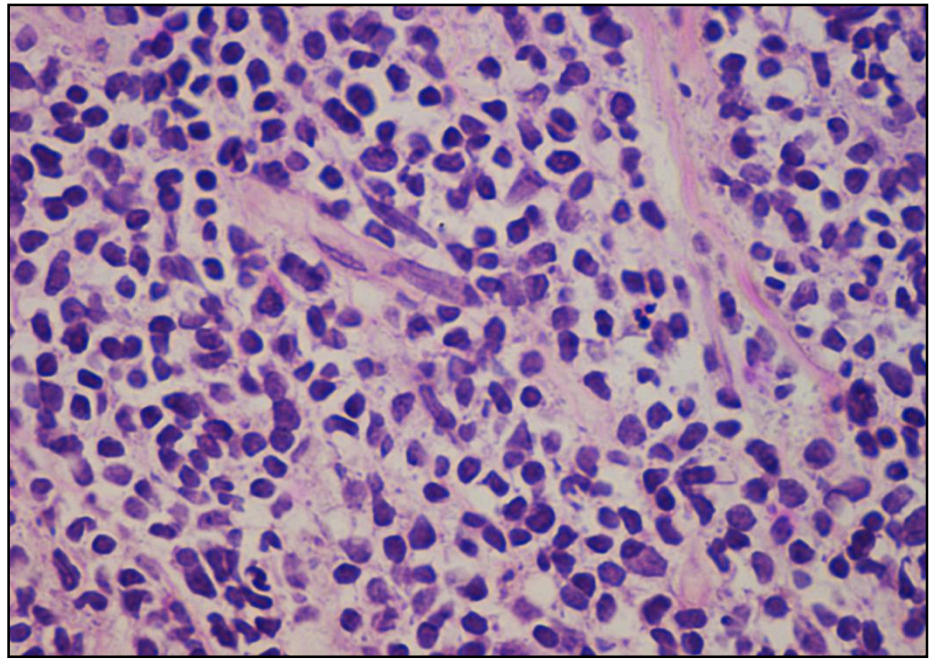
Interesting case

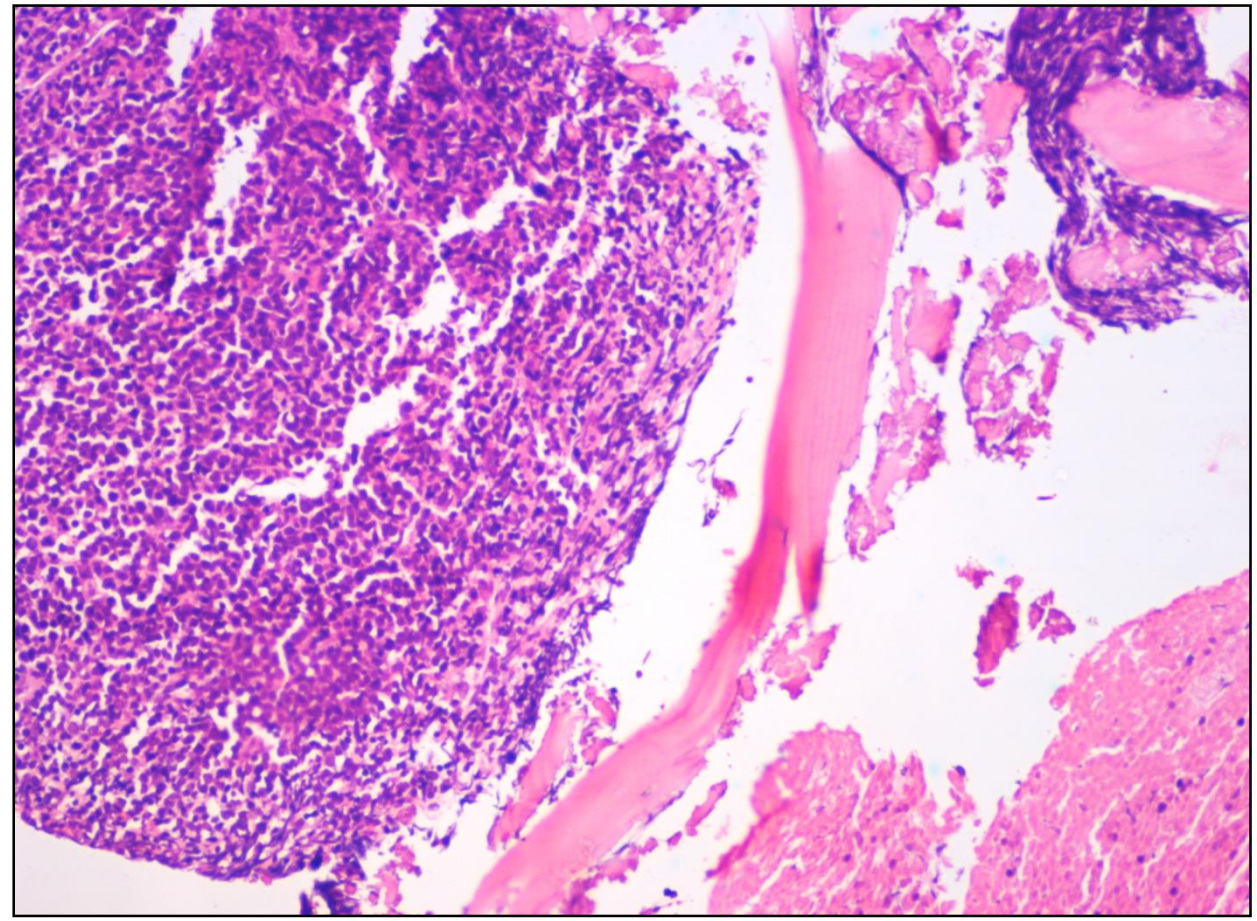
- 74 yr/Female
- Multiple lumps in both breasts
- BIRADS VI
- Biopsy from right breast lump (done elsewhere) - suggestive of Invasive lobular carcinoma
- Referred to our hospital for further work up and management
- PET CT - Lesion in right ischium
- Biopsy from ischial lesion - metastatic carcinoma





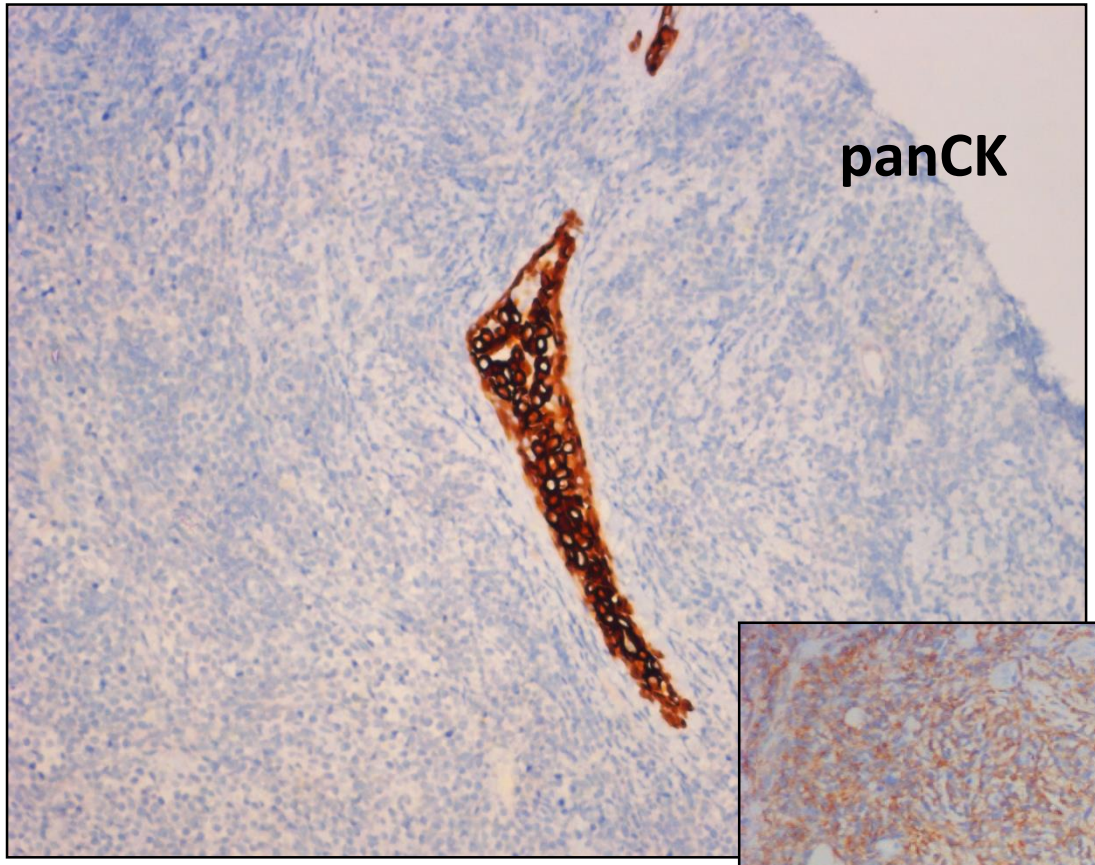


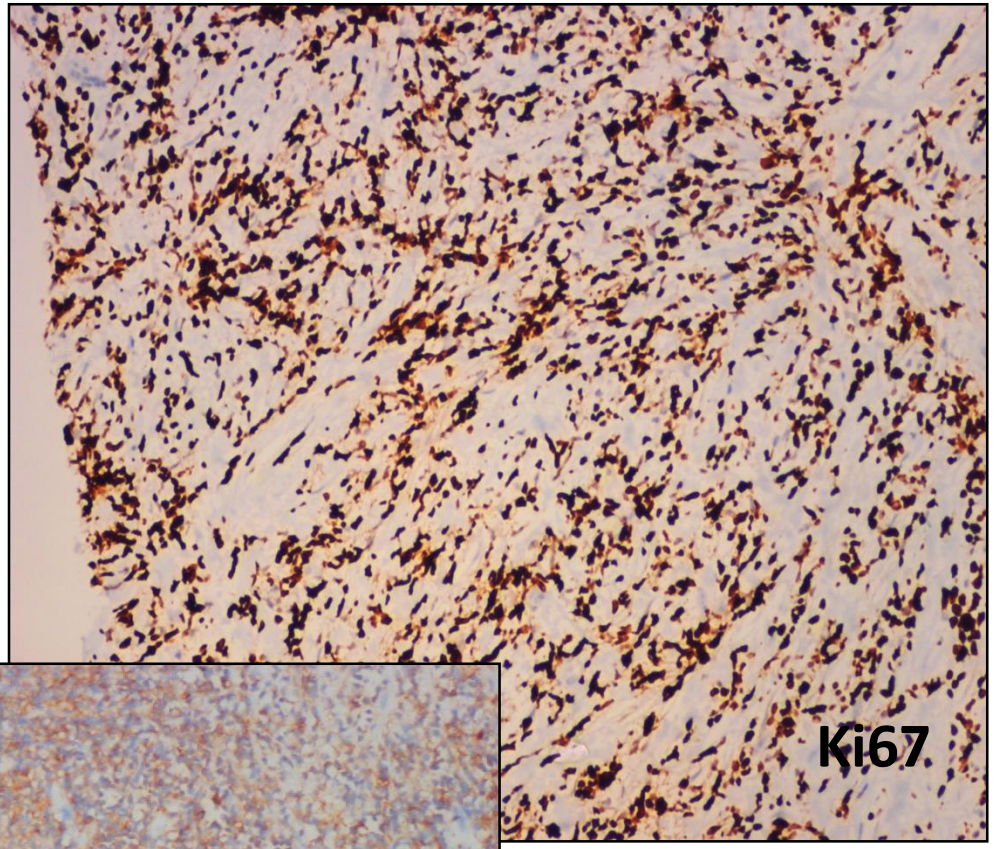


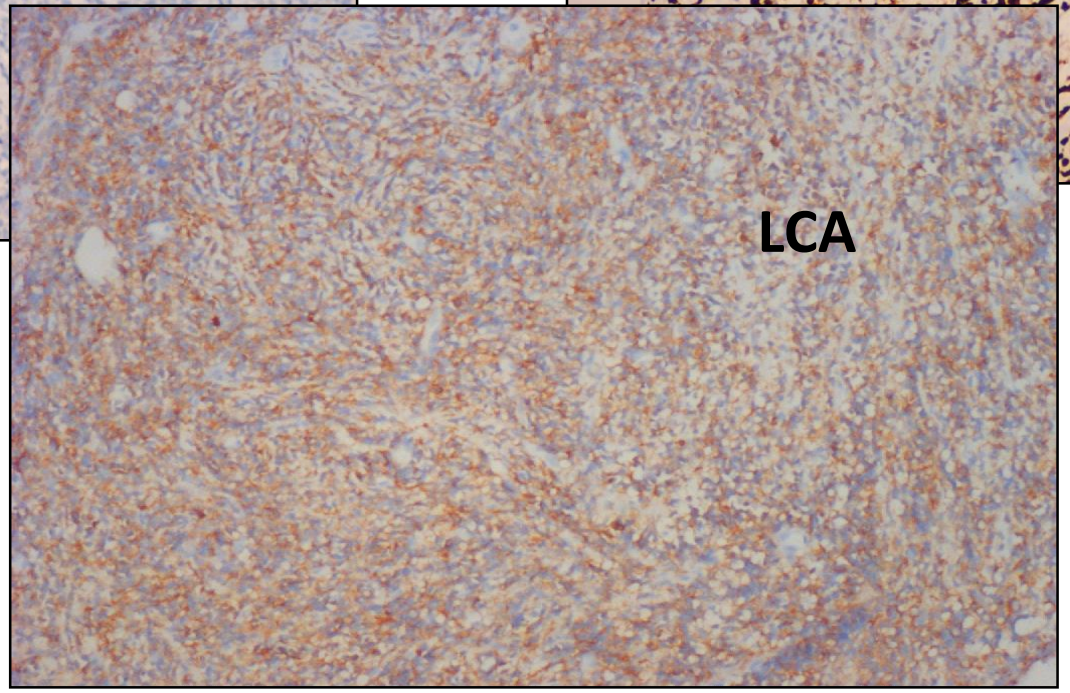


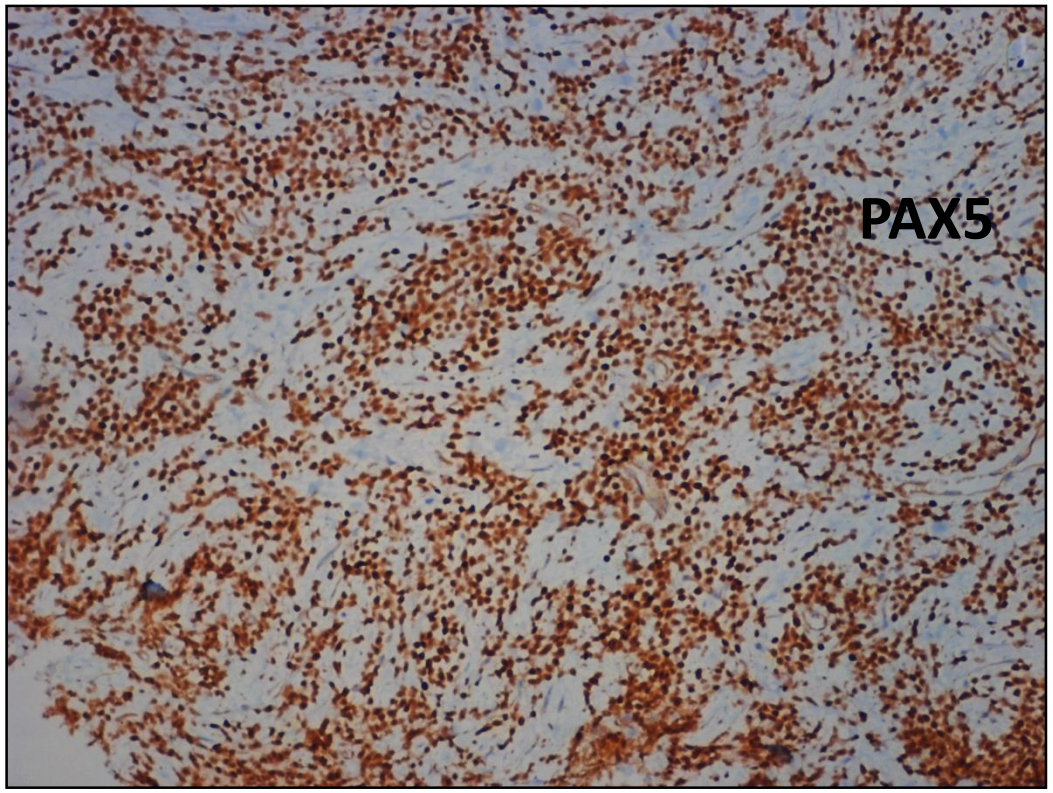
ER, PR, Her2 neu, E-cadherin – Negative

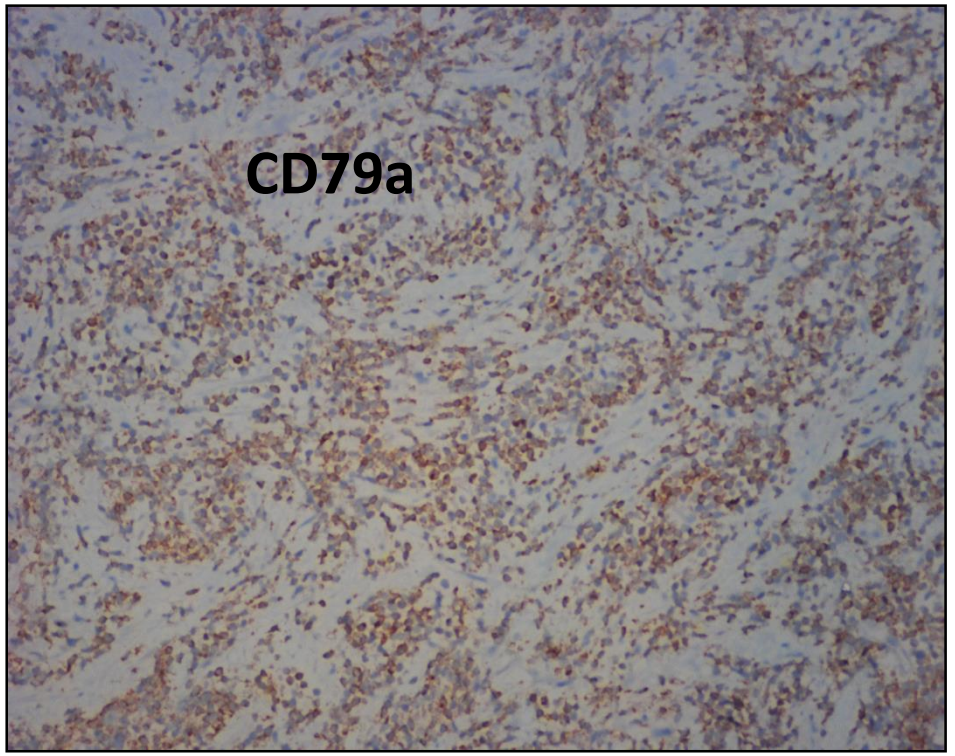
Ki 67 – 80-90%

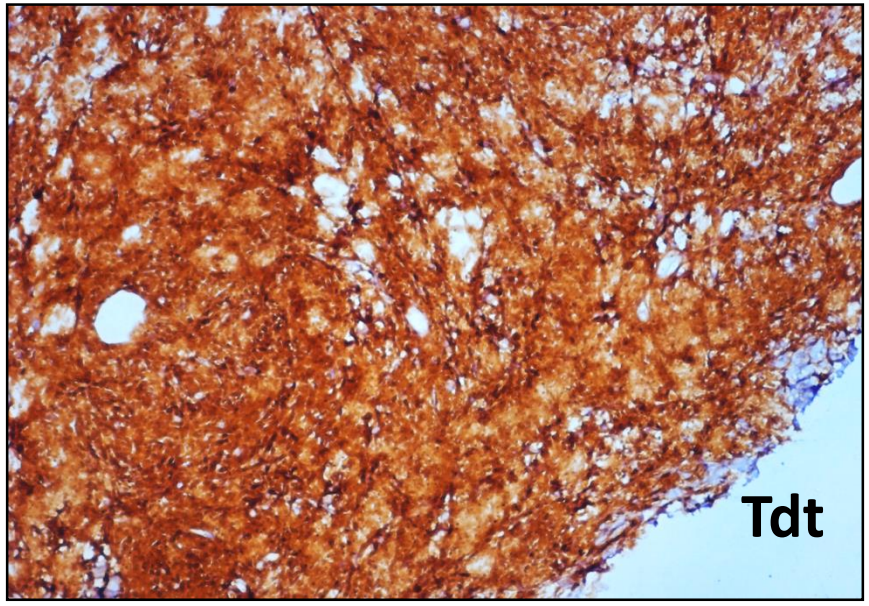

panCK

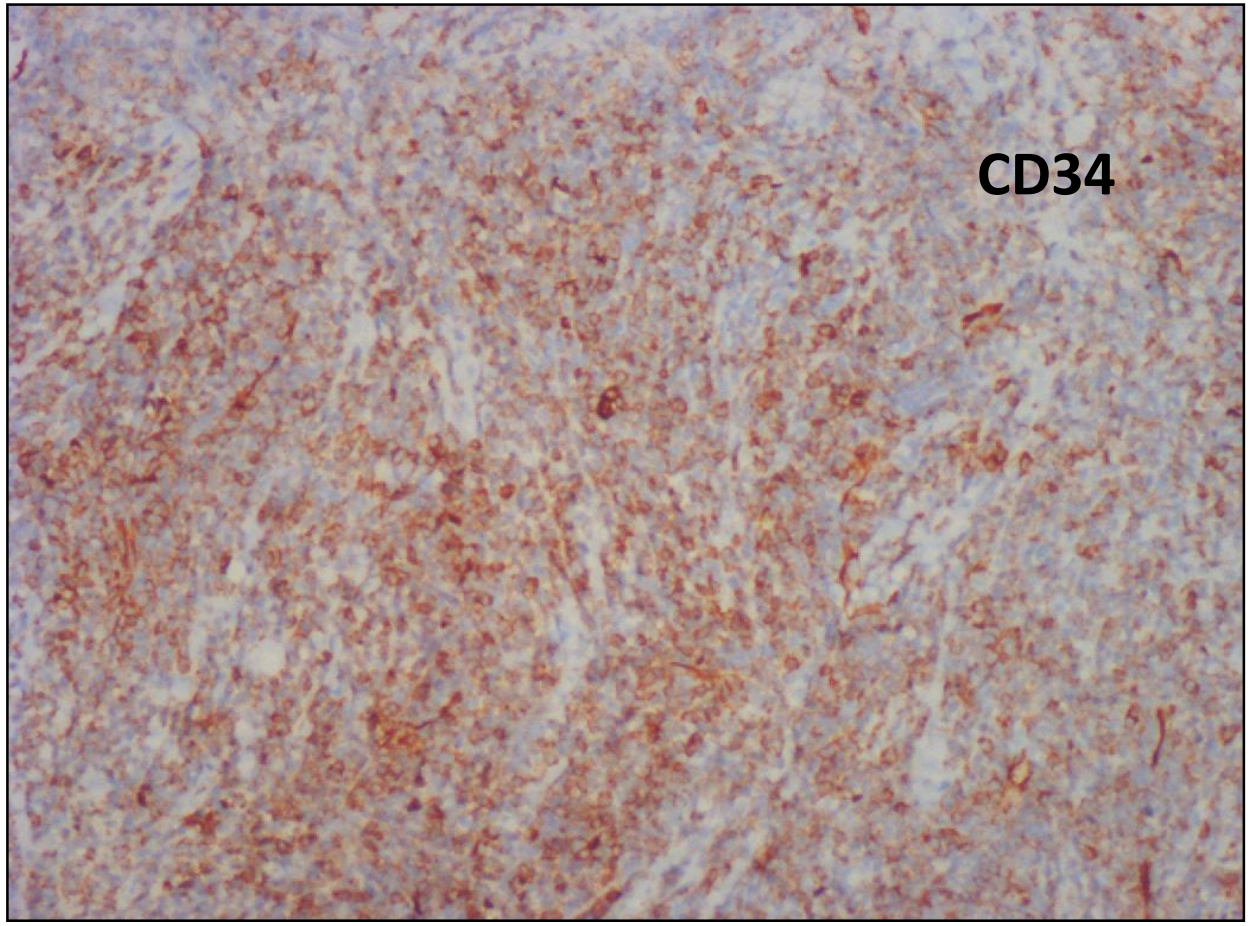

Ki67

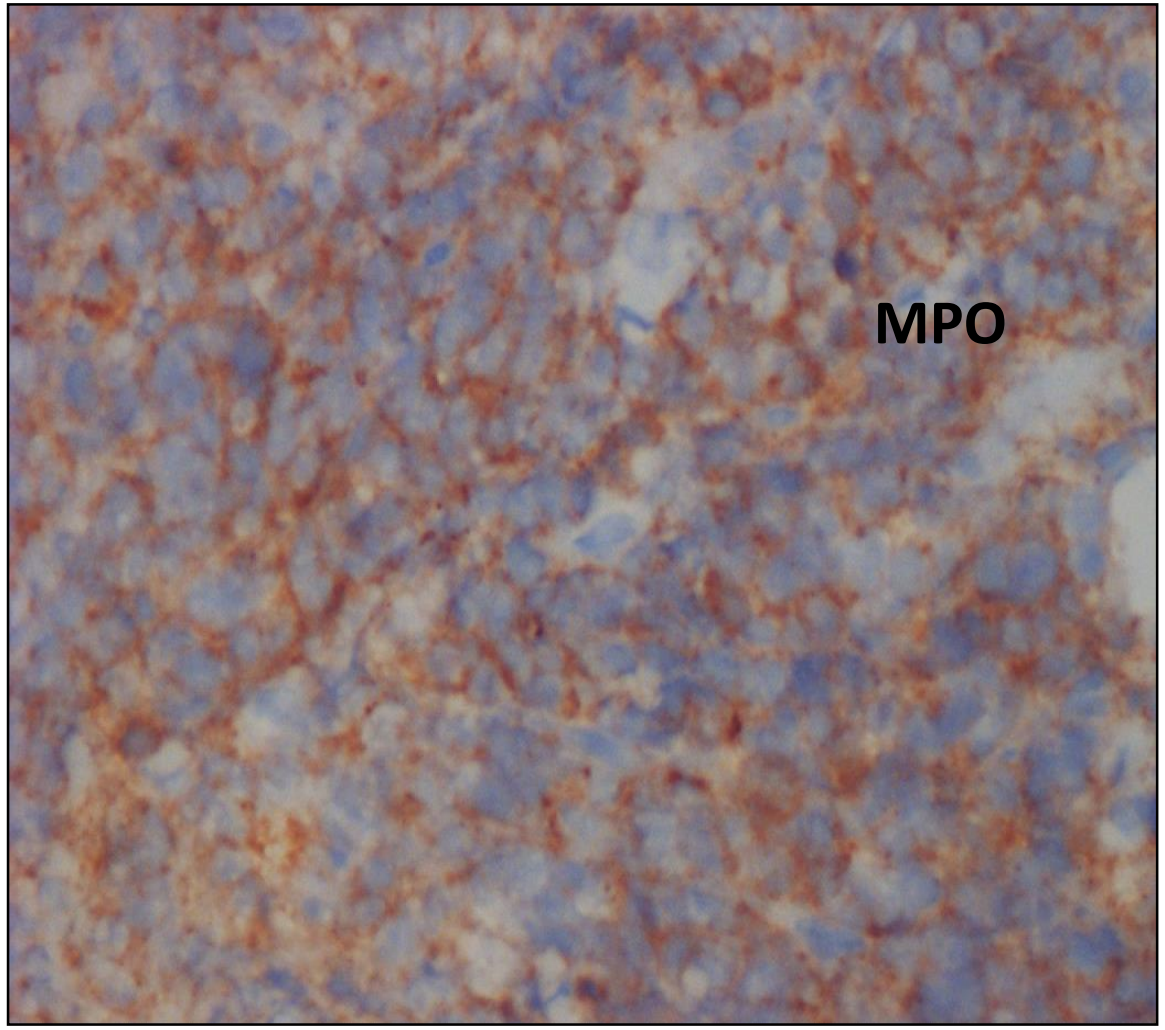

LCA


PAX5


CD79a


Tdt

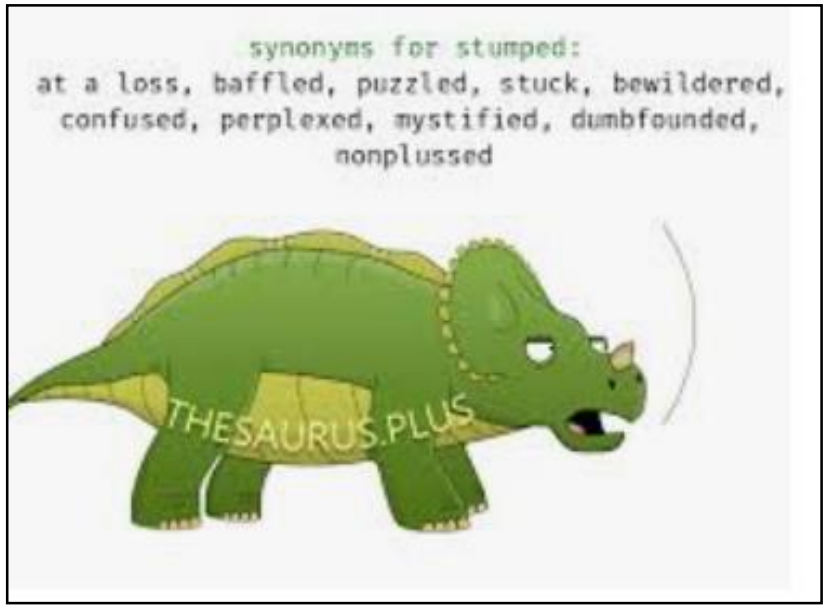

CD34


MPO

CBC (COMPLETE BLOOD COUNT)			
Haemoglobin	10.1	g/dL	12 - 15
RBC Count	3.47	million/cumm	3.8 - 4.8
PCV	31	%	36 - 45
MCV	89	fl	77 - 95
MCH	29	pg	27 - 30
MCHC	33	g/dL	32 - 35
Total Count	5400	/cmm	4000 - 10000
Platelet	27000	/cmm	150000 - 450000
Differential Count			
Neutrophils	56	%	40 - 70
Lymphocytes	34	%	20 - 40
Monocytes	2	%	2 - 10
Eosinophils	1	%	1 - 6
Basophils	0	%	1 - 2

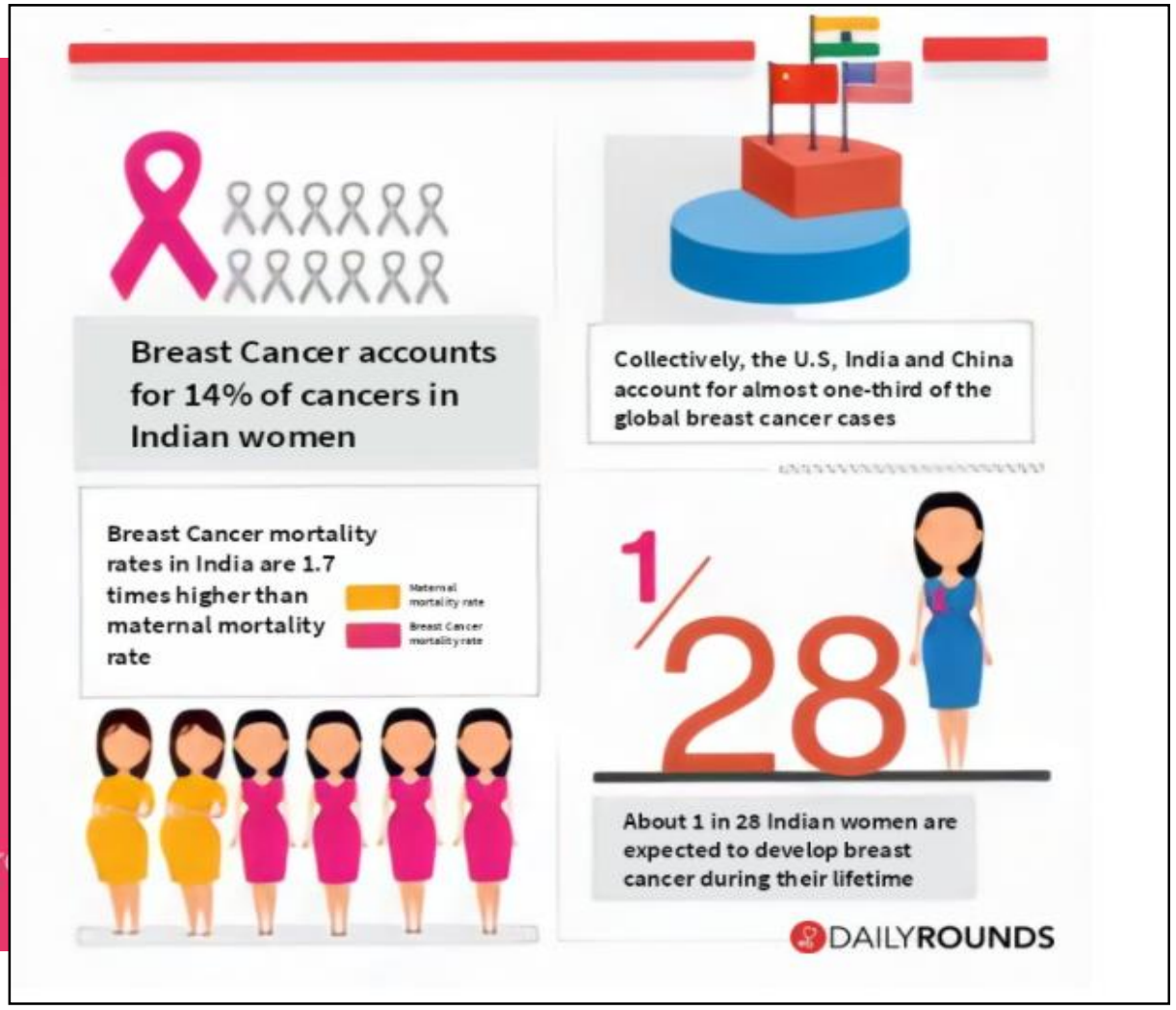
- Flow cytometry on marrow - CD19, CD 22, CD 79a, CD 34, CD 38 positive; and negative CD20, CD10, myeloid and T lymphoid markers
- Cytogenetics - hypodiploidy
- NGS - report awaited

Comprehensive diagnosis – Acute B lymphoblastic leukemia with aberrant MPO expression



THANK YOU!!!!


Sri
Shankara
CANCER FOUNDATION
OCTOBER
2021
BREAST CANCER
AWARENESS MONTH
www.shankaracancerhospital.org | 080-26981000| queries@sschr


Breast Cancer accounts for 14% of cancers in Indian women
Collectively, the U.S, India and China account for almost one-third of the global breast cancer cases
Breast Cancer mortality rates in India are 1.7 times higher than maternal mortality rate
Maternal mortality rate
Breast Cancer mortality rate
1/28
About 1 in 28 Indian women are expected to develop breast cancer during their lifetime
DAILYROUNDS