THE UNIVERSITY OF JORDAN,
School of Medicine

Breast cancer:
Introduction
for medical students



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Four clinical questions

A 52-year-old woman notices a new, firm breast lump.

Mammogram: irregular spiculated mass. Core biopsy: invasive carcinoma.



01 **What is it?**
Pathological type

02 **How will it behave?**
Biology and biomarkers

03 **How far has it spread?**
TNM and stage

04 **What should we treat with?**
Local and systemic therapy

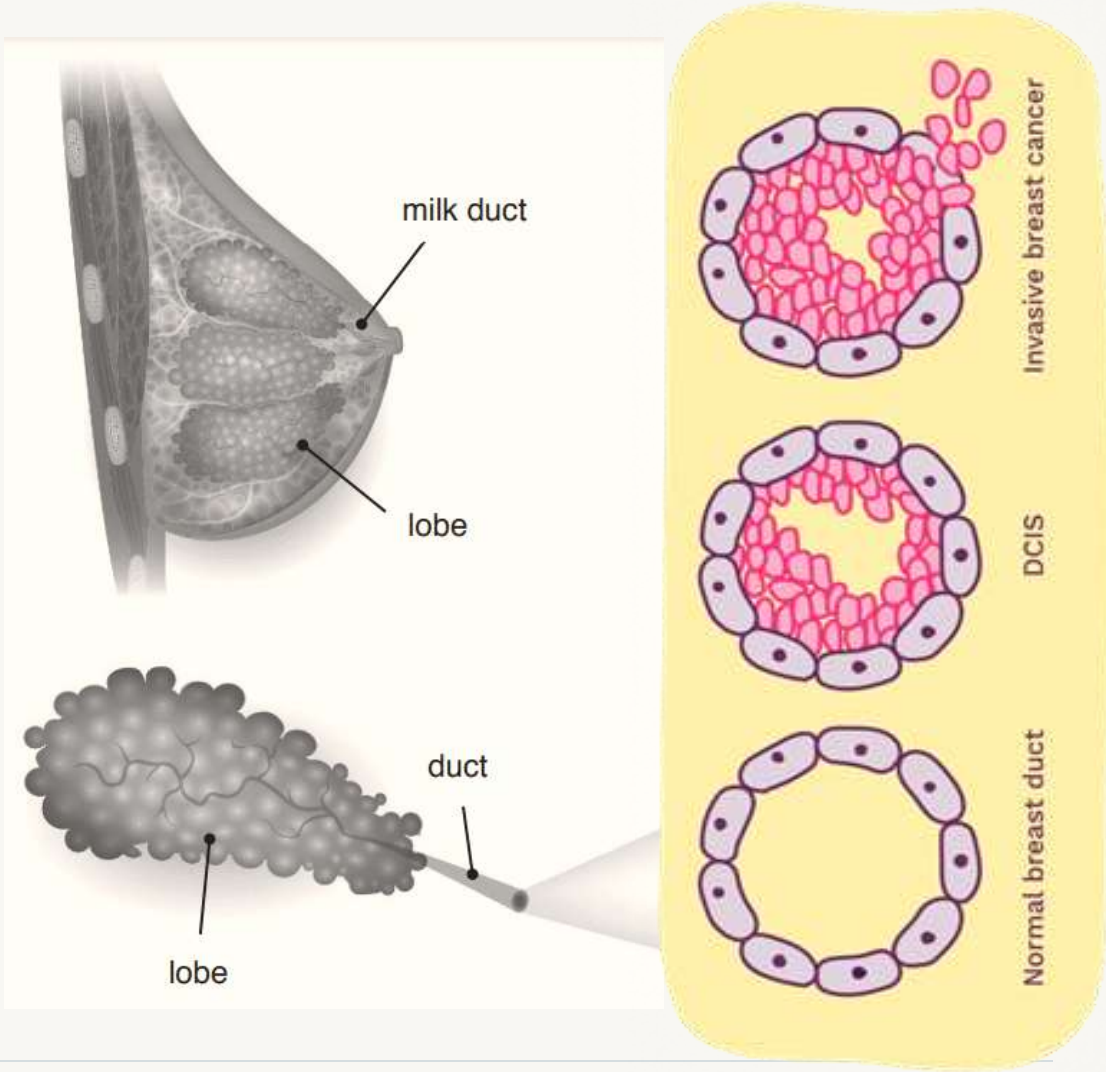
Pathology starts with invasion

IN SITU

Malignant cells remain within ducts or lobules.

INVASIVE

Cells breach the basement membrane and enter stroma.
Potential access to lymphatics and distant sites.

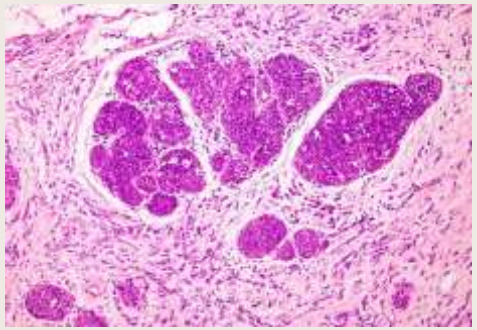


Common invasive types: pattern matters



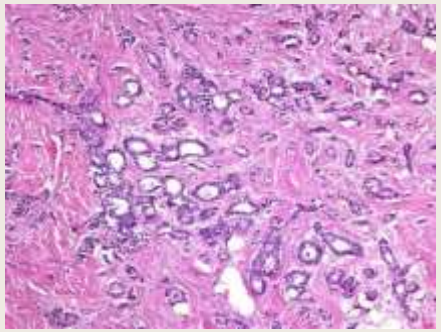
NST / “ductal”

Most common. Variable grade and receptor profile.



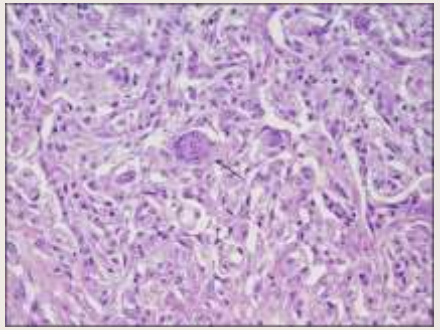
Lobular

Often discohesive, single-file growth. May be subtle or multifocal.



Special types

Tubular, mucinous, cribriform: often favorable when pure and low grade.



Aggressive patterns

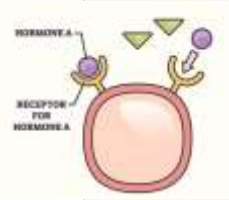
Metaplastic, micropapillary and inflammatory presentations need clinical context.

Special histology informs prognosis, but ER, PR, HER2, grade and stage still guide treatment.

Tumour biology: what the cells can do

G — Grade
Differentiation, nuclear atypia, mitotic activity

R — Receptors
ER / PR dependence and HER2 signalling



TUMOUR

P — Proliferation
Ki-67 is one estimate; interpret with context

G — Genomics
Selected assays refine recurrence risk and chemotherapy benefit

Biology explains why two tumours of the same size may need different treatment.

Molecular subtypes

CLINICAL GROUP	ER / PR	HER2	Typical biology	Treatment signal
Luminal A	ER+, PR high	−	Lower grade / Ki-67	Endocrine therapy
Luminal B	ER+; PR may be low	±	Higher proliferation	Endocrine ± chemo
HER2-positive	Any	+	HER2-driven	Anti-HER2 + systemic
Triple-negative	−	−	No ER/PR/HER2 target	Chemo; selected cases immunotherapy

HER2-low describes IHC 1+ or 2+/ISH-negative disease for selected drug eligibility. It is not a separate intrinsic molecular subtype.

Diagnosis: combine examination, imaging and tissue

1

Clinical

History, examination
Breast + regional nodes

2

Imaging

Diagnostic mammography
+ targeted ultrasound

3

Pathology

Image-guided core biopsy
Type, grade, ER / PR / HER2

Before treatment, answer four things

Invasive or in situ? | Histology and grade? | Receptors? | Clinical extent?

Staging: TNM describes anatomic extent

T Primary tumour

- Tis: in situ
- T1: ≤2 cm
- T2: >2 to ≤5 cm
- T3: >5 cm
- T4: chest wall / skin involvement or inflammatory cancer

N Regional nodes

- N0: no regional node disease
- N1: movable ipsilateral axillary nodes
- N2: fixed / internal mammary patterns
- N3: infraclavicular, supraclavicular or extensive nodal patterns

M Distant spread

- M0: no distant metastasis
- M1: distant metastasis present
- Any T / any N with M1 = stage IV

Stage groups: 0 in situ | I–II early invasive | III locally advanced | IV distant metastasis

AJCC 8th edition breast prognostic staging combines TNM + grade + ER / PR / HER2.

Treatment

LOCAL / REGIONAL

Surgery	Remove invasive disease and assess nodes.
Radiotherapy	Reduce local recurrence after breast conservation and in selected post-mastectomy settings.

SYSTEMIC

Endocrine	ER-positive disease; adjuvant or metastatic setting.
Chemotherapy	Higher-risk biology / burden, TNBC, or treatment response strategy.
Targeted / immune	HER2-targeted therapy; immunotherapy in selected TNBC.

Choice depends on stage, tumour biology, response goals, comorbidity and patient preference.

Treatment sequence follows risk and response

01

Define disease

Biopsy
ER / PR / HER2
Clinical TNM

02

Choose sequence

Surgery first for many operable, lower-risk tumours
Systemic first when downstaging / response matters

03

Local control

Breast surgery
Axillary staging
Radiotherapy as indicated

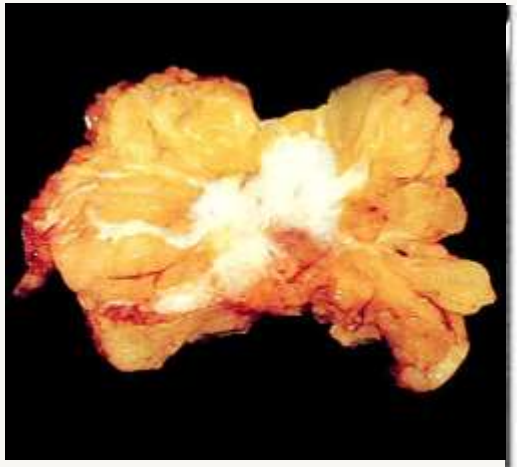
04

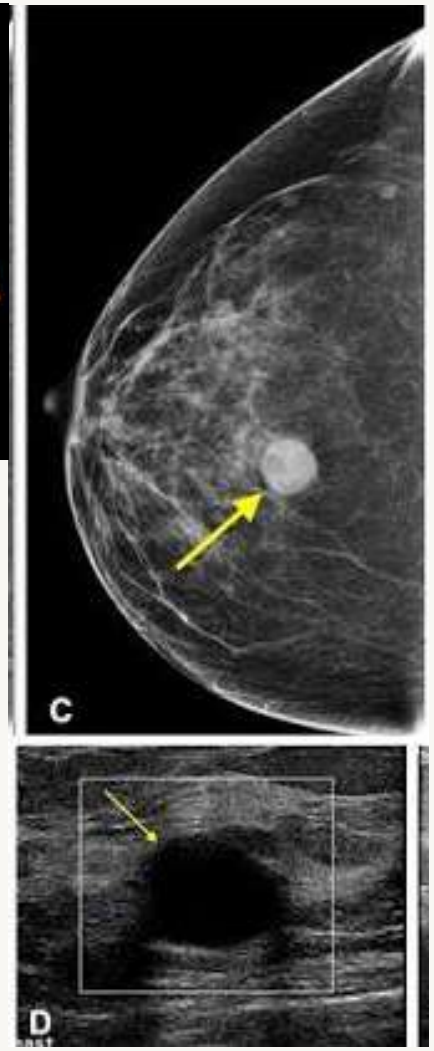
Reduce systemic recurrence

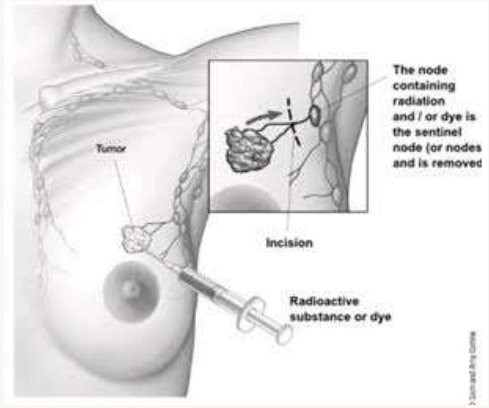
Endocrine, chemotherapy, anti-HER2, immunotherapy or selected combinations
Adjuvant Vs Neoadjuvant therapy

At every step: re-check the patient's goals, fitness, fertility concerns, comorbidities and treatment response.

Case 1 |







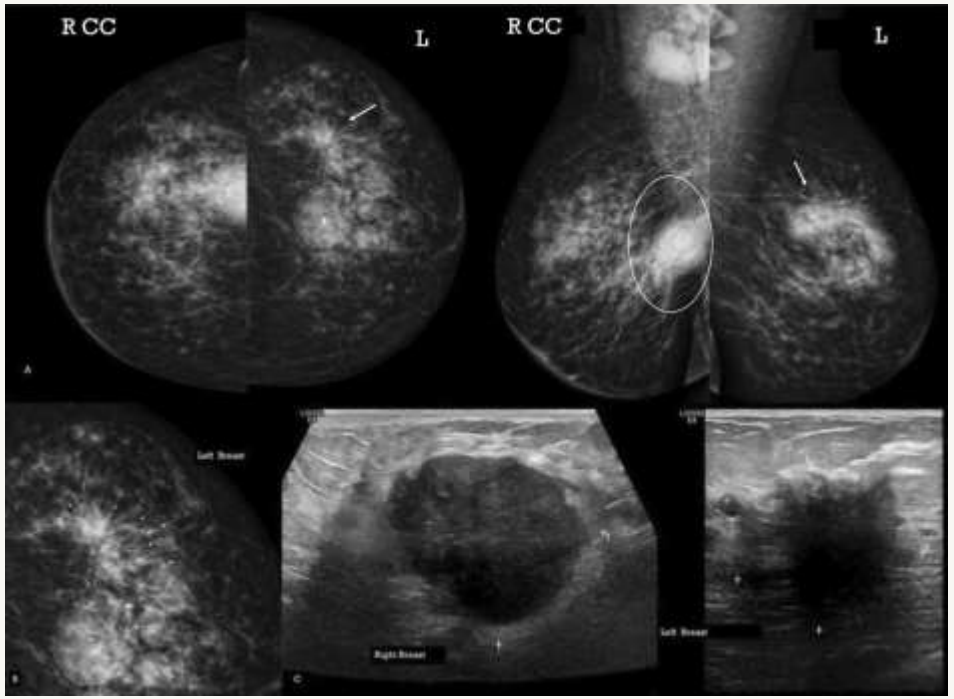
Core biopsy

- 1.3 cm invasive NST, grade 2
- ER 95%, PR 80%, HER2 0
- Axillary ultrasound: normal

Likely curative plan

1. Breast-conserving surgery + sentinel node biopsy
2. Whole-breast radiotherapy
3. Adjuvant endocrine therapy
4. Genomic assay / chemotherapy only if it changes the decision

Case 2 |



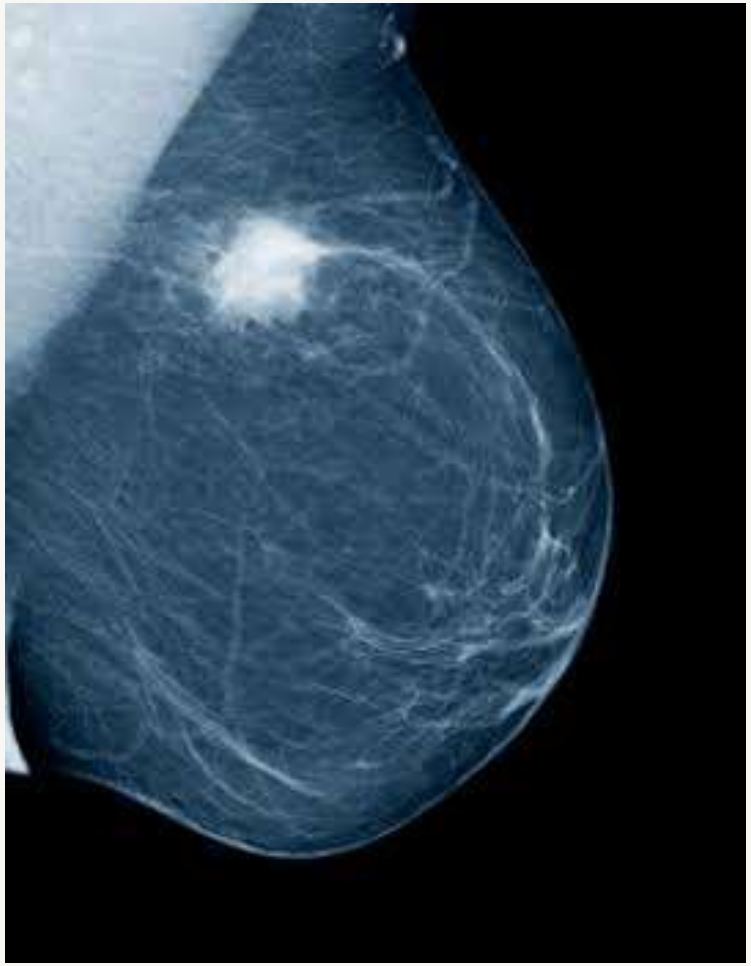
Core biopsy + axillary node

- 4.2 cm invasive NST, grade 3
- ER 20%, PR negative, HER2 IHC 3+
- Biopsy-proven axillary node

Why start before surgery?

1. Neoadjuvant chemotherapy + HER2-targeted therapy
2. Surgery and indicated radiotherapy
3. Use pathological response to guide adjuvant HER2 therapy
4. Add endocrine therapy because ER is positive

Case 3 |



Core biopsy

- 3.6 cm invasive NST, grade 3
- ER negative, PR negative, HER2 0
- No distant metastasis on indicated staging

Typical treatment direction

1. Neoadjuvant chemotherapy; consider pembrolizumab when eligible
2. Surgery after systemic treatment
3. Radiotherapy according to surgery / nodal risk
4. Residual disease can guide additional adjuvant options

Three questions to ask

1. **What is the pathology?**

   In situ or invasive; NST or special type; grade

2. **What is the biology?**

   ER / PR / HER2, proliferation and selected genomics

3. **What is the extent?**

   Clinical TNM now; pathological / yp stage when appropriate

Then choose local and systemic treatment with the MDT.

REFERENCES

Selected sources for further reading

National Cancer Institute	**Breast Cancer Types** https://www.cancer.gov/types/breast/breast-cancer-types
National Cancer Institute	**Breast Cancer Biomarker Tests** https://www.cancer.gov/types/breast/diagnosis/breast-cancer-biomarker-tests
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