

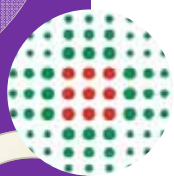


Le nuove metodiche diagnostiche per la diagnosi e lo studio del tumore mammario

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IRCCS Arcispedale Santa Maria Nuova - Reggio Emilia*

Screening Mammografico - AUSL Reggio Emilia



Provincia di Reggio Emilia

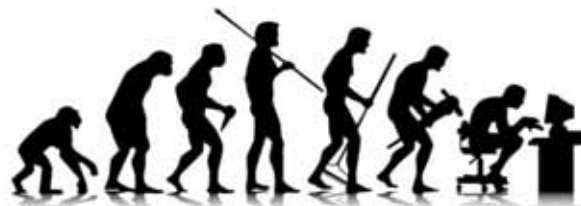
Senologia Dipartimentale

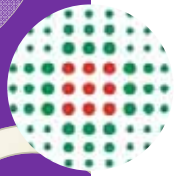
Analógico



2011

11 GE Senographe
Essential

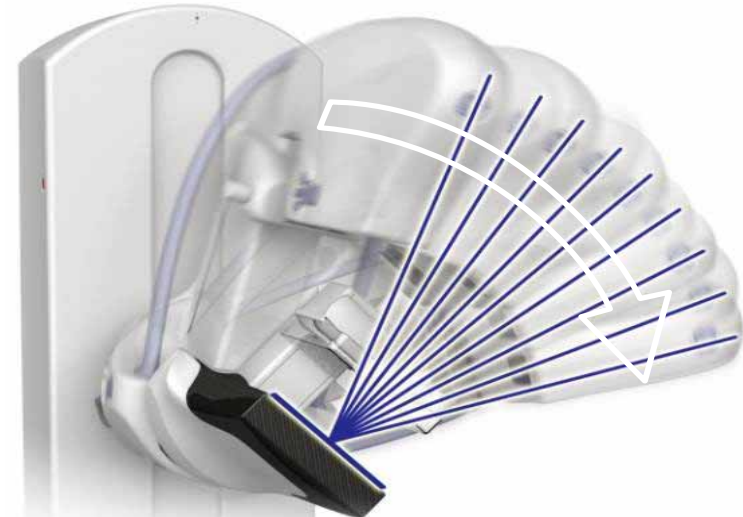




TOMOSINTESI



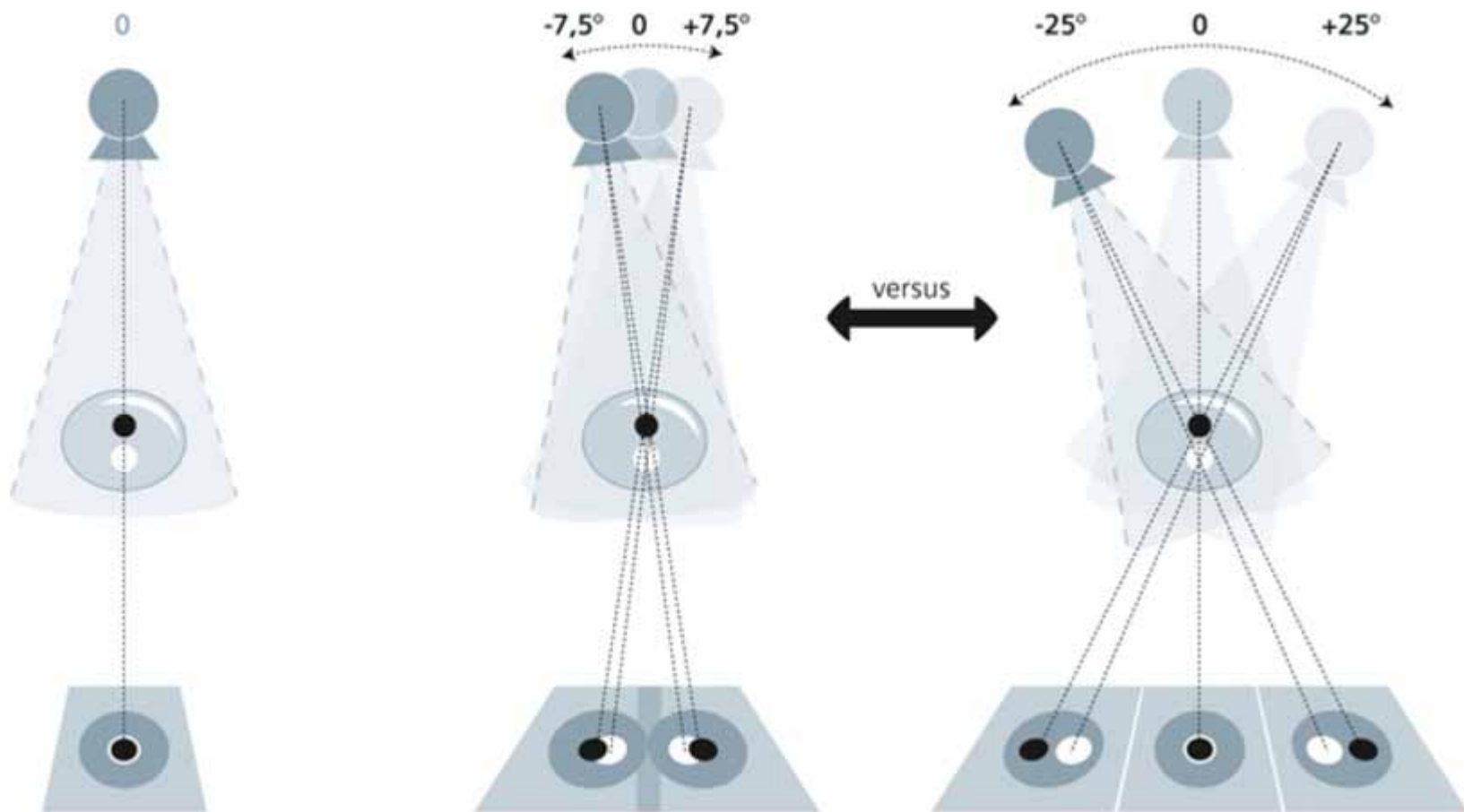
RMLO sequence



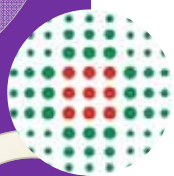
LMLO sequence

- Il tubo catodico compie un arco di rotazione (da ± 8 a $\pm 30^\circ$) rispetto all'asse verticale raccogliendo una serie di "proiezioni" della mammella sotto diversi angoli, mentre rimangono fermi la mammella ed il detettore
- La dose di una TOMO è sostanzialmente sovrapponibile a quella di una MX standard *Tomo AGD* $\sim 1,6 \text{ mGy}$ ($\sim 7\%$)

TOMOSINTESI

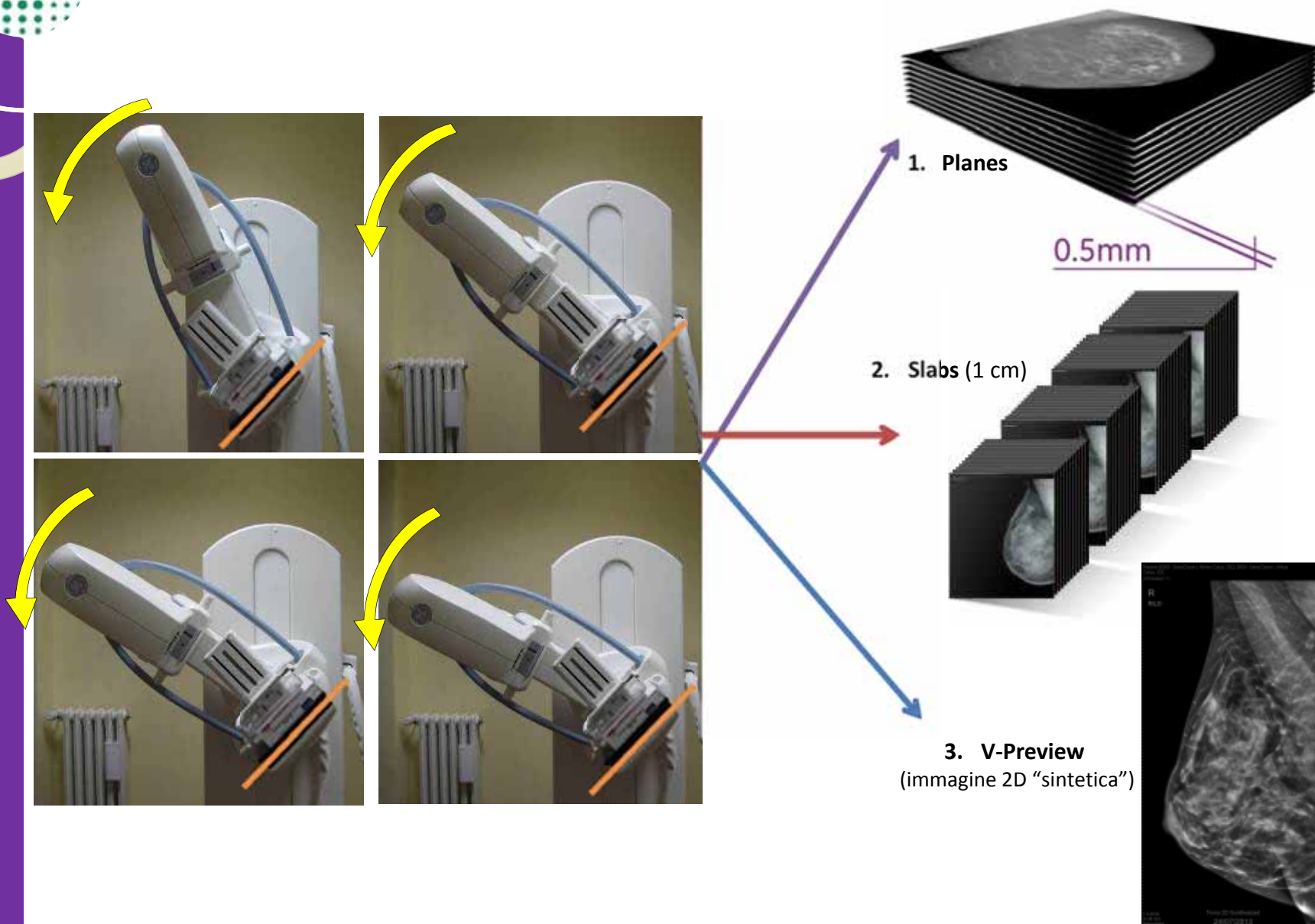


La mammella è visualizzata scorrendo le immagini corrispondenti a diverse sezioni perpendicolari all'asse verticale



TOMOSINTESI

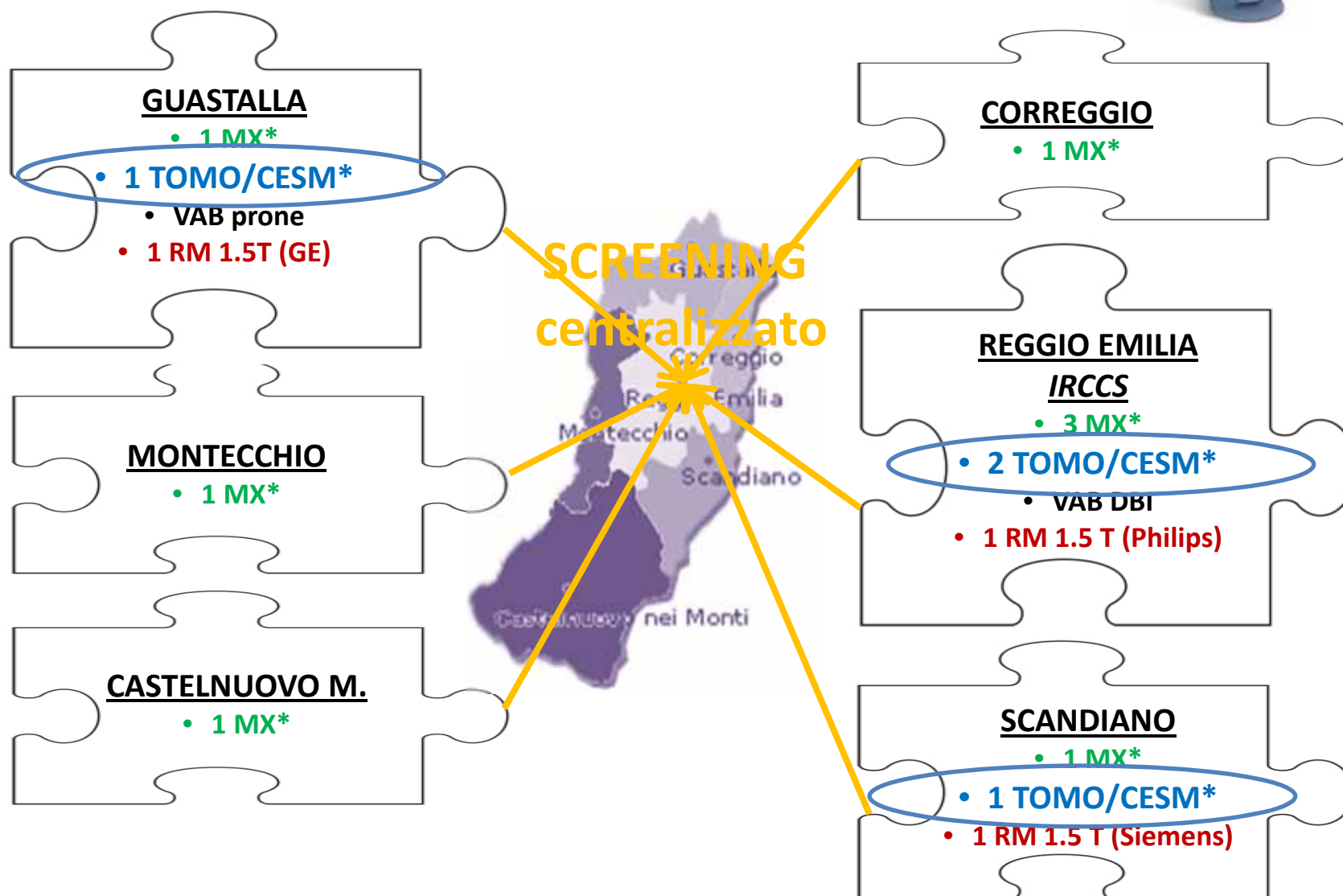
Le immagini vengono rielaborate con un algoritmo analogo a quello impiegato in TC



Provincia di Reggio Emilia

Senologia Dipartimentale

* 11 GE Senographe Essential

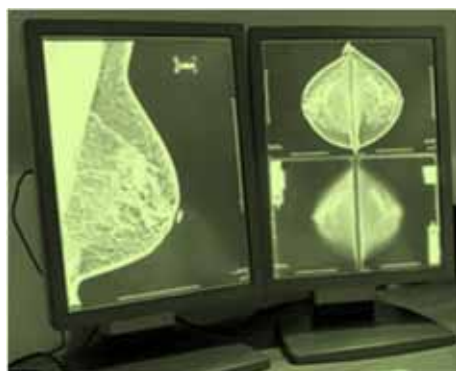


Provincia di Reggio Emilia

Senologia Dipartimentale

Screening

- Lettura centralizzata
- Staff: 9 lettori
- Carico di lavoro: 40/50 MX/ ora
- 3 (+1*) PACS Workstation (Sincro su RIS)
- *Referto strutturato 1° e 2° livello a RIS*
- Doppia lettura in cieco + 3° lettore se discordante



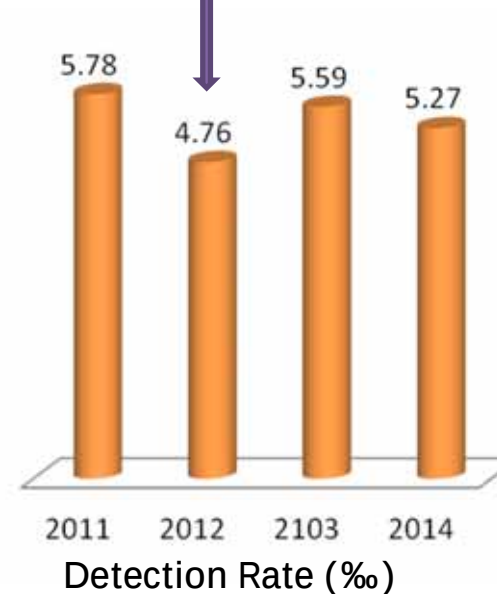
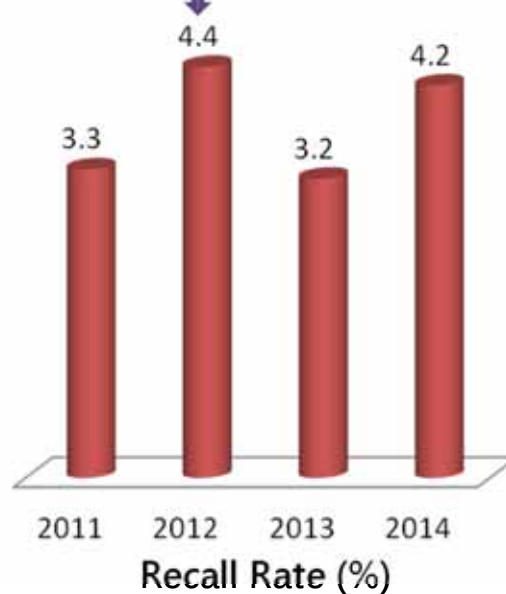
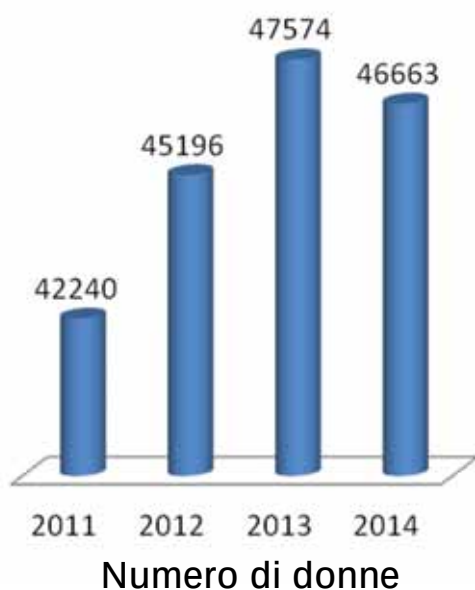
Provincia di Reggio Emilia

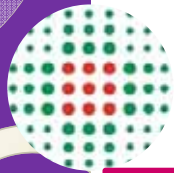
Senologia Dipartimentale

Screening

- Adesione ~**79%**
- Da **45** a 49 anni MX: annuale (da Marzo 2010: RER)
- Da 50 a **74** anni MX: biennale (70-74 da Marzo 2010: RER)

DAL 2 GENNAIO 2012 MAMMOGRAFIA DIGITALE!





TomoScreening Trial

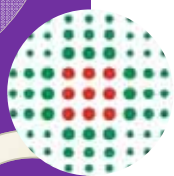


Trial Clinico per valutare l'efficacia della Tomosintesi nel Programma di Screening del carcinoma della mammella nella provincia di Reggio Emilia

Disegno dello studio

- Randomizzazione della popolazione (rapporto 1:1)
 - **Braccio Sperimentale:** doppio esame **Tomo + MX**
 - **Braccio di Controllo:** **MX** (*standard of care*)
- **55 000** donne *invitate* in un periodo di circa 3 anni
- Prevedendo il 72% di adesione allo studio, è previsto l'arruolamento di **20 000** donne per braccio. Questo campione dovrebbe permettere di dimostrare un aumento del 10% di sensibilità di Tomo + MX
- I primi studi* riportano un aumento della DR fino al 40%

* Oslo – Malmø – Verona/Trento



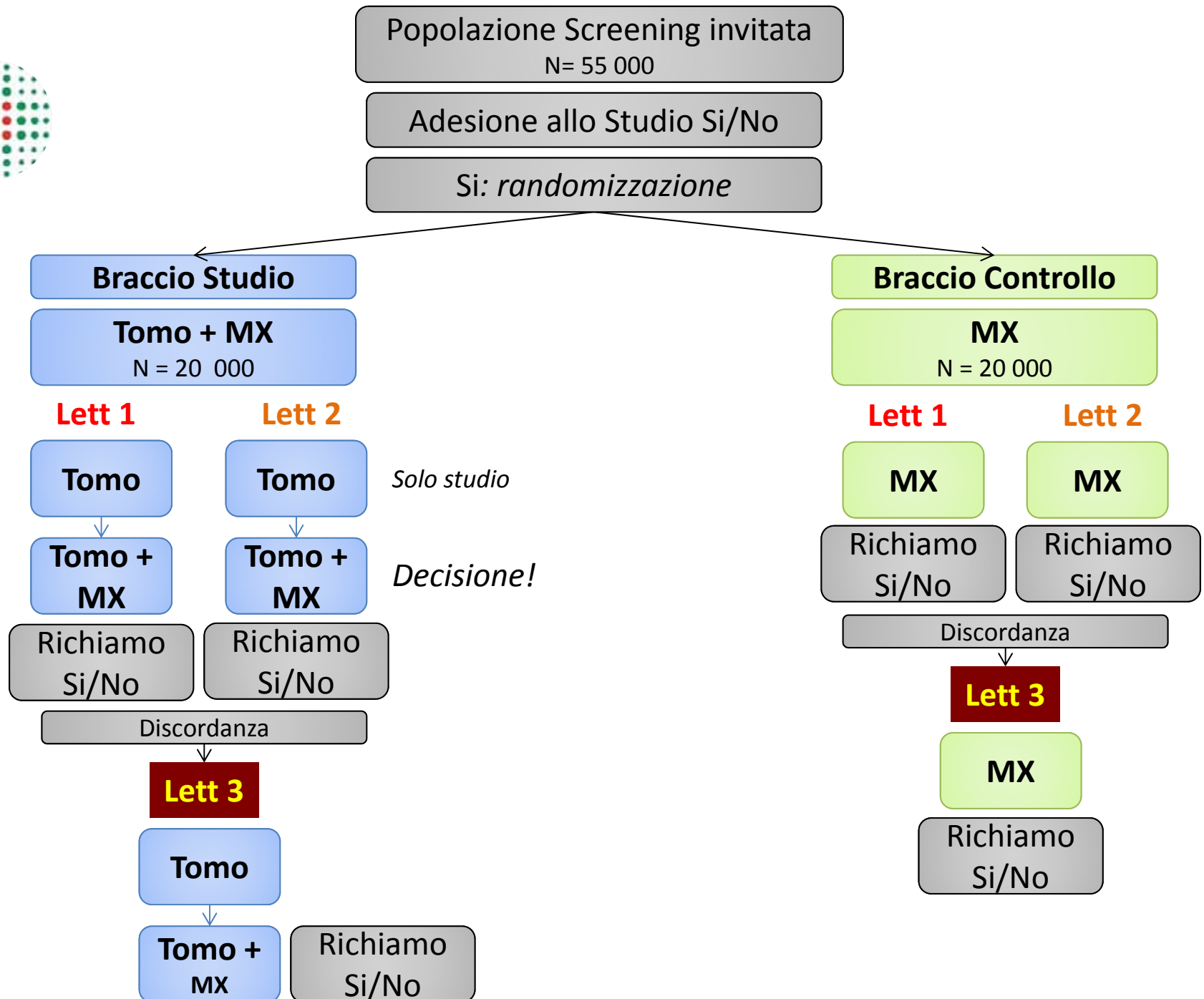
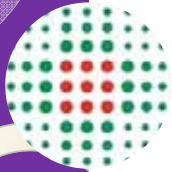
TomoScreening Trial

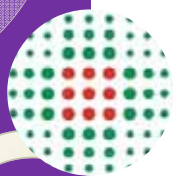
Criteri di Inclusione:

- Consenso informato
- 46-70 anni, invitate a Scandiano, Guastalla o Reggio Emilia (donne che hanno già partecipato al Programma di Screening almeno una volta)
- Ogni donna effettuerà **Tomo + MX** solo una volta

Criteri di Esclusione:

- Protesi
- Chemioterapia in atto
- Incapacità di fornire un consenso informato
- Tomosintesi già effettuata precedentemente
- Seni voluminosi che necessitano di più esposizioni già alla 2D
- Donne con pregresso Linfoma
- Mutazione BRCA 1 e 2 nota



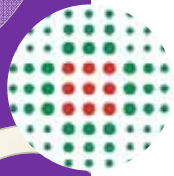


Tomo ScRE Trial – *Interim Analysis*

Aggiorn. Marzo 2015

- Inizio: *12 Marzo 2014* – Aggiornamento: *11 Marzo 2015*
- Adesione all'invito: 84 %
- Adesione allo studio: 66 %
- **9776** donne arruolate
 - 4832 nel **Braccio Controllo**
 - 4944 nel **Braccio Studio**

	MX 46-50 anni	MX 51-70 anni	Tomo + MX 46-50 anni	Tomo + MX 51-70 anni
popolazione	1513	3319	1590	3354



Tomo ScRE Trial – *Interim Analysis*

Aggiorn. Marzo 2015

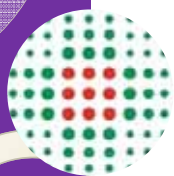
	MX 46-50 anni	MX 51-70 anni	Tomo + MX 46-50 anni	Tomo + MX 51-70 anni
RR	4.1 %	3.6 %	3.2 %	3.8 %

Recall Rate

- RR **Braccio Controllo** = 3.6 %
- RR **Braccio Studio** = 3.5 % - 3 %
 - 46-50 anni : **Tomo + MX** vs **MX** : RR - 22 %
 - 51-70 anni: **Tomo + MX** vs **MX** : RR + 6 %

Non (ancora) statisticamente significativo ma clinicamente rilevante!!!

	Oslo	Houston	Yale	Malmö
RR	- 18% (10.3/8.5)	- 37% (8.7/5.5)	- 30% (12/8.4)	+3%



Tomo ScRE Trial – *Interim Analysis*

Aggiorn. Marzo
2015

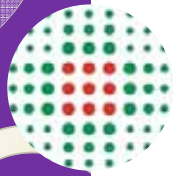
	MX 46-50 anni	MX 51-70 anni	Tomo + MX 46-50 anni	Tomo + MX 51-70 anni
DR	3.3 ‰	6.6 ‰	3.8 ‰	10.1 ‰

Detection Rate

- DR **Braccio Controllo** = 5.6 ‰
- DR **Braccio Studio** = 8.1 ‰ **+ 2.5 ‰ (+ 45 %)**
 - 46-50 anni: **Tomo + MX** vs **MX** : **DR + 0.5 ‰ (+ 15 %)**
 - 51-70 anni: **Tomo + MX** vs **MX** : **DR + 3.5 ‰ (+ 53 %)**

p value > 0.05: non (ancora) statisticamente significativo ma clinicamente rilevante!!!

	Trento	Oslo	Houston	Yale	Malmö
DR	+2.7‰ (5.3/8.1)	+2.3‰ (7.1/9.4)	+1.4‰ (4.0/5.4)	+0.5‰ (5.2/5.7)	+2.1‰ (4.7/6.8)

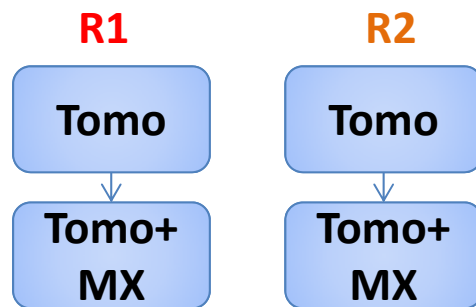


DBT Screening Trial – *Interim Analysis*

Up to March 2015

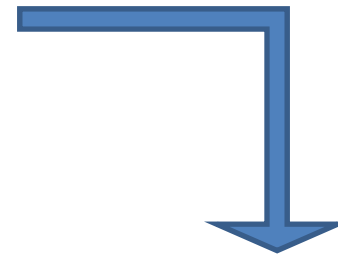
	MX 46-50 anni	MX 51-70 anni	Tomo + MX 46-50 anni	Tomo + MX 51-70 anni
DR	3.3 ‰	6.6 ‰	3.8 ‰	10.1 ‰

Braccio Studio



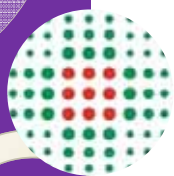
Solo studio

Decisione!



Braccio studio: popolazione: 4944 donne

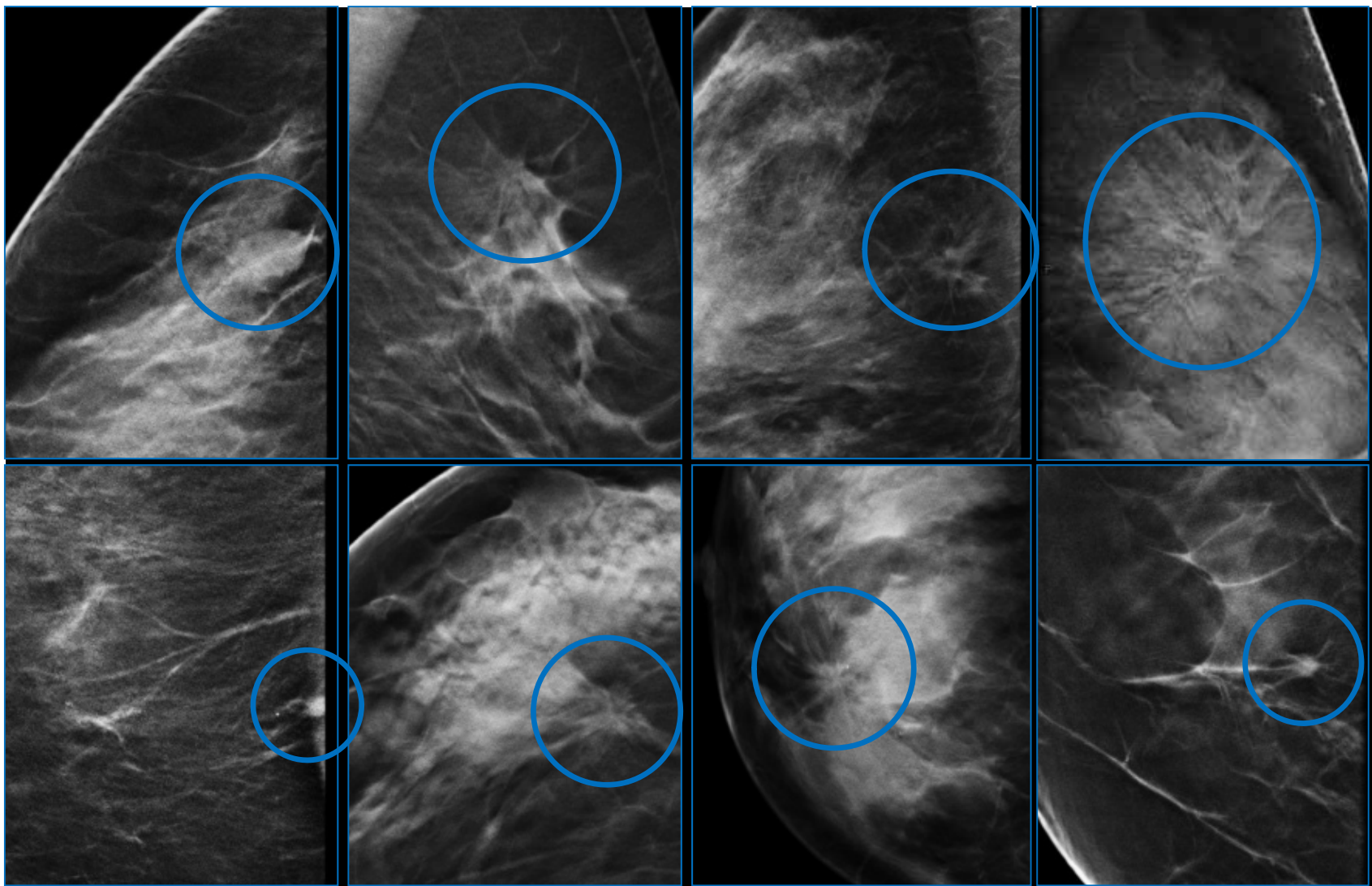
- Richiami: 172
 - Positive: 38
 - **Individuati SOLO con TOMO: 8 (/38) = 21%**

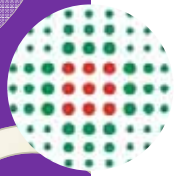


DBT Screening Trial

SLAB

Individuati SOLO con TOMO: 8 (/38) = 21%





Tomo ScRE Trial – *Interim Analysis*

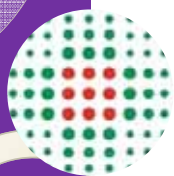
Aggiorn. Marzo
2015

	MX 46-50 anni	MX 51-70 anni	Tomo + MX 46-50 anni	Tomo + MX 51-70 anni
VPP	8.3 %	19.3 %	12.2 %	27.6 %

Valore Predittivo Positivo

- VPP **Braccio Controllo** = 15.5 %
- VPP **Braccio Studio** = 23.3 % **+ 50 %**
 - 46-50 anni : **Tomo + MX** vs **MX** : **VPP+ 47 %**
 - 51-70 anni : **Tomo + MX** vs **MX** : **VPP + 43 %**

p value > 0.05: non (ancora) statisticamente significativo ma clinicamente rilevante!!!



Tomo ScRE Trial – *Interim Analysis*

Aggiorn. Marzo
2015

Tempi di Lettura

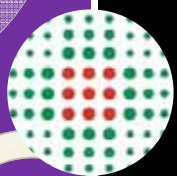
	1° Lett	2° Lett	1° Lett RICHIAMO	2° Lett RICHIAMO
MX	37 s	32 s	99 s	93 s
Tomo + MX	60 s	56 s	108 s	108 s
Δ %	+ 62 %	+ 75 %	+ 9 %	+ 16 %
<i>p value</i>	< 0.05	< 0.05	> 0.05	> 0.05

Trial/studio	MX	MX + Tomo	Δ %
<i>Trento*</i>	33 s	77 s	+ 135 %
<i>Oslo**</i>	48 s	89 s	+ 85 %
<i>Boston***</i>	114 s	168 s	+ 47 %

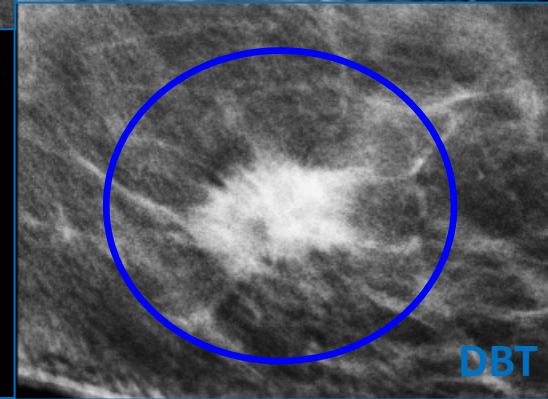
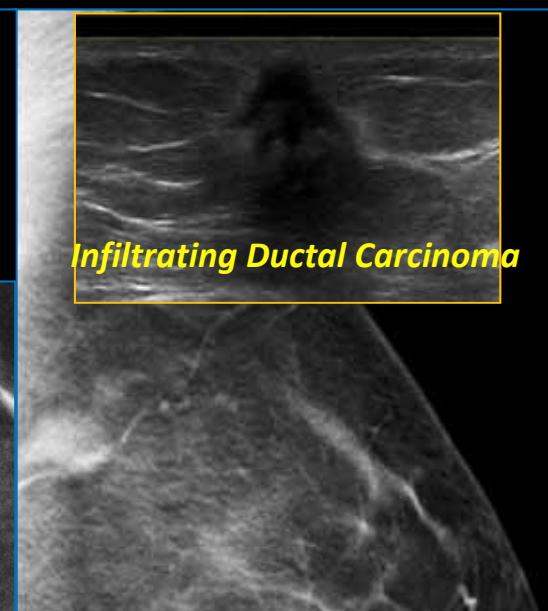
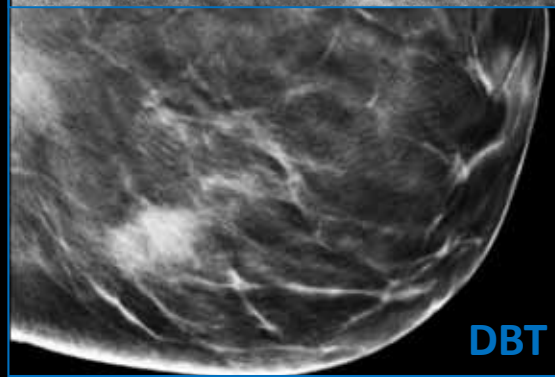
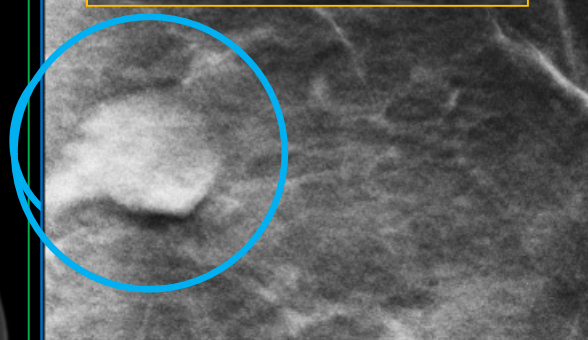
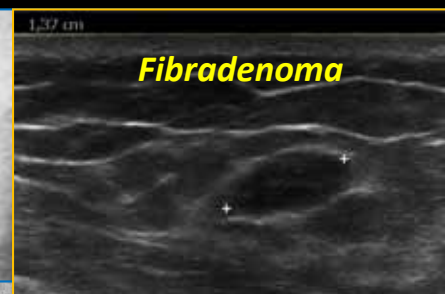
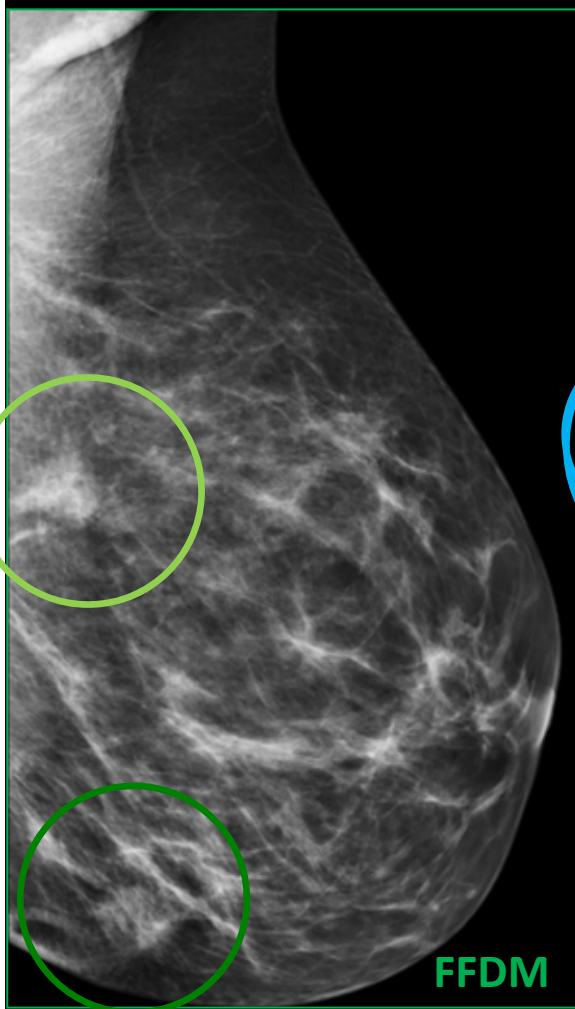
*Bernardi D, Ciatto S et al:BJR,2012

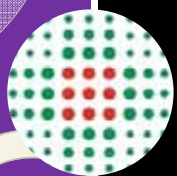
**Skaane P et al.:Eur Radiol.2013

***Dang PA et al: Radiology,2014

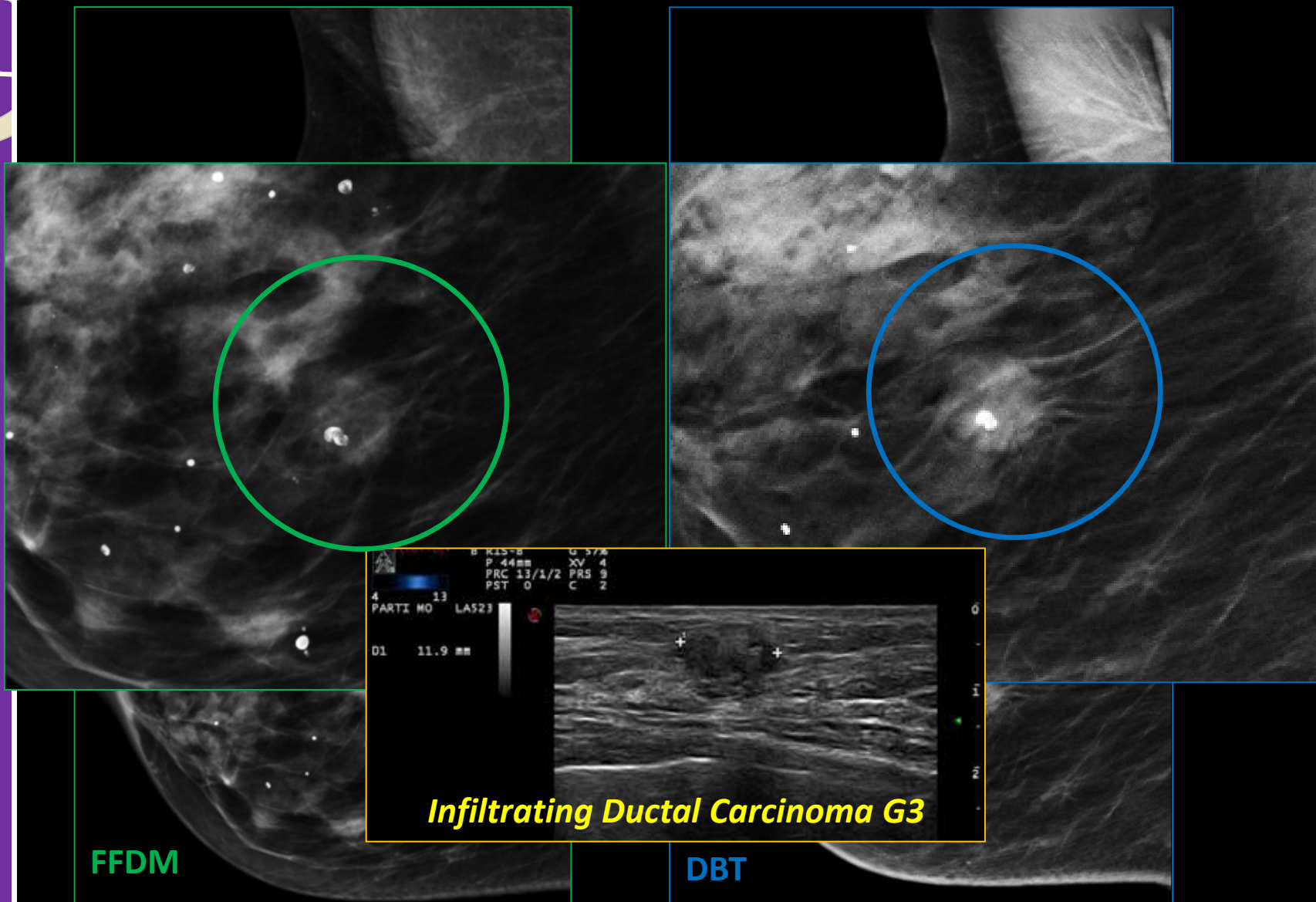


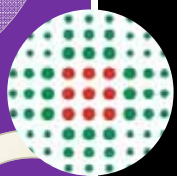
Tomo ScRE Trial - *Opacity*



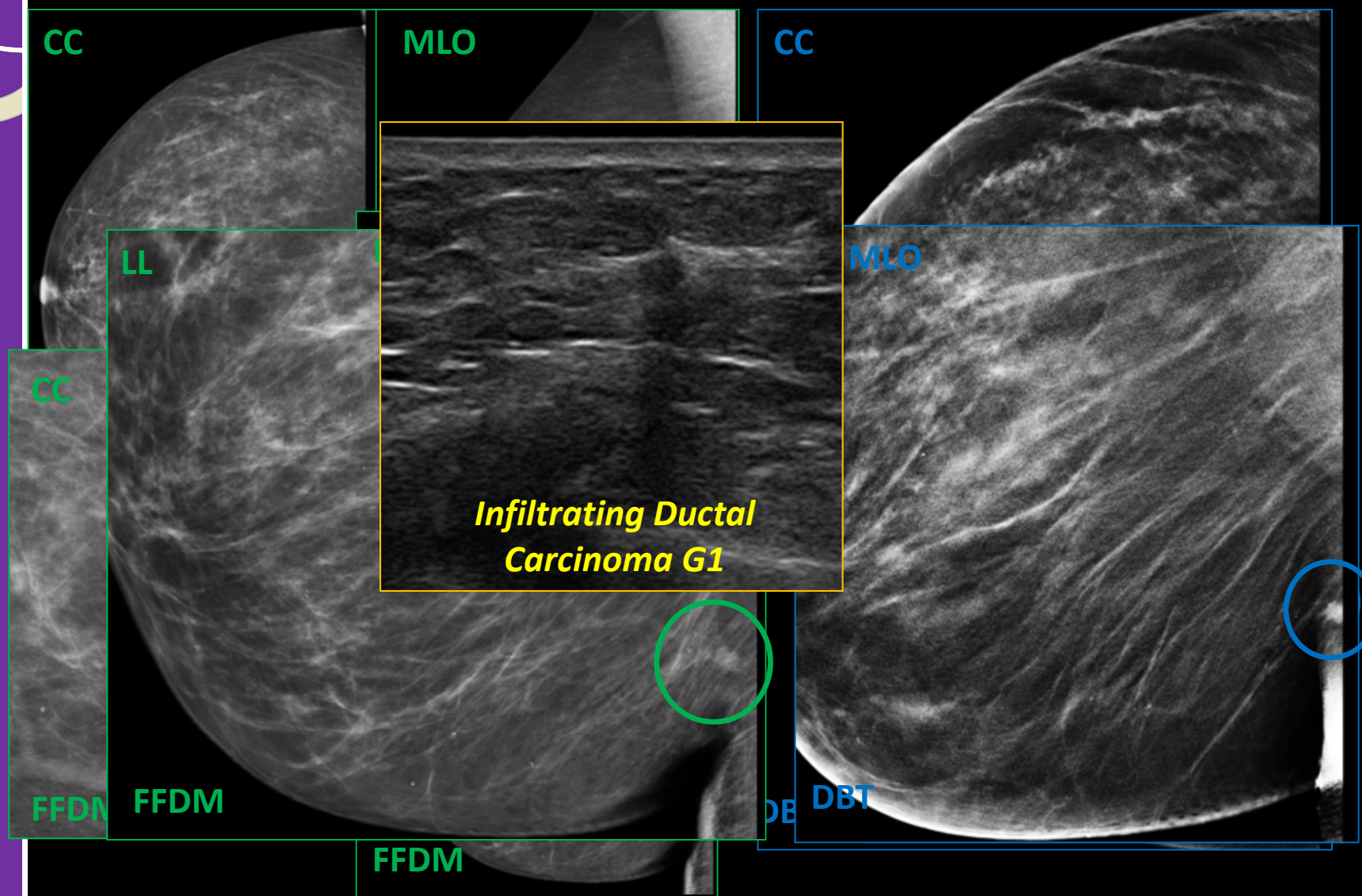


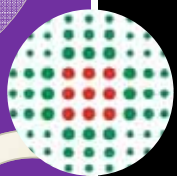
Tomo ScRE Trial - *Opacity*



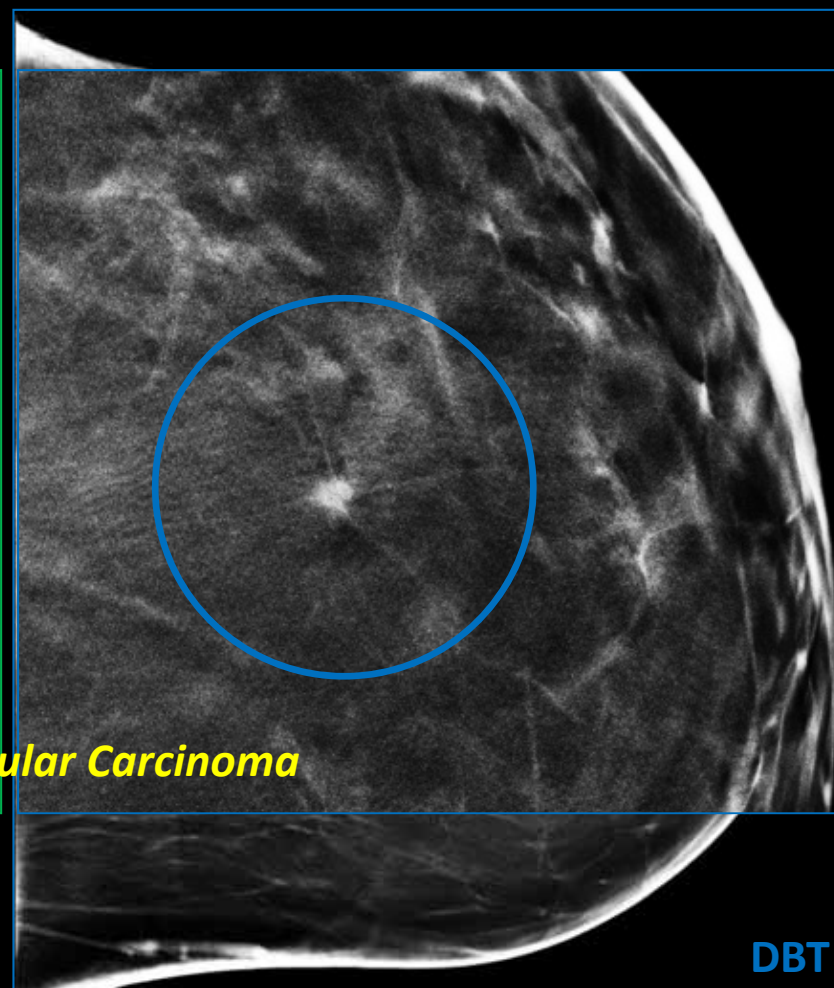
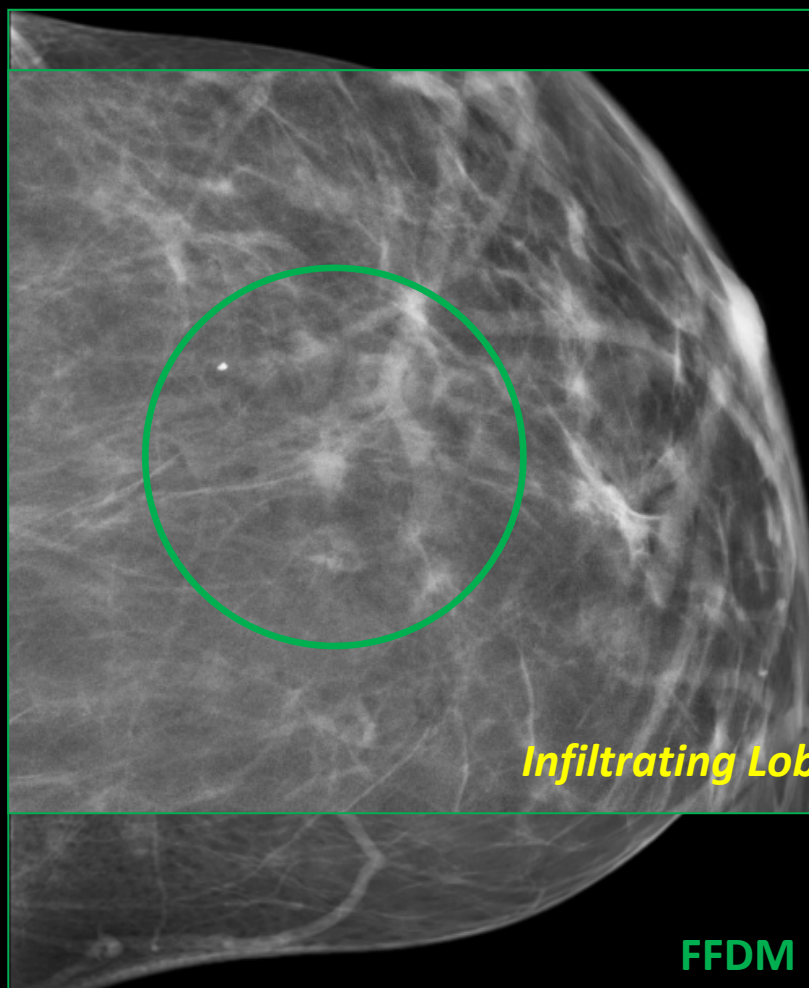


Tomo ScRE Trial - *Opacity*

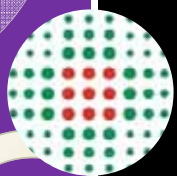




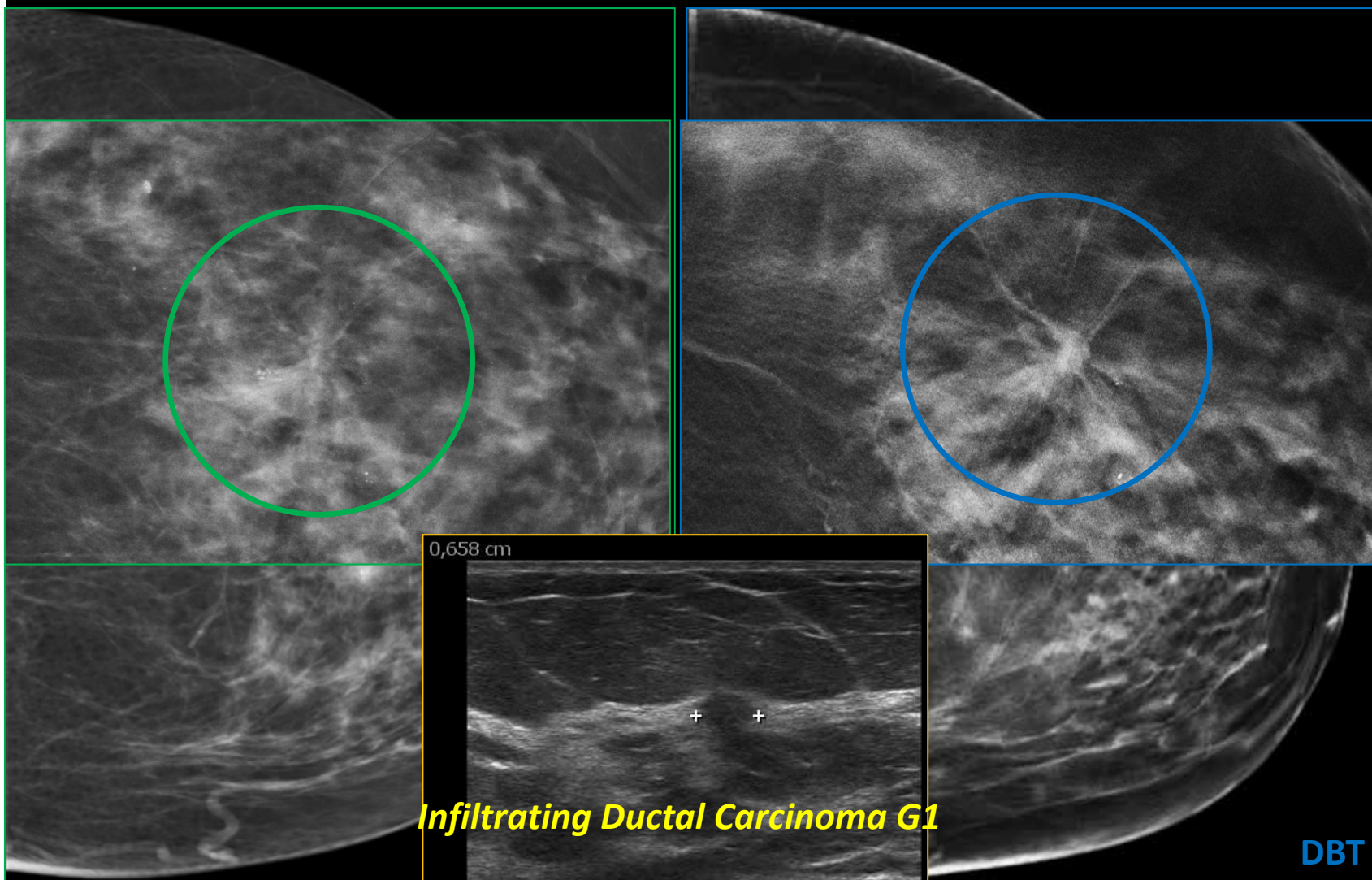
Tomo ScRE Trial - *Opacity*



Infiltrating Lobular Carcinoma

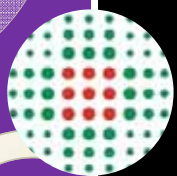


Tomo ScRE Trial - *Opacity*

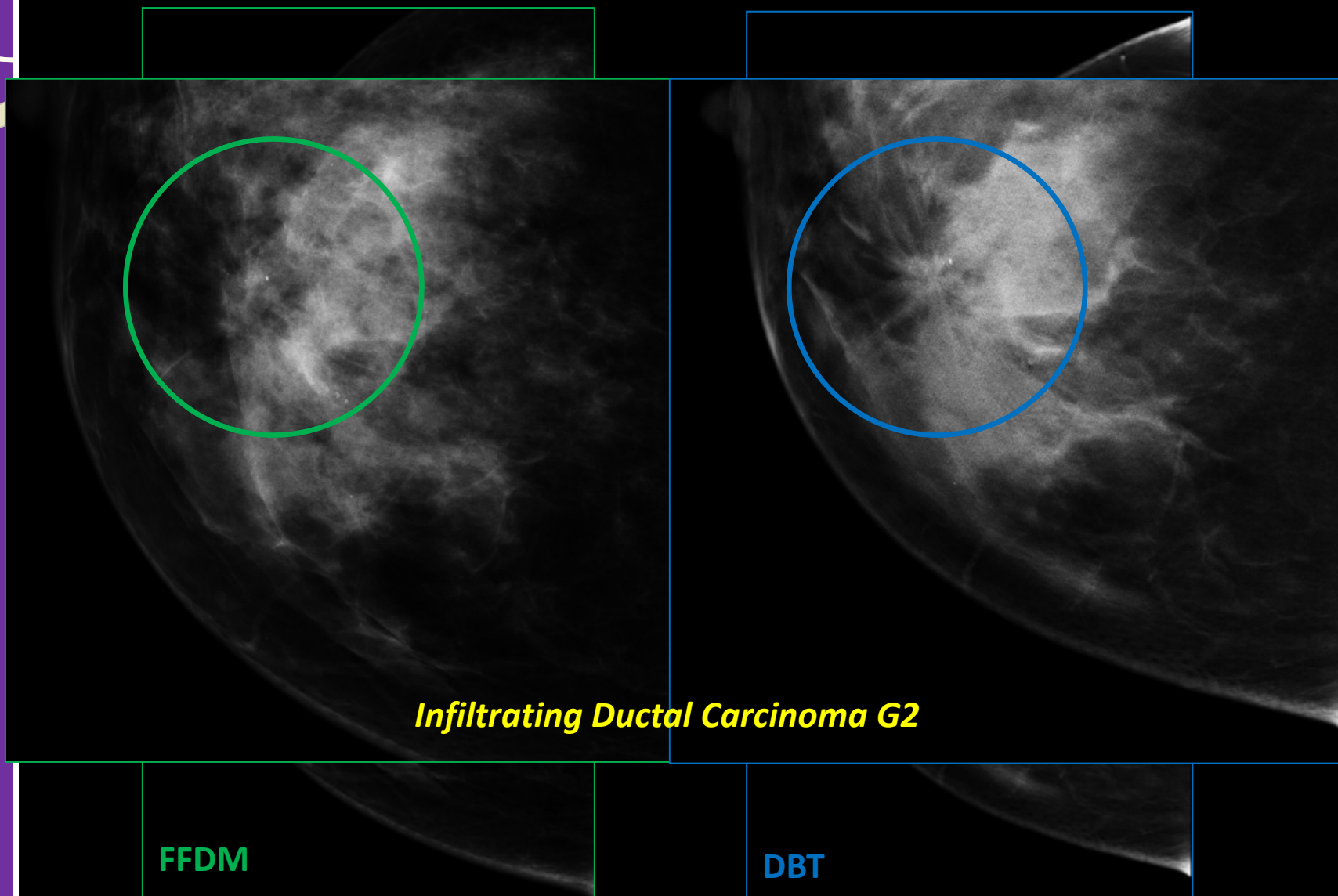


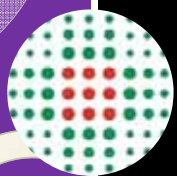
Infiltrating Ductal Carcinoma G1

DBT

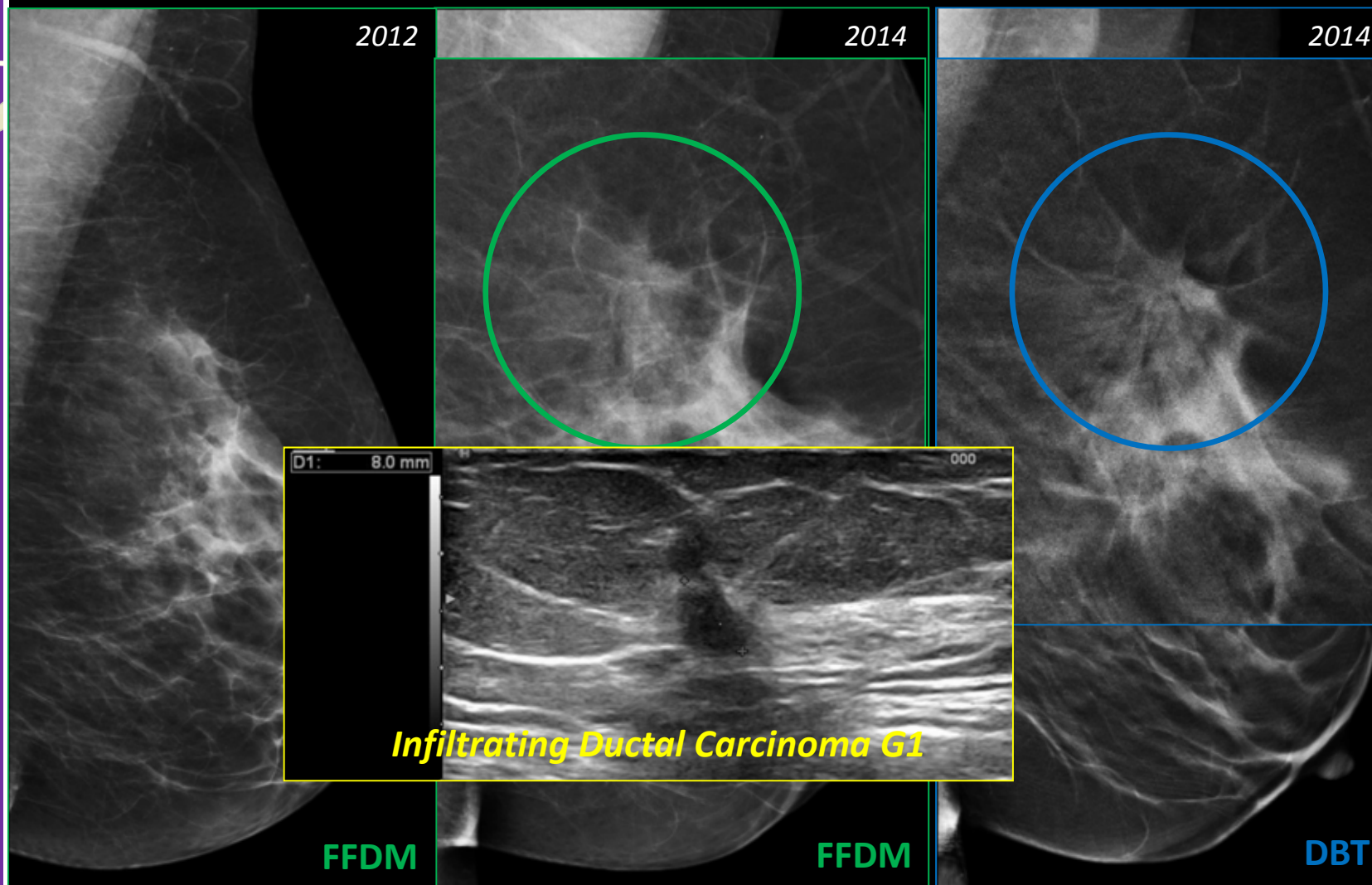


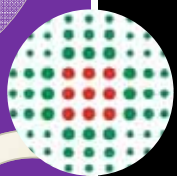
Tomo ScRE Trial – *Distortion*



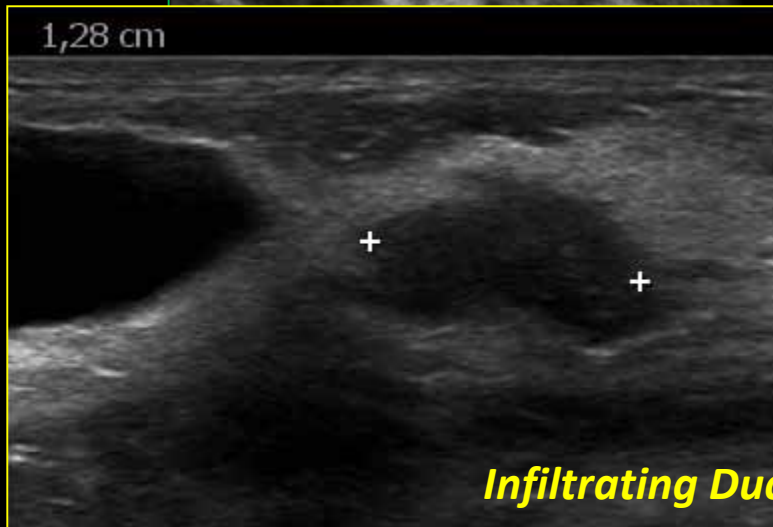
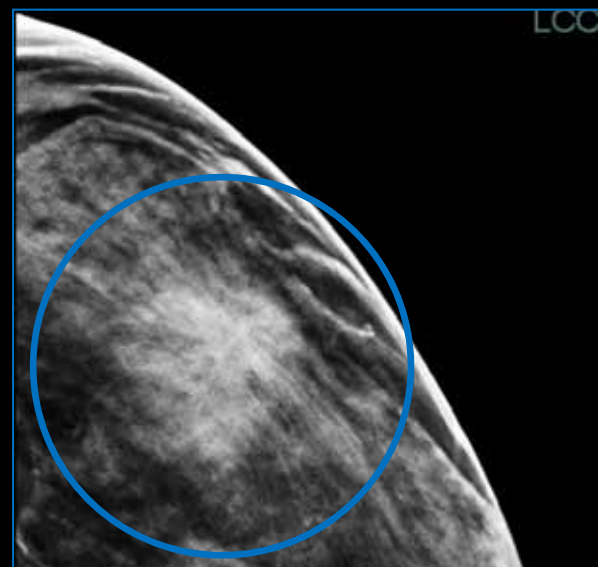
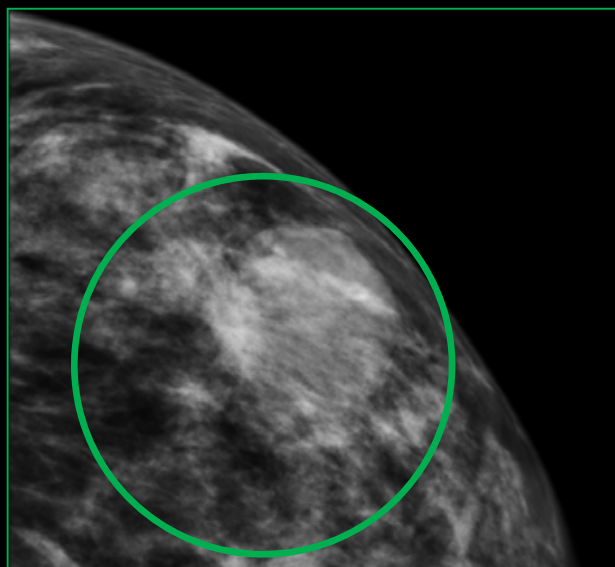


Tomo ScRE Trial – *Distortion*





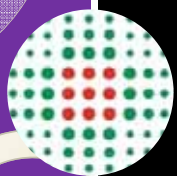
Tomo ScRE Trial – *Distortion*



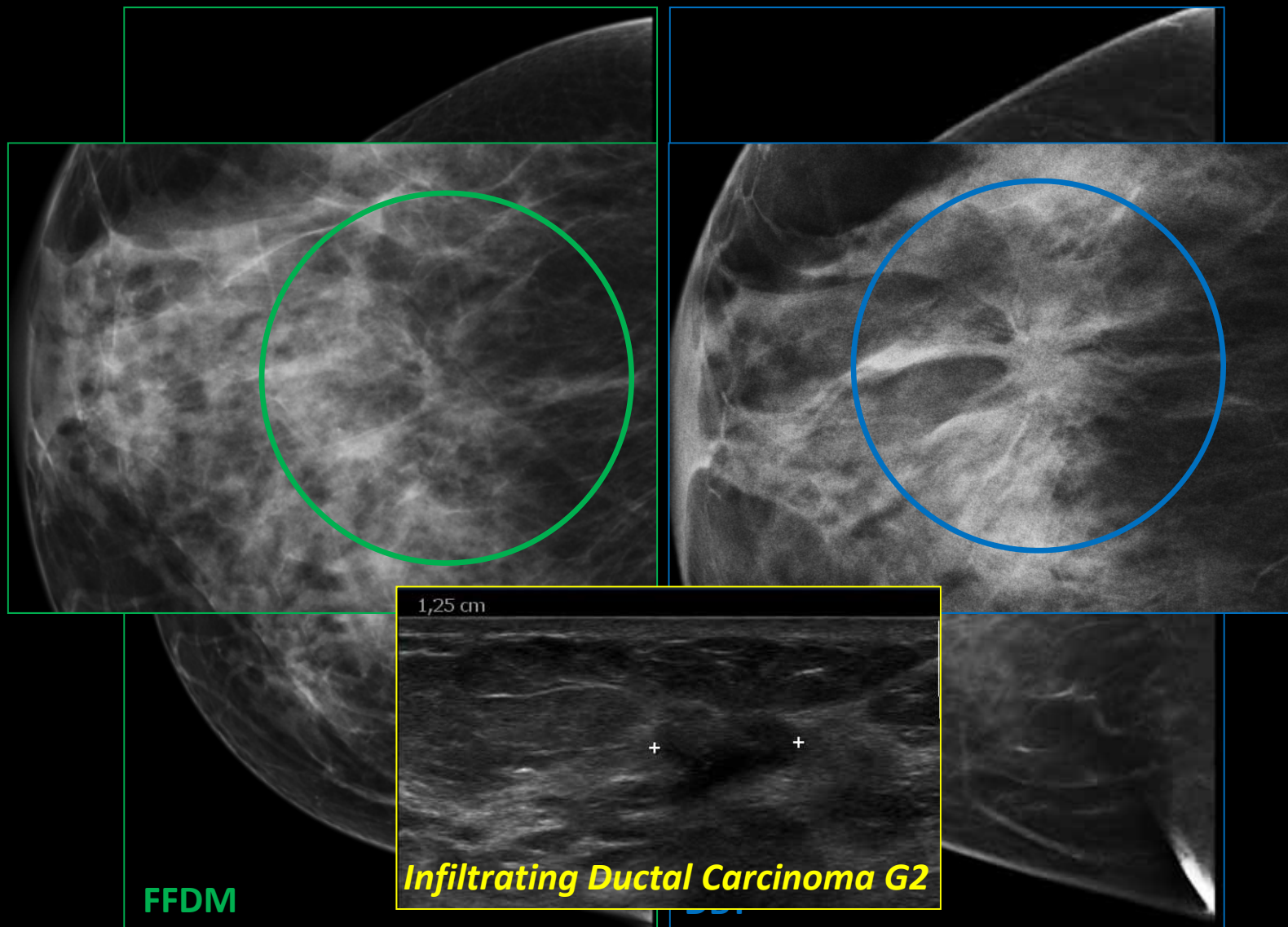
Infiltrating Ductal Carcinoma G2

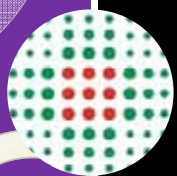
FFDM

DBT



Tomo ScRE Trial – *Distortion*



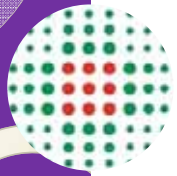


Tomo ScRE Trial – *Microcalcification*

Ductal Carcinoma in Situ

FFDM

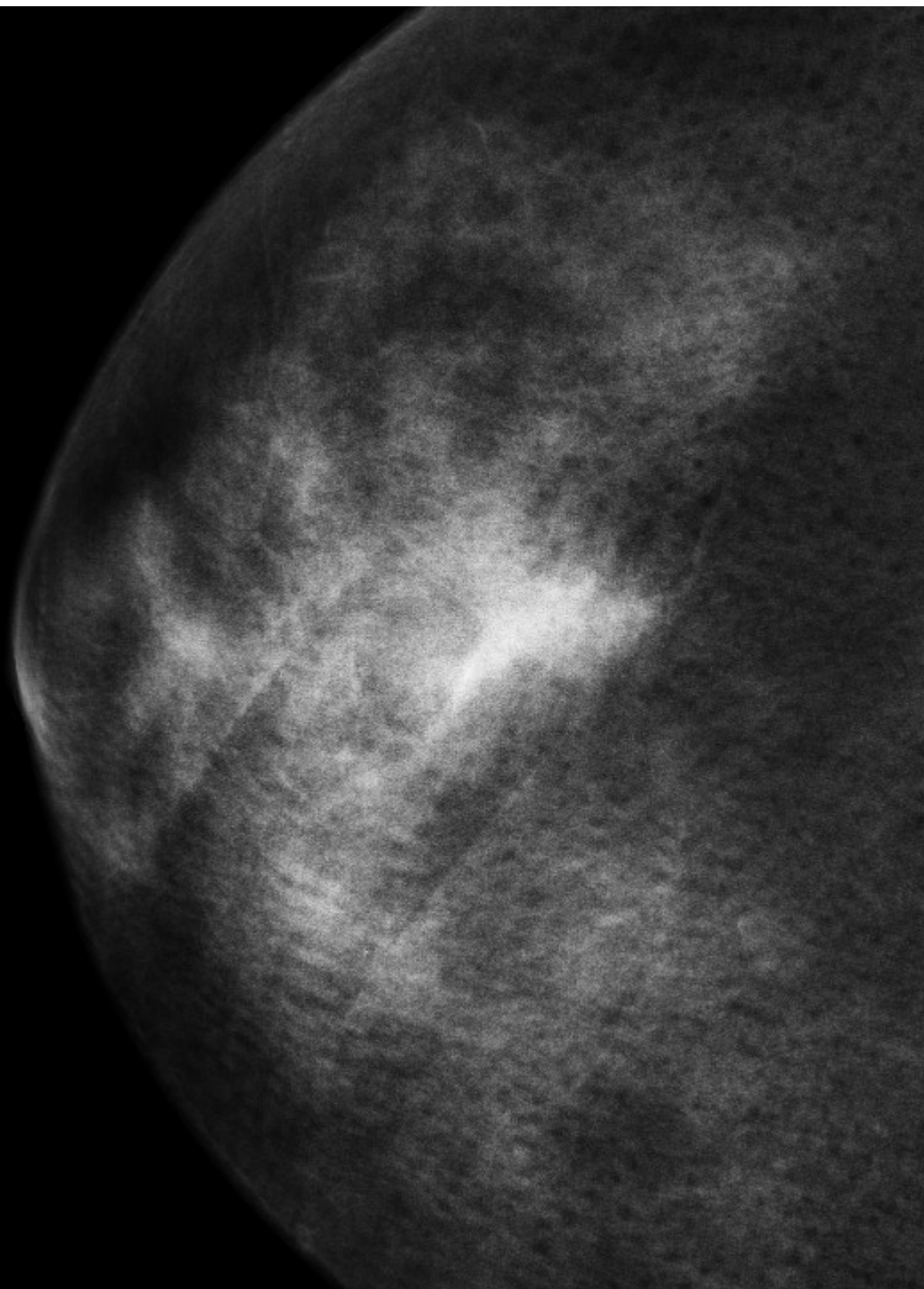
DBT



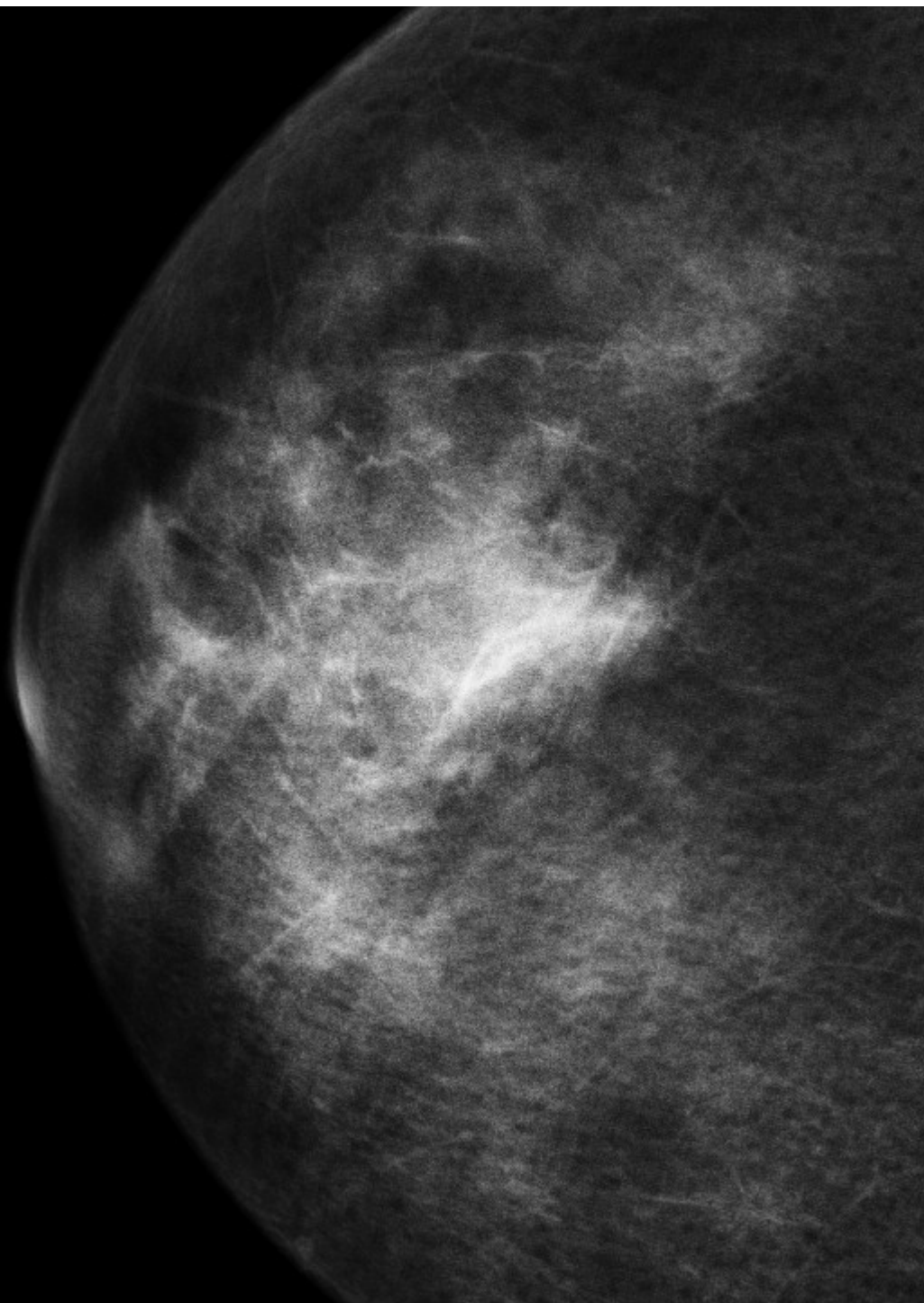
Take Home Message

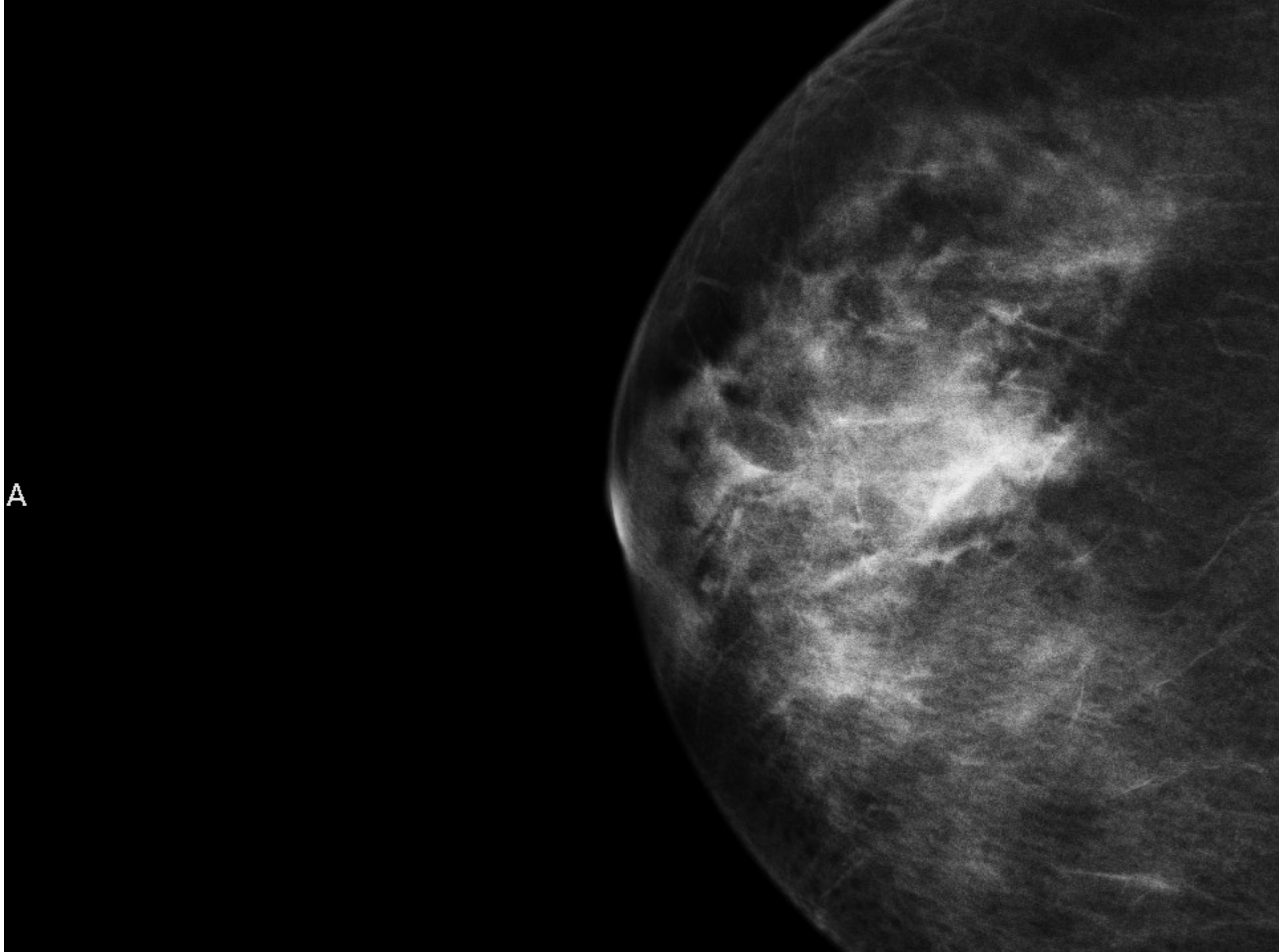
- Tomo come primo esame letto in Screening
- **Tomo + MX** vs **MX**:
 - **RR: - 3 %**
 - - **22 %** nei pazienti con 46-50 anni (seno denso)
 - **DR: + 45 %**
 - + 53 % nei pazienti con 51-70 anni
 - **VPP: + 50 %**
 - **Tempi di lettura: + 62 % (R1) / + 75% (R2)**
 - Non aumento significativo in caso di Richiamo!!

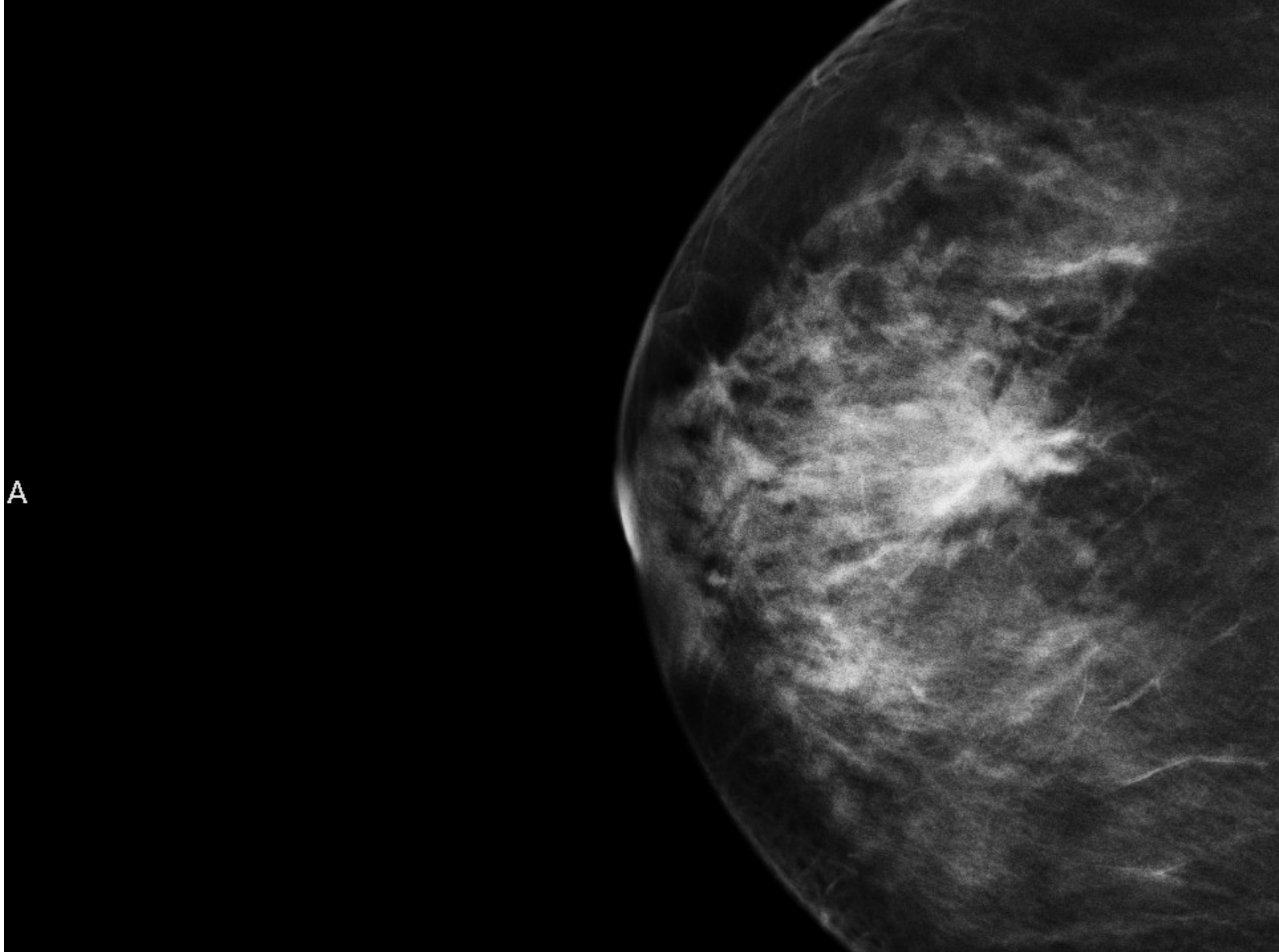
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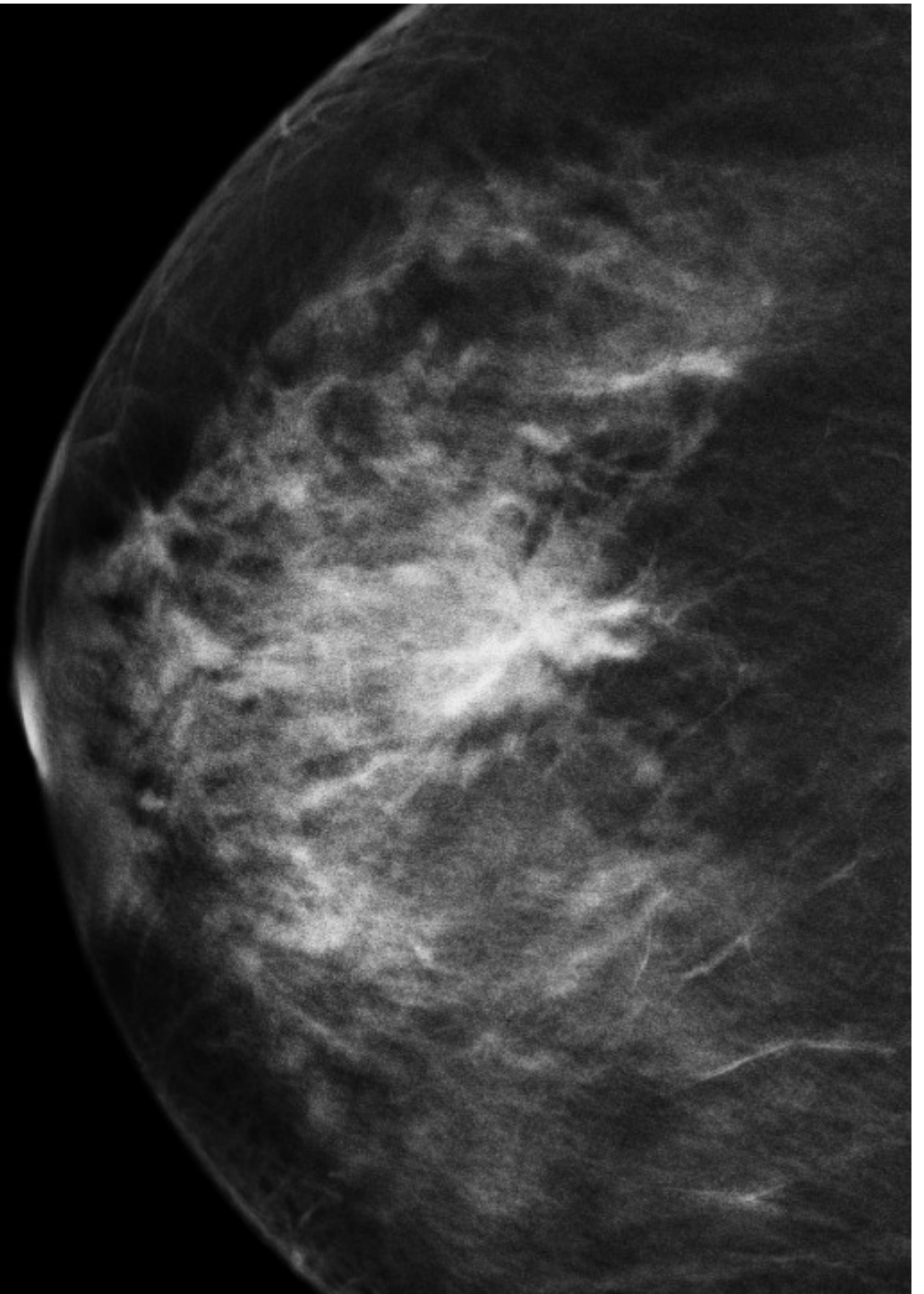
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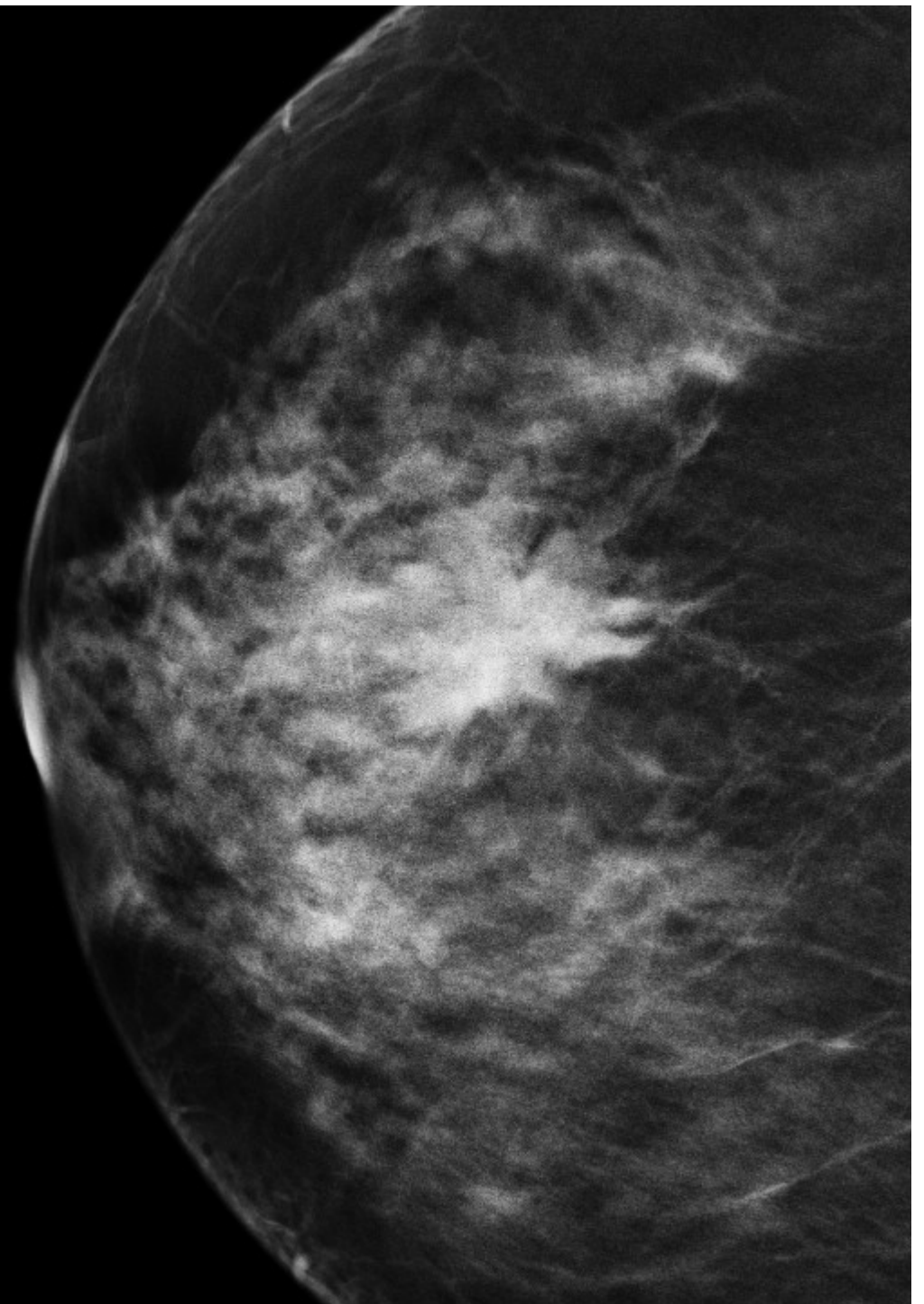




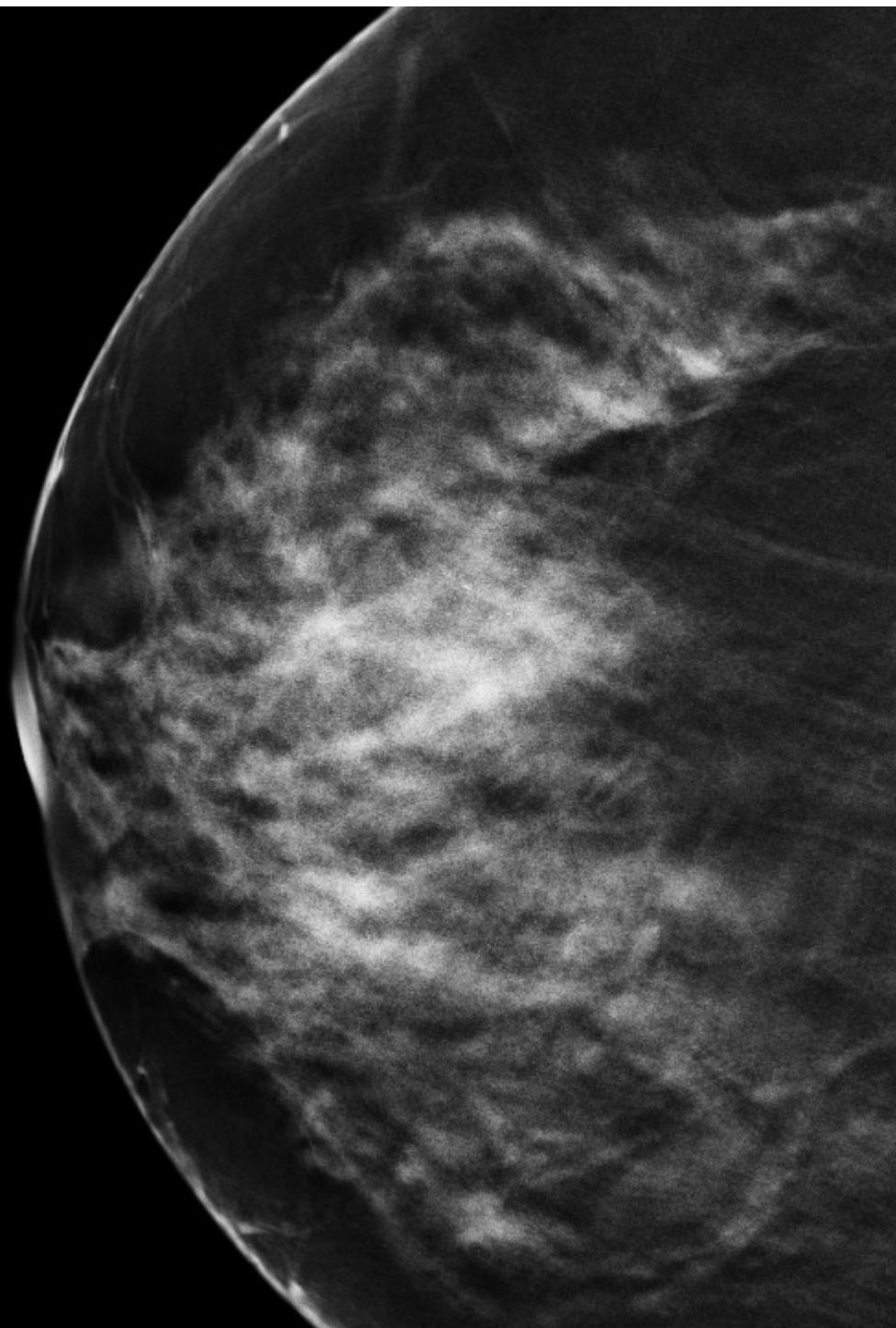
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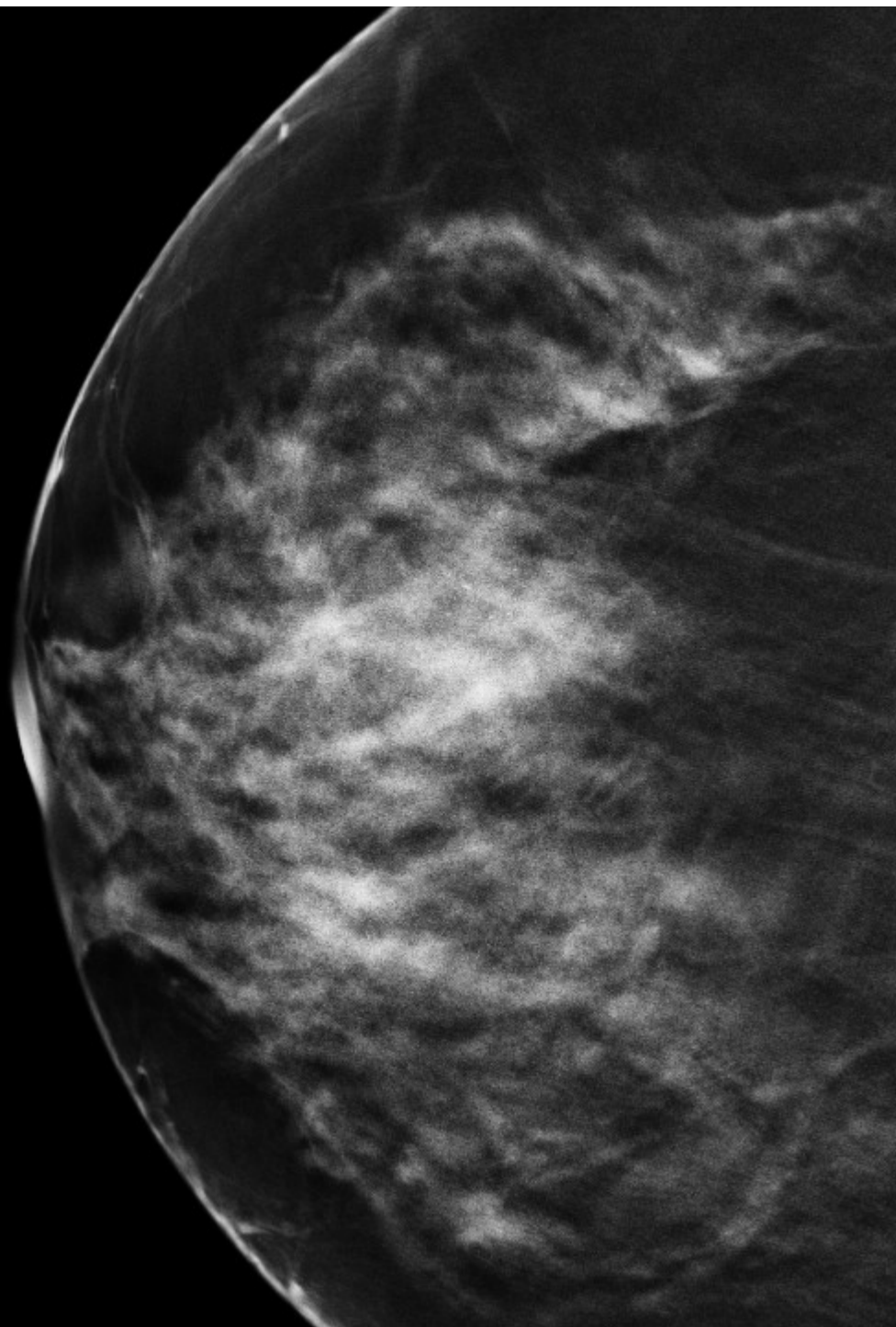
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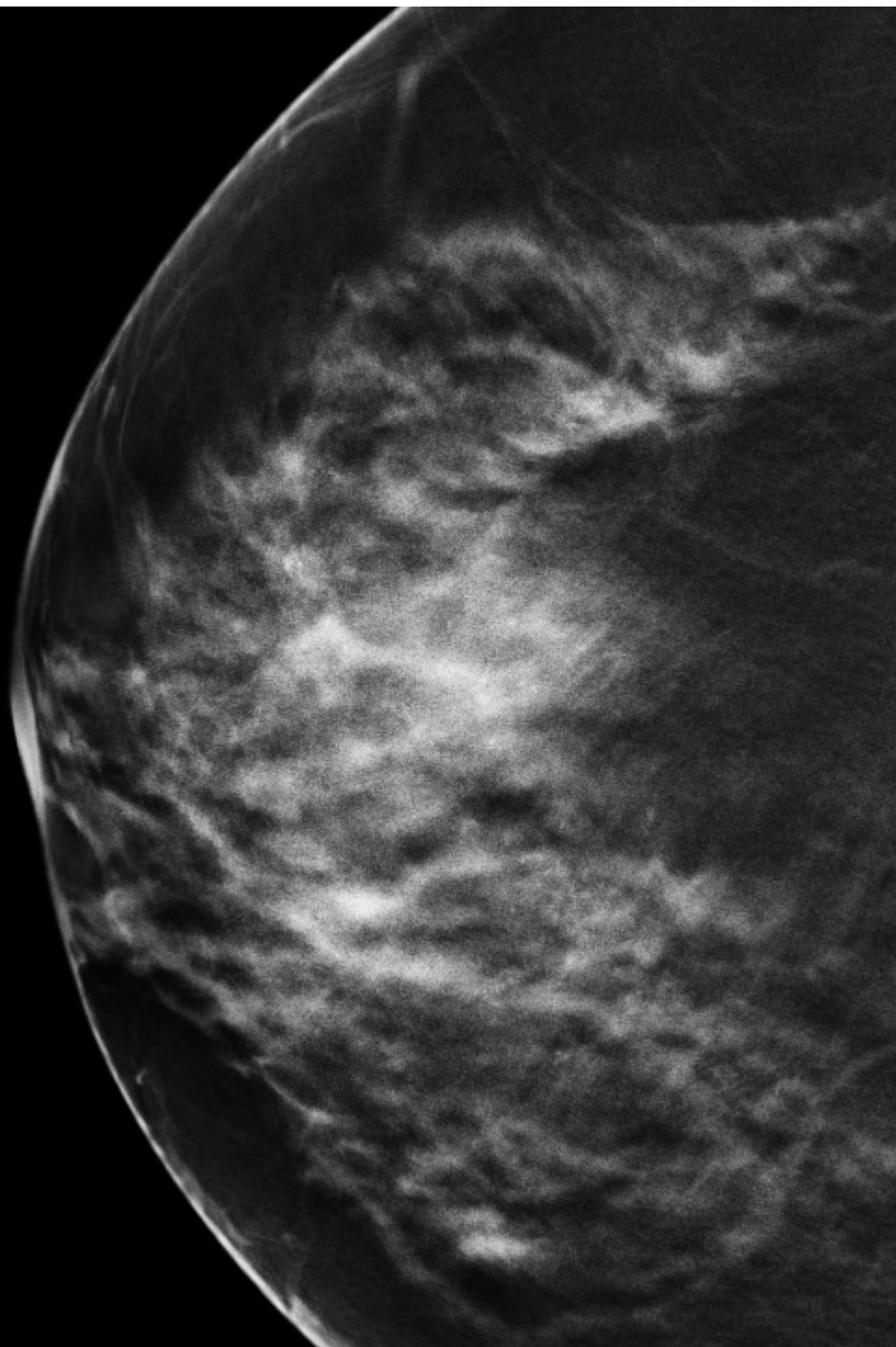
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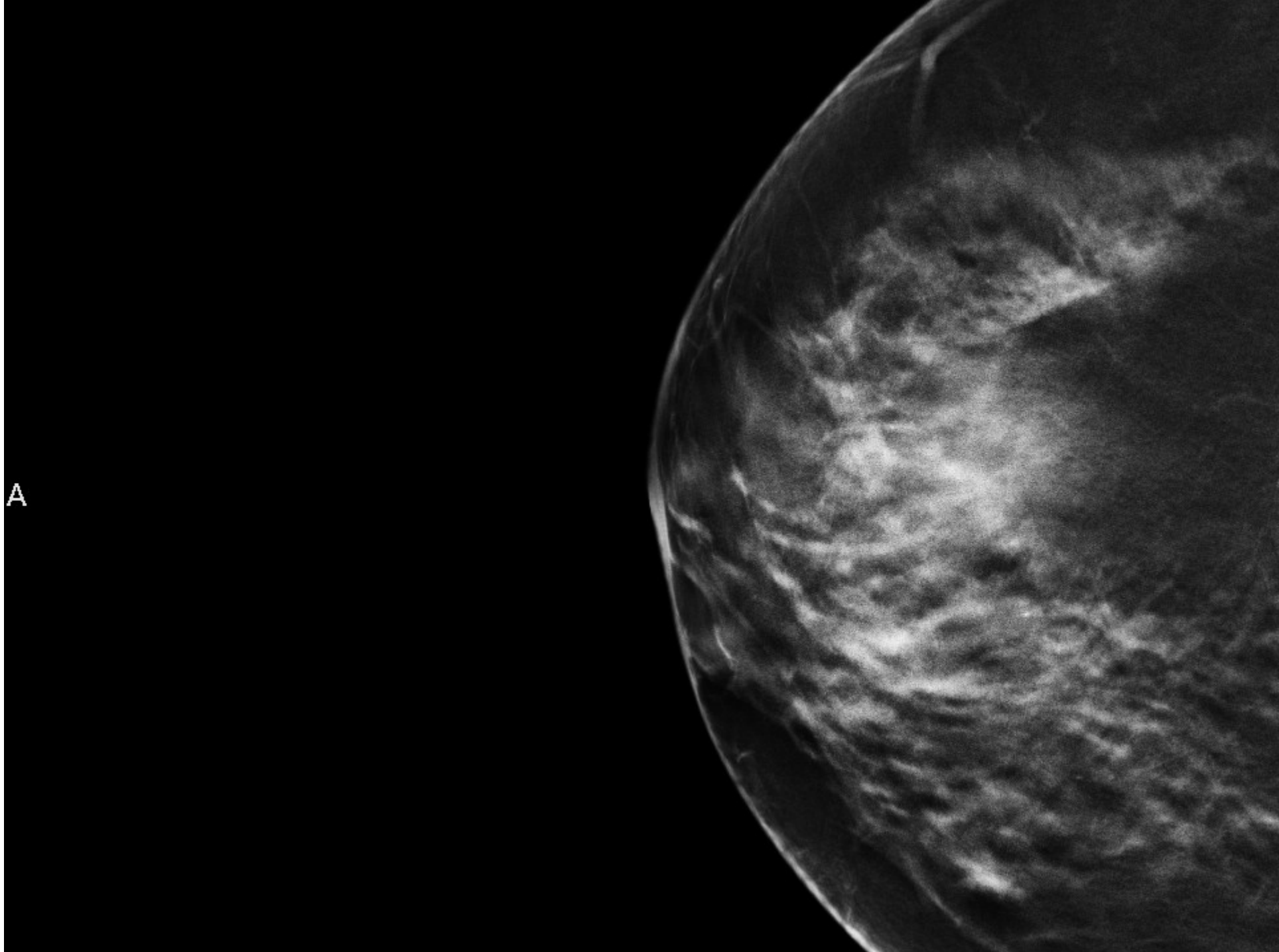


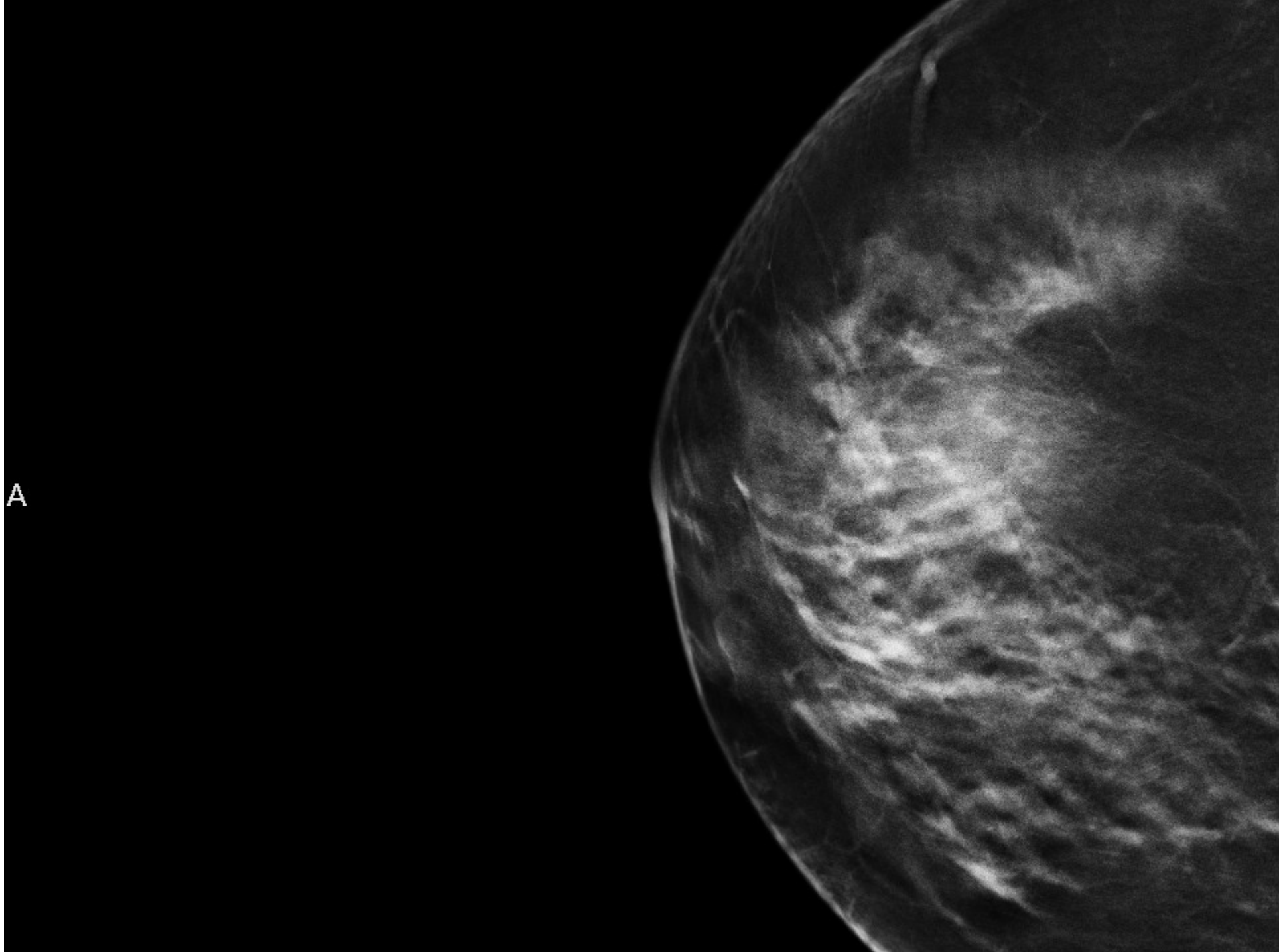
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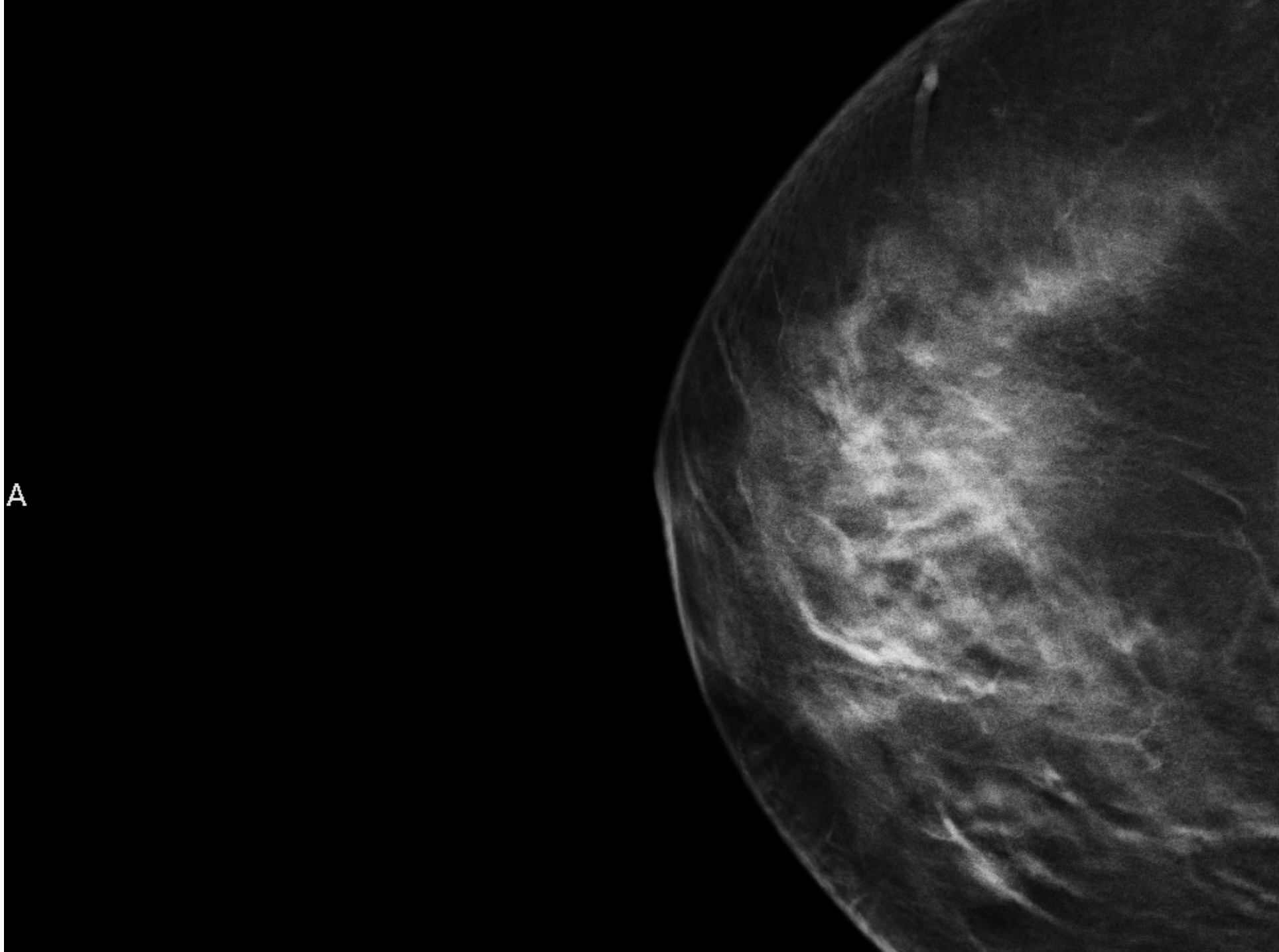


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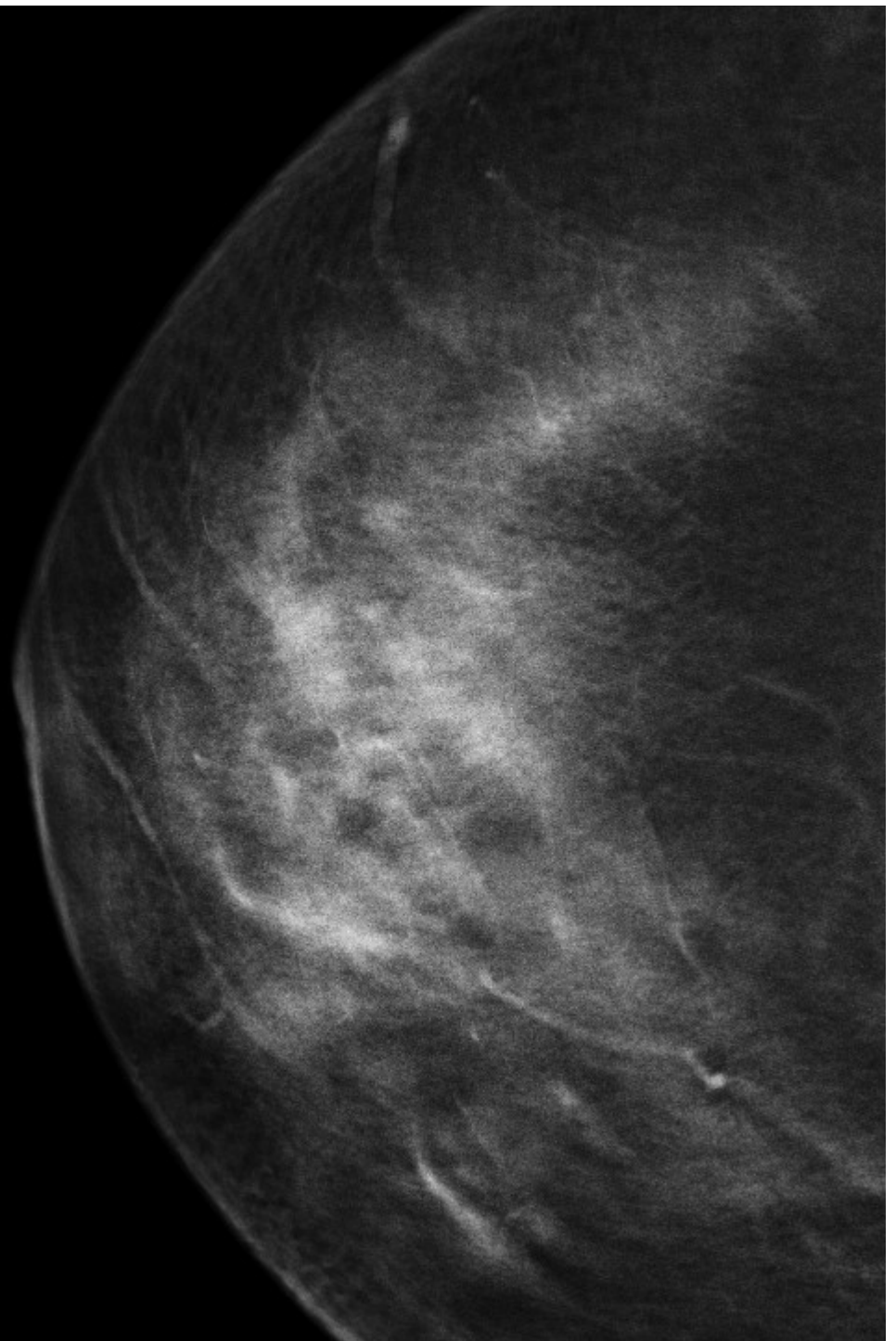




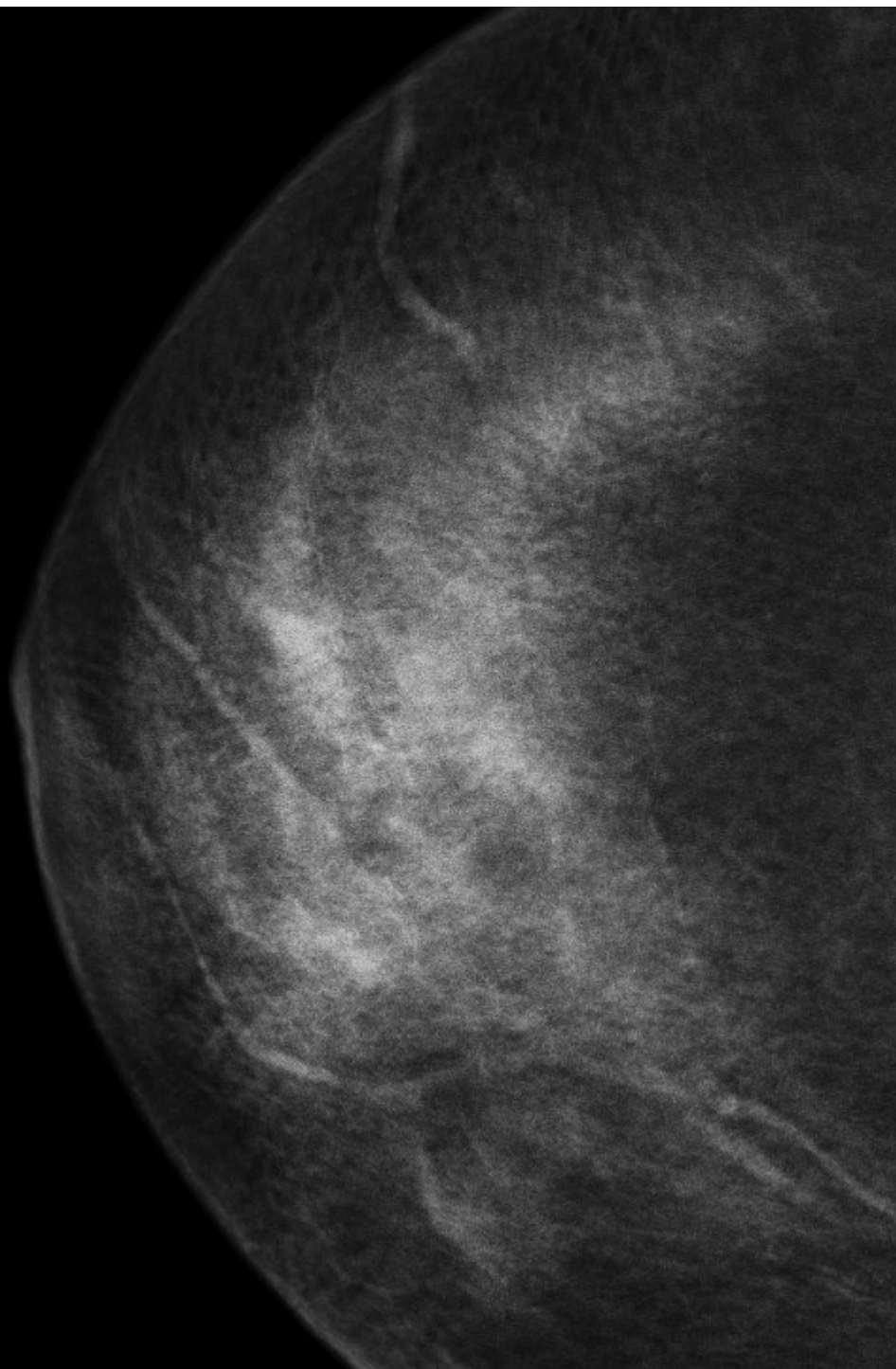




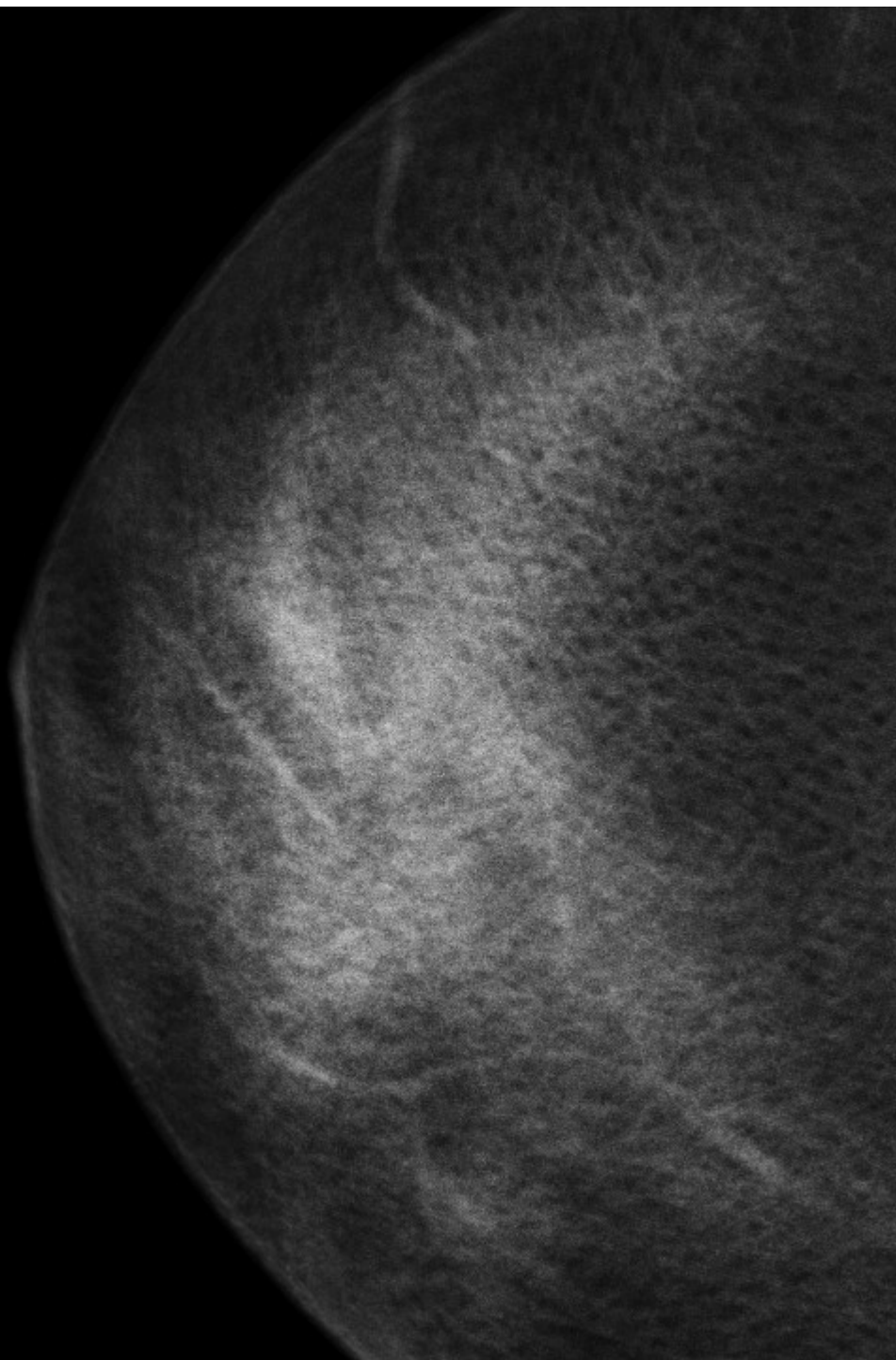
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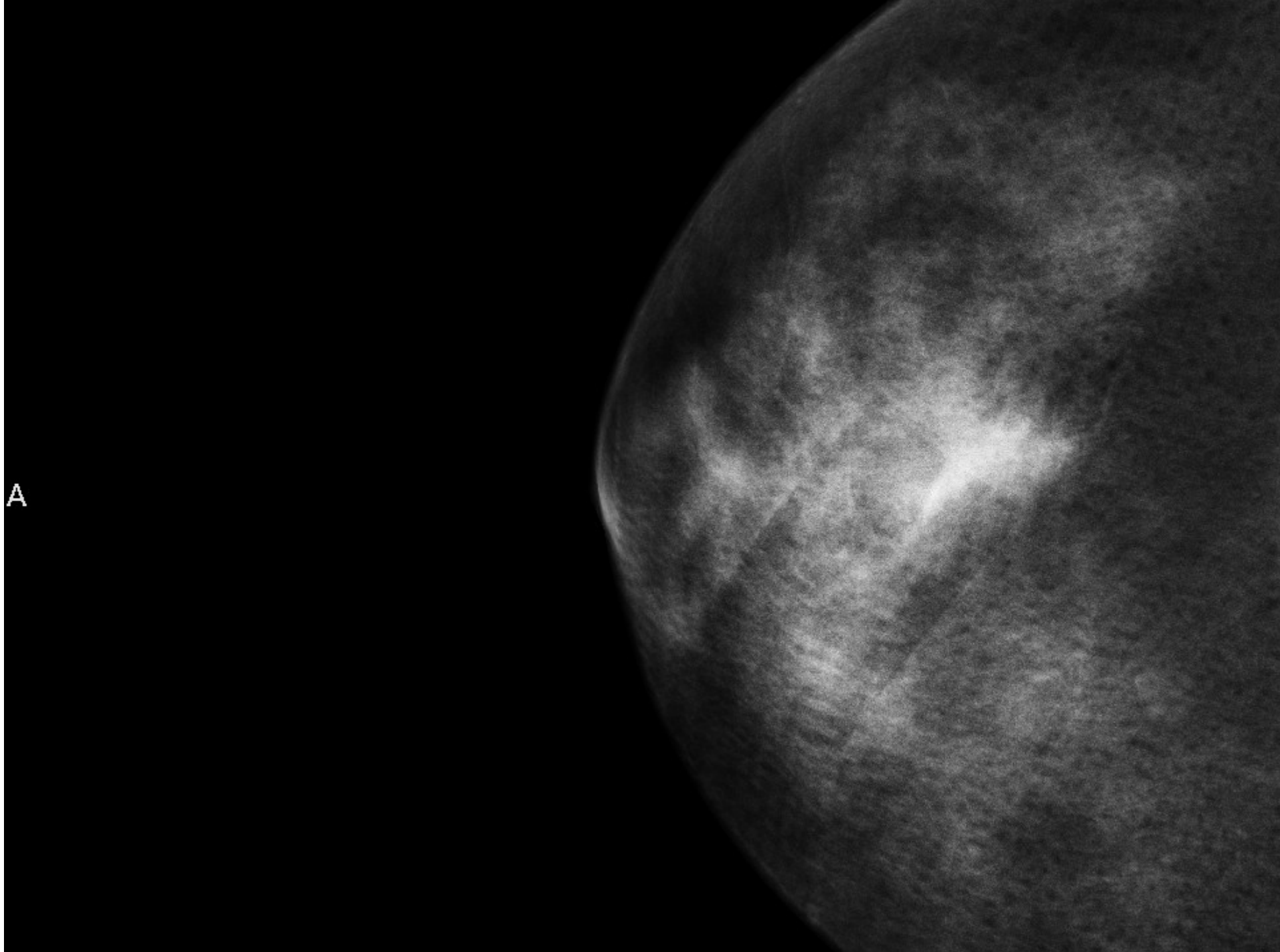


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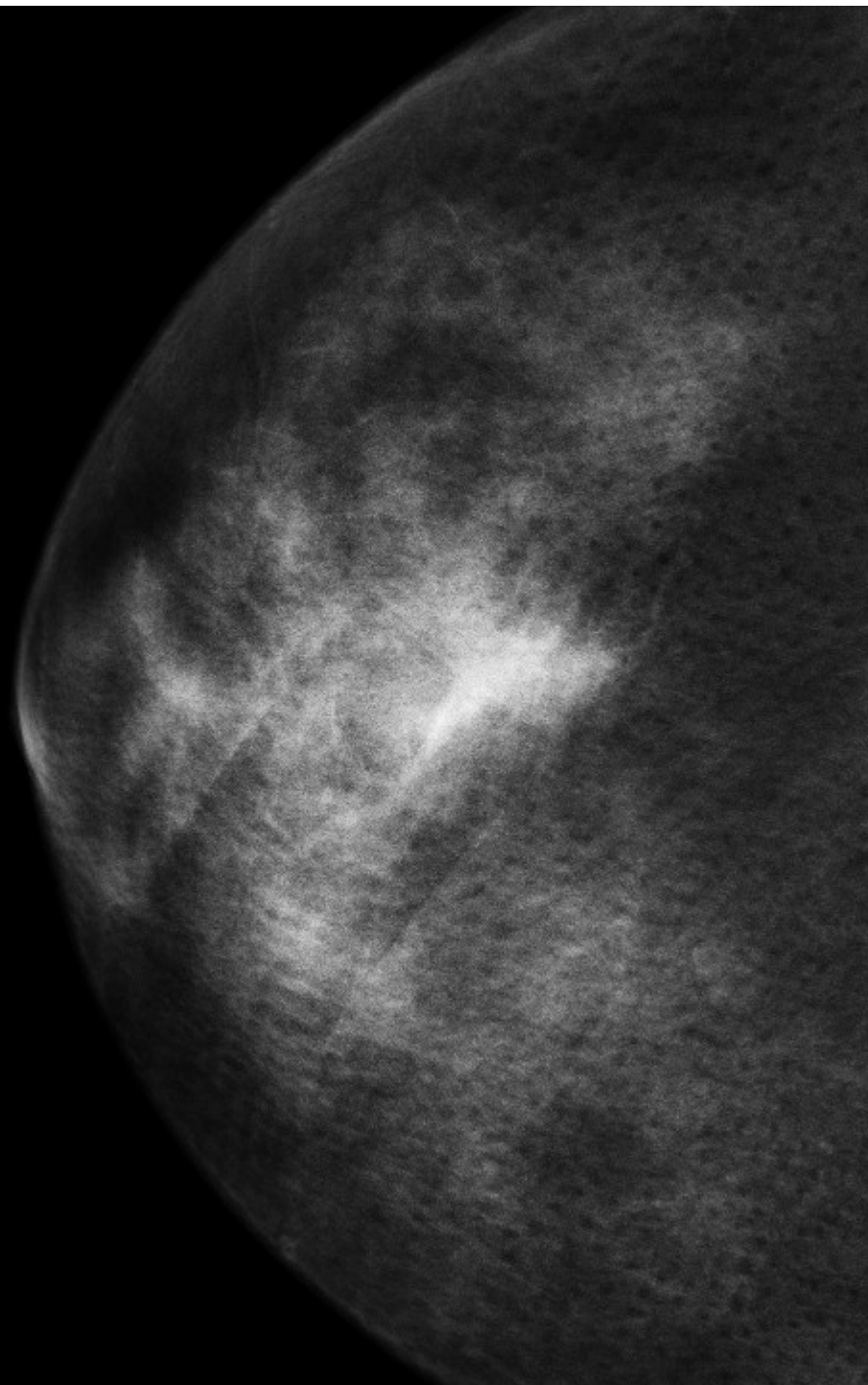


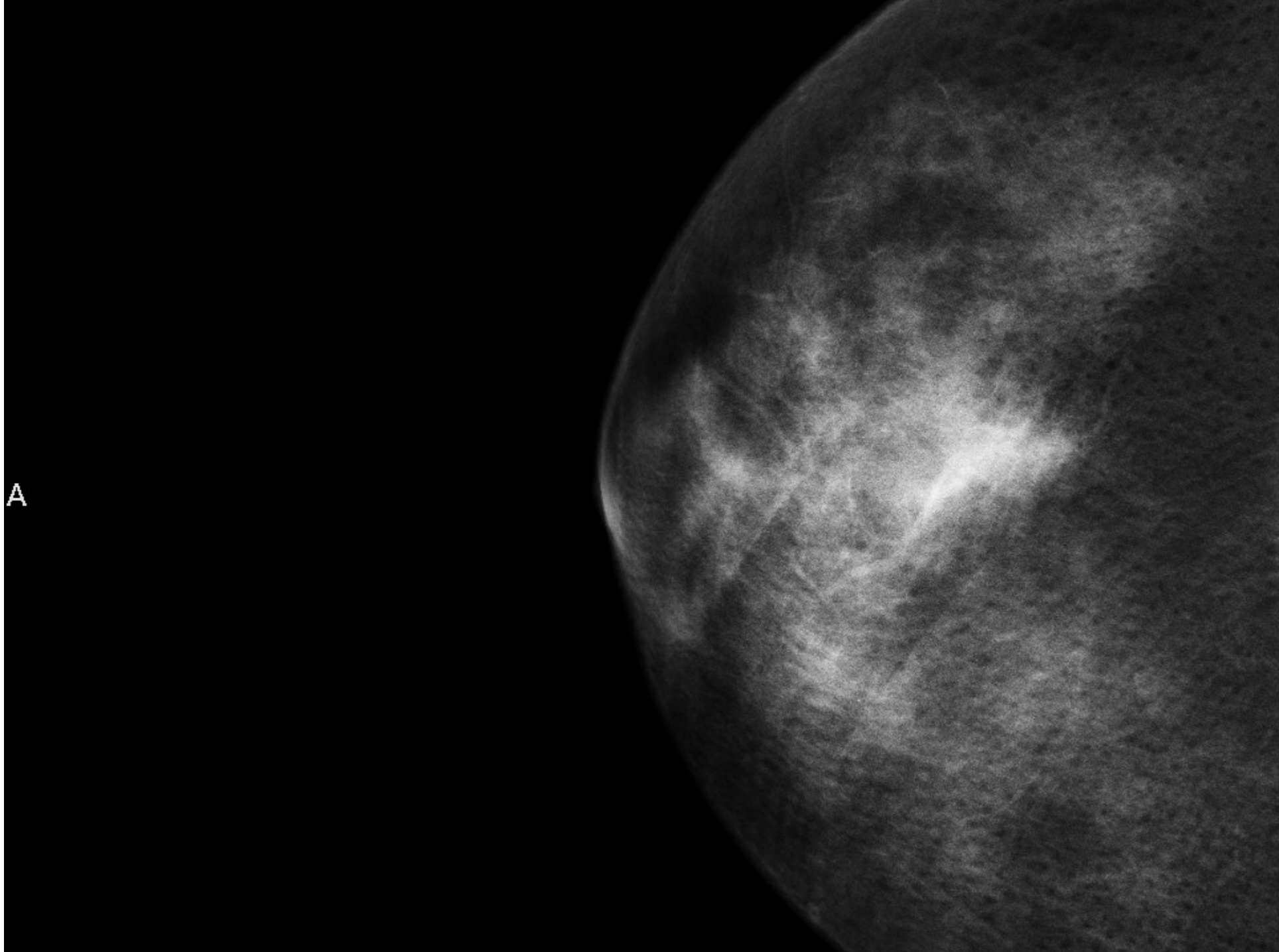
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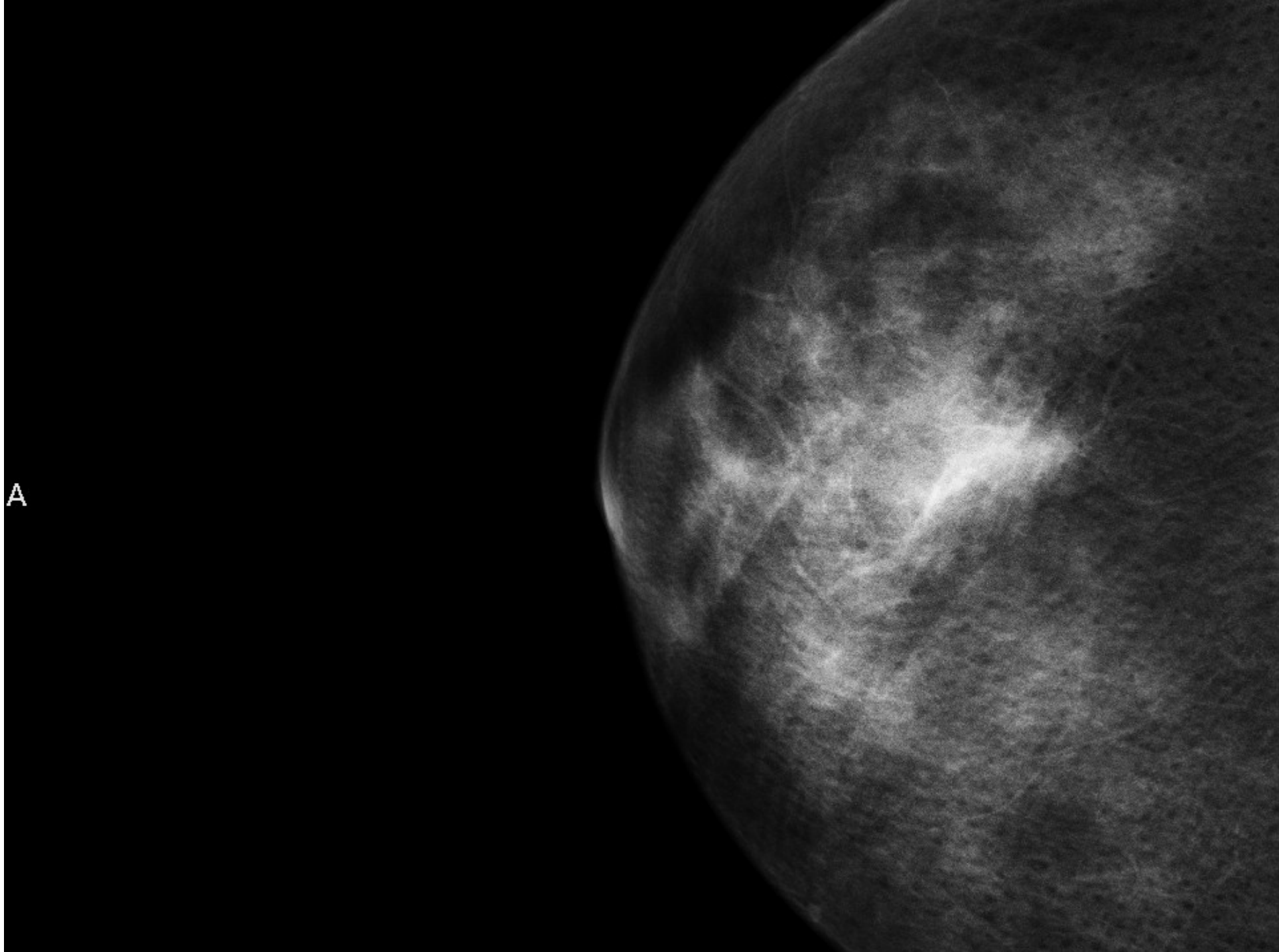


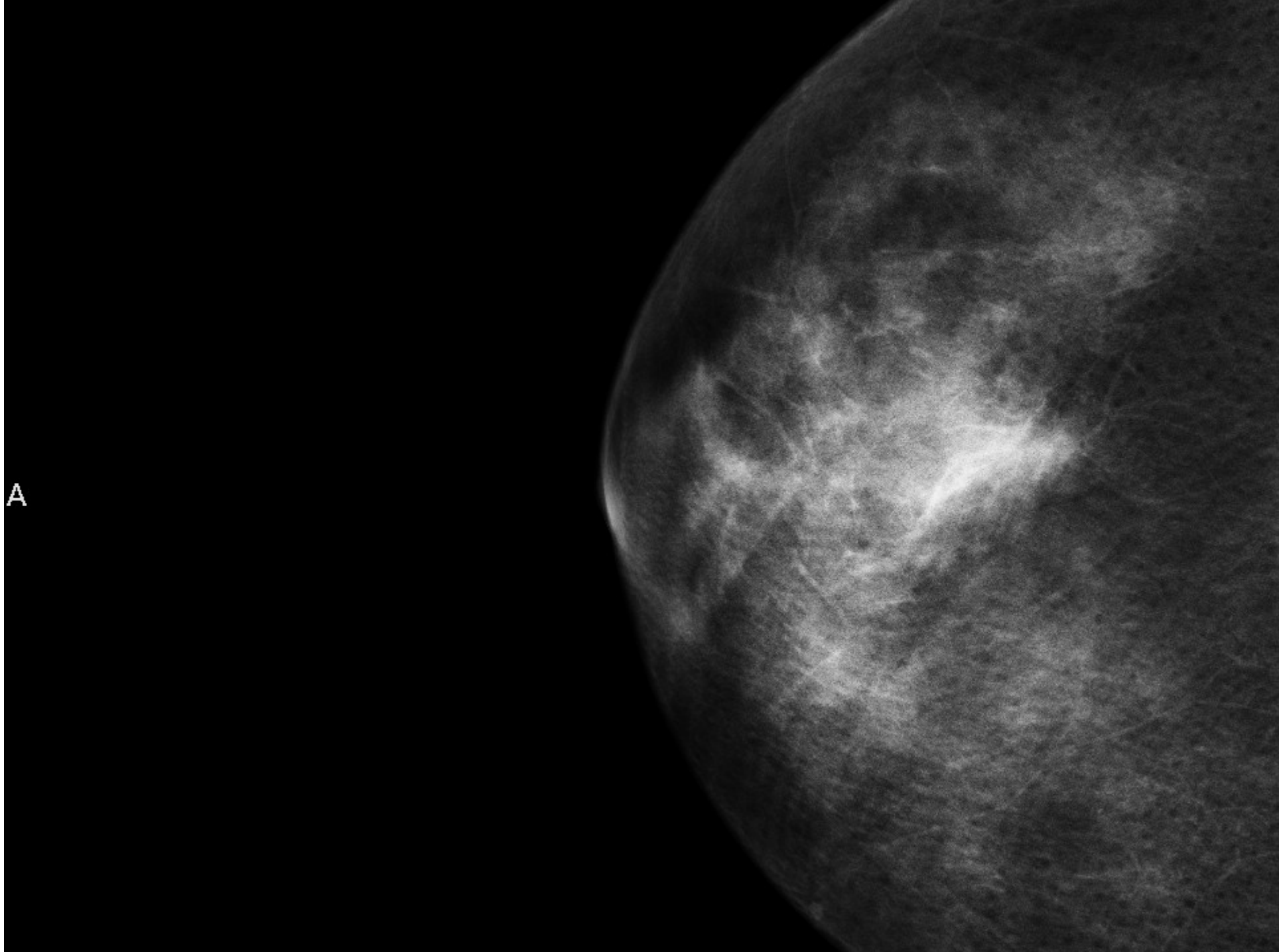


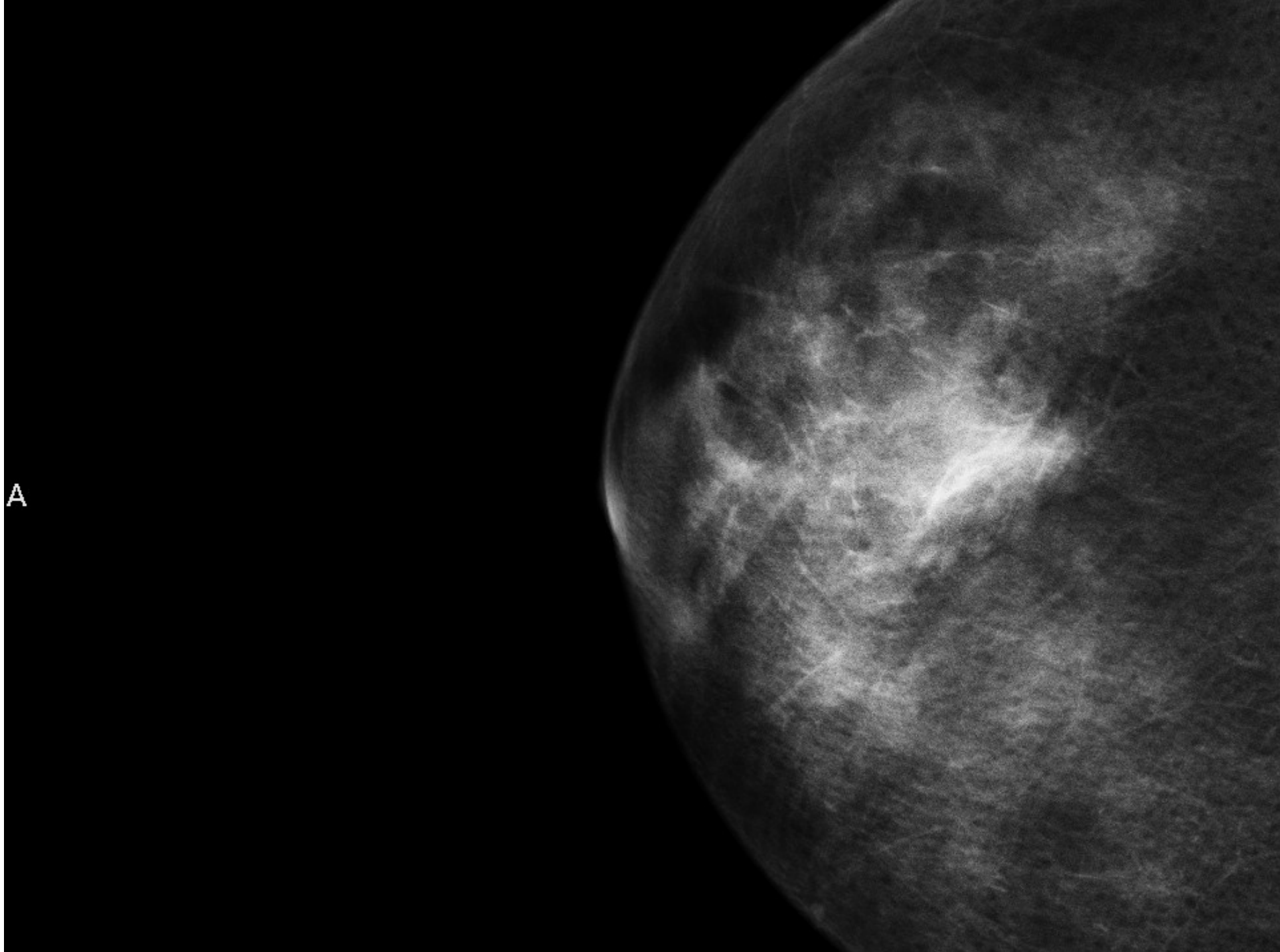
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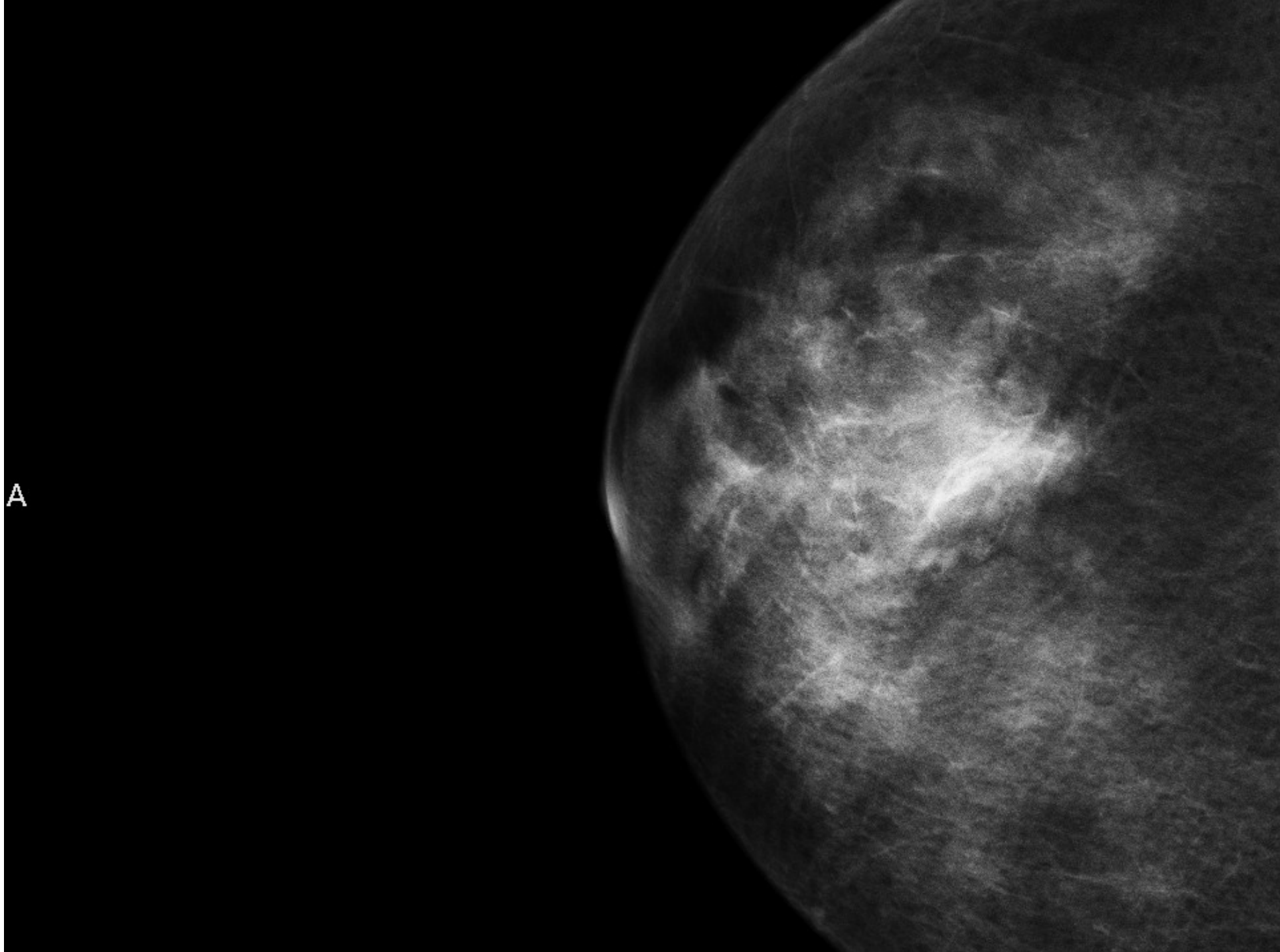


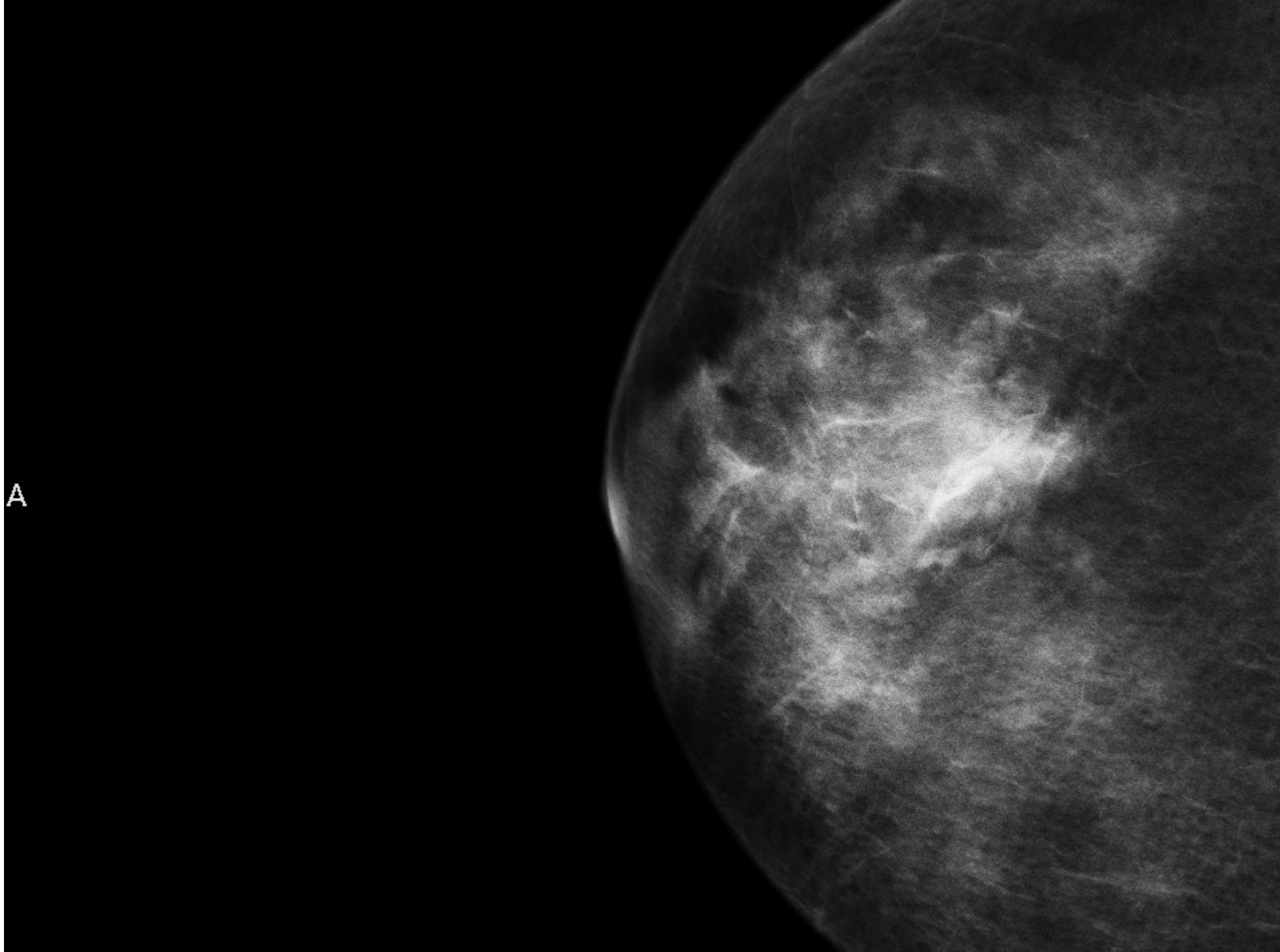




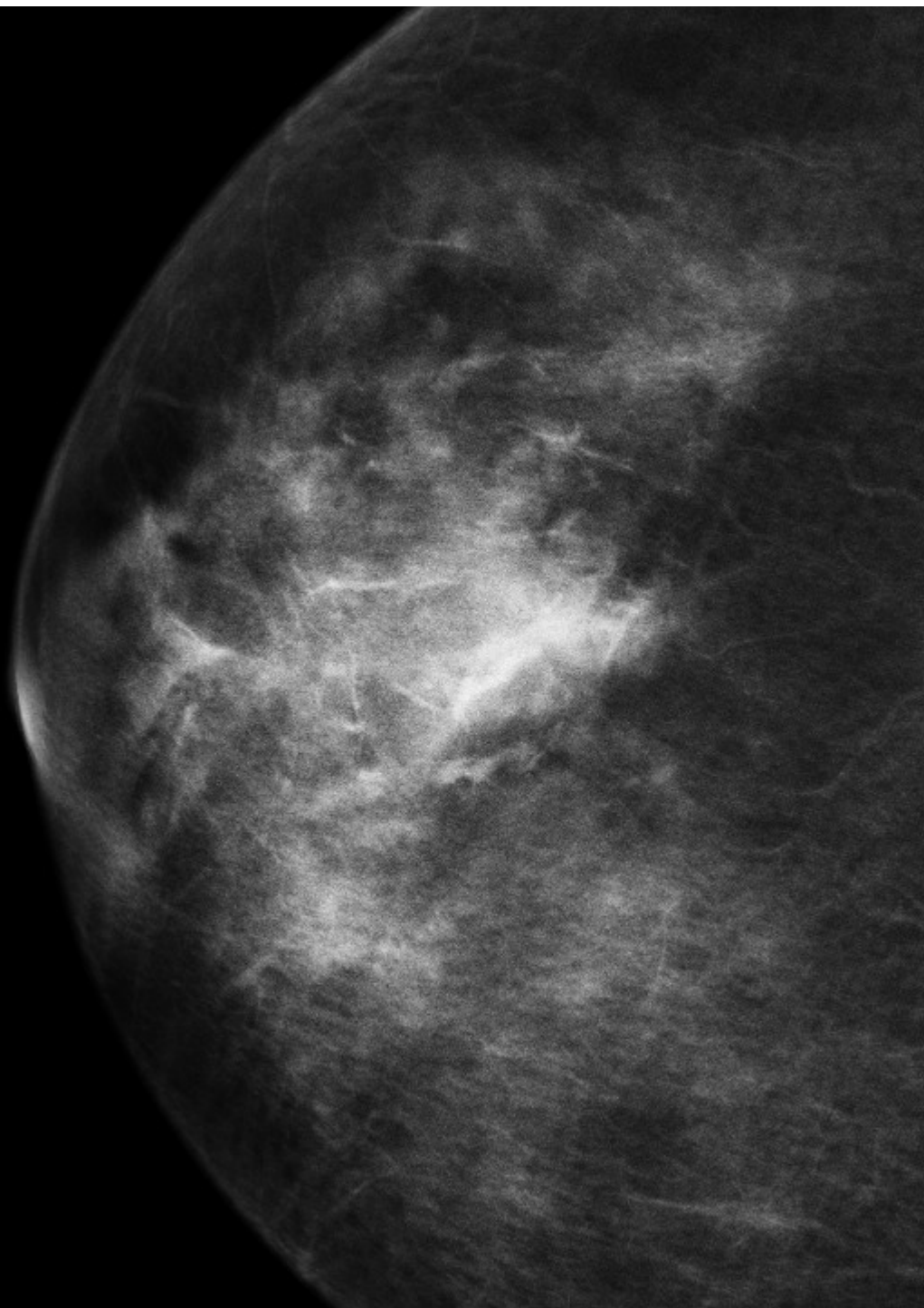


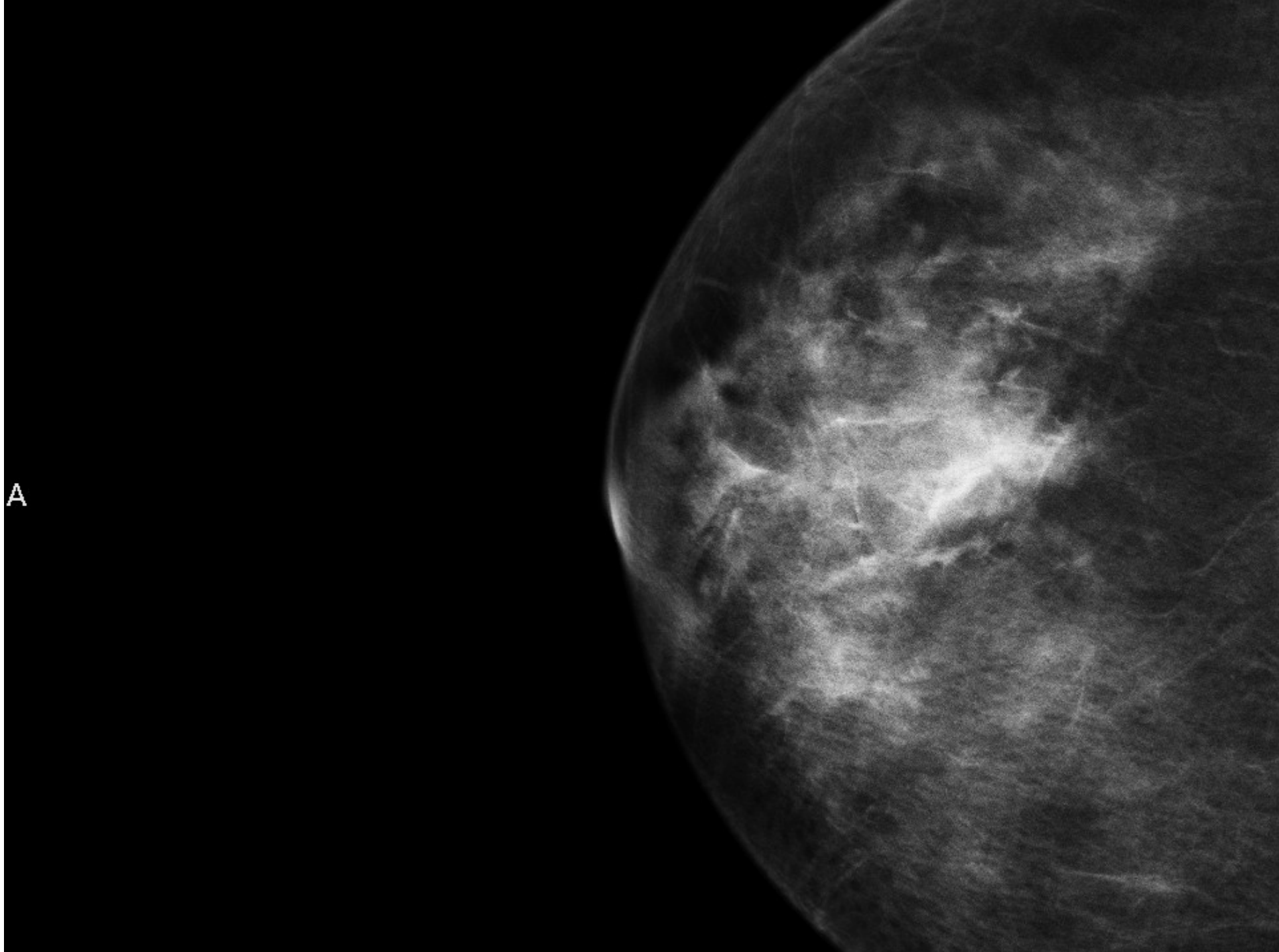


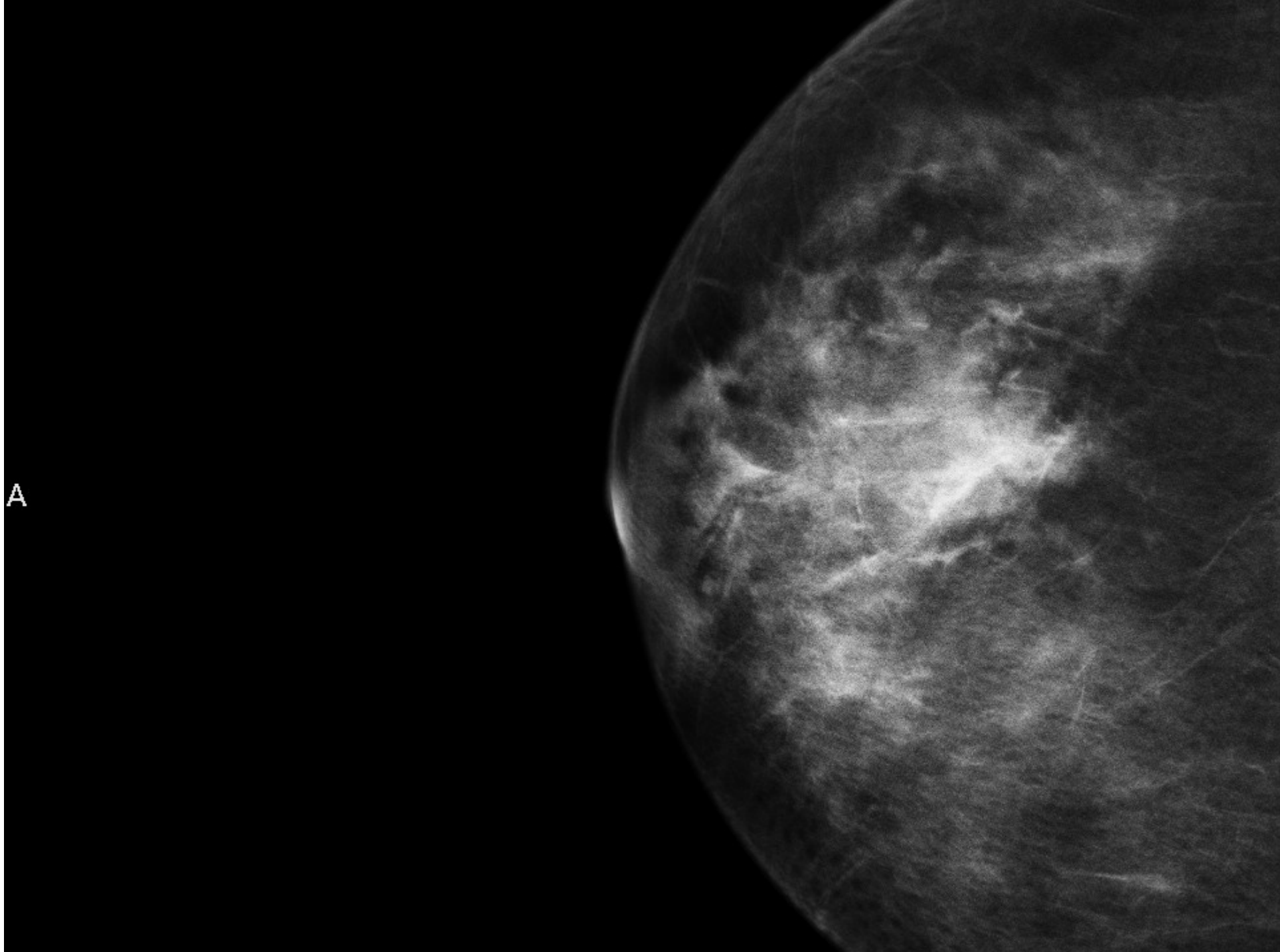


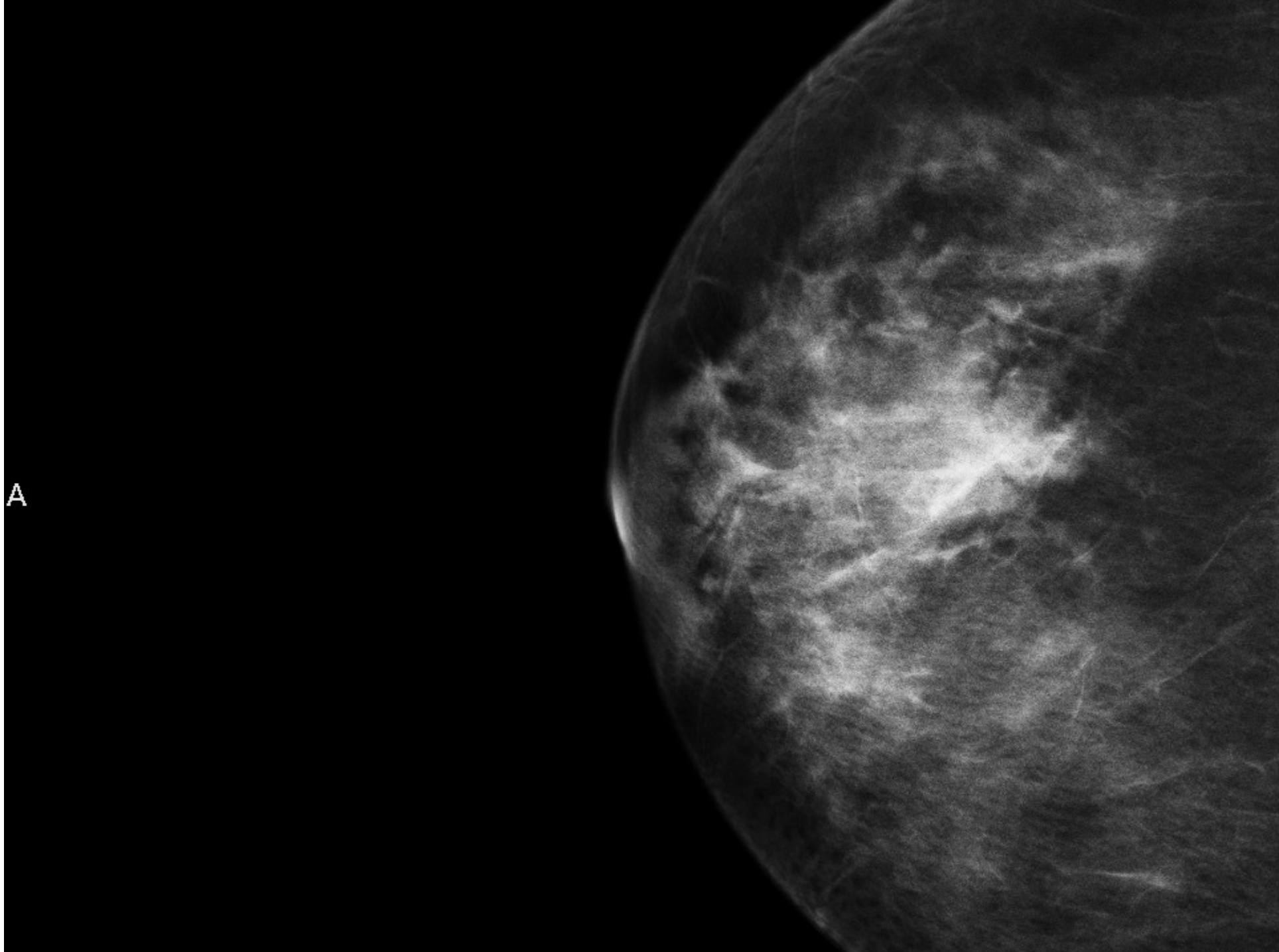


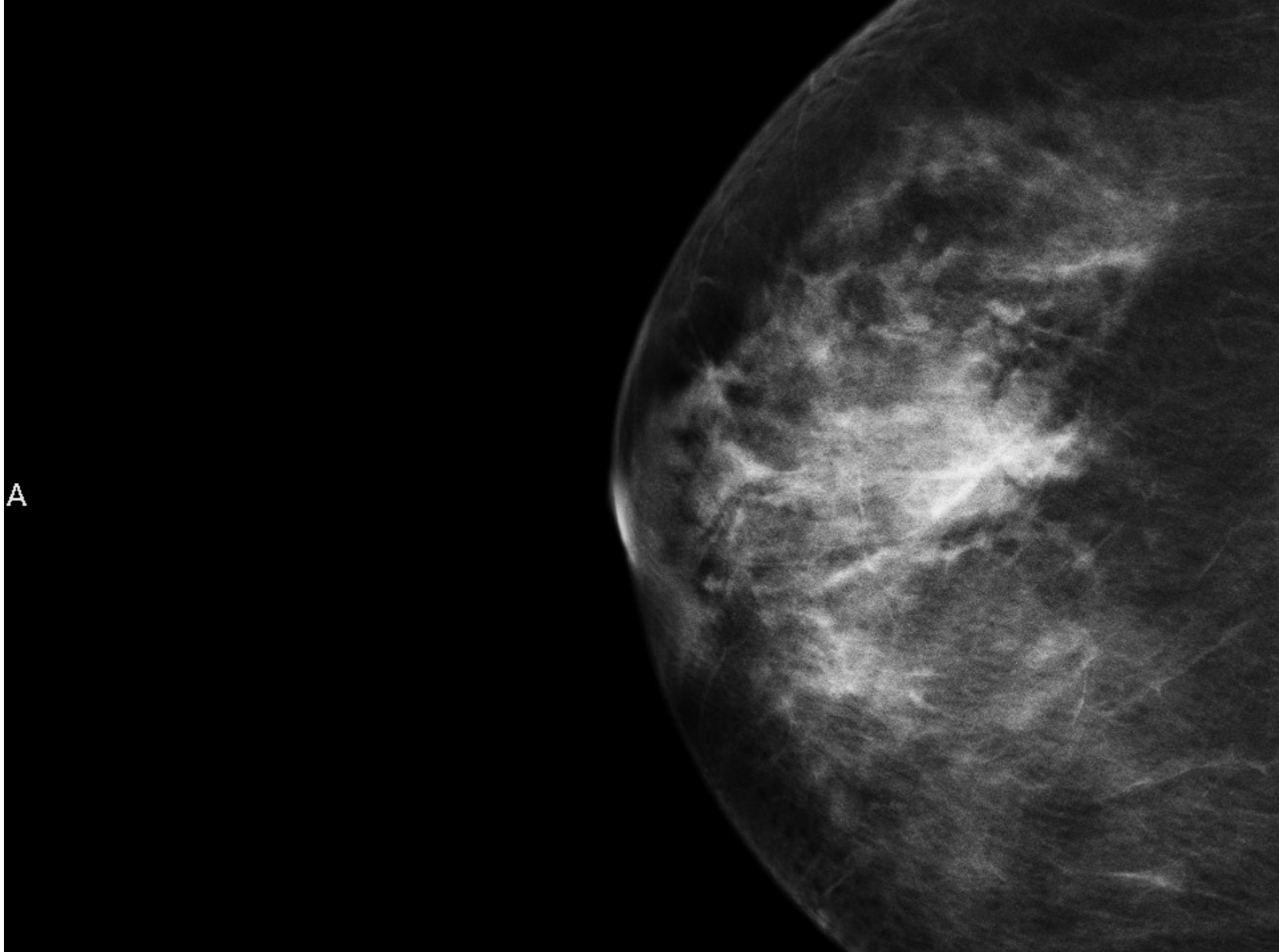
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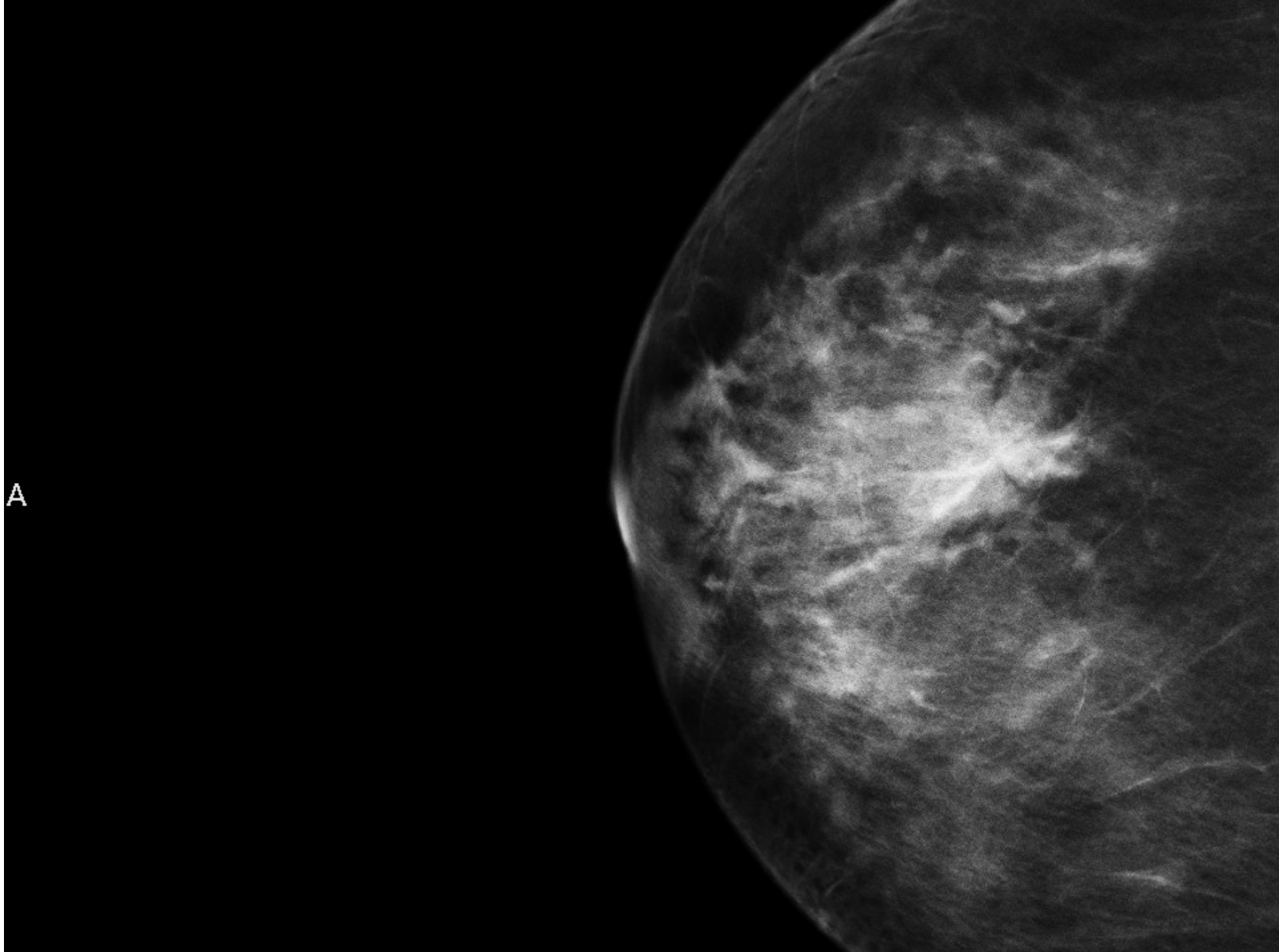


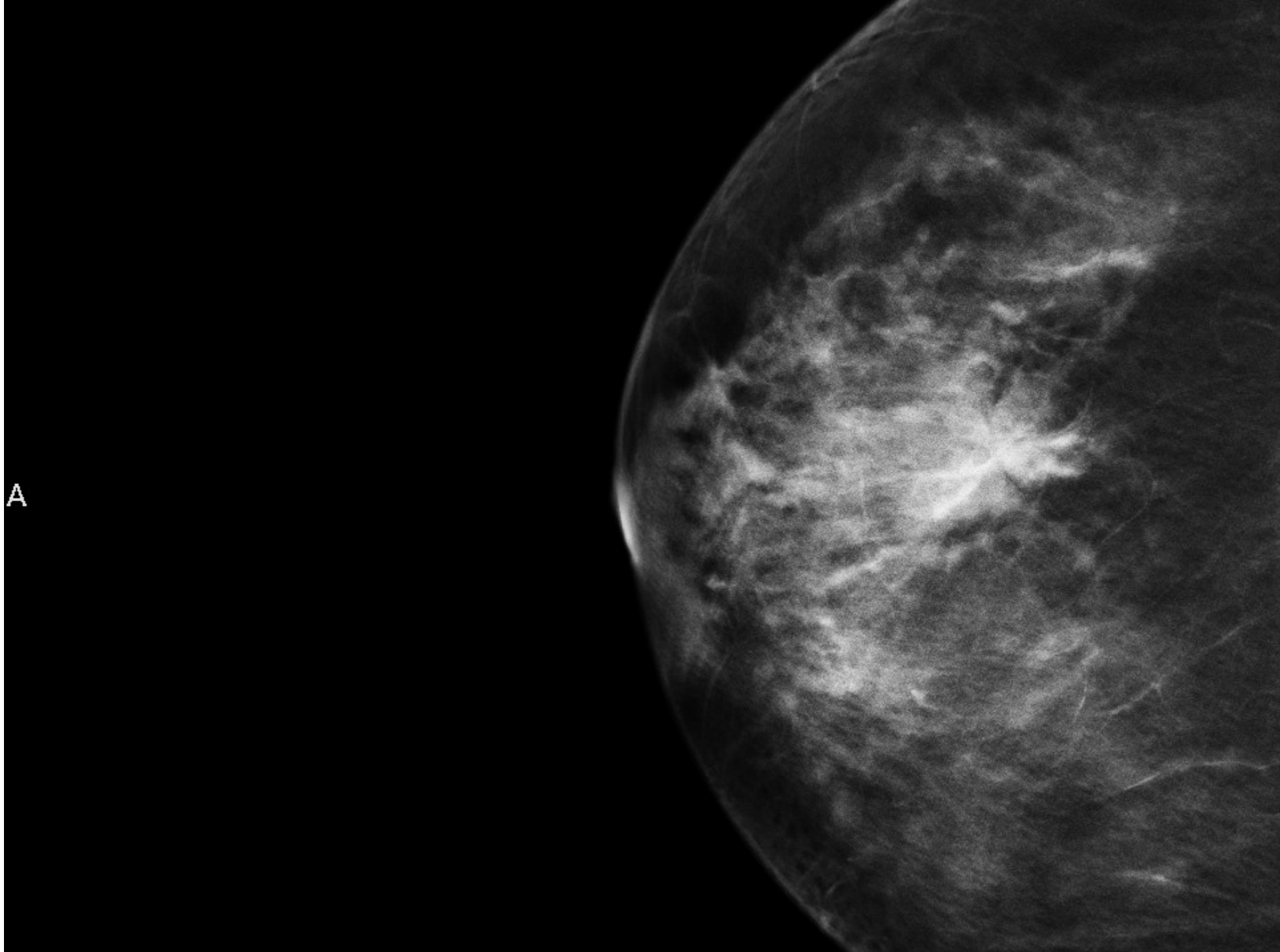


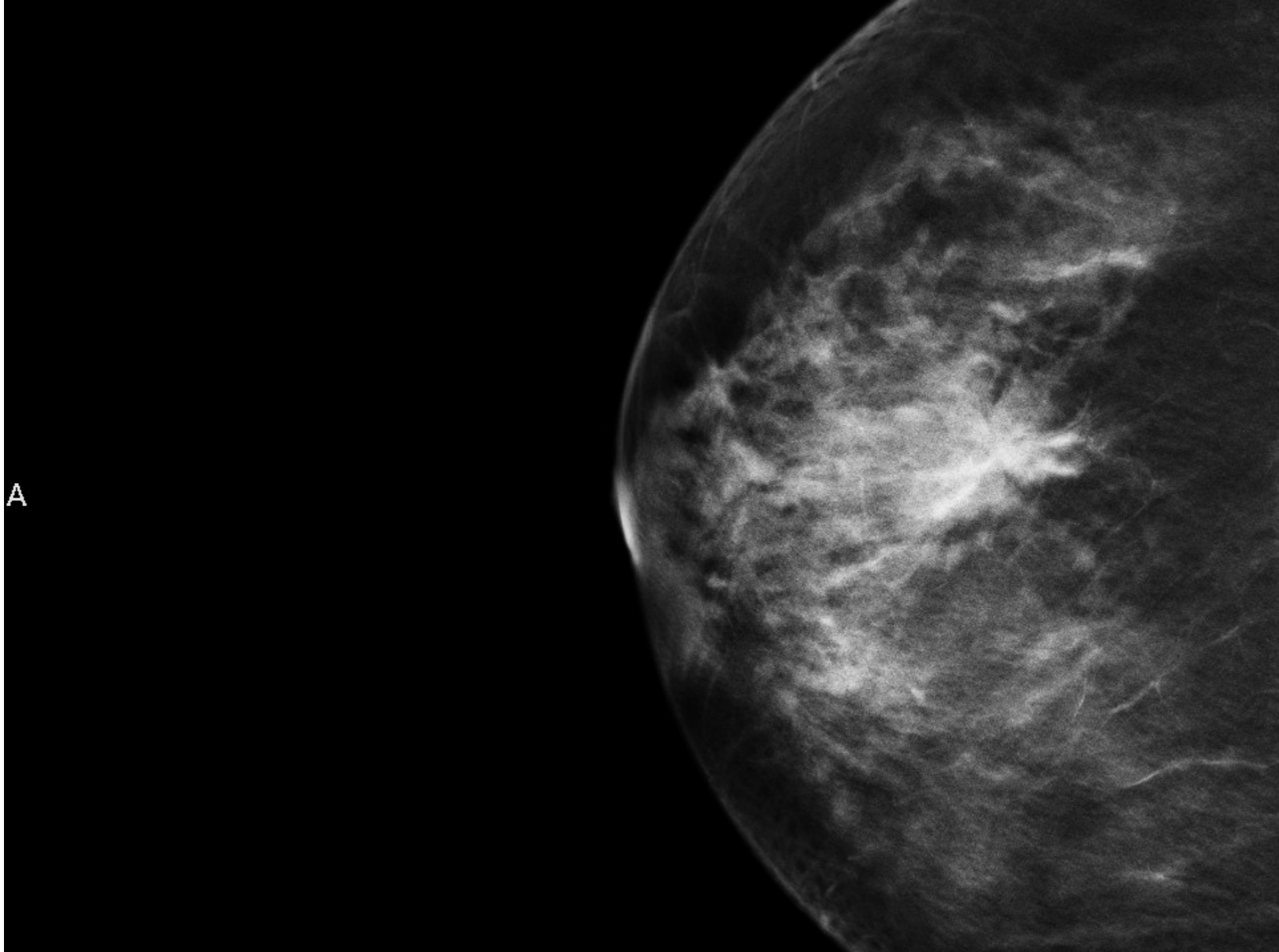


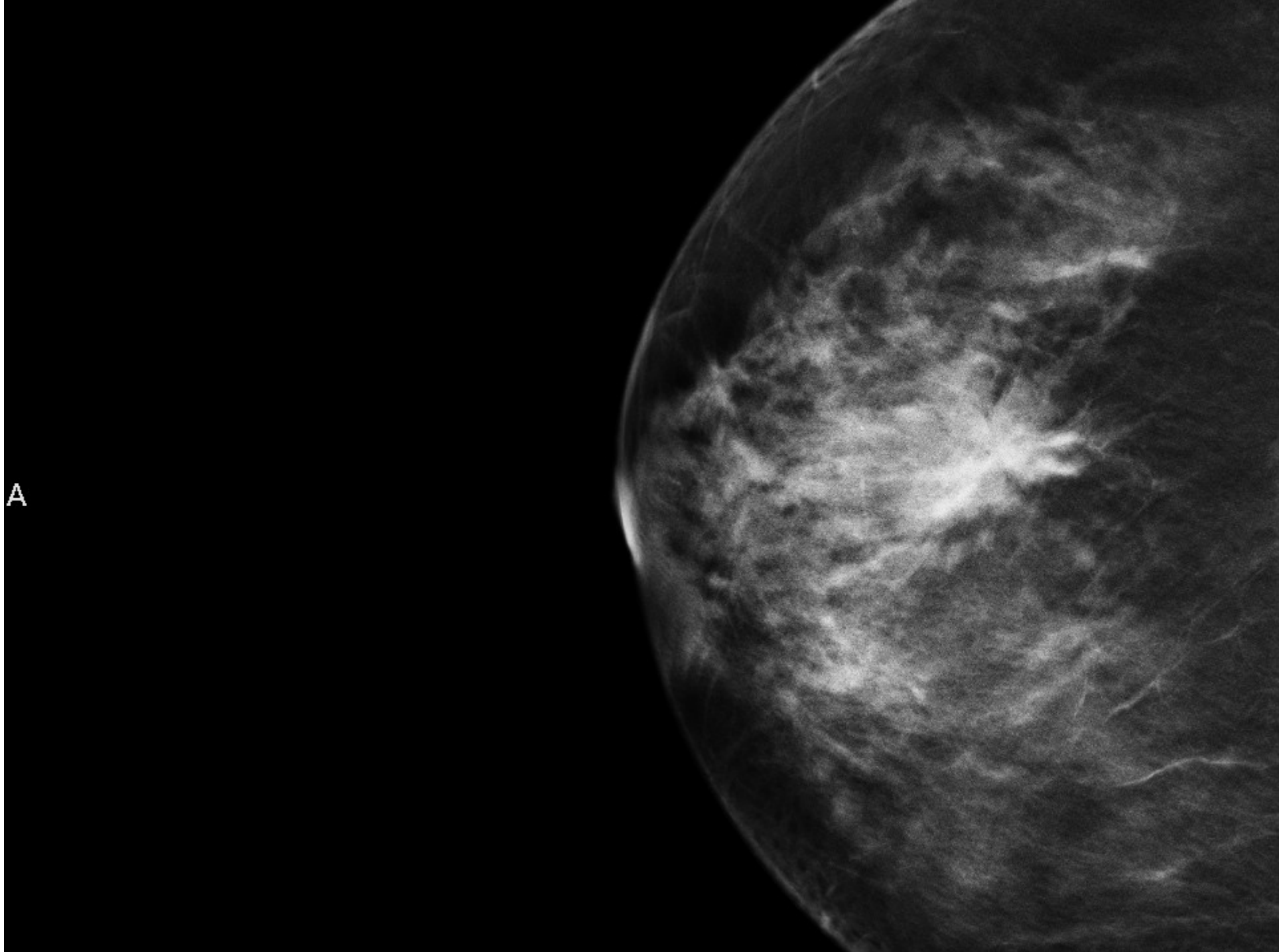


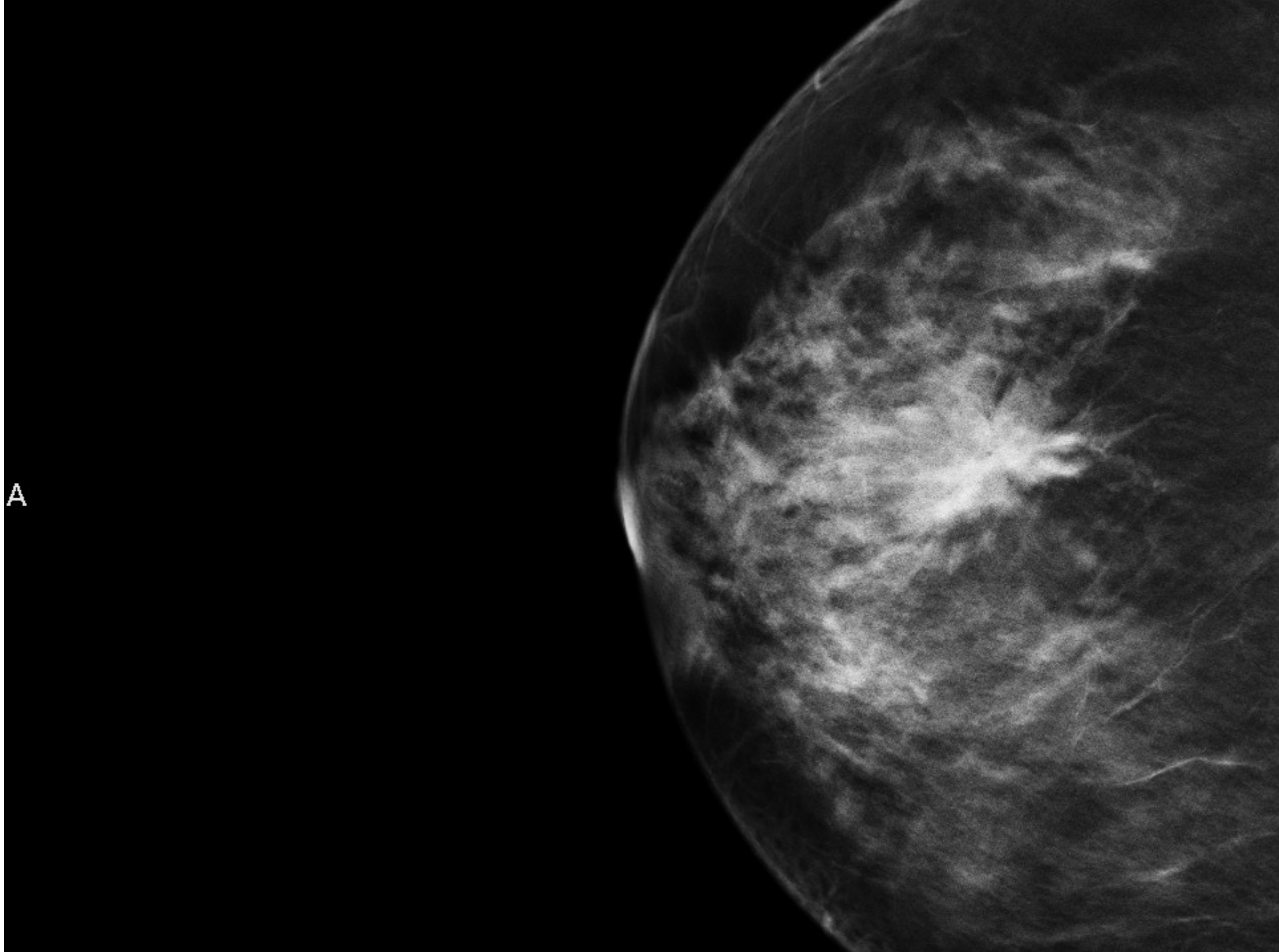




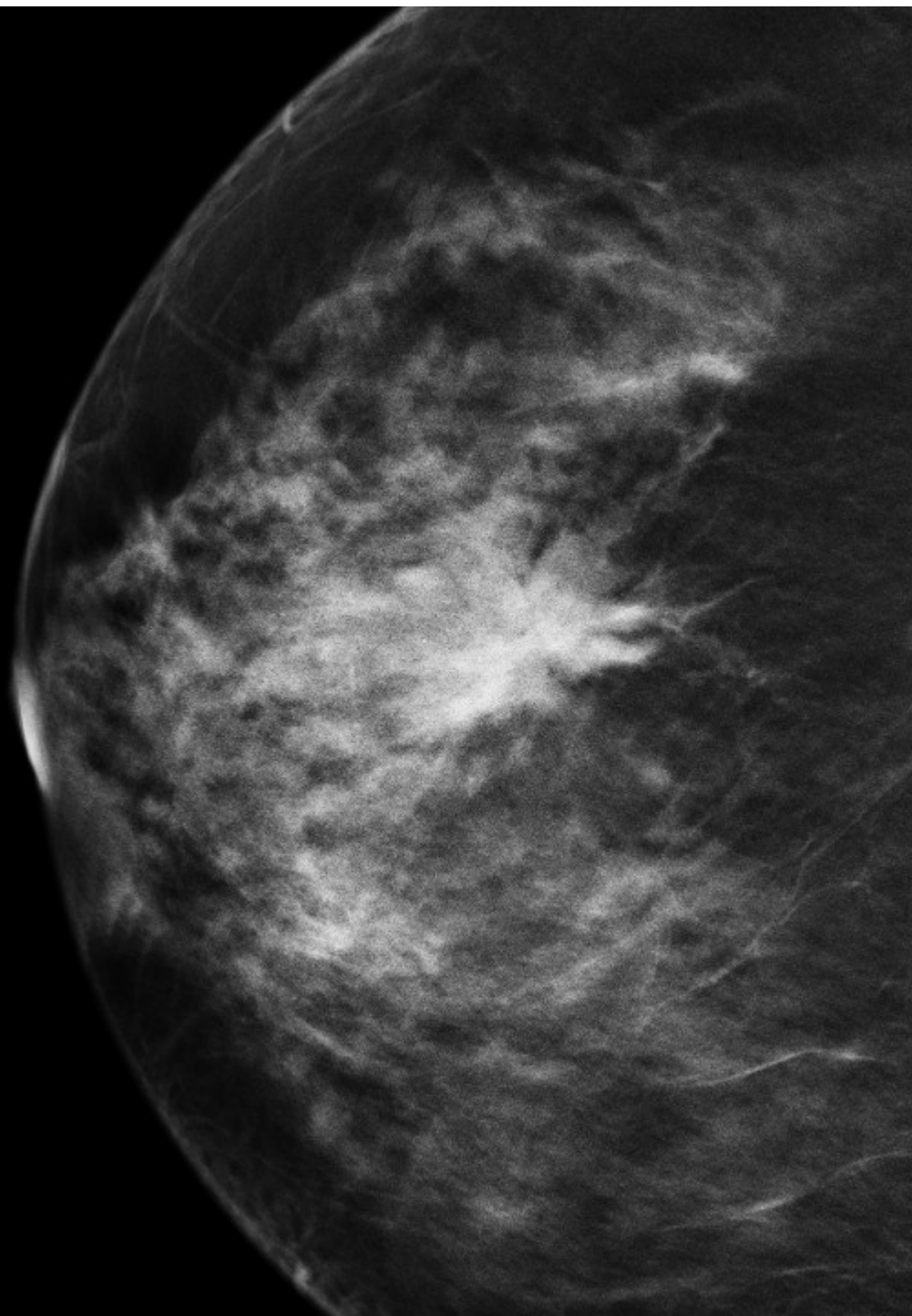




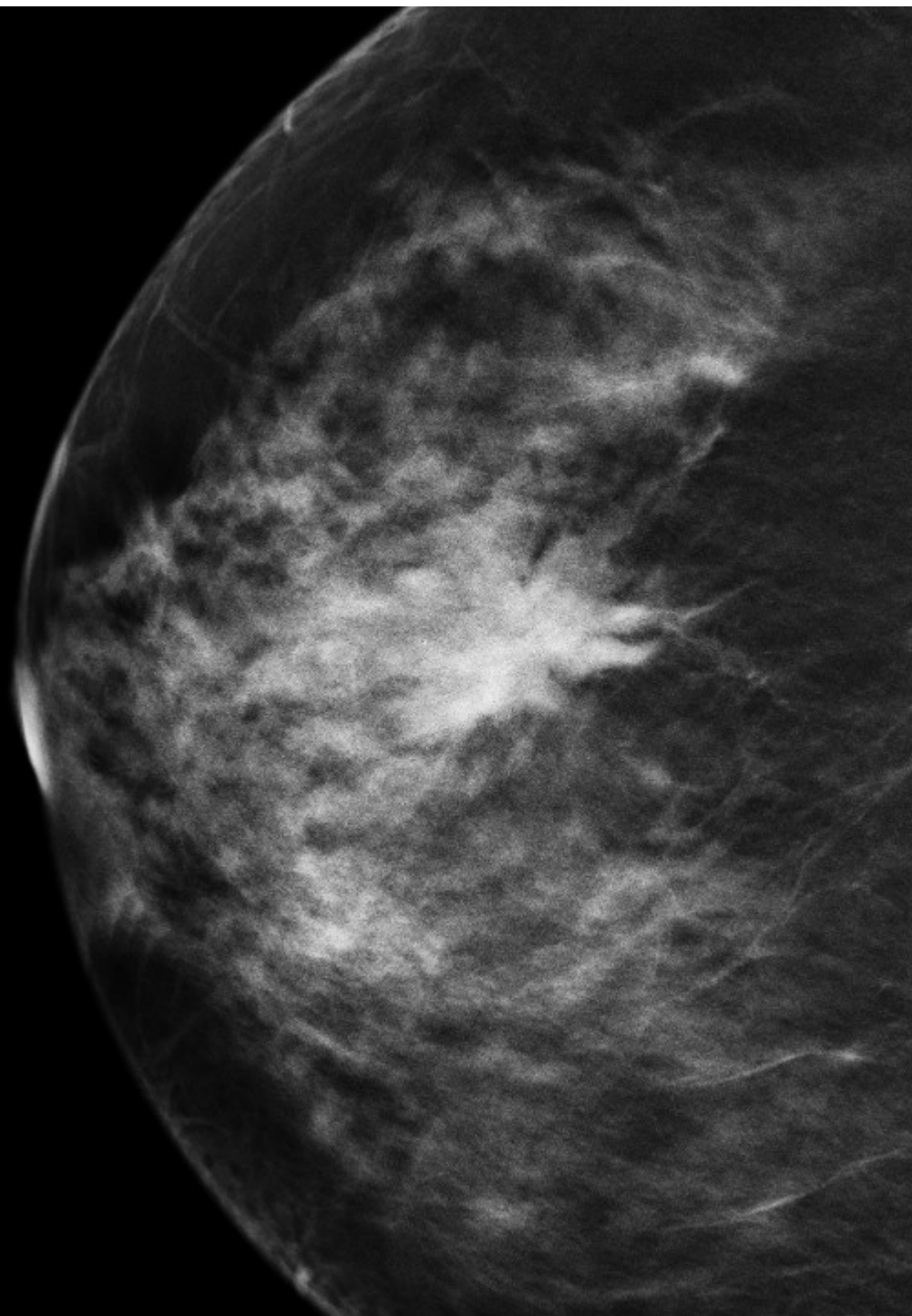


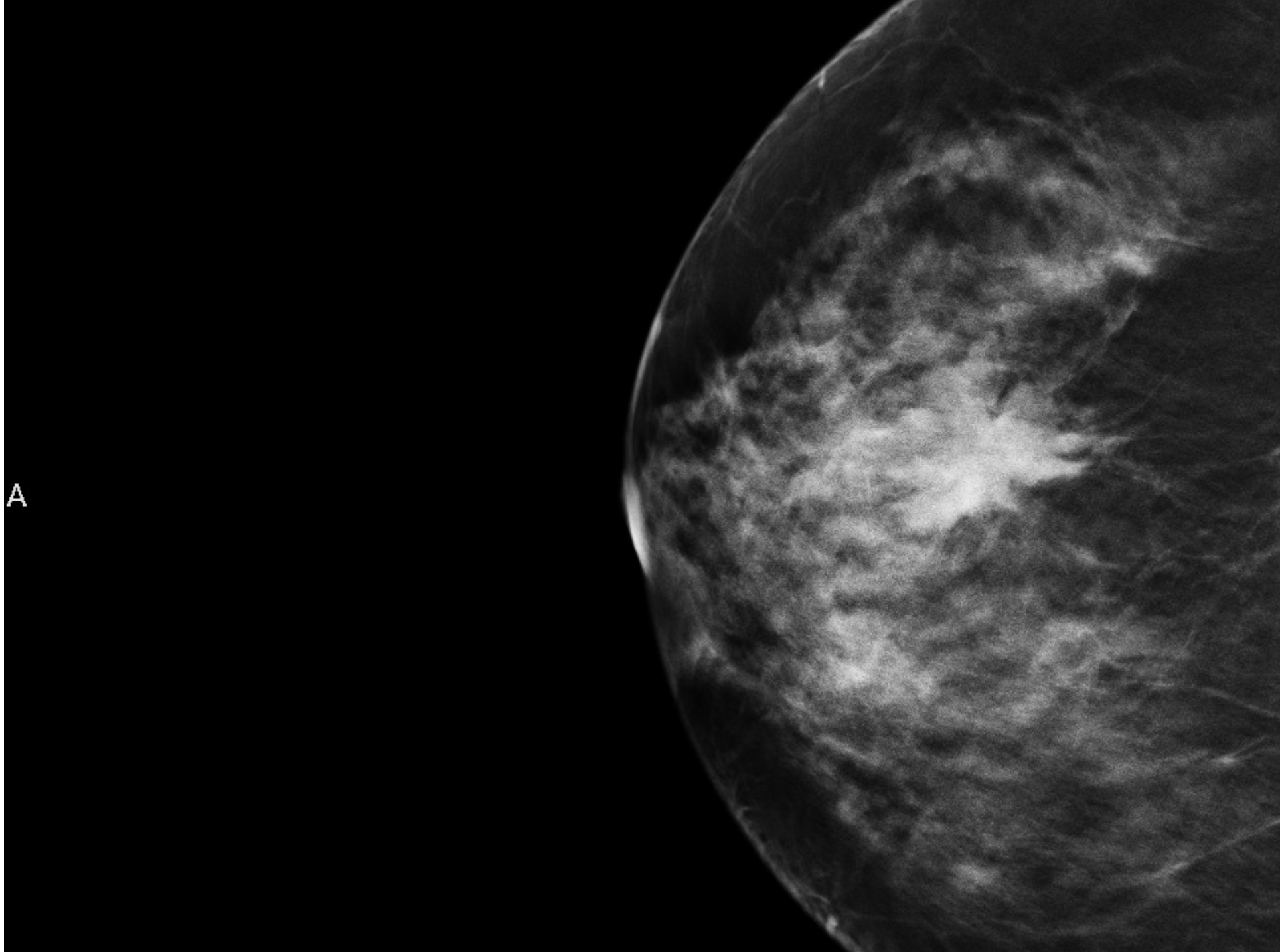


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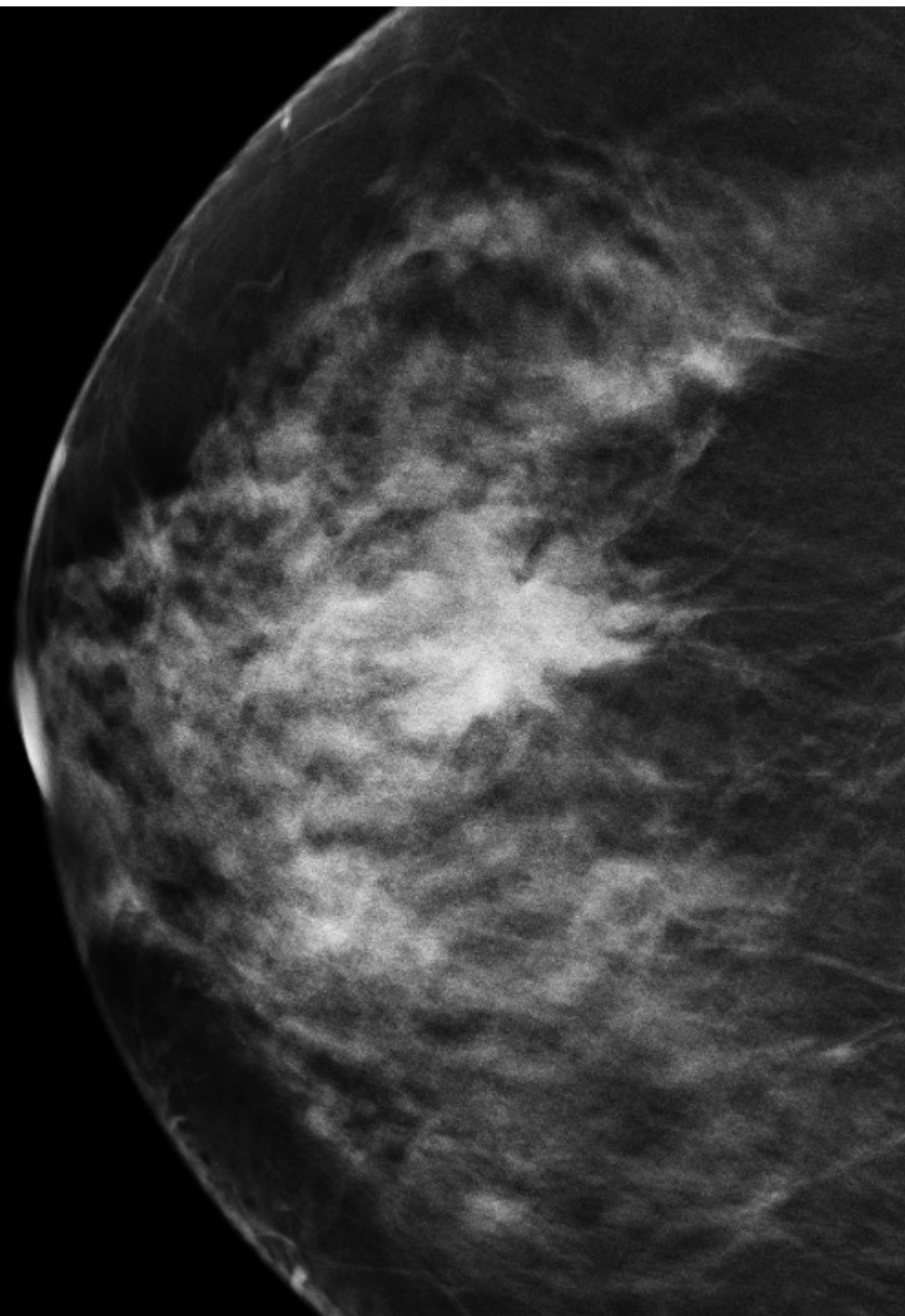


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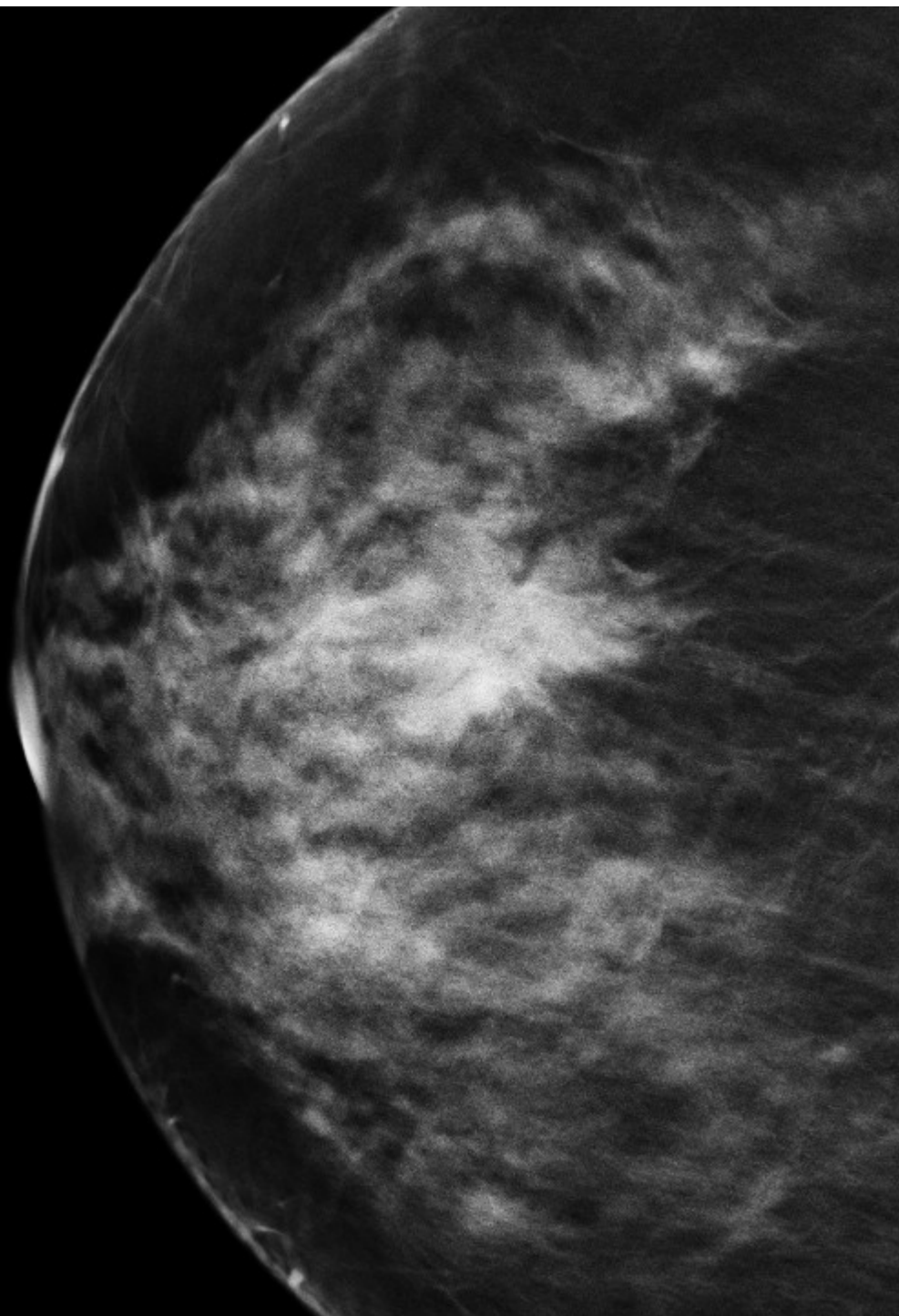


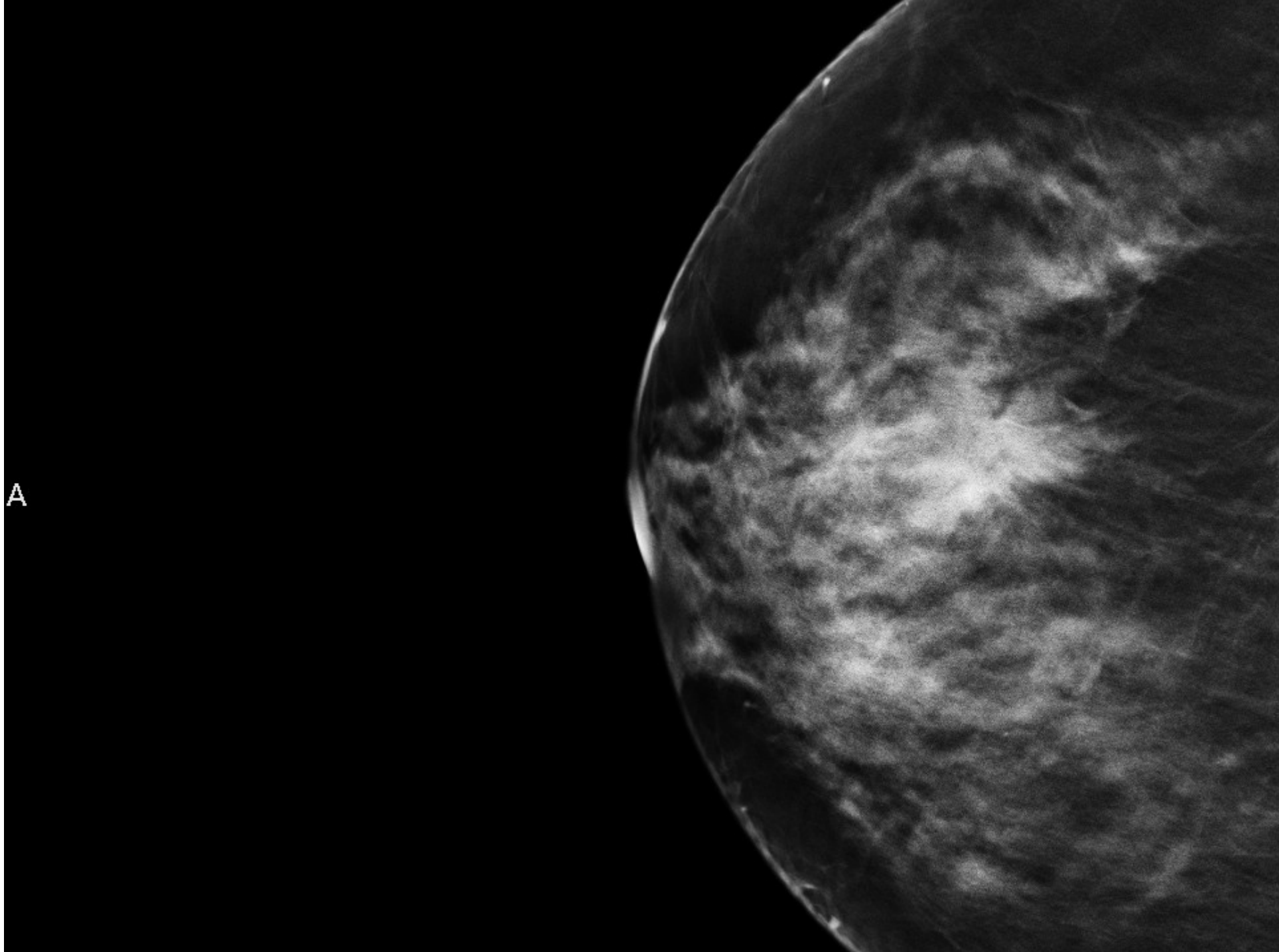


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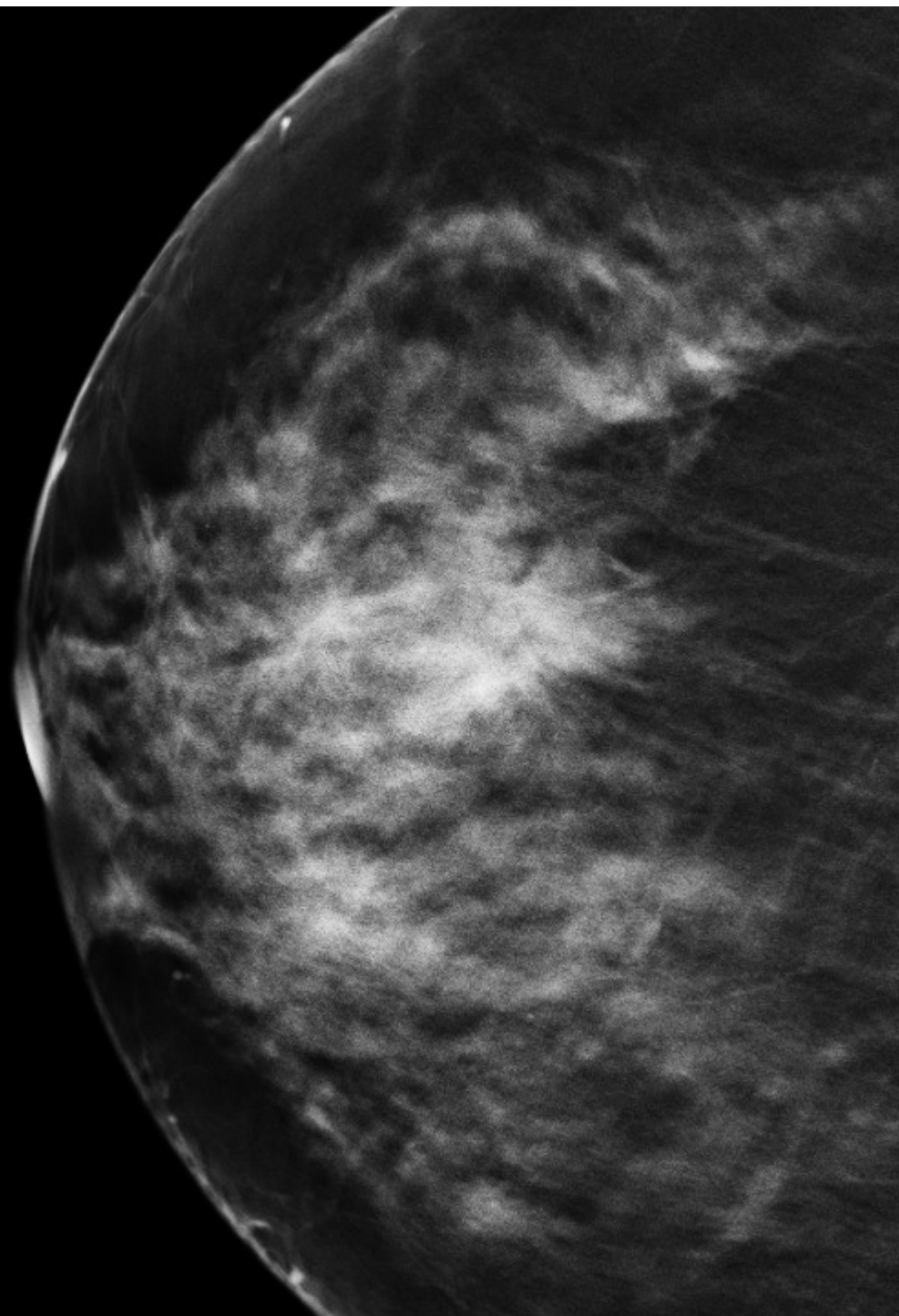


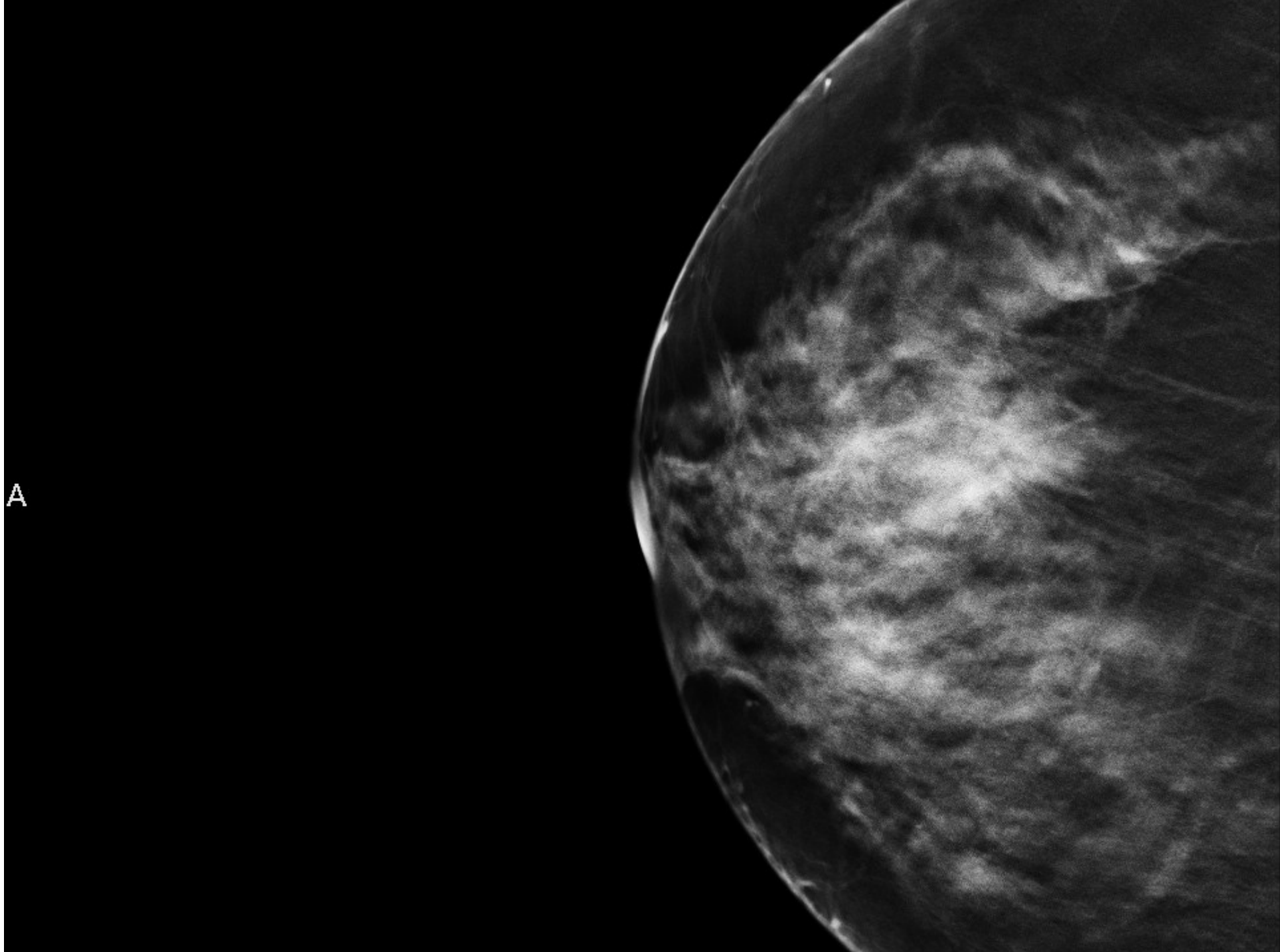
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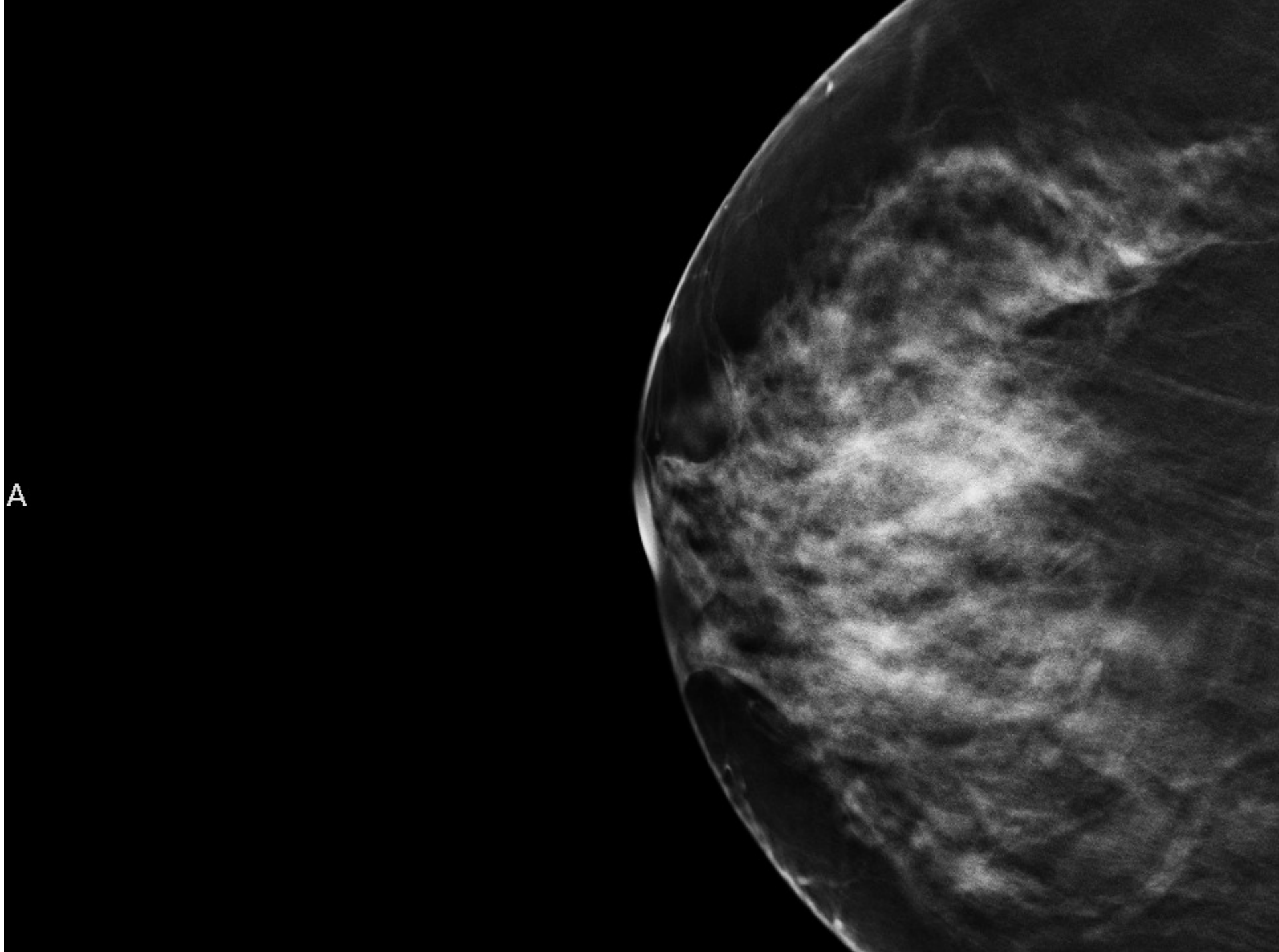


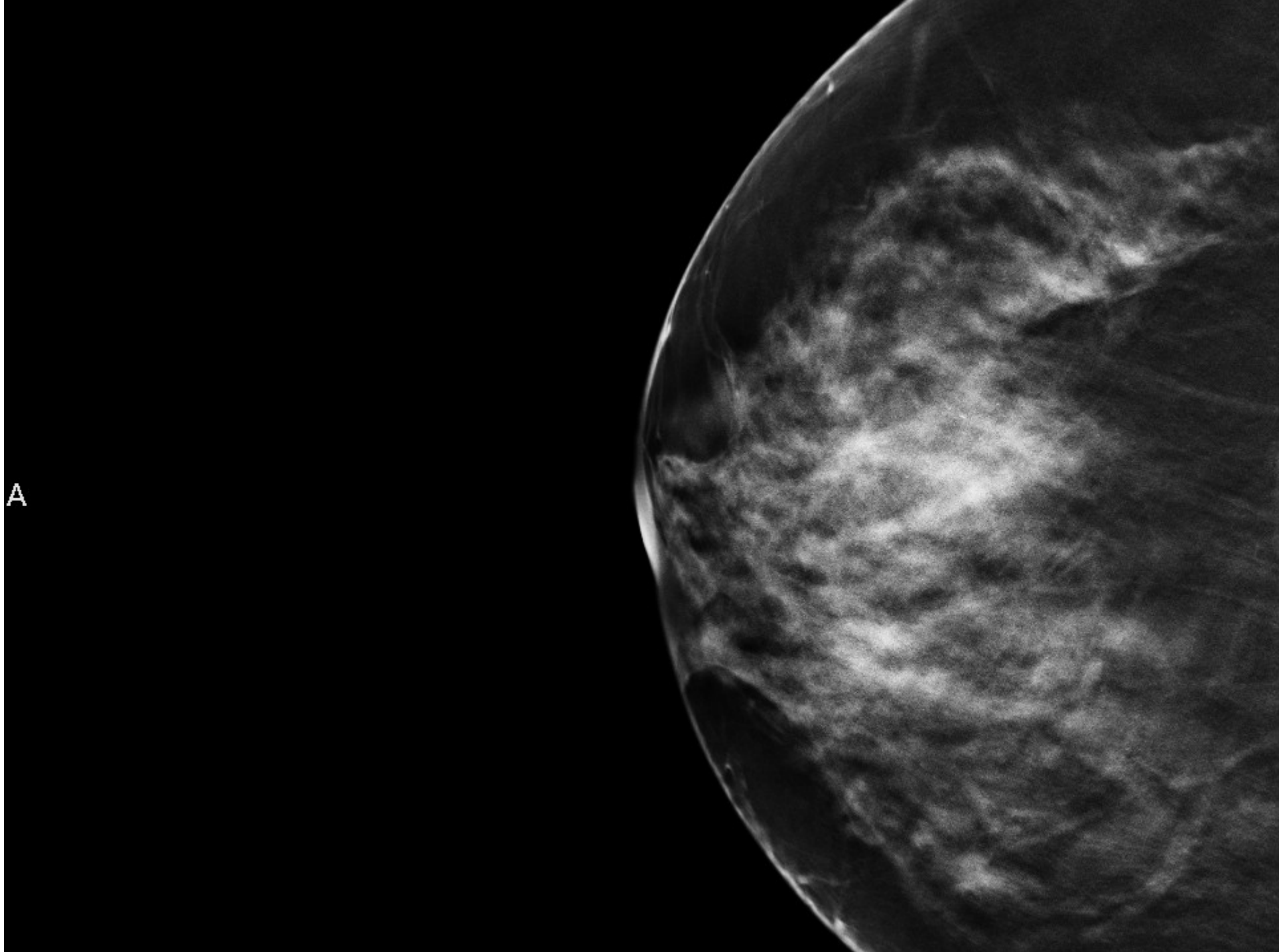


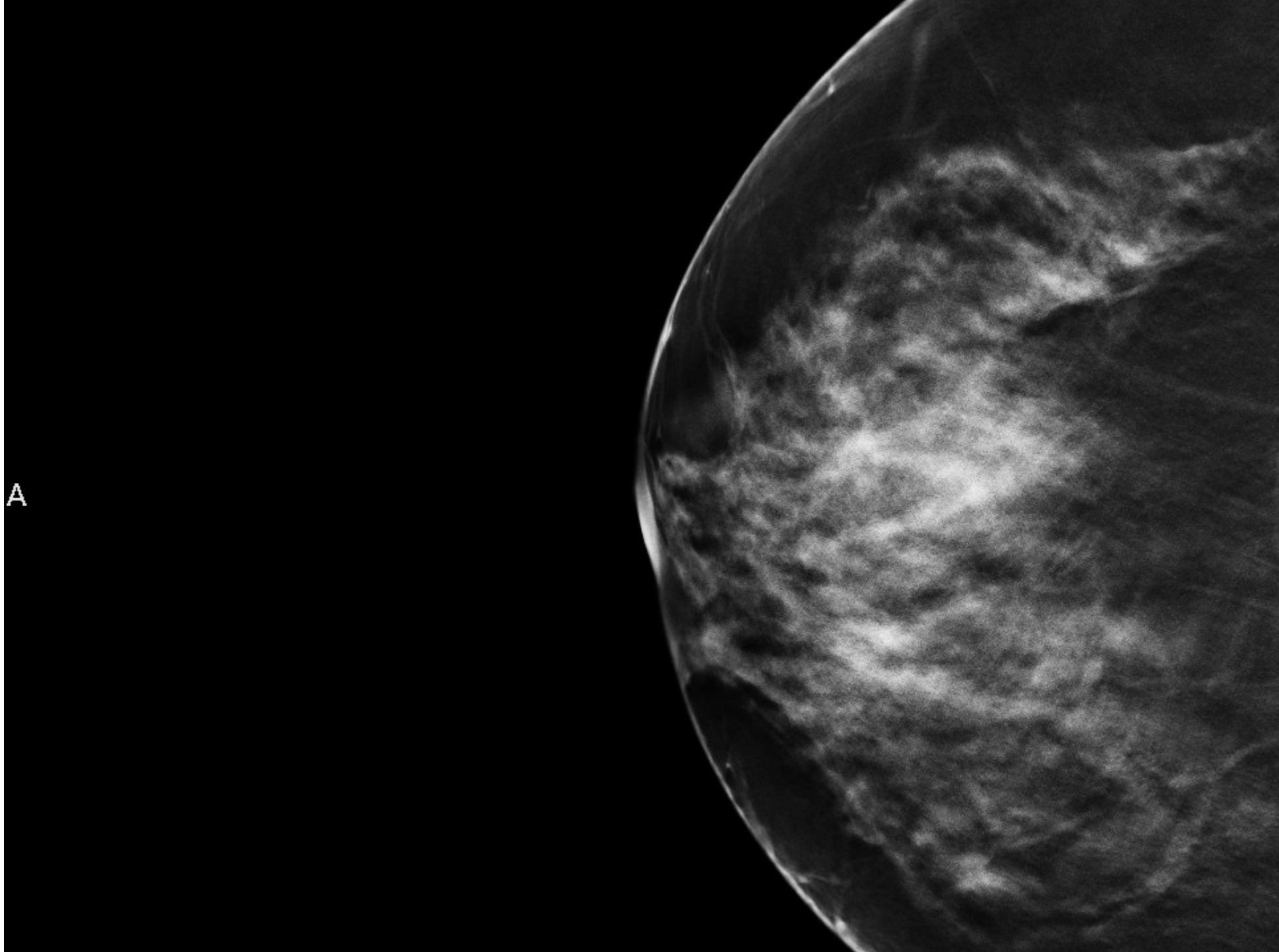
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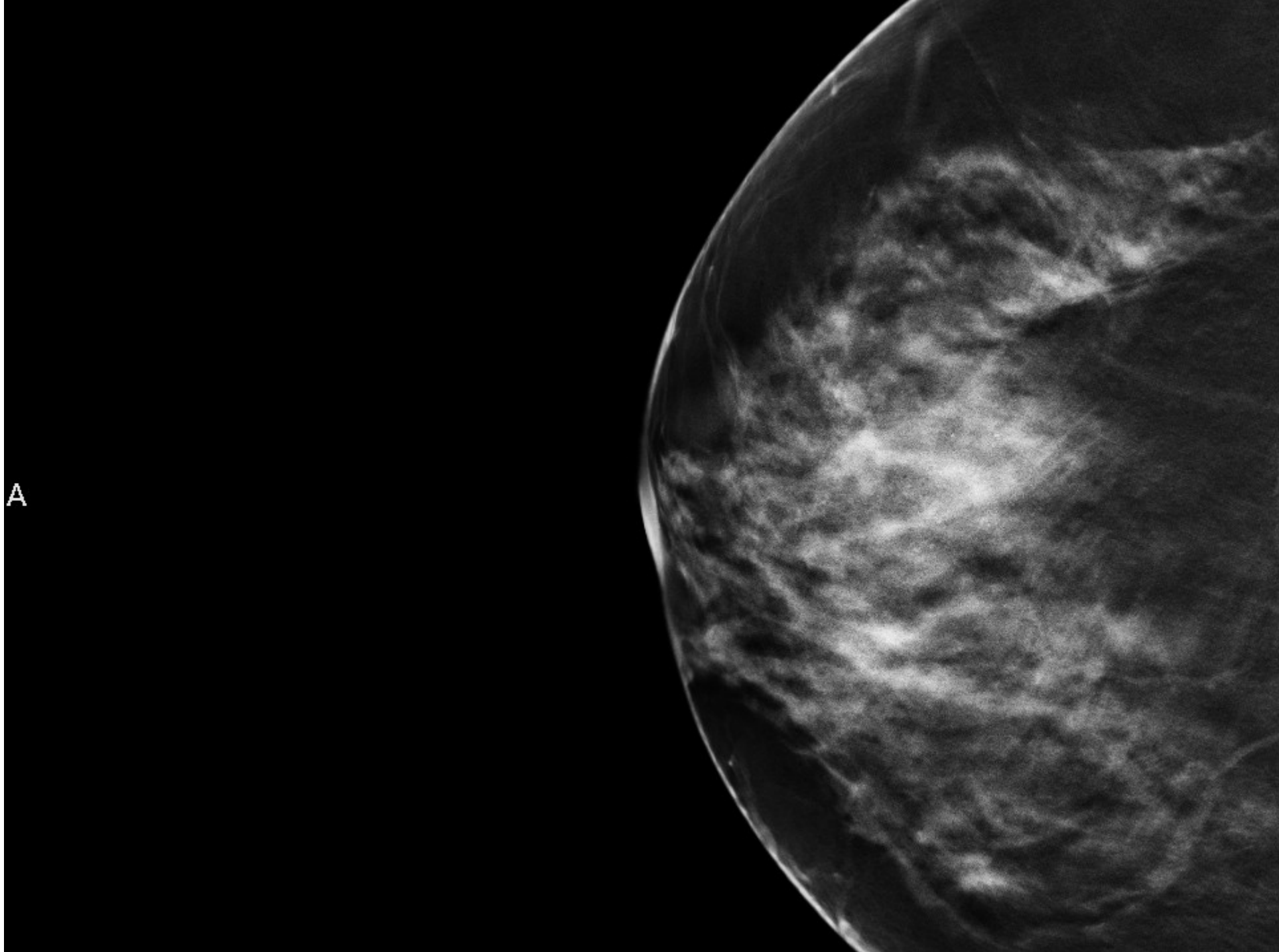




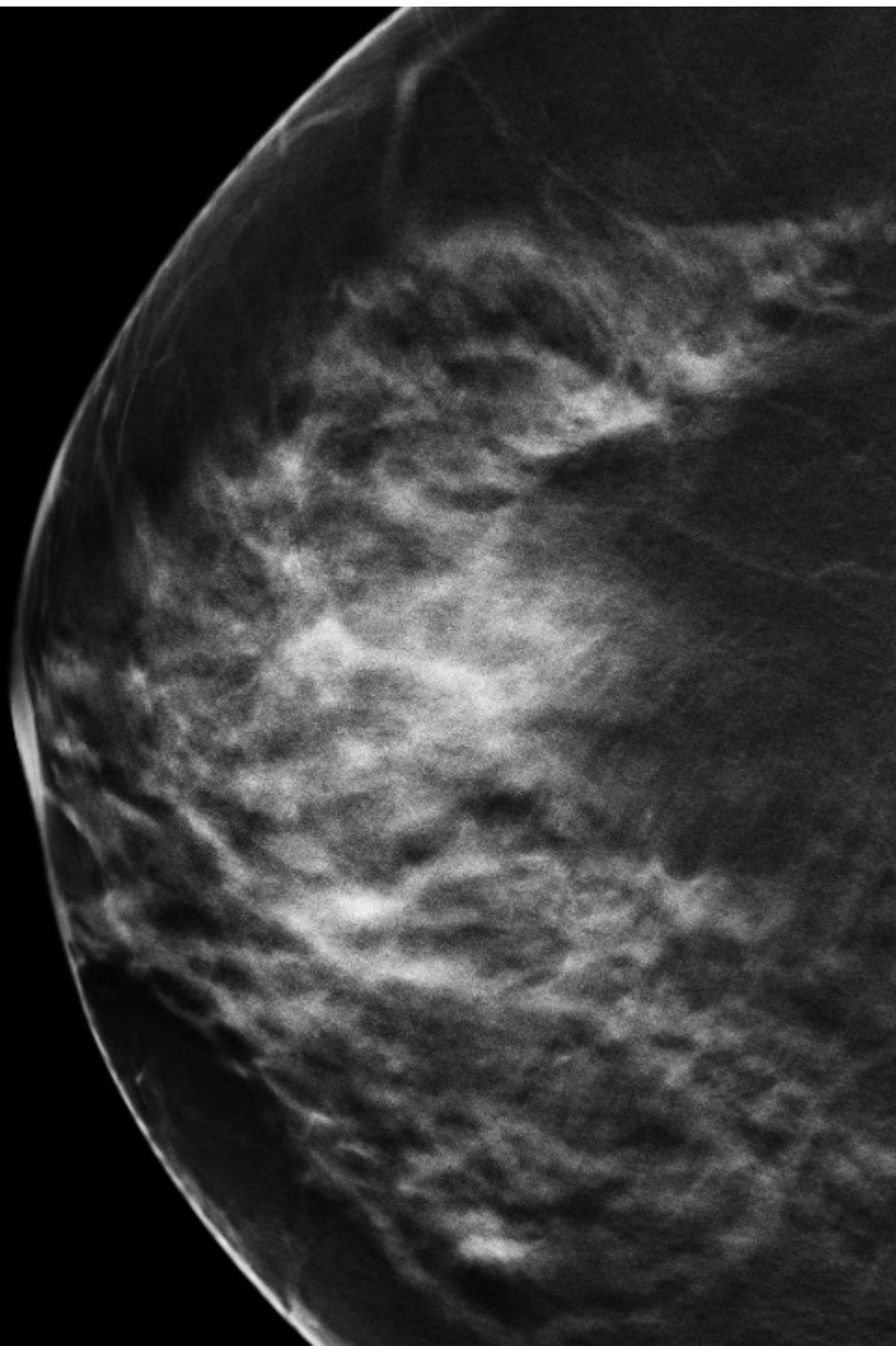


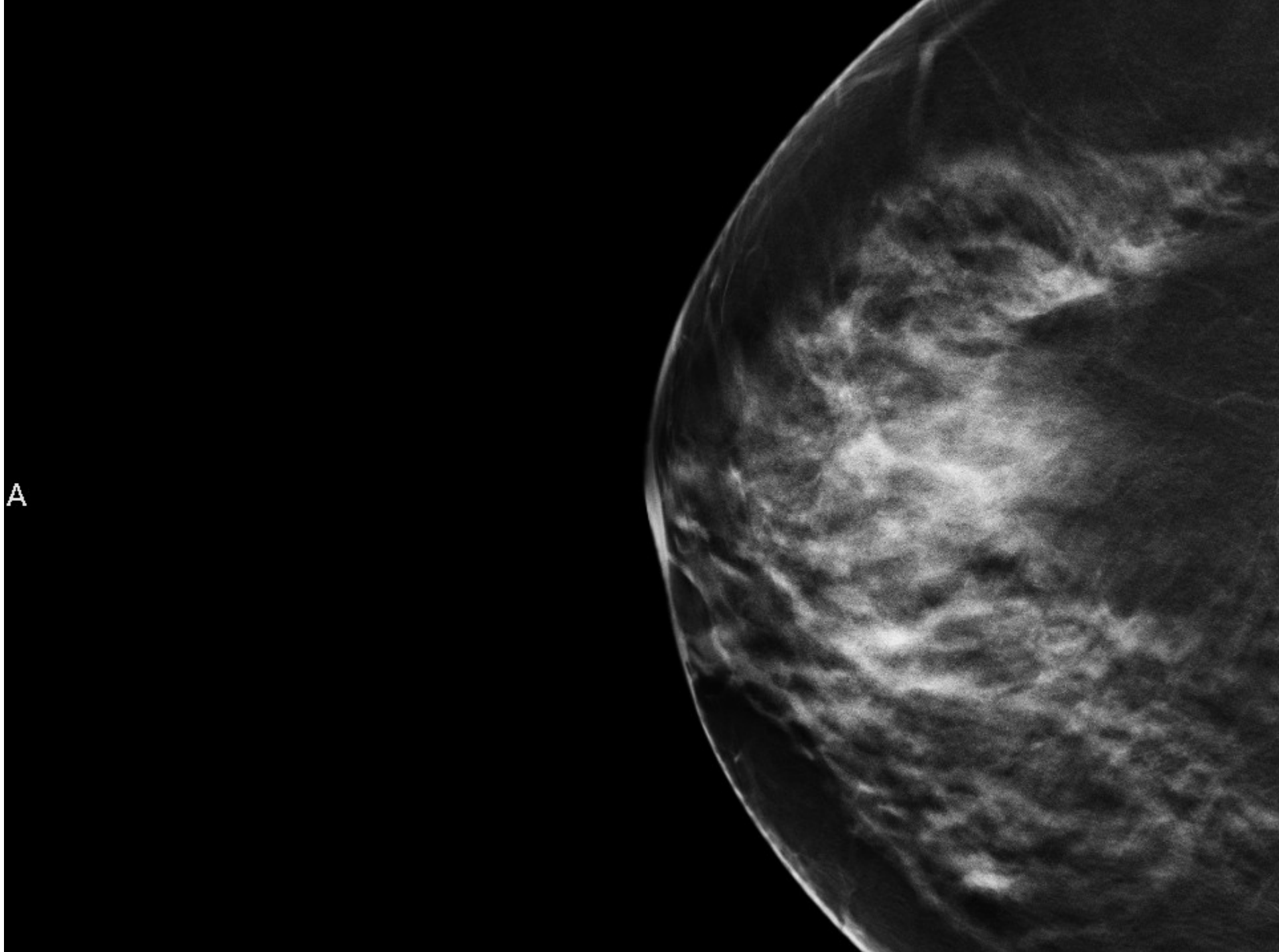


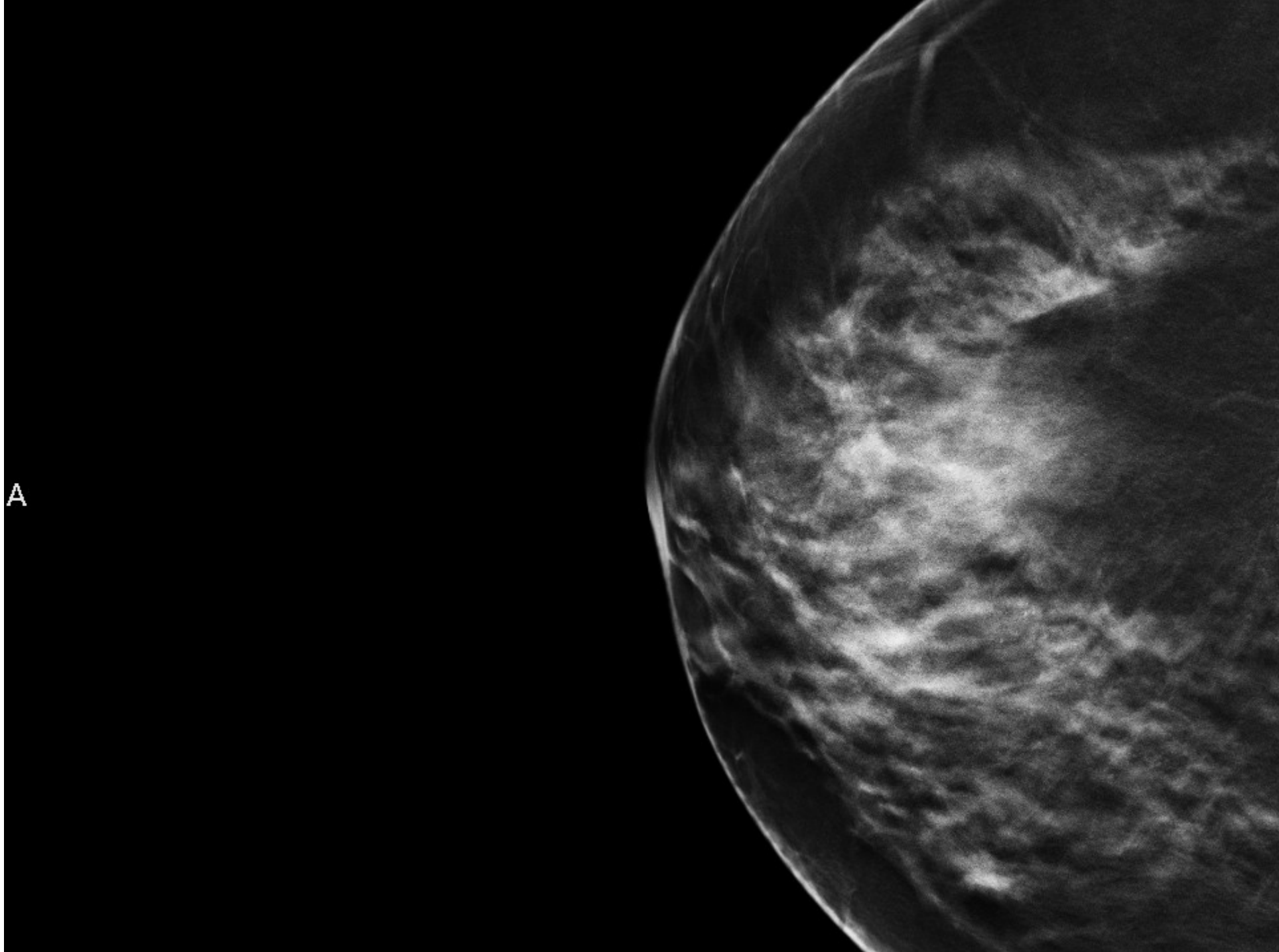


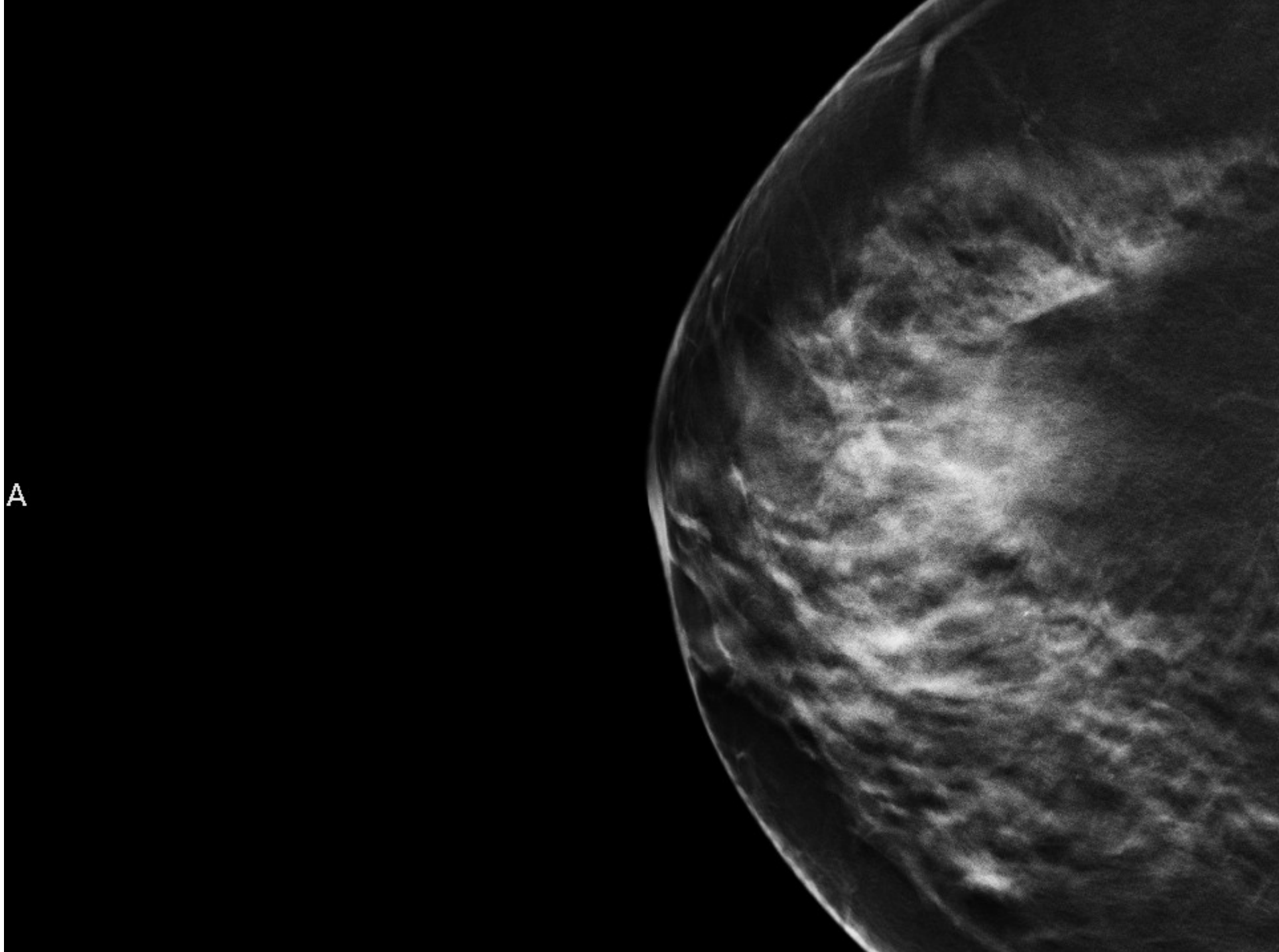


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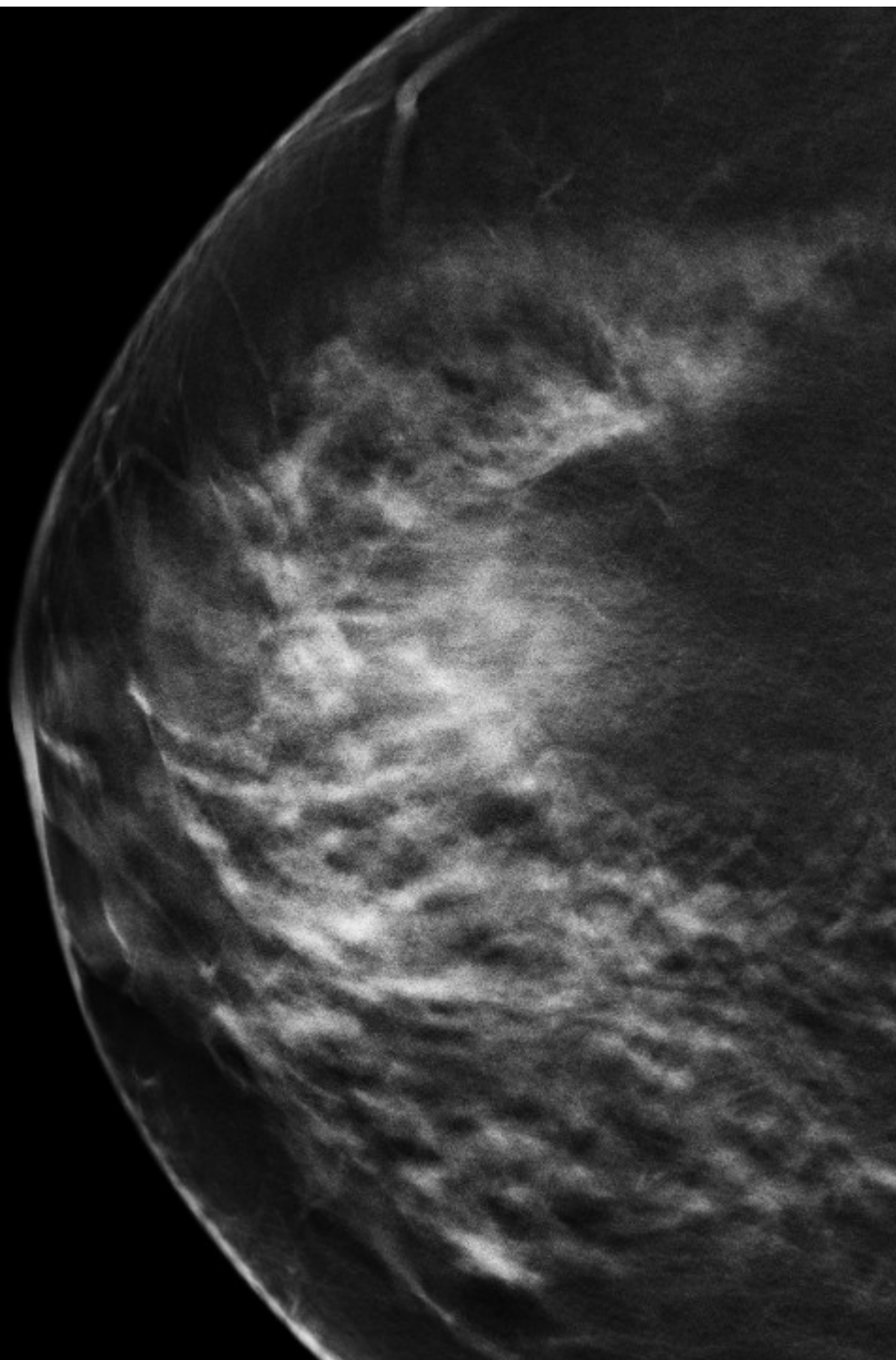


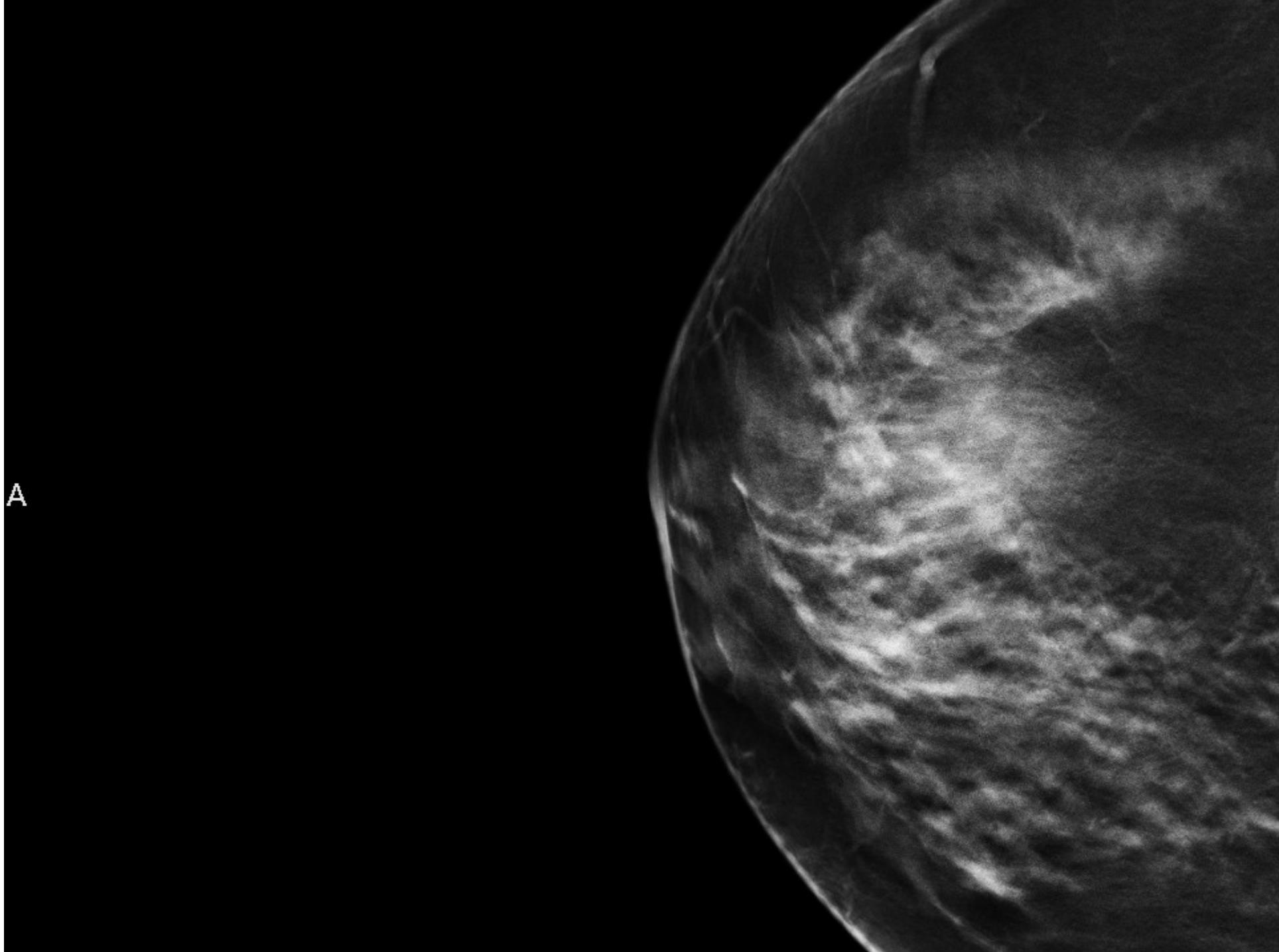


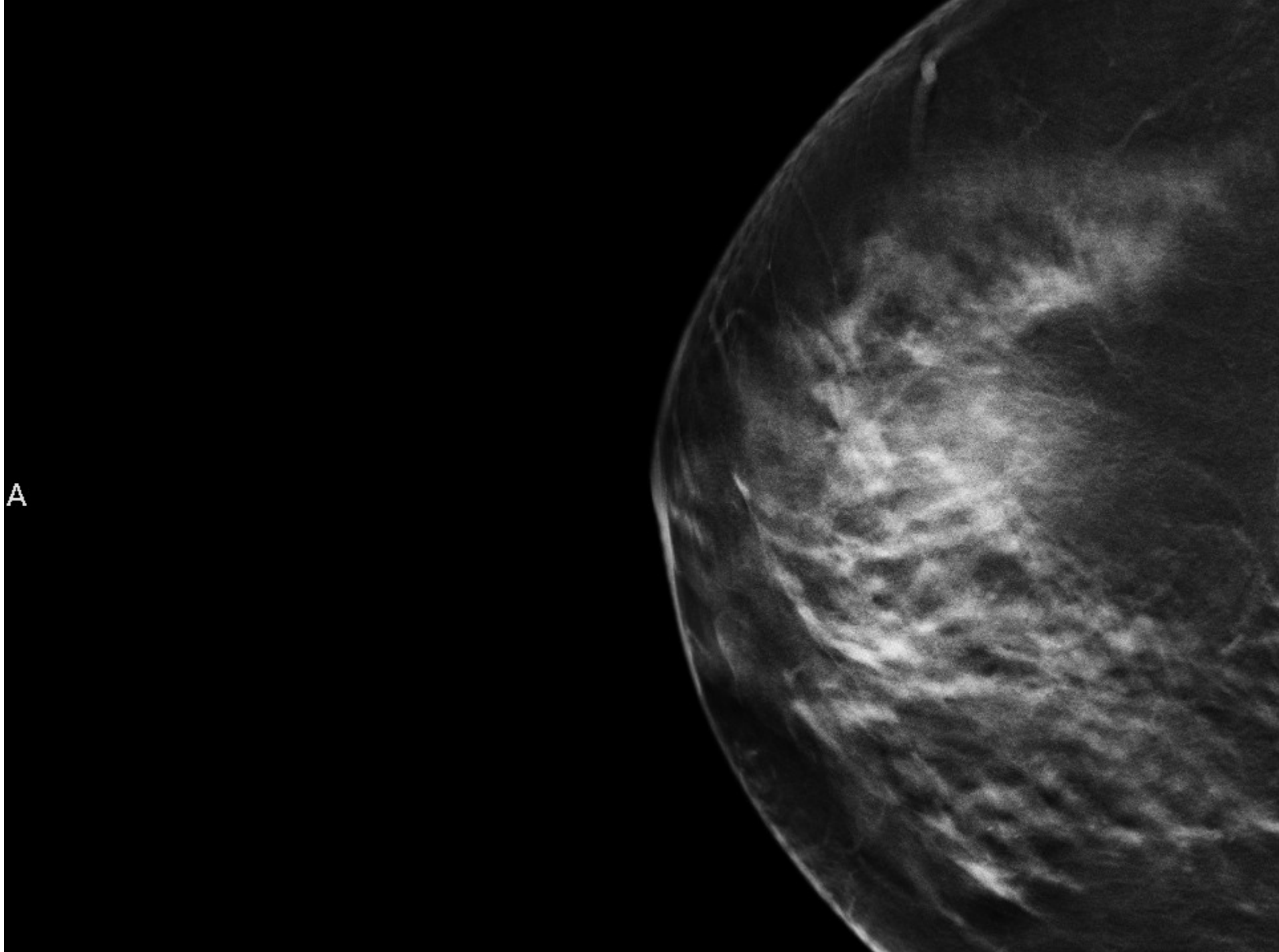


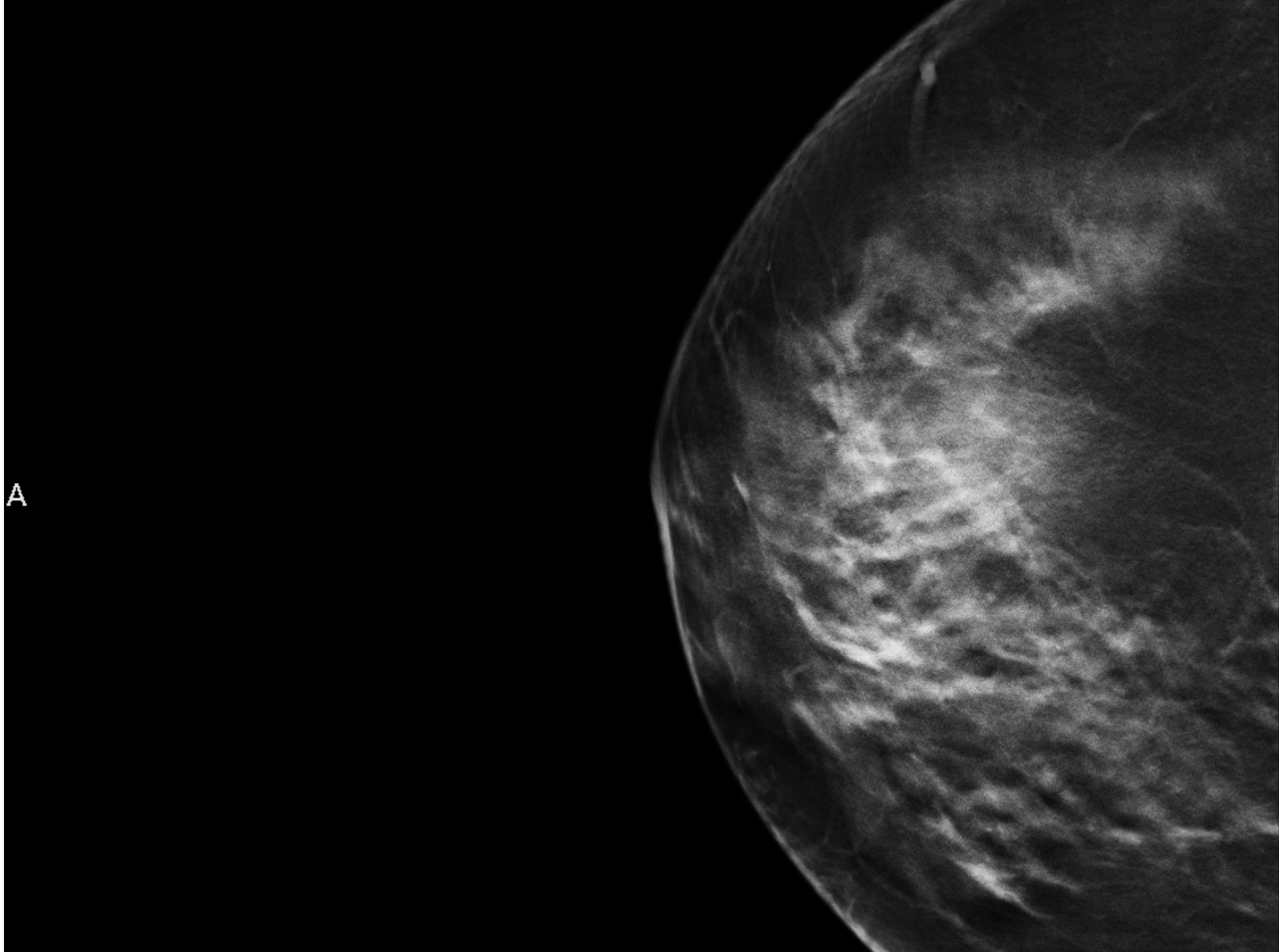


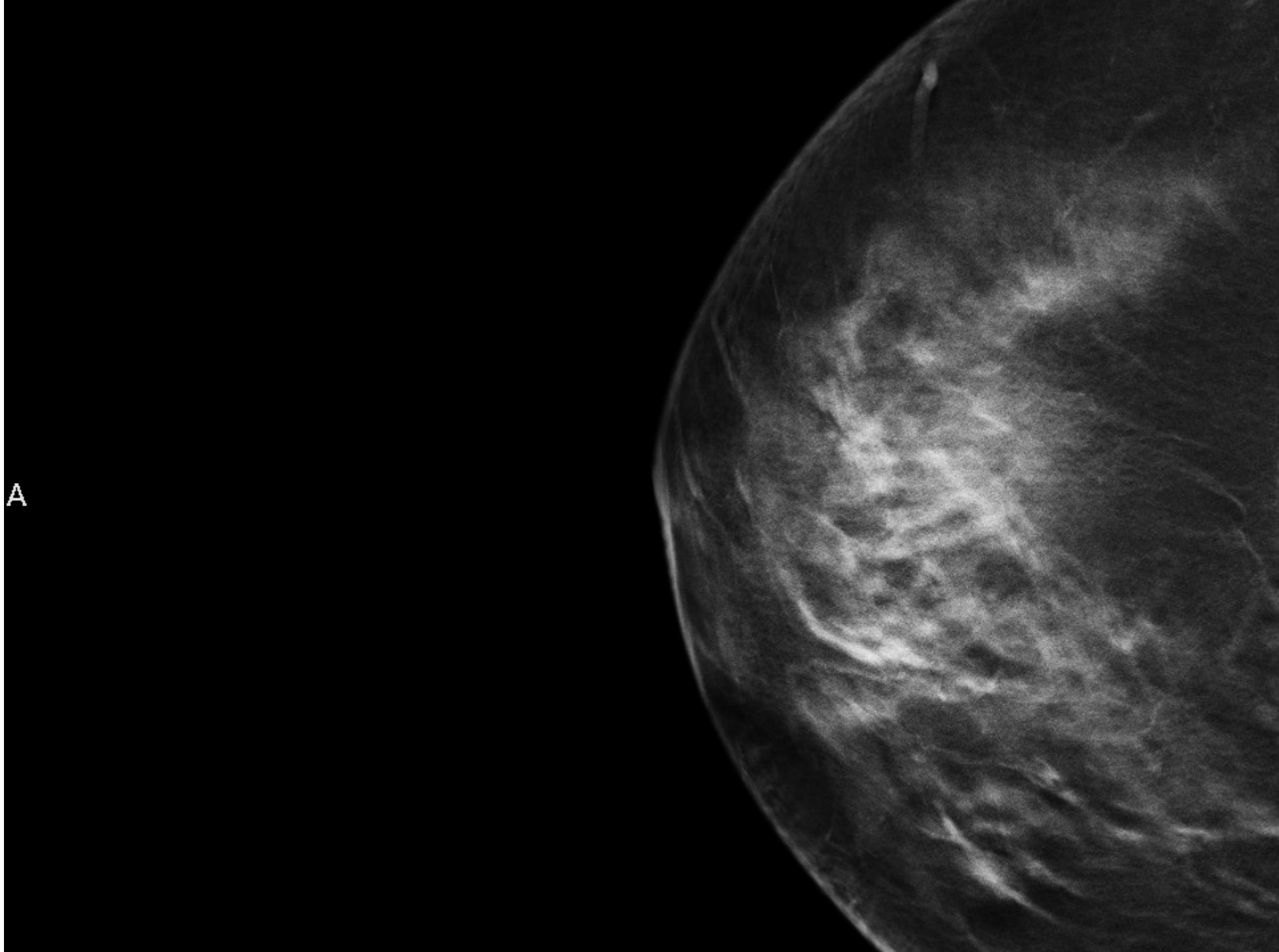
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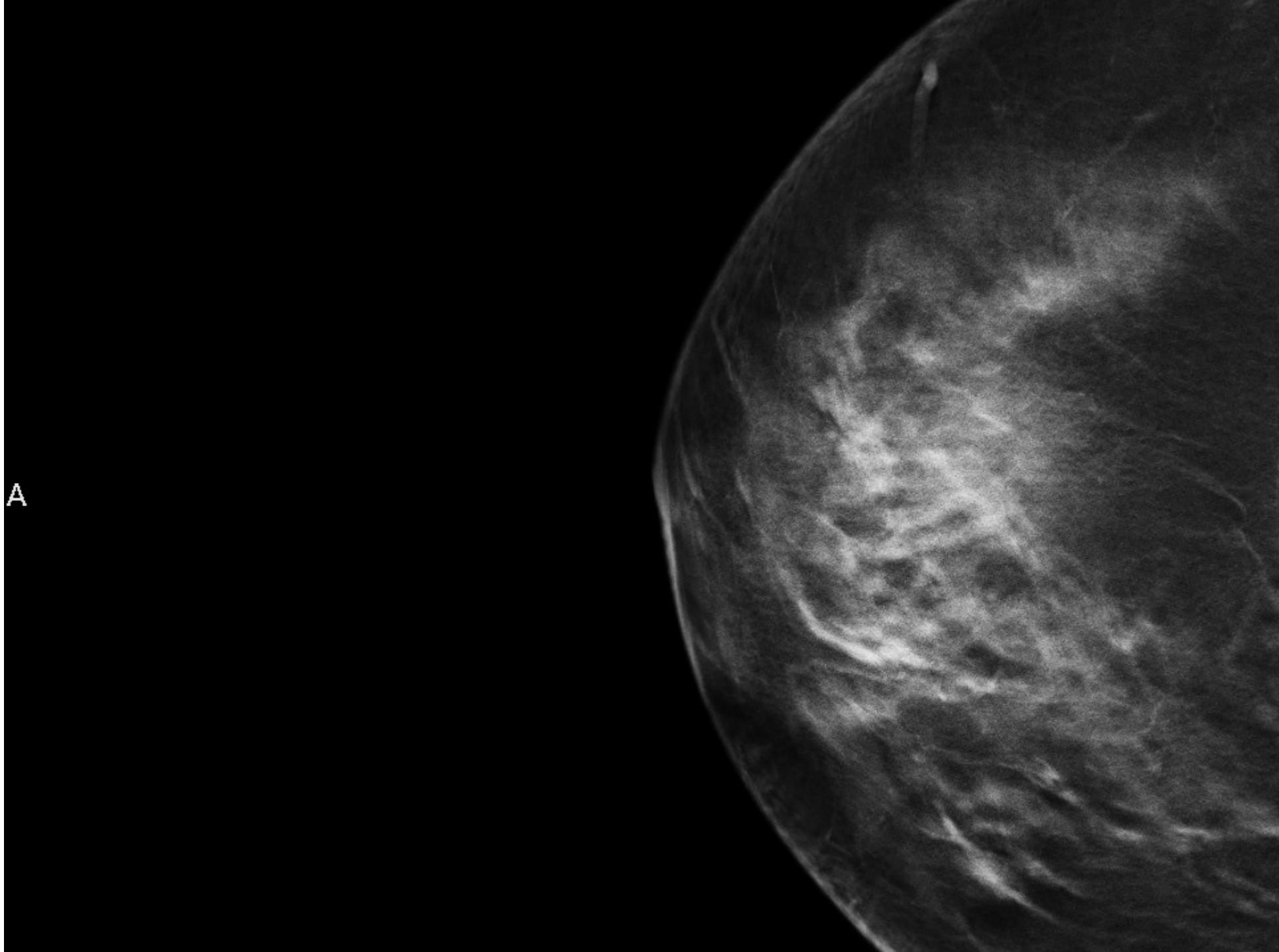


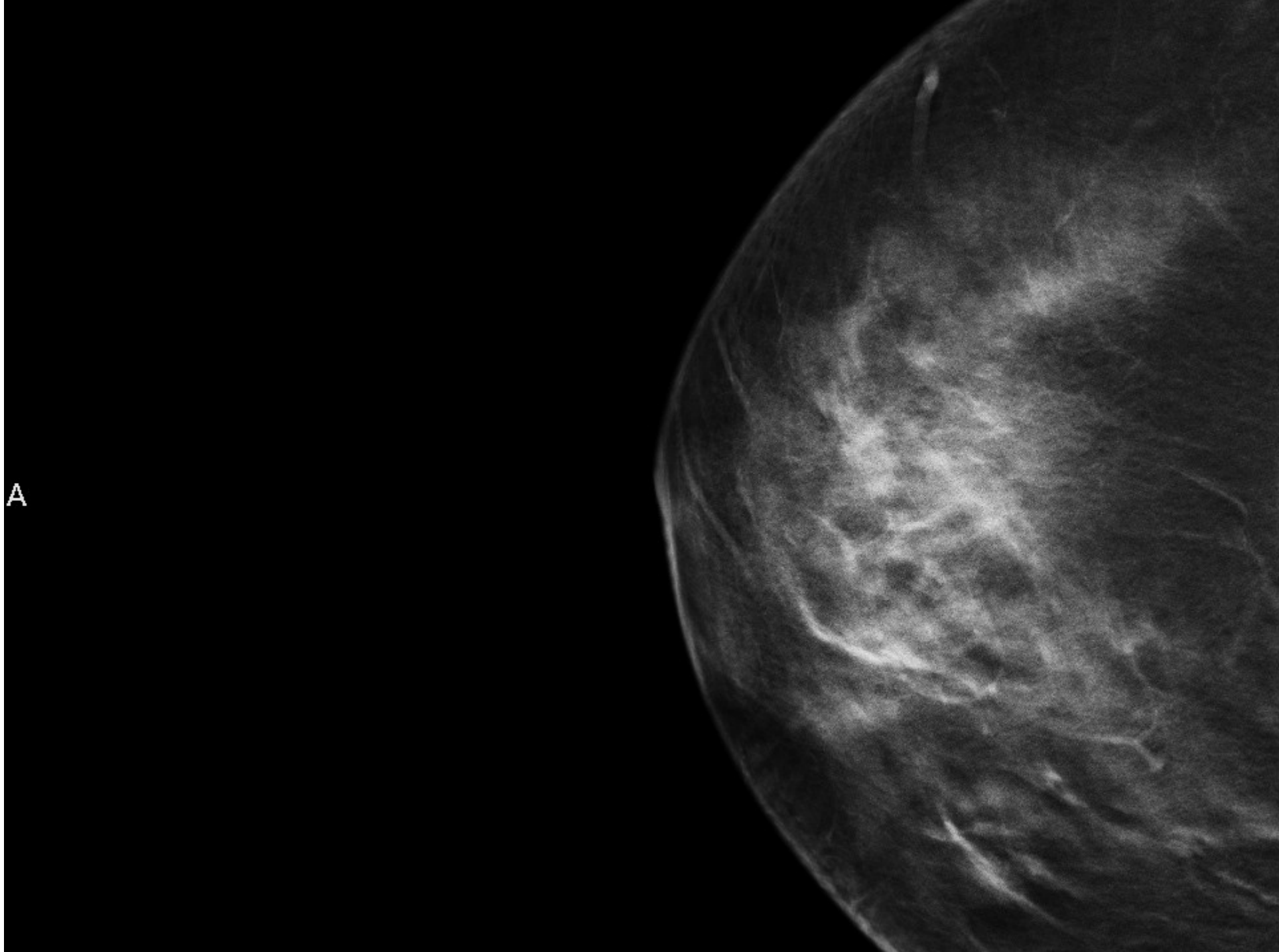


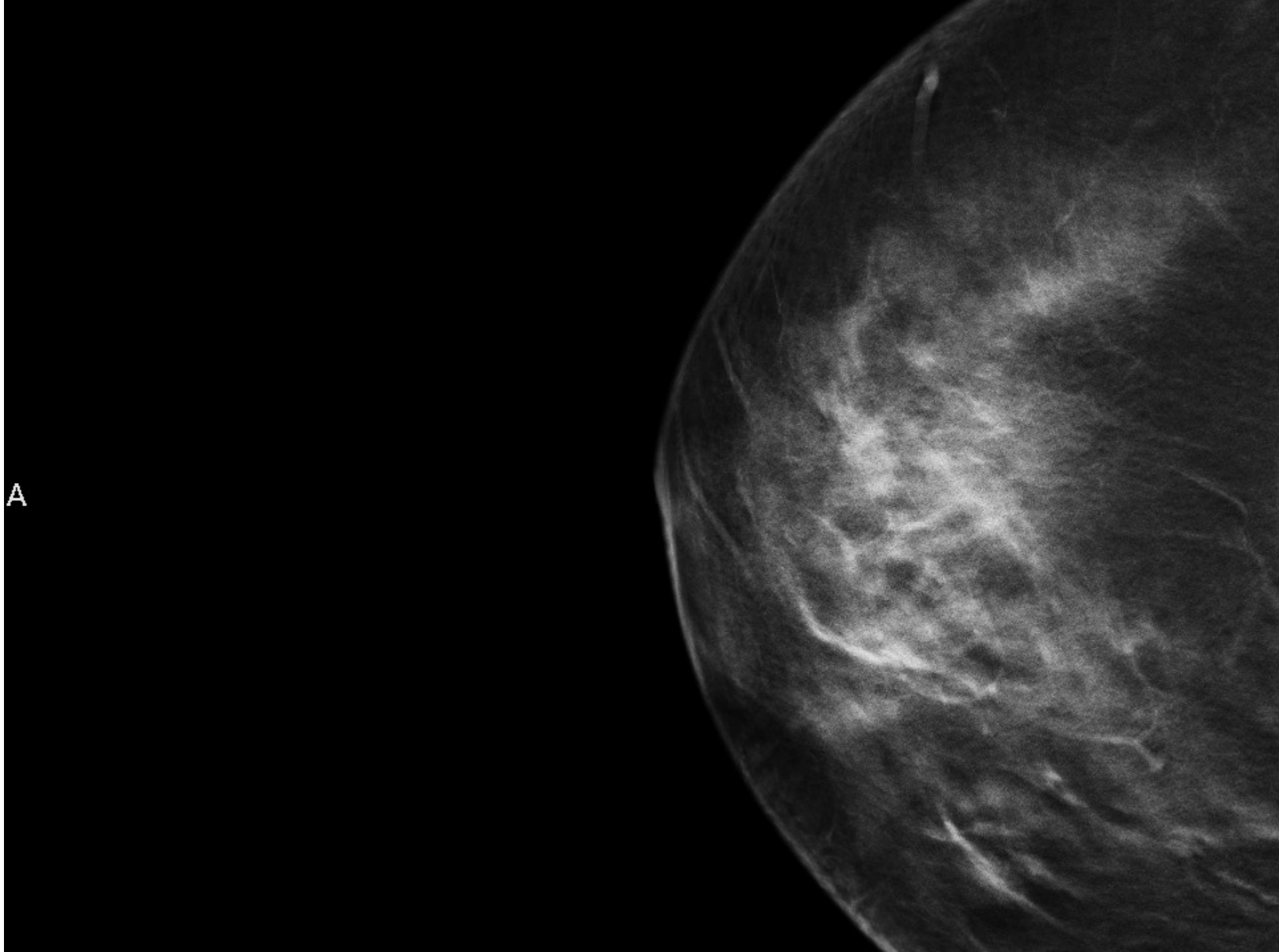




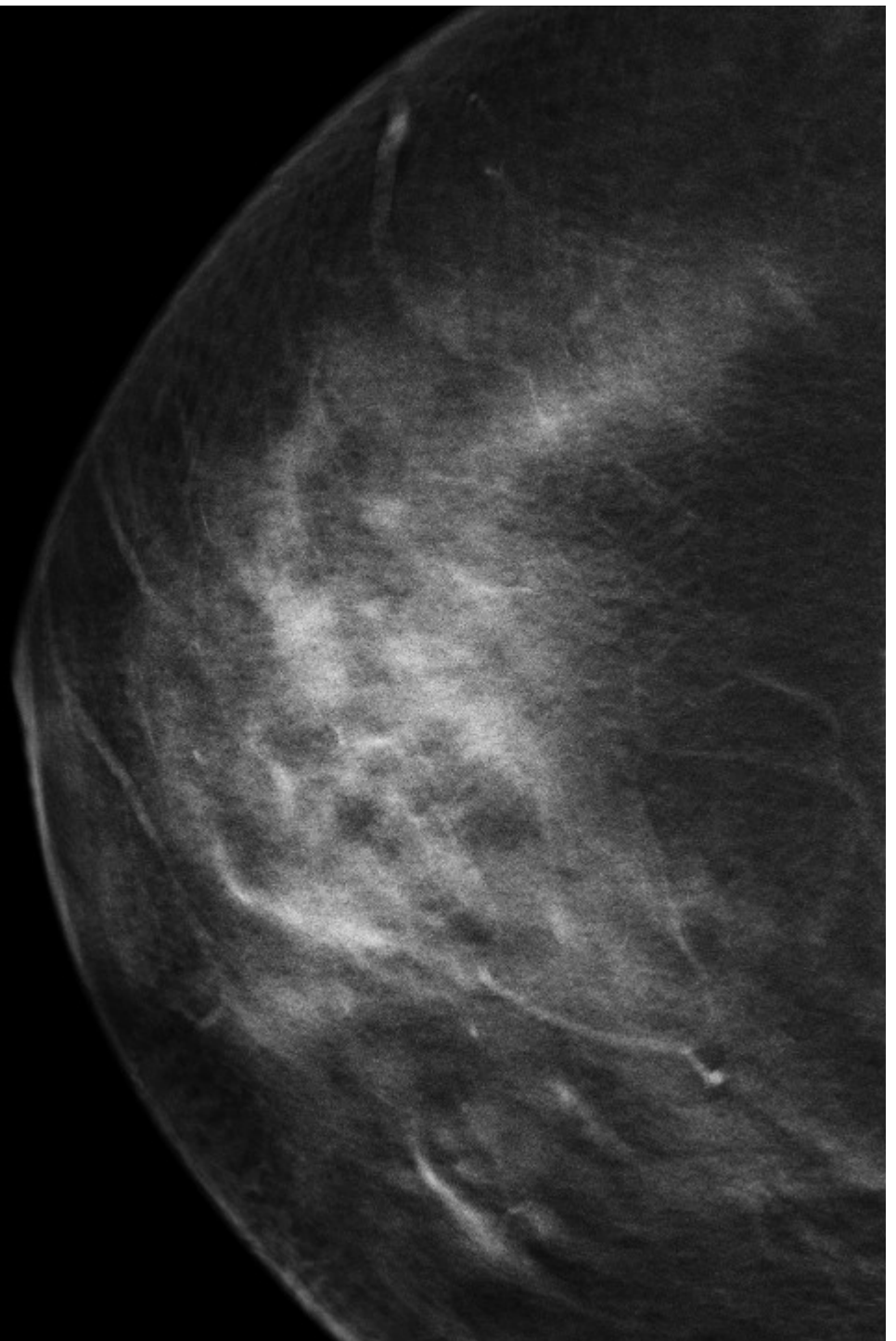




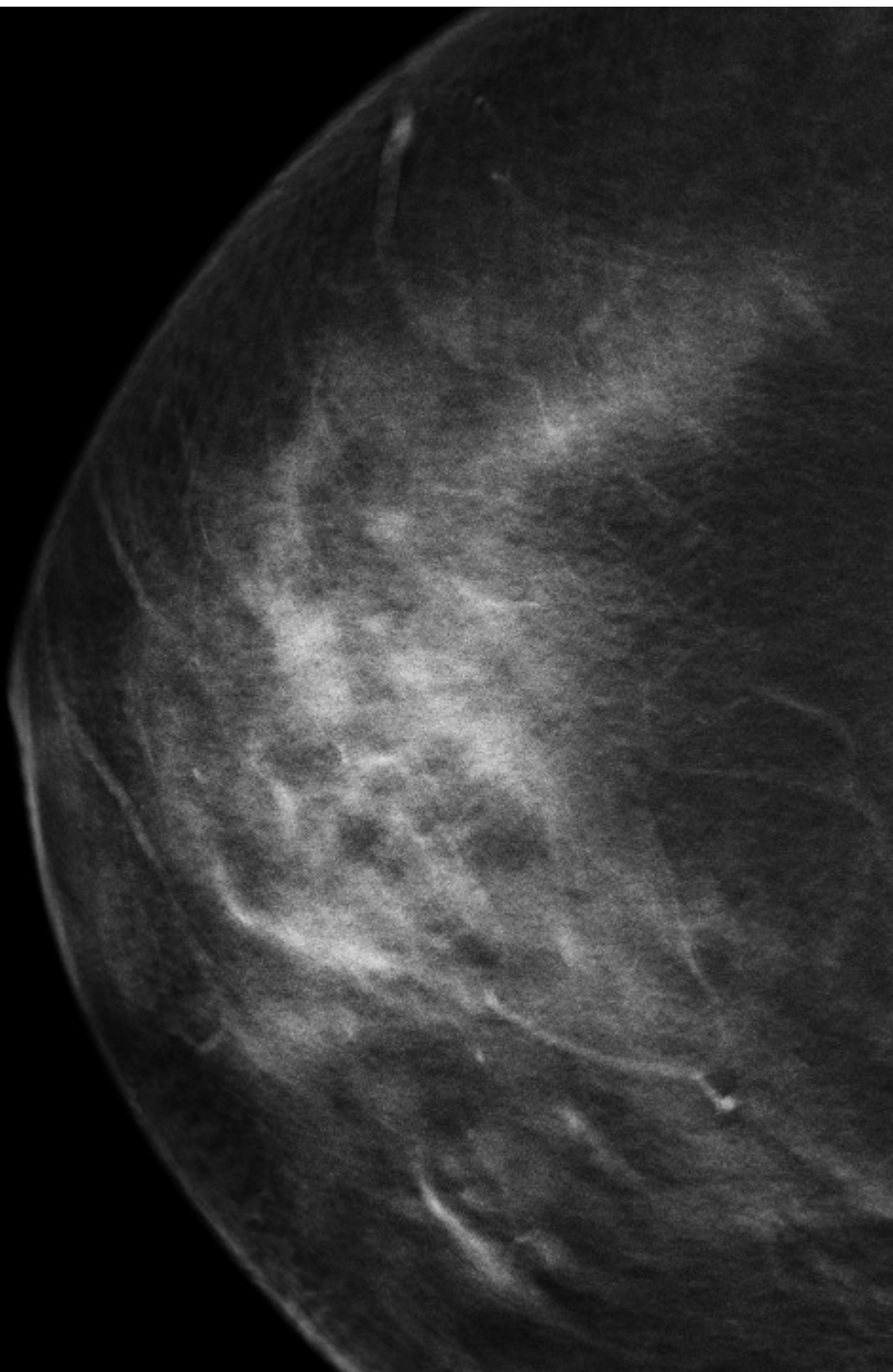




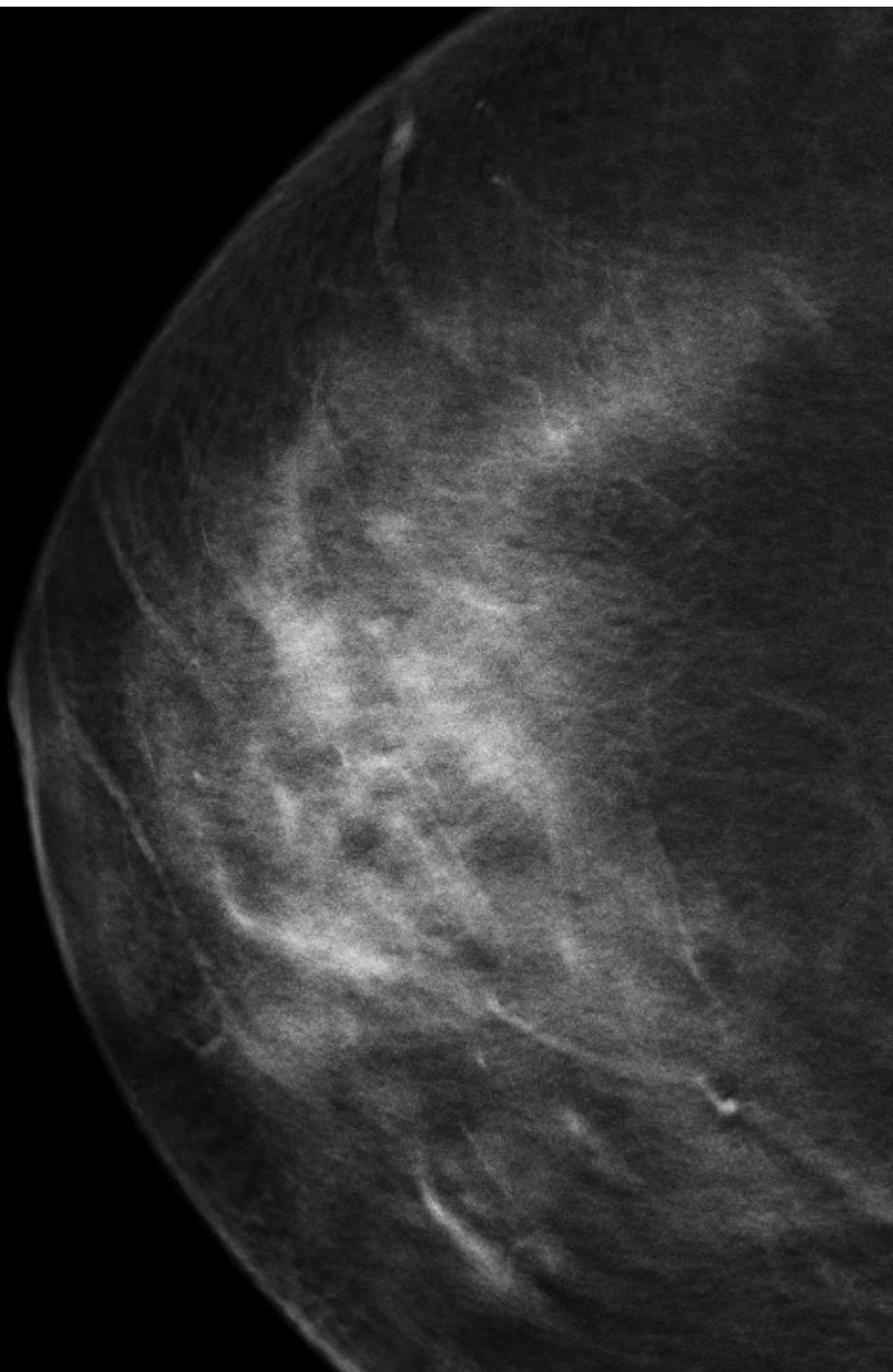
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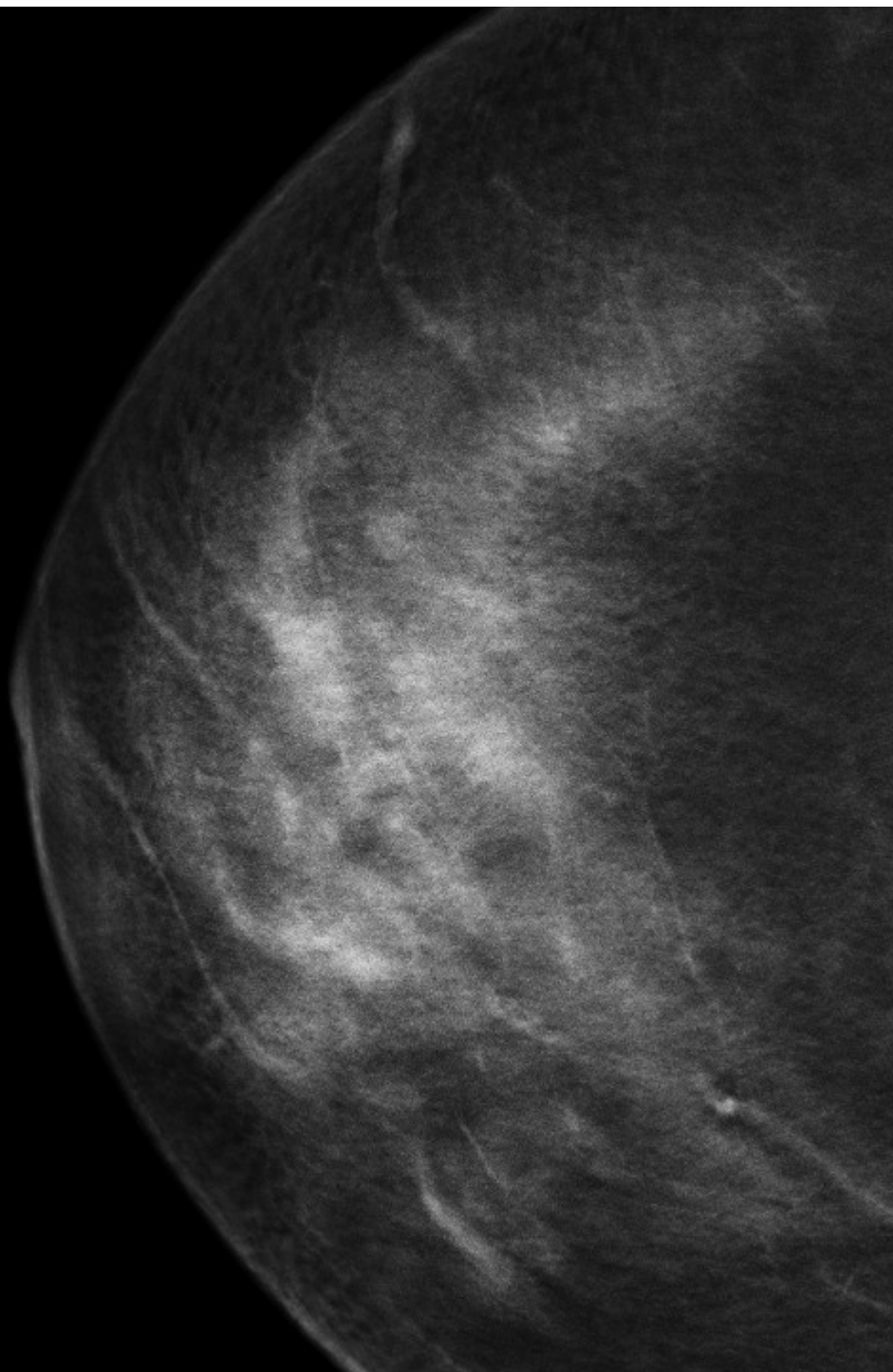
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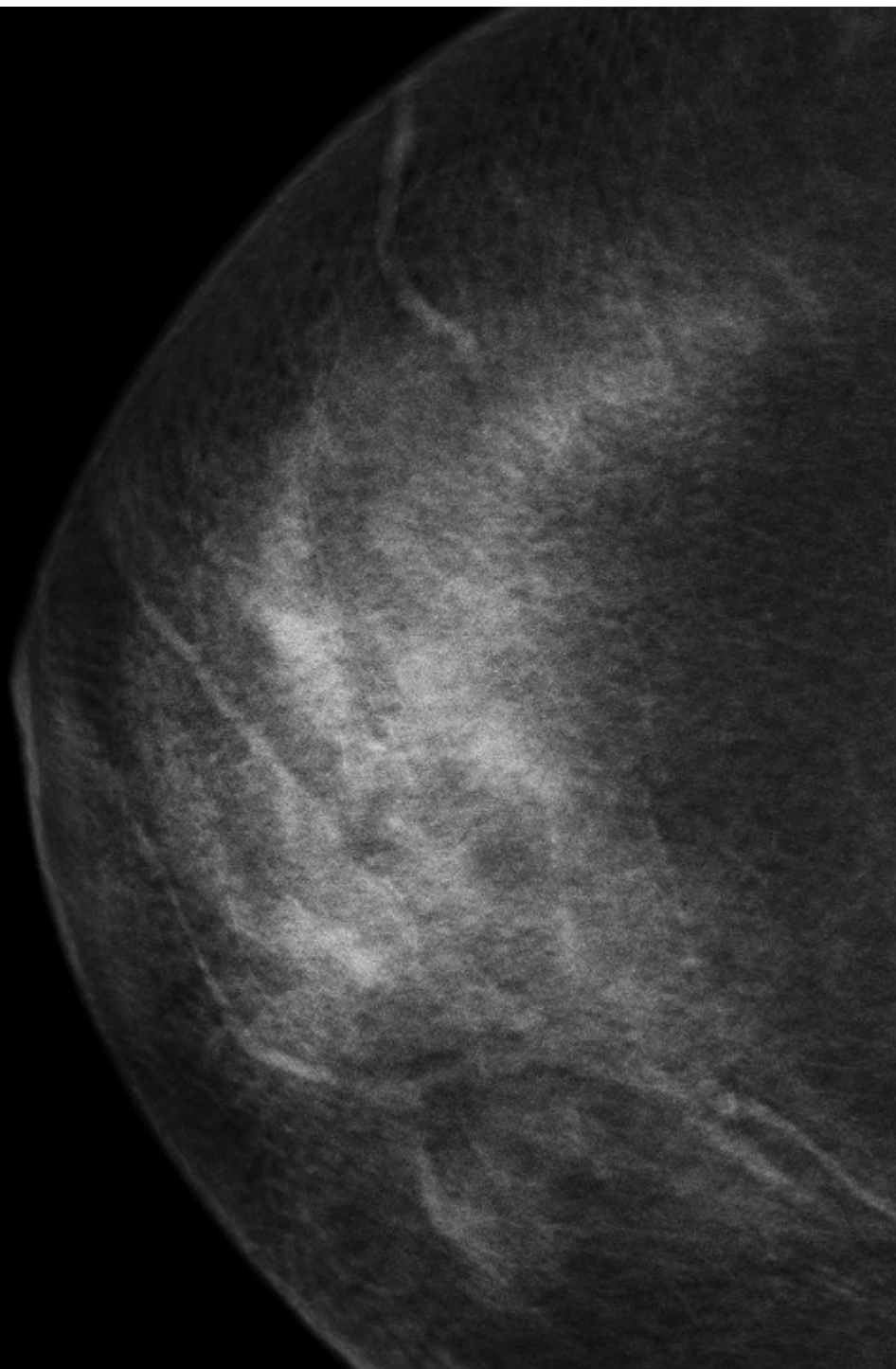
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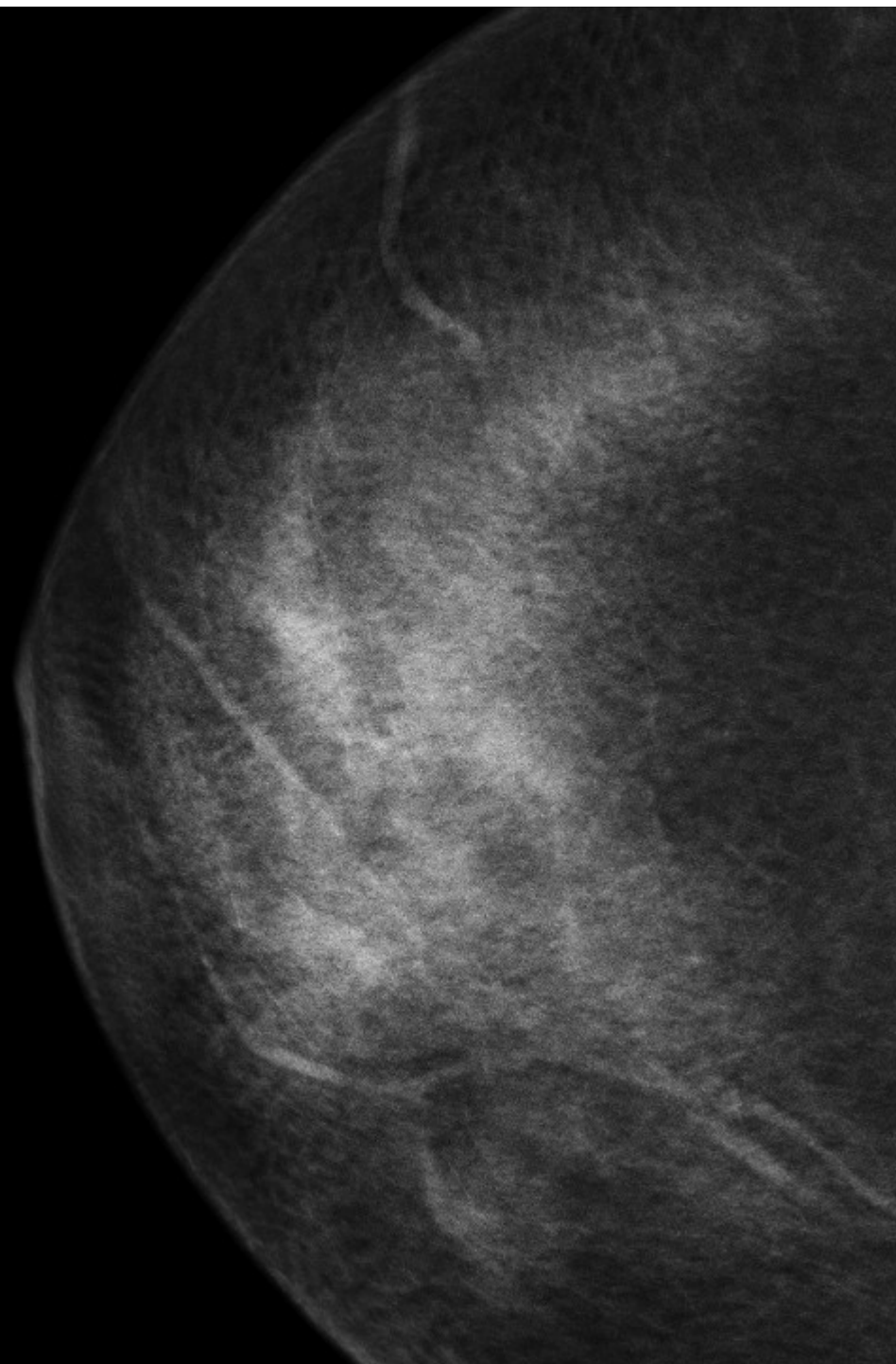
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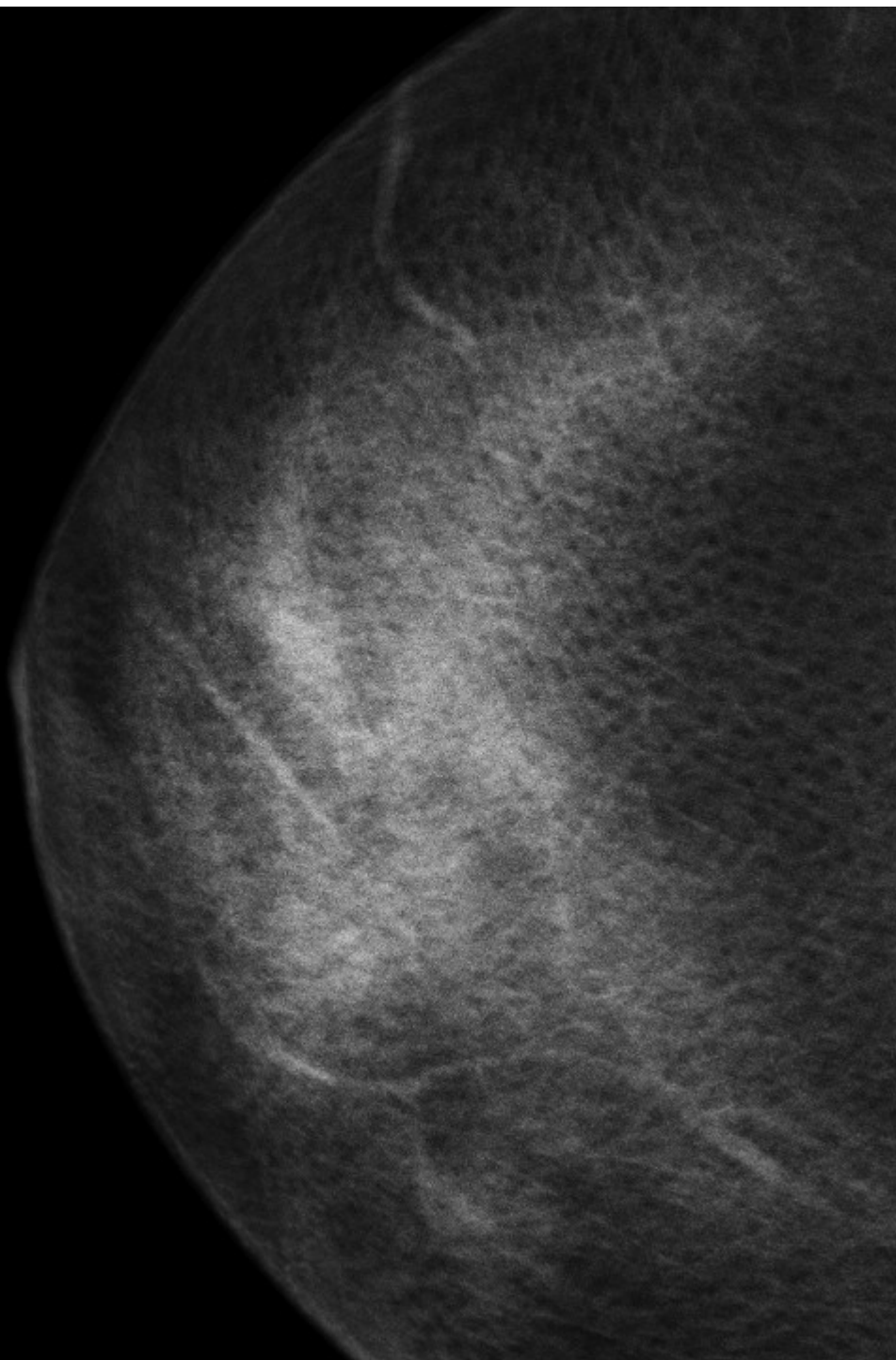
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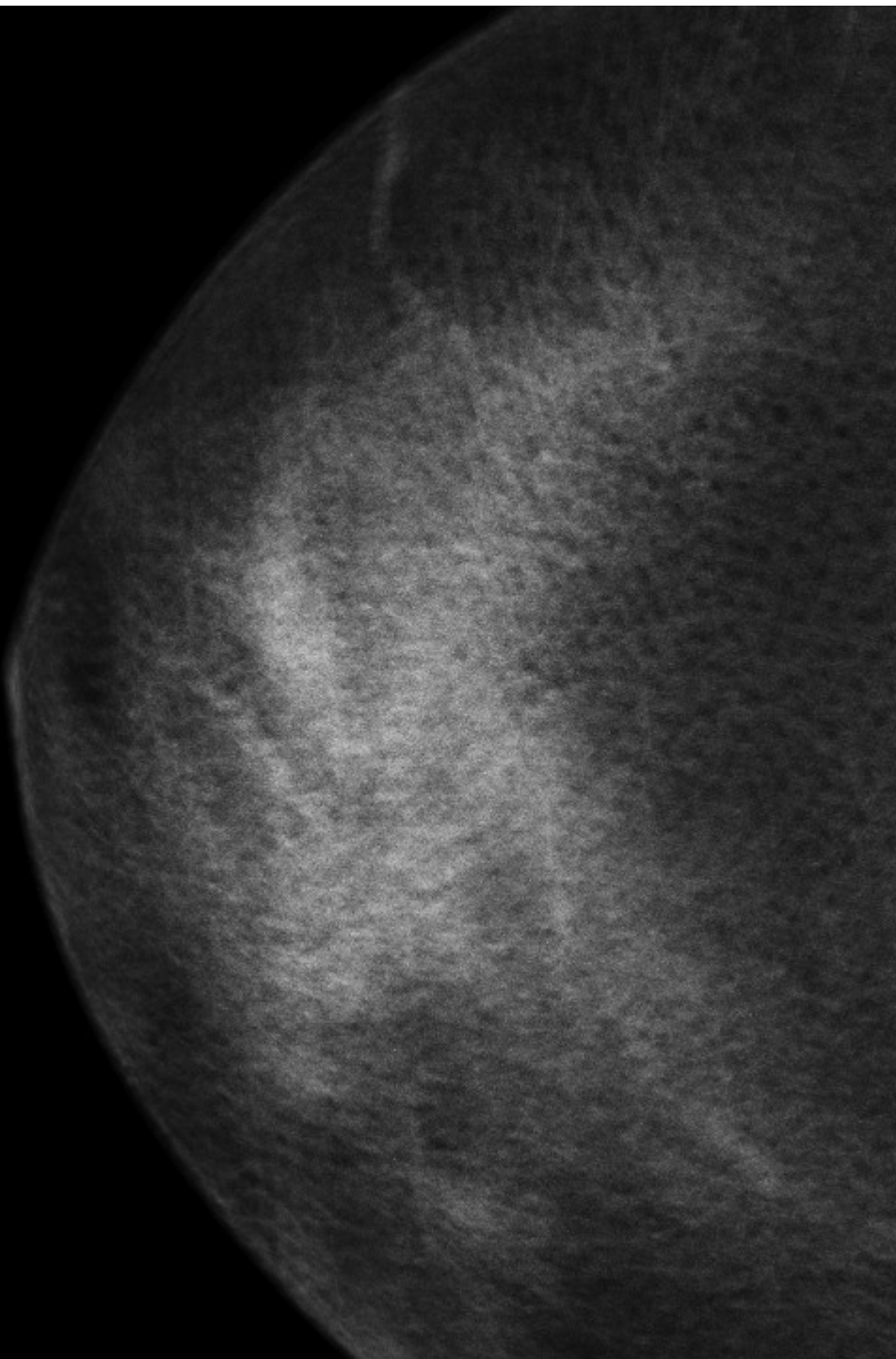
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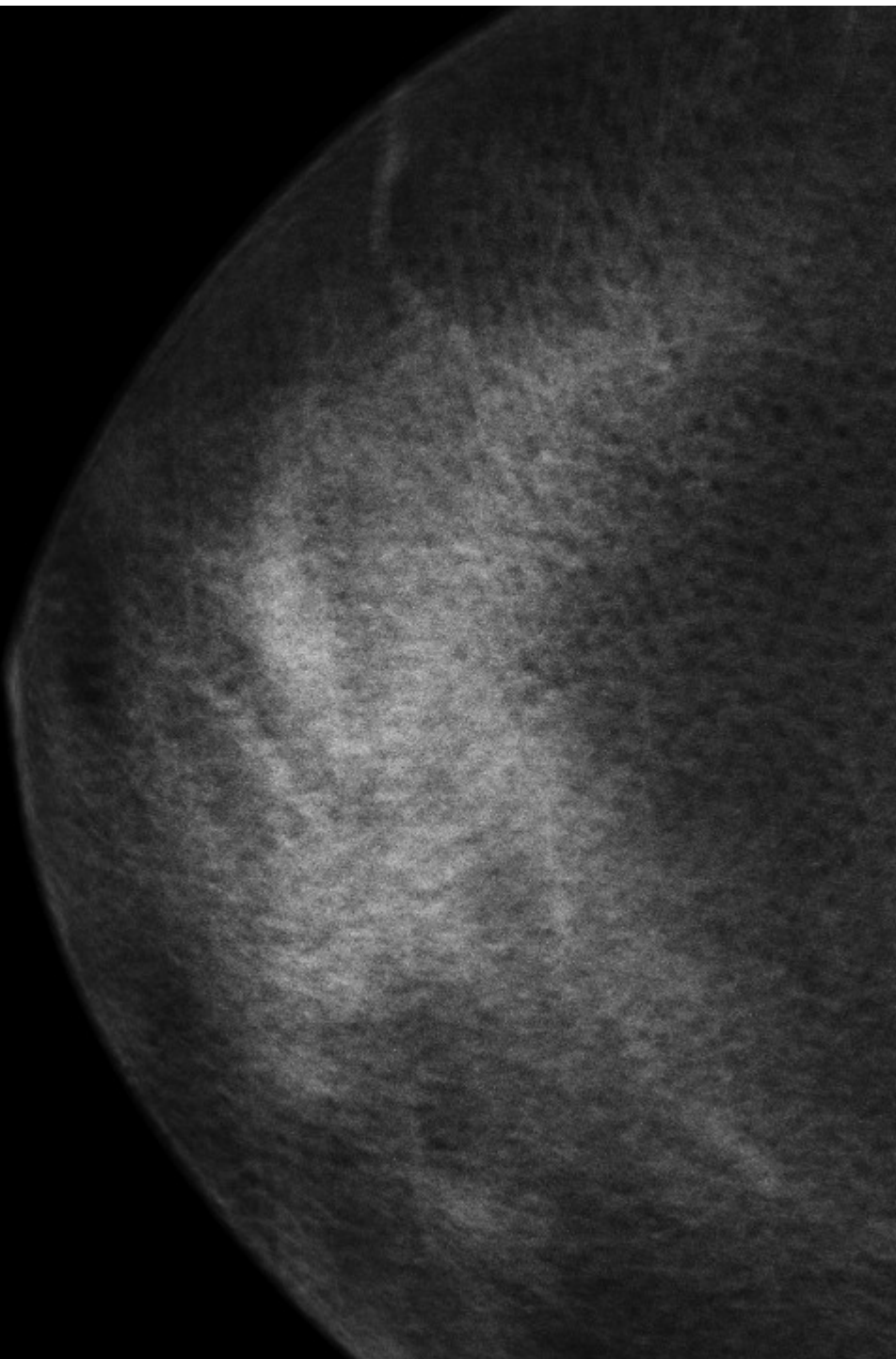
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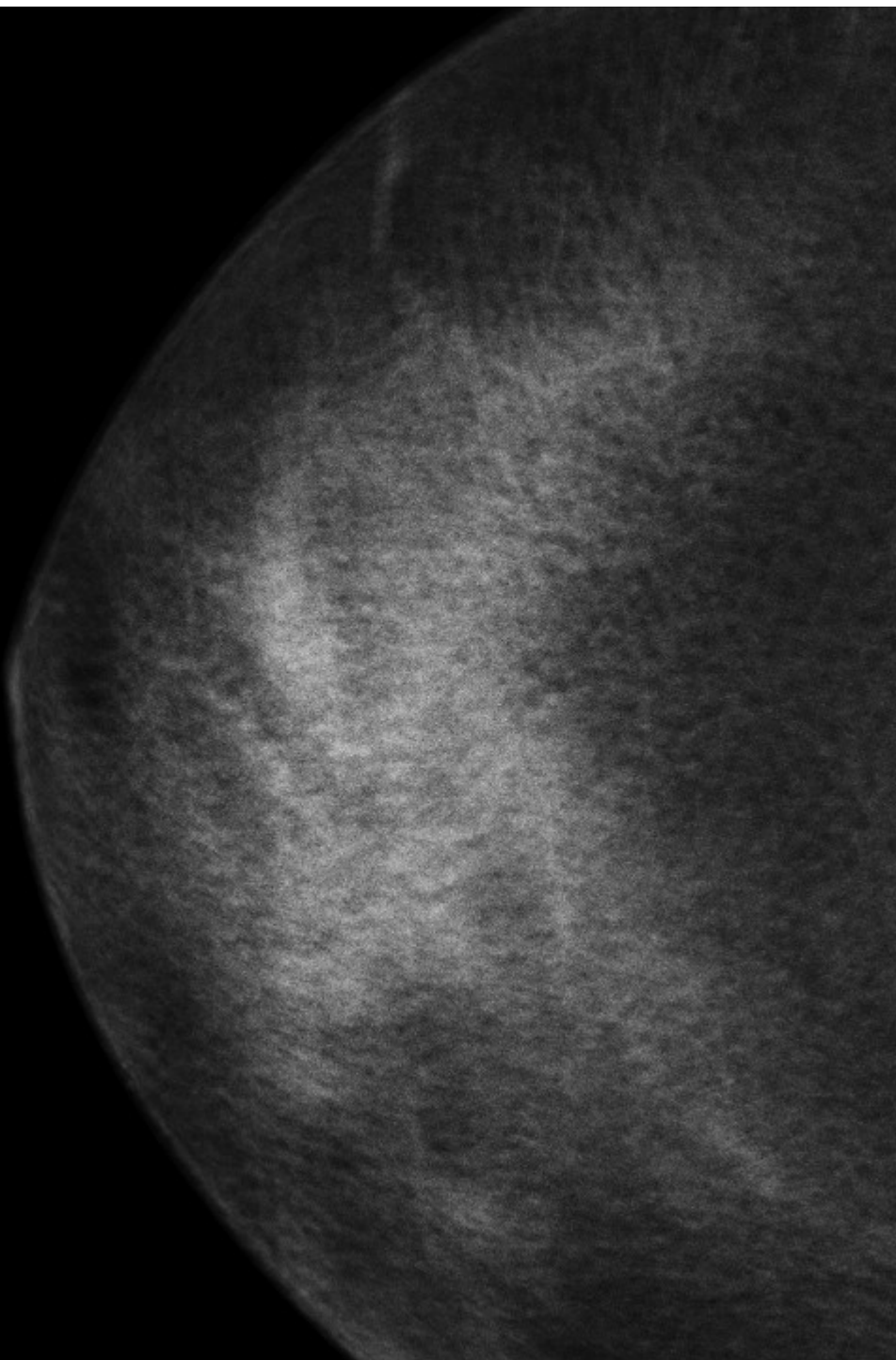
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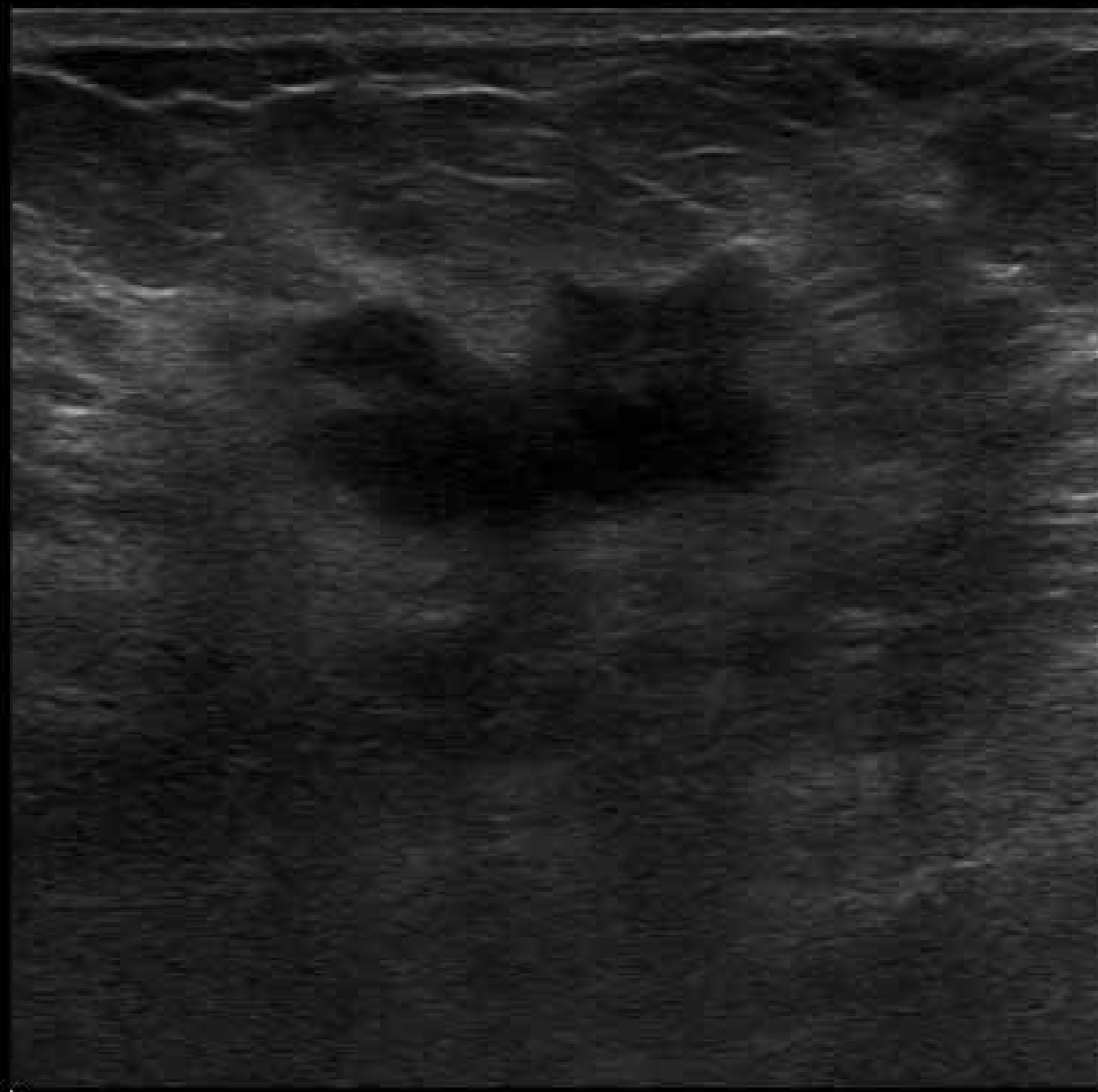
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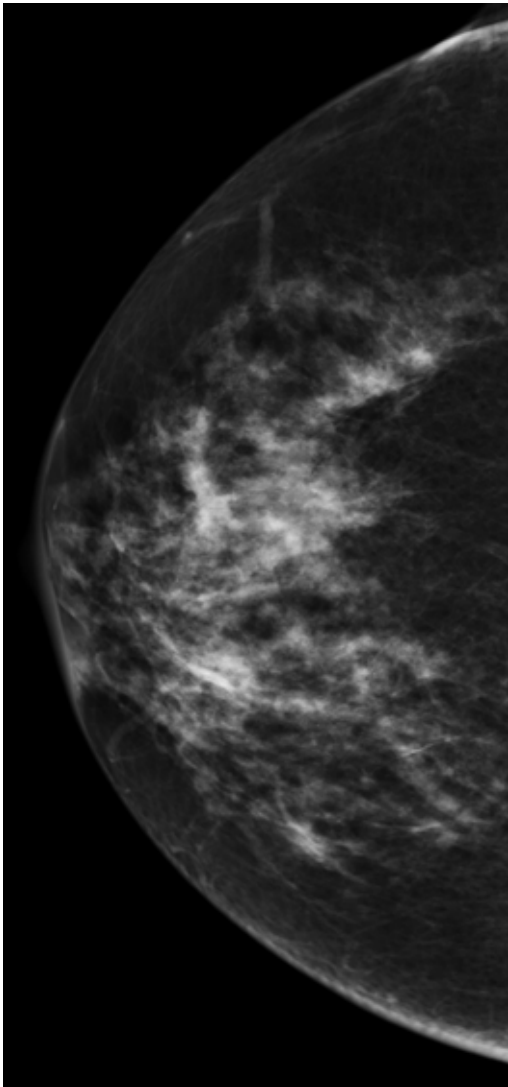


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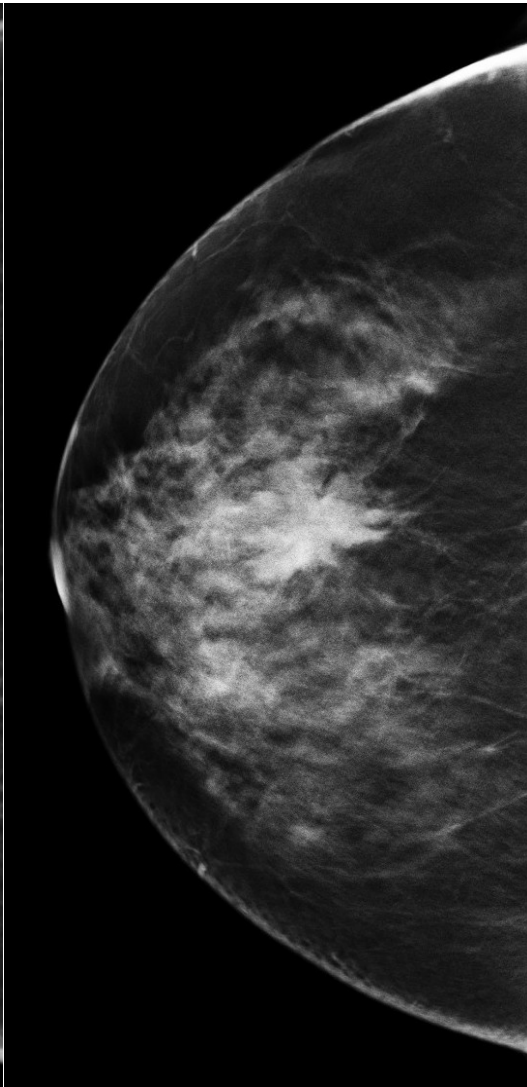


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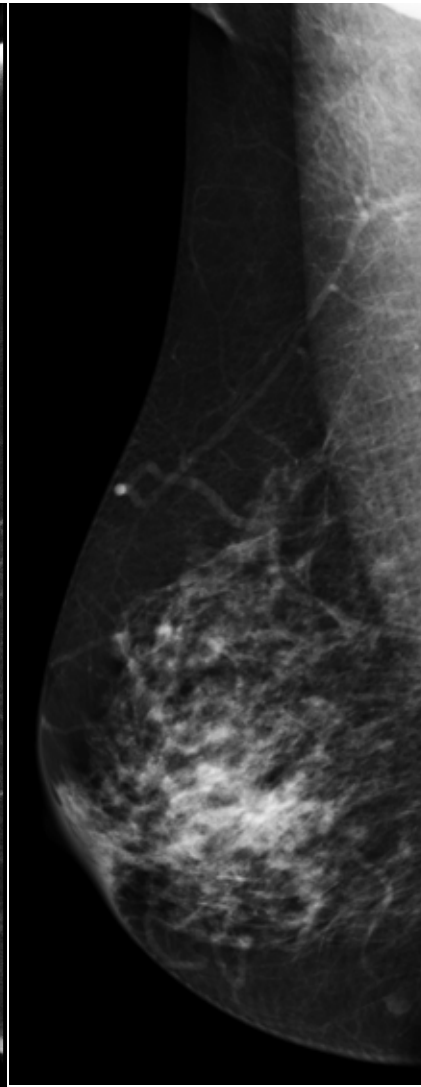




2D



V-PREVIEW



2D



V-PREVIEW

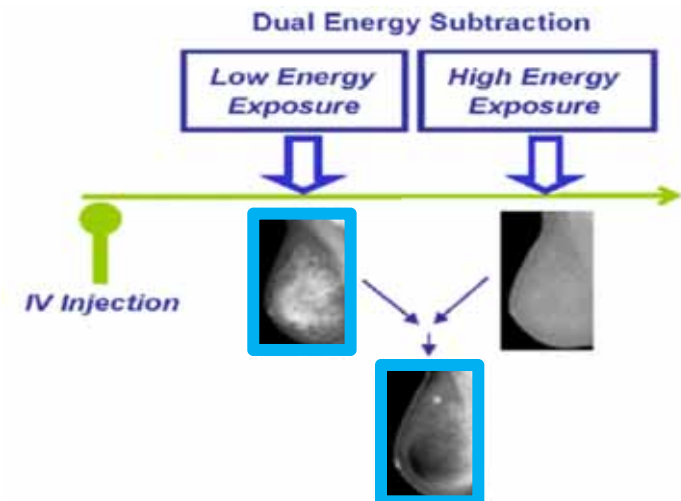
CESM

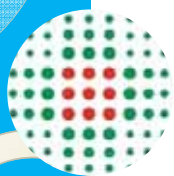
Contrast Enhanced Spectral Mammography



- Metodica **Dual-Energy** che sfrutta la differenza di Coefficiente di Attenuazione del fascio dello iodio
- Dopo somministrazione endovena di MdC iodato, durante una singola compressione del seno, viene effettuata una doppia esposizione: a **bassa energia** (pari alla MX standard) e ad **alta energia** (> k-edge dello iodio, 45-49 kV), ottenendo:

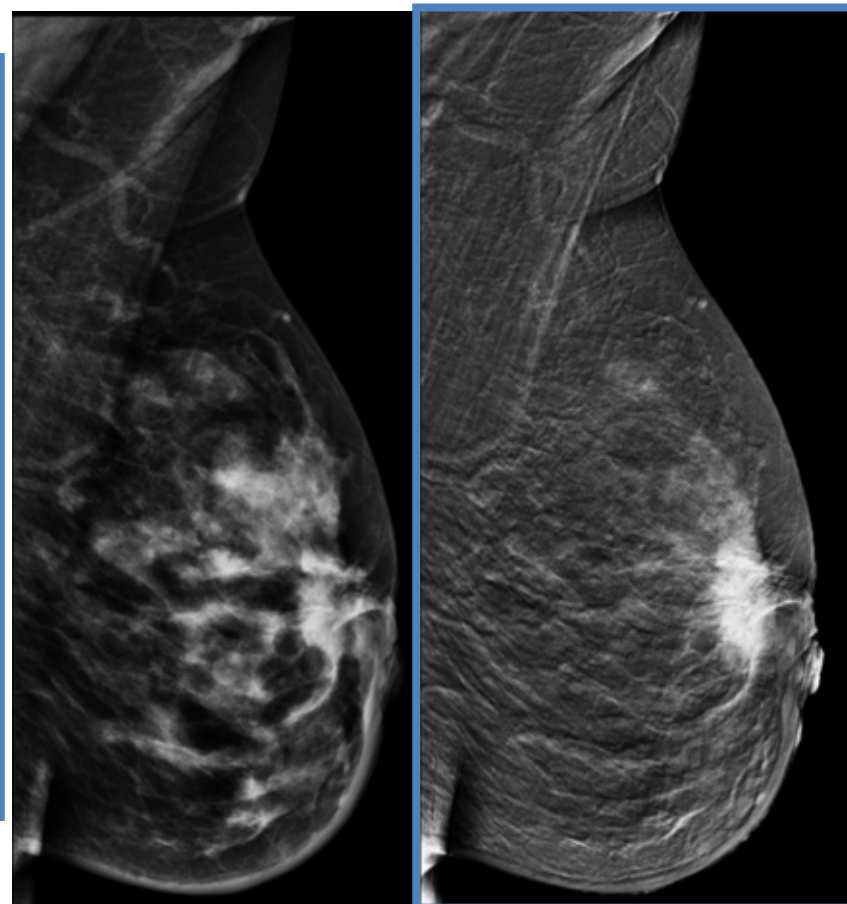
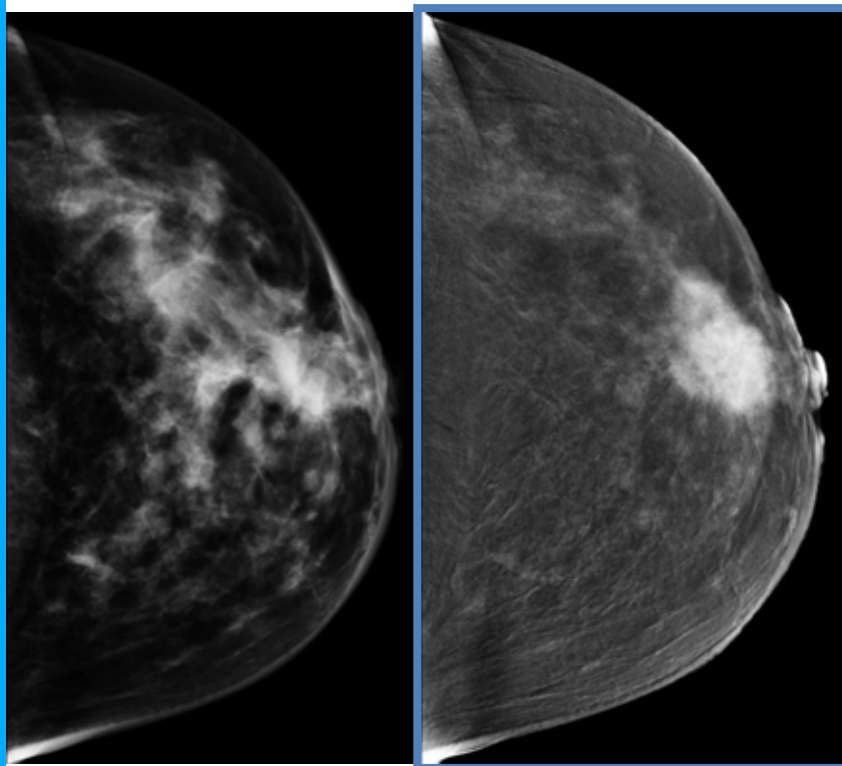
- Immagine **a bassa energia** = MX
- Immagine **RICOMBINATA**: *enhancement* correlato alla neoangiogenesi tumorale





Background

CESM - *Contrast Enhanced Spectral Mammography*



Background

CESM: che fare?

- **DIAGNOSI**

European Journal of Radiology 69 (2009) 34–42

Clinical Radiology 68 (2013) 935–944

Contents lists available at SciVerse ScienceDirect

Eur Radiol (2014) 24:256–264
DOI 10.1007/s00330-013-3007-7

BREAST

Contrast-enhanced spectral mammography: Initial results in the diagnosis of breast lesions

Clarisse Dromain^{a,*}, M.B.I. Lobbes^{a,*}, E. M. Fallenberg • C. Dromain • M. Krohn • J. M. Singh • B. Ing • U. Bick • D. M. Renz

Contrast-enhanced spectral mammography: Impact of the qualitative morphology descriptors on the diagnosis of breast lesions

Rasha Mohamed Kamal^a, Maha Hussien Helal^b, Rasha Wessam^a, Samir Mahmoud Mansour^{a,*}, Iman Godda^c, Nelly Al-Hadi^d

European Journal of Radiology

journal homepage: www.elsevier.com/locate/ejrad

PROBLEM SOLVING

SCREENING??

- **TREATMENT MONITORING** in *Chemioterapia Neo-adiuvante*

BACKGROUND

Chemioterapia Neo-Adiuvante

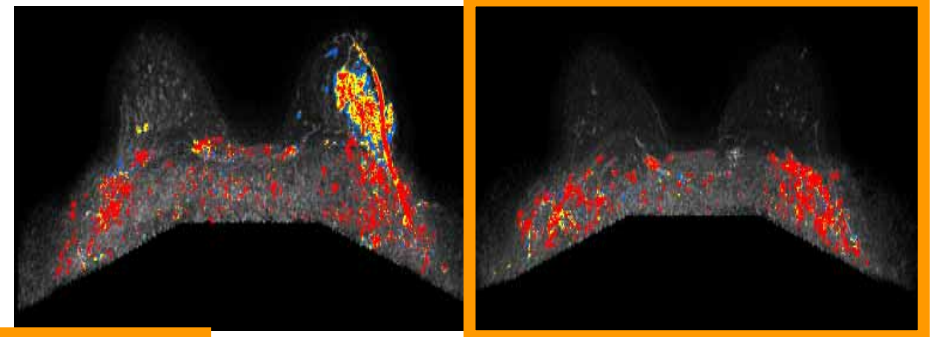
- *“Termine che identifica un trattamento pre-operatorio per il quale l’obiettivo è la guarigione della paziente, in analogia al trattamento adiuvante effettuato dopo l’intervento chirurgico. “*

Qualità dell’evidenza SIGN	Raccomandazione clinica	Forza della raccomandazione clinica
D	Nelle pazienti con carcinoma mammario <u>localmente avanzato non operabile (stadio IIIB, IIIC e carcinoma infiammatorio)</u> deve essere eseguita una terapia sistemica primaria in accordo con una valutazione multidisciplinare ⁴⁰⁻⁴² .	Positiva forte
B	Nelle pazienti con carcinoma mammario operabile (stadio I, II, IIIA) ma <u>candidate a mastectomia</u> , deve essere presa in considerazione la possibilità di effettuare una terapia sistemica primaria ² .	Positiva forte
B	Nelle pazienti con carcinoma mammario HER2+ candidate a terapia sistemica <u>primaria</u> , il trastuzumab associato a chemioterapia è raccomandato in quanto assicura un maggior tasso di risposte complete patologiche ^{25,26} .	Positiva forte

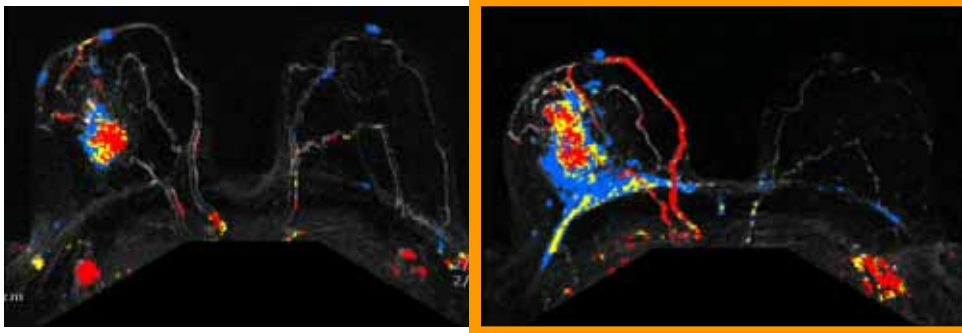
BACKGROUND

Chemioterapia Neo-Adiuvante

- Per valutare la Risposta alla **CtNA** si considera:
 - variazione di dimensioni
 - tipo di vascolarizzazione della lesione

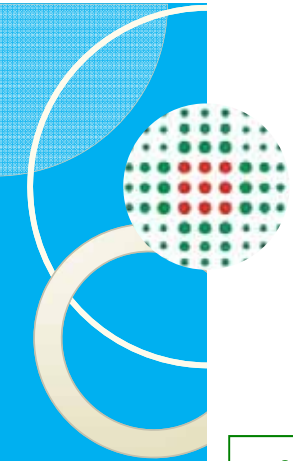


Risposta alla CtNA



Non Risposta - Progressione alla CtNA

*Fisher ER. et al, Cancer 2002
Gralow JR et al, J Clin Oncol 2008
Park SH et al, Radiology 2010*



BACKGROUND

Strumenti diagnostici per valutare la risposta alla CtNA:

Risonanza Magnetica *con mezzo di contrasto*

- Metodica più sensibile nel definire la risposta alla CtNA
- Rispetto a Mammografia ed Ecografia ha maggior sensibilità e specificità (più moderata) nel definire le lesioni mammarie
- Curve cinetiche di enhancement, ACD...

Boetes et al., Radiology 1995

Chen JH et al, Cancer 2008

Martincich L et al, AJR Am J Roentgenol. 2011

CESM: *Contrast Enhanced Spectral Mammography*

- Rispetto a Mammografia ed Ecografia ha maggior sensibilità e specificità nel definire le lesioni mammarie

Dromain C. et all. Eur Radiol 2011

STUDIO



Trial clinico di comparazione della Mammografia Digitale con Mezzo di Contrasto (CESM) alla Risonanza Magnetica (RM) nella stima dell'efficacia del trattamento di Chemioterapia Neoadiuvante in pazienti con neoplasia mammaria localmente avanzata.

Guastalla



*Reggio Emilia
IRCCS*



Montecchio



Correggio

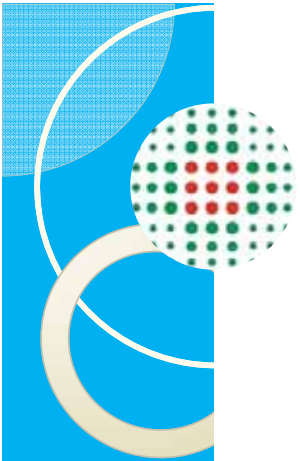


Scandiano



*Castelnuovo
Monti*



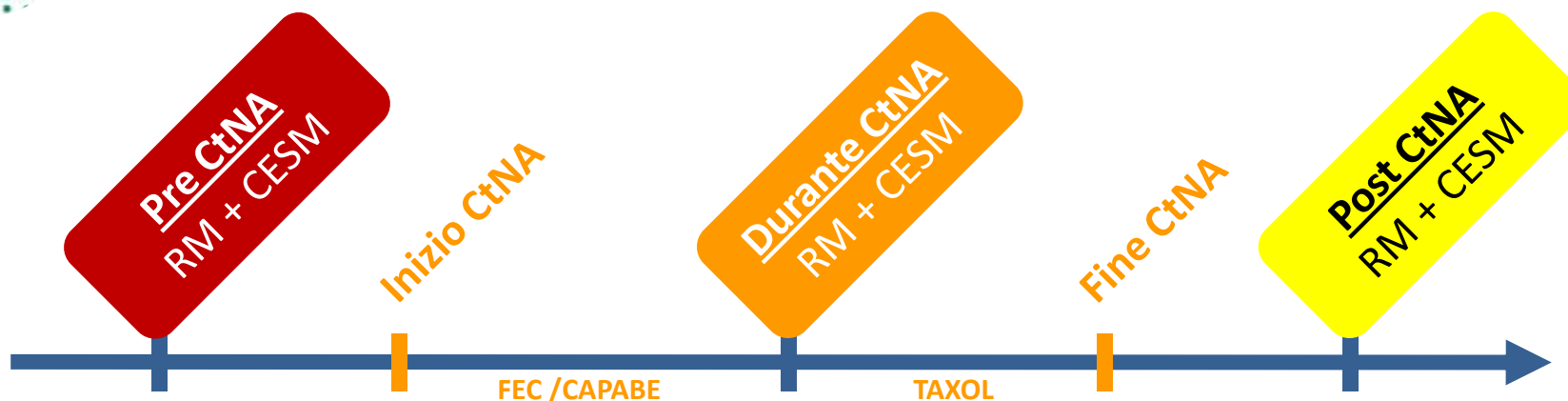


MATERIALI e METODI

- 54 donne con neoplasia mammaria e indicazione alla CtNA sono state arruolate da ottobre 2012 a dicembre 2014
- 46 hanno completato la terapia e sono state sottoposte a intervento chirurgico (luglio 2015)
- 7 sono state escluse dallo studio per interruzione del protocollo di chemioterapia neoadiuvante dopo il 1 controllo

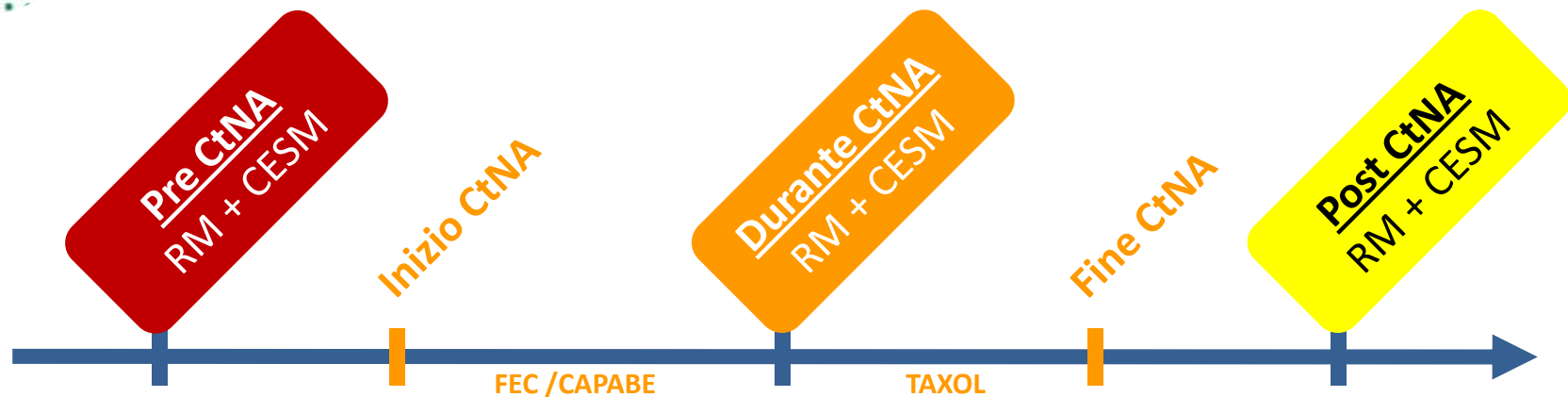
Criteri di Inclusione	Criteri di Esclusione
Diagnosi di neoplasia mammaria in stadio II o III, da sottoporre a CtNA	Controindicazioni al mezzo di contrasto iodato
Età > 18 anni	Controindicazioni alla RM
Consenso	Gravidanza
	BRCA +

Materiali e Metodi



1. È stata calcolata la **concordanza** tra le misurazioni della lesione in **CESM** e **RM** effettuate **Pre** – **Durante** – **Post CtNA**
2. Considerando le immagini **Post-CtNA**, è stata valutata la **concordanza** delle misurazioni delle due metodiche con il diametro ottenuto all'**esame istologico del pezzo operatorio**, considerato il *gold standard*

Materiali e Metodi



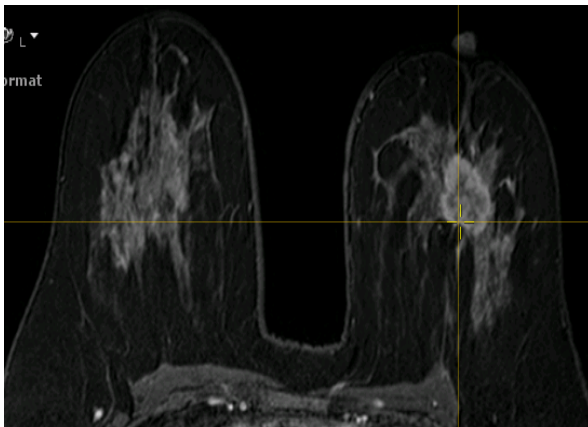
3. Per valutare la Risposta alla CtNA di CESM e RM, è stata considerata la % di variazione del diametro della lesione misurata **Pre** vs **Post CtNA** secondo i criteri **RECIST 1.1**:
 - ▶ Risposta: riduzione volumetrica $\geq 30\%$
 - ▶ Risposta Completa: scomparsa della lesione
4. Focus sulla capacità di **individuare la Risposta Completa**, che:
 - *Influenza la scelta dell'intervento chirurgico*
 - *Importante fattore prognostico*

MATERIALI e METODI

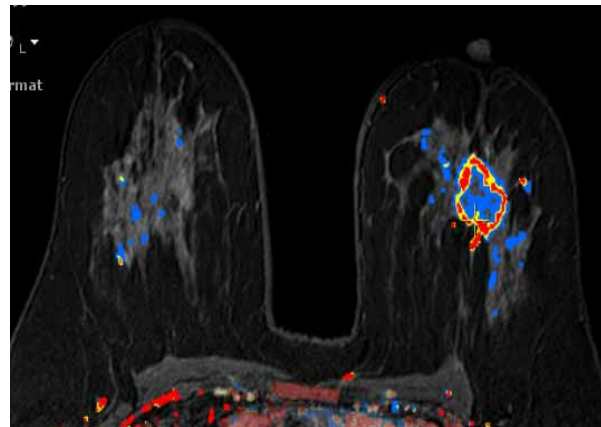
RM mammella (1.5 T): *protocollo di acquisizione*

- T2w Soppressa
- T1w Dinamica dopo somministrazione di MdC (1+8 acquisizioni, risoluzione temporale: $\sim 1'$)
- DWI
- CAD post processing

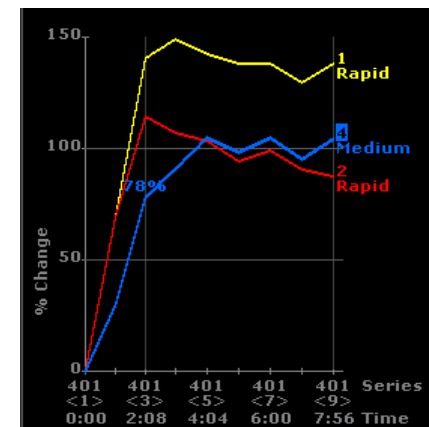
T1w dinamica
picco di enhancement)



CAD processing

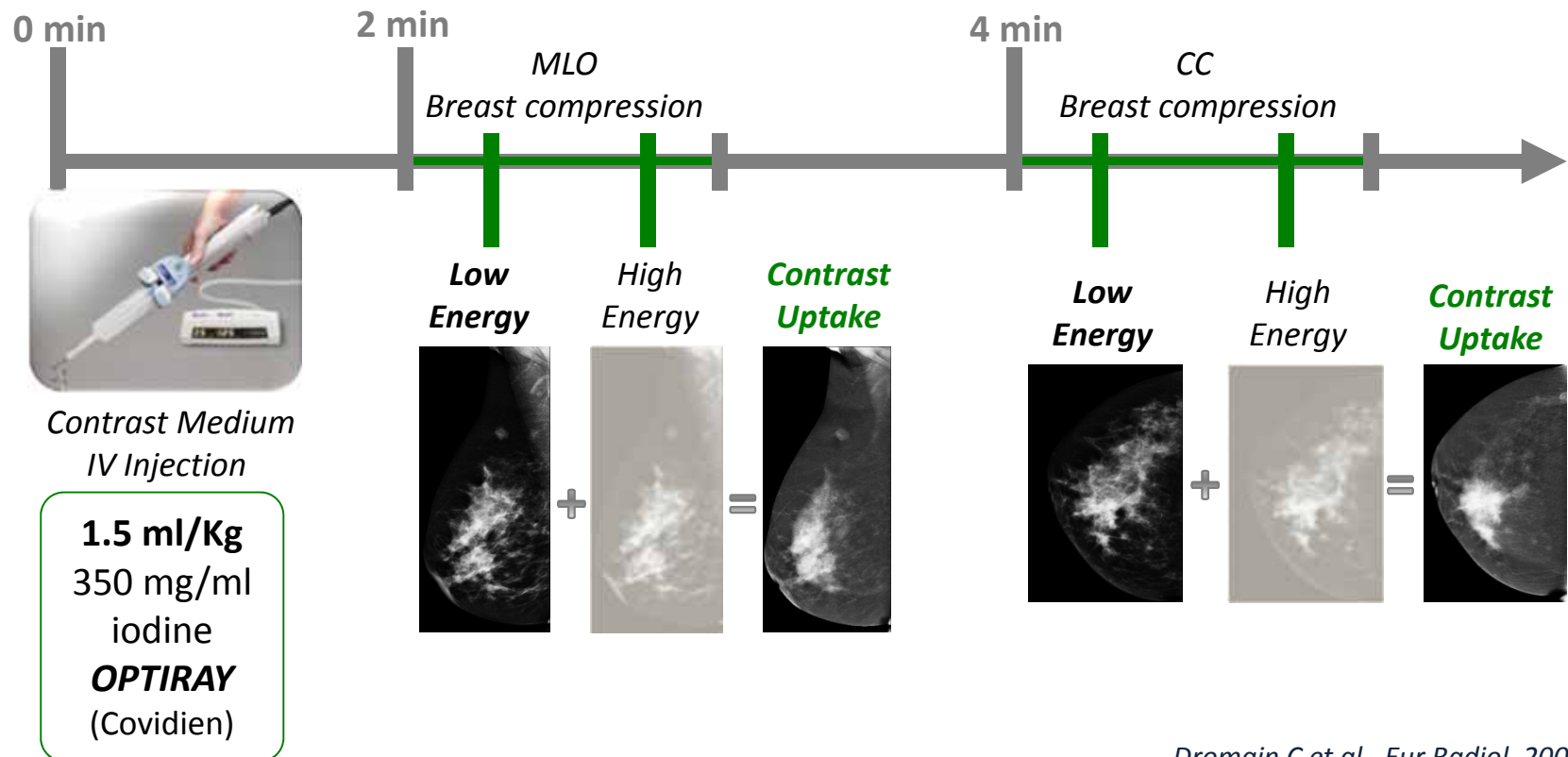


Curve cinetiche di
Enhancement



Materiali e Metodi

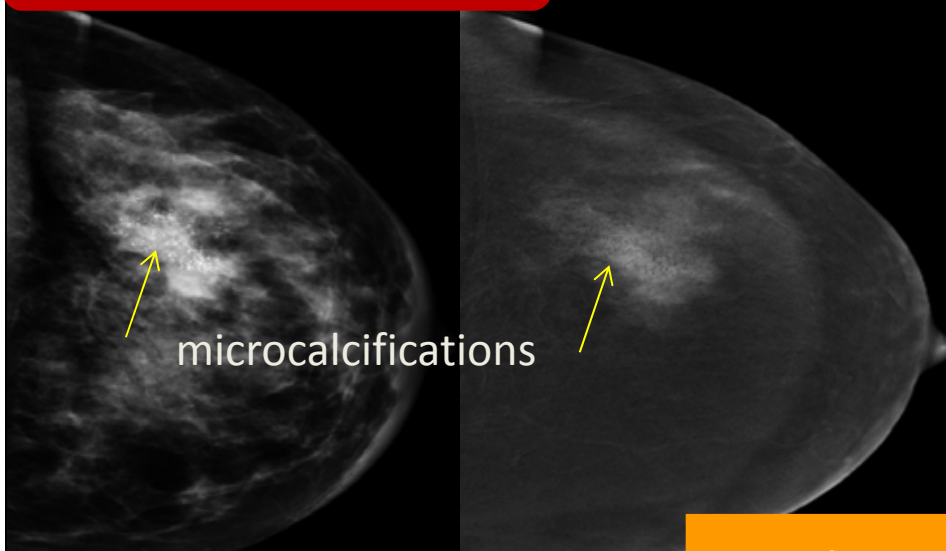
CESM examination consisted in a pair of low and high energy exposures for each mammographic view, combined to visualize lesions with contrast up-take



Risultati

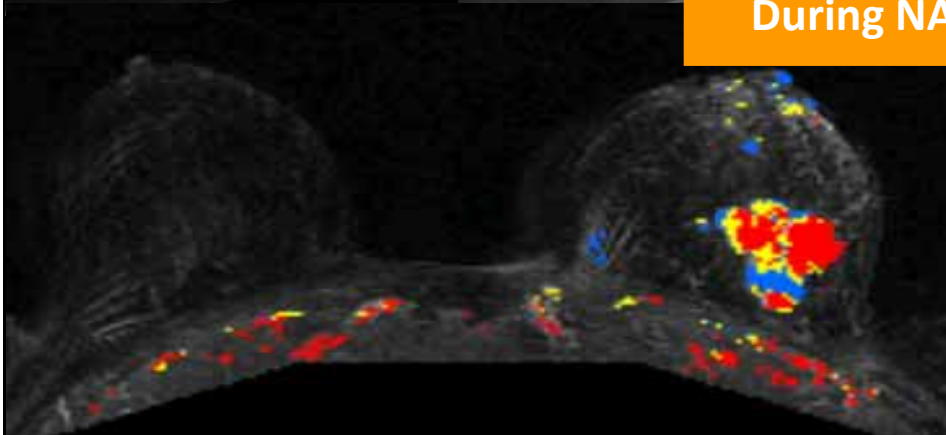
40-year-old woman with 44-mm **In situ and Invasive Ductal** Carcinoma in left breast

Pre - NAC

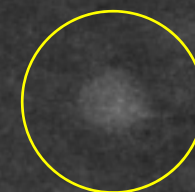


microcalcifications

During NAC



appearance of a
second lesion

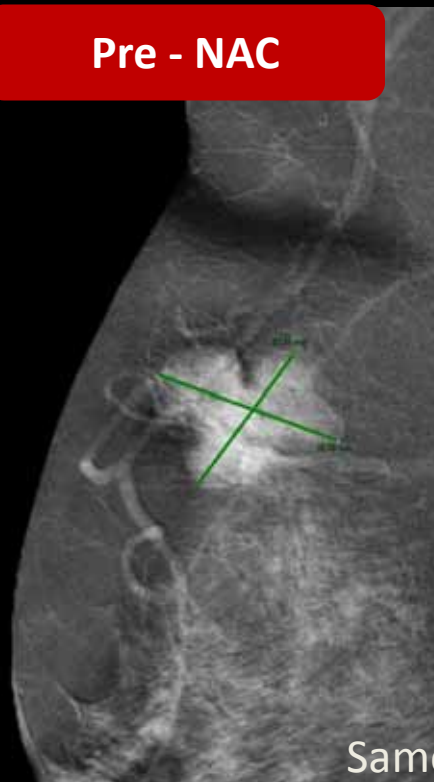


***NON Responder
Progressive Disease***

Risultati

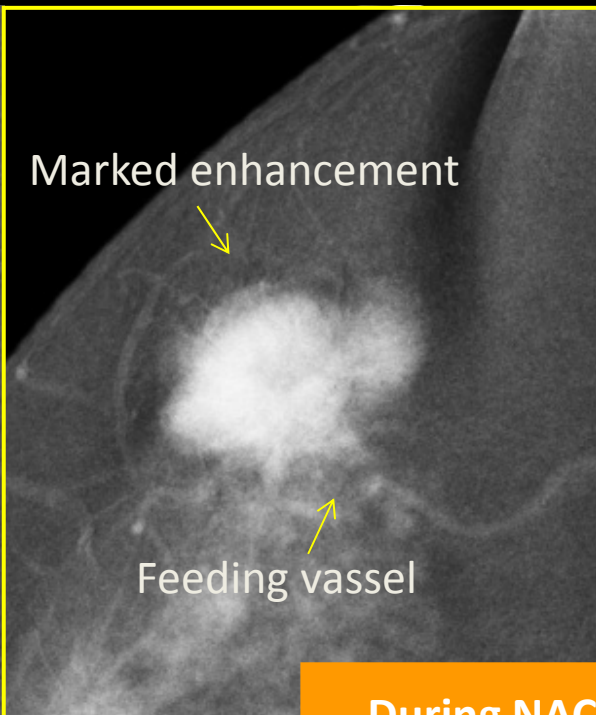
44-year-old woman with 30-mm **In situ and Invasive Ductal Carcinoma** in right breast

Pre - NAC



Marked enhancement

Feeding vessel



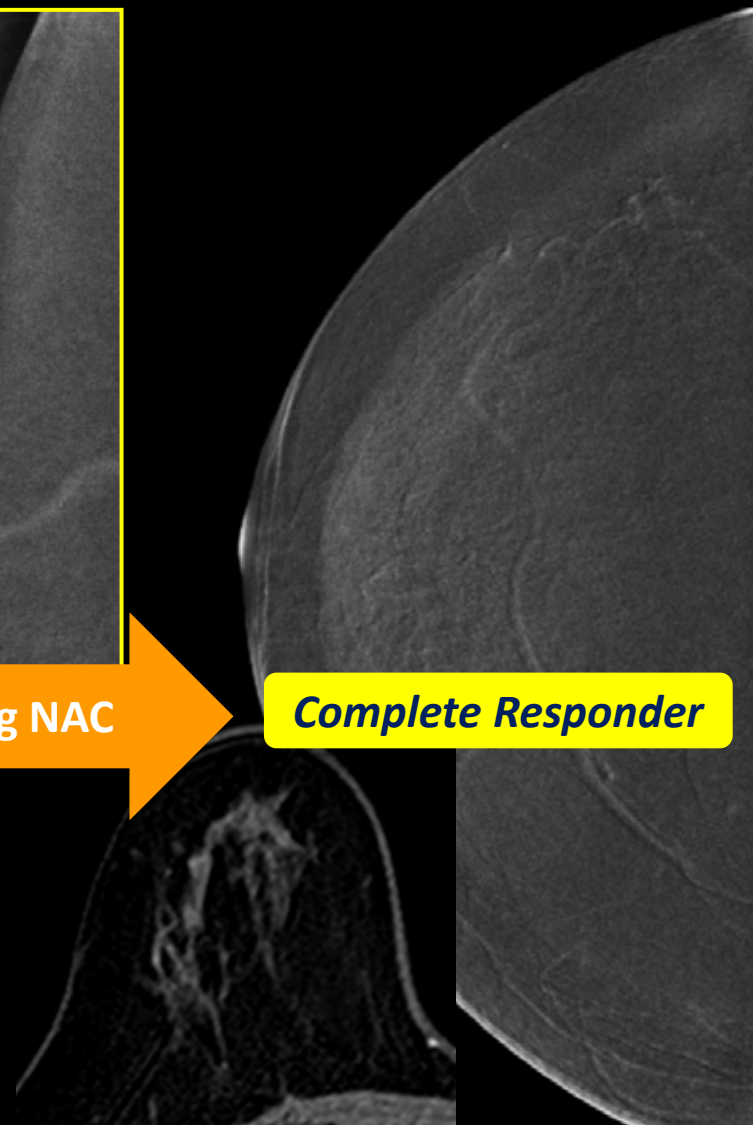
During NAC



Same shape
Same size
Same margins



Complete Responder



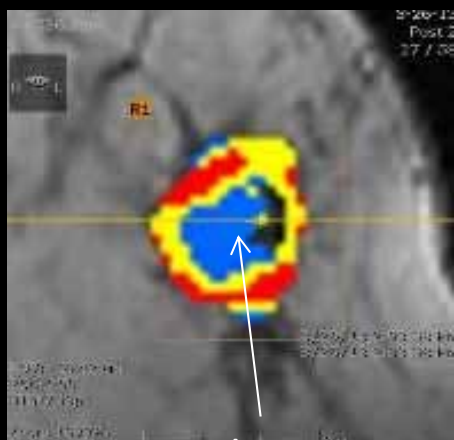
Risultati

45-year-old woman with 43-mm **Metaplastic** Carcinoma in right breast

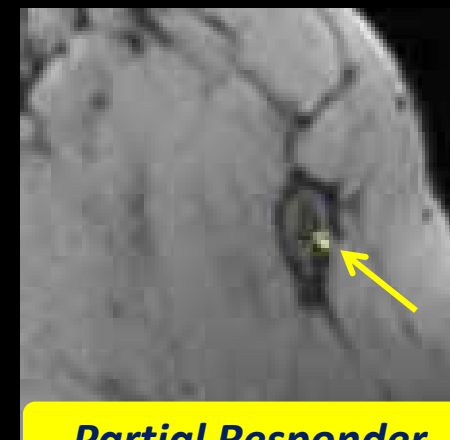
Pre - NAC

During NAC

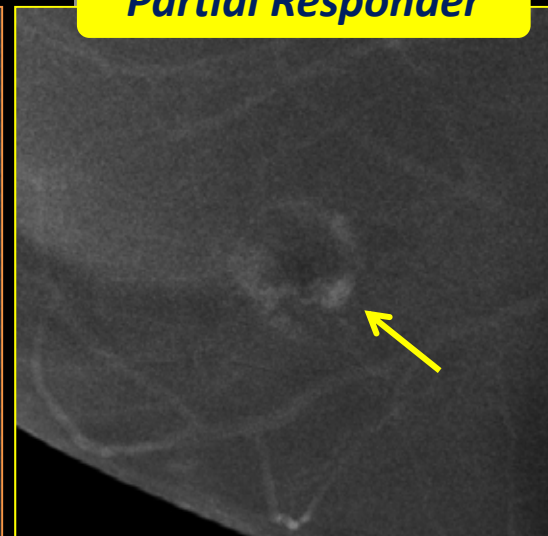
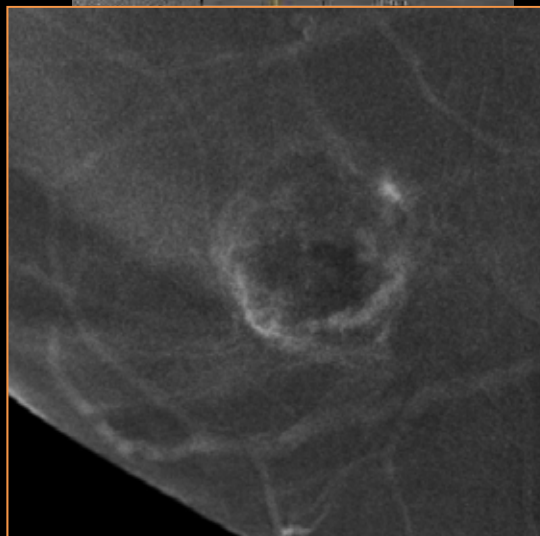
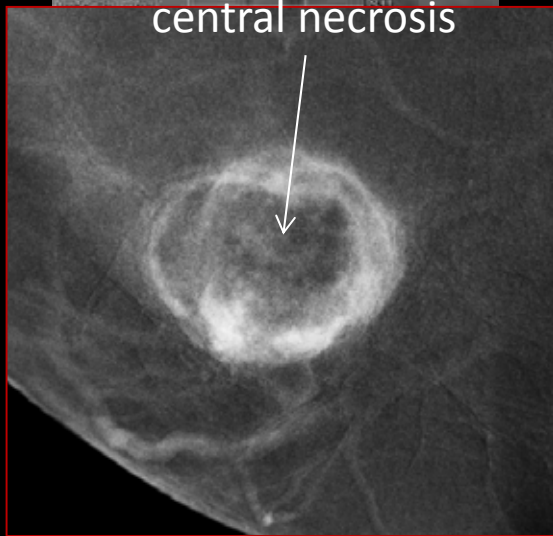
Post - NAC



central necrosis



Partial Responder



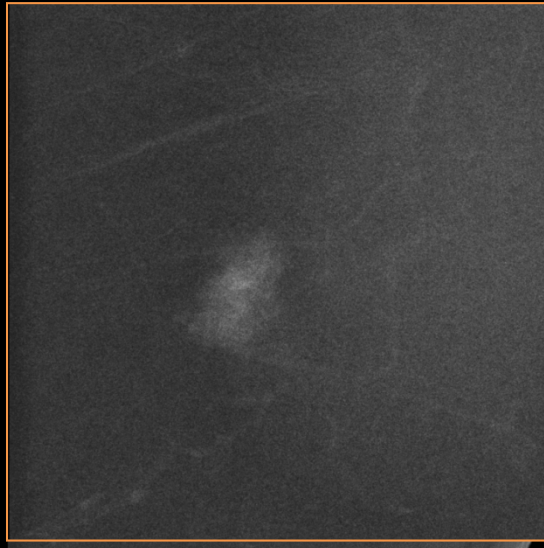
Risultati

47-year-old woman with 25-mm *Invasive Ductal G2* Carcinoma in left breast

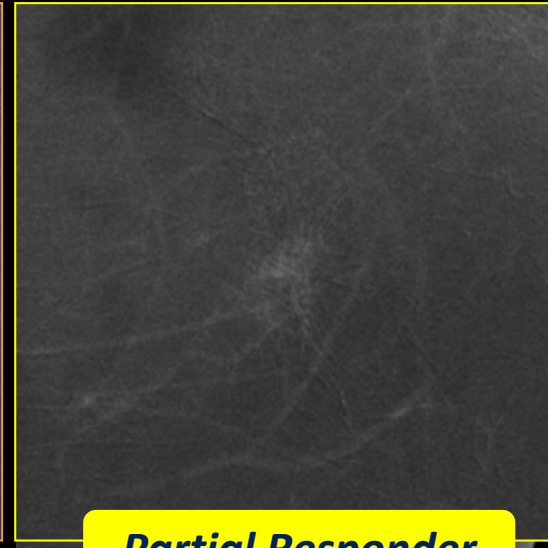
Pre - NAC



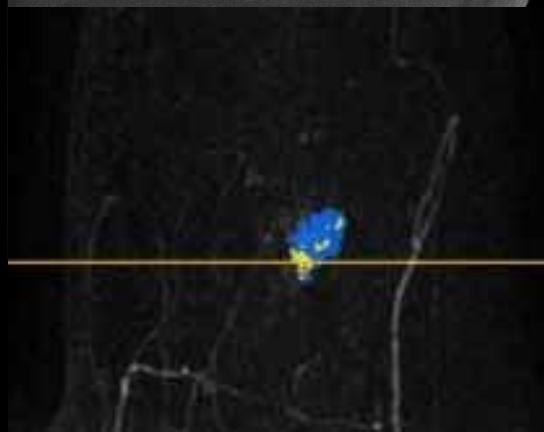
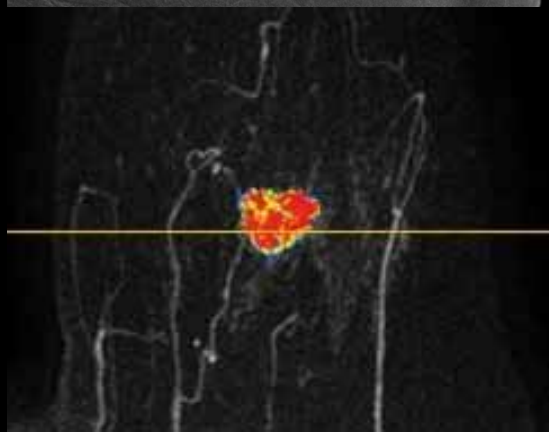
During NAC



Post - NAC



Partial Responder



Pre - NAC

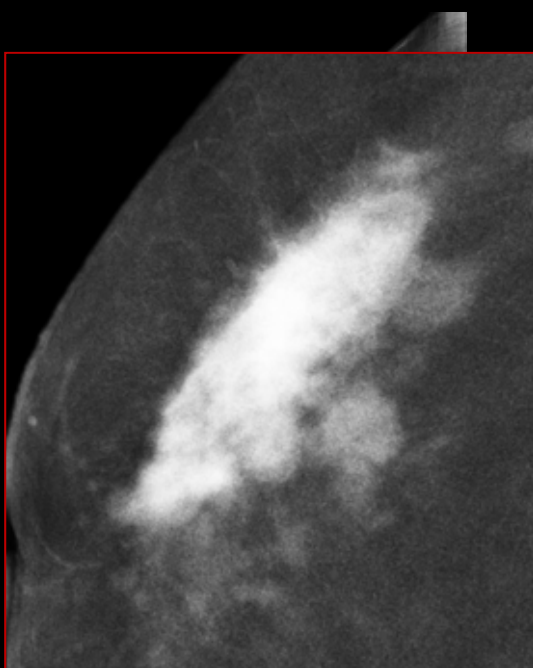
A dark, textured surface, possibly a book cover or endpaper, with a yellow border on the left side. The texture is grainy and uneven, with some lighter and darker patches. The yellow border is a solid, bright yellow line running vertically along the left edge of the image.



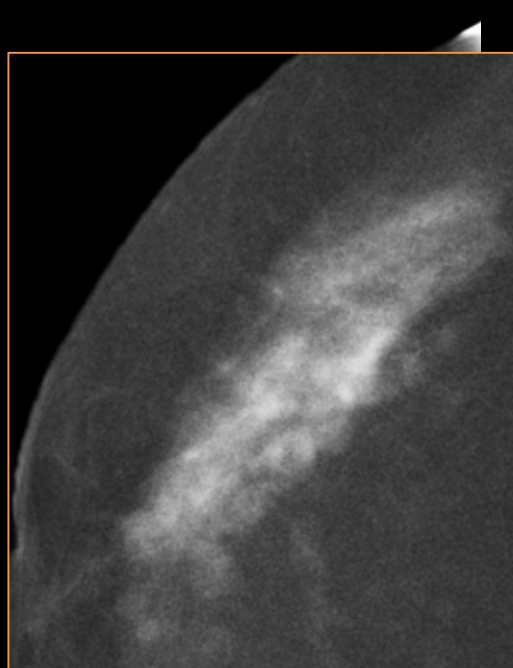
Risultati

71-year-old woman with 52-mm *Invasive Lobular* carcinoma in right breast

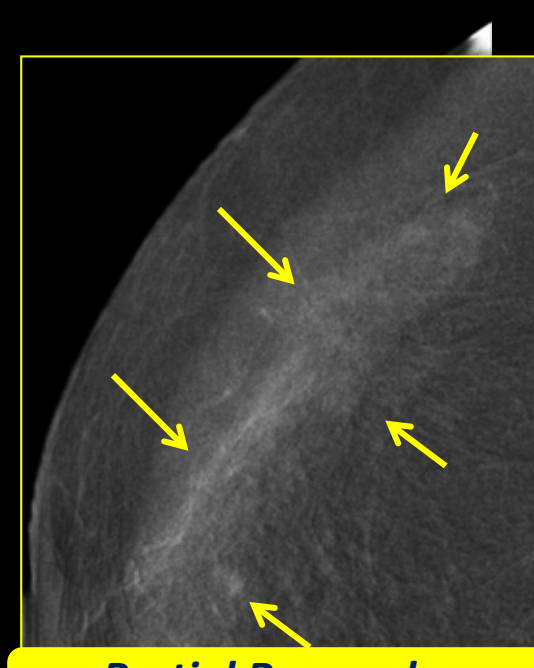
Pre - NAC



During NAC

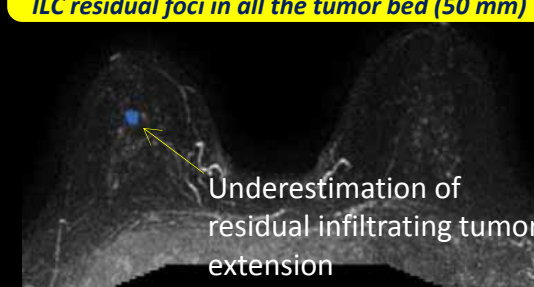
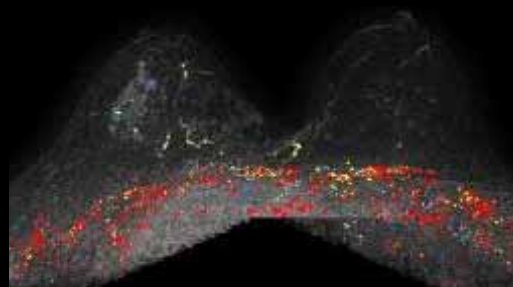
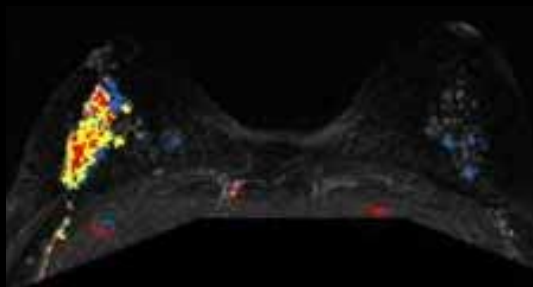


Post - NAC



Partial Responder

ILC residual foci in all the tumor bed (50 mm)

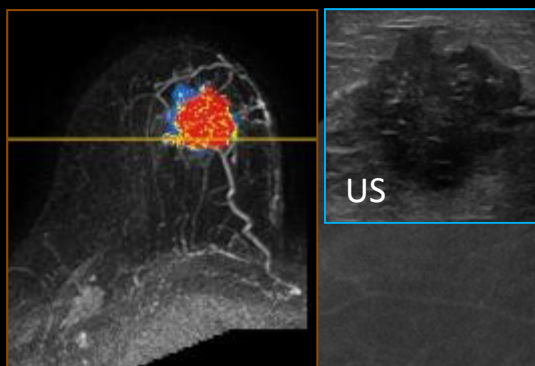


Underestimation of residual infiltrating tumor extension

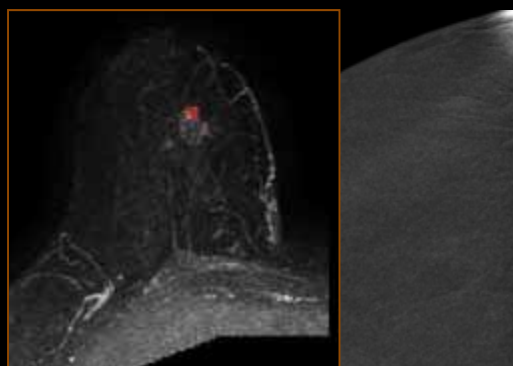
Risultati

57-year-old woman with 43-mm *Invasive Ductal G2* Carcinoma in right breast

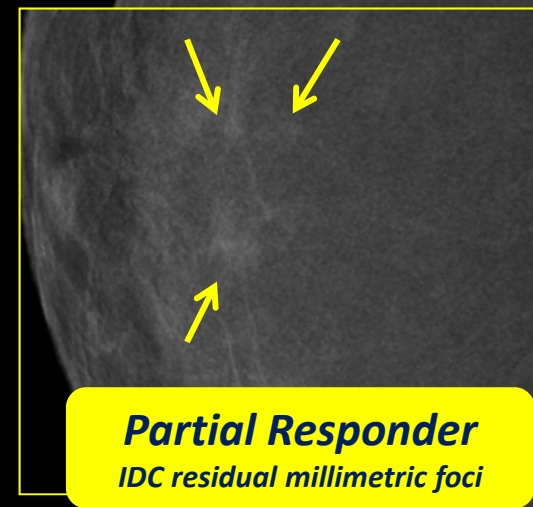
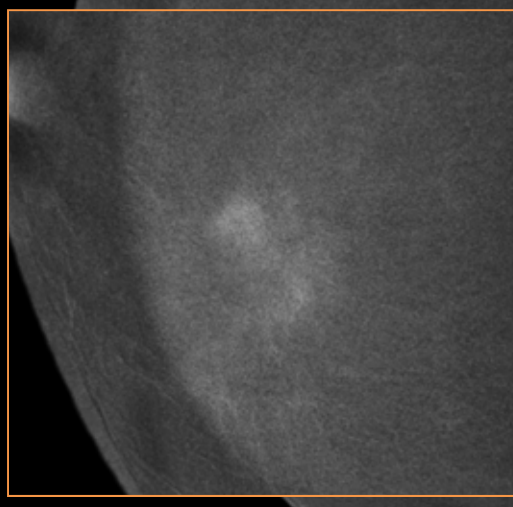
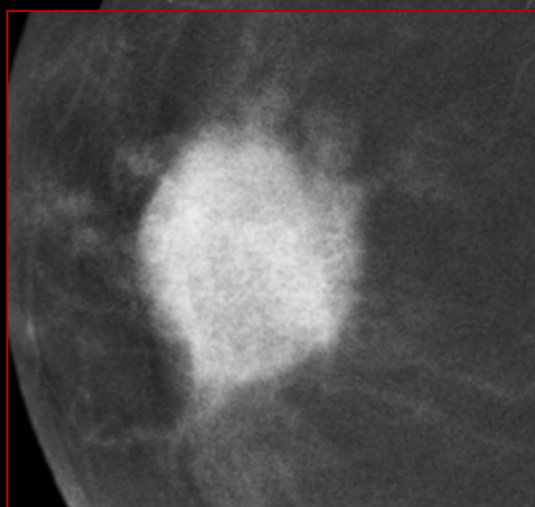
Pre - NAC



During NAC



Post - NAC

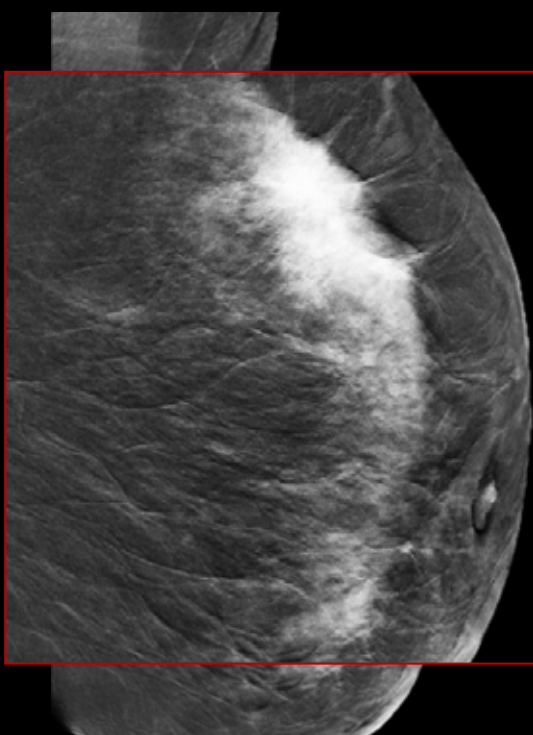


Partial Responder
IDC residual millimetric foci

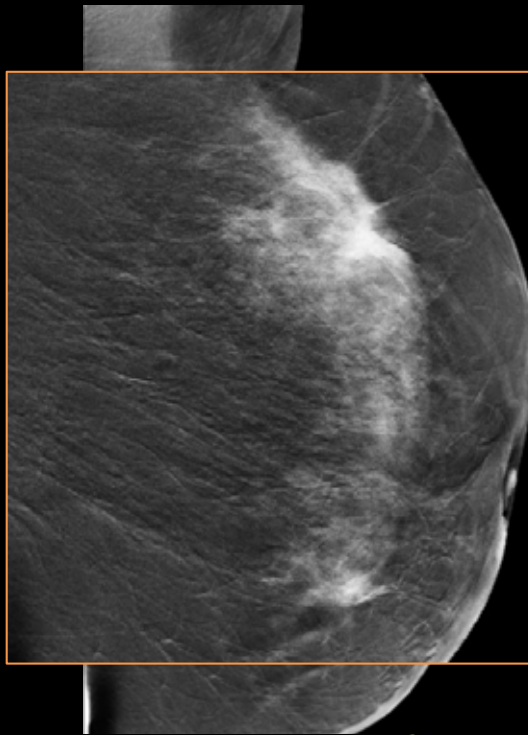
Risultati

48-year-old woman with 97-mm *Invasive Lobular* carcinoma in left breast

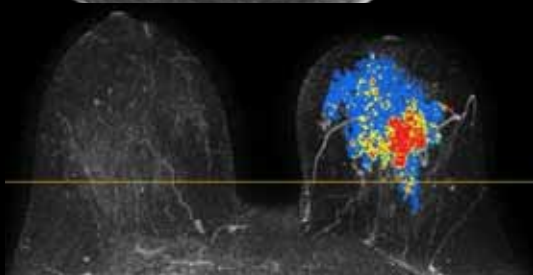
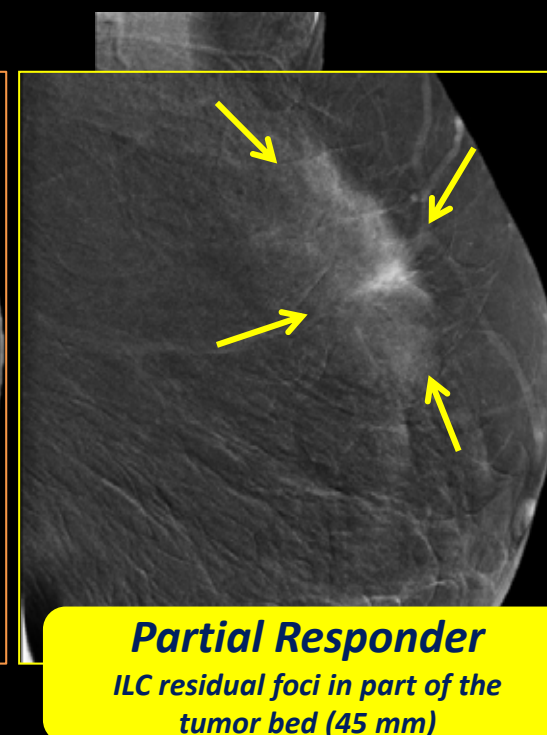
Pre - NAC



During NAC



Post - NAC



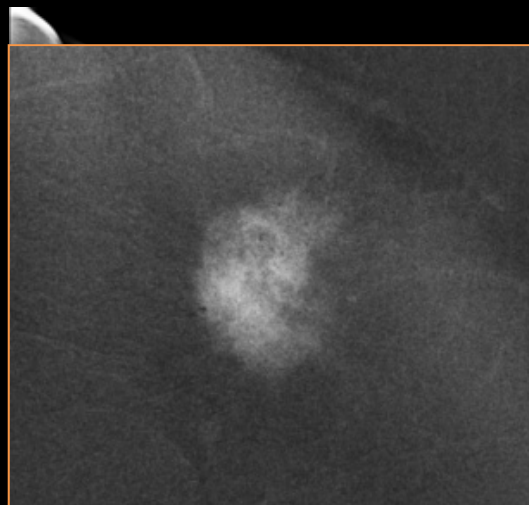
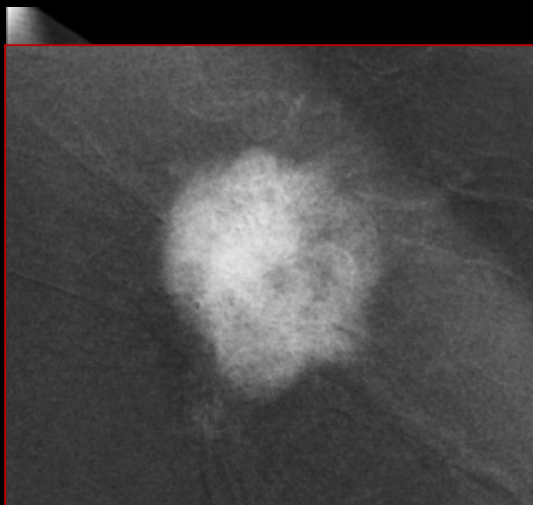
Results

63-year-old woman with 35-mm *Invasive DUCTAL G3 Carcinoma* in left breast

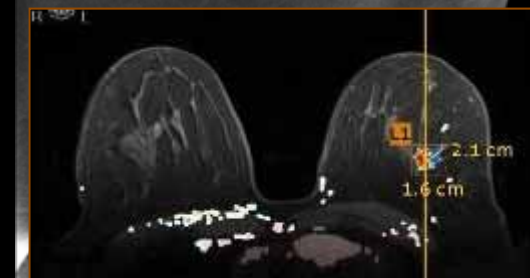
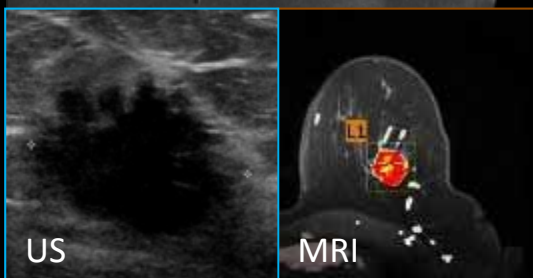
Pre - NAC

During NAC

Post - NAC



Partial Responder!

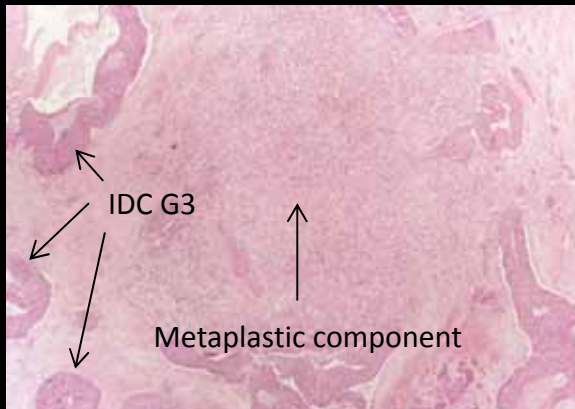


Results

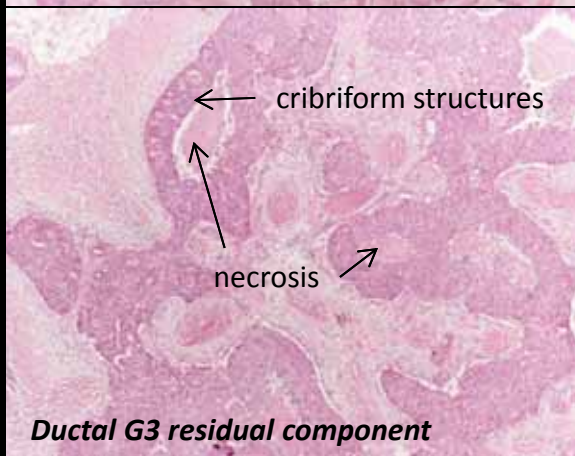
63-year-old woman with 35-mm *Invasive DUCTAL G3 Carcinoma* in left breast

Post-operative Histopathology

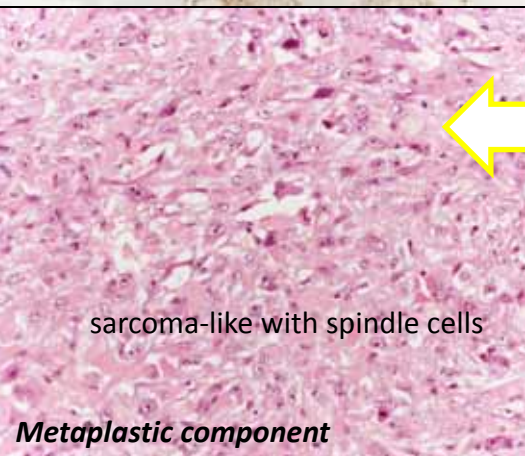
Post - NAC



Ki67 (45%)



Ductal G3 residual component



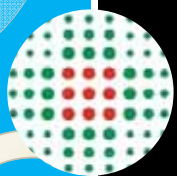
Metaplastic component



Partial Responder!



Special
Thanks to
Maira
Ragazzi, MD,
Anatomical
Pathology
Department,
ASMN, RE,
Italy



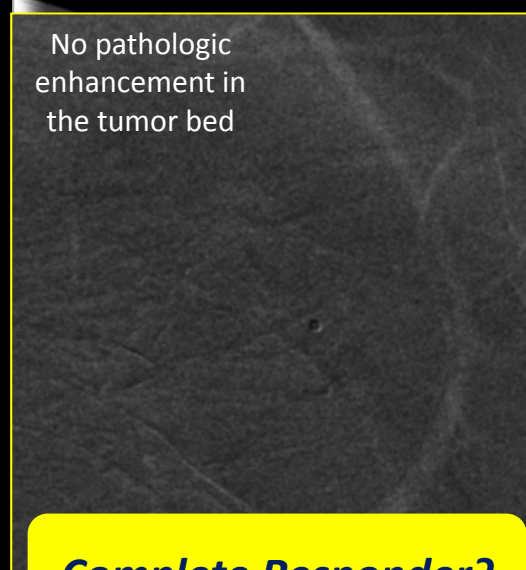
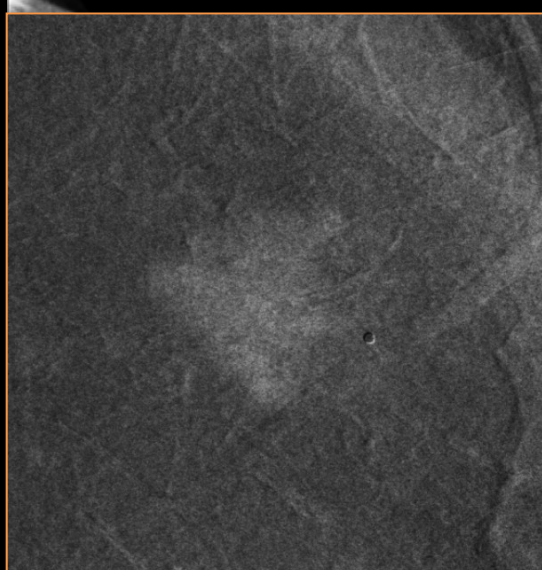
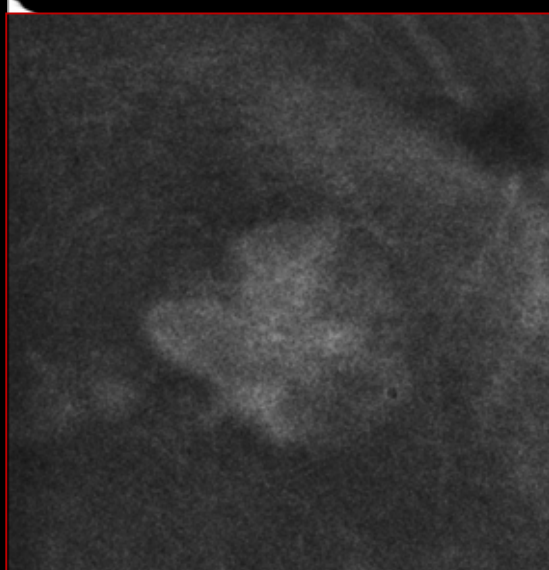
Results

48-year-old woman with 30-mm *Invasive DUCTAL G2 Carcinoma* in left breast

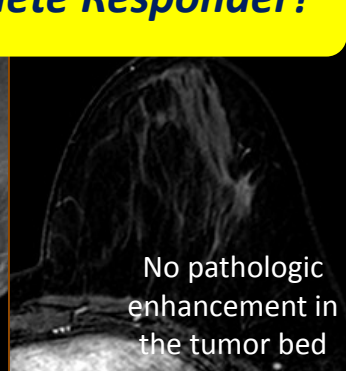
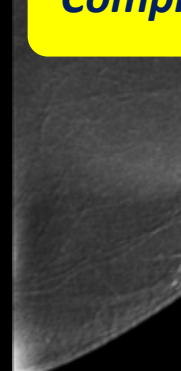
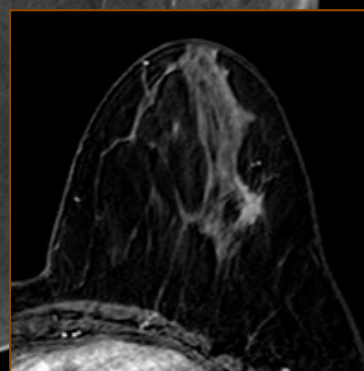
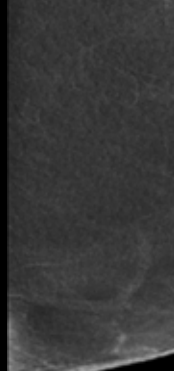
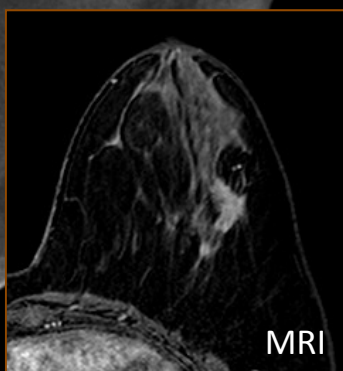
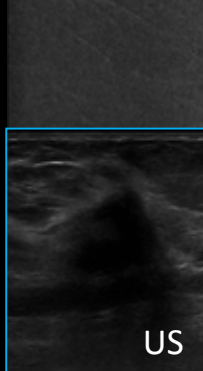
Pre - NAC

During NAC

Post - NAC



Complete Responder?



US

MRI

No pathologic
enhancement in
the tumor bed

Results

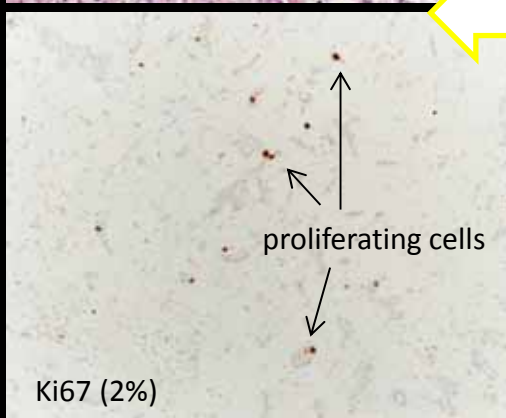
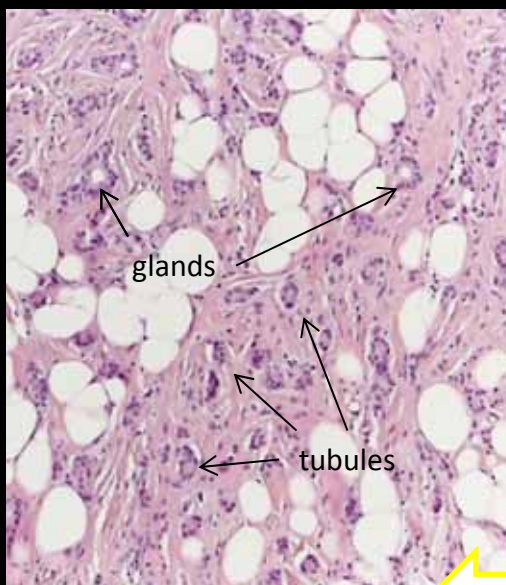
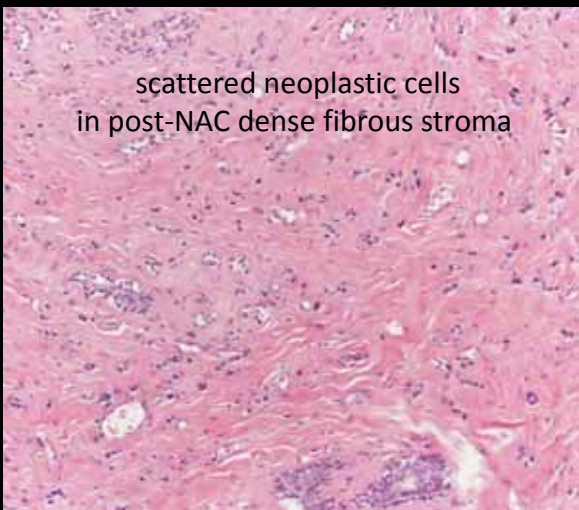
48-year-old woman with 30-mm *Invasive DUCTAL G2 Carcinoma* in left breast

Post-operative Histopathology

Ductal G1 residual component
panoramic view 2x



scattered neoplastic cells
in post-NAC dense fibrous stroma



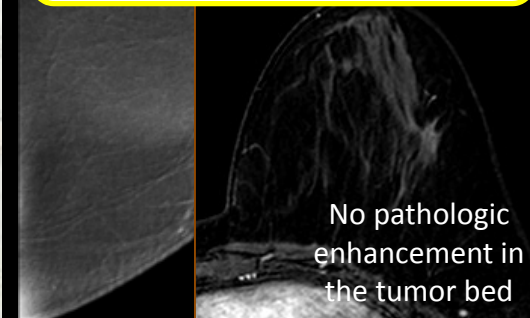
Ki67 (2%)

Post - NAC

No pathologic
enhancement in
the tumor bed



Partial Responder!
IDC residual millimetric foci



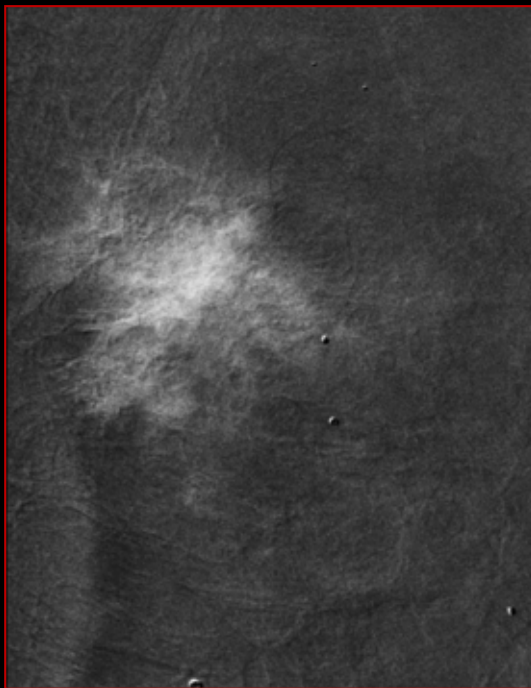
No pathologic
enhancement in
the tumor bed

Special
Thanks to
Maira
Ragazzi, MD,
Anatomical
Pathology
Department,
ASMN, RE,
Italy

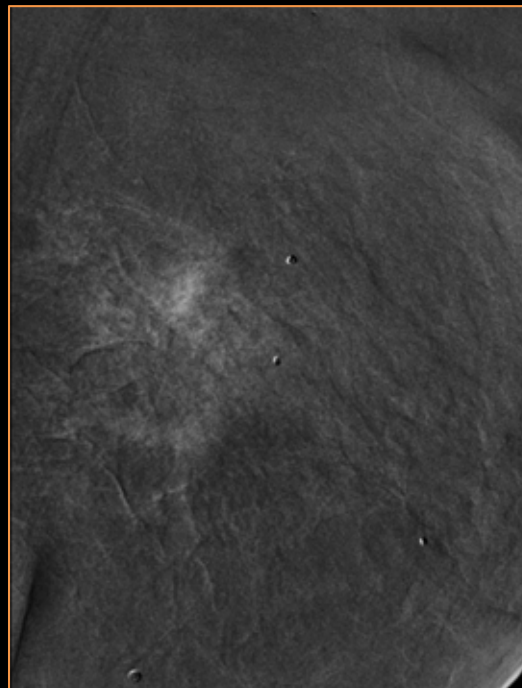
Results

69-year-old woman with 43-mm *Invasive LOBULAR Carcinoma* in left breast

Pre - NAC



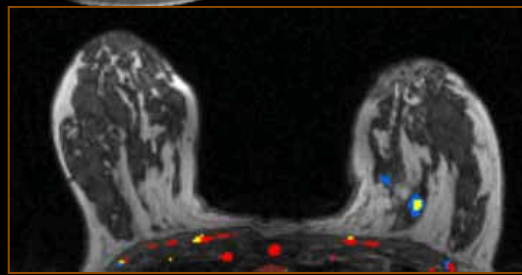
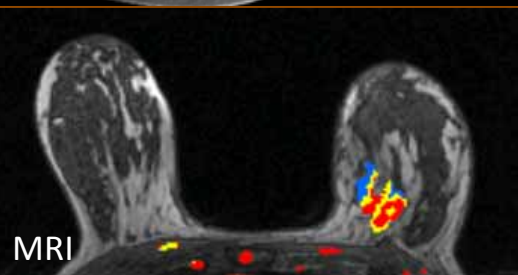
During NAC



Post - NAC



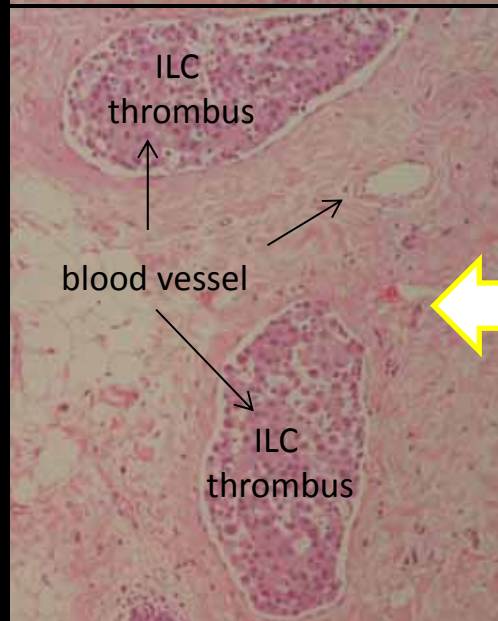
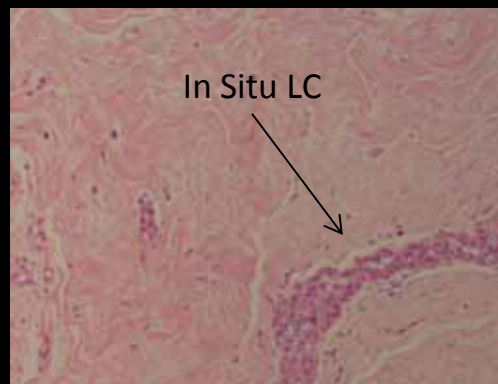
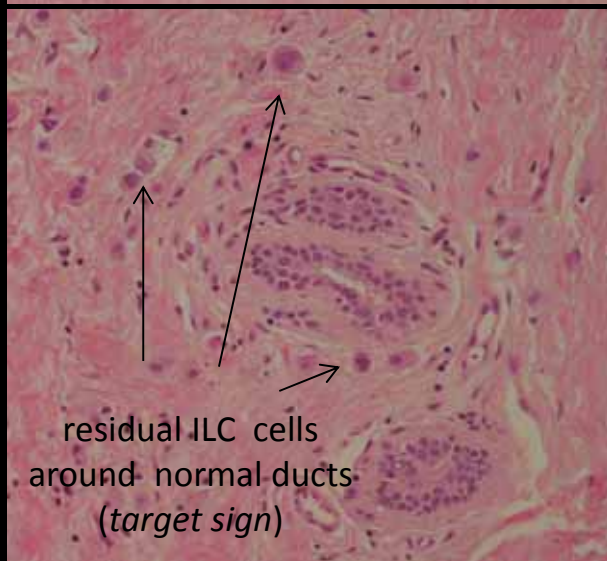
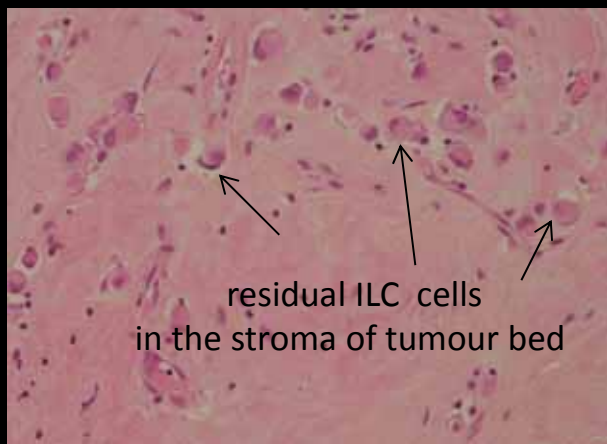
Complete Responder?



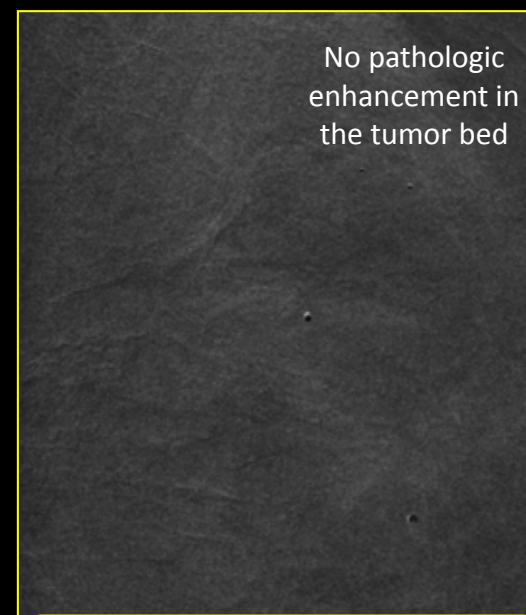
Results

69-year-old woman with 43-mm *Invasive LOBULAR Carcinoma* in left breast

Post-operative Histopathology

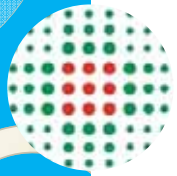


Post - NAC



Partial Responder!

Special
Thanks to
Maira
Ragazzi, MD,
Anatomical
Pathology
Department,
ASMN, RE,
Italy



RISULTATI

- Sia CESM che RM tendono a sottostimare l'estensione del residuo tumorale:
 - la CtNA modifica la neoangiogenesi (fonte di segnale)
 - puntiformi focolai di tumore residuo, al di sotto del potere di risoluzione
- La CESM ha mostrato una più forte correlazione con l'esame istologico:
 - differenze farmacocinetiche tra MdC iodato e Gd
 - differenze di timing nell'acquisizione delle immagini tra RM e CESM (*diffusione!*)
- La CESM ha mostrato maggior precisione nel definire il residuo di lesione in alcuni sottotipi istologici e/o molecolari, particolarmente insidiosi e difficili da caratterizzare, come il ca. Lobulare e Luminal B

Results

	ER	PgR	Ki67	HER2
Luminal A	+	+	-	-
Luminal B	+	+	+++	-
Luminal B HER2+	+	+	+++	+
Triplo Neg	-	-	+	-
Her2+	-	-	+	+

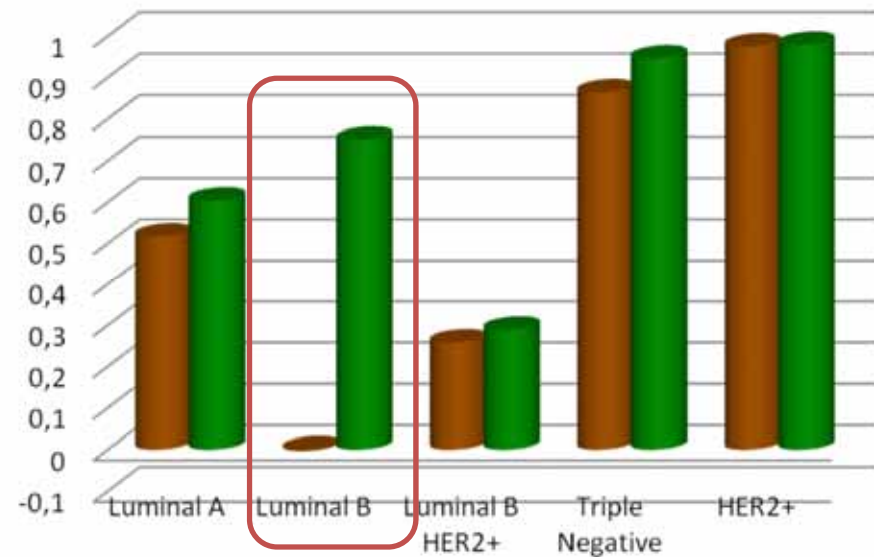
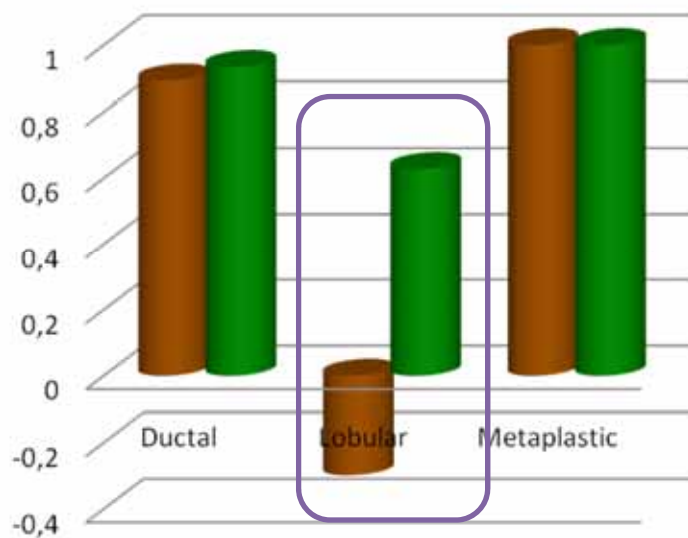
CORRELATION ("r" Pearson)

Histopathology vs

Histology	MRI	CESM
Ductal n. 40	r = 0.893	r = 0.934
Lobular n. 5	r = -0.298	r = 0.628
Metapl. n.2	r = 1	r = 1

* Small numbers are the main limitation!

Biology	MRI	CESM
Luminal A n. 3	r = 0.517	r = 0.604
Luminal B n. 17	r = -0.003	r = 0.750
Luminal B HER2+ n. 6	r = 0.258	r = 0.289
Triple Negative n. 12	r = 0.864	r = 0.946
HER2+ n. 9	r = 0.975	r = 0.979



Potenziale impatto sulla routine

- La **CESM** può essere utilizzata nei pazienti con controindicazioni alla **RM**
 - PM
 - Claustrofobia
 - Volume corporeo vs volume del gantry della RM
- **CESM** è più veloce, meno costosa e meglio accettata dalle pazienti



Journal of Medical Imaging and Radiation Oncology 59 (2015) 300–305

MEDICAL IMAGING—ORIGINAL ARTICLE

Contrast-enhanced spectral mammography (CESM) and contrast enhanced MRI (CEMRI): Patient preferences and tolerance

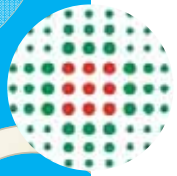
Max M Hobbs,¹ Donna B Taylor,^{1,2} Sebastian Buzynski¹ and Rachel E Peake²

Breast - MRI

CESM

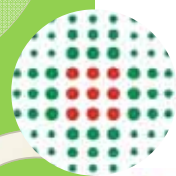
CESM mono?

CESM mono?



CONCLUSIONI

- **CESM e RM hanno mostrato una forte correlazione nel misurare le lesioni tumorali trattate con CtNA.**
- **La CESM può esser considerata un'alternativa alla RM nel definire la risposta alla CtNA.**
- **La CESM inoltre sembra migliore della RM nell'identificare le pazienti in RC.**



La rivincita degli ultrasuoni

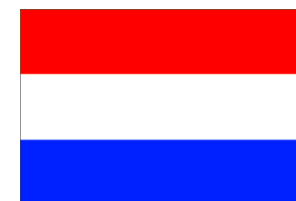
European Journal of Cancer 52 (2016) 67–76



Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.ejancer.com



Original Research

Ultrasound is at least as good as magnetic resonance imaging in predicting tumour size post-neoadjuvant chemotherapy in breast cancer



Birgit E.P.J. Vriens^a, Bart de Vries^b, Marc B.I. Lobbes^c,
Saskia M. van Gastel^d, Franchette W.P.J. van den Berkmortel^e,
Tineke J. Smilde^f, Laurence J.C. van Warmerdam^g, Maaïke de Boer^h,
Dick Johan van Spronsenⁱ, Marjolein L. Smidt^j, Petronella G.M. Peer^k,
Maureen J. Aarts^a, Vivianne C.G. Tjan-Heijnen^{a,*} on behalf of the
INTENS Study Group



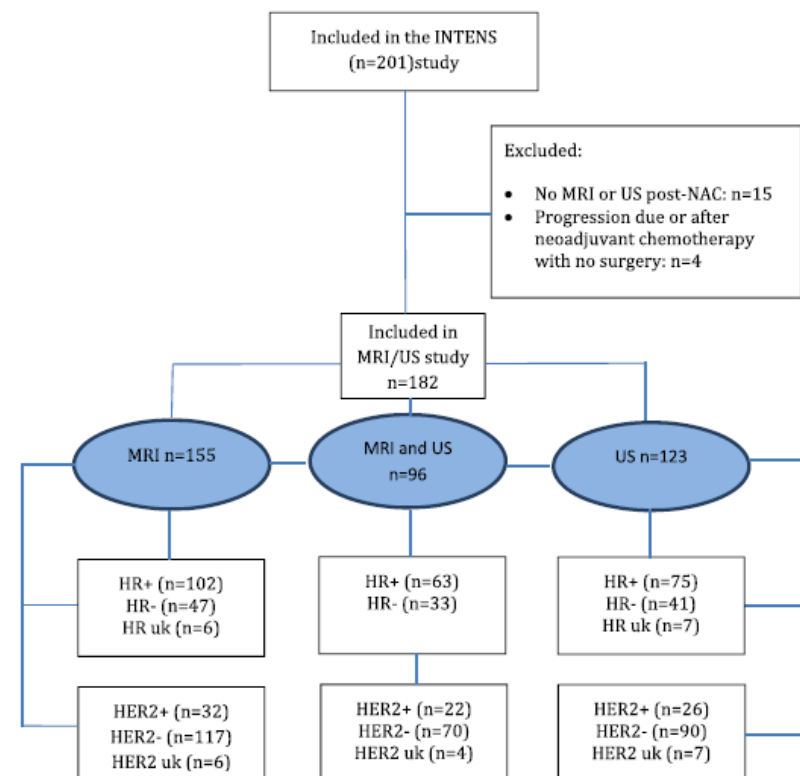


Original Research

Ultrasound is at least as good as magnetic resonance imaging in predicting tumour size post-neoadjuvant chemotherapy in breast cancer



- **Obiettivo:** valutare l'accuratezza della **RM** e dell'**ecografia** nel definire la dimensione del residuo di tumore mammario dopo chemioterapia neoadiuvante, confrontandola con l'esame istologico del pezzo operatorio (*gold standard*)
- e l'eventuale variazione a seconda del sottotipo tumorale
- 182 pazienti studiati



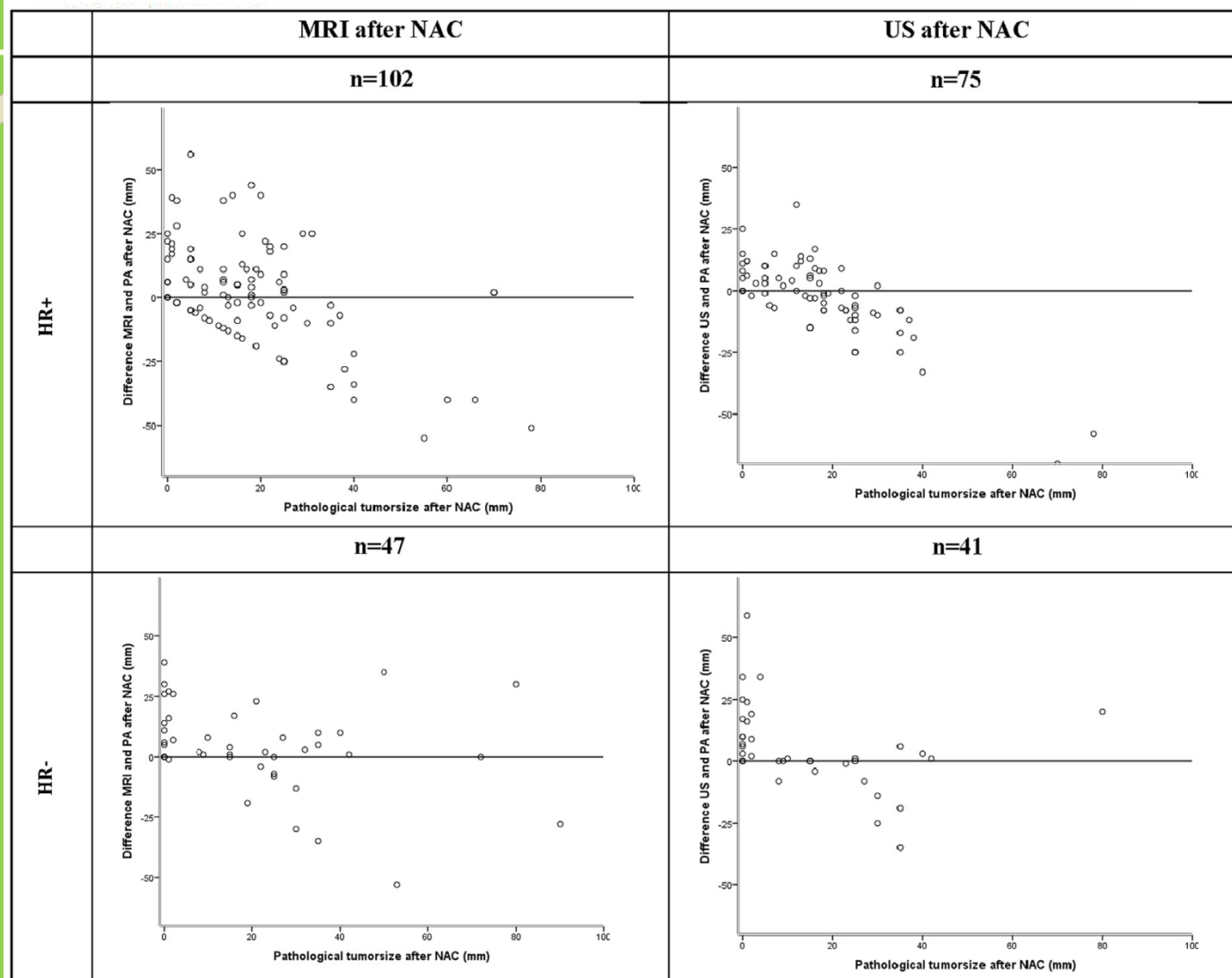


Original Research

Ultrasound is at least as good as magnetic resonance imaging in predicting tumour size post-neoadjuvant chemotherapy in breast cancer



	RM	Ecografia
discordanza minima (<10 mm) tra il diametro della lesione misurata all'esame istologico e:	54%	63%
di diametro SOVRAstimato	28%	20%
di diametro SOTTOstimato	18%	17%
Valore Predittivo Negativo nei tumori ormono+	26%	33%



Deviazione tra la dimensione tumorale (mm) misurata in RM e in Ecografia rispetto all'esame istologico del pezzo operatorio nei tumori ormono-positivi (HR+) e ormono-negativi (HR-)



Original Research

Ultrasound is at least as good as magnetic resonance imaging in predicting tumour size post-neoadjuvant chemotherapy in breast cancer



Conclusioni

- L'Ecografia è valida almeno tanto quanto la RM della mammella nel definire la dimensione del residuo tumorale dopo Chemioterapia Neoadiuvante
- Tuttavia, entrambe le metodiche risentono di una sostanziale percentuale di casi in cui la dimensione tumorale è sovra- o sotto-stimata, e di un basso VPN nel definire la risposta patologica completa

Original Article

Ability of contrast-enhanced ultrasonography to determine clinical responses of breast cancer to neoadjuvant chemotherapy

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CEUS

*Contrast Enhanced
Ultrasound*



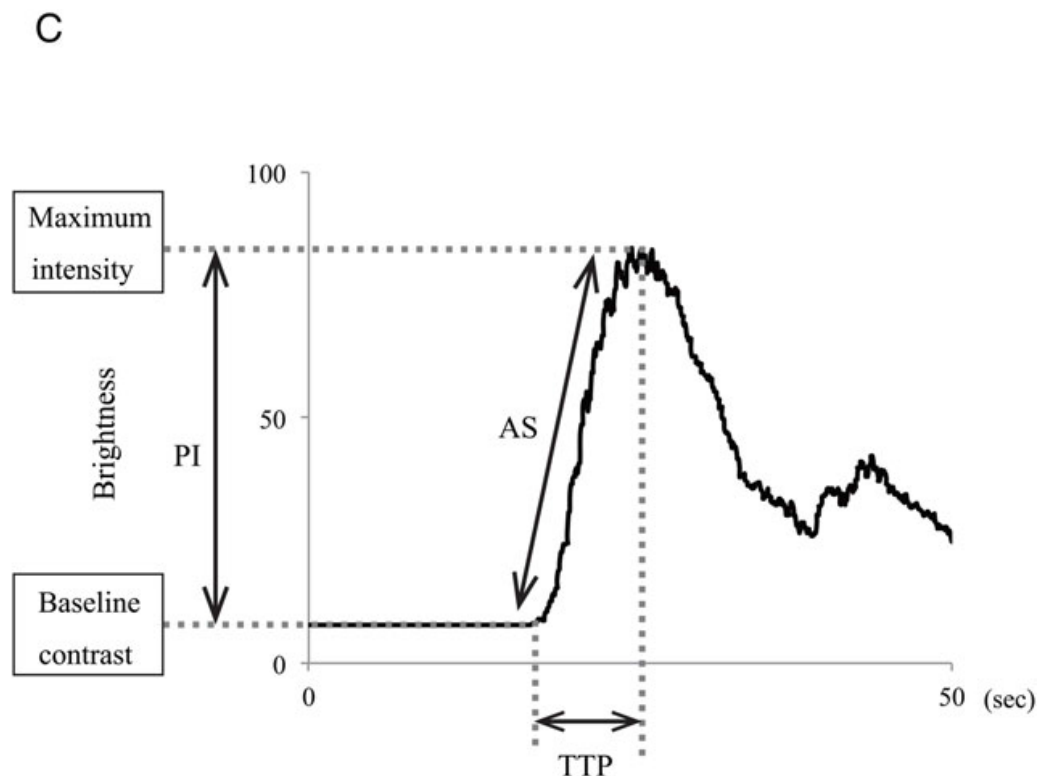
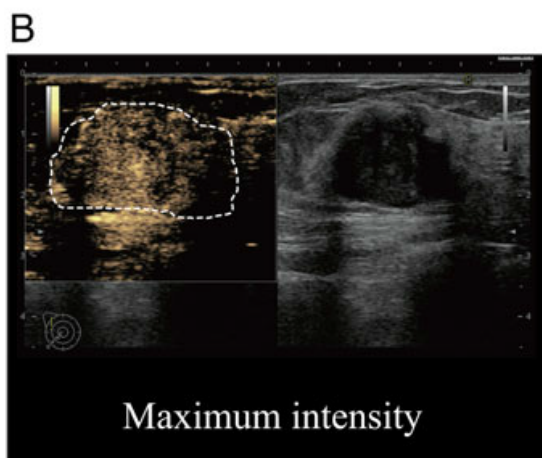
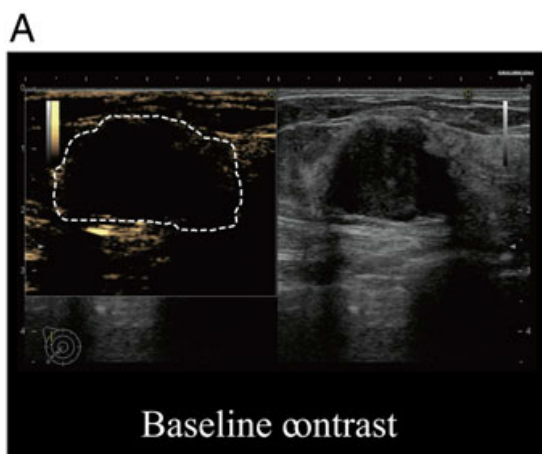
Original Article

**Ability of contrast-enhanced ultrasonography
to determine clinical responses of breast cancer
to neoadjuvant chemotherapy**

- **Obiettivo:** determinare se la CESU può valutare gli effetti della chemioterapia neoadiuvante nel tumore mammario
- 63 pazienti
- Per caratterizzare i reperti alla CESU, sono stati creati dei *parametri di perfusione* considerando delle *curve tempo/intensità* basate sull'intensità di enhancement e le sue modificazioni temporali
- Comparazione tra sensibilità, specificità e accuratezza di CEUS, RM e PET/TC nel definire la Risposta Completa dopo chemioterapia neoadiuvante, confrontata con l'esame istologico del pezzo operatorio (gold standard)

Original Article

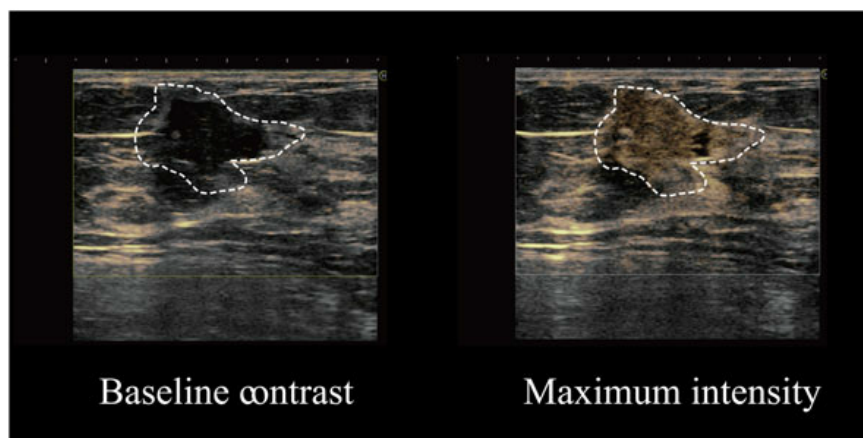
Ability of contrast-enhanced ultrasonography to determine clinical responses of breast cancer to neoadjuvant chemotherapy



Original Article

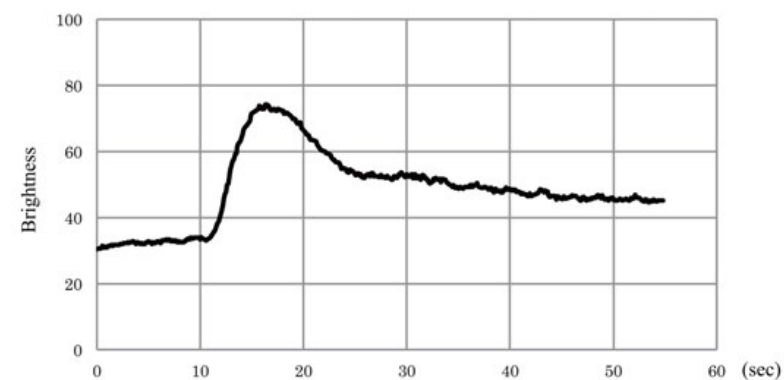
Ability of contrast-enhanced ultrasonography to determine clinical responses of breast cancer to neoadjuvant chemotherapy

A

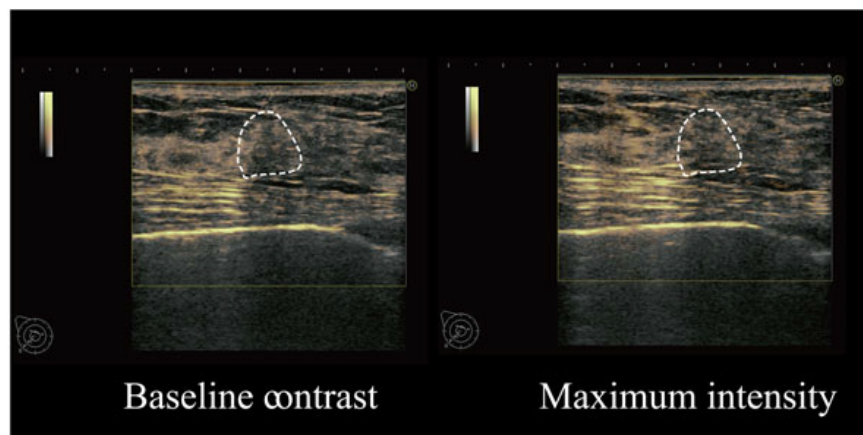


B

NON Risposta Completa

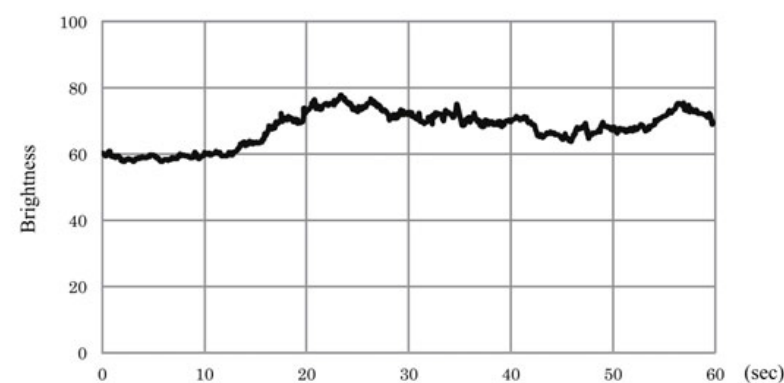


C



D

Risposta Completa



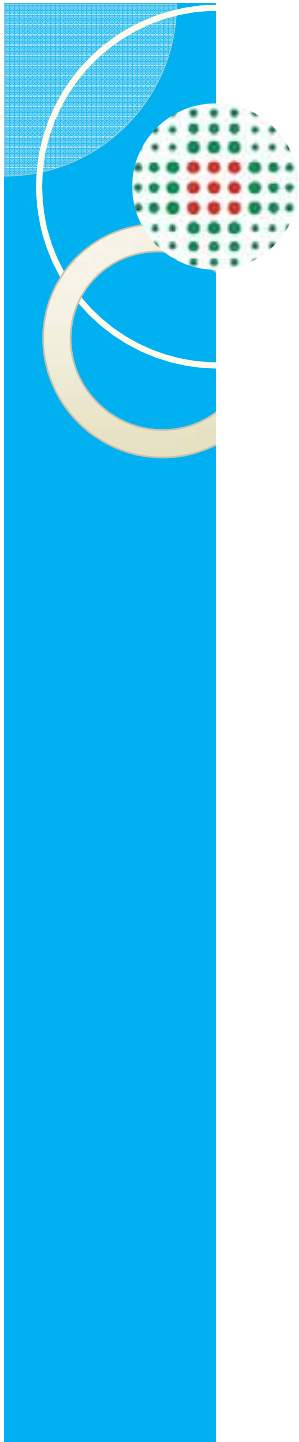
Original Article

**Ability of contrast-enhanced ultrasonography
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- 36.5% Risposta Completa patologica (pRC)

<i>Capacità di predire al pRC</i>	<i>Sensibilità</i>	<i>Specificità</i>	<i>Accuratezza</i>
CEUS	95.7%	77.5%	84.1%
RM	69.6%, (vs CEUS P = 0.047)		
PET/TC		52.5% (vs CEUS P = 0.02)	69.8% (vs CEUS P = 0.057)

- **Conclusion:** la CEUS può esser considerata una nuova metodica di imaging nella pianificazione terapeutica dei pazienti con tumore alla mammella sottoposti a chemioterapia neo-adiuvante



«Rare sono le persone che usano la mente.
Poche coloro che usano il cuore e uniche
coloro che usano entrambi.»

Rita Levi Montalcini

Grazie per la cortese attenzione