



S.S. FORMAZIONE PERMANENTE E AGGIORNAMENTO



Evento Formativo Residenziale

**PROGRAMMA REGIONALE DI SCREENING PER IL TUMORE DELLA MAMMELLA
PREVENZIONE SERENA – WORKSHOP 2018**

La tomosintesi subito?

Dibattite **Discussione**

Luisella Milanese *
SSD Senologia di Screening

- con la collaborazione e con materiale di F. Caumo, A. Frigerio

CRR / Centro di Riferimento Regionale per lo Screening Mammografico
Responsabile: A. Frigerio

Il tema affrontato: **Tomosintesi**

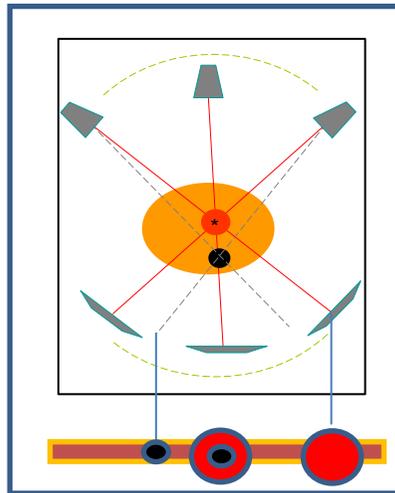
Tomosintesi / DBT (Digital Breast Tomosynthesis)

= Mammografia digitale 2D (FFDM) + **tomografia** digitale

= (cosiddetta) Mammografia 3D (DBT)

Tomosintesi / DBT / Mammografia 3D

= Mammografia digitale 2D + **tomografia** digitale



Principio: acquisire **multiple proiezioni**
mediante un **movimento angolare** del tubo radiogeno,
quindi, mediante **software dedicati**
produrre una **ricostruzione pseudo-tridimensionale** della mammella.

Vantaggio atteso: riduzione delle sovrapposizioni
e conseguente **miglioramento della capacità diagnostica (sensibilità e specificità)**

La tomosintesi subito?

Tomosintesi / Studi clinici

Study, place	Study period	Population: (<i>n</i>)	Age group (years)	Study design	Exam mode	Reading mode
STORM Trento/Verona ^a	08/2011–06/2012	7292	>48	Prospective; paired	2D: 2-view 3D: 2-view	Double; sequential
OTST Oslo ^b	11/2010–12/2012	25,547	50–69	Prospective; paired	2D: 2-view 3D: 2-view	Double; independent
MBTST Malmö ^c	01/2010–12/2012	15,000	40–74	Prospective; paired	2D: 2-view 3D: 1-view	Double; sequential

Prevenzione Serena, Screening mammografico, Workshop Regionale, Torino 6 dic 2018
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Study	Recall (false pos.), change (%)	Cancer detection (n/1000)	All cancer increase (%)	Inv. cancer increase (%)
STORM Trento/Verona ^a	–17	FFDM: 5.3 DBT: 8.1 (+2.8)	+53	+49
OTST Oslo ^b	–13	FFDM: 6.1 DBT: 8.0 (+1.9)	+27	+45
MBTST Malmö ^c	+43	FFDM: 6.3 DBT: 8.9 (+2.6)	+43	+42
US study Friedewald ^d	–16	FFDM: 4.2 DBT 5.4 (+1.2)	+29	+41

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La tomosintesi subito?

Tomosintesi / Studi recenti (2018)

Digital Breast Tomosynthesis with Synthesized Two-Dimensional Images versus Full-Field Digital Mammography for Population Screening: Outcomes from the Verona Screening Program¹

Francesca Caumo, MD
 Manuel Zorzi, MD
 Silvia Brunelli, MD
 Giovanna Romanucci, MD
 Rossella Rella, MD
 Loredana Cugola, MD
 Paola Bricolo, MD
 Chiara Fedato, MD
 Stefania Montemezzi, MD
 Nehmat Houssami, MD, PhD

Risultati di Detection Rate (DR) e recall rate (RR) 2D synt +DBT vs coorte FFDM

Table 1

Recall and Detection Outcomes in Women Screened with DBT Plus Synthetic 2D Imaging or with FFDM Alone

Parameter	FFDM			DBT Plus Synthetic 2D Imaging			P Value		
	First	Subsequent	Total	First	Subsequent	Total	First	Subsequent	Total
PPV for recall (%)	10.7 (16/149)	13.5 (62/456)	12.9 (78/605)	18.1 (35/193)	25.5 (120/470)	23.3 (155/663)	.10	<.001	<.001

Note.—FFDM indicates findings in the historical comparison group from the Verona screening program. DBT plus synthetic 2D = prospectively recruited study group from the Verona screening program.

RECALL RATE

4.2% for FFDM and 4.0% synt2D+DBT

DETECTION RATE

5,41 per 1000 for FFDM and 9,3 per 1000 synt2D +DBT

Digital Mammography versus Digital Mammography Plus Tomosynthesis for Breast Cancer Screening: The Reggio Emilia Tomosynthesis Randomized Trial

Radiology 2018; 288:375–385

Pierpaolo Pattacini, MD • Andrea Nitrosi, MMP • Paolo Giorgi Rossi, PhD • Valentina Iotti, MD • Vladimiro Ginocchi, MD • Sara Ravaioli, MD • Rita Vacondio, MD • Luca Braglia, MSc • Silvio Cavuto, MSc • Cinzia Campari, MSc • for the RETomo Working Group

Risultati di Detection Rate (DR) e recall rate (RR) DM versus DM+DBT

Table 1: Baseline Results according to Study Arm

Parameter	Experimental Arm	Control Arm (DM)	Risk Difference per Women Screened*	
Recall rate	RECALL RATE 3,5% for DM and DM+DBT			-5, +5)
With biopsy	126 (1.0)	79 (0.5)	1.60 (1.21, 2.11)	5 (2, 8)
Surgery	93 (0.9)	49 (0.5)	1.90 (1.35, 2.68)	5 (2, 7)
Invasive cancers	69 (0.71)	39 (0.40)	1.77 (1.20, 2.62)	3 (1, 5)
DCIS	DETECTION RATE 4,5 per mille for DM and 8,6 per mille DM+DBT			
Detection rate	24.1	13.0
PPV (%)	24.1	13.0
Benign [†]	10 (0.1)	5 (0.1)	2.00 (0.68, 5.85)	1 (0, 1)
Benign/malignant ratio	0.11	0.11
No. of false-positive results [‡]	261 (2.7)	295 (3.0)	0.89 (0.75, 1.04)	-3 (-8, +1)

RANDOMIZZAZIONE

Digital Breast Tomosynthesis and Synthetic 2D Mammography versus Digital Mammography: Evaluation in a Population-based Screening Program¹

Solveig Hofvind, PhD
 Tone Hovda, MD
 Åsne S. Holen, MSc
 Christoph I. Lee, MD, MS
 Judy Albertsen, MD
 Hilde Bjørndal, MD
 Siri H. B. Brandal, MD
 Randi Gullien, MSc
 Jon Lømo, MD, PhD
 Daehoon Park, MD, PhD
 Linda Romundstad, MD
 Pål Suhrke, MD, PhD
 Einar Vigeland, MD
 Per Skaane, MD, PhD

Table 1
Rates of Abnormal Mammographic Findings (Recall), Screen-detected Breast Cancer and Positive Predictive Values of Recalls and Needle Biopsies in Women Screened with Combined Digital Breast Tomosynthesis and Synthetic Two-dimensional Mammography or Digital Mammography

Characteristic	Screening with DBT and SM (n = 37 185)	Screening with DM (n = 61 742)	Overall (n = 98 927)	P Value*
Age (y)				
Average	59.2	59.4	59.3	<.001
Median	59.0	59.0	59.0	<.001
Recall[†]	1253 (3.4)	2037 (3.3)	3290 (3.3)	.563
Screen-detected cancer[‡]				
Invasive breast cancer	283 (7.6)	329 (5.3)	612 (6.2)	<.001
Ductal carcinoma in situ	65 (1.7)	50 (0.8)	115 (1.2)	<.001
Total	348 (9.4)	379 (6.1)	727 (7.3)	<.001
Positive predictive value of recalls (%) [§]	27.8	18.6	22.1	<.001
Positive predictive value of performed needle biopsies (%) [¶]	53.7	38.6	44.6	<.001

* P value was determined by comparing women who underwent digital breast tomosynthesis (DBT) and synthetic mammography (SM) with those who underwent digital mammography (DM).
[†] Data are number of abnormal mammographic findings. Data in parentheses are percentages.
[‡] Data are number of patients. Data in parentheses are rate per 1000 women screened.
[§] Ductal carcinoma in situ and invasive breast cancer among women recalled because of abnormal mammographic findings.
[¶] Ductal carcinoma in situ and invasive breast cancer among women who underwent needle biopsy after being recalled because of abnormal mammographic findings.

RECALL RATE
 3.3% DM
 3.4% synt2D+DBT

DETECTION RATE
 6.1 per 1000 synt2D+DBT
 9,4 per 1000 synt2D+DBT



Performance of breast cancer screening using digital breast tomosynthesis: results from the prospective population-based Oslo Tomosynthesis Screening Trial

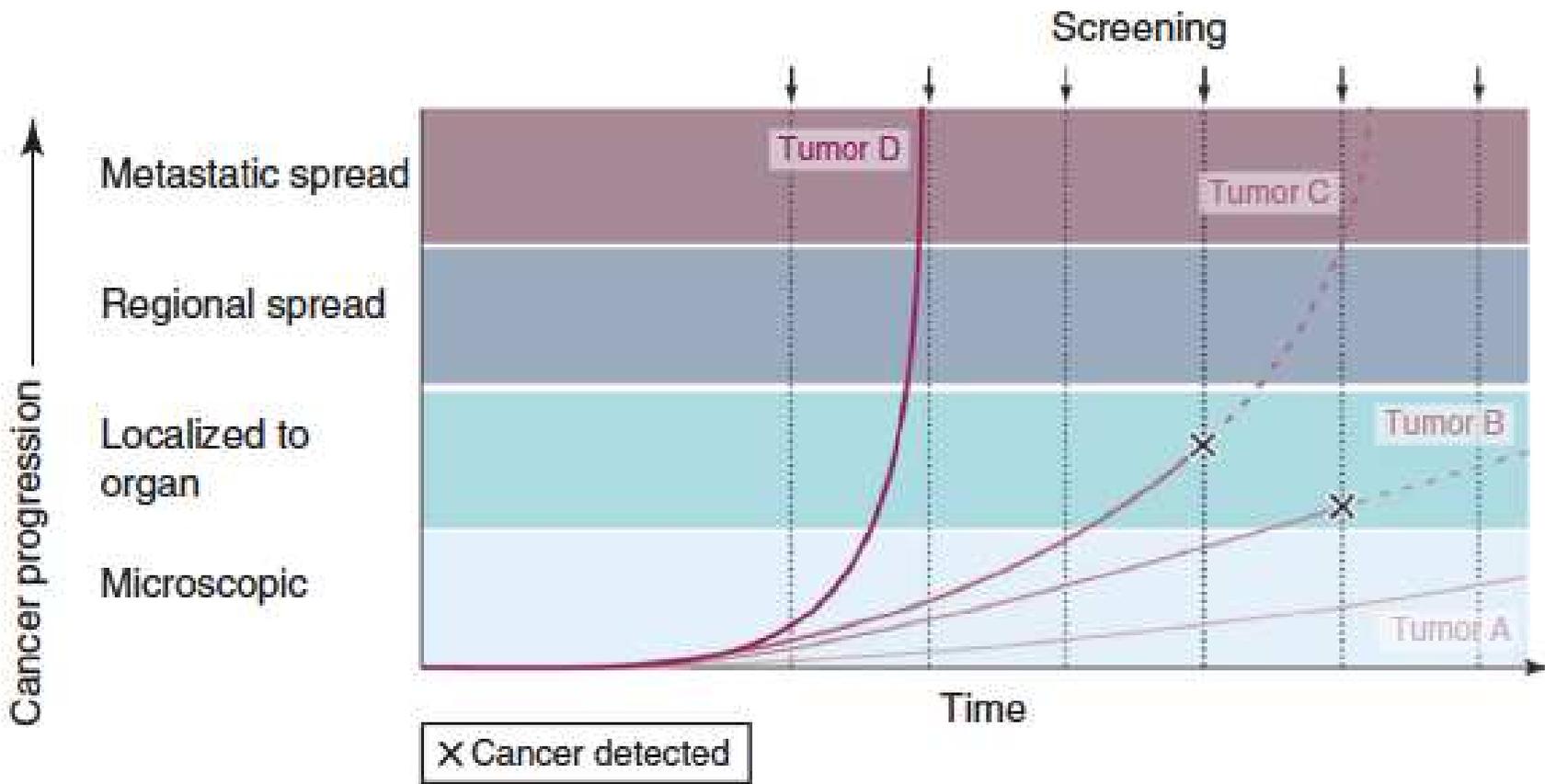
Per Skaane¹ · Sofie Sebuødegård² · Andriy I. Bandos³ · David Gur⁴ · Bjørn Helge Østerås⁵ · Randi Gullien⁶ · Solveig Hofvind⁷

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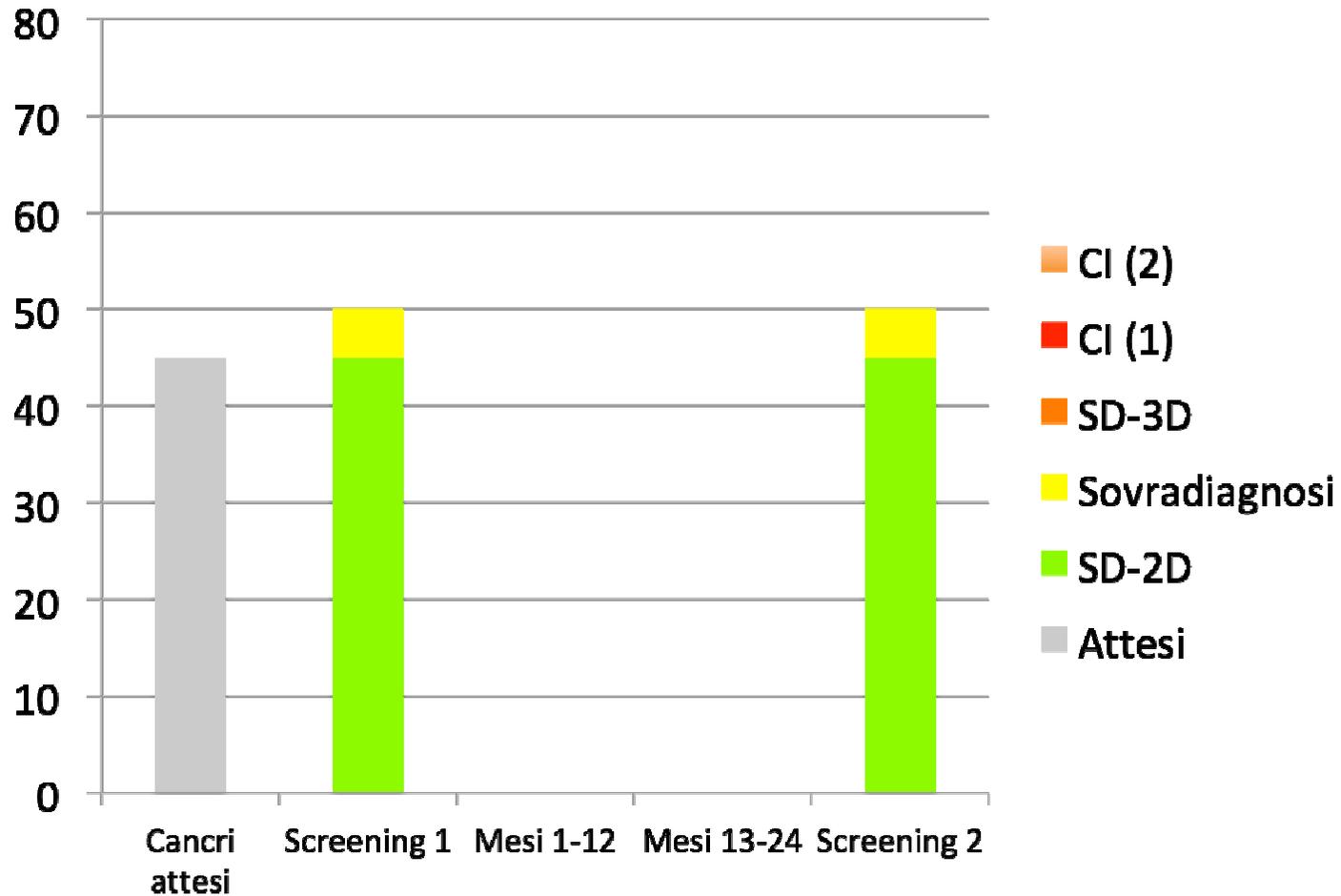
	2006–2007	2008–2009	Previous two rounds combined FFDM	OTST FFDM + DBT	Difference OTST and previous rounds combined (95% CI)	<i>p</i> value
Screen-detected cancers						
No.	195	183	378	227		
Rate ^a	6.6	6.0	6.3	9.3	3.0 (1.7, 4.4)	<i>p</i> < 0.001
Interval cancers						
No.	58	60	118	51		
Rate ^a	2.0	2.0	2.0	2.1	0.1 (– 0.5, 0.8)	<i>p</i> = 0.734

Non vi è una significativa riduzione dei Cancri Intervallo !

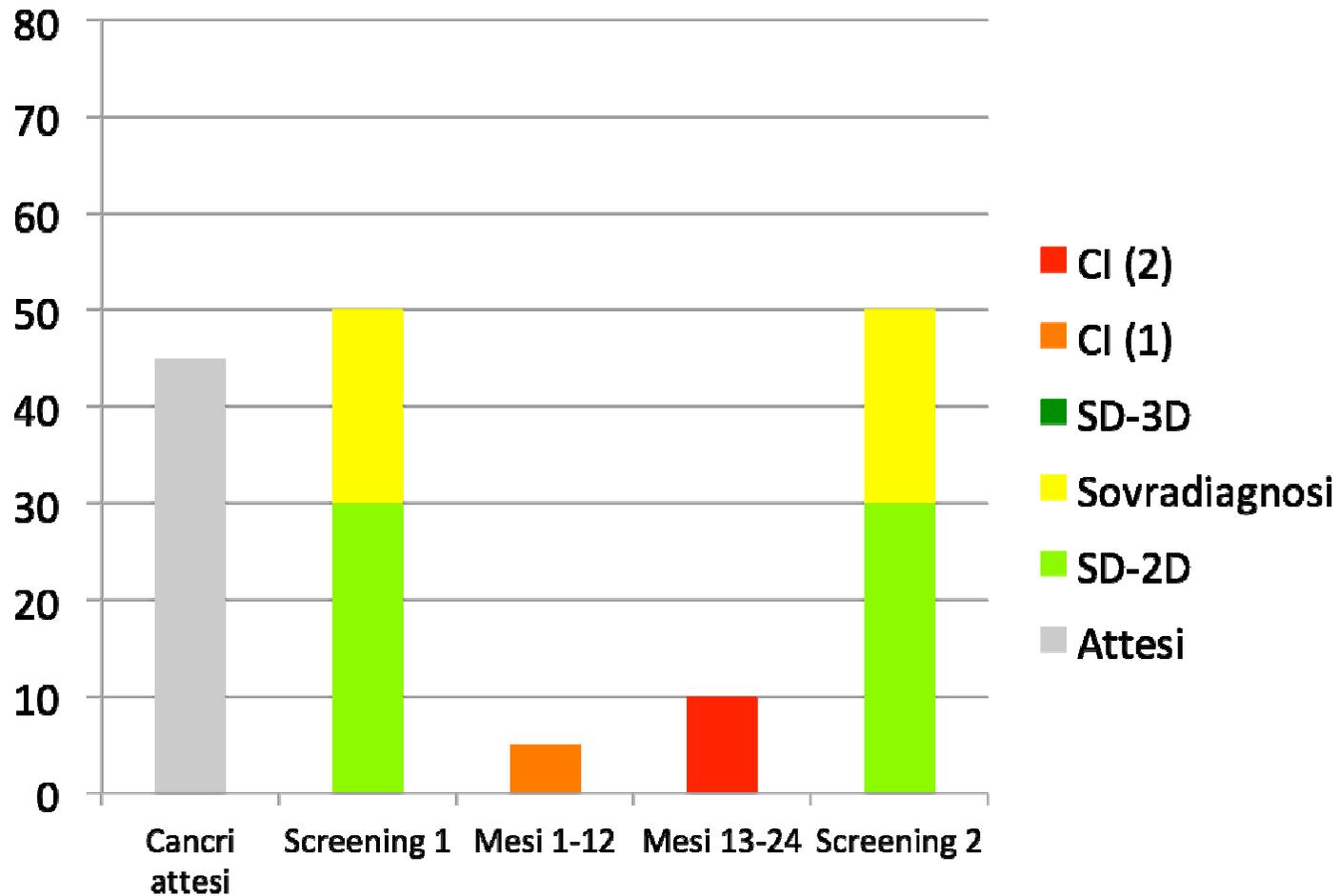
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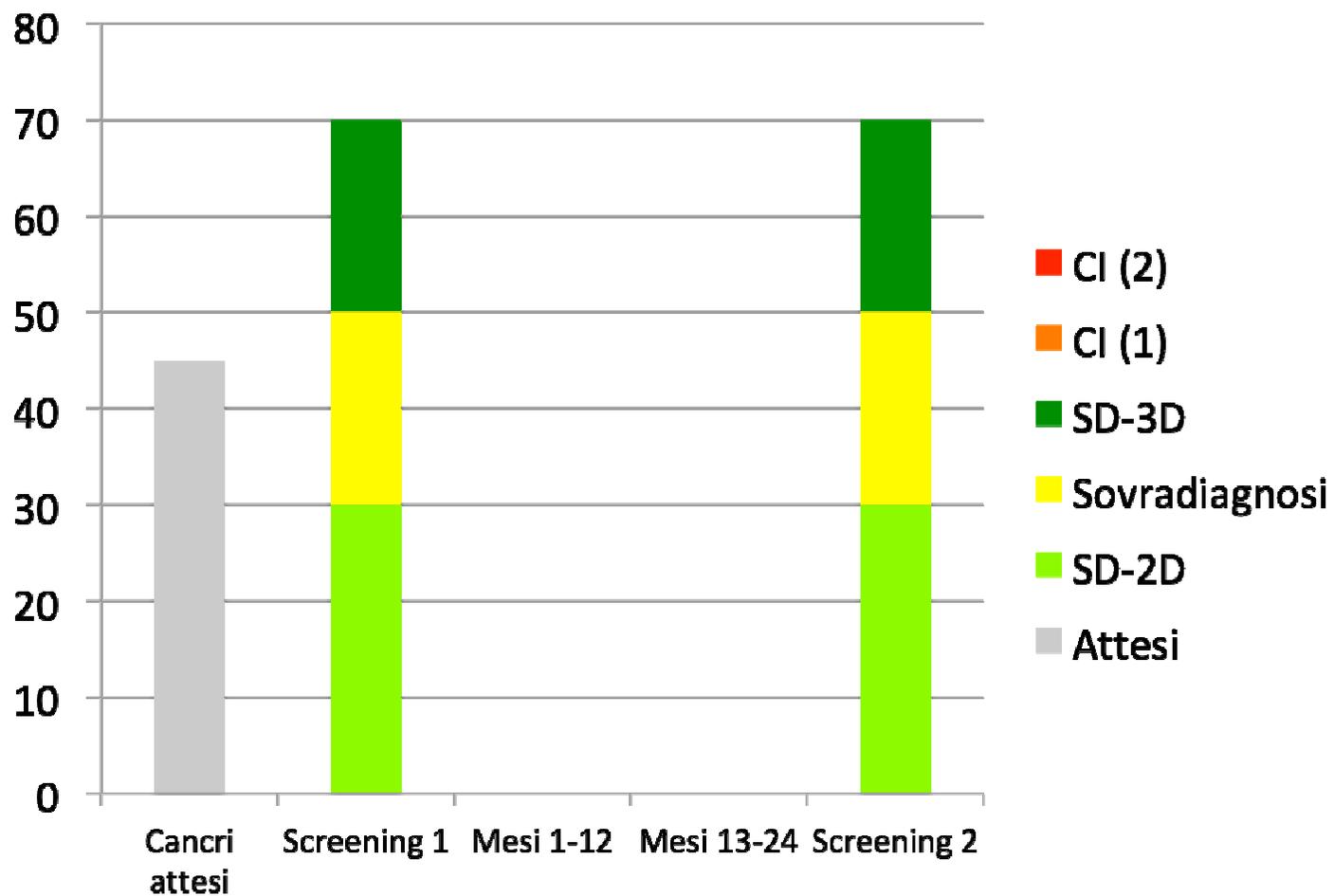
errare humanum ... / Torino, 22 ottobre 2016 / il progetto Proteus Donna
diagnosi, sovradiagnosi e cancro intervallo



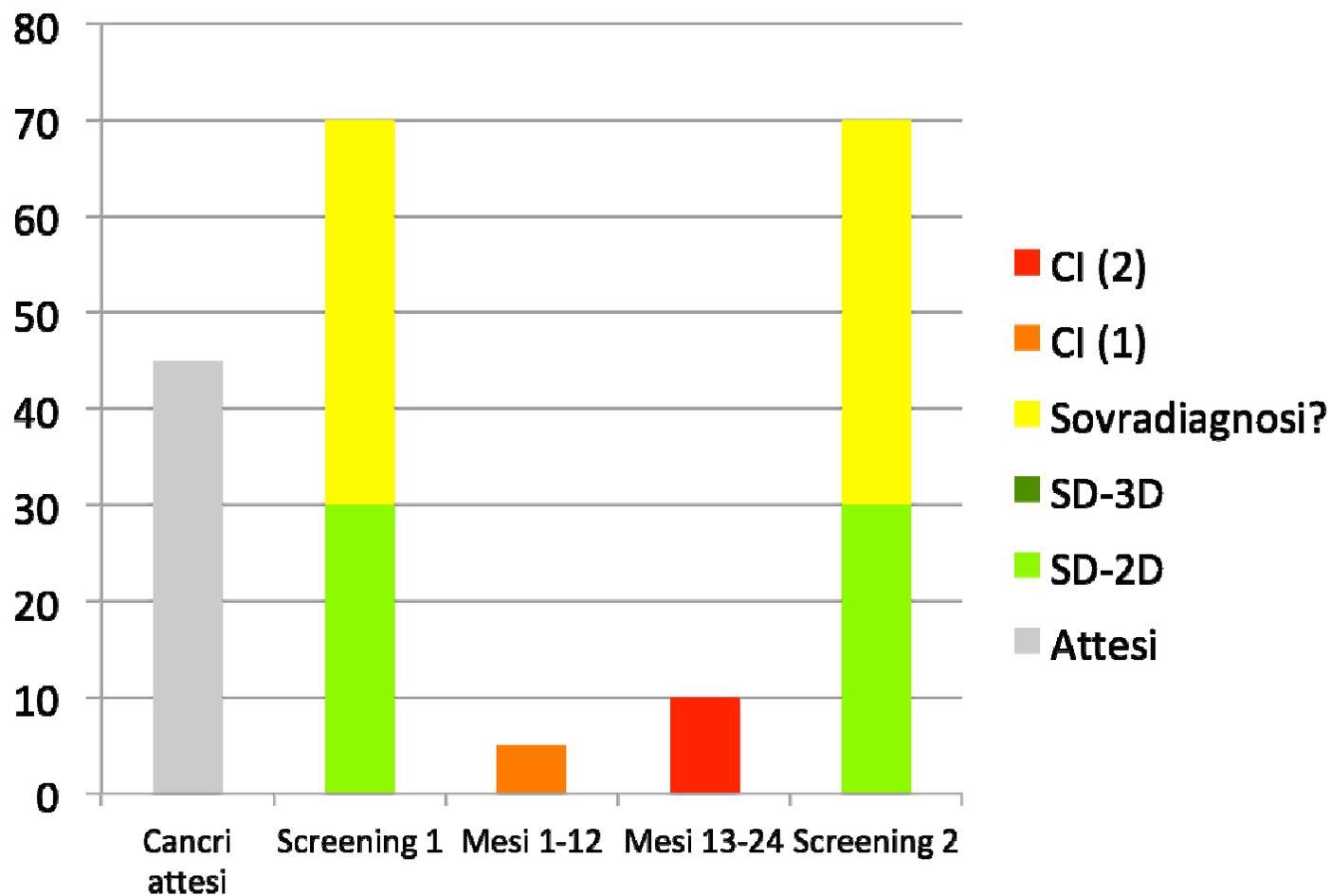
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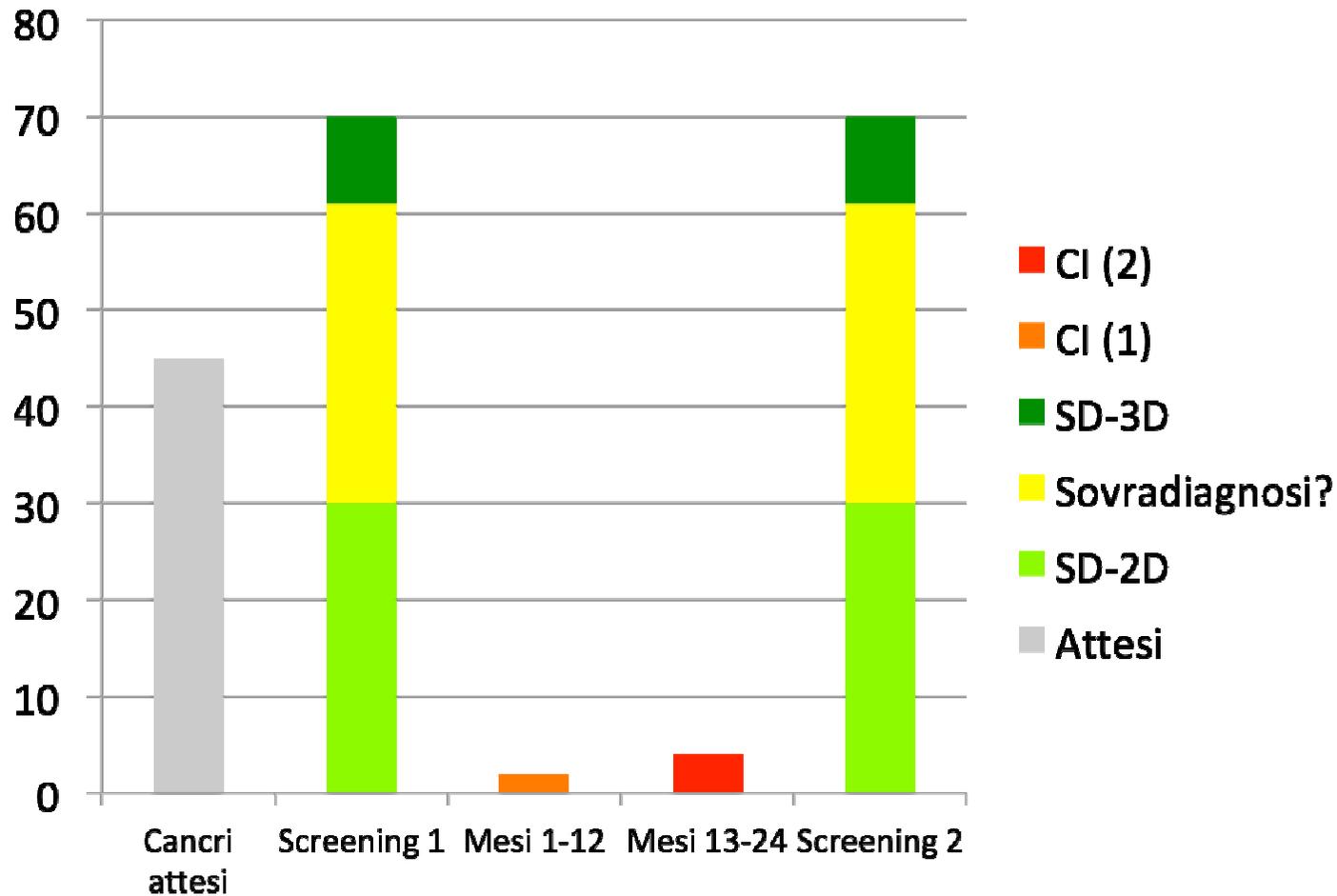
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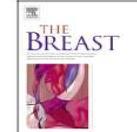


errare humanum ... / Torino, 22 ottobre 2016 / il progetto Proteus Donna
diagnosi, sovradiagnosi e cancri intervallo



il progetto Proteus Donna

- studio clinico controllato **prospettico randomizzato**
- **Tomosintesi vs Mammografia Digitale**
- attuato in un programma di screening di popolazione
- multicentrico (10 siti del **programma regionale piemontese Prev. Serena**)
- multivendor
- obiettivo: 69.000 partecipanti / 23.000 tomosintesi
- obiettivo principale dello studio: **cancri intervallo** e cancri avanzati



Original article

Interval breast cancers in the 'screening with tomosynthesis or standard mammography' (STORM) population-based trial



Nehmat Houssami ^{a,*}, Daniela Bernardi ^b, Francesca Caumo ^{c,d}, Silvia Brunelli ^c, Carmine Fantò ^b, Marvi Valentini ^b, Giovanna Romanucci ^c, Maria A. Gentilini ^e, Manuel Zorzi ^f, Petra Macaskill ^a

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^e Servizio di Epidemiologia Clinica Valutativa, Azienda Provinciale Servizi Sanitari (APSS), Trento, Italy

^f Veneto Tumour Registry, Veneto Region, Padua, Italy

7292 women
STORM
group

2D+ integrated 2D+3D

Interval breast cancers **9**

The estimated interval
cancer rate is 1.23/1000

Table 1
Characteristics of interval breast cancers observed in the STORM trial.

Case	Age at screen (years)	Density ^a	Interval ^b	Cancer histology	Tumour size mm	Tumour grade	Lymph node (N) status	ER/PR/HER2	MIB-1/Ki-67%
1	60	3	Year 1	Invasive ductal	22	3	N1micro	+/-/+	60
2	58	2	Year 1	Invasive ductal	30	3	N0	+/-/+	30
3	69	3	Year 1	DCIS (Paget's disease)	20	High-grade DCIS	N0	-/-/NR	8
4	60	3	Year 2	Invasive ductal	30	3	N3	-/-/+	36
5	60	2	Year 2	Invasive ductal	24	3	N0	+/+/-	38
6	50	4	Year 2	Invasive ductal	6	1	N0	+/+/-	10
7	65	2	Year 2	Invasive ductal	35	3	N0	-/-/-	70
8	51	2	Year 2	Invasive lobular	19	2	N0	+/+/-	9
9	51	3	Year 2	Invasive ductal, multifocal	12 (index)	2	N0	+/+/-	12

Key: (+) positive; (-) negative; (ER) oestrogen receptor; (PR) progesterone receptor; (HER2) human epidermal growth factor receptor 2; (NR) not reported; (DCIS) ductal carcinoma in-situ.

^a Based on BI-RADS classification using mammographic breast density at digital mammography [1].

^b Whether diagnosed in year 1 or year 2 (from negative screen) in biennial screening.

Sensitivity was 85.5 %

25058 women

2D

Interval breast cancers **40**

Sensitivity was 77.7 %

The estimated interval cancer
rate for 2D is 1.60/1000

Prevenzione Serena, Screening mammografico, Workshop Regionale, Torino 6 dic 2018

La tomosintesi subito? / Non nel primo livello
(se non entro situazioni di studio o strettamente monitorate)

BREAST RADIOLOGY

Digital breast tomosynthesis (DBT): recommendations from the Italian College of Breast Radiologists (ICBR) by the Italian Society of Medical Radiology (SIRM) and the Italian Group for Mammography Screening (GISMa)

Daniela Bernardi¹ · Paolo Belli² · Eva Benelli³ · Beniamino Brancato⁴ · Lauro Bucchi⁵ · Massimo Calabrese⁶ · Luca A. Carbonaro⁷ · Francesca Caumo⁸ · Beatrice Cavallo-Marincola⁹ · Paola Clauser¹⁰ · Chiara Fedato¹¹ · Alfonso Frigerio¹² · Vania Galli¹³ · Livia Giordano¹⁴ · Paolo Giorgi Rossi¹⁵ · Paola Golinelli¹⁶ · Doralba Morrone⁴ · Giovanna Mariscotti¹⁷ · Laura Martincich¹⁸ · Stefania Montemezzi¹⁹ · Carlo Naldoni²⁰ · Adriana Paduos¹⁴ · Pietro Panizza²¹ · Federica Pediconi⁹ · Fiammetta Querci²² · Antonio Rizzo²³ · Gianni Saguatti²⁴ · Alberto Tagliafico²⁵ · Rubina M. Trimboli²⁶ · Marco Zappa²⁷ · Chiara Zuiani²⁸ · Francesco Sardanelli^{7,29} 

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DBT for work-up of screen-detected suspicious findings, as a first-line diagnostic examination in symptomatic women, for preoperative staging, and targeted evaluation after MRI

Riduce il ricorso alla biopsia su reperti sospetti

E' più precisa nel definire la size della lesione

E' più efficace nel definire la presenza di lesioni aggiuntive rispetto alla DM e se associata alla US raggiunge quasi la sensibilità della MRI

Utile nel second look

Ottima guida per gli approfondimenti invasivi sotto guida sterotassica

La tomosintesi subito?

- In Screening la tomosintesi aumenta la DR e riduce (?) il RR
- La validazione della tomosintesi in ambito di screening non è terminata e servono altre evidenze sui CI e T2+ **(risultati degli studi randomizzati prospettici di tomosintesi di Reggio Emilia e del Piemonte / Studio Proteus)**
- Nel seno adiposo e seno denso le performances della tomosintesi non sono sovrapponibili
- L'aggiunta dell'ecografia in un contesto clinico ridimensiona il ruolo della tomosintesi
- Ipotesi di studi su ecografia automatica nel primo livello screening
- La tomosintesi in un contesto clinico (anche secondo livello screening) è utile nella stadiazione locale (lesioni aggiuntive e controlaterali) e nell'approccio bioptico.