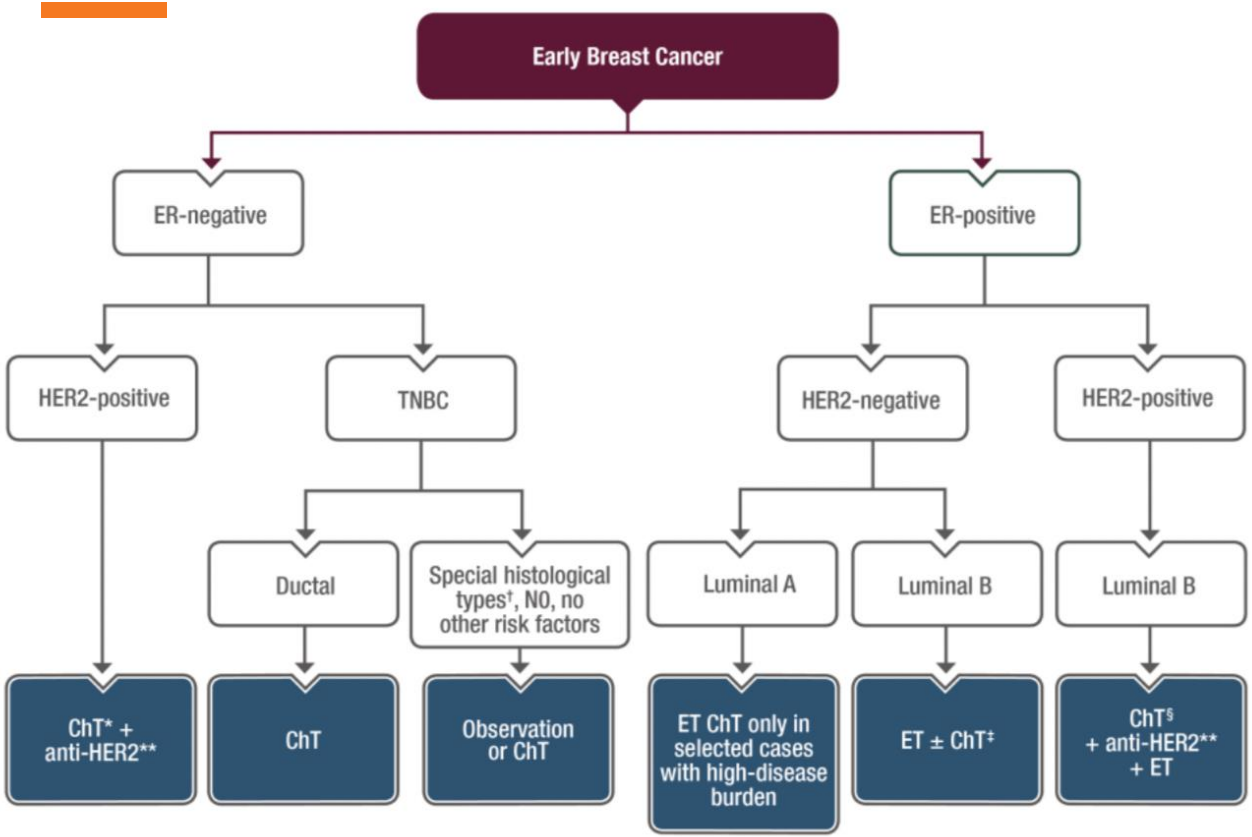
digistain

Un Nuevo Enfoque Espectroscópico Libre de Reactivos Para Agilizar Las Decisiones Sobre Terapia Adyuvante en el Cáncer de Mama Temprano

WWW.DIGISTAIN.CO.UK

Breast Cancer Management

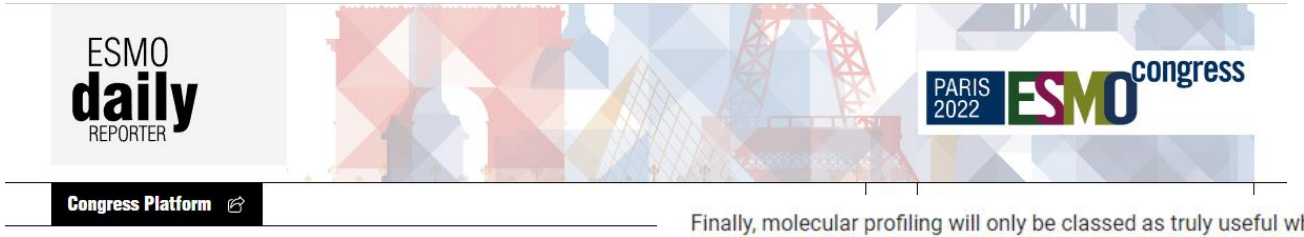


- ESMO Guidelines
- Highly stratified treatment protocols WRT to other cancer types
- Critically dependent on diagnostic outcomes

Bottleneck in Cancer Management

27% BC PATIENTS DEATHS - CHEMOTHERAPY OVERTREATMENT 2009 - UK

- 4,000 new Ecuador breast cancer patients annually
- Chemotherapy is the 1st line of defence
- Cancer therapy = biggest cost centre to health care system
- **Oncologists need a better way of making treatment decisions**



Finally, molecular profiling will only be classed as truly useful when it is available and affordable all over the world. There are genuine concerns that as the diagnostic testing costs rise, along with increasing medication prices, more disparities will be evident in terms of who can access cutting-edge

Harold J. Burstein, MD, PhD | Boston MA

Harvard & Dana Farber Inst.

Clinico-pathological Assessment in BC

MEETING THE UNMET NEEDS OF BREAST CANCER PATIENTS

- Subjectivity in grading leads to overtreatment of chemotherapy
- 2003 - Genomic risk profiling heralded as the solution
- Only 1 / 70 genes in Mammaprint (SCUBE2) appears in Oncotype gene panel
- **Comparatively <40% of BC tumours were classified similarly by genomic tests***
    - **There is still room for subjectivity in the vast parameter space of genomics**
- Gene expression is measured with RNA transcription
    - RNA expression level - inherent variability among patients
    - Leads to incorrect subgrouping of patient by risk**

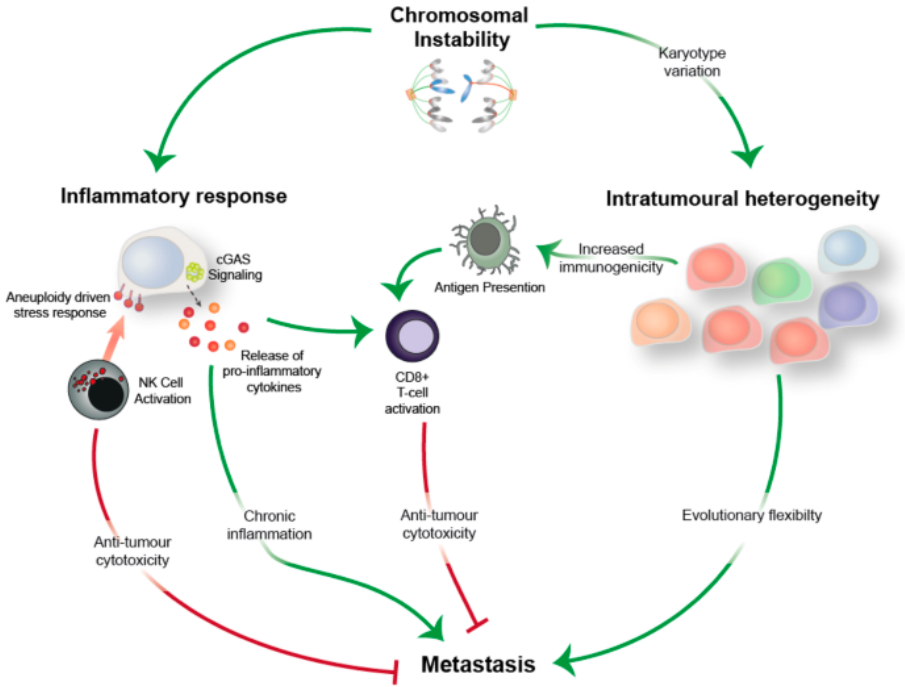
** Turner et al Nature Breast. 2023*

*** Ho et al Hong Kong. Coll. Path. 17 (2) 2022*

Genomic Instability Underpins Tumour Growth

CHROMOSOMAL ABERRATION DRIVES TUMOUR GROWTH

- Robust evidence of prognostic value
- **99% of breast tumours are aneuploid**
- CIN drives proliferation and pleomorphism*
- CIN significantly associated with BC metastasis**
  - CIN healthy cells - 1%
  - CIN cancer cells - 20%



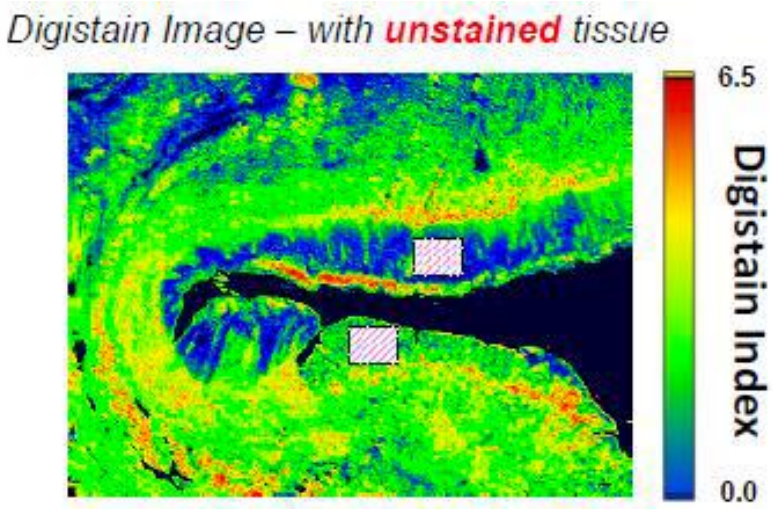
Mclelland et al Mol. Cytogenetics 2019

** Bakhoum et al Nature 2018*
*** Nguyen et al Cell 2022*

Chromosomal Instability/Aneuploidy

INDEPENDENT PROGNOSTIC FACTOR

- **Digistain index reflects aneuploidy***
- Spectroscopy - validated & well established analytical technique
- Precise & Objective Evaluation of Risk
    - Specific Sampling



** Amrania et al Converg. Sci. Oncol. 2018*

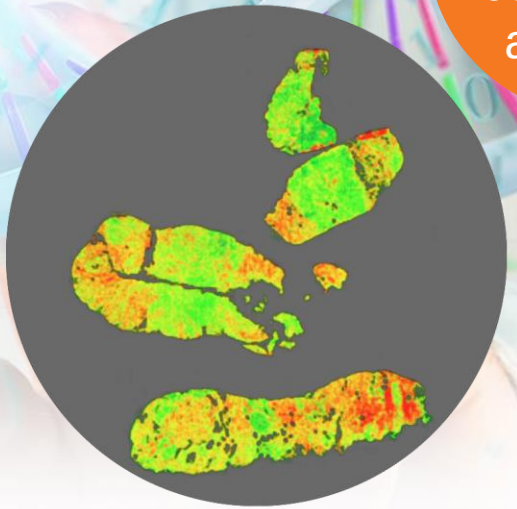
Digistain - Patented Technology

PRECISION ANALYSIS OF TUMOUR MARKERS

Tissue scan captures a unique spectral signature of the tumor to enable:

- **AI Based Approach**
- **Precise & Accurate Measurement of Aneuploidy***

>10,000 data points analysed



** Amrania et al Converg. Sci. Oncol. 2018*

Patent: *WO2016174441A1*

Game Changing Access to Precision Medicine

Delivers decision making data in 15min

- Developed with input from 1560 oncologists
- **UK & EU Market Clearance**
- **5 Clinical Trials**
- >1800 patients tested
- **Internationally deployed**

Digistain provides a personalized prognostic score by analyzing over 10,000 data points in 15 minutes.

Accessible Tumour Profiling for Therapy Guidance

IMPERIAL

Home | College and Campus | Science | Engineering | Health | Business

Digistain gains clinical data to support rapid breast cancer assessment method

by Ian Mundell
29 January 2024

Better diagnosis could spare women the stress of chemotherapy (Photo: Getty Images)

Share this
Post this
Share on reddit
Share on LinkedIn
Print this story

RELATED STORIES

Digistain, a company with its roots at Imperial, has proven the worth of its breast cancer assessment method in a significant clinical trial.

This is an exciting and significant technology, with real social impact.

– Professor Carlo Palmieri

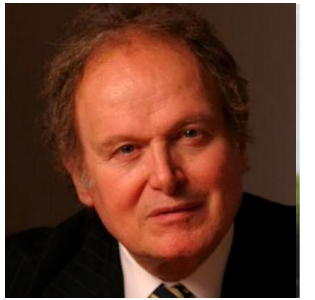
Clatterbridge Cancer Centre NHS Foundation Trust

Clinical Team

CHARLES COOMBES

CONSULTANT ONCOLOGIST

- *Head Director Cancer Research Imperial*
- *Chairman Int. Collaborative Cancer Group*
- *>30 years in Breast Oncology Charing Cross Hospital*
- *Specialism in Endocrine Therapy*



SIR NICK WRIGHT

CONSULTANT PATHOLOGIST

- *Prof Histopathology*
- *Head of Pathology CRUK*
- *President GB Pathological Society*
- *Knighted for Services to Medicine*

EMAD RAKHA

CONSULTANT PATHOLOGIST

- *General Secretary Int. Soc. Breast Pathology*
- *Journal Clin. Onc. Top Cited Author*
- *30 years experience Breast Pathology*
- *>350 Peer reviewed Publications*

Independent Landmark Validation

digistain

nature

Explore content | About the journal | Publish with us | Subscribe

nature > outlook > article

OUTLOOK | 11 July 2024

Infrared spectrometry guides cancer treatment

Determining who needs chemotherapy can be an expensive and complex task. A new technology could make the process more accessible.

Independent Landmark Validation

digistain

Performance of a novel spectroscopy-based tool for adjuvant therapy decision-making in hormone receptor-positive breast cancer: a validation study

R Charles Coombes[1] · Christina Angelou[1] · Zamzam Al-Khalili[1] · William Hart[1] · Darius Francescatti[2] · Nicholas Wright[3] · Ian Ellis[4] · Andrew Green[4] · Emad Rakha[4] · Sami Shousha[1] · Hemmel Amrania[1] · Chris C. Phillips[1] · Carlo Palmieri[5]

Received: 2 August 2023 / Accepted: 11 December 2023 / Published online: 20 January 2024

Independent Landmark Validation

Landmark Clinical Validation	Digistain
Patient Population	N = 801[1]
Patient Follow up	12.7 years
Diagnostic Performance	94%[2]

1 - Breast Cancer Research & Treatment Springer 2024

2 - Independently confirmed in government commissioned study

3 – Delahaye et al Personalized Medicine 2013

Randomised Study with 801 Patients

- The performance of DPS was assessed in a well-characterised cohort of 801 patients treated at the UK's Nottingham City Hospital (1998–2006).

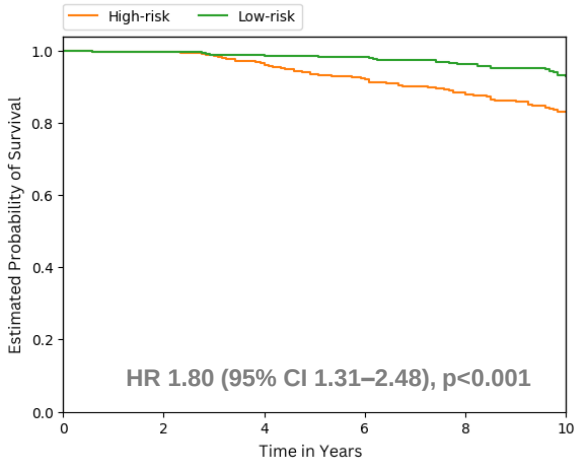
Inclusion Criteria

- Aged ≤70 years
- HR-positive HER2-negative primary operable breast cancer
- ≤3 positive lymph nodes
- Tumour <5 cm diameter
- Ductal carcinoma in situ excluded
- Without adjuvant chemotherapy
  - All patients received only endocrine therapy if HR positive

DPS, Digistain Prognostic Score; HER, human epidermal growth factor receptor 2; HR, hormone receptor; NPI, Nottingham Prognostic Index.

49% Patients Can Safely Avoid Chemotherapy

Recurrence-free survival

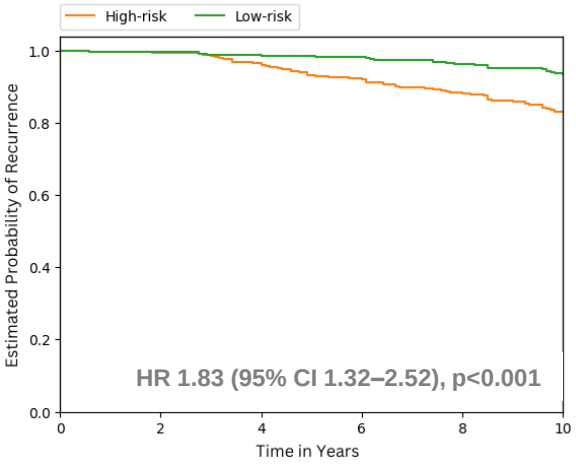


Number at risk

Low	391	387	376	353	321	281
High	404	398	375	335	291	248

Low risk	391 (49.2%)
High risk	404 (50.8%)

Recurrence

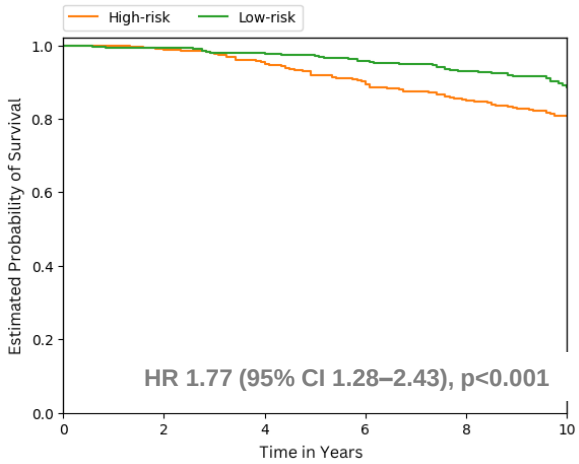


Number at risk

Low	394	390	379	357	325	286
High	401	395	372	331	287	243

Low risk	394 (49.6%)
High risk	401 (50.4%)

Overall survival



Number at risk

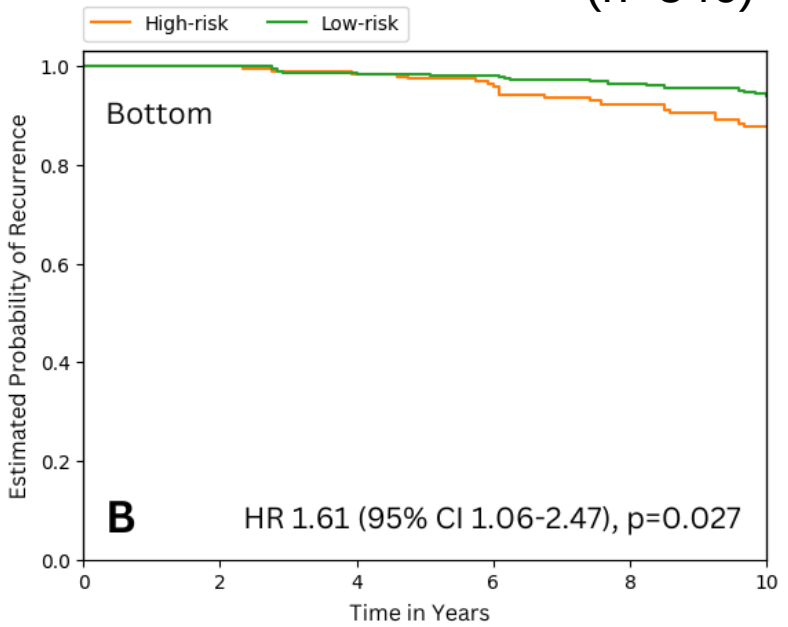
Low	349	344	335	314	285	249
High	446	441	416	374	327	280

Low risk	349 (43.9%)
High risk	446 (56.1%)

DPS, Digistain Prognosis Score; HR, hazard ratio.

LN- & Premenopaausal Patients

(n=546)

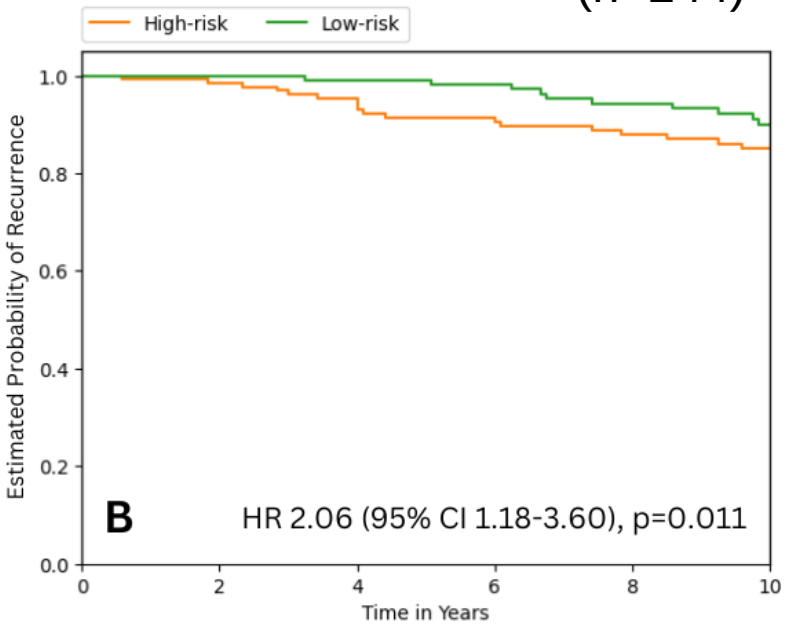


Number at risk

Low	341	338	328	309	280	246
High	205	203	194	176	149	124

LYMPH NODE NEGATIVE

(n=244)

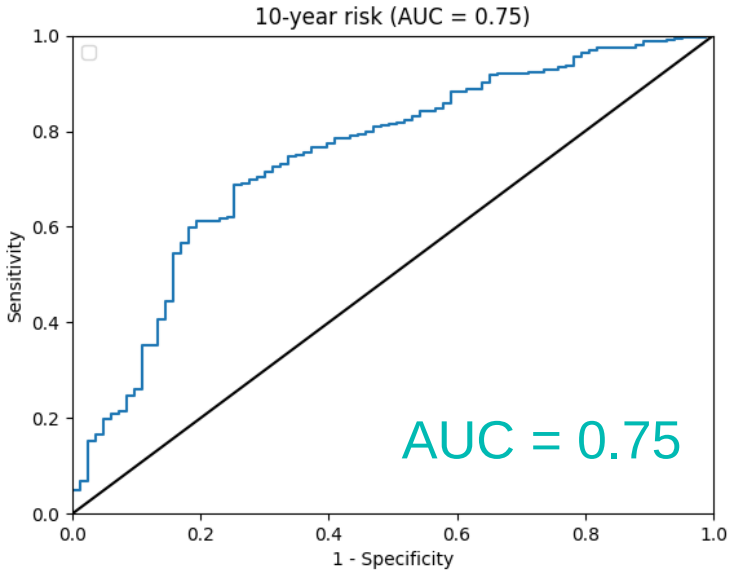


Number at risk

Low	114	114	113	105	90	79
High	130	128	120	111	97	84

PRE-MENOPAUSAL

Predicting Recurrence - Performance



		HR+/ HER2-/ LN+ ≤ 3		HR+/ HER2-/ LN-		HR+/ HER2-/ LN+ ≤ 3 & age ≤ 45 years (premenopausal)		HR+/ HER2-/ LN+ ≤ 3 & age ≥ 60 years (postmenopausal)	
		5-yrs	10-yrs	5-yrs	10-yrs	5-yrs	10-yrs	5-yrs	10-yrs
NPV	PFS	0.99	0.94	0.99	0.95	0.98	0.93	0.98	0.92
	Recurrence	0.99	0.94	0.99	0.95	0.98	0.93	0.98	0.92
AUC	PFS	0.81	0.75	0.71	0.70	0.73	0.62	0.71	0.74
	Recurrence	0.81	0.75	0.71	0.69	0.73	0.63	0.72	0.72

AUC: Area Under the Curve, NPV: Negative Predictive value

Typical AUCs for Incumbent Genomic Assays - 0.55-0.75

Analytical Validation

Genomic tests rely on RNA isolation

- Tissue fixation affects RNA quality
- Digistain measures chemical changes related to chromosomal instability
- Digistain independent of RNA
- Highly stable & reproducible results

Investigation of Prognostic Score Stability with Tissue Fixation Time (N = 233)

Fixation Time (Hours)	DigiStain Index		Oncotype Recurrence Score		Nottingham Prognostic Index	
	Samples	Average (% diff from mean)	Samples	Average (% diff from mean)	Samples	Average (% diff from mean)
0-12	39	0.5493 (0.75)	39	19.82 (8.1)	38	3.263 (2.7)
12-24	62	0.5542 (0.12)	57	19.51 (6.4)	62	3.177 (0.008)
24-48	59	0.5527 (0.14)	54	16.48 (10)	59	3.203 (0.81)
48-144	53	0.5538 (0.048)	48	19.71 (7.5)	53	3.113 (2.0)

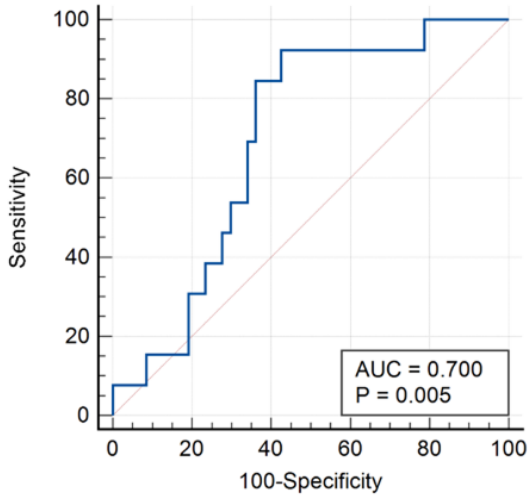
Digistain Score was significantly more stable compared with RNA Transcription based Tests*

** Data on file*

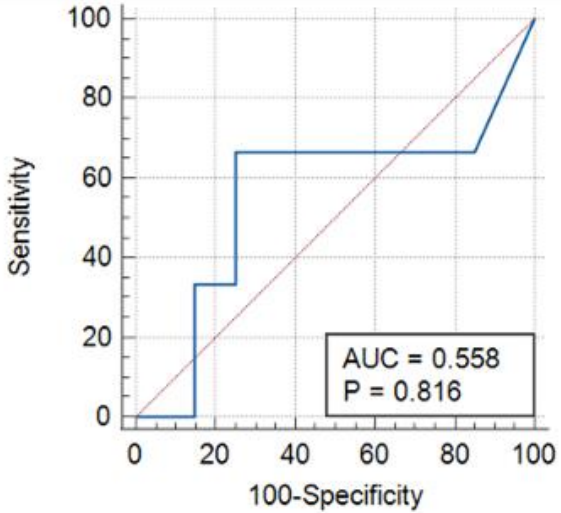
Multicentre Randomised UK Study >323 Patients

Head to Head vs Oncotype

ROC PLOTS FOR 10 YEAR RECURRENCE



Digistain
AUC = 0.70



Oncotype DX
AUC = 0.56

Digistain outperformed Oncotype DX in this patient cohort*

** Data on file*

Health Economic Impact - An Independent Evaluation

EOR analysis:

As an adjunct or as a replacement to Standard care

- £290Mn savings for the NHS
- 1266 Life Years saved

System Impact

- Pathway improvement in line with Health Inequality targets

Patient Population	LN0 Patients		LN1-3 Patients	
Scenario	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Cumulative Potential Cost Savings over 5 years (non-discounted)				
Mean	-£102,085,692	£286,659,734	-£46,244,513	-£31,891,005
Upper CI	-£65,413,296	£383,342,020	-£38,919,599	-£29,600,508
Lower CI	-£142,958,969	£188,611,299	-£54,183,203	-£34,444,436

Table 1. Results of Budget Impact Analysis – Primary Outcome

Patient Population	LN0 Patients		LN1-3 Patients	
Scenario	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Cumulative Potential Life Years Saved (LYS) over 5 years (non-discounted)				
Mean	58	0	30	**1266**
Upper CI	158	81	128	**2040**
Lower CI	-36	-86	-62	***434***

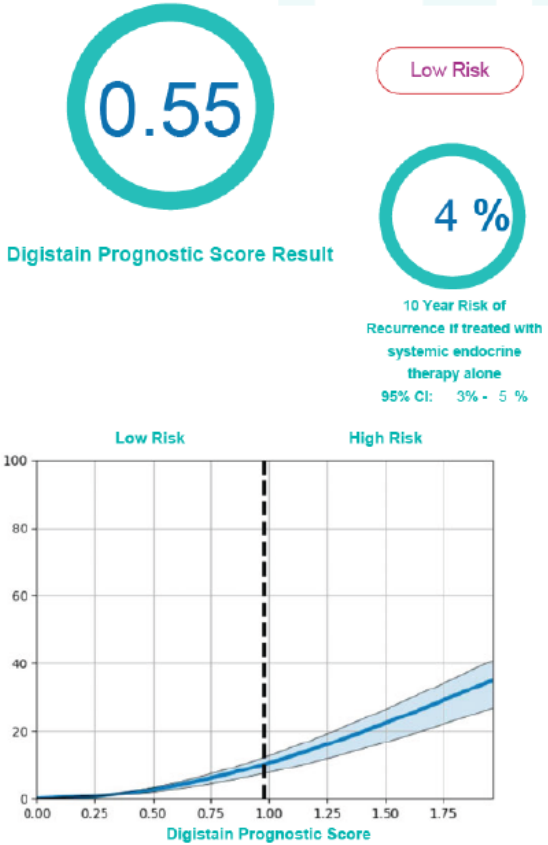
Table 2. Results of Budget Impact Analysis - Secondary Outcome

Case Study - Low Risk

Oncologist wanted adjuvant therapy guidance

- Node Negative
- Grade 2
- 2cm Tumour
- Intermediate Risk Patient (NPI = 3.4)

- Patient received endocrine therapy exclusively after Digistain reported low risk

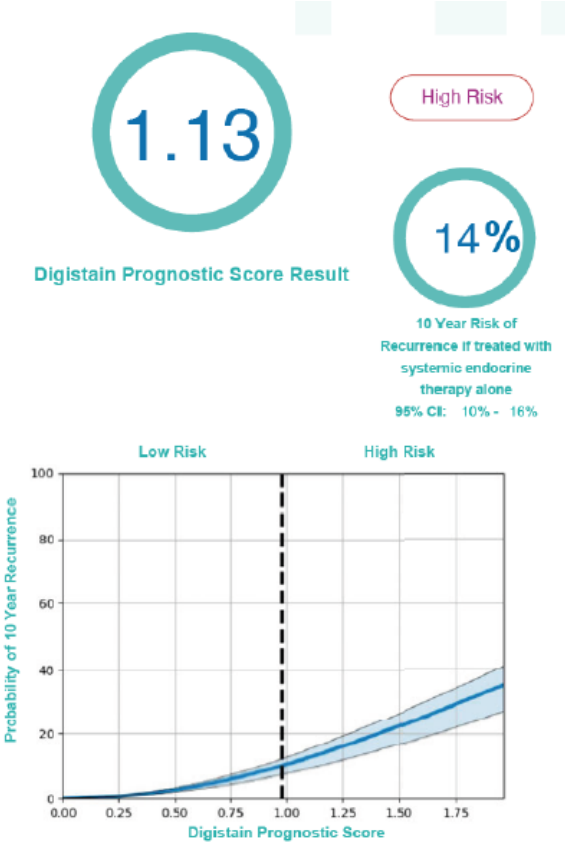


Case Study - High Risk

Oncologist needed adjuvant therapy guidance

- 1 Lymph Node Positive
- Grade 1
- 2.5cm Tumour
- Intermediate Risk Patient

- Patient received FEC adjuvant therapy after - is responded well to treatment



Case Study - Oncotype vs Digistain

Oncologist ordered Oncotype for low risk patient

- Node Negative
- Grade 3
- HER2- & ER+
- 4mm Tumour
- Age = 57
- Low risk Patient
- No serious comorbidities

- Patient received endocrine therapy only (tamoxifen)
- **Died of metastatic BC in 4.8 years**

	Risk Scoring Method
Nottingham Prognostic Index	3.08 (GPG)
Predict	4% risk of BC death in 5y
Oncotype	3% Recurrence Risk in 10y
Digistain	**85%** Recurrence Risk in 10y

Globally Adopted & Reimbursed

- Identical Clinical Evidence
- Global Patents
- Insurance Reimbursement
- Clinical Guidance

UK CA | CE

CLINICAL ADOPTION

SOLCA NÚCLEO DE QUITO

NHS England

Bupa

Apollo HOSPITALS TOUCHING LIVES

MAX Healthcare

Rapid Turnaround

digistain

digistain

Surgery

Spectrometer

Results

Results in 72 hours

$1.2k/ test

Current Process

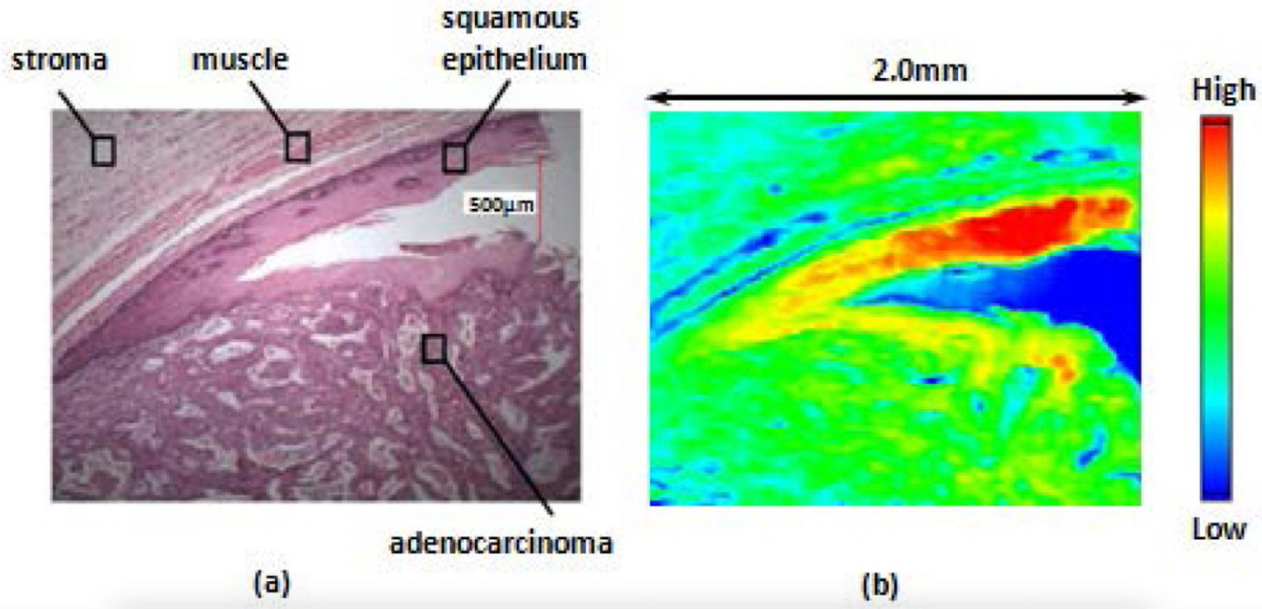
Results

$4k/ test

Patient waits 3-4 weeks

Breast Cancer is Just the Beginning

Digistain is Extensible to Other Cancers



Wright et Al Optics Express 2012

Digistain Marker hallmark of all solid tumours

Proof of Concept studies in variety of cancers:

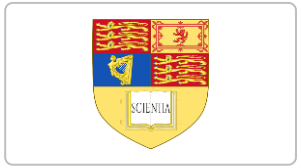
- Checkpoint Inhibitors
- Kidney/bladder
- Colon
- Prostate
- Lung

Acknowledgements

digistain

ACCOLADES

Royal Society Innovation Award



President's Award: Outstanding Research

Institute of Physics Innovation Award

Cancer Research UK Pioneer Award