

Screen-detected versus symptom-detected breast cancer: Tumour characteristics, treatment patterns and survival outcomes

Editor's message

This paper provides a valuable complement to the "Hong Kong Breast Cancer Registry Report No. 18", further elucidating the relationship between breast cancer detection mode and clinical outcomes. Our findings suggest that breast cancer screening, primarily through mammography (MMG), enables the detection of breast cancer with a smaller tumour size and less nodal involvement, leading to less aggressive surgical treatment and systemic therapies. Additionally, breast cancer screening significantly improves breast cancer survival. These results aim to address the evidence gaps in the usefulness of local breast cancer screening and provide local evidence to healthcare providers and policymakers to support the expansion of regular MMG screening.

Introduction

The incidence of breast cancer in women has been rising both globally and locally. In Hong Kong, 5,585 invasive breast cancer cases and 831 in situ cases were newly diagnosed in 2023.¹ Given that MMG is the gold standard for breast cancer detection, the Cancer Expert Working Group on Cancer Prevention and Screening (CEWG) incorporated the latest evidence to revise its guidelines on breast cancer screening in 2020 to recommend a risk-based approach, thereby updating the screening recommendations for women at moderate risk and other women in the general population.²

Although the HKSAR Government launched the Breast Cancer Screening Pilot Programme Phase I in September 2021³ and Phase II in June 2025,⁴ a population-wide government-subsidised breast cancer screening programme has not yet been established.⁵ As reported, about 80% of the cases were self-detected in Hong Kong, along with a low uptake of self-initiated screening.⁶ The current literature suggests that MMG screening reduces breast cancer mortality through early detection and is cost-effective.^{7,8} However, limited local research has been conducted to examine the impact of detection mode on clinical outcomes, particularly regarding survival benefits. When long-term survival outcomes regarding the mode of breast cancer detection begin to mature, these results could provide an improved understanding of the potential benefits of screen-detected breast cancer. A more comprehensive analysis of local data may facilitate decision making by healthcare professionals and policymakers regarding the further expansion of regular MMG screening to a wider population. This study aims to

examine the differences between screen-detected and symptom-detected breast cancer cases, including tumour characteristics, treatment patterns and survival outcomes.

Methods

Data from women aged 18-80 years who were first diagnosed with stage 0-IV breast cancer between 2011 and 2015 were retrieved from the Hong Kong Breast Cancer Registry (HKBCR). These cases were categorised into either screen-detected or symptom-detected group. The screen-detected group was defined as asymptomatic patients whose breast cancers were identified through MMG screening or breast magnetic resonance imaging (MRI), whereas the symptom-detected group was defined as patients who presented with breast symptoms leading to diagnostic imaging. Those who had unknown breast cancer detection methods or missing key information such as staging and survival data were excluded from the analysis.

Descriptive analysis was performed to compare patient profiles, tumour characteristics and treatment patterns between screen-detected and symptom-detected groups. Kaplan-Meier method was used to estimate survival outcomes, including overall survival (OS) and breast cancer-specific survival (BCSS). OS was defined as the time between date of diagnosis and date of death from any cause, while BCSS was defined as the time between the date of diagnosis and the date of breast cancer death. Subgroup analyses, specifically stage-stratified analyses, were also conducted for further investigation. Significance tests (chi-square test and log-rank test) were performed using pairwise deletion to handle missing data. The level of statistical significance was set at $p < 0.05$.

Results and Discussion

In this study, 6,942 patients were eligible for analysis, of whom 733 were screen-detected (99.3% by MMG) and 6,209 were symptom-detected. The median age of the screen-detected group was 53.9 years and that of the symptom-detected group was 52.7 years. As shown in Table 1, 13.0% of the symptom-detected group self-reported a history of regular MMG screening prior to cancer diagnosis, suggesting the presence of interval cancers. Most women were postmenopausal in both the screen-detected (59.8%) and symptom-detected group (52.8%). More patients reported a personal history of benign breast disease in the screen-detected group than in the symptom-detected group (23.6% vs 13.5%). A higher proportion of patients in the screen-detected group had a family history of breast cancer than

those in the symptom-detected group (21.2% vs 13.7%). More than 99% of the patients in either group did not undergo BRCA genetic testing.

Table 1: Clinical characteristics of patients in screen- and symptom-detected groups (N=6,942)

	Screen-detected (n=733)		Symptom-detected (n=6,209)		p value
	n	%	n	%	
Age at diagnosis					<0.001
18-39	10	1.4	578	9.3	
40-49	202	27.6	1,880	30.3	
50-59	346	47.2	2,068	33.3	
60-69	162	22.1	1,274	20.5	
70-80	13	1.8	409	6.6	
Self-reported history of MMG screening					<0.001
Never	224	30.7	4,732	76.5	
Occasional	107	14.7	648	10.5	
Regular	398	54.6	807	13.0	
Unknown	4	—	22	—	
Menopausal status					<0.001
Premenopausal	293	40.2	2,905	47.2	
Postmenopausal	436	59.8	3,246	52.8	
Unknown	4	—	58	—	
Personal history of benign breast disease					<0.001
Yes	171	23.6	825	13.5	
No	553	76.4	5,307	86.5	
Unknown	9	—	77	—	
Family history of breast cancer					<0.001
Yes	153	21.2	844	13.7	
No	568	78.8	5,302	86.3	
Unknown	12	—	63	—	
BRCA testing					0.587
BRCA1	0	0.0	0	0.0	
BRCA2	0	0.0	1	<0.1	
BRCA negative	4	0.5	20	0.3	
No BRCA testing	728	99.5	6,175	99.6	
Unknown	1	—	13	—	

A. Tumour characteristics

As shown in Table 2, 82.9% of the screen-detected group had stage 0-I disease, versus 37.5% of the symptom-detected group. In addition, the proportion of hormone receptor-positive, HER2-negative (HR+HER2-) patients was significantly higher in the screen-detected group, while the proportion of triple-negative breast cancer (TNBC) patients was significantly higher in the symptom-detected group. Patients with screen-detected breast cancer had a smaller tumour size than those who were symptom-detected. The nodal staging was lower in screen-detected group than in the symptom-detected group.

B. Treatment patterns

Across the entire patient cohort (stages 0-IV), over 99% of the patients in both the screen-detected and symptom-detected groups underwent breast surgery (Table 3). Compared to the

Table 2: Tumour characteristics of screen- and symptom-detected groups (N=6,942)

	Screen-detected (n=733)		Symptom-detected (n=6,209)		p value
	n	%	n	%	
Cancer stage					<0.001
Stage 0	302	41.2	472	7.6	
Stage I	306	41.7	1,858	29.9	
Stage II	101	13.8	2,570	41.4	
Stage III	19	2.6	1,113	17.9	
Stage IV	5	0.7	196	3.2	
Immunohistochemical subtype					<0.001
HR+ HER2-	448	70.7	3,795	65.1	
HER2+	143	22.6	1,340	23.0	
TNBC	43	6.8	696	11.9	
Unknown	99	—	378	—	
Primary tumour (T stage)					<0.001
No evidence of primary tumour (T0)	0	0.0	4	0.1	
Carcinoma in situ (Tis)	302	41.4	472	7.7	
Tumour ≤ 20 mm (T1)	361	49.5	2,425	39.4	
Tumour > 20 mm but ≤ 50 mm (T2)	62	8.5	2,648	43.1	
Tumour > 50 mm (T3)	3	0.4	335	5.4	
Chest wall and/or skin invasion (T4)	2	0.3	265	4.3	
Unknown	3	—	60	—	
Regional lymph nodes (N stage)					<0.001
No regional lymph node metastasis (N0)	634	86.8	3,510	57.1	
Micrometastases (N1mi)	12	1.6	218	3.5	
1-3 lymph nodes (N1)	65	8.9	1,456	23.7	
4-9 lymph nodes (N2)	14	1.9	538	8.8	
≥ 10 lymph nodes (N3)	5	0.7	421	6.9	
Unknown	3	—	66	—	

symptom-detected group, the screen-detected group was less likely to undergo extensive breast surgery (mastectomy: 43.0% vs 66.5%, $p<0.001$) and axillary surgery (axillary dissection +/- SLNB: 17.3% vs 51.9%, $p<0.001$).

As shown in Table 4, the use of adjuvant radiotherapy for those who underwent breast-conserving surgery (BCS) was comparable between the two groups (97.1% vs 97.1%, $p=0.962$), reflecting adjuvant radiotherapy as a standard recommendation after BCS.⁹ In contrast, a lower proportion of patients who had mastectomy in the screen-detected group received adjuvant radiotherapy as compared with symptom-detected group (21.0% vs 49.1%, $p<0.001$).

Chemotherapy was less commonly used for screen-detected than symptom-detected breast cancer (25.3% vs 65.7%, $p<0.001$) (Table 5). Although the HR+ HER2- subtype was more common in the screen-detected group, it is unexpected that adjuvant endocrine therapy was much less frequently received compared with the symptom-detected group (50.0% vs 70.9%, $p<0.001$). Less aggressive surgery and systemic therapies by MMG screening potentially saves treatment costs and should be further investigated in cost minimisation models.

C. Survival outcomes

The median follow-up duration was 54 months (range, 1-165 months) for the screen-detected group and 56 months (range, 1-167 months) for the symptom-detected group. As of the data cutoff in June 2025, in the screen-detected group of 733 patients, 37 deaths (5.0%) were reported, including 15 from breast cancer and 21 from unrelated causes. Among the 6,209 patients in the symptom-detected group, there were 831 deaths

(13.4%), of which 559 were due to breast cancer and 271 were due to other causes.

Figure 1 illustrates the Kaplan-Meier estimates of OS for the overall cohort (a) and by cancer stage (b-f). The estimated 10-year OS for the screen-detected group was significantly higher than that for the symptom-detected group (88.0% vs 74.3%, $p<0.001$). The OS benefit of screen-detected as compared with

the symptom-detected group did not persist when stratified by breast cancer stages, except in stage I.

Figure 2 illustrates the Kaplan-Meier estimates of BCSS for the overall cohort (a) and by cancer stage (b-f). The estimated BCSS at 10 years favoured the screen-detected group over symptom-detected group (95.3% vs 82.5%, $p<0.001$). Our findings also revealed that the 10-year BCSS benefit from MMG screening was observed in stage I breast cancer patients.

To understand why survival advantages were observed exclusively in patients with stage I breast cancer, an exploratory stage-stratified analysis of clinicopathological characteristics was performed. Detailed results are presented in Table 6. Owing to the small number of screen-detected patients presenting with stage III ($n=19$) and IV ($n=5$) disease, they were excluded from this comparative analysis to maintain statistical rigor. Within the stage I subgroup, the tumour size was smaller in the screen-detected group (58.5% with tumour ≤ 1 cm) compared to the symptom-detected group (27.6%). Screen-detected tumours generally have a lower tumour grade and a lower prevalence of lymphovascular invasion, and those features are linked to a more favourable prognosis. This may signify deeper biological distinctions in screen-detected versus symptom-detected breast cancer rather than mere stage migration.

The lack of a survival advantage in breast cancer diagnosed at stage II does not imply that screening is non-beneficial, but rather that its primary benefit is derived from inducing stage migration. When breast cancer is diagnosed at stage II or higher, effective standard-of-care treatments and relatively homogenous tumour biology may diminish the marginal prognostic significance of the detection method. Likewise, breast cancer screening may not confer an additional survival benefit to stage 0 patients as their clinical course is more indolent, resulting in a near-perfect long-term survival.

Table 3: Surgical treatment received in screen- and symptom-detected groups (N=6,942)

	Screen-detected (n=733)		Symptom-detected (n=6,209)		p value
	n	%	n	%	
Breast surgery					<0.001
Breast-conserving surgery	415	56.6	2,021	32.6	
Mastectomy	315	43.0	4,118	66.5	
None	3	0.4	54	0.9	
Unknown	0	—	16	—	
Axillary surgery					<0.001
Sentinel node biopsy (SLNB)	498	68.5	2,749	45.4	
Axillary dissection +/- SLNB	126	17.3	3,146	51.9	
None	103	14.2	164	2.7	
Unknown	6	—	150	—	

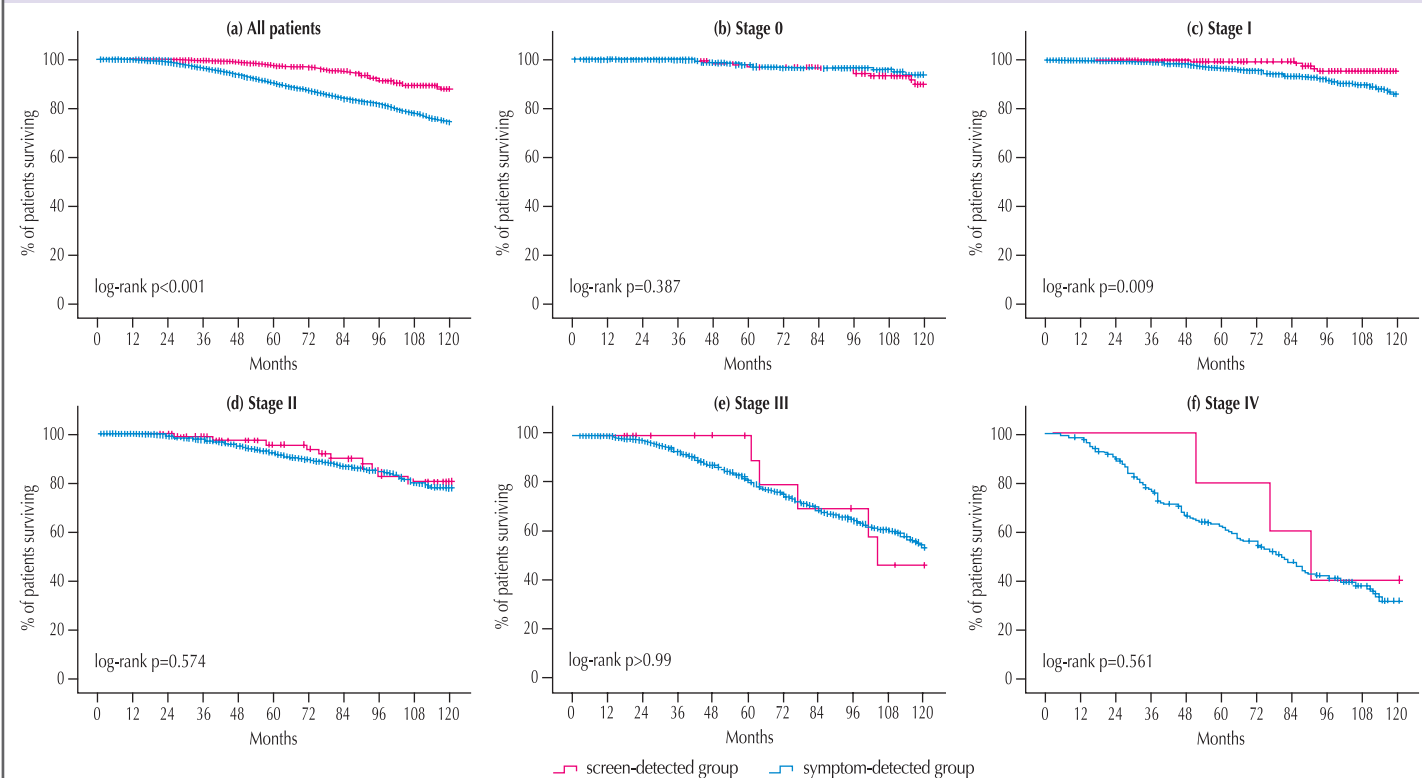
Table 4: Use of adjuvant radiotherapy reported separately for breast-conserving surgery and mastectomy in screen- and symptom-detected groups

	Screen-detected (n=730)		Symptom-detected (n=6,139)		p value
	n	%	n	%	
Breast-conserving surgery					0.962
Adjuvant radiotherapy	403	97.1	1,951	97.1	
No adjuvant radiotherapy	12	2.9	59	2.9	
Unknown	0	—	11	—	
Mastectomy					<0.001
Adjuvant radiotherapy	66	21.0	2,014	49.1	
No adjuvant radiotherapy	248	79.0	2,086	50.9	
Unknown	1	—	18	—	

Table 5: Use of systemic treatments between screen- and symptom-detected groups among stage 0-III patients

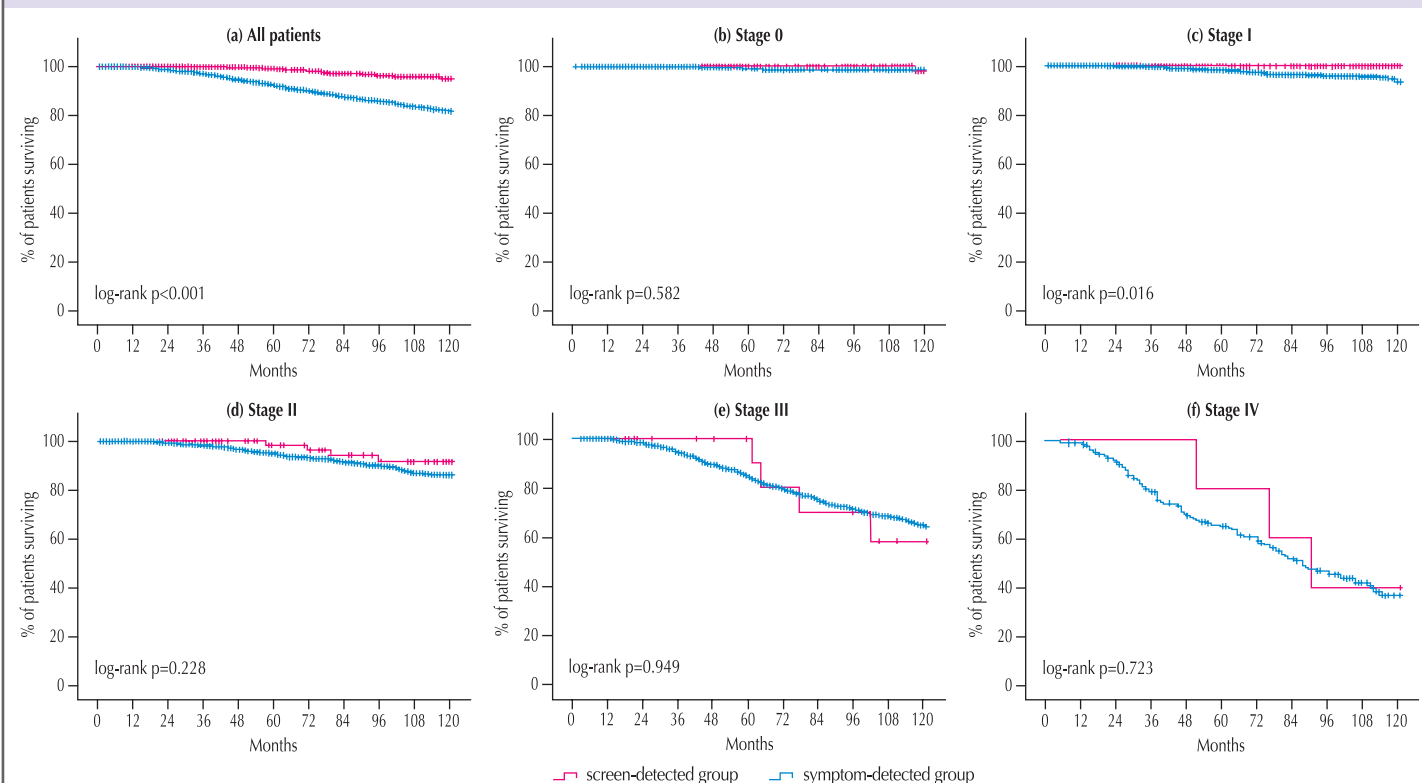
	Screen-detected (n=728)		Symptom-detected (n=6,013)		p value
	n	%	n	%	
Chemotherapy					<0.001
Yes	184	25.3	3,943	65.7	
No	542	74.7	2,057	34.3	
Unknown	2	—	13	—	
Adjuvant endocrine therapy					<0.001
Yes	363	50.0	4,244	70.9	
No	363	50.0	1,745	29.1	
Unknown	2	—	24	—	

Figure 1: 10-year OS of all patients and by cancer stage



Note: See Table 2 for detailed group sizes.

Figure 2: 10-year BCSS of all patients and by cancer stage



Note: See Table 2 for detailed group sizes.

Conclusion

In conclusion, our local data confirm the well-established overall benefits of breast cancer screening by MMG, namely lower stage at diagnosis, less aggressive treatment modalities and improved survival. These results also add valuable real-world evidence to the effectiveness of breast cancer screening

and provide local evidence for healthcare providers and policymakers to decide on population-wide MMG screening.

References

(Please refer to Chinese version)

Table 6: Clinicopathological features of stage 0, I and II breast cancer in screen- and symptom-detected groups

	Stage 0					Stage I					Stage II				
	Screen- (n=302)		Symptom- (n=472)		p value	Screen- (n=306)		Symptom- (n=1,858)		p value	Screen- (n=101)		Symptom- (n=2,570)		p value
	n	%	n	%		n	%	n	%		n	%	n	%	
Age at diagnosis					<0.001					<0.001					0.002
18-39	3	1.0	47	10.0		5	1.6	173	9.3		1	1.0	226	8.8	
40-49	98	32.5	174	36.9		71	23.2	606	32.6		25	24.8	720	28.0	
50-59	137	45.4	134	28.4		151	49.3	581	31.3		47	46.5	884	34.4	
60-69	59	19.5	81	17.2		73	23.9	358	19.3		27	26.7	577	22.5	
70-80	5	1.7	36	7.6		6	2.0	140	7.5		1	1.0	163	6.3	
Self-reported history of MMG screening					<0.001					<0.001					<0.001
Never	85	28.2	317	67.4		84	27.7	1,331	72.1		40	39.6	2,002	78.1	
Occasional	42	14.0	74	15.7		52	17.2	216	11.7		10	9.9	246	9.6	
Regular	174	57.8	79	16.8		167	55.1	300	16.2		51	50.5	314	12.3	
Unknown	1	—	2	—		3	—	11	—		0	—	8	—	
Family history of breast cancer					0.005					0.008					0.203
Yes	68	22.7	69	14.7		61	20.5	267	14.5		18	18.0	344	13.5	
No	231	77.3	399	85.3		237	79.5	1,571	85.5		82	82.0	2,197	86.5	
Unknown	3	—	4	—		8	—	20	—		1	—	29	—	
Invasive tumour size										<0.001					<0.001
≤0.10 cm	—	—	—	—		24	8.2	45	2.6		0	0.0	4	0.2	
0.11-0.50 cm	—	—	—	—		66	22.4	175	10.0		0	0.0	13	0.5	
0.51-1.00 cm	—	—	—	—		82	27.9	262	15.0		11	10.9	39	1.5	
1.01-2.00 cm	—	—	—	—		122	41.5	1,266	72.4		37	36.6	347	13.7	
2.01-5.00 cm	—	—	—	—		—	—	—	—		52	51.5	2,071	81.5	
>5.00 cm	—	—	—	—		—	—	—	—		1	1.0	66	2.6	
Unknown	—	—	—	—		12	—	110	—		0	—	30	—	
Tumour grade										0.014					<0.001
Grade 1	—	—	—	—		86	30.4	452	26.5		20	20.2	301	12.8	
Grade 2	—	—	—	—		142	50.2	781	45.8		57	57.6	1,034	44.1	
Grade 3	—	—	—	—		55	19.4	472	27.7		22	22.2	1,011	43.1	
Unknown	—	—	—	—		23	—	153	—		2	—	224	—	
Lymphovascular invasion										<0.001					0.809
Present	—	—	—	—		20	7.2	257	15.5		33	35.5	759	34.3	
Absent	—	—	—	—		256	92.8	1,406	84.5		60	64.5	1,456	65.7	
Unknown	—	—	—	—		30	—	195	—		8	—	355	—	
Immunohistochemical subtype					0.955					0.108					0.011
HR+HER2-	148	68.5	188	68.1		208	70.0	1,294	71.8		78	78.0	1,599	63.6	
HER2+	56	25.9	74	26.8		67	22.6	328	18.2		15	15.0	545	21.7	
TNBC	12	5.6	14	5.1		22	7.4	180	10.0		7	7.0	369	14.7	
Unknown	86	—	196	—		9	—	56	—		1	—	57	—	
Ki-67 index					0.845					0.212					0.040
<20%	55	68.8	135	69.9		93	58.5	558	53.2		26	48.1	485	34.5	
≥20%	25	31.3	58	30.1		66	41.5	491	46.8		28	51.9	919	65.5	
Unknown	222	—	279	—		147	—	809	—		47	—	1,166	—	

Note: Due to the small number of screen-detected patients presenting stage III (n=19) and IV (n=5) disease, cross-tabulations and inferential statistical testing were omitted.

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