Different MammaPrint and BluePrint molecular profiles and clinical-pathological features of early stage breast cancer in Chinese patients in the United States and Hong Kong

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BACKGROUND

Breast cancer rates among Asian women are relatively low compared with Western populations; however, rates have increased in recent years (1-2). Few studies have characterized clinical-pathological features and molecular subtypes in Asian breast cancer patients, although substantial variation in occurrence among Asian subpopulations has been reported (2). Here, we report clinical factors, pathology, and molecular profiles of Chinese patients enrolled in the US and Hong Kong, HKSAR, and from randomly selected and age-matched Caucasian (Cau) and African-American (AA) patients.

STUDY POPULATION AND METHODS

This analysis included Chinese patients enrolled in the United States (n=24) and Hong Kong (n=42) with early stage, invasive breast cancer for whom clinical characteristics were captured with informed consent, enrolled between 2012 and 2018 (NCT02669745). For ethnicity comparisons, randomly selected Cau (n=100) and AA (n=100) were included from the prospective, US-based FLEX registry (NCT03053193).

Because Chinese patients were significantly younger than Cau and AA patients, age-matched Cau (n=132) and AA (n=33) patients were included for comparison. Ethnicity was patient reported. Clinical characteristics, pathology, and results from the 70-gene (70-GS, MammaPrint) risk of recurrence and 80-gene (80-GS, BluePrint) molecular subtyping signatures were compared. Student t test and Chi squared test were used for comparisons.

CLINICAL CHARACTERISTICS

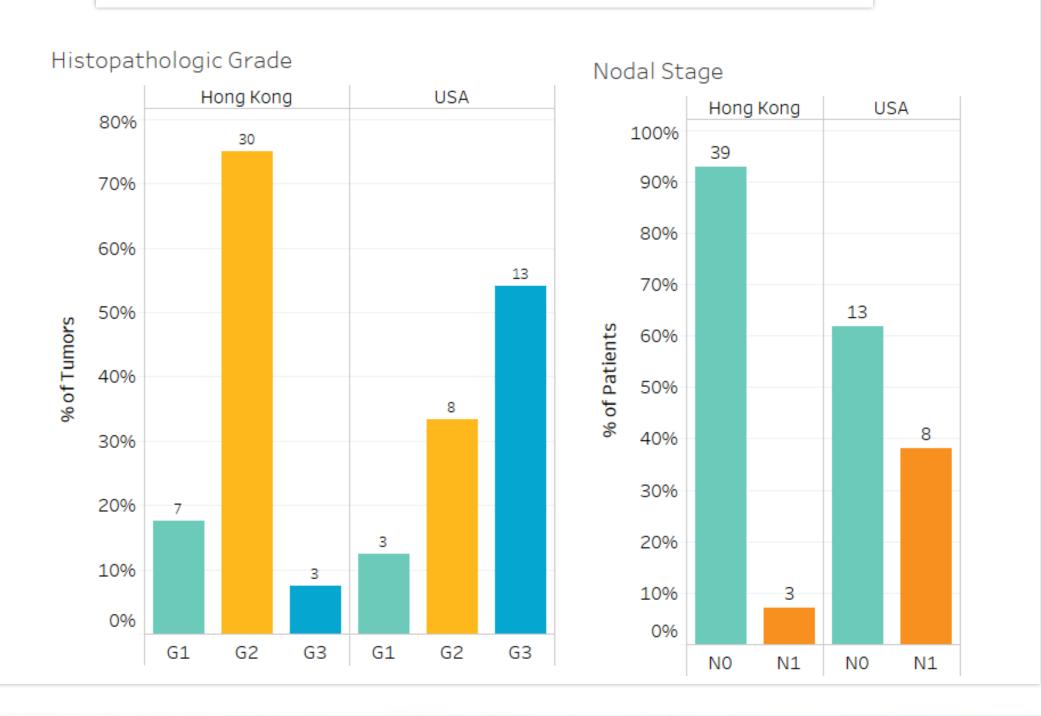| Clinical Characteristics (unknowns excluded)	Chinese (n=66)	Caucasian (n=100)	African American (n=100)	Age-matched Caucasian (n=132)	Age-matched African American (n=33)
Patient Ethnicity					
Age, years					
Median	51	63	61	51	51
Mean	51.0	60.9	58.9	51.0	51.3
Menopausal Status					
Pre or Peri	35 (54%)	13 (14%)	21 (23%)	62 (50%)	12 (41%)
Post	30 (46%)	82 (86%)	69 (77%)	61 (50%)	17 (59%)
Tumor Stage					
T1	48 (74%)	64 (64%)	50 (50%)	94 (73%)	14 (50%)
T2	17 (26%)	28 (28%)	41 (41%)	28 (22%)	13 (46%)
T3	0	7 (7%)	5 (5%)	5 (4%)	1 (4%)
T4	0	1 (1%)	4 (4%)	1 (1%)	0
Nodal Stage					
N0	55 (83%)	81 (83%)	73 (75%)	104 (83%)	23 (79%)
N1	11 (17%)	16 (16%)	16 (16%)	20 (16%)	5 (17%)
N2	0	1 (1%)	6 (6%)	2 (2%)	1 (3%)
N3	0	0	2 (2%)	0	0
Grade					
G1	10 (16%)	29 (31%)	26 (27%)	39 (32%)	4 (13%)
G2	38 (59%)	47 (50%)	33 (34%)	63 51%)	10 (32%)
G3	16 (25%)	17 (18%)	37 (39%)	21 (17%)	17 (55%)
Tumor Type					
IDC	53 (80%)	72 (72%)	69 (69%)	109 (88%)	26 (87%)
ILC	5 (8%)	15 (15%)	15 (15%)	9 (7%)	3 (10%)
Mixed IDC/ILC	2 (3%)	3 (3%)	4 (4%)	0	0
Other	6 (9%)	10 (10%)	12 (12%)	6 (5%)	1 (3%)
ER status (IHC)					
Positive	60 (91%)	95 (97%)	77 (79%)	120 (93%)	27 (82%)
Negative	6 (9%)	3 (3%)	20 (21%)	9 (7%)	6 (18%)
HER2 IHC/FISH					
Negative	55 (83%)	83 (87%)	80 (87%)	115 (89%)	27 (87%)
Equivocal	4 (6%)	5 (5%)	2 (2%)	4 (3%)	1 (3%)
Positive	7 (11%)	7 (7%)	10 (11%)	10 (8%)	3 (10%)

Clinical Characteristics Chinese patients (N=66)	Caucausian (n=100)	African American (n=100)	Age-matched Caucasian (n=132)	Age-matched African American (n=33)
Age	p<0.0001	p<0.0001	ns	ns
Menopausal Status	p<0.0001	p<0.0001	ns	ns
Tumor Stage	ns	p=0.02	ns	p=0.04
Histopathologic grade	ns	p=0.008	p=0.049	p=0.014
ER status	ns	p=0.048	ns	ns

MAMMAPRINT AND BLUEPRINT RESULTS

Patient Group	MP Low Risk Luminal A	MP High Risk Luminal B	MP High Risk HER2-type	MP High Risk Basal-type
Chinese (pooled)	28 (44%)	25 (39%)	6 (9%)	5 (8%)
Hong Kong	17 (49%)	20 (42%	1 (2%)	3 (7%)
US	8 (35%)	8 (35%)	5 (22%)	2 (9%)
Caucasian	53 (53%)	41 (41%)	1 (1%)	5 (5%)
African American	32 (32%)	38 (38%)	6 (6%)	24 (24%)
Age-matched Caucasian	69 (52%)	45 (34%)	6 (5%)	12 (9%)
Age-matched African American	8 (24%)	12 (36%)	2 (6%)	11 (33%)

Hong Kong vs. US Chinese Patients

Between US- and Hong Kong Chinese patients, grade (p=0.0001) and nodal status (p=0.002) were significantly different. BluePrint subtyping distribution was approaching significance (p=0.081) between these groups.

Histopathologic Grade — Hong Kong vs USA

Nodal Stage — Hong Kong vs USA

CONCLUSIONS

- The current study revealed disparities in clinical and molecular features of breast tumors between Chinese American and Hong Kong patients, and among Chinese, Cau, and AA patients.
- Compared with Caucasian patients, Chinese breast cancer patients were significantly younger, more likely to be pre/peri-menopausal, had a greater frequency of high grade and HER2-type tumors, and fewer Luminal A-type tumors.
- Chinese patients were also significantly younger than AA patients, although high grade and Basal-type tumors were more frequent in AA patients.
- Compared with Hong Kong patients, Chinese American patients had greater frequency of grade 3 tumors and lymph node involvement. HER2-type tumors were also more prevalent, although not statistically significant.
- Although the sample size is small, these results are consistent with other reports of younger age and greater prevalence of HER2-type tumors in Asian breast cancer patients, compared with those of European ancestry (2-5). These findings suggest a possible interaction between genetics and lifestyle factors, and perhaps influenced by immigration.
- Further study is needed to validate these trends, and future studies of breast cancer in ethnic subpopulations should incorporate evaluation of genomic profiling.

References
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