Prediction of Survival Outcome Using Chuang's Prognostic Scale in Metastatic Breast Cancer

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Abstract

Background: For physicians and patients, survival estimation is vital for the treatment plan, especially with frequent use of new therapeutic agents in metastatic breast cancer (MBC). The Chuang's Prognostic Scale (CPS) is a validated prognostic score that may be useful in the avoidance of unnecessary palliative systemic treatment. **Aim:** The present study aimed to evaluate the CPS in survival prediction in patients with MBC after at least two lines of palliative systemic chemotherapy protocols (PSCPs). **Methods:** CPS was prospectively measured in 221 patients with MBC. The total score ranged from 0 to 8.5; the lower score refers to a good prognosis. The survival assessment was made by the Kaplan–Meier curve and the survival difference among the groups was estimated by log-rank test. **Results:** Using the cutoff value of CPS 5.7, the patients were classified into two groups: Group A had score ≤5.7 (174 patients, 78.7%) and Group B had CPS score >5.7 (47 patients, 21.3%). About 86.2% of the patients in Group A survived >3 months (median survival was 165 days, 95% confidence interval [CI]: 77–261) compared with 21.3% of patients survived in Group B (median survival was 81 days, 95% CI: 55–123) (P = 0.00). The sensitivity, specificity, positive predictive value, and negative predictive value were 97.6% (95% CI: 87.4–99.9), 98.3% (95% CI: 95.2–99.7), 93.2% (95% CI: 81.6–97.7), and 99.4% (95% CI: 96.2–99.9), respectively, for the 3-month mortality prediction. **Conclusion:** CPS could be helpful in estimating the survival outcome in patients with MBC who received at least two PSCPs.

Keywords: Chuang's Prognostic Scale, metastatic breast cancer, palliative systemic chemotherapy

INTRODUCTION

Globally, breast cancer (BC) is the most commonly diagnosed cancer and is the second cause of disease-related deaths. In 2020, BC diagnosed cases will be 279,100 and 42,690 will die, according to the American Cancer Society.[1]

Metastatic BC (MBC) patients are usually receiving multiple chemotherapy protocols at the end of life. This maybe due to the relative chemosensitivity and the multiplicity of newly approved drugs.[2]

Despite there is growing evidence supporting the use of palliative care service alone for patients may be to die shortly, still, aggressive care at the end of life is a common practice.[3]

Standardized models to predict the survival in MBC may help to avoid cancer-directed therapy in patients who may not benefit and even associated with detrimental outcome. The prognostic models evolved to meet these needs.[4]

Chuang *et al.* proposed a score based on a prospective trial that included 356 Taiwanese patients with terminal cancer. The scale ranged from 0.0 to 8.5, with a lower score denoting better prognosis.[5]

The current study aimed to evaluate the Chuang's Prognostic Scale (CPS) in survival prediction in patients with MBC after at least two lines of palliative systemic chemotherapy protocols (PSCPs).

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METHODS

A prospective study included 221 patients with MBC who were treated at Oncology Center, King Salman Armed Forces Hospital, KSA, and in Medical Oncology Department, Faculty of Medicine, Zagazig University, Egypt. The inclusion criteria were age ≥18 years, histopathological confirmed BC, radiological evidence of metastasis, and received ≥2 chemotherapy protocols.

CPS was assessed at the first time encountering the patients. The required information to define the CPS score was collected by the main responsible physician (MRP). CPS scored according to eight items: cognitive impairment, tiredness, edema, ascites, lung metastases, liver metastases, weight loss, and Eastern Cooperative Oncology Group performance status (ECOG PS). Table 1 illustrates the scoring and severity.

The follow-up period was till death or at least 3 months. The cutoff value of CPS for 3-month prediction of death was determined by the receiver operating characteristic (ROC) curve. The survival was estimated by the Kaplan–Meier method, and the difference in survival among the CPS groups was estimated by log-rank test. The survival was defined as the time interval from scoring assessment until the last follow-up or death.

Statistical analysis

It was carried out by SPSS 22.0 for Windows (SPSS Inc., Chicago, IL, USA). $P < 0.05$ was considered statistically significant.

RESULTS

The main clinical, pathological, and demographic features of 221 eligible patients with MBC are illustrated in Table 2. The majority of the patients are postmenopausal, and capecitabine represented the most commonly used chemotherapy (39.8%). A total of 160 patients (73.4%) survived more than 3 months.

The cutoff value of CPS was 5.7 for 3-month mortality prediction, referring to ROC curve [Figure 1]. Based on this value, our patients were divided into two groups: Group A that included a CPS score ≤5.7 (174 patients, 78.7%) and Group B had CPS score >5.7 (47 patients, 21.3%).

Nearly 86.2% of the patients in Group A survived >3 months when compared with 21.3% of patients who survived in Group B.

Table 3 illustrates the criterion values and coordinates of the ROC curve (sensitivity, specificity, positive predictive value [PPV], and negative predictive value [NPV]).

The median CPS score was 4.2. For all the patients, the median survival was 152 days (95% confidence interval [CI]: 55–261),

Table 1: The Chuang's Prognostic Scale; severity band scoring

Category	Degree	Description	Score
ECOG PS	1	0-1	0.0
	2	2	1.5
	3	3	2
	4	4	3
Cognitive impairment	0	Never happened	0.0
	1	Lethargy	0.5
	2	Confusion	0.5
	3	comatose	0.5
Tiredness	0	Never happened	0
	1	Mild	0
	2	Moderate	0
	3	Severe	1
Weight loss at last 3 months	0	Non	0.0
	1	<5	0.2
	2	5-10	0.7
	3	>10	1
Edema	0	Non	0
	1	Pitting edema <1/2 fingerbreadth	1
	2	Pitting edema 1/2-1 fingerbreadth	1
	3	Pitting edema >1 fingerbreadth	1
Ascites	0	Non	0
	1	Ultrasound detection	0
	2	Shifting dullness on clinical examination	1
	3	Umbilical protrusion	1
Liver metastasis	No	Absent	0
	Yes	Present	0.5
Lung metastasis	No	Absent	0
	Yes	Present	0.5

ECOG PS: Eastern Cooperative Oncology Group performance status

Table 2: Characteristics of 221 patients with metastatic breast cancer

Category	Total=221, *n* (%)
Age (years)	
<60	107 (48.4)
≥60	114 (51.6)
Menopause	
Premenopausal	71 (32.1)
Postmenopausal	150 (67.9)
Pathology	
IDC	180 (81.4)
Non-IDC	41 (18.6)
Grade	
I	27 (12.2)
II	101 (45.7)
II	93 (42.1)
Hormone status (ER/PR)	
Negative	60 (27.1)
Positive	161 (72.9)
Her-2	
Negative	181 (81.9)
Positive	40 (18.1)
Ki-6	
Low	70 (31.7)
High	151 (68.3)
Type of chemotherapy	
Capecitabine	88 (39.8)
Carboplatin	47 (21.3)
Taxane	36 (16.3)
Anti-HER-2 therapy	32 (14.5)
Eribulin	18 (8.1)
Bone metastasis	
Yes	67 (30.3)
No	154 (69.7)
Lymph node metastasis	
Yes	39 (17.6)
No	182 (82.4)
Liver metastasis	
Yes	117 (52.9)
No	104 (47.1)
Lung metastasis	
Yes	93 (42.1)
No	128 (57.9)
Survival (months)	
<3	61 (26.6)
>3	160 (73.4)

ER: Estrogen receptors, PR: Progesterone receptors, IDC: Invasive duct carcinoma

Table 3: Sensitivity and specificity of Chuang's Prognostic Scale cutoff value of 5.7 for predicting 3-month mortality

Category	Percentage	95% CI
Sensitivity	97.6	87.4-99.9
Specificity	98.3	95.2-99.7
PPV	93.2	81.6-97.7
NPV	99.4	96.2-99.9

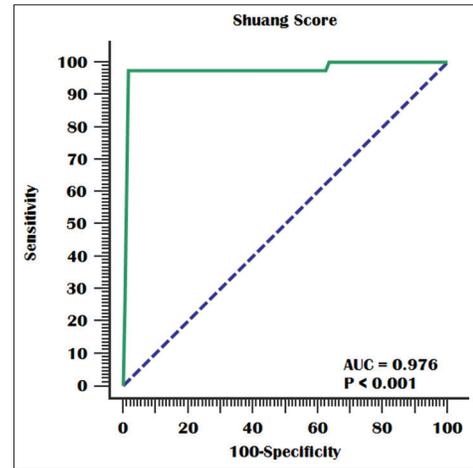PPV: Positive predictive value, NPV: Negative predictive value, CI: Confidence interval

Figure 1: The prediction of 3-month mortality using the Chuang's Prognostic Scale using receiver operating characteristic curve

survival estimation, researchers attempted to incorporate different prognostic factors to utilize models that enable physicians to apply in those subtypes of patients. The rational of prognostication improvement is to give patients a clear data about their anticipated survival to allow them the freedom to choose the treatment category (palliative, disease directed, or combined) based on the medical and social information.[6]

CPS is a simple clinical and radiological score developed to predict the survival in patients with terminal cancer. The median OS was 13 days. The PPV was 0.76 and the NPV was 0.71 when the used cutoff score was ≥3.5 to predict survival <2 weeks, while it was 0.75 and 0.7, respectively, when the cutoff score was ≥6.0 to predict survival <1 week.[5]

Moreover, CPS was evaluated on 61 patients with advanced cancer to predict in-hospital mortality and reported that, the median survival was 118 days in patients with low scores. These results reflect the possibility of applying this score in advanced nonterminal cancer patients.[7]

In a prospective study that included 36 patients with metastatic colorectal cancer receiving PSCP, CPS was used to divide the patients into two groups based on the cutoff value which was 5. The authors reported that patients with a high score (>5) were associated with poor survival (61 days) compared with 149 days for those with CPS ≤5.[8]

Among a systematic review, Ter Veer *et al.* evaluated seven prognostic tools (Palliative Prognostic Score,

whereas it was 165 days for Group A (95% CI: 77–261) and was 81 days (95% CI: 55–123) for Group B (*P* = 0.00). Figure 2 shows the Kaplan–Meier curve of Group A and Group B.

DISCUSSION

Although the importance of prognostication in patients with terminal cancer, it is not precise enough. To improve the
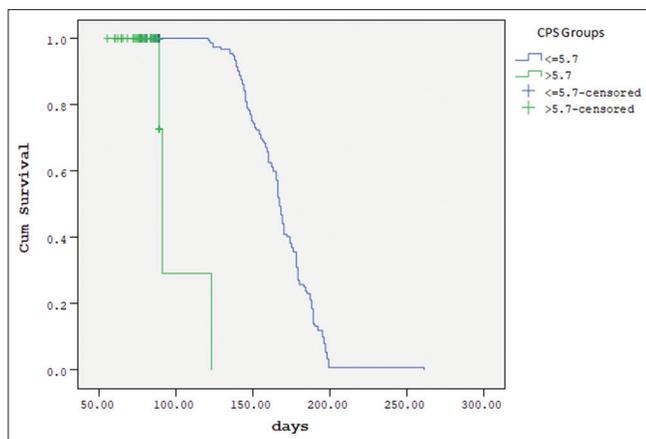
Figure 2: Kaplan–Meier survival curves of patients with metastatic breast cancer receiving chemotherapy according to the Chuang's Prognostic Scale score (Group A [≤5.7] vs. Group B [>5.7])

Delirium-Palliative Prognostic Score, B12/C-Reactive Protein Index, Prognosis in Palliative Care Study, Palliative Prognostic Index, Palliative Performance Scale [PPS], and Glasgow Prognostic Score) in patients with advanced cancer including 49 studies. They reasoned that although these prognostic tools had been validated in advanced cancer prognosis, there was a difference in subjectivity and complexity.[9]

Another study enrolled 1655 advanced cancer patients attended the Princess Margaret Cancer Center from April 2007 to February 2010 reported that the PPS, ECOG PS, and Karnofsky Performance Scale (KPS) were associated with survival outcomes. The concordance index ranged from 0.63 to 0.64 for the three scales.[10]

For our resources, the current study is the first one to evaluate the value of CPS score in MBC receiving PSCPs.

The present study proposed the possibility of classifying patients with MBC receiving PSCPs on the third line or beyond into two groups based on CPS. Patients with a CPS >5.7 experienced a survival <3 months compared with those who had CPS ≤ 5.7 (more than 5.5 months), which was statistically significant.

Moreover, the high sensitivity (97.6%) and specificity (98.3) to predict 3-month mortality obtained using this cutoff point may help physicians judgment when PSCP is deemed for these patients. Consequently, in patients with MBC who had CPS >5.7, the decision of palliative care may be realistic.

In patients with advanced cancer, PSCP may control symptoms and/or prolong survival. Nevertheless, the same protocol may not only lead to short survival, but also deteriorates the quality of life when given to inappropriate patients.[11]

CONCLUSION

The CPS is quick, simple, and easy to apply to patients with MBC receiving PSCPs on the third line or beyond. It may be used by MRP to improve the survival prediction to avoid unneeded systemic therapy.

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Conflicts of interest
There are no conflicts of interest.

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