Cost-Utility Analysis of Trastuzumab Deruxtecan versus Treatment of Physician's Choice in HER2-Positive Metastatic Breast Cancer in Chinese Setting

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INTRODUCTION

- Despite significant improvements in healthcare conditions and funding for cancer control, breast cancer (BC) is one of the top five most common cancers in China[1].
- BC is the most diagnosed and deadliest cancer in women worldwide, with approximately 2.26 million new cases and 680,000 deaths each year[2].
- Antibody-drug conjugates (ADCs) are a means to deliver cytotoxic drugs specifically to kill HER2-overexpressing cancer cells and are one of the fastest-growing anticancer drugs[3].
- Trastuzumab deruxtecan (T-DXd) expressed a favorable benefit–risk profile for progression-free survival and overall survival compared with treatment of physician' s choice (TPC) in patients with HER2-positive metastatic breast cancer (mBC), becoming the second-line standard of care, promisingly. TPC was either capecitabine plus trastuzumab or capecitabine plus lapatinib[4].
- In China, T-DXd was approved for marketing in China in February 2023. However, the cost-effectiveness of T-DXd has not been fully characterized.

Objective

- To estimate the cost-effectiveness of T-DXd versus TPC in HER2-Positive mBC from the Chinese healthcare perspective.
- To explore the most moderate price for T-DXd in a Chinese setting to provide promising suggestions for price and decision-makers.

METHOD

- A partitioned survival model (PSM) was used to evaluate the cost-effectiveness of T-DXd in comparison to TPC. In this research, a three-state PSM was constructed for estimating the lifetime health outcomes and costs of treatment strategies for HER2-Positive mBC. HER2-Positive mBC was assumed as three independent health states, including PFS, progressive disease (PD), and death (**Fig 1, Fig 2**).
- The efficacy and safety data of T-DXd versus TPC for treating HER2-positive mBC patients in our economic research were sourced from the Destiny-Breast 02 trial[4].
- From the Chinese healthcare provider's perspective, direct medical costs were collected and inflated to 2023 US dollars ($) (¥1 = $0.1415) in this research, including medication costs, administration costs, costs of best supportive care (BSC), costs of follow-up visits, costs of terminal care, and adverse event costs.
- The total costs and quality-adjusted life months (QALMs) between the T-DXd group and TPC group for treating Chinese mBC patients were simulated and reported by PSM in TreeAge software. A cost-utility analysis was implied to estimate the lifetime economics evaluation between the two therapies by the total costs and QALMs. The incremental cost-utility ratio (ICUR) was calculated as the key evaluation indicator.
- The willingness-to-pay threshold was set at $3188/QALM.
- Univariate, scenario, and probabilistic sensitivity analyses were performed.

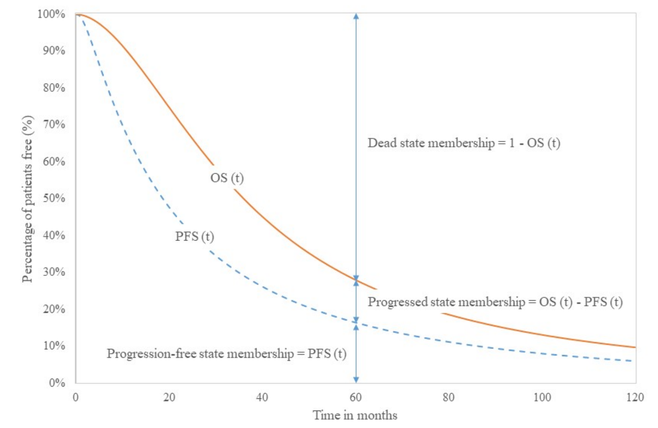

Fig 1 Determining state membership in a 3-state partitioned survival model

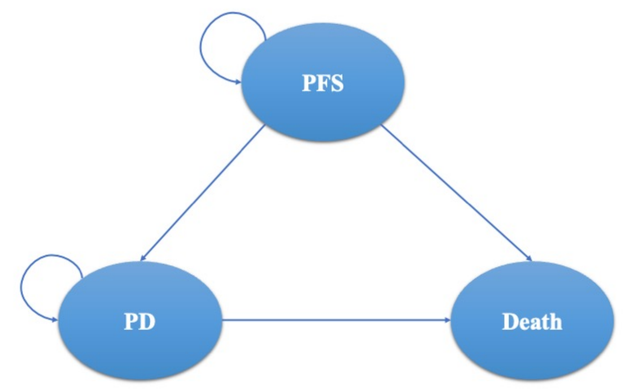

Fig 2 Partitioned survival model outline

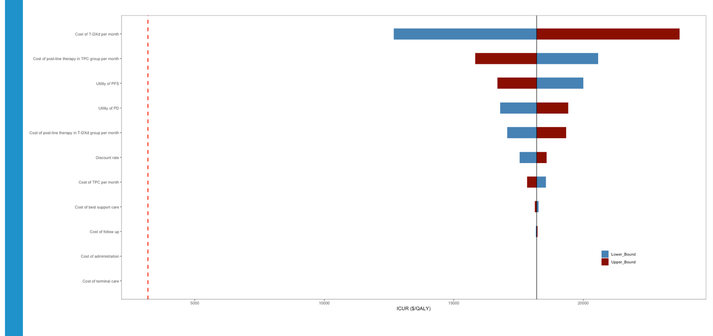

Fig 3 Tornado diagram of univariate sensitivity analyses (T-DXd vs. TPC)

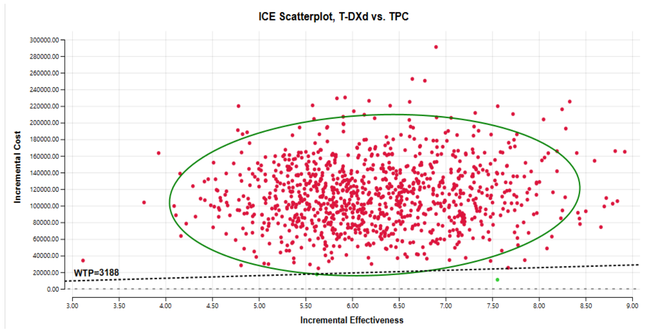

Fig 4 Incremental cost-effectiveness scatter plot of PSA (T-DXd vs. TPC)

RESULTS

- Over a 10-year simulation (**Table 1**), the T-DXd group and TPC group generated 37.15 QALMs and 31.12 QALMs, respectively, indicating that T-DXd showed better performance in treating HER2-positive mBC patients than TPC. When taking medical costs into account, the T-DXd group and TPC group cost $212370.32 and $102658.71, respectively, indicating that T-DXd was not the preferred option. After cost-utility analysis, the ICUR of T-DXd versus TPC was $18201.06, much higher than WTP, indicating that T-DXd appears to be a less cost-effective strategy than TPC in treating patients with HER2-positive mBC for a lifetime in China.
- The results of univariate sensitivity analysis are depicted as a tornado diagram in **Fig 3**. The five factors that have the greatest impact on ICUR are the cycle cost of T-DXd, the cycle cost of post-line therapy in the TPC group, the utility of the PFS state, the utility of the PD state, and the cycle cost of post-line therapy in the TPC group, respectively. However, there were no parameters reverse conclusions.
- The results of the scenario analysis are shown in **Table 2**. The ICUR at three different time horizons did not change the conclusion in the base-case analysis.
- The results of PSA were expressed as an incremental cost-utility scatter plot in **Fig 4**, showing that a 100% proportion of ICUR points was above the WTP threshold.
- Therefore, univariate sensitivity analysis, scenario analysis, and PSA confirmed the base-case conclusion.

Table 1 Results of base-case analysis

Strategy	T-DXd	TPC	T-DXd vs. TPC
Cost, $			
Cost of progression-free state	172067.39	20858.96	151208.43
Cost of post-progression state	40302.93	81799.76	-41496.82
Total cost	212370.32	102658.71	109711.61
QALM, month			
QALM of progression-free state	27.13	11.88	15.25
QALM of post-progression state	10.02	19.25	-9.23
Total QALM	37.15	31.12	6.03
ICUR, $/QALM	-	-	18201.06

Note
The willingness-to-pay threshold was set at $3188/QALM.
All expenses in this study are presented in US dollars for the year 2023.

Table 2 Results of scenario analysis

Time horizon	T-DXd		TPC		Incremental		ICUR*
	QALM	Cost	QALM	Cost	QALM	Cost	
3 years	22.80	126860	19.50	57576	3.30	69284	20964.36
5 years	29.73	168616	25.32	79518	4.41	89097	20203.85
10 years (Baseline)	37.15	212370	31.12	102659	6.03	109712	18201.06
15 years	39.56	228701	32.86	111463	6.71	117238	17481.47

CONCLUSIONS

T-DXd appears to be not cost-effective compared with TPC for HER2-positive mBC patients who were refractory or resistant to trastuzumab emtansine in China. At best, when the cycle cost of T-DXd of $2501.86, T-DXd has an 54.41% probability of being a better choice.

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