Cost-Effectiveness Analysis of Larotrectinib and Entrectinib for Adult Patients with NTRK Gene-Fusion Positive for Breast Cancer

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Background

Breast cancer remains one of the most common cancers globally, affecting millions each year. According to the World Health Organization, over 2 million new cases are diagnosed annually. In the United States, an estimated 1 in 8 women will develop invasive breast cancer during their lifetime. Despite these high incidence rates, the mortality rate of breast cancer has been decreasing by an average of 1.3% per year over the past decade. This decline in mortality can be credited to enhanced diagnostic techniques and more effective treatment options. These advancements include drugs like larotrectinib and entrectinib, which are designed to target the NTRK gene fusion in adult patients, representing a more personalized approach to cancer therapy.

Objective

The study evaluated the cost-effectiveness of larotrectinib and entrectinib, targeting NTRK gene fusion-positive breast cancer in adults. This vital assessment balanced clinical benefits with economic impact, spanning from market introduction to the current rapidly evolving breast cancer treatment landscape. It also encompasses the wider societal consequences, within the healthcare system.

Methods

This study evaluated the cost-effectiveness of treatments for breast cancer, incorporating data from the FDA website, IBM Micromedex, and relevant literature up to November 2023.

The assessment included direct medical expenses, such as drug prices based on the wholesale acquisition cost of the drugs, adverse events cost and the cost of hospitalization. The primary outcome measured was the quality-adjusted life year (QALY), and a thorough sensitivity analysis was carried out using Monte Carlo simulation within Microsoft Excel.

Results

Table 1. Comparison of Survival Life for Larotrectinib and Entrectinib

Outcomes	Larotrectinib	Entrectinib
Preprogression Life years	12.4	7.2
Overall Survival Life years	-	25.8

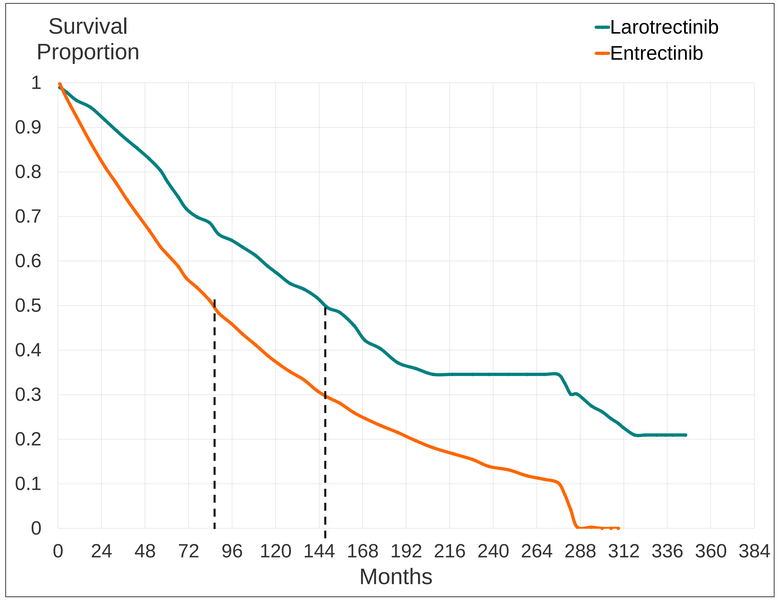
Table 2. Incremental Cost-Effectiveness of Larotrectinib vs. Entrectinib

	Larotrectinib	Entrectinib
Cost	$651,718	$397,970
QALYs[a]	5.8	2.3
ICER[b]	$72,499 per QALY	

[a]QALYs – Quality-adjusted life years
[b]ICER – Incremental cost-effectiveness ratio

The study results indicate that Larotrectinib leads in preprogression life years with 12.4 compared to Entrectinib's 7.2, reflecting a better QALYs. Despite the absence of overall survival life years data for larotrectinib, entrectinib shows a total of 25.8 years. In terms of cost effectiveness, larotrectinib with a greater cost of $651,718, results in greater QALYs (5.8) than entrectinib, which costs $397,970 and yields 2.3 QALYs. The incremental cost-effectiveness ratio (ICER) for larotrectinib versus entrectinib stands at $72,499 per QALY, highlighting larotrectinib's superior effectiveness in prolonging preprogression years despite its high cost.

Figure 1. Survival Comparison of Larotrectinib and Entrectinib



Conclusions

In Figure 1, we observe a drop in the survival proportion for patients on Entrectinib after 270 months, indicating a sharp decline in patient survival rates where as for Larotrectinib shows a steadier progression, suggesting that patients on Larotrectinib tend to maintain better survival rates over the same period. Larotrectinib is costlier yet more effective than entrectinib for the treatment of adult patients with NTRK gene fusion-positive breast cancer. The ICER per QALY gained was below the often-cited societal threshold of $75,000.