

การศึกษาจากโลกแห่งความเป็นจริงแบบย้อนหลังเชิงสังเกต เพื่อประเมินความปลอดภัยและประสิทธิผลของการใช้ยา Fulvestrant (Eranfu) แบบเดี่ยวในผู้ป่วยมะเร็งเต้านมระยะลุกลามชนิด HR+/HER2-

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A real-world, retrospective, observational study to evaluate the safety and effectiveness of Fulvestrant (Eranfu) monotherapy in HR+/HER2-advanced breast cancer patients

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Abstract **Background:** Fulvestrant, a selective estrogen receptor degrader (SERD), is a standard endocrine therapy for HR-positive, HER2-negative advanced breast cancer (ABC). Despite the recent approval of combination regimens with targeted therapies, fulvestrant monotherapy remains widely used. However, real-world data from high-burden, resource-limited settings like Thailand are scarce. **Objective:** To evaluate the real-world safety and clinical effectiveness of generic fulvestrant (Eranfu) monotherapy in Thai patients with HR+/HER2- ABC across treatment lines. **Methods:** A retrospective review of 74 medical records of postmenopausal women (≥ 18 years) treated with fulvestrant between 1 January 2022 and 31 January 2024 was conducted. Of these, 29 patients met inclusion criteria: no prior endocrine therapy, relapse on/after adjuvant anti-estrogen therapy, or progression on anti-estrogen therapy, with ≥ 6 months of follow-up. Patients received Eranfu monotherapy as 1st line (n=4), 2nd line (n=15), or ≥ 3 rd line (n=10). Safety was evaluated using CTCAE v5.0. Secondary endpoints included progression-free survival (PFS), overall survival (OS), and overall response rate (ORR). **Results:** Median age was 61 years (range 43–89); 86.2% had ECOG performance status 0–1. Bone metastases were present in 55.2%, and 51.7% had

visceral involvement. Patients had received up to two prior lines of endocrine or chemotherapy. Fulvestrant was well-tolerated, with only eight grade ≥ 4 adverse events. Median PFS was 3.67 months overall, longer in 1st line (6.73 months) than 2nd (3.27 months) or later lines (4.27 months). Median OS was 30.77 months. ORR was 14.2% overall and 50% with 1st line fulvestrant monotherapy. **Conclusion:** Fulvestrant demonstrated favorable safety and efficacy in Thai HR+/HER2- ABC patients, including those with visceral metastases and prior endocrine therapy. Improved results with 1st line use underscore the value of early initiation, supporting its continued role across treatment lines, especially in resource-limited settings. (*Thai Cancer J* 2026;46:92–113)

Keywords: fulvestrant, advanced breast cancer, endocrine therapy, real-world evidence

Introduction

Breast cancer is the most prevalent malignancy and the fourth leading cause of cancer-related mortality worldwide. In Thailand, it accounts for 23.3% of all cancers in women¹ with an age-standardized mortality rate of 1 per 100,000 person-years². Approximately 46.2% of Thai female breast cancer patients present with locally advanced disease and 26.5% with metastases³.

Breast cancer subtypes are classified based on hormone receptor (HR) and human epidermal growth factor receptor 2 (HER2) status, with the HR-positive/HER2-negative (HR+/HER2-) subtype being the most common⁴. Approximately 80% of breast cancers express the estrogen receptor (ER), which promotes tumor growth by triggering an AF1 and AF2 signaling cascade that drives proliferation⁵.

Endocrine therapy (ET) is better tolerated than chemotherapy for hormone-sensitive advanced breast cancer (ABC)⁶, but specific risks exist. Tamoxifen is associated with an increased risk of endometrial cancer, thromboembolic events, and cerebrovascular events, while aromatase inhibitors (AIs) may negatively impact lipid levels and cause androgenic effects. Sequential hormonal therapy is standard practice to maintain quality of life, necessitating agents with distinct mechanisms of action to avoid cross-resistance⁷.

Tamoxifen and fulvestrant are anti-estrogens that inhibit estrogen signaling via the estrogen receptor. Tamoxifen, a selective estrogen receptor modulator (SERM), inhibits AF2 activity but retains partial agonist effects. In contrast, fulvestrant, a selective estrogen receptor

degrader (SERD), disrupts both AF1 and AF2 activity, destabilizing the ER complex and accelerating its degradation^{8,9}. With high ER binding affinity (89% of estradiol), fulvestrant prevents receptor dimerization and nuclear localization, leading to complete estrogen signaling inhibition^{7,10,11}.

Fulvestrant was introduced into clinical practice in 2002 with an initially approved dose of 250 mg. The currently approved standard dose is 500 mg, and administered every 14 days for the first three doses, and then every 28 days thereafter¹². Clinical trials have well-established the role of fulvestrant in ABC. Two parallel studies showed that fulvestrant (250 mg every 4 weeks) was as effective as anastrozole in postmenopausal women with ABC progressing after prior ET, with comparable median time to progression in both studies (5.5 vs. 5.1 months and 5.4 vs. 3.4 months)^{13,14}. A trial comparing fulvestrant with tamoxifen in patients without prior ET for metastatic breast cancer (mBC) found no significant difference in median time to progression (6.8 vs. 8.3 months; hazard ratio [HR] 1.18; $p = 0.09$)¹⁵.

In 2010, the phase III CONFIRM trial reported a 20% reduction in the risk of progression¹⁶, 19% reduction in the risk of death and a 4.1-month difference in median overall survival (OS) with fulvestrant 500 mg vs 250 mg and no additional toxicity concerns¹⁷. The superiority of 500 mg dosage was consistent in both the 1st and 2nd line settings^{18,19}. Furthermore, the randomized phase III FALCON trial demonstrated significant improvement in progression-free survival (PFS) with fulvestrant 500 mg versus the 3rd generation AI anastrozole 1 mg (HR 0.80, 95% CI 0.64–1, $p=0.05$) in postmenopausal women with ET-naïve, HR+/HER2- ABCs²⁰. The final OS analysis of the FALCON study demonstrated a 15% reduction in the relative risk of death with fulvestrant versus anastrozole (median OS, 65.2 vs 47.8 months; HR 0.85 [95% CI, 0.60 to 1.20]) in patients with non-visceral disease²¹. In August 2017, the United States Food and Drug Administration (US FDA) expanded the approval of fulvestrant to include monotherapy for postmenopausal women with advanced HR+/HER2- breast cancer who had not received prior endocrine therapy²².

Fulvestrant in combination with CDK4/6 inhibitors (palbociclib, ribociclib, and abemaciclib) is approved for the treatment of hormone receptor-positive/human epidermal growth factor receptor 2-negative (HR+/HER2-) metastatic breast cancer in several Southeast Asian countries, including Thailand, Vietnam, and Malaysia. However, reimbursement for these regimens in Thailand remains limited and is typically restricted to select public insurance schemes (e.g., the Civil Servant Medical Benefit Scheme, CSMBS), resulting in constrained access for much of the population. Recent data from the MONARCH-2 and MONALEESA-3 trials

also indicate an OS benefit, supporting the use of fulvestrant in combination with CDK4/6 inhibitors as a potential 1st line treatment option²³.

The real-world applicability of fulvestrant in the high disease burden Thai population remains unexplored. Therefore, we conducted a real-world, retrospective, observational study to evaluate the safety and efficacy of fulvestrant monotherapy (generic fulvestrant ‘Eranfu’ by Dr. Reddy’s Laboratories Ltd.) in patients with HR+/HER2- ABC across various lines of treatment. This particular fulvestrant formulation was used because it was the available product at the study center during the study period.

Materials and methods

This was a single-arm, retrospective, single-centre, real-world study. Ethical approval was obtained from the ethics committee of the Institutional Review Board (IRB), (COA No. 0869/2024, IRB No. 0369/67) from the Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand prior to commencing the study. Medical records of 74 patients with HR+/HER2- ABC, who received treatment with fulvestrant at King Chulalongkorn Memorial hospital January 1, 2022, and January 31, 2024, were collected and analyzed retrospectively. Included patients were postmenopausal females aged ≥ 18 years diagnosed with HR+/HER2- ABC, who were treated with fulvestrant as monotherapy, with at least 6 months of follow-up data. The patients were either those who had not previously been treated with endocrine therapy, or with disease relapse on or after adjuvant anti-estrogen therapy, or with disease progression on anti-estrogen therapy.

Patients receiving newer treatments (like PARP inhibitors or CDK 4/6 inhibitors such as palbociclib, ribociclib, or abemaciclib) along with fulvestrant, or those taking part in any clinical study during fulvestrant treatment were excluded. (Figure 1)

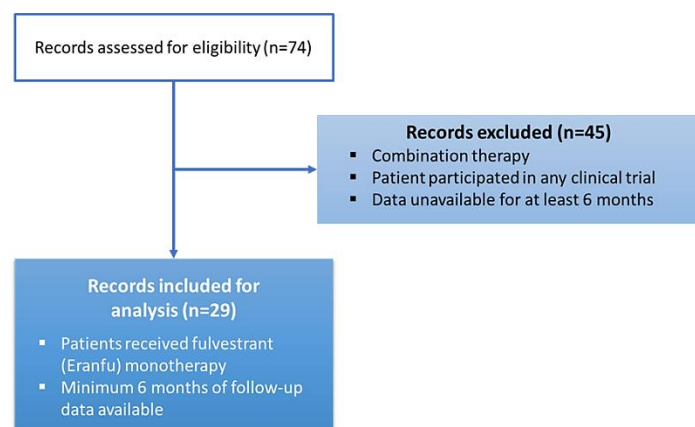


Figure 1 Study flowchart

In this study, patients received intramuscular fulvestrant at a dose of 500 mg every 28 days. The number of treatment cycles ranged from 1 to 24. At the time of the last follow-up, fulvestrant therapy was ongoing in 2 patients, one receiving it as 2nd line treatment and the other as 3rd line.

Data collected were segregated based on patient demographics, dates of first diagnosis of breast cancer, adjuvant therapy, date of ABC diagnosis, dates of start/end of the treatment and line of use of fulvestrant. The lines of fulvestrant treatment included front-line ET for patients not previously treated with ET for metastatic disease, after prior adjuvant ET for patients with disease relapse on or after adjuvant anti-estrogen therapy, or subsequent lines (2nd line or more) of ET for patients with disease progression on anti-estrogen therapy. Laboratory evaluations included hematology, hepatic and renal function tests, and 12-lead ECG. All adverse events (AEs) and serious adverse events (SAEs) during treatment, all concomitant therapies during the treatment period of the study and reasons for their use, and clinical efficacy measurement results with dates and methods such as clinical judgment and radiological investigations (PET/CT, MRI, and bone scans) were also collected.

Study endpoints

Safety assessment was the primary outcome. Clinical AEs were recorded based on the type of adverse events, incidence, nature, and severity of all adverse events by using the Common Terminology Criteria for Adverse Events (CTCAE) version 5.0. SAEs and the assessment of the relationship of AEs/SAEs to the study treatment were also recorded.

Secondary outcomes aimed to assess the clinical effectiveness of fulvestrant by evaluating progression-free survival (PFS), overall survival (OS), overall response rate (ORR), complete response (CR), and partial response (PR). ORR is defined as the proportion of patients with CR or PR. PFS is defined as the duration from the initiation of fulvestrant treatment to disease progression or death from any cause. OS is defined as the duration from the start of fulvestrant treatment to death from any cause.

Categorical data were summarized as frequency and corresponding proportions. For continuous data, frequency, median, inter-quartile range, mean (as appropriate), and standard deviation were calculated. The correlation between patient clinicopathologic features and survival was evaluated using Fisher's exact test (for categorical variables), and the Wilcoxon rank-sum test (for quantitative variables). A descriptive summary report in the form of a frequency table for CR, PR, and ORR was prepared. Kaplan–Meier and log-rank methods were

used to determine PFS and OS. The ORR was estimated together with the exact two-sided 95% confidence interval. SPSS version 26 was used for statistical analysis.

Results

A total of 29 patients with HR+/HER2- advanced breast cancer who received fulvestrant monotherapy and had complete and adequate clinical data were included in the analysis.

Patient characteristics

The median age of the cohort was 61 years (range 43–89). The mean age at the diagnosis of breast cancer was 55.21 years (SD 13.28 years). Nearly a quarter of the patients (24.1%, n=7) presented with metastatic disease at diagnosis, while 37.9% (n=11) presented with locally advanced disease (stage 3A-7, 3B-2, 3C-2). Among the patients, 68.9% (n=20) had previously received an adjuvant therapy either endocrine therapy or chemotherapy while 45% (9 out of 20) received both. Tamoxifen was the most common endocrine treatment prior to starting fulvestrant. the maximum number of prior endocrine treatments were two. Systemic chemotherapy administered to 55% (n=11), with a maximum of two chemotherapy regimens. 96.5% (n=28) patients had metastatic disease, and visceral involvement was present in 51.7% (n=15). Among those, 6 (40%) had metastases in multiple visceral organs. The lungs were the most commonly affected, followed by the liver, pleura and adrenal gland. Among patients with non-visceral metastases, bone involvement was most common followed by nodal metastases.

Detailed information regarding our cohort of patients including baseline patient and tumor characteristics, prior endocrine and cytotoxic chemotherapies are shown in Table 1.

Table 1 Baseline demographics

Baseline Characteristics	n (%) (Total N=29)
Mean age (SD) at first diagnosis of breast cancer	55.21 years (13.28)
Menopausal status	
Post menopause	29 (100)
Comorbidities	
- Diabetes	5 (17.24)
- HT	14 (48.28)
- Dyslipidemia	8 (27.59)
- CKD	2 (6.90)
- CVD	1 (3.45)
ECOG	
- 0	2 (6.90)
- 1	23 (79.31)
- 2	4 (13.79)
Hormonal receptor status	
- ER+	28 (96.55)
- ER status unknown	1 (3.45)
- PR+	25 (86.21)
- PR-	3 (10.34)
HER2 receptor status	
- IHC 0	8 (27.59)
- IHC 1	11 (37.93)
- IHC 2	10 (34.48)
Stage at diagnosis of breast cancer	
- 1	2 (6.90)
- 2	8 (27.59)
- 3	11 (37.93)
- 4	7 (24.14)
- Unknown*	1 (3.45)

Table 1 Baseline demographics (cont.)

Baseline Characteristics	n (%) (Total N=29)
De novo metastasis (total n=29)	7 (24.14)
Recurrent disease (n=22)	
- RFI < 12 months	2 (9.09)
- RFI ≥ 12 months	20 (90.91)
Adjuvant therapy (n=20) [†]	
- Chemotherapy (n=11)	
• Anthracycline-based	7 (63.63)
• Taxane-based	3 (27.27)
• Others	1 (9.09)
- Endocrine treatment (n=18)	
• Tamoxifen alone	10 (55.56)
• Sequential Tamoxifen then Als	1 (5.56)
• Aromatase inhibitor alone	7 (38.89)
Metastasis sites (n=29)	
- Liver	7 (24.14)
- Lung	9 (31.03)
- Bone	16 (55.17)
- Pleura	3 (10.34)
- Adrenal	1 (3.44)
- Lymph node	12 (41.38)
Number of metastatic sites (n=28) [‡]	
- <3 sites	24 (85.71)
- ≥ 3 sites	4 (14.28)

Abbreviations; ABC: Advance breast cancer, AI: Aromatase inhibitors, CDK4/6: Cyclin-Dependent Kinase 4 and 6, CKD: Chronic kidney disease, CVD: Cardiovascular disease, ECOG: Eastern Cooperative Oncology Group, ER: Estrogen receptor, HER2: Human Epidermal growth factor Receptor 2, HT: Hypertension, IHC: Immunohistochemistry, PR: Progesterone receptor, RFI: Recurrence-free interval, SD: Standard deviation

* Stage/diagnosis was not documented for 1 patient (shown as 'Unknown'); a known stage was available for 28 of 29 patients.

† Of the 22 patients with non-de novo metastasis, adjuvant therapy details were unavailable for 2 patients; chemotherapy and endocrine-treatment percentages are therefore calculated out of the 20 patients with documented adjuvant therapy (n=20).

‡ Number of metastatic sites is reported among the 28 patients with metastatic disease (n=28); one patient had no distant metastasis. Note: Percentages are calculated out of the subgroup denominator (n) shown in each section header.

Treatment pattern for advanced breast cancer

Endocrine therapy was the most commonly employed 1st line treatment for the ABC patients (n = 14, 48.3%), with letrozole being the most frequently administered agent, followed by fulvestrant. Endocrine therapy remained the preferred approach in the 2nd line setting, where fulvestrant emerged as the predominant agent. Among patients who had not received fulvestrant in the 1st or 2nd line, 6 out of 10 were subsequently treated with fulvestrant as a 3rd line option. (Figure 2)

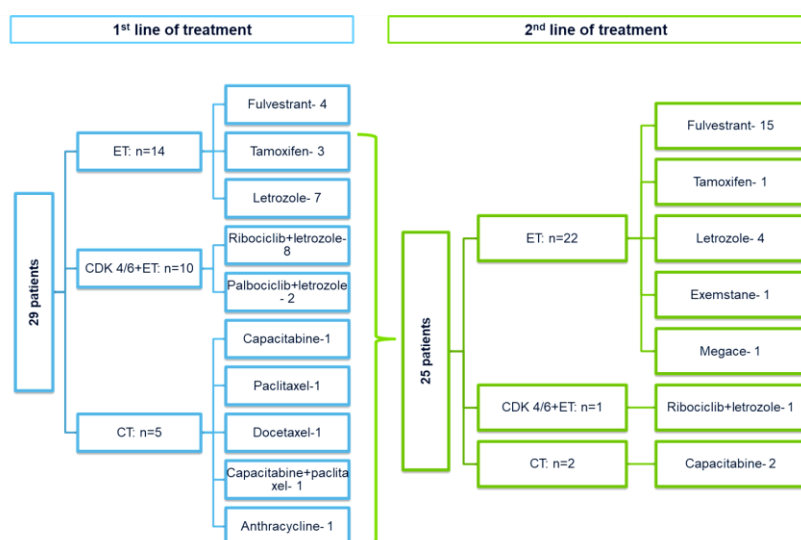


Figure 2 Fulvestrant treatment across various lines of treatment

Abbreviations; CDK: Cyclin-Dependent Kinase, CT: Chemotherapy, ET: Endocrine therapy

Safety outcomes

Safety outcomes were assessed in 29 patient records. Fulvestrant demonstrated a favorable safety profile across all lines of treatment, with no cases of treatment discontinuation due to fulvestrant-related toxicity. Severe cardiac toxicity was absent, with no instances of grade 4 QTc prolongation reported across the cohort. Hematological toxicities were rare and manageable. Only 1 patient experienced grade 4 anemia, this patient had received fulvestrant as 3rd line of treatment. Pre-existing anemia was documented in 8 patients at 1st line and in 2 patients at 2nd line therapy. Grade 4 neutropenia was largely absent, while grade 4 thrombocytopenia was observed in one patient who had received fulvestrant as 4th line agent.

With regards to liver toxicity, grade 4 AST/ALT elevations were observed in 6 patients receiving fulvestrant at different lines (1 each in the 1st, 3rd, 4th, and 5th line; 2 in the 2nd line). Two patients each had pre-existing AST/ALT elevations at 1st line and 2nd line treatment. Grade 4 gastrointestinal toxicity (nausea and vomiting) was not reported in any patient, and no worst injection site reactions were observed throughout fulvestrant administration.

Efficacy outcomes

PFS was assessed in 28 out of the 29 patients, as one patient declined further treatment after the initial therapy, and progression data from subsequent lines of treatment was unavailable. OS and ORR were analyzed in all 29 records. In addition, visceral involvement could not be determined in one patient; this patient was therefore included in the overall analysis but excluded from the visceral and non-visceral subgroup analyses. Consequently, the subgroup analyses included 27 patients for PFS—15 with visceral disease and 12 with non-visceral disease—and 28 patients for OS—15 with visceral disease and 13 with non-visceral disease. The overall analyses included 28 patients for PFS and all 29 patients for OS.

The median PFS for the entire cohort was 3.67 months (95% CI: 2.28-5.05) following fulvestrant treatment. Patients with visceral metastases had a shorter median PFS of 3.20 months (95% CI: 1.35–5.05) whereas patients with non-visceral metastases had the same median PFS of 3.67 months (95% CI: 0.05–7.29). Kaplan-Meier survival curves were generated to evaluate PFS and OS according to metastatic pattern (visceral vs. non-visceral) and various treatment lines (Figure 3 a-d). Patients with non-visceral metastases showed slightly longer median PFS (3.67 months) compared with those with visceral metastases (3.20 months) (Figure 3a). When stratified by treatment lines, patients receiving fulvestrant as 1st line treatment had a median PFS of 6.73 months (95% CI: 0.00–14.02), while patients receiving fulvestrant as 2nd line treatment had a median PFS of 3.27 months (95% CI: 2.13–4.40). In patients receiving fulvestrant as 3rd-line or beyond, the median PFS was 4.27 months (95% CI: 0.27–8.26). (Table 2, Figure 3c)

Table 2 Survival outcomes across the various line of treatment*†

Subgroup	n	Median PFS (months) (95% CI)	Median PFS (days) (95% CI)	n	Median OS (months) (95% CI)	Median OS (days) (95% CI)
Overall	28	3.67 (2.28-5.05)	110 (68.52-151.49)	29	30.77 (20.11-41.43)	923 (603.19-1242.82)
Visceral	15	3.20 (1.35-5.05)	96 (40.46-151.54)	15	21.0 (NE)	630 (NE)
Non-Visceral	12	3.67 (0.05-7.29)	110 (1.37-218.63)	13	30.77 (20.17-41.37)	923 (605.06- 1240.94)

Table 2 Survival outcomes across the various line of treatment (cont.)

Subgroup	n	Median PFS (months) (95% CI)	Median PFS (days) (95% CI)	n	Median OS (months) (95% CI)	Median OS (days) (95% CI)
1 st line fulvestrant	4	6.73 (0.00-14.02)	202 (0.00-420.54)	4	NE	512.5 (279.12-745.89)
2 nd line fulvestrant	15	3.27 (2.13-4.40)	98 (63.92-132.08)	15	23.57 (18.69-28.44)	707 (560.83-853.17)
≥3 rd line fulvestrant	9	4.27 (0.27-8.26)	128 (8.21-247.79)	10	30.77 (0.00-69.16)	923 (0.00-2074.75)

Abbreviations: CI: Confidence interval, n: Number, NE: not evaluable, PFS: Progression-free survival, OS: Overall survival

* PFS was evaluable in 28 patients since 1 patient (in the ≥3rd-line group) declined further treatment after initial therapy and had no evaluable progression data. OS and ORR were assessed in all 29 patients.

† Visceral involvement could not be determined in 1 patient, who is included in the overall analysis but not in the visceral/non-visceral subgroups. Accordingly, the visceral (n=15) and non-visceral (n=12) subgroups sum to 27 for PFS analysis and 28 for OS (visceral n=15 and non-visceral n=13).

Similarly, the median OS was 30.77 months (95% CI: 20.11–41.43) in patients with non-visceral metastases, which was longer than the median OS in patients with visceral metastasis, which was 21.0 months (95% CI: not estimable [NE]) (Figure 3b). Based on the treatment line, OS was not evaluable in patients receiving 1st line fulvestrant. Patients receiving 2nd line treatment had a median OS of 23.57 months (95% CI: 18.69–28.44), while those on 3rd line or beyond had a median OS of 30.77 months (95% CI: 0.00–69.16). (Table 2, Figure 3d)

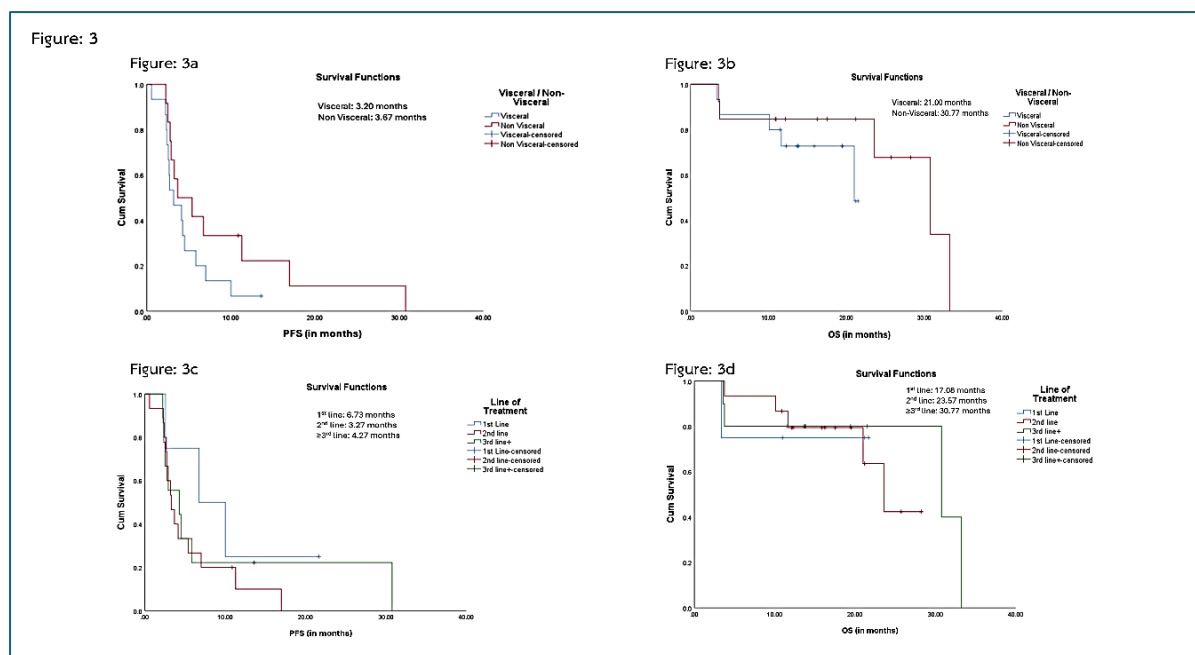


Figure 3 Kaplan-Meier survival curves showing progression-free survival (PFS) and overall survival (OS) of patients based on metastatic patterns and treatment lines

3a. Progression-free survival in patients with visceral and non-visceral disease, 3b. Overall survival in patients with visceral and non-visceral disease, 3c. Progression-free survival across various line of fulvestrant treatment, 3d. Overall survival across various line of fulvestrant treatment

3a. Out of 15 patients with visceral disease, 1 patient was censored. The median PFS was 3.20 months (95% CI: 1.35-5.05) or 96 days (95% CI: 40.46-151.54). Out of 12 patients with non-visceral disease, 1 patient was censored. The median PFS was 3.67 months (95% CI: 0.05-7.29) or 110 days (95% CI: 1.37-218.63).

3b. Out of 15 patients with visceral disease, 5 patients died, while 10 patients were censored. The median OS was 21 months or 630 days. Out of 13 patients with non-visceral disease, 5 patients died, while 8 patients were censored. The median OS was 30.77 months (95% CI: 20.17 - 41.37) or 923 days (95% CI: 605.06-1240.94).

3c. Out of 4 patients receiving 1st line fulvestrant monotherapy, 1 patient was censored. The median PFS was 6.73 months (95% CI: 0.00- 14.02) or 202 days (95% CI: 0.00- 420.54). Out of 15 patients receiving 2nd line fulvestrant monotherapy, 1 patient was censored. The median PFS was 3.27 months (95% CI: 2.13-4.40) or 98 days (95% CI: 63.92-132.08). Out of 9 patients receiving ≥3rd line fulvestrant monotherapy, 1 patient was censored. The median PFS was 4.27 months (95% CI: 0.27 -8.26) or 128 days (95% CI: 8.21-247.79).

3d. Out of 4 patients receiving 1st line fulvestrant monotherapy, 1 patient died, while 3 patients were censored. The mean OS was 17.08 months (95% CI: 9.30- 24.86) or 512 days (95% CI: 279.11- 745.89). Out of 15 patients receiving 2nd line fulvestrant monotherapy, 5 patients died, while 10 were censored. The median OS was 23.57 months (95% CI: 18.69-28.44) or 707 days (95% CI: 560.83-853.17). Out of 10 patients receiving $\geq 3^{\text{rd}}$ line fulvestrant monotherapy, 4 patients died, while 6 were censored. The median OS was 30.77 months (95% CI: 0.00-69.16) or 923 days (95% CI: 0.00-2074.75).

The DCR (CR+PR+SD) was 53.5% (15/28). Meanwhile, the ORR (CR+PR) was 14.2% (4/28). For patients receiving 1st line fulvestrant treatment, the DCR was 75% (3/4) while the ORR was 50% (2/4). For patients receiving 2nd line fulvestrant treatment, the DCR was 53.33% (8/15) and the ORR was 6.67% (1/15). In patients receiving 3rd line or beyond fulvestrant treatment, the DCR was 44.45% (4/9) and the ORR was 11.12% (1/9).

None of the clinical or pathological variables analyzed had a significant impact on survival, including diabetes mellitus (p=1.00), hypertension (p=0.52), dyslipidemia (p=0.68), progesterone receptor status (p=0.44), HER2 receptor status (IHC p=1.00, ISH p=0.43), Ki67 index, (p=0.53), de novo versus recurrent disease (p=0.37), local recurrence (p=1.00), metastatic sites (liver, lung, bone, and pleura, all p=1.00).

Discussion

The efficacy and safety of fulvestrant are primarily supported by pivotal clinical trials, but real-world data is crucial for assessing its effectiveness in clinical practice. This study in Thai population evaluated fulvestrant monotherapy in ABC and its outcomes across different lines of treatment. The study aimed to evaluate the clinical outcomes associated with fulvestrant therapy in real-world practice rather than to compare different commercial formulations. Fulvestrant showed anti-tumor activity comparable to the clinical trials. Notably, median PFS was longer in 1st line treatment compared to the 2nd and later lines of treatment.

The majority of patients were ER+ (96.5%) and PR+ (86.2%), with half presenting with visceral metastases. This is in line with real-world studies from the Asian region²⁴. Fulvestrant treatment was well-tolerated, with no cases of toxicity-related discontinuation and a low overall toxicity burden.

The median PFS for the overall population was 3.67 months, which is lower than 5.5 months reported in retrospective real-world studies from Western countries on locally advanced or metastatic ER+/HER2- breast cancer treated with fulvestrant²⁵. The relatively

shorter PFS in our study may therefore reflect variations in patient characteristics, such as prior exposure to endocrine therapy, the presence of visceral metastases, and fulvestrant use in later-line treatment settings. These factors are recognized to affect treatment responses and may account for some variations in results among various real-world studies. However, the ORR of 14.2% in our cohort was similar to the 15% observed in the Western study, indicating comparable effectiveness. Endocrine therapy is typically preferred for patients with a low tumor burden and a better prognosis, and bone-only metastasis^{26,27}. This was likely the case in the Western study, where all patients had received a median of 2 prior lines of endocrine therapy but no prior chemotherapy. In contrast, 37.9% of patients in our study had received chemotherapy. Bone metastasis was present in 72% of patients in the Western study, whereas our study included only 55.2% patients with bone involvement. These differences potentially reflect the high and diverse tumor burden of our population. Furthermore, 10.2% of our patients received fulvestrant as a 4th or 5th line of treatment and were endocrine resistant. Notably, the median OS in our study was 30.77 months, exceeding the 22.5 months reported in the Western study. This difference could be explained by lower visceral involvement in our cohort (50% vs. 69%) and differences in treatment patterns, as a slightly higher proportion of our patients (13.8% vs. 10%) received fulvestrant as a 1st line treatment. These findings suggest that fulvestrant is effective in the Thai population, with outcomes influenced by patient characteristics and treatment strategies. Although PFS was shorter in our study, OS was comparable to that in the Western study. This difference in PFS may reflect differences in patient populations, as many patients in our cohort had endocrine-resistant disease, which could have contributed to a shorter median PFS compared with other studies. OS, however, reflects the cumulative effect of multiple treatment lines and may be influenced by factors beyond initial treatment response, including subsequent systemic therapies after progression and differences in follow-up duration.

Our findings highlight the efficacy of fulvestrant in a younger patient population, including those with visceral metastases. Notably, there was no difference in median PFS between visceral and non-visceral subgroups, the pattern consistent with real-world observational studies on fulvestrant like the one by Blancas I et al²⁸. Furthermore, survival outcomes remained consistent regardless of the site of visceral metastases, reinforcing the treatment's effectiveness across different metastatic profiles. However, the median PFS in our study was shorter than that reported by Blancas et al., likely due to differences in patient characteristics. Although a higher proportion of ER-positive patients is generally associated with

improved endocrine responsiveness, PFS is affected by multiple clinical factors beyond ER status. In our study, a considerable proportion of patients had received prior endocrine therapy or received fulvestrant in later treatment lines, suggesting endocrine resistance and likely shorter PFS. In our cohort, nearly all of our patients were ER+, compared to only 68.8% in the Blancas study. Another key difference is that 24.1% of our patients presented with de novo metastatic disease, whereas none in the Blancas study did. Local relapse was more common in our study (20.7% vs. 10.2%). Notably, 16.66% of our patients had a disease-free duration of less than 12 months following adjuvant endocrine therapy, suggesting endocrine resistance. Nearly a quarter of our patients (24.1%, n=7) were diagnosed with advanced disease at presentation. Among these, 3 patients (42.9%) were diagnosed with ABC at age ≤ 50 years, a well-established risk factor²⁹ for more aggressive disease and poorer prognosis. These differences may explain why PFS was shorter in our population.

Fulvestrant is recommended as a standard 1st line endocrine therapy for HR+ ABC. Findings from the phase II FIRST^{20,30} and phase III FALCON³¹ trials suggest that fulvestrant is more effective than third-generation aromatase inhibitors in patients without prior endocrine therapy. Though in our study, patients receiving first-line fulvestrant had a median PFS of 6.73 months, which was lower than real-world Western (14.6 months)²⁸ and Asian studies (13 and 14.1 months)^{24,32}. However, the ORR (50%) for 1st line fulvestrant in our study was notably higher than those reported in the Western (35.2%) and Asian cohorts (11.3% and 3.8%). The shorter PFS was likely due to the patients' primary endocrine resistance profile and disease progression to metastatic disease during adjuvant endocrine therapy. Since we do not routinely test for molecular profile of the disease at progression, it might be possible that these patients carry a genetic characteristic associated with poor prognosis (e.g., *ESR1* mutation, *PIK3CA* mutation or others).

The median PFS was longer for 1st line fulvestrant (6.73 months), compared to 2nd line (3.27 months) and later-line (4.27 months) treatments, emphasizing the importance of early initiation of fulvestrant therapy to optimise treatment outcomes. This finding aligns with findings from a multicenter retrospective study of 1,072 advanced/metastatic breast cancer patients in Japan reported by H. Kawaguchi et al, where 1st/2nd line fulvestrant use was associated with improved efficacy compared to 3rd or 4th line of treatments (1st and 2nd vs. 3rd vs. $\geq 4^{\text{th}}$ line; HR = 0.80, p < 0.001)³³.

Second line fulvestrant monotherapy is one option for patients with HR+ mBC who progress on 1st line treatment with CDK 4/6 inhibitors³⁴. In our study, the median PFS (3.27 months) was

shorter than that reported by other Asian real-world studies in ABC patients (6.0 months) who received fulvestrant as maintenance therapy³⁵. Notably, the ORR in our study (6.67%) was slightly higher than that reported in other Asian studies (5.5%)³², which may be attributed to differences in primary resistance to endocrine therapy. Moreover, nearly 32% of the patients receiving 2nd line fulvestrant were diagnosed with breast cancer at young age (< 50 years old) which could have contributed to the more aggressive nature of the cancer. Additionally, our findings indicate that prior 1st line treatment with chemotherapy or endocrine therapy did not significantly impact the efficacy of 2nd line fulvestrant treatment, reinforcing its role as an effective option following chemotherapy or endocrine therapy. These results further support the use of fulvestrant as a viable 2nd line therapy in HR+ ABC.

In this study, the PFS for all patients, 1st line users, and 2nd line users were 3.67, 6.73, and 3.27 months, respectively, which is shorter than the PFS reported in clinical trials. This discrepancy may be due to the fact that most patients in the FALCON trial had not received prior treatments, including neoadjuvant or adjuvant therapy (in the fulvestrant arm, neoadjuvant chemotherapy was administered to 5% of the patients, while 15% received adjuvant chemotherapy. Additionally, 1% had undergone hormonal therapy)²⁰. In contrast, the majority of patients (62%) in our study had undergone adjuvant endocrine therapy, which may have reduced the effectiveness of subsequent hormonal treatments. Both our study and previous clinical trials indicate that initiating fulvestrant earlier is linked to improved patient outcomes. Additionally, prolonged exposure to multiple lines of endocrine therapy can lead to changes in ER status, potentially contributing to drug resistance. Our findings reinforce the importance of administering fulvestrant at an early stage for patients with HR+ ABC. In the FALCON trial, 20% of the participants had previously received chemotherapy. However, in clinical practice in Asian countries, HR+ ABC patients typically undergo chemotherapy before starting endocrine therapy, which was also observed in our study.

The median PFS for 3rd line or later fulvestrant treatment in our study was 4.27 months, which was lower than the real-world Chinese study (6.7 months)³². Similar to other lines of therapy, the ORR was higher in our cohort (11.12%) compared to the 1.1% reported in the Chinese study, suggesting potential efficacy in later-line treatment. These findings underscore the relatively underexplored role of 3rd line fulvestrant in ABC and highlight the need for further research in this setting.

A retrospective cohort study from the West observed a higher OS in early-line fulvestrant treatment (<3 prior lines: 26 months) compared to later-line therapy (≥3 prior lines:

16 months)³⁶ likely due to a higher rate of prior chemotherapy before initiating fulvestrant. This underscores the impact of treatment sequencing and the importance of optimizing fulvestrant use in later lines to improve outcomes in HR+ ABC.

Our study has few limitations. Firstly, it was a single-center retrospective analysis with a small sample size especially for 1st line therapy, which may limit generalizability. Secondly, the absence of a comparative arm prevents direct evaluation of fulvestrant's efficacy relative to other agents. Thirdly, drug resistance, a known challenge in endocrine therapy, was not assessed due to resource limitations. Lastly, the present study did not include healthcare cost or resource utilization data; therefore, a cost-effectiveness analysis could not be performed.

Recently fulvestrant plus novel targeted therapy have been approved in this setting, but fulvestrant monotherapy is still one of the options in HR+ve HER2- ABC in real world practice. A key strength of our study lies in its comprehensive assessment of fulvestrant monotherapy across both early and later lines of treatment, with later-line use being particularly underrepresented in the existing literature.

Conclusion

Fulvestrant demonstrated sustained disease control and a favorable safety profile in Thai patients with HR+/HER2- advanced breast cancer, including those with visceral metastases and prior endocrine therapy. Our study highlights its effectiveness in both early and later treatment lines, demonstrating a satisfactory median PFS and manageable adverse event profile even in patients with visceral metastases or those with prior exposure to endocrine therapy.

Although, current guidelines recommend a combination of AI with three CDK4/6 inhibitors (palbociclib, ribociclib, and abemaciclib) as a first-line therapeutic options for HR+/HER2-metastatic breast cancer, fulvestrant monotherapy remains a well-tolerated treatment option for selected patients. These include patients with low disease burden (e.g., non-visceral or bone-only disease) who are endocrine-naïve or have relapsed after prior AI/tamoxifen, particularly when first-line ET plus a CDK4/6 inhibitor has already been used or is not feasible, or when no actionable PIK3CA or AKT/PTEN alteration is identified to support later-line targeted options. Moreover, fulvestrant monotherapy remains a commonly utilized option for HR-positive, HER2-negative advanced breast cancer in real-world clinical practice, even though combinations of fulvestrant with new targeted therapies have received recent approval for this setting. Its effectiveness remains unaffected by prior chemotherapy or

endocrine therapy, supporting its role in later treatment lines as well. While established in advanced HR+ breast cancer, ongoing research aims to refine its optimal use through biomarker-driven selection and combination strategies.

References

1. Ferlay J, Ervik M, Lam F, Laversanne M, Colombet M, Mery L, et al. Global Cancer Observatory: Cancer Today [Internet]. Lyon (FR): International Agency for Research on Cancer; 2024 [cited 2026 Jun 26]. Available from: <https://gco.iarc.who.int/media/globocan/factsheets/populations/764-thailand-fact-sheet.pdf>
2. Vichapat V, Hinon A, Boonaob J, Ukritanon P, Meeniran B, Pansaksiri S. Unveiling cancer burden: an epidemiological study in a tertiary cancer center, Thailand. *Asian Pac J Environ Cancer*. 2023;6(1):39-48. Available from: <https://waocp.com/journal/index.php/apjec/article/view/1229>
3. Sukpan P, Kanokwiroon K, Sriplung H, Paisarn P, Sangkhathat S. Survival outcomes in breast cancer patients and associated factors in a border province of Thailand: a hospital-based review. *J Health Sci Med Res*. 2023;41(3):2022911. Available from: <https://www.jhsmr.org/index.php/jhsmr/article/view/911>
4. Ditsatham C, Sripan P, Chaiwun B, Klunklin P, Tharavichitkul E, Chakrabandhu S, et al. Breast cancer subtypes in northern Thailand and barriers to satisfactory survival outcomes. *BMC Cancer*. 2022;22(1):1147. Available from: <https://bmccancer.biomedcentral.com/articles/10.1186/s12885-022-10196-0>
5. Movérare-Skrtic S, Börjesson AE, Farman HH, Sjögren K, Windahl SH, Lagerquist MK, et al. The estrogen receptor antagonist ICI 182,780 can act both as an agonist and an inverse agonist when estrogen receptor α AF-2 is modified. *Proc Natl Acad Sci U S A*. 2014;111(3):1180-5. Available from: <https://www.pnas.org/doi/full/10.1073/pnas.1322910111>
6. Im SA, Gennari A, Park YH, Kim JH, Jiang ZF, Gupta S, et al. Pan-Asian adapted ESMO Clinical Practice Guidelines for the diagnosis, staging and treatment of patients with metastatic breast cancer. *ESMO Open*. 2023;8(3):101231. Available from: [https://www.esmoopen.com/article/S2059-7029\(23\)00767-6/fulltext](https://www.esmoopen.com/article/S2059-7029(23)00767-6/fulltext)
7. Osborne CK, Wakeling A, Nicholson RI. Fulvestrant: an oestrogen receptor antagonist with a novel mechanism of action. *Br J Cancer*. 2004;90(Suppl 1). Available from: <https://www.nature.com/articles/6601629>

8. Fan M, Rickert EL, Chen L, Aftab SA, Nephew KP, Weatherman RV. Characterization of molecular and structural determinants of selective estrogen receptor downregulators. *Breast Cancer Res Treat.* 2007;103(1):37-44. Available from: <https://link.springer.com/article/10.1007/s10549-006-9353-2>
9. Howell SJ, Johnston SRD, Howell A. The use of selective estrogen receptor modulators and selective estrogen receptor down-regulators in breast cancer. *Best Pract Res Clin Endocrinol Metab.* 2004;18(1):47-66. Available from: <https://doi.org/10.1016/j.beem.2003.08.006>
10. Wakeling AE, Bowler J. Steroidal pure antioestrogens. *J Endocrinol.* 1987;112(3). Available from: https://joe.bioscientifica.com/view/journals/joe/112/3/joe_112_3_023.xml
11. Fawell SE, White R, Hoare S, Sydenham M, Page M, Parker MG. Inhibition of estrogen receptor-DNA binding by the "pure" antiestrogen ICI 164,384 appears to be mediated by impaired receptor dimerization. *Proc Natl Acad Sci U S A.* 1990;87(17):6883-7. Available from: <https://www.pnas.org/doi/10.1073/pnas.87.17.6883>
12. Boér K. Fulvestrant in advanced breast cancer: evidence to date and place in therapy. *Ther Adv Med Oncol.* 2017;9(7):465-79. Available from: <https://journals.sagepub.com/doi/10.1177/1758834017711097>
13. Howell A, Robertson JFR, Quaresma Albano J, Aschermannova A, Mauriac L, Kleeberg UR, et al. Fulvestrant, formerly ICI 182,780, is as effective as anastrozole in postmenopausal women with advanced breast cancer progressing after prior endocrine treatment. *J Clin Oncol.* 2002;20(16):3396-403. Available from: <https://ascopubs.org/doi/10.1200/JCO.2002.10.057>
14. Osborne CK, Pippen J, Jones SE, Parker LM, Ellis M, Come S, et al. Double-blind, randomized trial comparing the efficacy and tolerability of fulvestrant versus anastrozole in postmenopausal women with advanced breast cancer progressing on prior endocrine therapy: results of a North American trial. *J Clin Oncol.* 2002;20(16):3386-95. Available from: <https://ascopubs.org/doi/10.1200/JCO.2002.10.058>
15. Howell A, Robertson JFR, Abram P, Lichinitser MR, Elledge R, Bajetta E, et al. Comparison of fulvestrant versus tamoxifen for the treatment of advanced breast cancer in postmenopausal women previously untreated with endocrine therapy: a multinational, double-blind, randomized trial. *J Clin Oncol.* 2004;22(9):1605-13. Available from: <https://ascopubs.org/doi/10.1200/JCO.2004.02.112>

16. Di Leo A, Jerusalem G, Petruzelka L, Torres R, Bondarenko IN, Khasanov R, et al. Results of the CONFIRM phase III trial comparing fulvestrant 250 mg with fulvestrant 500 mg in postmenopausal women with estrogen receptor-positive advanced breast cancer. *J Clin Oncol*. 2010;28(30):4594-600. Available from: <https://ascopubs.org/doi/10.1200/JCO.2010.28.8415>
17. Di Leo A, Jerusalem G, Petruzelka L, Torres R, Bondarenko IN, Khasanov R, et al. Final overall survival: fulvestrant 500 mg versus 250 mg in the randomized CONFIRM trial. *J Natl Cancer Inst*. 2014;106(1). Available from: <https://academic.oup.com/jnci/article/106/1/djt337/2517856>
18. Di Leo A, Jerusalem G, Torres R, Verhoeven D, Pendergrass K, Malorni L, et al. First-line versus second-line fulvestrant for hormone receptor-positive advanced breast cancer: a post-hoc analysis of the CONFIRM study. *Breast*. 2018;38:144-9. Available from: [https://www.thebreastonline.com/article/S0960-9776\(17\)30805-6/abstract](https://www.thebreastonline.com/article/S0960-9776(17)30805-6/abstract)
19. Kalinsky B, Bianchini G, Hamilton E, Graff SL, Park KH, Jeselsohn R, et al. Abemaciclib plus fulvestrant in advanced breast cancer after progression on CDK4/6 inhibition: results from the phase III postMONARCH trial. *J Clin Oncol*. 2025;43(9). Available from: <https://ascopubs.org/doi/10.1200/JCO-24-02086>
20. Robertson JFR, Bondarenko IM, Trishkina E, Dvorkin M, Panasci L, Manikhas A, et al. Fulvestrant 500 mg versus anastrozole 1 mg for hormone receptor-positive advanced breast cancer (FALCON): an international, randomised, double-blind, phase 3 trial. *Lancet*. 2016;388(10063):2997-3005. Available from: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(16\)32389-3/abstract](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(16)32389-3/abstract)
21. Robertson JFR, Shao Z, Noguchi S, Bondarenko I, Panasci L, Singh S, et al. Fulvestrant versus anastrozole in endocrine therapy-naïve women with hormone receptor-positive advanced breast cancer: final overall survival in the phase III FALCON trial. *J Clin Oncol*. 2025;43(1):JCO.24.00994. Available from: <https://ascopubs.org/doi/10.1200/JCO.24.00994>
22. National Cancer Institute. FDA expands approval of fulvestrant for breast cancer [Internet]. Bethesda (MD): National Cancer Institute; 2017 [cited 2025 Feb 15]. Available from: <https://www.cancer.gov/news-events/cancer-currents-blog/2017/fda-fulvestrant-breast-cancer>

23. Iorfida M, Mazza M, Munzone E. Fulvestrant in combination with CDK4/6 inhibitors for HER2-negative metastatic breast cancer: current perspectives. *Breast Cancer* (Dove Med Press). 2020;12:45-56. Available from: <https://www.dovepress.com/fulvestrant-in-combination-with-cdk4-6-inhibitors-for-her2--metastatic-peer-reviewed-fulltext-article-BCTT>
24. Zhao Y, Geng C, Zhang H, Cai L, Yao H, Lin Y, et al. Tolerability and effectiveness of fulvestrant as first-line endocrine therapy in unselected patients with advanced breast cancer: results of a multicenter, single-arm, non-interventional study. *J Clin Oncol*. 2023;41(16 Suppl):e13061. Available from: https://ascopubs.org/doi/abs/10.1200/JCO.2023.41.16_suppl.e13061
25. Lerner A, Keshwani K, Okines A, Sanderson B, Board RE, Flynn M, et al. A multicentre retrospective study of fulvestrant use and efficacy in advanced/metastatic breast cancer. *Clin Oncol (R Coll Radiol)*. 2022;34(4):261-6. Available from: [https://www.clinicaloncologyonline.net/article/S0936-6555\(21\)00498-2/fulltext](https://www.clinicaloncologyonline.net/article/S0936-6555(21)00498-2/fulltext)
26. Watanabe J, Hayashi T, Tadokoro Y, Nishimura S, Takahashi K. Clinical pattern of primary systemic therapy and outcomes of estrogen receptor-positive, HER2-negative metastatic breast cancer: a review of a single institution. *Breast Cancer Res Treat*. 2017;166(3):911-7. Available from: <https://link.springer.com/article/10.1007/s10549-017-4478-z>
27. Lobbezoo DJA, van Kampen RJW, Voogd AC, Dercksen MW, van den Berkmortel F, Smilde TJ, et al. In real life, one-quarter of patients with hormone receptor-positive metastatic breast cancer receive chemotherapy as initial palliative therapy: a study of the Southeast Netherlands Breast Cancer Consortium. *Ann Oncol*. 2016;27(2):256-62. Available from: [https://www.annalsofoncology.org/article/S0923-7534\(19\)35546-2/fulltext](https://www.annalsofoncology.org/article/S0923-7534(19)35546-2/fulltext)
28. Blancas I, Olier C, Conde V, Bayo JL, Herrero C, Zarcos-Pedrinaci I, et al. Real-world data of fulvestrant as first-line treatment of postmenopausal women with estrogen receptor-positive metastatic breast cancer. *Sci Rep*. 2021;11:4274. Available from: <https://www.nature.com/articles/s41598-021-83622-1>
29. McGuire A, Brown JAL, Malone C, McLaughlin R, Kerin MJ. Effects of age on the detection and management of breast cancer. *Cancers (Basel)*. 2015;7(2):908-29. Available from: <https://www.mdpi.com/2072-6694/7/2/815>

30. Ellis MJ, Llombart-Cussac A, Feltl D, Jasiówka M, Dewar JA, Hewson N, et al. Fulvestrant 500 mg versus anastrozole 1 mg for the first-line treatment of advanced breast cancer: overall survival analysis from the phase II FIRST study. *J Clin Oncol*. 2015;33(32):3781-7. Available from: <https://ascopubs.org/doi/10.1200/JCO.2015.61.5831>
31. Skinner KE, Olufade T, Walker MS, Schwartzberg LS. Real-world effectiveness of fulvestrant monotherapy as first endocrine treatment in patients with metastatic breast cancer. *Breast J*. 2020;26(2):112-9. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/tbj.13492>
32. Lei W, Li H, Song G, Zhang R, Ran R, Yan Y, et al. Efficacy and safety of fulvestrant 500 mg in hormone receptor-positive, human epidermal growth factor receptor 2-negative advanced breast cancer: a real-world study in China. *J Cancer*. 2020;11(22):6612-22. Available from: <https://www.jcancer.org/v11p6612.html>
33. Kawaguchi H, Masuda N, Nakayama T, Aogi K, Anan K, Ito Y, et al. Outcomes of fulvestrant therapy among Japanese women with advanced breast cancer: a retrospective multicenter cohort study (JBCRG-C06; Safari). *Breast Cancer Res Treat*. 2017;163(3):545-54. Available from: <https://link.springer.com/article/10.1007/s10549-017-4212-x>
34. Luhn P, O'Hear C, Ton T, Sanglier T, Hsieh A, Oliveri D, et al. Abstract P4-13-08: time to treatment discontinuation of second-line fulvestrant monotherapy for HR+/HER2 – metastatic breast cancer in the real-world setting. *Cancer Res*. 2019;79(4 Suppl):P4-13-08. Available from: https://aacrjournals.org/cancerres/article/79/4_Supplement/P4-13-08/639727/Abstract-P4-13-08-Time-to-treatment
35. Lv M, Mao Y, Ma T, Wang Y, Liu X, Song Y, et al. Real-world efficacy of fulvestrant monotherapy as the first treatment or maintenance treatment in patients with metastatic breast cancer. *Breast Care (Basel)*. 2021;16(4):368-75. Available from: <https://karger.com/brc/article/16/4/368/819799/Real-World-Efficacy-of-Fulvestrant-Monotherapy-as>
36. Andrahennadi S, Sami A, Haider K, Chalchal HI, Le D, Ahmed O, et al. Efficacy of fulvestrant in women with hormone-resistant metastatic breast cancer (mBC): a Canadian province experience. *Cancers (Basel)*. 2021;13(16):4163. Available from: <https://www.mdpi.com/2072-6694/13/16/4163>