**Supplementary data**

**Table S1. Summary of the available evidence about PARPi use in patients with BMs from EOC, according to the search criteria reported in the *search strategy section (below).***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author (Year)** | **Number of cases/**  **Primary cancer** | **Age** | **BRCA**  **mutation**  **status** | **CNS site(s)** | **PARPi agent** | **PARPi**  **setting**  **at time of**  **BMs** | **Extra-**  **cranial site(s)** | **Local therapies**  **for BMs** | **CNS**  **BOR and PFS**  **on PARPi** |
| **Tao [18]**  **(2020)** | 1 (EOC) | 62 | BRCA2  PV | Multiple (fronto-  parietal, right cerebellar) BMs | Niraparib | PSR | Abdominal  lymph nodes | RT (WBRT) | CR   PFS 15 m |
| **Gray [26]**  **(2019)** | 1  EOC | 68 | BRCA1  PV | Multiple (the largest in the left centrum semiovale) BMs | Niraparib | PSR | No | RT  (WBRT) | PR  PFS 17 m |
| **Cabitza [10]**  **(2023)** | 1  EOC | 47 | BRCA1-2 wild-type | Single (left cerebellar) BM | Niraparib | Frontline | No | Surgery | CR  PFS 20 m |
| **Alizzi**  **[5]**  **(2023)** | 39  EOC | 65  (44–84) | BRCA1-2 PV and wild-type | ≥3 (n=25)  1-2 (n=14)  BMs | Niraparib  Olaparib | PSR | No (n=14)  Yes (n=25) | Surgery  RT (SRS, WBRT) | CR-PR  PFS 18-20 m |
| **Zhang**  **[32]**  **(2023)** | 1  EOC | 48 | BRCA1-2 wild-type | Single (left frontal) BM | Niraparib | PSR | No | Surgery | CR  PFS 29 m |
| **Kasher-**  **man [15]**  **(2020)** | 1  EOC | 47 | BRCA1  PV | Multiple (right frontal; left cerebellar) BMs | Olaparib | PSR  (beyond CNS oligo-recurrence) | No | Surgery  and LITT | PR  PFS 21 m |
| **Cerda**  **[41]**  **(2022)** | 1 (out of 58 pts)  EOC | NR | BRCA1-2 wild-type | ≤3 CNS sites | Olaparib | PSR | Peritoneal (≤3 sites) | Surgery  RT (SRS) | PR  PFS NR |
| **Gallego**  **[14]**  **(2020)** | 1  EOC | 54 | BRCA1  PV | Multiple (left occipital; right cerebellar) BMs | Olaparib | PSR | Mediasti-nal sites | RT (WBRT) | PR  PFS 42 m |
| **Bangham**  **[34]**  **(2020)** | 1  EOC | 61 | BRCA2  PV | Multiple (left parietal, lepto-  meningeal)BMs | Olaparib | PSR  (beyond CNS oligo-PD) | No | Surgery  RT (SRS) | PR  PFS 12 m |
| **Sakamo-**  **to**  **[35]**  **(2018)** | 1  PPC | 58 | BRCA1  PV | Multiple BMs | Olaparib | PSR | No | None | PR  PFS 18 m |
| **Favier**  **[38]**  **(2020)** | 1  EOC | 54 | BRCA2  PV | Lepto-  meningeal BMs | Olaparib | PSR | Peritoneal sites | RT  (WBRT) | PR  PFS 14 m |
| **Wang**  **[33]**  **(2021)** | 1  G3 USC | 54 | BRCA1  PV | Multiple (parieto-  occipital and right cerebellar) BMs | Niraparib | PSR | No | None | PR  PFS 8 m |
| **Sliwinska**  **[37]**  **(2023)** | 5  EOC | 48.9 (mean)±10.8 (SD) | BRCA1-2  PV | Single and multiple BMs | Olaparib | PSR  (even beyond CNS-PD) | No | Surgery  RT (SRS) (n=2)  Palliative CNS RT (n=2) | PR  PFS 8 m |

Abbreviations. EOC: epithelial ovarian cancer. PPC: primary peritoneal cancer. USC: uterine serous carcinoma. PV: pathogenic variant. BMs: brain metastases. CNS: central nervous system. PSR: platinum-sensitive relapse. BOR: best overall response.CR: complete response. PR: partial response. PFS: progression-free survival. pts: patients. LITT: Laser interstitial thermal therapy. NR: not reported.

**Search Strategy**

The Literature searches for the present narrative reviewwere conducted in the following databases from 2013 to March 2023: PubMed/MEDLINE; Google Scholar; US National Institutes of Health Ongoing Trials Register. We used the following search terms: (("PARP inhibitor" OR "PARP inhibitors" OR "Niraparib" OR "Olaparib" OR "Rucaparib") AND ("brain metastases" OR "CNS metastases" OR "intracranial recurrence") AND ("ovarian cancer" OR "epithelial ovarian cancer" OR "ovarian carcinoma")). A PubMed (PubMed, RRID:SCR\_004846) search alert was used to capture additional articles published between May 2023 and December 2023. Searches were restricted to “epithelial ovarian cancer,” “brain metastases”, “CNS recurrence” and “PARP inhibitors”. A literature search from ASCO Annual Meeting 2024 was performed to capture the ongoing PARPi clinical trials. The 42 articles retrieved from the above sources included preclinical studies, in vitro studies, case reports, case series, retrospective studies and review articles providing a rationale for chemoresistance and potential targeting therapeutics. Only English language articles were included in the searches. Forward citation searching of the reference lists of the research studies and review papers was also performed. Thus, key papers were included based on the authors’ clinical experience and knowledge of the field. The results of our research are summarized in Table S1.