**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 | Abdominallymph nodes | RT (WBRT)  |  CR  PFS 15 m |
| **Gray [26]****(2019)** | 1EOC | 68 | BRCA1 PV | Multiple (the largest in the left centrum semiovale) BMs | Niraparib | PSR | No | RT (WBRT) | PR PFS 17 m |
| **Cabitza [10]****(2023)** | 1EOC | 47 | BRCA1-2 wild-type | Single (left cerebellar) BM | Niraparib | Frontline | No | Surgery | CRPFS 20 m |
| **Alizzi****[5]****(2023)** | 39EOC | 65(44–84)  | BRCA1-2 PV and wild-type | ≥3 (n=25)1-2 (n=14)BMs | NiraparibOlaparib | PSR | No (n=14)Yes (n=25) | Surgery RT (SRS, WBRT) | CR-PRPFS 18-20 m |
| **Zhang****[32]****(2023)** | 1EOC | 48 | BRCA1-2 wild-type | Single (left frontal) BM | Niraparib | PSR | No | Surgery  | CRPFS 29 m |
| **Kasher-****man [15]****(2020)** | 1EOC | 47 | BRCA1 PV | Multiple (right frontal; left cerebellar) BMs | Olaparib | PSR (beyond CNS oligo-recurrence) | No | Surgery and LITT | PRPFS 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)** | 1EOC | 54 | BRCA1 PV | Multiple (left occipital; right cerebellar) BMs | Olaparib | PSR | Mediasti-nal sites | RT (WBRT) |  PR PFS 42 m |
| **Bangham****[34]****(2020)** | 1EOC | 61 | BRCA2 PV | Multiple (left parietal, lepto-meningeal)BMs | Olaparib | PSR (beyond CNS oligo-PD) | No | SurgeryRT (SRS) | PRPFS 12 m |
| **Sakamo-****to****[35]****(2018)** | 1PPC | 58 | BRCA1 PV | Multiple BMs | Olaparib | PSR | No | None | PRPFS 18 m |
| **Favier****[38]****(2020)** | 1EOC | 54 | BRCA2 PV | Lepto-meningeal BMs | Olaparib | PSR | Peritoneal sites | RT (WBRT) | PRPFS 14 m |
|  **Wang** **[33]** **(2021)** | 1G3 USC | 54 | BRCA1 PV | Multiple (parieto-occipital and right cerebellar) BMs | Niraparib | PSR | No | None | PRPFS 8 m |
|  **Sliwinska** **[37]** **(2023)** | 5EOC | 48.9 (mean)±10.8 (SD) | BRCA1-2 PV | Single and multiple BMs | Olaparib | PSR (even beyond CNS-PD) | No | SurgeryRT (SRS) (n=2)Palliative CNS RT (n=2) | PRPFS 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.