LETTER TO THE EDITOR

Characteristics and outcomes of patients with breast cancer diagnosed with SARS-Cov-2 infection at an academic center in New York City

Kevin Kalinsky1 · Melissa K. Accordino1 · Kristina Hosi1 · Jessica E. Hawley1 · Meghna S. Trivedi1 · Katherine D. Crew1 · Dawn L. Hershman1

Received: 23 April 2020 / Accepted: 5 May 2020 / Published online: 14 May 2020 © Springer Science+Business Media, LLC, part of Springer Nature 2020

Previous reports of patients with Coronavirus disease 2019 (COVID-19) showed higher severity of disease in cancer patients, including the intubation rate [1]. These series focused on those with symptoms from COVID-19 requiring hospitalization, with lung cancer being the most frequent malignancy [1, 2]. We report characteristics and outcomes of COVID-19+ patients with breast cancer (BC) at an academic center in New York City.

Methods

We collected demographic, treatment, and outcome data from established patients with stage I-IV BC at Columbia University Irving Medical Center (CUIMC) and COVID-19+ from 3/10/20 to 4/29/20 (data cut off). COVID-19+ was determined by reverse transcription-polymerase chain reaction (RT-PCR) by nasal swab and/or high clinical or radiographic suspicion. Initially, all outpatients with symptoms were referred to the emergency department (ED) for testing; however, outpatient testing, including at an ambulatory referral-based CUIMC fever clinic, was rapidly expanded with cobas® SARS-CoV-2 testing (Roche). This study was CUIMC Institutional Review Board approved.

Results

Of the 4515 COVID-19+ total patients at CUIMC, 27 (0.6%) were established patients with a history of BC (Table 1). Twenty-six (96%) were female; 15 (56%) White, 6 (22%) Black, and 12 (44%) identified as Hispanic. The median age was 56 years (range: 32–87), median body mass index was 28.5 kg/m² (range: 21–47), and 7 (26%) were current/former smokers. Co-morbidities included 15 (56%) with hypertension, 6 (22%) diabetes, and 6 (22%) pulmonary disease. The majority had stage I-III BC and 5 (19%) metastatic disease. In the 6 months prior to COVID-19+, 16 (59%) received chemotherapy, 12 (44%) hormone therapy, 6 (22%) HER2-directed therapy, 1 (4%) checkpoint inhibitor, 6 (22%) breast surgery, and 2 (7%) radiation therapy. Prior to COVID-19+, the last received therapy was chemotherapy for 14 patients [52%, median: 12 days (range 7–749)], 10 (37%) hormone therapy [median: 1 day (range 1–81)], and 3 (11%) HER2-directed antibodies without chemotherapy [median: 21 days (range 20–34)]. Treatment disruptions occurred in 20 patients (74%) due to COVID-19+.

Most common symptoms were cough (70%), fever (52%), shortness of breath (52%), fatigue (30%), diarrhea (22%), and myalgia (19%), with 30% having ≥ 4 symptoms (Fig. 1). Twenty-two patients (81%) had COVID-19+ confirmation by RT-PCR, 4 (15%) presumed COVID-19+ per clinical symptoms, and 1 (4%) based on imaging and symptoms. Eight (30%) were initially tested in the ED, of whom 3 were not admitted. The majority were tested in the outpatient setting: ambulatory oncology clinic (6 patients; 22%) or CUIMC fever clinic (8 patients: 30%).

Of the 7 patients requiring hospitalization (26%), 3 were non-Hispanic Black, 3 Hispanic White, and 1 non-Hispanic White. Two received recent chemotherapy without targeted agents for early stage BC and 5 single-agent hormone therapy (1 for metastatic disease). Five admitted patient had at least 1 co-morbid disease, and 3 were former smokers. Five admitted patients required supplemental oxygen, and none needed intensive care-level support, including intubation or dialysis. All were discharged from the hospital. With a median follow-up from COVID-19+ diagnosis of 26 days (range 1–38), all patients were alive, except for an 87-year-old male with coronary artery disease, hypertension, and...
Table 1 Baseline demographics, treatments, and outcomes in COVID-19+ patients with a history of breast cancer (n = 27)

| Pt # | Age | Gender | Stage | Smoker | Co-morbidity | Last treatment | Time from last treatment to COVID-19+, days | COVID-19 + determination | COVID-19 RT-PCR test location | Admitted | Treatment disruption | Alive |
|------|-----|--------|-------|--------|--------------|----------------|---------------------------------------------|---------------------------|----------------------------------|---------|---------------------|-------|
| 1    | 65  | F      | III   | Never  | Htn          | Nab-paclitaxel  | 7                                           | RT-PCR                    | ED                              | N       | Y                   | Y     |
| 2    | 32  | F      | IV    | Never  | N/A          | Nab-paclitaxel/atezolizumab | 12                                          | RT-PCR                    | ED                              | N       | Y                   | Y     |
| 3    | 39  | F      | II    | Never  | N/A          | Goserelin/aromatase inhibitor | 1                                           | RT-PCR                    | Onc clinic                      | N       | Y                   | Y     |
| 4    | 87  | M      | II    | Former | Cad, Htn    | Carboplatin/paclitaxel | 7                                           | Presumed (Imaging)         | N/A                              | N       | N                   | N     |
| 5    | 68  | F      | I     | Never  | Cad, Pulm   | Cytoscan/methotrexate/5-FU | 16                                          | RT-PCR                    | ED                              | Y       | Y                   | Y     |
| 6    | 41  | F      | III   | Never  | Pulm         | Goserelin/aromatase inhibitor | 81                                          | RT-PCR                    | Fever clinic                     | N       | Y                   | Y     |
| 7    | 62  | F      | I     | Never  | Htn          | Pertuzumab/trastuzumab | 21                                          | RT-PCR                    | Onc clinic                      | N       | Y                   | Y     |
| 8    | 54  | F      | II    | Former | N/A          | Aromatase inhibitor | 1                                           | RT-PCR                    | Fever clinic                     | Y       | Y                   | Y     |
| 9    | 46  | F      | II    | Never  | N/A          | Trastuzumab/pertuzumab/goserelin/aromatase inhibitor | 20                                          | RT-PCR                    | Fever clinic                     | N       | Y                   | Y     |
| 10   | 80  | F      | III   | Former | Htn, Pulm   | Doxorubicin/cyclophosphamide | 22                                          | RT-PCR                    | ED                              | Y       | Y                   | Y     |
| 11   | 48  | F      | II    | Never  | Htn          | Taxol           | 56                                          | RT-PCR                    | Fever clinic                     | N       | Y                   | Y     |
| 12   | 54  | F      | I     | Never  | DM, Htn     | Aromatase inhibitor | 1                                           | Presumed (symptoms)         | N/A                              | N       | N                   | Y     |
| 13   | 49  | F      | I     | Never  | DM, Htn, Pulm | Tamoxifen    | 1                                           | RT-PCR                    | ED                              | Y       | N                   | Y     |
| 14   | 78  | F      | II    | Never  | DM, Htn     | Taxotere/cytoscan | 11                                          | RT-PCR                    | ED                              | N       | Y                   | Y     |
| 15   | 46  | F      | IV    | Never  | DM          | Fulvestrant    | 47                                          | RT-PCR                    | Fever clinic                     | N       | Y                   | Y     |
| 16   | 55  | F      | IV    | Current | Htn, Pulm   | Nab-paclitaxel | 749                                         | Presumed (symptoms)         | N/A                              | N       | N                   | Y     |
| 17   | 56  | F      | II    | Never  | N/A          | Paclitaxel     | 7                                           | RT-PCR                    | Onc clinic                      | N       | Y                   | Y     |
| 18   | 62  | F      | I     | Never  | Htn, Cad    | Paclitaxel/trastuzumab | 7                                           | RT-PCR                    | Onc clinic                      | N       | N                   | Y     |
| 19   | 73  | F      | IV    | Never  | DM, Htn     | Oral selective estrogen receptor downregulator | 1                                           | RT-PCR                    | Fever clinic                     | Y       | Y                   | Y     |
| 20   | 49  | F      | II    | Current | N/A          | Taxotere/carboplatin/trastuzumab/pertuzumab | 8                                           | RT-PCR                    | Fever clinic                     | N       | Y                   | Y     |
| 21   | 79  | F      | II    | Former | Htn          | Paclitaxel/trastuzumab | 9                                           | Presumed (symptoms)         | N/A                              | N       | Y                   | Y     |
| 22   | 47  | F      | III   | Never  | Htn, DM     | Trastuzumab    | 34                                          | RT-PCR                    | Fever clinic                     | N       | Y                   | Y     |
| 23   | 58  | F      | II    | Former | N/A          | Aromatase inhibitor | 1                                           | RT-PCR                    | ED                              | Y       | N                   | Y     |
| 24   | 59  | F      | II    | Never  | Htn          | Aromatase inhibitor | 1                                           | RT-PCR                    | ED                              | Y       | N                   | Y     |
| 25   | 74  | F      | II    | Never  | N/A          | Aromatase inhibitor | 1                                           | Presumed (symptoms)         | N/A                              | N       | N                   | Y     |
| 26   | 75  | F      | IV    | Never  | Htn, Pulm   | Carboplatin/etoposide | 19                                          | RT-PCR                    | Onc clinic                      | N       | Y                   | Y     |
| 27   | 51  | F      | III   | Never  | N/A          | Carboplatin    | 21                                          | RT-PCR                    | Onc clinic                      | N       | Y                   | Y     |

*Cad* coronary artery disease, *DM* diabetes mellitus, *ED* emergency department, *F* female, *HTN* hypertension, *M* male, *N* no, *N/A* not applicable, *Onc Clinic* oncology clinic, *Pulm* pulmonary disease, *RT-PCR* reverse transcription polymerase chain reaction (nasal swab), *Y* Yes
Fig. 1  a Percentage of COVID-19-related symptoms with which patients presented who had a history of stage I–IV breast cancer (n = 27). b Percentage of these patients who presented with 0, 1, 2, 3, or at least 4 COVID-19-related symptoms
former smoker who received taxane-based chemotherapy for stage II BC seven days before symptoms.

**Discussion**

In our racially/ethnically diverse population of 27 COVID-19 + patients with BC, the majority (74%) did not require hospitalization, and one male with multiple co-morbidities died. This is of interest, as COVID-19 + males have reported worse outcomes than females [3]. While treatment disruptions occurred in most patients (74%), it is unknown whether this represents a deviation from other patients who develop infections on therapy. While larger series are needed to understand the impact of COVID-19 in patients with BC, these initial data are reassuring that a substantial number recover from their infection.

**Funding**  No funding to report.

**Compliance with ethical standards**

**Conflict of interest**  No conflicts are related to this particular study. For unrelated confictions, Kevin Kalinsky served as a consultant/advisory board member for Immunomedics, Biotheranostics, Pfizer, Novartis, Eisai, Eli-Lilly, Amgen, and AstraZeneca. He has received institutional grants from Immunomedics, Novartis, Incyte, Genentech/Roche, Eli-Lilly, Pfizer, Calithera Biosciences, Acetylon, Seattle Genetics, Amgen, Zentalis Pharmaceuticals, and CytomX Therapeutics. Served on speakers’ bureau for Eli-Lilly. Received travel expenses from Lilly and Astra Zeneca. Spouse was previously employed by Novartis, Array Biopharma, and Pfizer.

**Ethical approval**  All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed consent**  Informed consent was obtained from all individual participants included in the study.

**References**

1. Liang W et al (2020) Cancer patients in SARS-CoV-2 infection: a nationwide analysis in China. Lancet Oncol 21:335–337. https://doi.org/10.1016/S1470-2045(20)30096-6
2. Yu J, Ouyang W, Chua MLK, Xie C (2020) SARS-CoV-2 Transmission in patients with cancer at a Tertiary Care Hospital in Wuhan, China. JAMA Oncol. https://doi.org/10.1001/jamaoncol.2020.0980
3. Grasselli G et al (2020) Baseline characteristics and outcomes of 1591 patients infected with SARS-CoV-2 admitted to ICUs of the Lombardy Region, Italy. JAMA. https://doi.org/10.1001/jama.2020.5394

**Publisher’s Note**  Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.