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Breast Surgery can be Performed Safely During the COVID-19 Pandemic: A Retrospective Single-Center Analysis

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ABSTRACT

Introduction: The Coronavirus disease-2019 (COVID-19) outbreak has affected the diagnosis and treatment of various diseases including breast cancer. This study aimed to investigate whether breast surgery can be performed safely during the COVID-19 pandemic.

Methods: Patients who underwent surgery for breast cancer or suspicious breast lesions in the pre-pandemic, first wave, and second wave periods of the pandemic were evaluated retrospectively.

Results: Data of 220 patients who underwent breast surgery were analyzed. No significant difference was found between the pre-pandemic, first wave, and second wave periods of the COVID-19 pandemic in terms of patient characteristics, complications, types of complication, Clavien-Dindo classification of complications, and complications requiring intervention. No COVID-19 related complication was also observed.

Conclusion: Breast surgery can be performed safely in the COVID-19 pandemic. For safe surgery, appropriate precautionary measures against COVID-19 and COVID-19 screening should be initiated. COVID-19-free surgical pathway is also important for safe surgery. With the continuation of surgeries, fear of upstaging, subsequent requirement of more aggressive treatment for tumors, and post-pandemic overload can be prevented.

Keywords: COVID-19, breast, breast surgery, complication

Introduction

The Coronavirus disease-2019 (COVID-19) outbreak caused by severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) has spread rapidly worldwide since December 2019 and declared as a pandemic by the World Health Organization (WHO) on March 11, 2020 (1,2). With the rapid spread of the infection, various quarantine measures had to be taken.

Since the first case on March 11, 2020, additional measures were taken well and quarantine protocol were also initiated in Turkey (1,2): i.e., declaration of both state and private hospitals as pandemic hospitals, emphasizing the importance of social isolation, encouraging social isolation, and implementing curfews including people aged ≥65 years or those with comorbidities. A circular was issued by the Ministry of Health of Turkey to stop surgeries other than emergency and cancer surgeries. During this period, it was unknown how COVID-19 would affect the surgical results. Suggestions related to COVID-19 management have been reported for many malignancies, including breast cancer (1,3-5). During the pandemic, the safety of surgeries was questioned, and some authors expressed an opinion that surgeries should be delayed, if possible. On the contrary, the postponement of surgeries and a decrease in hospital admissions lead to a fear of upstaging and therefore a wider treatment requirement with enlarging tumors. However, over time, studies have started reporting that safe surgery can be performed in the pandemic period have. Thus, this study aimed to investigate whether safe breast surgery can be performed during the COVID-19 pandemic.

Methods

Based on the daily number of patients with COVID-19 taken from the website of the Ministry of Health of Turkey, the first wave of the COVID-19 pandemic was considered between April 1, 2020, and May 15, 2010, and the second wave was between November 15, 2020, and December 31, 2020 (6). Although the first case in Turkey was seen on March 11, 2020, the period between March 11 and March 31, 2020, was not included in the first wave because of the small number of COVID-19 cases.

In this study, patients who underwent upfront surgery for breast cancer or suspicious breast lesions or surgery after neoadjuvant chemotherapy

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(NACT) for breast cancer in the first and second wave of the pandemic were evaluated retrospectively. As the control group, patients who underwent surgery between December 15, 2019, and March 15, 2020, were evaluated retrospectively. The study was conducted in Acibadem Mehmet Ali Aydinlar University Research Institute of Senology (RISA).

Age, sex, tumor side, hospital stay duration, tumor type (benign, invasive, or non-invasive), type of initial treatment (upfront surgery or NACT), and number and type of surgery to the breast and axilla of each patient were recorded. Procedures were evaluated separately as upfront surgery and surgeries performed after NACT. Procedures were first evaluated in three groups as excisional biopsies, breast-conserving surgeries (BCS), and mastectomies. Subsequently, mastectomies were evaluated in separate groups as simple, skin-sparing, and nipple-sparing mastectomies (NSM). Excisional biopsies included surgeries performed for suspicious lesions in which only the lesion is excised. BCS included surgeries in which the entire breast was not removed. Simple mastectomy included mastectomies in which the nipple and skin were removed without simultaneous reconstruction. Skin-sparing mastectomies included mastectomies in which the nipple is removed, but simultaneous reconstruction is performed while preserving the breast skin. NSM included mastectomies in which both the nipple and breast skin were preserved, and simultaneous reconstructions were performed. Reconstructions were examined in two groups as reconstructions with silicone implants or autologous tissues. Axillary surgeries were examined in two groups as sentinel lymph node biopsy and axillary lymph node dissection.

Complications were evaluated according to the type of surgery to both the breast and axilla and whether they developed after upfront surgery or surgeries after NACT. The severity of the complications was evaluated according to the Clavien-Dindo classification (7). If there was more than one complication in the same patient, the patient was evaluated according to the more serious complication based on the Clavien-Dindo classification.

With the declaration of the pandemic in Turkey, RISA-affiliated hospitals were declared as pandemic hospitals. Multidisciplinary tumor meetings were conducted with the participation of doctors on-site by restricting the participation of nurses, secretaries, and allied health professionals. All patients were discussed and treatment decisions were made at the multidisciplinary tumor meetings as in the pre-pandemic period. During the pandemic, all surgeries were performed in COVID-19-free operating rooms and patients were hospitalized in COVID-19-free wards. During the pandemic period, low-dose thoracic computed tomography was taken for each patient scheduled for surgery until June 1, 2020. After this time, reverse-transcriptase polymerase chain reaction (PCR) testing for SARS-CoV-2 was used in accordance with the European guidelines (8). Surgeries of patients with positive PCR for COVID-19 were delayed for 4 weeks until having negative PCR results and disappearance of symptoms. The algorithm applied to patients before surgery is shown in Figure 1.

Patients who did not have any postoperative complaints were called for a follow-up on the 10th postoperative day to evaluate the wound site and to inform the patient about the postoperative treatment protocols. If the patient had complaints, the patient was assessed by phone. If the complication was considered as at least class 2 according to the Clavien-Dindo classification, an in-hospital appointment was planned.

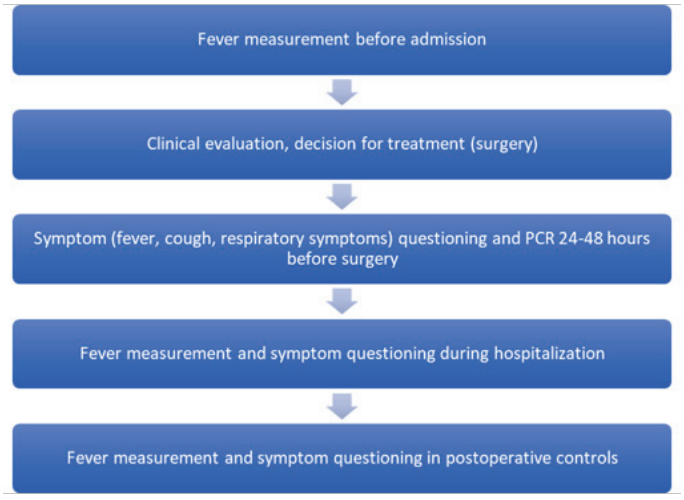

Figure 1. Algorithm applied to patients before surgery for COVID-19 screening

COVID-19: Coronavirus disease-2019, PCR: polymerase chain reaction

Ethical approval

Ethics committee approval from the Ministry of Health of Turkey was taken (file no: Akif Enes ARIKAN-2021-03-20T12_50_30) and from the Ethics Committee of Acibadem Mehmet Ali Aydinlar University (approval number: 2021-06/25, date: 24.03.2021).

Statistical Analysis

Study data were collected and managed using research electronic data capture (REDCap) tools hosted at the Acibadem Mehmet Ali Aydinlar University (9). All statistical analyses were performed using SPSS 25.0 (IBM Corp., Armonk, NY, USA). A p-value <0.05 was considered significant. Analysis of variance was performed for continuous variables, and a chi-square or Fisher's exact test was used for categorical variables. Continuous data are reported as mean ± standard deviation.

Results

Data of 220 patients who underwent breast surgery during the first and second wave of the COVID-19 pandemic and of the control group between December 15, 2019, and March 15, 2021, were retrospectively analyzed.

The COVID-19 PCR test was positive in two patients with cough during the preoperative period. Preoperative PCR test was positive for two patients without symptoms. The surgeries of these patients with positive PCR were delayed for 4 weeks after the symptoms resolved and the PCR results became negative. No COVID-19 case was detected in the first 30-day postoperatively in any of the patients, including patients with PCR-positive results preoperatively, and no COVID-19-related complications were observed. In addition, COVID-19 was not detected in healthcare personnel participating in breast surgeries. COVID-19 developed in two surgeons from the surgical team and the sources of infections were their family members.

Table 1. Characteristics of the patients

		Pre-pandemic	First wave	Second wave	Total	p
n		130	28	62	220	-
Age (years)		48.23±12.26	50.75±15.19	47.87±12.94	48.45±12.94	0.594
Hospital stay (day)		1.469±0.769	1.785±1.343	1.645±0.925	1.56±0.91	0.167
Tumor side	Left	64 (49.2%)	13 (46.4%)	35 (56.5%)	112 (50.9%)	0.567
	Right	66 (50.8%)	15 (53.6%)	27 (43.5%)	108 (49.1%)	
Sex	Male	1 (0.8%)	0 (0%)	0 (0%)	1 (0.5%)	0.706
	Female	129 (99.2%)	28 (100%)	62 (100%)	219 (99.5%)	
Tumor type	Benign	20 (15.4%)	3 (10.7%)	10 (16.1%)	33 (15%)	0.286
	In situ	12 (9.2%)	3 (10.7%)	8 (12.9%)	23 (10.5%)	
	Invasive	98 (75.4%)	22 (78.6%)	44 (71%)	164 (74.5%)	
Type of surgery to the breast	Excisional biopsy	17 (13.1%)	3 (10.7%)	10 (16.1%)	30 (13.6%)	0.139
	Breast-conserving surgery	65 (50%)	15 (53.6%)	23 (37.1%)	103 (46.8%)	
	Simple mastectomy	14 (10.8%)	3 (10.7%)	8 (12.9%)	25 (11.4%)	
	Skin-sparing mastectomy	5 (3.8%)	1 (3.6%)	0 (0%)	6 (2.7%)	
	Nipple-paring mastectomy	29 (22.3%)	6 (21.4%)	21 (33.9%)	56 (25.5%)	
Type of surgery to the axilla	None	22 (16.9%)	8 (28.6%)	10 (16.1%)	40 (18.2%)	0.47
	SLNB	76 (58.5%)	12 (42.9%)	38 (61.3%)	126 (57.3%)	
	ALND	6 (4.6%)	0 (0%)	3 (4.8%)	9 (4.1%)	
	SLNB + ALND	26 (20%)	8 (28.6%)	11 (17.7%)	45 (20.5%)	
Initial treatment	Upfront surgery	101 (77.7%)	20 (71.4%)	43 (69.4%)	164 (74.5%)	0.427
	Neoadjuvant chemotherapy	29 (22.3%)	8 (28.6%)	19 (30.6%)	56 (25.5%)	
Complication	Yes	28 (21.5%)	9 (32.1%)	9 (14.5%)	46 (20.9%)	0.157
	No	102 (78.5%)	19 (67.9%)	53 (85.5%)	174 (79.1%)	
Clavien-Dindo classification of complications	I	9 (32.1%)	1 (11.1%)	2 (22.2%)	12 (26.1%)	0.806
	II	13 (46.4%)	6 (66.7%)	6 (66.7%)	25 (54.3%)	
	IIIa	3 (10.7%)	1 (11.1%)	1 (11.1%)	5 (10.9%)	
	IIIb	3 (10.7%)	1 (11.1%)	0 (0%)	4 (8.7%)	
Complications requiring intervention	No*	22 (78.6%)	7 (77.8%)	8 (88.9%)	37 (80.4%)	0.775
	Yes**	6 (21.4%)	2 (22.2%)	1 (11.1%)	9 (19.6%)	

SLNB: Sentinel lymph node biopsy, ALND: axillary lymph node dissection, *: Clavien-Dindo class 1-2 complication, **: Clavien-Dindo class 3 complication

Table 2. Type and timing of complications after breast surgery

Complications	Period	
	Early (<30 days)	Late (>30 days)
Fibrosis	-	1 (6.3%)
Hematoma	2 (5.6%)	-
Lymphedema	-	3 (18.8%)
Necrosis (full thickness)	1 (2.8%)	-
Ischemia	2 (5.6%)	-
Capsule formation	-	3 (18.8%)
Prosthesis rejection	-	3 (18.8%)
Seroma	21 (58.3%)	5 (31.3%)
Wound infection	4 (11.1%)	-
Fever	2 (5.6%)	-
Postoperative nausea	4 (11.1%)	-
Rotation of implant	-	1 (6.3%)

No significant difference was found between the pre-pandemic, first wave, and second wave periods in terms of age, sex, hospital stay, tumor site, tumor type (benign/*in situ*/invasive), type of initial treatment, and type of surgery to the breast and axilla. The characteristics of the patients are shown in Table 1.

The types and timing (early/late period) of the complications are shown in Table 2. Clavien-Dindo classification of complications according to the type of initial treatment and pandemic period is shown in Table 3.

No significant difference was noted between the pre-pandemic, first wave, and second wave periods in terms of complication development, complication type, Clavien-Dindo classification of complications, and complications requiring intervention.

Discussion

In this single-center study of 220 patients, no complications related to COVID-19 were detected in breast surgeries performed in the first and second waves of the pandemic period. In addition, the number

Table 3. Clavien-Dindo classification of complications according to the type of initial treatment and pandemic period

Type of initial treatment	Period	Clavien-Dindo classification				Total	p
		1	2	3a	3b		
Upfront surgery	Pre-pandemic	4 (23.53%)	11 (64.71%)	1 (5.88%)	1 (5.88%)	17	0.688
	First wave	-	5 (83.33%)	1 (16.67%)	-	6	
	Second wave	2 (33.33%)	3 (50%)	1 (16.67%)	-	6	
	Total	6 (20.69%)	19 (65.52%)	3 (10.34%)	1 (3.45%)	29	
Surgery after neoadjuvant chemotherapy	Pre-pandemic	5 (45.45%)	2 (18.18%)	2 (18.18%)	2 (18.18%)	11	0.359
	First wave	1 (33.33%)	1 (33.33%)	-	1 (33.33%)	3	
	Second wave	-	3 (100%)	-	-	3	
	Total	6 (35.29%)	6 (35.29%)	2(11.76%)	3 (17.65%)	17	

of complications did not increase because of breast surgery. Our study shows that with appropriate precautions, breast surgery can be performed safely in the pandemic period.

Following the announcement of the COVID-19 pandemic by the WHO, measures have been taken in many countries. Like other countries, the government of Turkey emphasized the importance of social isolation and directed people to practice social isolation. Curfews were implemented for patients aged >65 or for those with comorbidities. Private and public hospitals were declared as pandemic hospitals, and a circular was issued by the Ministry of Health of Turkey to stop surgeries other than emergency and cancer surgeries.

The safety of surgeries was questioned in the early period of the pandemic. Studies in this period had reported high mortality and morbidity associated with surgeries, especially in patients with COVID-19 (4,10,11). In the international cohort study by the COVIDSurg group covering 1,128 patients who underwent surgery between January 1 and March 31, and 294 of whom were diagnosed with COVID preoperatively, the 30-day mortality rate was 23.8% (268 of 1,128) (10). Pulmonary complications occurred in 577 (51.2%) of 1,128 patients, and the 30-day mortality rate in these patients was 38.0% (219 of 577), accounting for 81.7% (219 of 268) of all deaths. Many authors have recommended postponement of surgeries if possible in the early period of the COVID-19 pandemic due to reasons such as the effects of COVID-19 on mortality and morbidity and the allocation of hospital beds and sources to patients with COVID-19 (1,3-5). Moreover, since COVID-19 was seen more in healthcare workers in the early pandemic period, ensuring the protection of healthcare workers had also been effective on this decision (12,13).

However, studies reporting that safe surgery can be performed in the pandemic period have started to emerge (14-23). These studies have reported that complications due to surgery do not increase during the pandemic and that COVID-19-associated complications are not high. In the present study, as there was no increase in complications during the pandemic period, no COVID-19-related complications were observed.

Although the risks associated with COVID-19 are high in patients with malignancy in the early pandemic period, there are publications that show breast cancer does not pose a high risk for COVID-19 (24,25). In the study involving 279 patients who received chemotherapy, 92 of which had breast cancer, between January 19 and April 2020, more complications were found in hematologic cancers compared than in solid tumors (24). The author reports that treatment can be applied by taking precautions in solid cancers such as breast cancer. Similarly, Zhang et al. (25) compared 35 patients with COVID-19 and breast cancer and 55 patients with COVID-19 without breast cancer and 81 patients with COVID-19 and cancer other than breast cancer as controls. They reported no differences in disease severity and outcomes between patients with COVID-19 and breast cancer and common patients with COVID-19. Moreover, the clinical characteristics of patients with breast cancer were milder than those with other types of cancers. In line with these studies, we can state that breast cancer does not pose a high risk for COVID-19, considering the short duration of hospitalizations because of breast surgery (26).

Ji et al. (16) evaluated a total of 621 patients, 141 of whom underwent breast-endocrine surgery, who underwent elective cancer surgery between 01.02.2020 and April 27, 2020. While PCR was performed in only symptomatic cases (n=40, 6.4%), COVID-19 infection was not detected in any patients postoperatively.

One of the most important studies regarding safe surgery during the COVID-19 pandemic is the study by the COVIDSurg group, which includes 9,171 patients, of which 2,140 had undergone breast surgery (17). In total, 2,481 patients received surgery following the COVID-19-free surgical pathway (i.e., complete segregation of the operating theater, critical care, and inpatient ward areas). COVID-19-free surgical pathways were followed for younger patients with less comorbidities. The postoperative SARS-CoV-2 infection rate was also lower in COVID-19-free surgical pathways. Pulmonary complication rates were lower with COVID-19-free surgical pathways (2.2% vs 4.9%). Therefore, they suggest that dedicated COVID-19-free surgical pathways should be established to provide safe elective cancer surgery in the current and before future outbreaks of SARS-CoV-2.

Another important study of Kane et al. (18) showed that elective surgeries can be performed under appropriate conditions; the study involved 557 patients between March 29 and June 12, 2020. Patients without COVID-19 symptoms were screened by oronasal swab and chest imaging (chest X-ray or computed tomography if aged ≥18 years) and preceded to surgery if negative. While 13 (2.4%) patients tested positive during screening, 7 (1.4%) tested positive for COVID-19 [1.4%, 95% confidence interval (CI): 0.7-2.8%] with one COVID-19-related death (0.2%, 95% CI: 0.0-1.1%) within 30 days.

Another issue related to the postponement of surgeries during the pandemic is the overload problem that may occur after the pandemic. The COVIDSurg group performed an estimation using a Bayesian β-regression model for 12-week cancellation in 190 countries (27). The best estimate was that 28,404,603 operations would be cancelled or postponed. If countries increased their normal surgical volume by 20% after the pandemic, a median of 45 weeks is needed to clear the backlog of operations resulting from the COVID-19 disruption. The rapid decrease in the number of patients in the early period of the pandemic supports this estimation. However, the number of operations has increased after the first wave because of reasons such as the adaptation of the clinic and patients, fluctuating course of the pandemic, and application of COVID-free protection methods throughout the country. To prevent this scenario, which the COVIDSurg group estimates, appropriate measures should be taken and the surgeries should continue. Therefore, hospitals can be made available for surgery or not every hospital is declared a pandemic, and some can be spared.

In the COVID-19 pandemic or similar pandemics that may occur in the future, precautions should be taken from the first diagnosis of the patient to the end of the treatment so that the surgeries can continue, treatments are not delayed, and post-pandemic overload can be prevented. These measures should include the following:

- Hospitals with COVID-19-free surgical pathway should be organized, and these hospitals should not be declared as pandemic hospitals and should be spared for oncological treatments.

- Patients should be questioned in terms of COVID-19 related complaints at the time of admission and follow-up.

- Symptom screening and suspicious travel questioning should be conducted at the entrance of the hospital, and patients with suspicious symptoms should be directed to the COVID-19 clinic.

- At the beginning of the treatment, in line with the guidelines of the institutions, PCR, chest radiography, or low-dose thorax CT should be performed for COVID-19.

- In the hospital, patients should wear a mask without valve.

- The number of companions should be reduced.

- To provide a social distance between patients, the space between the seats should be widened and daily magazine or tabloid magazines should be removed.

- The use of personal protective equipment by all healthcare professionals is mandatory.

- Healthcare professionals and patients should pay attention to hand hygiene.

- The number of healthcare personnel and patients in all areas within the hospital should be minimized.

- Movements of patients and healthcare personnel between departments should be minimized.

- In areas where healthcare personnel gather, such as dining halls, the sitting areas should be made sparse. Meals can be prepared in disposable containers, and the healthcare personnel can eat in the department where they work or the meals can be sent to the departments to reduce contacts between departments.

- In operating rooms, a minimum number of medical personnel should be employed.

- In case of delay or delay in elective breast cancer surgery, a metallic marker should be placed in every patient who has an image-guided biopsy if it does not contain microcalcification.

- Telemedicine can be used to reduce the number of hospital admissions (28).

Conclusion

Breast surgery can be performed safely during the COVID-19 pandemic. For safe surgery, appropriate precautions against COVID-19 should be taken and COVID-19 screening should be performed. COVID-19-free surgical pathway (i.e., complete segregation of the operating theater, critical care, and inpatient ward areas) is also important for a safe surgery. With the continuation of surgeries, our method can prevent the fear of upstaging and therefore requirement of more aggressive treatment for tumors and post-pandemic overload.

Ethics Committee Approval: Ethics committee approval from the Ministry of Health of Turkey was taken (file no: Akif Enes ARIKAN-2021-03-20T12_50_30) and from the Ethics Committee of Acibadem Mehmet Ali Aydinlar University (approval number: 2021-06/25, date: 24.03.2021).

Informed Consent: Retrospective study.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions: Surgical and Medical Practices - O.D., C.U.; Concept - A.E.A., H.K., O.D., C.U.; Design - A.E.A., H.K., O.D., C.U.; Data Collection or Processing - O.D., C.U.; Analysis or Interpretation - A.E.A., H.K.; Literature Search - H.K., O.D.; Writing - A.E.A., H.K., O.D., C.U.

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