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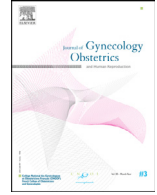
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Original Article

Collateral damage of COVID-19 pandemic: The impact on a gynecologic surgery department



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ABSTRACT

Objective: This study focuses on changes in gynecologic surgical activity at Hospital Foch, Paris, France during the first French COVID lockdown in 2020. Additional goals include the evaluation the extent of the postponement suffered for each type of surgery and estimate the possible negative impact for patients.

Study design: Single-center, retrospective, chart-review cohort study in the gynecology department of Hospital Foch. Comparison of all patients scheduled, postponed and operated during the first COVID lockdown (March 14, to May 11, 2020) versus the same period in 2019. Postponed surgeries were classified into 4 scheduling interval categories according to the Society of Gynecology Oncology (SGO) recommendations: urgent (without delay), semi-urgent (1–4 weeks), non-urgent (>4–12 weeks) and elective (>3 months) and evaluated to determine whether COVID-19-related delays of surgeries fell within guidelines. The potential “loss of chance” or medical risk associated with postponed surgeries was estimated according to a composite criterion including death, aggravation of expected tumor stages/grades in cancers, increase in surgical complexity compared to that initially planned, need for preoperative transfusions, start of morphine consumption during preoperative treatment for opiate-naïve patients, additional hospitalization or consultations in emergency room and delay in treatment when surgery was urgent.

Results: During the 2020 French COVID lockdown, 61 patients had a surgical procedure and 114 were postponed; in the comparator 2019 group, 232 patients underwent surgical procedures, indicating an overall decrease of 65% of activity. Analysis of differences between the two years revealed a reduction of 64% in emergency procedures, 90% of functional pathologies, and 13% of cancers. According to SGO guidelines, the only type of surgical procedures that had excessive delay was the semi-urgent group, where time to surgery was 6.7 weeks [range 5.4–10 weeks] instead of the recommended interval of 1–4 weeks. Among postponed surgeries there were 10 patients (8.7%) with a potential “loss of chance” according to the composite criteria, all included in the semi-urgent group.

Conclusion: The COVID 19 pandemic was responsible for a significant decrease of activity in the surgical department of Hospital Foch. Difficulty of rescheduling surgeries was responsible for an increased delay in semi-urgent operations. In almost 9% of postponed surgeries, there was a potential “loss of chance”, which likely represents only the tip of iceberg of collateral damages due to COVID 19 pandemic in this surgical unit. These data show the importance of continuing to treat pathologies requiring urgent or semi-urgent surgery during pandemics.

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Abbreviations

ICUS intensive care units

CNGOF French National College of Obstetricians and Gynecologists

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Introduction

The pandemic of coronavirus disease 2019 (COVID-19) has rapidly spread globally following the first case reports in Hubei province, China. The pressure on hospital wards and intensive care units (ICUs) triggered a massive disruption and reorganization of hospitalization all around the world. Hospital Foch in Paris area, France was required to postpone all non-urgent surgical procedures during the first French COVID lockdown between March and May 2020 to sustain adequate hospitalization capacity and health care professional

availability for management of patients with COVID-19. Furthermore, some surgical procedures potentially associated with an increased risk of SARS-CoV-2 were deprioritized (e.g. aerosol generation from endoscopy, hysteroscopy) [1].

The prioritization of patients is a complex strategy that poses several organizational and ethical issues. Since March 2020, numerous recommendations have been published to standardize the urgency of specific indications and recommended intervals of delay for patients who need to undergo surgical procedures, with a goal of avoiding an increased risk of adverse prognosis [2–5]. This study focused on how gynecologic surgical activity changed during the first French lockdown in 2020 compared to the same period in 2019. It also evaluated whether the delay of each type of gynecologic surgery was in accordance with the recommended intervals, and estimated any possible negative impact for patients.

Materials and methods

A retrospective single-center cohort chart review study was carried out in the gynecology and obstetrics department of Hospital Foch, Suresnes, France in the Parisian area. All surgeries performed or initially planned and postponed during the first French Lockdown (between March 14 and May 11, 2020) were compared to surgeries performed during the same period in 2019. Patients scheduled for follicular puncture or Caesarean section or those who were opposed to the use of their data for research purposes were excluded from the analysis. As recommended by the French National College of Obstetricians and Gynecologists (CNGOF), all non-urgent surgeries were postponed during the Spring 2020 lockdown [2,3]. However, nonoperative conservative treatment was initiated for patients awaiting surgical procedures; for example, pharmacological therapies for hormone-sensitive pathologies were implemented (i.e., GnRH agonist in endometriosis or myomas, hormonal therapy for endometrial and breast cancer and chemotherapy for advanced stages ovarian cancers).

Medical records were reviewed using the hospital's computerized database. The variables analyzed included diagnosis, type of surgery, indication for surgery (cancer, functional, emergency), dates of planned and actual surgeries, and "loss of chance" according to the composite criteria described below, lost to follow-up, operations in

another hospital, postoperative complications, main symptoms and changes in management. Data collection ended in October 2020. The extent of surgical delays were classified according to the four urgency categories defined by the Society of Gynecology Oncology (SGO): urgent (procedures which have to be performed without delay), semi-urgent (1–4 weeks), non-urgent (>4–12 weeks) and elective (>3 months) [5]. These guidelines were edited during the first lockdown in order to prioritize gynecologic surgery. Even if this classification details cancer indications, it also includes some functional gynecologic surgery and emergencies as shown in Table 2. We added laparoscopy for extra uterine pregnancy, Bartholinitis, breast abscess in the urgent group; discontinued pregnancy treated by curettage (n = 9), cervical cerclage in the semi-urgent group; hysteroscopy and myomectomy without hemorrhage, pain or suspected pathology and mastectomy for Benjamin Syndrome in the elective group according to the CNGOF recommendations [3].

The negative impact on patients was evaluated using a composite "loss of chance" criterion that included occurrence of any of the following outcomes in the setting of postponed surgery: death, aggravation of expected tumor stages/grades in cancers, increase in surgical complexity compared to that initially planned, need for preoperative transfusions, start of morphine consumption during preoperative treatment for opiate-naive patients, additional hospitalization or consultations in emergency room and delay in treatment when surgery was urgent.

Statistical analysis was performed using descriptive evaluation with the median [1st Quartile–3rd Quartile] for continuous variables and percentage for categorical variables. Fisher's exact test or Chi-square test were used to compare distribution ratios. Microsoft Excel software was used for data recording and analyses were performed using SAS v9.4.

This study was approved by the hospital institutional review board (IRB 00012437).

Results

During the French first lockdown, 61 patients had a surgical procedure and 114 were postponed; in the comparator 2019 group, 232 patients underwent surgical procedures, indicating an overall decrease of 65% of activity (Table 1). Comparing 2020 to 2019, there

Table 1
Planned and actual surgeries during French first lockdown in comparison with 2019 same period.

Surgery n(%)	2019	2020 Planned	P	2020 Actual	P
Cancer	23(10)	35 (20)	0.01	20(33)	0.0002
Endometrial cancer	1(0.4)	13(7.4)	0.0002	7(11.5)	0.000008
Ovarian cancer	11 (4.7)	13(7.4)	0.3	8(13.1)	0.03
Breast cancer	11(4.7)	9(5.1)	0.8	5(8.2)	0.3
Functional	150(65)	113(65)	0.99	14(23)	0.0006
Cervical cerclage	4(1.7)	2(1.1)	0.6	2(3.2)	0.4
Others laparoscopy	22(9.5)	7(4)	0.04	1(1.6)	0.05
Conization	4(1.7)	7(4)	0.1	3(4.9)	0.1
Prolapse repair	0	3(1.7)	NA	0	NA
Hysteroscopy	71(30.6)	48(27.4)	0.6	5(8.2)	0.003
Cystectomy	5(2.1)	6(3.4)	0.44	2(3.2)	0.6
Laparotomy myomectomy	7(0.8)	12(6.8)	0.08	1(1.6)	0.5
Mastectomy for Benjamin Syndrome	2(0.9)	4(2.3)	0.24	0	NA
Hysterectomy for benign diseases	30 (13)	21(12)	0.8	0	NA
Other surgery	5(2.1)	3(1.7)	0.75	0	NA
Emergency	59(25.4)	27(15.4)	0.04	27(44)	0.04
Breast abscess	6(2.5)	2(1.1)	0.3	2(3.2)	0.7
Bartholinitis	11(4.7)	1(5.7)	0.01	1(1.6)	0.2
Other laparoscopy	0	2(1.1)	NA	2(3.2)	NA
Curettage	26(11.2)	9(5.1)	0.04	9(14.7)	0.5
Ectopic pregnancy	13(5.6)	5(2.9)	0.2	5(8.1)	0.48
Vulvar hematoma	0	1(5.7)	NA	1(1.6)	NA
Hysteroscopy	0	2(1.1)	NA	2(3.2)	NA
Ovarian torsion	3(1.3)	5(2.9)	0.2	5(8.2)	0.004
TOTAL	232(100)	175(100)		61(100)	

NA: non applicable; n : number of patients.

Table 2
SGO Guidelines for classification of urgency in gynecologic surgery [5].

Emergent/Urgent immediate	Semi urgent 1–4 weeks	Non urgent >4–12 weeks	Elective >3 months
Emergent: procedure performed without delay to preserve life or limb. Urgent: Procedure performed when the patient is medically stable -Viscus perforation -Closed-loop bowel or colonic obstruction -Incarcerated hernia with gynecologic tumor -Vaginal, uterine or pelvic hemorrhage -Molar pregnancy -Pelvic mass with torsion or with urinary or intestinal obstruction	Procedure performed to preserve the patient's life or prevent expected progression of disease/morbidity. Designation determined by specialty -Establishment of cancer diagnosis when high suspicion exists (i.e. laparoscopy, hysteroscopy) -Grade 1 endometrial cancer when hormonal therapy is contra- indicated or not possible -High grade uterine cancers, all stage -Cervical and vulvar cancer-surgery, with curative intent -Advanced ovarian cancer -Abdominopelvic masses concerning for malignancy -Symptomatic gynecologic cancer in pregnancy requiring surgery -Symptomatic patients with inoperable primary or recurrent cancer requiring palliative cancer procedures -Moderate-severe anemia requiring repeated transfusion	Progression of disease or symptoms, or readmission within 3 months is unlikely or nonsurgical treatments available -Benign-appearing ovarian cysts/masses -VAIN/VIN2–3 -CIN 2–3 -CAH/EIN; grade 1 endometrial cancer when hormonal therapy is not contra- indicated -Completion surgery for early-stage ovarian cancer -Recurrent cancer requiring palliative resection	Procedure that does not involve a medical emergency. The procedure can be delayed without meaningful disease progression or morbidity. -Risk reducing surgery for genetic predisposition to gynecologic cancer -Hysterectomy for benign disease in absence of anemia -Uncomplicated endometriosis -Pelvic organ prolapse -Urinary incontinence

VAIN: Vaginal intra epithelial neoplasia; VIN: Vulvar intraepithelial neoplasia; CIN: Cervical intra epithelial neoplasia; CAH/EIN: Complex atypical hyperplasia/Endometrial intraepithelial neoplasia.

was a reduction of 64% in emergency procedures (27 vs 59), 90% of functional pathologies (14 vs 150), and 13% of cancers (20 vs 23). There was also a decrease in the number of curettages (9 vs 26) and bartholinitis (1 vs 11) performed. The proportion of planned cancer surgery was higher in 2020 vs 2019 (20% vs 10%, $p = 0.01$). The difference remained significant for the proportion of cancer procedures that were performed (33% vs 10% $p = 0.002$). Effective operations for functional pathology surgeries were significantly decreased in 2020 (23% vs 65% $p = 0.0006$). Emergency operations accounted for a higher proportion of procedures in 2020 (44% vs 25% in 2019, $p = 0.04$), but were significantly less common overall in 2020 (27 procedures in 2020 vs 59 in 2019). As shown in Fig. 1, the proportions of type of surgery reversed between 2020 and 2019. Fifteen cancer procedures were postponed during the 2020 lockdown, with a median delay of 11 weeks (range: 4–15 weeks). These included six cases of endometrial cancer, 5 cases of ovarian cancer and 4 cases of breast cancer that were treated by hormonal therapy or chemotherapy. Four conization procedures were postponed during the 2020 lockdown, with a median delay of 5.5 weeks for surgery (range 2–9 weeks). Histological analysis was consistent with colposcopy biopsies (cervical intraepithelial neoplasia (CIN) grade 3).

As shown in Fig. 2 and Table 3, after classifying surgeries according to SGO guidelines [5], none of the immediate emergency procedures ($n = 18$) and 94% of procedures in the elective group ($n = 65/69$) were postponed. A total of 80% of patients in the non-emergency group ($n = 29/36$) and 38% of patients in the semi-urgent group ($n = 20/52$) had their procedures delayed.

The median [1st Quartile–3rd Quartile] delay of surgical care was 12.8 weeks [range: 10.4–17.1 weeks] for patients in the elective group, 9.7 weeks [range: 7.71–14 weeks] for patients in the non-urgent group, and 6.7 weeks [range: 5.4–10 weeks] for patients in the semi-urgent group (Fig. 3). However, 30 patients (26%) were not included in this analysis, because their procedure had not yet occurred by the end of data collection. Three were lost to follow-up and their surgical indications included hysteroscopies initially planned for synechia, metrorrhagia and infertility. One patient had a procedure performed in another center for a functional pathology. Two patients canceled their operations for a malignant tumor of the breast and an endometrial cancer grade 1a, because of fear of COVID-

19 contamination in hospital and did not reschedule surgery, despite explanations of the necessity for the procedures. Two patients did not have procedures due to pregnancy. Five patients with Benjamin Syndrome were rescheduled for hysterectomy in early 2021. The rest of the patients were in the elective group (with surgical indications including myomectomy, prolapse, endometriosis, polyps or synechia).

There was a potential “loss of chance” in 10 patients among those who had postponed surgeries ($n = 10/114$, 8.7%). For these patients, the median delay was 11 weeks (range: 2 – 26 weeks). One patient with a 6-weeks delayed procedure had a difference between the expected (benign ovarian cyst) and effective histology (clear cell ovarian cancer IIIB FIGO stage) with a post-operative pulmonary embolism. One had an endometrial cancer (endometrioid adenocarcinoma, 1A FIGO stage) instead of expected endometrial atypia with a delay of 5 weeks; this patient had post-operative complications including active hemorrhage which required embolization, transfusion and post-operative resuscitation and pelvic abscess with radiologic drainage. One patient needed an axillary lymph node dissection and tumorectomy for T2N2M0 invasive ductal carcinoma that was initially expected to be a papillary carcinoma T2N1M0 following an 11-weeks delayed procedure. Six patients consulted in the emergency room for endometriosis or myomas: 5 for pelvic pain, among them one required the introduction of morphine and one a hospitalization; one had adverse effects of GnRH analogs introduced to delay surgery for endometriosis. One patient had an increase in size of an ovarian Cyst (from 9 to 17 cm) (benign fibro thecoma) responsible for higher complexity of surgery (mini-laparotomy) following a delay of 12.4 weeks. One patient underwent an emergency hysteroscopy for hemostasis in the context of hemorrhagic bleeding 3 weeks after the initial date of planned surgery (endometrectomy for endometrial hypertrophy).

Discussion

We observed a 65% drop of surgical activity primarily among procedures for functional pathologies. Our prioritization policy was good for the emergency group (none of surgeries were unduly postponed) and elective group (which were primarily postponed). The delay of

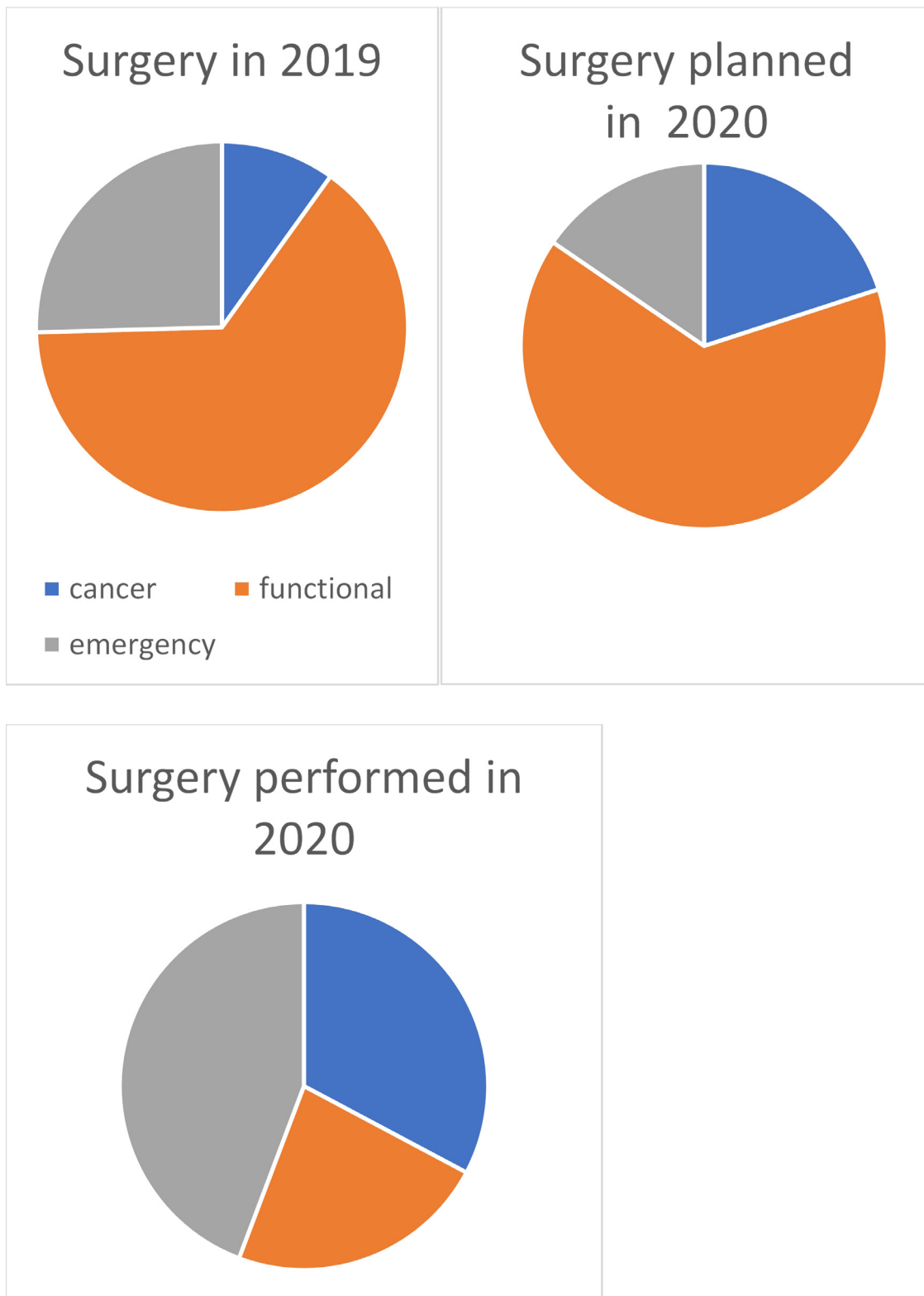


Fig. 1. Pie chart. Proportions of surgery between 2020 and 2019 (March- 14-May 11).

surgery was, however, longer than recommended for semi-urgent group [5]. We identified 10 patients (8.7%) with a potential “loss of chance”, all in the semi-urgent group with a median delay of 11 weeks (range: 2 – 26 weeks).

The COVID-19 pandemic had a significant impact on the types of procedures and scheduling intervals in the Hospital Foch gynecologic surgery department. Globally, there was a 65% drop of surgical

activity, primarily among procedures for functional pathologies. These data agree with other published French data: Pinar et al. showed a 55% reduction in overall urologic activity in 8 departments in Paris between 2019 and 2020, with a decrease in oncological activity and emergencies of 31% and 44% respectively which translates in more than 1033 h of surgical intervention that needed to be rescheduled at the end of the lockdown period [6].

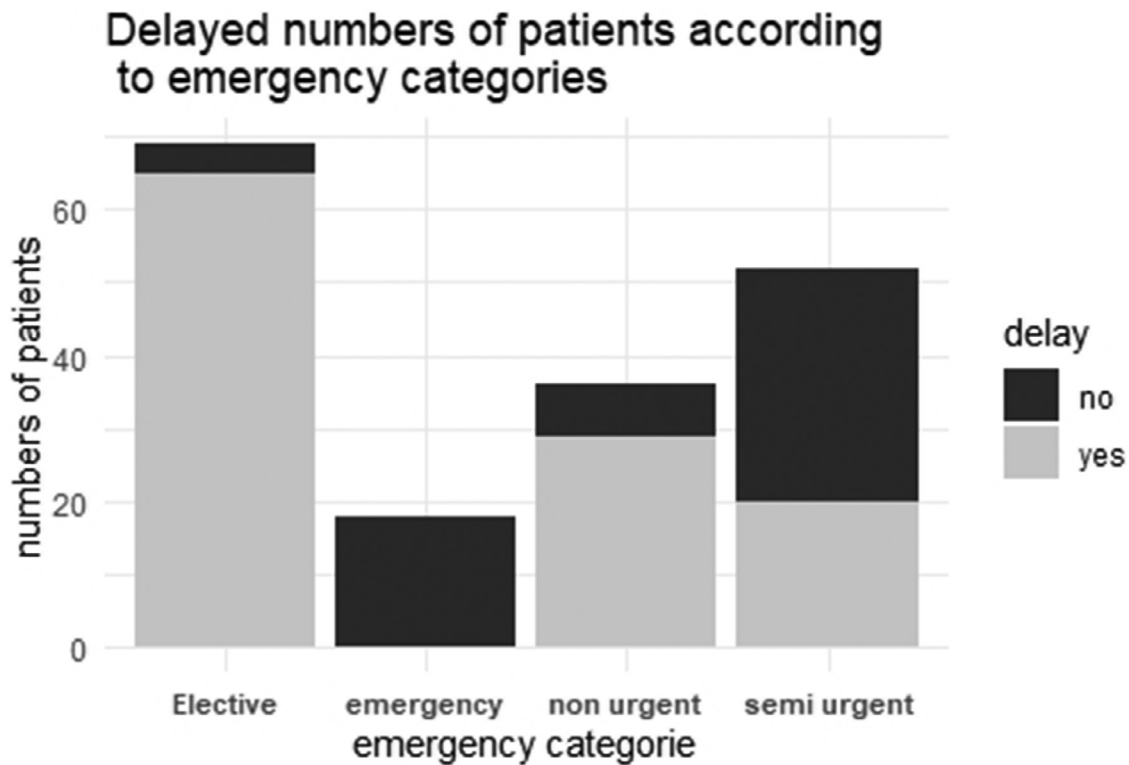


Fig. 2. Delayed number of patients according to SGO emergency categories [5].

Analysis revealed a significant decrease in the proportion of functional surgeries and an increase rate of emergency and cancer surgeries, as expected. But the absolute number of planned surgeries and emergency procedures also decreased. Lack of data about patients who did not consult physicians during this period may have led to underestimate the impact of the COVID-19 [7,8]. There was an increase of planned surgeries for cancer during this period at Foch Hospital, which could be due to the fact that patients had fewer consultations for cancer during the lockdown but we cannot eliminate the possibility of transfers of patients from one center to another. A multicenter French survey showed that 50% of 12 centers increased their activity concerning breast cancer surgery in the first lockdown but reduced the duration of hospitalization [9]. In a survey involving 16 European countries, gynecological cancer patients expressed significant anxiety about progression of their disease due to modifications of care related to the COVID-19 pandemic and wished to pursue their treatment as planned despite the associated risks [10]. Nevertheless, two cancer patients in our department decided to cancel their surgeries because of fear of COVID-19 contamination in the hospital. This situation had a dramatic impact on their prognosis. A total of 57% of our patients with cancer could maintain their surgery date without delay, a rate that is similar to that reported by others [11]. Hormonal therapy for breast and endometrial cancers and neoadjuvant chemotherapy for ovarian cancer were started in the setting of

procedural delay [5,12]. Currently available evidence is limited by small sample size, and the full impact of this pandemic on gynecologic cancer is yet to be determined [13]. It is feasible there could be a secondary mortality and morbidity peak due to missed or delayed procedures [14].

The CNGOF has provided recommendations based on data from three lockdown phases during the COVID-19 pandemic ranging from Phase 1 where only immediate emergency surgeries could be performed to Phase 3, where all surgeries could restart [3]. A classification for prioritizing patients in four groups was also set up by the Society of Gynecologic Oncology [5]. We used this system to evaluate the delays in surgeries by priority. Our prioritization was good for the emergency group (none of surgeries were unduly postponed) and elective group (which were primarily postponed). Approximately 30% of the postponed procedures had not been performed at the end of the data collection, which could artificially improve the median delay described particularly for the elective group and underestimate “loss of chance” for these patients as definitive information provided during surgery was not available. The delay of surgery was, however, longer than recommended for semi-urgent group.

Collateral damage of COVID-19 may have negatively impacted patients with other diseases [15]. For example, the COVID-19 outbreak impacted stroke care significantly, including prehospital and in-hospital care, resulting in a significant drop in admissions,

Table 3
Classification of planned and actual surgeries according to SGO classification [5].

Surgery n(%)	2019	2020 Planned	P	2020 Actual	P
Urgent	59(25%)	NA	NA	18 (29%)	0,6
Semi-urgent	23(10%)	52 (30%)	0,000002	32 (52%)	0,00000009
Non urgent	8(4%)	36 (20%)	0,0000009	7 (12%)	0,01
Elective	142(61%)	69 (40%)	0,01	4 (7%)	0,0000005
TOTAL	232 (100%)	175 (100%)		61 (100%)	

NA: non applicable; n : number of patients.

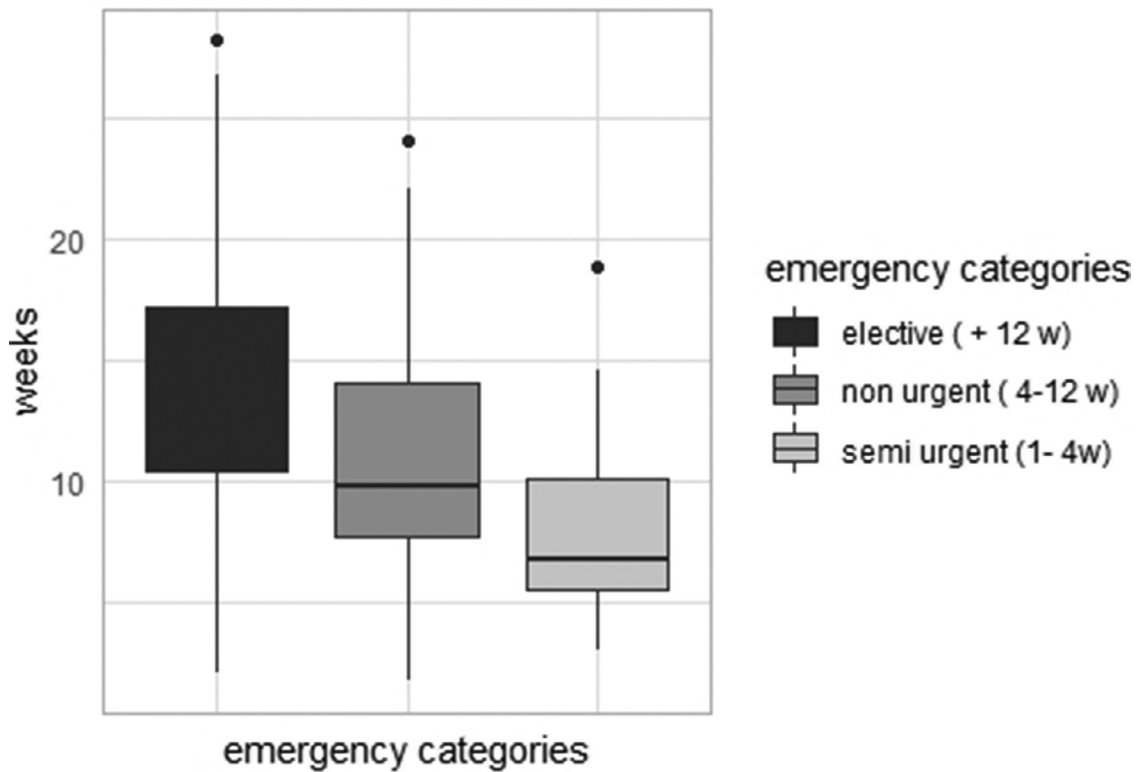


Fig. 3. Median Delay of surgical care according to emergency categories [5].Source: Box plot with median 1st Quartile-3rd Quartile; w: weeks.

thrombolysis, and thrombectomy [16]. Additionally, there was an increase in mortality for patients with chronic cardiovascular diseases included in a waiting list due to cancelation of invasive elective procedures [17]. The early stages of the COVID-19 pandemic have focused on containing SARS-CoV-2 infection and identifying treatment strategies. While controlling this communicable disease is of utmost importance, the long-term effect on individuals with non-communicable diseases is also significant. We evaluated the potential negative impact of postponed surgeries due to COVID-19 among Hospital Foch gynecologic patients using a composite criterium, identifying 10 patients (8.7%) with increased risk. The patients all had indications considered semi-urgent, but the median interval to surgery was 11 weeks, which is much longer than recommended [5]. Three cases of cancers were initially underestimated (ovarian, endometrial and breast cancer). For the ovarian cancer, it was certainly due to a poor analysis of the imaging. Atypia are the site of real endometrial tumors in about 30% of cases, which could explain the misdiagnosis of the endometrial cancer [18]. Furthermore, axillary lymph node dissection in breast cancer is debatable for 2 sentinel lymph nodes containing metastases [19]. Even if it was not measurable, the delayed time to surgery for these three patients who had cancer severity underestimated may have translated to a negative impact on their long-term prognosis and increased medical risk. These cases show the pitfalls of preoperative triage in crisis period. It is our opinion that immediate post-operative complications were not related to surgical delays in these cases. For the other cases, morbidity was increased and involved pain, bleeding, poor tolerance of medications, or increase in surgical complexity. It seems likely this represents a small proportion of the collateral impacts of COVID-19 outbreak on our patients, since there was an unknown population of patients who didn't consult hospital physicians due to fear of infection. A recent study of 181 pelvic gynecological cancers showed a direct detrimental impact of the COVID-19 pandemic for 39 patients, representing 22% of the patients [20].

As for other medical specialties, a lack of medical care was observed in gynecology during the first Lockdown due to COVID-19 pandemic. Delay of surgery gynecologic pathologies led to collateral damages including potential "loss of chance" for these patients. Interruption in medical care should be avoided as much as possible. Urgent and semi-urgent surgeries shouldn't be rescheduled. Teleconsultation should be widespread during a pandemic in order to maintain a minimal follow-up.

A major weakness of our study is that we used the classification according SGO in four urgency categories, which deals mainly with oncologic surgeries. Non oncologic indications were lacking, so we added some benign diseases in a personal manner. In addition we lack data about how many patients avoided consultations. Another limitation is that it was a single-center study carried out in one gynecology and obstetrics department in the Parisian area. The study had a low statistical power, and had no control group to assess "loss of chance". We used a composite criterion to increase statistical power and provide a glimpse into real-world clinical data. However, interpretation of the results was challenging because events of different severity were grouped together. This study had few exclusion criteria, but so in view of the above arguments, our study had a poor external validity. To date, there have been few studies highlighting the potential "loss of chance" for postponed medical care due to COVID-9. To our knowledge, this is the first study to evaluate year-over-year changes in amounts, types, and scheduling of gynecologic surgeries across all categories.

Conclusion

The COVID-19 pandemic was the cause of a significant decrease (65%) of activity in our surgical department during the first French lockdown. It was difficult to reschedule procedures, which resulted in an increased delay in semi-urgent operations beyond the interval recommended by guidelines. We observed a potential "loss of

chance" for almost 9% of postponed surgeries. This collateral damage of COVID 19 pandemic was probably underestimated, as only 50% of surgery were initially planned in comparison with the same period in 2019. It is important to continue to treat pathologies requiring urgent or semi-urgent surgery during pandemics so as not to increase the collateral damage.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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