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SHORT REPORT



Personal Protective Equipment during the COVID-19 pandemic and operative time in cesarean section: retrospective cohort study*

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ABSTRACT

Introduction: The covid-19 pandemic has meant a change in working protocols, as well as in Personal Protective Equipment (PPE). Obstetricians have had to adapt quickly to these changes without knowing how they affected their clinical practice. The aim of the present study was to evaluate how COVID-19 pandemic and PPE can affect operative time, operating room time, transfer into the operating room to delivery time and skin incision to delivery time in cesarean section.

Methods: This is a single-center retrospective cohort study. Women with confirmed or suspected SARS-CoV-2 infection having a cesarean section after March 7th, 2020 during the COVID-19 pandemic were included in the study. For each woman with confirmed or suspected SARS-CoV-2 infection, a woman who had a cesarean section for the same indication during the COVID-19 pandemic and with similar clinical history but not affected by SARS-CoV-2 was included.

Results: 42 cesarean sections were studied. The operating room time was longer in the COVID-19 confirmed or suspected women: 90 (73.0 to 110.0) versus 61 (48.0 to 70.5) minutes; $p < .001$. The transfer into the operating room to delivery time was longer, but not statistically significant, in urgent cesarean sections in COVID-19 confirmed or suspected women: 25.5 (17.5 to 31.75) versus 18.0 (10.0 to 26.25) minutes; $p = .113$.

Conclusions: There were no significant differences in the operative time, transfer into the operating room to delivery time and skin incision to delivery time when wearing PPE in cesarean section. The COVID-19 pandemic and the use of PPE resulted in a significant increase in operating room time.

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Cesarean section; COVID-19; operative time; pandemics; Personal Protective Equipment

Introduction

SARS-CoV-2 is spread by respiratory droplets and direct contact with bodily fluids through eyes, nose, mouth, or an open cut, wound, or abrasion [1,2]. In addition, the SARS-CoV-2 virus can be viable on plastic and stainless steel surfaces for up to 72 h [3]. The ease of spreading along with the virus stability make protecting health workers against SARS-CoV-2 a real challenge [4].



The World Health Organization (WHO) has provided guidance on the rational use of Personal Protective Equipment (PPE) for COVID-19, and there are also manuals and videos on how to use PPE [5,6]. Unfortunately, meta-analyses indicate that the protection of PPE may be limited and it is unknown if putting more layers on and covering more parts of the body is beneficial [7].

With regard to PPE there are also concerns that it could influence healthcare. In fact, it is known that using PPE requires time, and changes in operative time can have important repercussions on the health of mothers and newborns in cesarean section [8].

The aim of the present study was to evaluate how PPE for the COVID-19 pandemic can affect operative time, operating room time, transfer into the operating room to delivery time and skin incision to delivery time in cesarean section.

Materials and methods

This is a single-center retrospective cohort study. Ethical clearance was obtained from the institutional ethics committee (PI-4210).

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The first cesarean delivery in a woman affected by SARS-CoV-2 infection in our center took place on March 7th, 2020. To avoid the influence of other cofounders, we decided to include only women having a cesarean section after March 7th, 2020 during the COVID-19 pandemic.

There were two study groups:

- Group one: Women who were confirmed or suspected COVID-19 cases who delivered by cesarean section with the healthcare workers wearing PPE.
- Group two: For each woman in the Group one, one woman who had a cesarean section for the same indication and with similar clinical history but not affected by SARS-CoV-2.

Operative time, operating room time, transfer into the operating room to delivery time, skin incision to delivery time, estimated blood loss during surgery, neonatal umbilical artery pH values and the demographic data of the mother and newborn were recorded.

The PPE used to prevent exposure included gloves, a gown, a respirator with a rating of N95 or higher, and a full face shield. On top of all this, the attending obstetricians had to wear a sterile surgical gown and sterile gloves.

Statistical analyses

Numerical variables were expressed as median (interquartile range) and qualitative variables were expressed as proportions (absolute and relative frequencies). Comparisons between groups were performed by Mann-Whitney U-test or two-tailed χ^2 -test as appropriate. Level of significance was set at 0.05. All analyses were performed using SPSS version 22.0 (SPSS Inc., Chicago, IL, USA).

Results

There were 25 cesarean sections in confirmed or suspected COVID-19 cases from March 7th till May 20th, 2020 in our center. Four cesarean sections in confirmed or suspected COVID-19 cases were not included in the study. In one of the cesarean sections not included, the obstetrician did not use a complete PPE because an umbilical cord prolapse was diagnosed, and the obstetrician decided to attend the cesarean section with the least possible delay. In the other 3 not included cesarean sections, women of the matched control group could not be obtained according to the study protocol. One cesarean section was due to acute respiratory failure, another due to congenital maternal sacrococcygeal teratoma, and the last one on maternal request.

Cesarean section was indicated in the 42 women studied due to: breech presentation (16 cases), one previous cesarean section without trial of labor after previous cesarean (TOLAC) (6 cases), TOLAC and prolonged second-stage of labor (4 cases), pathological CTG (8 cases), active-phase arrest (6 cases) and two previous cesarean sections (2 cases). All cesarean sections were performed with epidural or spinal anesthesia.

There were no significant differences in maternal age, gestational age, body mass index, fetal weight, operative time, transfer into the operating room to delivery time, skin incision to delivery time, estimated blood loss, umbilical artery pH, Apgar score, between the study groups (Table 1). The operating room time was longer in the COVID 19 group (90 (73.0 to 110.0) versus 61 (48.0 to 70.5) minutes; $p < .001$).

The transfer into the operating room to delivery time was longer in the COVID 19 group in urgent cesarean sections, although not statistically significant (25.5 (17.5 to 31.75) versus 18.0 (10.0 to 26.25) minutes; $p = .113$). In cesarean sections with no

Table 1. Data are presented as medians (interquartile range) and absolute and relative frequencies for qualitative variables.

	COVID 19. PPE. $n = 21$	No COVID 19. No PPE. $n = 21$	p
Age (years)	34 (29.5 to 38.5)	37 (32.0 to 39.5)	.570
GA (weeks)	39.29 (38.00 to 39.86)	39.57 (38.71 to 40.64)	.182
BMI (kg/m ²)	26.80 (22.84 to 31.27)	28.29 (22.91 to 32.85)	.545
Nulliparous	13 (61.9%)	13 (61.9%)	1.000
Operative time (minutes)	39 (30.0 to 43.5)	38 (30.5 to 48.0)	.650
Operating room time (minutes)	90 (73.0 to 110.0)	61 (48 to 70.5)	<.001
Transfer into the operating room to delivery time (minutes)	26 (20.5 to 33.0)	21 (13.5 to 33.5)	.222
Skin incision to delivery time (minutes)	7 (4.5 to 8.0)	7 (4.5 to 10.5)	.909
Estimated blood loss (ml)	350 (300 to 500)	300 (200 to 500)	.470
Umbilical Artery pH	7.33 (7.26 to 7.38)	7.28 (7.24 to 7.33)	.082
Apgar 1	9 (8 to 9)	9 (9 to 9)	.637
Apgar 5	10 (9 to 10)	10 (10 to 10)	.839
Neonatal weight (g)	3120 (2635 to 3552)	3230 (2887 to 3695)	.237

BMI: Body Mass Index; GA: Gestational age; PPE: Personal Protective Equipment.

epidural anesthesia before entering the operating room, only the operating room time was longer in the COVID 19 group (90.0 (78.0 to 116.0) versus 57.5 (67.0 to 76.5) minutes; $p = .002$).

Discussion

The use of PPE for the COVID-19 pandemic did not increase the operative time and the skin incision to delivery time for cesarean section in our center. Only the operating room time was importantly prolonged. The transfer into the operating room to delivery time was longer, but the difference was not statistically significant. There are no reports in the literature on how pandemics affect operative time in cesarean section. A study in relation to the Ebola epidemic in Sierra Leone, states that some obstetricians operated faster to reduce their exposure, while others slower to avoid adverse events such as needle-stick injuries [9]. Surgery for confirmed or suspected COVID-19 patients may take longer to prepare than general operations due to the special requirements for the preoperative use of PPE [4,10–12].

Operative time, transfer into the operating room to delivery time and skin incision to delivery time are considered very important in obstetrics because they can affect neonatal prognosis especially in emergent cesarean sections [8,13–15]. In our hospital, an obstetrician attended a cesarean section indicated by cord prolapse without using PPE. After evaluating our results, it is not possible to affirm that wearing a full PPE could result in a clinically relevant time delay in emergent cesarean sections.

The use of PPE by anesthesiologists in suspected or confirmed COVID-19 cases is highly recommended, even with spinal or epidural anesthesia [16]. As there were no time differences when comparing women who did not receive epidural anesthesia before entering the operating room, the impact of using PPE by anesthesiologists is scarce in terms of transfer into the operating room to delivery time.

The significant increase in operating room time occurred as a consequence of the time necessary to remove the PPE, prepare the transfer of the woman and the newborn and avoid contamination during these proceedings [5]. Any increment in the operating room time may be very important for scheduling surgeries [17].

The main weaknesses of this study are the lack of randomization, being retrospective and the low number of cases. The risk for health workers did not allow the use of PPE to be randomized. However, having

collected all the cases during the COVID-19 pandemic, we think both groups are fairly comparable.

In conclusion, the COVID-19 pandemic and the use of PPE resulted in a significant increase in operating room time. There are no significant differences in the operative time and skin incision to delivery time when wearing PPE in urgent and planned cesarean sections.

Disclosure statement

The authors report no conflict of interest.

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