

Immediate impact of the COVID-19 pandemic on pediatric surgery: analysis of a tertiary healthcare facility

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ABSTRACT

Introduction. The pandemic caused by the SARS-CoV-2 virus has led to an unprecedented situation, with population lockdowns, congestion of healthcare resources, cancellation of scheduled surgical activity, fear of contagion, and delays in patient care. The objective of this study was to analyze its impact on pediatric surgical activity at a reference healthcare facility.

Materials and methods. A comparative study of activity in the pediatric surgery environment at a Spanish reference healthcare facility was carried out. It included outpatient consultations, scheduled surgeries, and activity at the emergency department during the lockdown period in Spain (March-May 2020) vs. the same 2019 period. Number of consultations and surgeries, type of surgery performed and/or cancelled, and stage of the pathologies treated were collected.

Results. A 98% decrease in scheduled surgeries, an 84% decrease in healthcare burden from the pediatric emergency department, a 55.24% decrease in urgent surgeries, an 82% decrease in outpatient activity at external consultations, and a 94% decrease in inter-hospital referrals, along with a 66% increase in urgent pathology severity, were found.

Conclusions. The COVID-19 pandemic cancelled virtually all pediatric surgery activity, which caused treatment delays in severe pathologies and increased morbidity in regular urgent procedures.

KEY WORDS: COVID-19; Pandemic; Infectious disease; Healthcare.

IMPACTO INMEDIATO DE LA PANDEMIA POR COVID-19 EN CIRUGÍA PEDIÁTRICA: ANÁLISIS DE UN CENTRO TERCIARIO

RESUMEN

Introducción. La pandemia surgida como consecuencia del virus SARS-CoV-2 ha provocado una situación inaudita, el confinamiento de la población, el colapso de los recursos sanitarios, la suspensión de la actividad programada en los servicios quirúrgicos, el miedo al contagio y la demora en la atención de pacientes. El objetivo es analizar el impacto de esta situación en la actividad del Servicio de Cirugía Pediátrica de un centro de referencia.

Material y métodos. Se ha realizado un estudio comparativo de la actividad realizada en el ámbito de Cirugía Pediátrica de un centro de referencia español, incluyendo consultas ambulatorias, cirugía programada y actividad en urgencias durante el periodo de confinamiento (marzo-mayo 2020) frente al mismo periodo de tiempo en 2019. Se recogen el número de consultas e intervenciones, el tipo de cirugía practicada y/o anulada y el grado de evolución de las patologías atendidas.

Resultados. Se ha registrado un descenso del 98% de las cirugías programadas, del 84% de la presión asistencial desde urgencias pediátricas, un 55,24% menos de cirugías urgentes y un 82% la actividad ambulatoria en Consultas Externas. Se ha registrado un descenso en los traslados interhospitalarios del 94% y un incremento del 66% de la gravedad de la patología urgente.

Conclusiones. La pandemia por COVID-19 ha supuesto la anulación de la práctica totalidad de la actividad del Servicio de Cirugía Pediátrica, con la consiguiente demora en el tratamiento de patologías graves y un aumento en la morbilidad de procesos urgentes habituales.

PALABRAS CLAVE: COVID-19; Pandemia; Enfermedad infecciosa, Cuidado de la salud.

INTRODUCTION

The pandemic caused by the SARS-CoV-2 coronavirus disease⁽¹⁾ has led to an unprecedented situation, with population lockdowns, congestion of healthcare resources, cancellation of scheduled surgical activity, fear of contagion at healthcare facilities, and delays in patient care.

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Date of submission: June 2020

Date of acceptance: August 2020

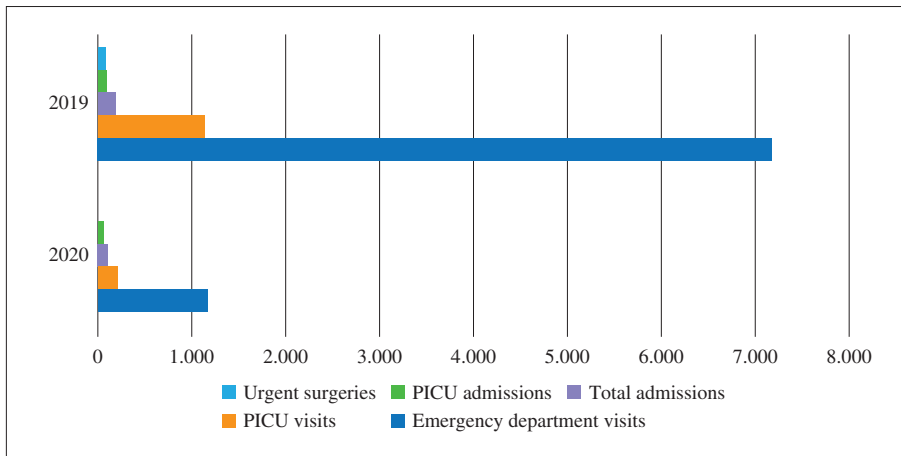


Figure 1. Emergency department environment: comparison of activity.

On March 11, 2020, the COVID-19 was declared a pandemic by the WHO⁽¹⁾. In Spain, this led to a state of emergency that imposed a strict lockdown on the population. SARS-CoV-2 infection cases spread globally, with the first patient in mainland Spain being identified on February 24, 2020. The rapid propagation of the virus and the increase in the number of patients in Spain since the first cases had been detected in Wuhan (China) in December 2019⁽²⁾ led to a quick redistribution of healthcare resources for patient care at emergency departments. De novo creation of Intensive Care Units was also necessary in response to the great number of patients requiring invasive ventilation^(3,4).

In high incidence areas, such as our reference area, patient care needs led to a decrease in oncological surgeries and to the cancellation of virtually all non-oncological scheduled activity. Healthcare personnel reorganization was also required to support COVID patient units and rooms⁽⁵⁾.

The objective of this study was to analyze the impact of this anomalous situation on pediatric surgery activity at a reference healthcare facility from the beginning of the state of emergency in Spain, with the resulting lockdown, to the end of it and the progressive lifting of confinement measures.

MATERIALS AND METHODS

A descriptive study comparing activity in the surgical and outpatient environment of a Spanish tertiary pediatric surgery department from March 2020 to May 2020 vs. the same 2019 period was carried out.

In the surgical environment, diagnoses, number of surgeries, and surgical techniques used were collected. In the outpatient environment, the number of first visits and subsequent controls and/or healings was gathered. In the emergency department environment, data on diagnoses, number of surgeries and visits, and procedures carried out were included. Data on pathology severity and COVID-19

detection were also recorded. Case distribution in groups within the same time frame was carried out according to the criteria in force in the relevant month.

Data were collected from computer-based clinical records by the documentation department. The SPSS software, version 21.0, was used for statistical analysis purposes.

RESULTS

Scheduled surgical environment

From March 2020 to May 2020, only ten outpatient scheduled surgeries were performed. They were carried out in late May, with the beginning of phase 0 in Spain.

In the same 2019 period, 610 surgeries – 183 inpatient surgeries and 427 outpatient surgeries – were performed, which means 98.32% of the activity was cancelled in 2020.

Urgent surgical environment

In the 2019 period, 7,188 urgent visits were recorded at the pediatric emergency department, 1,134 of which were managed by the pediatric surgery department. 187 admissions corresponded to the pediatrics department, and 97 admissions corresponded to the pediatric surgery department. 78 emergency, urgent, and/or deferred urgent surgeries were carried out.

In the 2020 lockdown period, the number of visits recorded at the pediatric emergency department was 1,163, i.e., 16% vs. regular activity, with a total of 105 admissions. Visits recorded at the pediatric surgery department were 206, with 48 admissions, 47 of which required surgery (Fig. 1). The only patient requiring admission without surgery was a child with ileocolic invagination successfully treated by means of a water enema. Reasons for admission are featured in Table I.

Even though fewer appendicitis cases were recorded, an increase in the percentage of complicated appendicitis cases (plastrons, peritonitis, and perforated appendicitis)

Table I. Admissions at the pediatric surgery department from the emergency department.

Reason for admission	N (2020) = 48	N (2019) = 97
NC acute appendicitis	11	31
C acute appendicitis	20	14
>6 h testicular torsion	6	0
<6 h testicular torsion	2	3
Surgical wound infection	1	2
Abscess	1	7
Bronchial foreign body	1	2
Intestinal obstruction	1	4
Hypertrophic pyloric stenosis	2	1
Severe bite	2	0
Ileocolic invagination	1	4
Incarcerated inguinal hernia	0	3
Severe burn	0	8
Polytrauma	0	12
Other reasons for admission	0	6

NC: non-complicated; C: complicated (localized/diffuse peritonitis or appendicular plastron).

(64% vs. 31%) and in that of testicular torsions with symptoms originating more than 6 hours prior to consultation (75% vs. 0%) was noted as compared to the previous year. Overall, complicated appendicitis and testicular torsion cases were the most frequent reason for urgent surgery at our department, with an increase in severity of 66% vs. 29% (χ^2 p = 0.0004, CI: 95%).

Certain procedures classified as “deferred emergencies” or “preferential procedures”, such as biopsies, surgical wound examinations, and treatment of inguinal hernias with a high risk of incarceration, were carried out at the emergency department’s operating room – if available and following assessment by the surgical coordinator.

Table II. Deferred pediatric surgeries carried out at the emergency department’s operating room.

Procedure	N
Surgical wound dehiscence examination	2
Intestinal mapping (congenital intestinal dysplasia)	1
Symptomatic inguinal hernia	4
Gastrostomy replacement	1
Lymph node biopsy	1
Double J stent removal (+10 weeks)	1

This allowed 10 non-deferrable surgeries to be performed (Table II).

Inter-hospital referrals

Regarding patient origin, 5 out of the 47 patients undergoing surgery (10.63%) had been referred from other hospitals, for which we are the reference healthcare facility in our area. However, in 2019, the percentage of patients referred from other healthcare facilities was 41.8%.

COVID-19 detection

In the 48 patients admitted, a SARS-CoV-2 PCR test was carried out. The result was positive in just one patient – a 5-year-old girl with appendicular peritonitis (2.08%).

Outpatient environment

In the 2020 period, 25 face-to-face outpatient visits were recorded. Outpatient visits and outpatient surgical activity were resumed in mid-May. Care at external consultations was maintained, but mostly through teleconsultations, with a total of 445 phone consultations – 338 follow-up consultations and 132 first consultations. In 2019, 2,748 visits were recorded at the pediatric surgery department, all of which were face-to-face – 1,274 first visits and 1,474 follow-up visits and/or healings. Activity

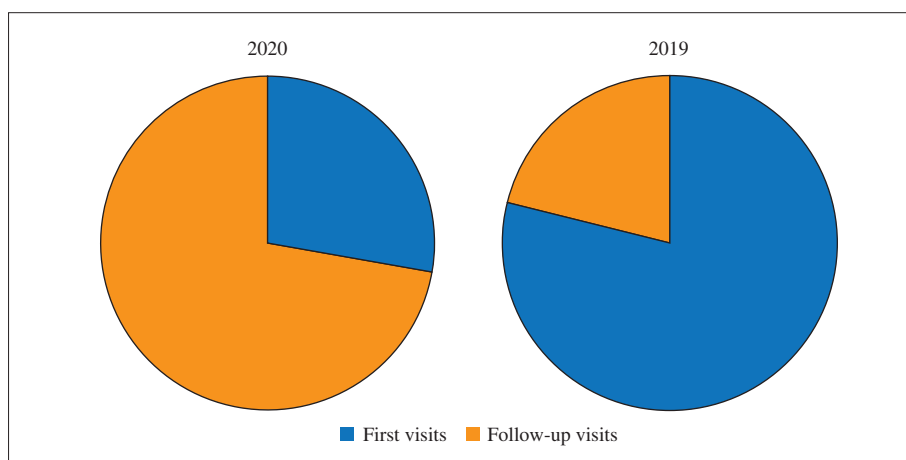


Figure 2. Reasons for consultation in the outpatient environment.

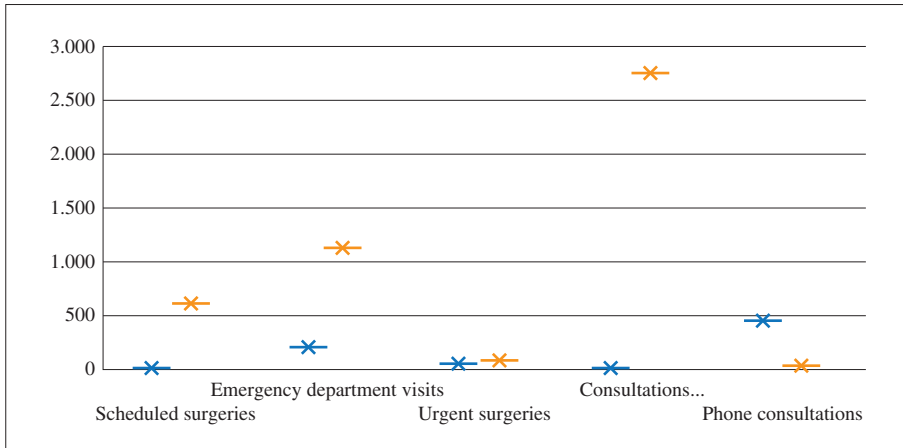


Figure 3. Overall impact on activity: comparative data.

decreased by 484% (Fig. 2), with an even more significant decline in first consultations (24% vs. 46.39% of the total visits). This can be explained by the lack of activity at primary care healthcare facilities (Fig. 3).

DISCUSSION

The pandemic caused by the SARS-CoV-2 virus has led to an unprecedented situation at surgical departments. With more than 6 million infections worldwide⁽⁶⁾ and close to 242,000 cases in Spain⁽⁷⁾, some 330 million surgeries are believed to have been cancelled globally⁽⁸⁾. The need for healthcare personnel and the reorganization of resources caused virtually all elective surgeries to be cancelled.

In many healthcare facilities, only oncological surgeries were maintained, and not always. Some urgent pathologies such as appendicitis, cholecystitis, and colon obstruction were conservatively managed in selected patients⁽⁹⁾, according to various scientific societies' guidelines^(10,11). This decision was not based on the lack of resources only, but also on the risk of an increase in morbidity and mortality in COVID-positive patients undergoing surgery. Indeed, this decision proved right in light of the data collected in the study period, especially in elderly patients, with an increase in pulmonary complications in 50% of patients and mortality rates above 20%^(12,13).

In our healthcare facility, a consensus document⁽¹⁴⁾ for pediatric surgical patient management was drafted. It was led by the pediatric surgery department and agreed with the anesthesia and pediatrics departments. It established pediatric patients might undergo urgent surgery as long as a PCR test had been previously carried out. In emergency situations where serologic results were not available, thoracic x-ray and the use of personal protective equipment (PPE) by the whole operating room personnel was mandatory. In addition, a new patient pathway was created. It established COVID patients or patients waiting for serologic results should remain isolated, with two PICU cubicles being

adapted for that purpose. In terms of reorganization of human resources, the structural personnel was distributed to maintain outpatient activity and ongoing care, and it was integrated into the pool of physicians working shifts at units with COVID patients.

Our hospital is a reference healthcare facility for pediatric polytrauma. In order to avoid potential congestion as a result of patient referral to our healthcare facility, polytrauma patient management (both for adult and pediatric patients) was referred to another hospital.

Our results demonstrate a huge impact, with a nearly 500% decline in activity at our department. Considering all environments altogether, 718 patients were treated in 2020 vs. 4,517 in 2019 (Fig. 3).

Given that the number of inter-hospital referrals was lower than usual, the decrease in urgent surgeries was most likely caused by the fact other healthcare facilities without pediatric surgeons managed pediatric urgent cases in order to avoid patient referral. A significant decline in reasons for consultation at the pediatric emergency department, particularly in the medical environment, was also noted. This makes us wonder whether emergency departments are adequately used by the population in ordinary times, since the number of urgent consultations requiring admission remained particularly stable in the pediatrics environment. The stage of the pathologies treated, which was more advanced than in regular practice, was a result of the population's fear of attending the emergency department.

In the outpatient environment, the decrease in first visits and the growing number of phone interviews are worth noting. Even though face-to-face consultation is the main tool for outpatient management, particularly in surgical departments, we believe the pandemic has consolidated phone consultations, which will definitely become, to a greater or lesser extent, an additional instrument for the various departments, especially for complementary test result communication purposes.

The low COVID19 prevalence in the population analyzed at our healthcare facility should also be highlighted.

However, this was not a representative sample, which means no conclusions should be drawn in this respect.

In spite of the numbers and our patients' pathologies, we would like to emphasize we are having difficulty in resuming surgical activity. The end of the strict lockdown period allowed non-oncological surgical activity to be resumed. However, access to the operating rooms by our department and scheduled surgical activity resumption occurred one month following the return to normal activity, in the last phase of the Spanish government's end-of-lockdown plan. This demonstrates that selection criteria of eligible patients somewhat exclude the pediatric population, in spite of being ideal patients according to the American College of Surgery (ACS) – young patients without comorbidities and with a low risk of lung disease having no medical alternative and requiring a short hospital stay⁽¹⁵⁾. Therefore, an increase in morbidity and a worsening of prognosis is to be expected in some of our pediatric patients, especially those with obstructive urinary pathologies or anorectal malformations. A delay in the optimal surgical calendar of multiple pediatric surgical pathologies, particularly cryptorchidism and hypospadias, is also predicted, since these pathologies can impact patients' sexual development and psycho-emotional environment – as well as their families'. There is definitely room for improvement in this respect if a new COVID wave occurred. Consequently, the management of pediatric patients endorsed by scientific societies should be planned based on documents supporting the need to prioritize certain congenital pathologies, given the serious implications treatment delays may have⁽¹⁶⁾. Our work represents a starting point to keep analyzing the actual impact of the pandemic on our jobs and our patients.

REFERENCES

1. COVID 19: Cronología de la actuación de la OMS. Disponible en: (<https://www.who.int/es/news-room/detail/27-04-2020-who-timeline---covid-19>).
2. WJ Guan, ZY Ni, Y Hu, Liang WH, Ou CQ, He JX, et al. Clinical characteristics of Coronavirus Disease 2019 in China. *N Engl J Med.* 2020; 382: 1708-20.
3. Adams JG, Walls RM. Supporting the health care workforce during the COVID-19 global epidemic. *JAMA.* 2020; 323(15): 1439-40.
4. Anderson RM, Heesterbeek H, Klinkenberg D, Hollingsworth TD. How will country-based mitigation measures influence the course of the COVID-19 epidemic? *Lancet.* 2020; 395: 931-4.
5. Álvarez Gallego M, Cortázar de las Casas S, Pascual Migueláñez I, Rubio-Pérez I, Barragán Serrano C, Álvarez Pela E, Díaz Domínguez J. Impacto de la pandemia por SARS-CoV-2 sobre la actividad y profesionales de un Servicio de Cirugía General y del Aparato Digestivo en un hospital terciario. *Cir Esp.* 2020. 10.1016/j.ciresp.2020.04.001 [Epub ahead of print].
6. Arshad S, Baloch M, Ahmed N, Arshad A, Iqbal A. The outbreak of Coronavirus Disease 2019 (COVID-19)-An emerging global health threat. *J Infect Public Health.* 2020; 13: 644-6.
7. Ministerio de Sanidad: Situación actual. Disponible en: <https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/situacionActual.html> Consulta: 9 de junio de 2020.
8. Søreide K, Hallet J, Matthews B, Schnitzbauer AA, Line PD, Lai PBS, et al. Immediate and long-term impact of the COVID-19 pandemic on delivery of surgical services. *BJS.* 2020; 107(10): 1250-61.
9. Slim K, Veziant J. Urgent Digestive surgery, a collateral victim of the COVID-19 crisis? *J Visc Surg.* 2020; 157(3): S5-6.
10. Rubio-Pérez I, Badía JM, Mora-Rillo M, Martín Quirós A, García Rodríguez J, Balibrea JM. COVID-19: conceptos clave para el cirujano. *Cir Esp.* 2020; 98(6): 310-9.
11. Shakiba B, Irani S. Covid-19 and perioperative mortality; where do we stand. *Eclinical Medicine.* 2020; 22: 100364.
12. COVIDSurg Collaborative. Mortality and pulmonary complications in patients undergoing surgery with perioperative SARS-CoV-2 infection: an international cohort study. *Lancet.* 2020; 29: S0140-6736(20)31182.
13. Núñez B, López S. Protocol de Desescalada Post-Covid Ambit Anestesiología Pediátrica. Corporació Sanitaria Parc Tauli. Mayo 2020.
14. Grupo de Trabajo Cirugía-AEC-Covid. Recomendaciones de la AEC para el "desescalado". Disponible en: https://www.aecirujanos.es/-Recomendaciones-de-la-AEC--para-el-desescalado--COVID19-040520_es_116_509_0_345.html
15. Create a Surgical Review Committee for COVID-19-Related Surgical Triage Decision Making. American College of Surgeons, American Society of Anesthesiologists, and Association of periOperative Registered Nurses. Disponible en: <https://www.facs.org/covid-19/clinical-guidance/review-committee>