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Retrospective Study

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Influence of the Covid19 Epidemic on the Daily Practice of Major Ambulatory Surgery in a Pediatric Surgery Unit

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Summary

Introduction: The pandemic caused by the new severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) had a major impact on hospital organization, which also affected pediatric surgery. Given the scarce evidence about the consequences, a study of the patients operated in conditions of Major Ambulatory Surgery (MAS) is carried out in a pediatric surgery unit during the immediate weeks of this health emergency.

Material and methods: Retrospective study of the pediatric patients operated in our center, from the beginning of February to the end of March 2020. Demographic variables, diagnosis, technique and date of surgery, complications and post-surgical evolution were analyzed.

Results: Thirty-four patients undergoing surgery were included, with a median age of 6.5-years (range 3 months-14 years). Among the surgical diagnoses, the pathology of the inguinal area predominated as a whole (20% in total). Individually, cryptorchidism (18%) was the most common pathology, and 50% of digestive endoscopies were performed on patients diagnosed with eosinophilic Esophagitis. No infections confirmed by SARS-CoV-2 were documented after the surgical procedure. Moreover, when analyzing the evolution after 30 days, no clinical case of possible infection by COVID-19 was found. Only one patient presented symptoms compatible with the disease after 60 days of evolution.

Conclusions: No infections by SARS-CoV-2 have been documented in the pediatric patients operated by MAS in our sample. It is essential to take into consideration the recommended measures, in selected patients and promoting a correct use of telemedicine.

Keywords

SARS-Cov-2, Pediatric major ambulatory surgery, Digestive endoscopy, Telemedicine

Introduction

The health emergency caused by COVID-19 disease, which began in Wuhan, China, in December 2019, expanded unexpectedly [1]. Following, the declaration of the pandemic by the World Health Organization on March 11, 2020, the health system have collapsed due to the need to deal with numerous severe cases [2]. As of September 2020, more than 400,000 people have been documented as infected and more than 40,000 deaths in Spain [3].

The signs and symptoms of the disease are well known among adults, fever, dry cough, dyspnea, anosmia, ageusia and fatigue. Similarly, the manifestations in children are overlapping. In contrast, the percentage of deaths in pediatric age is minimal. Most children present mild, moderate, or symptomatic forms of the disease and can be asymptomatic carriers of this highly infectious virus [1].

Recently, the pediatric multisystem inflammatory syndrome has been described. This new inflammatory disorder, of still unknown physiopathology, occurs 2-4 weeks after SARS-CoV-2 infection, and although it is similar to Kawasaki disease, it causes more inflammation, greater heart damage and occurs in older children [4].

The pandemic caused by the new Coronavirus has a con-

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siderable impact on various areas of the pediatric field, including pediatric surgery [5].

The virus first spreads in the respiratory tract through droplets, secretions and direct contact. There is emerging evidence that procedures and techniques that include the aero-digestive route are extremely dangerous for transmission [6]. In addition, SARS-CoV-2 RNA has been detected in the feces of most COVID-19 patients and asymptomatic carriers for up to 30 days after the start of the clinic [7].

After entering the airway, the virus crosses the cell membrane of the respiratory epithelium through binding to receptors of the angiotensin-converting enzyme 2 (ACE2), which are expressed in high proportion, not only in the lungs, heart and kidneys, but also in ileum enterocytes, colon, hepatocytes and cholangiocytes [7]. Numerous studies suggest that the level of expression of ACE2 and of the transmembrane protease TMPRSS2, in charge of facilitating viral entry into the cell, are diminished in the nasal and bronchial epithelium of children, when compared to adults. Among other factors, this fact may contribute to a lower rate of infection and severe disease in younger populations [8,9].

All of this makes healthcare workers vulnerable to viral contamination, and especially personnel involved in the operation of a pediatric surgery unit (surgeons, anesthesiologists, nurses, and transit personnel), where interventions are performed under general anesthesia. The handling of the airway and the control of the aerosols by means of suction evacuation systems during the anesthesia procedure are fundamental [10]. Other fields such as otolaryngology or digestive endoscopy are also greatly affected. During upper endoscopy, endoscopists have prolonged contact with oropharyngeal secretions. In the lower endoscopy, however, exposure to feces and flatulence has been described with SARS-CoV [2-7].

There are two critical points: The protection of exposed healthcare personnel and the protection of the patient [10]. To minimize transmission, the use of personal protective equipment (PPE) contact and droplet prevention measures is essential, and it is highly recommended that procedures be performed in a space with negative pressure and adequate ventilation [6]. In addition, the use of masks with appropriate filters, double gloves, face protection, waterproof gowns, tights and a cap are necessary [6,7,11].

Considering that in many hospital centers, resources were massively allocated to the treatment of patients affected by COVID-19, it has been necessary to reorganize different aspects of the management of patients and hospital materials, such as the surgical management of patients, and even adults have been treated in pediatric areas. In this way, hospitalization and unnecessary transmission risks were avoided [1,4,5]. Health institutions postponed elective surgery and minimized the volume of endoscopies, which implied potential collateral damage [4,5].

Despite the interest aroused by SARS-CoV-2, there is a lack of studies that analyze the pediatric surgical procedures performed during this period and the possible consequences, derived not only from the intervention, but also from the intra- and extra hospital epidemiological context secondary to potential contact with the virus.

Therefore, our aim has been to analyze the impact of the epidemic and its influence on the management of hospital resources related to pediatric surgery and especially in the field of MAS and in the treatment of patients in the unit. As well as to study with special interest the potential infectious complications that children operated on during this critical phase.

Material and Methods

A retrospective study of patients operated on in the pediatric surgery unit of a third-level hospital in the Community of Madrid in the period between February 1 and the end of March 2020, when SARS-CoV-2 was already in residence in Spain, has been carried out. All pediatric patients requiring surgery or endoscopic digestive procedures, both in MAS conditions, were included in the period between these dates.

Data were collected from 34 patients in whom we studied the following variables: Demographics (sex and age at the time of surgery), pre-surgical diagnosis, technique and date of surgery, complications and post-surgical evolution (compatible symptoms and PCR of SARS-Cov-2). The SARS-CoV-2 epidemiological, clinical, and PCR data were obtained from our center's Electronic Medical Record System. Demographic, clinical, surgical and evolutionary variables were collected.

The data were collected and analyzed with the Microsoft Excel program with which the parameters that appear synthesized in the section "Results" were obtained, as well as the tables that support the data and conclusions obtained.

Results

The mean age of the patients was 7.3-years (range 3 months-14-years). As for the distribution by sexes, the male/female ratio was 26/8. In our series, patients did not present significant preoperative associated comorbidities.

The procedures studied are divided into general pediatric surgery (70%) and digestive endoscopy (30%). All patients were followed by telephone, with no complications resulting from the procedures in any case.

30 days after the intervention, no symptoms compatible with COVID-19 disease were documented. Only one patient presented symptoms related to possible SARS-CoV-2 infection (fever and gastroenteritis) 60 days after surgery. There was no PCR record for SARS-CoV-2 in the patients studied (Table 1).

The surgical procedures performed respond to different diagnoses. Among them, inguinal pathology predominated (20% in total: 11% phimosis, 6% inguinal hernia, and 3% hydrocele). Followed by cryptorchidism, in 18% of cases. Another relatively frequent pathology was ankyloglossia (9%). Less frequently, cysts of the thyroglossal duct and pylomatrixomas (6%). Only one case of conditions such as imperforate hymen with cystoscopy, perianal fistula, pilonidal cyst or subcutaneous foreign body of the upper limb was treated.

50% of the digestive endoscopies, performed by pediat-

Table 1: Clinical features, procedures and follow up.

	Clinical features	**Number of patients**	
Mean age (years)		7,3	
Sex	Boy	26	76%
	Girl	8	24%
Procedure (MAS)	Surgery	24	70%
	Digestive Endoscopy	10	30%
Complications		0	0%
30 day follow up	Symptoms (possible SARS-CoV-2 infection)	0	0%
	Nasopharyngeal swab for SARS-CoV-2	0	0%
60 day follow up	Symptoms (possible SARS-CoV-2 infection)	1	<1%
	Nasopharyngeal swab for SARS-CoV-2	0	0%

Table 2: Diagnosis.

Procedure	**Diagnosis**	**Number of patients**	
Surgery	Undescended testicles	6	18%
	Phimosis	4	11%
	Inguinal hernia	2	6%
	Inguinal hernia	1	3%
	Imperforate hymen	1	3%
	Anal fissure	1	3%
	Pilonidal cyst	1	3%
	Pilomatricoma	2	6%
	Ankyloglossia	3	9%
	Thyroglossal duct cyst	2	6%
	Foreign body in spinal canal	1	3%
Digestive endoscopy	Eosinophilic esophagitis	5	15%
	Coeliac disease	4	11%
	Collagenous colitis	1	3%

ric gastroenterology, were carried out on patients diagnosed with eosinophilic Esophagitis (15% of the total number of patients). Celiac disease was the second most common digestive pathology (11%). Only one case of inflammatory disease (collagenous colitis) was treated (Table 2). In 91% of the cases, the procedure was performed under general anesthesia with a laryngeal mask. Only the surgical treatment of ankyloglossia was performed under sedation (9%).

Discussion

In the present research we have analyzed the infectious episodes related to SARS-CoV-2 in patients intervened in dates close to the official declaration of the pandemic. As previously mentioned, the information available on procedures in the pediatric age group carried out during the establishment of the global health emergency and associated collateral damage is scarce, and this was one of the main reasons for carrying out this study. However, this fact also makes it difficult to contrast our results with the published data.

During the months of February and March, an emergency situation was established that would lead to a pandemic on March 11, 2020. Until then, hospital medical practice continued its course, with MAS procedures being performed at our center until mid-March, by which time the virus had already colonized the country, crossing borders.

In an attempt to comply with legislated distancing measures, healthcare institutions made dramatic changes in patient care during the pandemic, including indefinitely postponing all non-essential medical consultations and elective surgeries [12]. Interventions were recommended only for pediatric patients with urgent pathology or oncologic indications, until the outbreak were resolved [10]. Therefore, elective surgery was completely paralyzed, preserving resources, operating rooms and health personnel available to patients infected by COVID-19.

The fact that MAS interventions were maintained until the aforementioned date (March 20, 2020) allowed certain pathologies to be treated as recommended in the surgical calendar. As mentioned by Quaedackers, et al. this situation will undoubtedly generate cases of patients with congenital malformations, such as hypospadias or cryptorchidism, where

the optimal time for intervention is exceeded [5]. These children may be at risk of suboptimal evolution or increased psychological burden due to surgical delay and should be prioritized on the waiting list [5-7]

All patients operated on at our center were free of symptoms of clinical or epidemiological suspicion for SARS-CoV-2 at the time of the procedure. Different studies suggest the need for special care in procedures associated with upper airway aerosolization [5,6,10]. As well as the reduction of intraoperative smoke, for example, by less powerful electrocautery systems [10-13]. Protective measures were used, in accordance with the center's regulations (masks with appropriate filters, double gloves, facial protection, waterproof gowns, tights and cap) and meticulous hand washing. An attempt was made to reduce the number of medical personnel in the operating room and the duration of the intervention, as far as possible, with the use of adequate ventilation.

Cryptorchidism and phimosis predominated among the diagnoses of the operated patients (29% of the total). Both were considered part of the procedures established as elective surgery since the declaration of the pandemic [12]. Eosinophilic Esophagitis accounted for half of the endoscopic work in pre-pandemic times. Subsequently, non-urgent digestive endoscopies were canceled, as recommended by Wash et al in the ESPGHAN and NASPGHAN clinical practice guidelines for endoscopic procedures [7].

Multiple studies conducted in different medical specialties show that telemedicine is feasible and safe and can have a positive impact on healthcare resources, patient quality of life and the environment [12]. The rapid and expansive implementation of this telematic service has allowed pediatric surgeons to advise children and families about surgical pathology while maintaining social distance and keeping families at home; however, it is crucial to guarantee quality standards through effective virtual communication with a clear purpose and frequent pauses in the conversation, ensuring patient privacy [14]. Based on these principles, teleconsultation was carried out on all post-surgical patients in this research, taking into account the warning signs and symptoms for possible screening of patients who require a face-to-face visit and for a minimum period of 30 days. In this series, no complications associated with the surgery were objectified and, therefore, the patients did not need to physically attend the consultation, thus reducing the influx of people to the hospital.

In the present study, no post-operative SARS-CoV-2 confirmed infections were documented. When analyzing the evolution 30 days after surgery, there were no patients with compatible symptoms. Only one child was found with possible COVID-19 infection (fever and gastroenteritis) after 60 days of evolution, without PCR confirmation. We have not found in the literature similar studies to compare the infectious processes produced by SARS-CoV-2 after general pediatric surgery procedures.

The delay in the diagnosis and management of non-interventional pathologies can generate anxiety among patients, caregivers and healthcare personnel [7]. Cautious monitoring, using telemedicine, is important, optimizing an optimal order in the surgical list.

The negative impact that this pandemic has is unavoidable, not only on the patient, but also on the healthcare workers. During the pandemic, many residents from different specialties have been in charge of COVID-19 plants and patients, which affect to some extent the specific training of residents. This repercussion not only extends to the quarantine period, but also perpetuates the "new normality", since the reduction of outpatient consultations and surgical volume limits the educational opportunities [6].

Finally, professionals involved in healthcare during the pandemic have probably learned and modified new strategies for resource management and patient control regardless of the specialty. This learning will contribute to improve the efficiency of procedures and increase caution in the prevention of post-surgical complications or in other areas of pediatric care.

Conclusions

No SARS-CoV-2 infections have been documented in the pediatric MAS patients in our research. It is essential to work according to the recommended protection and social distancing measures. Telemedicine is imposed as a useful and key working tool during the pandemic, which will probably remain in daily medical practice.

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