

Arranging an emergency Vascular Accesses Program during COVID-19 pandemic

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The Journal of Vascular Access
1–3

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DOI: 10.1177/1129729820957819

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Dear Editor,

Since late February the first patients with COVID-19 have been identified in Northern Italy and immediately hospitals in Lombardy have been rapidly overwhelmed by the spreading of the pandemic emergency.^{1,2} Our Institution, “ASST Spedali Civili” Hospital, is the second largest hospital in Italy and it is located in Brescia, one of the first and most affected red zones worldwide.

Before the outbreak of COVID-19 infection, our Institution counted 1200 bed sites plus 3 adult Intensive Care Units (ICUs) with 30 bed sites; moreover, there were two additional ICUs dedicated to newborn and pediatric patients, accounting for 5 and 15 bed sites, respectively. The first confirmed COVID patient was admitted to our Institution on February 23rd: in the following days a radical change in the hospital’s structure and organization was undertaken, with many departments and wards being completely converted and dedicated to the treatment of COVID patients. On March 31st, 100 ventilated ICU-bed sites were made available for COVID patients. Until April 20th, 2020, a total of 2850 COVID patients were managed and 2200 of them admitted. The medical and nursing staff have been forced to dramatically change their daily routine and adapt to this unforeseen health emergency, facing the challenge to cope with an increasing number of admitted patients requiring the insertion of venous access devices (VADs).

Before the spreading of the infection, our Hospital did not have an institutional vascular access team (VAT); on the contrary, there were few doctors reporting to different Departments that implanted “on demand” vascular devices in their wards. From half of March, a radical modification in the layout of our Pediatric Surgery Department was adopted: elective surgery stopped and only emergency procedures were guaranteed. Part of our staff was reallocated to COVID-19 wards in order to support colleagues in adult departments and cover some day and night shifts.^{2,3} In addition to covering pediatric rosters, a member of our team with high expertise in vascular access management started

to insert catheters also in adult COVID patients, in non-ICU setting; in few weeks, a team was rapidly organized with two additional doctors trained on these procedures. Patients admitted to ICUs and requiring ventilation underwent placement of PICC, CICC or FICC by the anaesthesiologic team.

At the very beginning of our experience with COVID patients, we chose to place ultrasound-guided 10-cm long cannulae (mini-midline). At that time, heparin was not yet considered as part of the medical armamentarium for COVID patients. Few days after catheter insertion, nevertheless, we experienced a not negligible incidence of malfunction and occlusion of the cannulae; in some patients, we were forced to remove the device and replace it with longer cannulae (25-cm midline). Based on our 12-years previous experience with these devices both in pediatric that adult settings, we were surprised by these new findings. In early April 2020, the GAVeCelt⁴ and SIAARTI⁵ recommendations for vascular accesses in COVID patients confirmed our empiric impression and strongly recommend the placement of midlines instead of mini-midlines. Therefore, we have rapidly endorsed these guidelines and started to use polyurethane midlines, and more than 200 devices were successfully implanted in less than 2 months. Based on this early experience, we have rapidly developed a bundle of strategies in order to ensure an appropriate vascular device and minimize the risks for our team.

Technical aspects

The current standard care of non-ICU COVID patients includes intravenous hydration, supportive therapy and

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blood sampling.¹ In this setting, parenteral nutrition is usually not necessary. The supportive drugs, with no extreme pH, do not damage the endothelium of the veins. Therefore, patients with confirmed COVID-19 and no need for intensive care can usually be managed with a peripheral venous access. Nevertheless, in order to reduce the number of vein cannulations, respect the vascular tree and avoid repeated maneuvers by nurses to trace a vein with waste of precious time and resources, we suggested to COVID departments to adopt a policy of care that starts from the identification of the most adequate vascular device at admission.⁴ We considered the basilic and brachial veins as the best choice for our patients because a VAD in the arm would allow continuous positive airway pressure (CPAP) treatment or pronation when necessary; they are also away from potential sites of infection (inguinal region, tracheostomy). We have chosen to perform the procedure directly at bedside to prevent the patient's mobilization from COVID wards, avoiding the possibility of contamination of the hospital's common spaces and reducing the risks of infection for the staff. The adoption of this strategy has proved successful in our Institution: at the beginning, we were called only when the venous patrimony was scant; then adult Departments started to involve our VAT at an earlier stage. We adopted the policy of inserting a polyurethane midline catheter in these non-intensive care patients, promoting and encouraging the insertion of the device within few days from the admission. Twenty-five-centimeter midline catheters have several advantages, including long duration, low risk of extravasation and dislodgement and feasibility of blood tests, mandatory in COVID patients.^{4,6} They were implanted only under ultrasound guidance, after choosing the appropriate vein with an adequate caliber (basilic or brachial veins). Ultrasound also allows to check the correct position of the catheter tip in the axillary vein just before the clavicle, the ideal position for enabling smooth blood sampling.^{7,8} Our hospital does not have wireless ultrasound probes, thus a portable ultrasound device with battery was used instead. All the procedures were performed in compliance with the international sterility precautions guidelines and all involved operators wore FFP2/N95 masks without valve, with a surgical mask above it and a face shield, impermeable gowns, goggles, double pair of gloves and shoe covers.⁷ Moreover, we adopted additional equipment for the COVID patients, including sterile drapes with an adhesive border to stable the puncture field even in the patient who was not fully collaborative. As tourniquet we adopted sterile, single-use silicon Penrose tube drain, that could be loosened or tightened by the operator without any additional assistance, in order to reduce the team's exposure to the patient. Moreover, COVID patients show a not negligible risk of tearing the catheter, mainly related to hypoxia; so, we adopted a sutureless subcutaneous system of fixation and application of the surgical skin glue on the exit site.

Standard transparent semipermeable dressing was applied on the skin.

We strived to reduce the positioning time and maximize the number of daily implants by providing all COVID Departments with a written protocol, including the list of facilities and material to be prepared before our arrival. We carried in the patient's room only the COVID dedicate ultrasound and a single use bag containing all the necessary equipment. After the procedure, personal protective equipment was eliminated and a rigorous hygiene protocol was undertaken. After each procedure, the ultrasound was fully sanitized with sodium hypochlorite 0.115% right at the entrance of the patient's room and directly placed in a plastic wheeled box with a lid. Our Hospital has been profoundly and dramatically impacted by the COVID-19 pandemic, and in absence of an institutional vascular access team we experienced the challenge to cope with an increasing number of admitted suspected or confirmed COVID patients requiring vascular access. In few weeks we have rapidly developed a set of strategies in order to ensure the most appropriate vascular device for each patient and minimize the risks for the staff involved. Certainly, the VADs management by a non-expert and not properly trained nursing staff has led to many more complications than expected, in terms of accidental displacement or local and bloodstream infections. This finding further proves the relevance of having a VAT in hospitals and providing a widespread training of the personnel. As we face this emergency in one of the most affected red zones worldwide, we would like to share our lessons learned with a view for helping other hospitals promote and develop a dedicated program of vascular access management for COVID patients.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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