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Embolization of a Renal Solid Bleeding Lesion in Intensive Care Unit in a Critically Ill Patient with Severe Acute Respiratory Syndrome-Related Coronavirus Infection and Difficult Mobilization due to Extracorporeal Membrane Oxygenation and Continuous Renal Replacement Therapy

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The Cardiovascular and Interventional Radiological Society of Europe recommends that, in case of Covid-19 patients, procedures requiring high end angiographic imaging, such as embolization procedures, should be performed using a predesigned angiosuite, transferring the patient directly into that, and only simple interventional vascular procedures should be performed using a mobile C-arm [1].

However, if Covid-19 critical patients require emergency interventional procedures but the mobilization is difficult, due to extracorporeal membrane oxygenation (ECMO) and continuous renal replacement therapy (CRRT), the transfer to a predesigned angiosuite could represent an additional source of risk for the patient himself.

Despite in our hospital a dedicated Covid-19 angiographic room had been planned, we present a case of a selective trans-catheter arterial embolization of a renal solid lesion, responsible for multiple intermittent episodes of severe hematuria. The procedure was performed bed side in intensive care unit (ICU) on a Covid-19 patient with a severe ARDS and a very difficult logistics mobilization due to the mechanical ventilation by a tracheostomy access, to the active veno-venous ECMO life support with femoro-jugular setting and, to the CRRT.

An expert staff involvement, including the interventional radiologist and radiographers together as well as the anesthesiologists, the infectious disease specialists and the isolation ward staff, was essential to formulate a detailed workflow. Because of the small ICU room size, the anesthesiologists and the nurse were immediately out of the room to intervene only if necessary and no more than a radiologist and a radiographer were included in the interventional dedicated personnel. The whole recommended personal protective equipment for the safe management of Covid-19 patients was worn by each of them [1, 2]. In addition, a radiologist and a radiographer wore lead apron and thyroid shield on the coverall suit [1, 3–5] just before the procedure started.

Because of the intensive care bed's radiopacity, the patient was transferred to a radiolucent stretcher (Fig. 1). And the procedure was performed transporting a flat-panel mobile C-arm (Cios Alpha, Siemens Healthineers), with DSA capability, and a power injector into the Covid-ICU room (Fig. 2).

Only essential and strictly selected medical devices were brought into the ICU room including (one per type): disposable Angiographic Operation Kit, 18 G femoral arterial needle, 5 French Introducer Sheath, 0.035 inch fixed core wire guide, 5 French C2 angiographic catheter, infusion microcatheter (0.027 inch) and microwire (0.018 inch) kit, Nonionic/Iso-Osmolality iodinated contrast media (iodixanol 320 mgI/mL), injector materials (syringe and extension line) and embolic materials (polyvinyl alcohol

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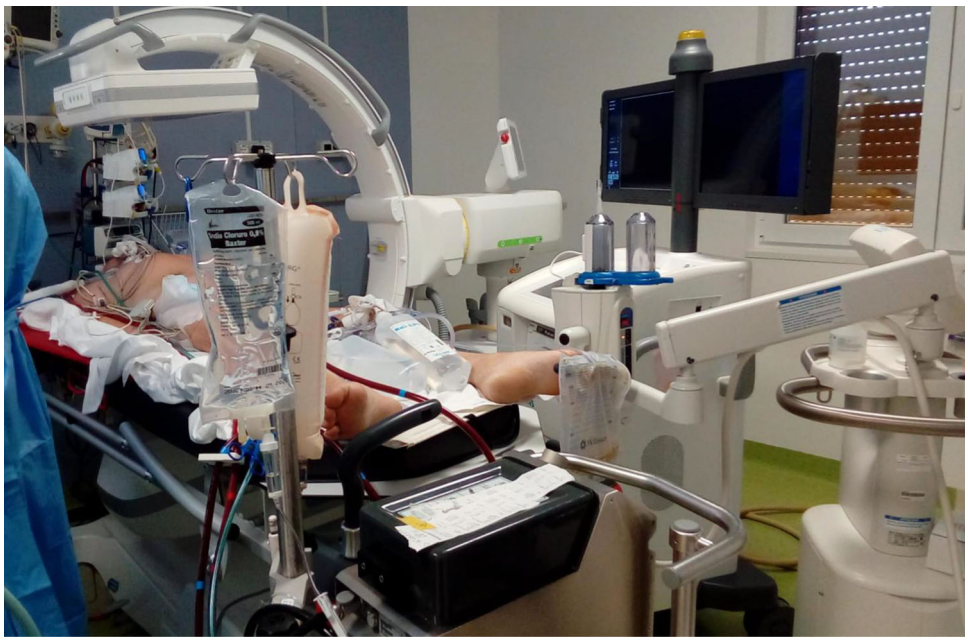

Fig. 1 Shows the patient lying on a radiolucent stretcher which allowed the C-Arm x-ray tube to be placed underneath the patient

Fig. 2 On the right, the portable C-arm, and the power injector transported into the Covid-ICU room. On the left, veno-venous extracorporeal membrane oxygenation (ECMO) and continuous renal replacement therapy (CRRT)

particles, 500–710 microns). Additional medical devices were brought in the ICU ‘‘clean‘‘ area on a portable cart; a second radiographer was able to provide them if required, communicating wirelessly to the interventional personnel within the Covid-room by a handheld radio.

The initial angiography showed a solid mild hypervascular, lesion in the left kidney; (Fig. 3a) after selective catheterization with the microcatheter, subsequent embolization was successfully performed injecting embolic materials under fluoroscopic guidance (Fig. 3b–c). The patient survived to the Covid-19 infection and was discharged by the hospital 4 weeks later.

So, this case shows that the management of such vascular lesions may be performed directly in the ICU, avoiding patient transportation to the Covid-dedicated angiosuite, risks associated with the transfer of critical patient and, in consideration of less personnel involved, the risk of health care provider contamination too. An accurate sharing of information and a detailed workflow formulation were essential to achieve the expected result and to alleviate anxiety, reduce the waste of medical devices and any source of confusion among staff allowing the procedure successful outcome.

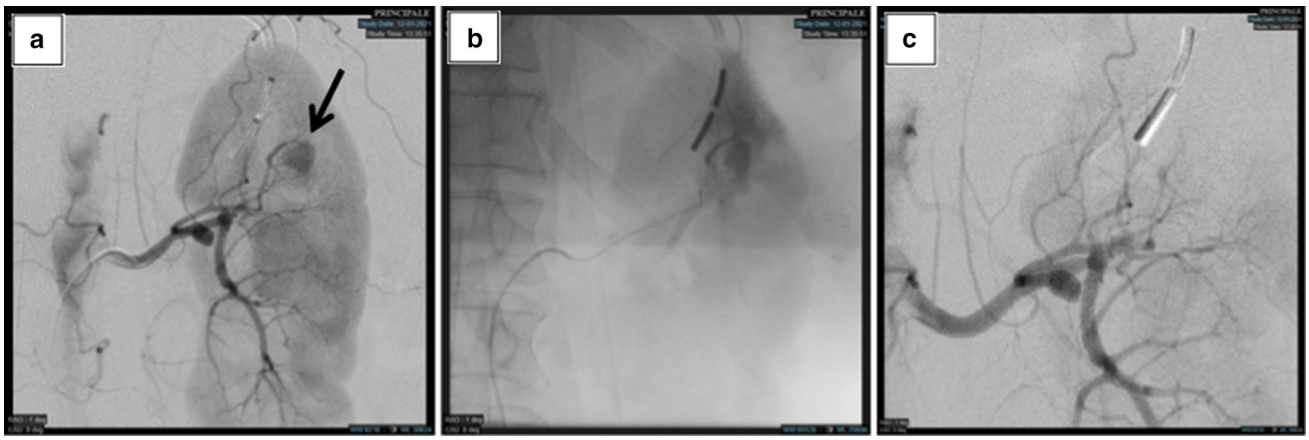

Fig. 3 On the left, the initial angiography (**a**) shows a solid mild hyper-vascular lesion in the left kidney (black arrow) responsible for multiple intermittent episodes of severe hematuria. In the middle, the selective catheterization (**b**) with the microcatheter that enabled targeted embolization of bleeding vessels. On the right, the final DSA acquisition (**c**) shows stasis of flow in arteries feeding the tumor and lack of opacification of the lesion

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Consent for publication Consent for publication was obtained for every individual person's data included in the study.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of HELSINKI and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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