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A call to optimize haemodialysis vascular access care in healthcare disrupted by COVID-19 pandemic

Carlo Basile^{1,2} · Carlo Lomonte¹ · Christian Combe^{3,4} · Adrian Covic⁵ · Dimitrios Kirmizis⁶ · Vassilios Liakopoulos⁷ · Sandip Mitra⁸ · on behalf of the EUDIAL Working Group

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Abstract

The COVID-19 pandemic has resulted in major disruption to the delivery of both routine and urgent healthcare needs in many institutions across the globe. Vascular access (VA) for haemodialysis (HD) is considered the patient's lifeline and its maintenance is essential for the continuation of a life saving treatment. Prior to the COVID-19 pandemic, the provision of VA for dialysis was already constrained. Throughout the pandemic, inevitably, many patients with chronic kidney disease (CKD) have not received timely intervention for VA care. This could have a detrimental impact on dialysis patient outcomes in the near future and needs to be addressed urgently. Many societies have issued prioritisation to allow rationing based on clinical risk, mainly according to estimated urgency and need for treatment. The recommendations recently proposed by the European and American Vascular Societies in the COVID-19 pandemic era regarding the triage of various vascular operations into urgent, emergent and elective are debatable. VA creation and interventions maintain the lifeline of complex HD patients, and the indication for surgery and other interventions warrants patient-specific clinical judgement and pathways. Keeping the use of central venous catheters at a minimum, with the goal of creating the right access, in the right patient, at the right time, and for the right reasons, is mandatory. These strategies may require local modifications. Risk assessments may need specific "renal pathways" to be developed rather than applying standard surgical risk stratification. In conclusion, in order to recover from the second wave of COVID-19 and prepare for further phases, the provision of the best dialysis access, including peritoneal dialysis, will require working closely with the multidisciplinary team involved in the assessment, creation, cannulation, surveillance, maintenance, and salvage of definitive access.

Keywords Arteriovenous fistula · COVID-19 · Chronic kidney disease · Haemodialysis · Vascular access

The impact of the COVID-19 pandemic on the provision of vascular access for dialysis

An epidemic of SARS-CoV-2 (COVID-19), a new strand of the coronavirus family, was declared a pandemic across the globe by the World Health Organization as of 11th March, 2020 [1]. This profoundly and dramatically changed the global health perspectives. Over the past several decades, epidemiological transition generally shifted the world's

public health problems from communicable to non-communicable diseases. However, the COVID-19 pandemic may reverse the epidemiological transition with an unclear duration and potential resolution. The complexity of the COVID-19 pandemic among chronic kidney disease (CKD) and end-stage kidney disease patients results from the interplay of the main factors of the epidemiological triad including the host (patients), the agent (SARS-CoV-2), and the environment (outpatient, inpatient haemodialysis (HD) units).

The COVID-19 pandemic has resulted in a major disruption in healthcare. In an effort to tackle the COVID-19 illness burden and demand on healthcare resources, elective procedures have needed deferral or suspension. Resumption of these services have been limited by subsequent second and third waves of the pandemic spanning the most part of an annual cycle of activity. It has been estimated that almost

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28.4 million surgical procedures have already been cancelled globally [2].

Vascular access (VA) for HD is considered the patient's lifeline and its maintenance is essential for treatment continuity. The VA offering was suboptimal prior to the pandemic in most countries. International rates of definitive access are highly variable [3, 4]. Despite this, the benefits of definitive VA, notably arteriovenous fistula (AVF), and avoidance of central venous catheters (CVCs) are clearly demonstrated, particularly in the younger and less comorbid patients [5–7]. Inevitably, timely arteriovenous access surgery would have been further disrupted and delayed in the COVID-19 pandemic era. A global survey revealed that > 90% of vascular surgeons have reduced or ceased performing elective procedures such as VA creation [8].

The challenge of matching resources with demand amid the COVID-19 crisis

To manage constrained services, many societies issued prioritisation to allow rationing based on clinical risk, mainly according to estimated urgency and need for treatment. These have been classified as (1a) emergency < 24 h; (1b) urgent (up to 72 h); (2) up to 1 month; (3) up to 3 months; and (4) over 3 months by the Federation of Surgical Specialty Associations in the UK [9], and by the Society for Vascular Surgery as (1) postpone; (2a) consider postponing; (2b) postpone if possible; and (3) do not postpone [10].

The recommendations that were recently proposed by the European and American Vascular Societies in the COVID-19 pandemic era regarding the triage of various vascular operations into urgent, emergent and elective based on the nature of their pathology are debatable [10–12]. In particular, the recommendation that primary creation of an AVF could be postponed as an elective procedure is rather questionable for ethical, socio-economic and medico-legal reasons. VA creation is the lifeline of HD patients and the indication for surgery warrants patient-specific clinical judgement rather than 'group labelling' [13].

Recommendations of the EUDIAL Working Group for optimizing HD VA care in the COVID-19 pandemic era

- Stricter implementation of hygienic precautions in the dialysis setting is recommended: a 91% reduction in catheter-related bloodstream infections compared to the same period in 2019 [incidence rate ratio 0.09 (95% CI 0.002–0.64)] and an 83% reduction compared to the whole of 2019 [incidence rate ratio 0.17 (95% CI 0.004–1.009)] have recently been reported [14]. Prevention of these

infections so as to minimize their incidence is, therefore, a key aspect of dialysis care. In this perspective, KDOQI 2019 VA guidelines suggest incorporating an infection surveillance program into clinical care [15].

- As a general recommendation, with the overburdened healthcare systems and the risk of potential contamination in the acute hospital setting, preference should be given to performing procedures with rapid access, where possible in an outpatient or ambulatory care facility, in designated green areas. Hospitals should avoid redeployment of skilled surgical and radiology staff and should ensure adequate inpatient capacity, theatre capacity and radiology capacity to support this group of patients [16].
- Face-to-face pre-assessments should be kept to the absolute minimum, where possible.
- Whenever possible, procedures involving patients with suspected or confirmed COVID-19 infection should be postponed until the end of the quarantine period to prevent the virus from spreading.
- Procedures that guarantee VA creation for patients incident to the dialysis treatment (stage CKD-5D) should not be postponed because in some cases deferral of these procedures may have independent deleterious effects on the involved patients. These procedures include: placement of an AVF or graft, insertion of a non tunnelled or tunnelled CVC, exchange of a non tunnelled CVC into a tunnelled one [17]. Finding safe opportunities to place permanent VA could stave off life-threatening bloodstream infections and thromboembolic complications associated with long-term dialysis catheter use.
- Procedures that avoid the risk of VA loss or serious complications in patients already on HD treatment should not be delayed. These procedures include: (a) radiological interventions in dysfunctional AVFs or grafts limiting effective dialysis or at risk of failure; (b) thrombolysis or thrombectomies for salvage of clotted fistula or grafts; (c) removal or exchange of tunnelled CVCs due to catheter-related bacteraemia or flow-related problems; (d) surgical interventions for infected arteriovenous grafts, bleeding aneurysms or ulceration at risk of dehiscence [17]. We recommend a 7-day a week interventional service, with access to surgical support, for the urgent treatment of serious VA complications in order to avoid worsening health and prolonged hospitalisation and to allow routine HD care to continue.

An opportunity for change in the interest of kidney patients

The COVID-19 pandemic represents an opportunity for change in the interest of kidney patients. KDOQI 2019 VA guidelines underline the primary importance of a dedicated

team with experience in VA care in order to implement effective surveillance programs so as to prevent and manage VA issues such as infections. Keeping the use of CVCs to a minimum, with the goal of creating the "right access, in the right patient, at the right time, for the right reasons", is mandatory [15].

These strategies may require local modifications. Risk assessments may need specific "renal pathways" to be developed rather than applying standard surgical risk stratification. Where surgical services are overwhelmed or resources compromised, other strategies should be considered, particularly endovascular approaches to maintenance, salvage, and even creation of the VA [18]. Endovascular AVF placements, performed using thermal energy or radiofrequency, can be performed in an office-based fluoroscopy laboratory. This may increase the availability of additional operators (e.g., interventional nephrologists and interventional radiologists) where staff redeployment or sickness is a problem, and also allow procedures to be performed in alternative facilities, avoiding hot sites and potentially freeing up theatres. However, it must be stressed that endovascular AVFs are a relatively new technology, and although early results are promising, robust data on their efficacy remain limited [19].

Finally, the following model could be a further operative option in order to maintain surgical and interventional procedures for the creation and maintenance of dialysis access: non-COVID-19 hubs are created where patients could be sent for procedures when their hospital is overwhelmed by COVID-19 patients. Surgeons from the spoke hospital could travel to the hub and operate their own patients with a non-Covid-19 surgical team in the hub hospital. However, it must be underlined that this model is effective only if dialysis stations are available for dialysis patients coming from other hospitals when surgery requires hospital admission.

In conclusion, in order to recover from the second wave of COVID-19 and prepare for further phases, the provision of the best dialysis access, including peritoneal dialysis, will require working closely with the multidisciplinary team involved in assessment, creation, cannulation, surveillance, maintenance, and salvage of definitive access.

Conclusions

The COVID-19 pandemic has brought unprecedented challenges to the delivery of healthcare to patients with CKD. It has resulted in major logistic and organizational problems in nephrology care, which likely contributed to its devastating impact. Unfortunately, these problems also reflect the low level of awareness and understanding of kidney disease outside the

nephrology community, including administrators and health authorities, and even non-nephrology medical professionals.

The COVID-19 crisis has unmasked a huge set of challenges and constraints within interfacing services in kidney care, particularly in VA. The disruption caused by the pandemic, however, provides us with an opportunity for innovation and driving efficiency in traditional care models. Doing things differently through a review of patient pathways, tools and the pre-and post-procedural operative steps in the context of COVID-19 risk reduction is necessary to achieve the goal of delivering good outcomes with a rapid turnover [13]. The well-being and retention of a highly skilled workforce remains the Achilles heel in VA and must be addressed to deliver sustainably high standards in VA care. Managing dialysis VA appropriately during peaks of COVID-19 will require better identification and triaging of those in need with more timely assessment and creation of access. Early identification of problematic access through skilled clinical examination, timely and appropriate referral for diagnostics, and treatment using optimal technologies and devices by those with expertise should be available. Follow-up and surveillance should be based around dialysis sessions. Moreover, training dialysis centre staff to cannulate, examine, and identify problems, and providing liaison and accessibility to experts needs to be made easily available. The challenges in dialysis access have long existed but have been severely exacerbated by the pandemic. This is a timely opportunity for VA programmes to redesign and restructure new pathways for situations where there is a larger health crisis such as during a pandemic, and to build resilient programmes to address the unmet needs of dialysis patients whose lives are critically dependent on their lifeline, i.e. an optimal VA for HD [20].

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