

## SPECIAL ARTICLE

## Vascular Surgery in the era of COVID-19 pandemic

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Since the first case of COroNaVirus Disease (COVID-19) that was identified on the 17<sup>th</sup> of November of 2019 in Wuhan of China, a pandemic across the world has spread. COVID-19 is caused by Severe Acute Respiratory Syndrome CoronaVirus-2 (SARS-CoV-2), a single-stranded RNA encapsulated corona virus which is highly contagious and spreads predominantly by either droplets (larger particles) or direct contact with patients (or fomites) rather than 'airborne spread' of smaller particles.<sup>1</sup>

Patients that are in greater risk are people >80 years old, and people with underlying medical problems such as cardiovascular disease, diabetes, chronic respiratory disease, and cancer. Currently, there are no specific vaccines or treatments for COVID-19. However, there are many ongoing clinical trials evaluating various potential treatments.<sup>1</sup>

As the COVID-19 pandemic continues to explode, hospital systems are scrambling to intensify their measures for protecting patients and health care workers from the virus. The vascular surgery communities around the world are trying to prioritize the management of patients according to their individual needs, but also accept that the hospital circumstances have changed and this may have an impact on clinical decision-making. Principles include reducing unnecessary exposure to hospitals, deferring less urgent cases and reducing hospitalization, dependency on ICU and blood transfusion.

The Hellenic Society of Vascular and Endovascular Surgery (HSVES) has recently issued some recommendations for the current situation with the COVID-19 pandemic.<sup>2</sup> Thus, for patients positive for COVID-19 or high clinical suspicion, conservative treatment is recommended where possible and safe for the patient. In case of intervention (endovascular or open) then the use of personal protective equipment is necessary as well as the observance of all precautions to preserve the

health of the medical - nursing team.

Table 1 shows the recommendations<sup>2</sup> of the HSVES regarding patients that need treatment and a surgery should not be deferred.

Category	Recommendation on what to treat
Aortic disease	Symptomatic or Rupture- EVAR with local is first choice
	Mycotic or Graft infection
	Asymptomatic aneurysm >65mm- except if it possible to delay surgery
	Acute aortic dissection
Carotid disease	Aorto-enteric fistula
	Symptomatic
Popliteal aneurysm	>2.5cm
Peripheral arterial disease	Acute limb ischemia or critical limb ischemia
	AV graft or AV fistula thrombosis or infection
Access	Central Venous Catheter
Vein disease	Acute iliac-femoral thrombosis
Amputation	Ischemia- Infection- Sepsis
Uncontrolled bleeding	Embolization- surgery

Table 1. shows the recommendations<sup>2</sup> of Hellenic Society of Vascular and Endovascular Surgery regarding patients that need treatment and a surgery should not be deferred. EVAR: endovascular aortic aneurysm repair; AV: arteriovenous.

The Hellenic Surgical Society has also published some general recommendations and from the perspective of Vascular surgery they defined the following clinical entities as urgent<sup>3</sup>:

- Hemorrhage or peritonitis from blunt or penetrated trauma
- Abdominal aortic rupture
- Acute arterial occlusion

Regarding the elective procedures they recommend interventional treatment only for:

- Arterial occlusion with ischemia limb lesions
- Symptomatic carotid disease

They also recommend some general principles:

- COVID-19 test of each patient that is going to be treated even for acute cases if this is possible and available.
- Chest X ray or computed tomography (CT) scan 24 hours before surgery

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- All patients should wear their mask
- The operation should be done as fast as possible, with an experienced operator and the least number of surgeons.
- If possible do not operate during the night
- If conservative treatment is an option please prefer that or any minimal invasive treatment

Other strong and prestigious Vascular and Surgical Societies have already published their own guides.

The Vascular Society of Great Britain and Ireland has suggested that most arterial surgery is either urgent or emergency in nature and should continue at present where possible.<sup>4</sup> When possible, only urgent outpatients should be seen, and virtual clinics should be considered. On discharge, many vascular patients will either need no outpatient follow (but be given a telephone number to ring if in trouble) or can be reviewed in remote outpatient clinics.

Regarding the elective cases, guidelines recommend that elective arterial surgery and venous surgery should be deferred. Asymptomatic carotid surgery and surgery for claudication should be deferred. The size threshold for abdominal aortic aneurysm (AAA) surgery needs to weigh up risk of rupture in the next few months with risk of intervention and resource limitation. Thus, a diameter of >7cm or imminent rupture AAA is currently recommended.

Regarding the urgent cases, ruptured aneurysms should ideally be treated by endovascular aortic aneurysm repair (EVAR) whenever possible to reduce dependence on the High Dependency Unit and reduce length of stay. Open surgery should only be considered when EVAR is inappropriate or unavailable and in cases where there is a good chance of success. Intensive care unit (ICU) capacity will need to be considered prior to intervention. Patients with critical leg ischemia, which means legs immediately threatened, should undergo urgent intervention. There may be situations where primary amputation may be more appropriate than complex revascularisations, multiple debridements and potential prolonged hospital stay. Crescendo TIAs would normally need urgent surgery. If there are severe resource limitations, aggressive best medical therapy would be more appropriate for recently symptomatic carotids.

They also pointed that this situation might have an impact on Clinical training and education. Remote or virtual meetings will become important. The next sitting of the final Fellowship has been already cancelled.

Additionally, the Royal College of Surgeons of England have made clear their main principles for the management of this situation.<sup>5</sup>

1. Adapting surgical services
  - Triage of non-emergency surgery
  - Clinical networks
  - Rotas
  - Virtual outpatient clinics
2. Working in an extended scope of practice

- Working beyond one's regular scope of practice as part of a team
- Retired surgeons and trainees

3. Caring for patients at the end of life

4. Protecting the workforce

- Infection prevention
- Ensuring surgeons' and surgical teams' well-being

The American College of Surgery<sup>6</sup> has also published their recommendations on the management of vascular surgery patients. Thus the procedures that should not be postponed are:

- Ruptured or symptomatic TAAA or AAA
- Aneurysm associated infection or Prosthetic graft infection
- AAA or thoraco-abdominal AAA (TAAA) >6.5cm (postpone if possible)
- Symptomatic peripheral aneurysm
- Symptomatic non-aortic intra-abdominal aneurysm
- Acute aortic dissection with rupture or malperfusion
- Aorto-enteric fistula (AEF) with septic/hemorrhagic shock, or signs of impending rupture
- Symptomatic acute mesenteric occlusive disease
- Infected arterial prosthesis without overt sepsis, or hemorrhagic shock, or impending rupture
- Symptomatic Carotid Stenosis: carotid endarterectomy (CEA) and transcarotid artery revascularization (TCAR)
- Thrombosed or nonfunctional dialysis access or infected or ulcer or patient needing an access
- Acute limb ischemia or Limb Ischemia: Progressive tissue loss, acute limb ischemia, wet gangrene, ascending cellulitis or Fasciotomy for compartment syndrome
- Traumatic injury with hemorrhage and/or ischemia
- Acute iliofemoral deep vein thrombosis (DVT) with phlegmasia
- Amputations for infection/necrosis
- Surgery/Embolization for uncontrolled bleeding in unstable patients

In particular regarding the management of stroke, the American Heart Association/ American Stroke Association (AHA/ASA) Stroke Council Leadership have released the Temporary Emergency Guidance to United States Stroke Centers during the COVID- 19 Pandemic.<sup>7</sup>

Thus, they believe that all stroke teams should endeavor to adhere to all published guidelines regarding patient selection for therapy; treatment times; and post-recanalization monitoring. Across the wide variety of health care delivery systems in their country, full compliance with all guidelines cannot happen at all times in every locality. They stated that "The global spread of the 2019 novel coronavirus has profoundly

affected the way we conduct our healthcare practices”.<sup>8</sup>

In our region the 1<sup>st</sup> COVID-19 case (in Thessaly, Greece) was reported on 10.03.20, almost two weeks after 1<sup>st</sup> COVID-19 case in the country (26.02.20). Currently (06.04.20), the COVID total cases are 1,735 in Greece (93 ICU; 73 deaths), while in Thessaly only 22 cases have been reported (3 ICU; no death)

On the 9<sup>th</sup> of March, we have stopped our outpatient clinic, while on the 11<sup>th</sup> of March the elective operations were also stopped in our Hospital. All patients that need treatment that could not be postponed and will be electively operated are tested 48h before operation for COVID-19, while the imminent urgent and emergency patients are tested just before the operation, to know the result even after the operation, in order to take the right precautions. No COVID-19 patient needed a Vascular procedure so far. Table 2 shows the patients’ management of our Department from 06.03.20 to 06.04.20. It is profound that all numbers of patients that have been examined and treated either electively or urgently have been significantly decreased during this period.

Currently, only the on-call Doctors are in the Hospital in order to protect the rest of the medical staff from COVID-19 infection. The indications for patients treatment are mainly AAA >60mm (local anesthesia with MAC if possible), symptomatic carotid disease and CLI. We are trying to treat at least 2-3 cases per week in a semi-elective base.

We should bear in mind that during such a difficult period the recommendations are defined by the following parameters:

- the need for surgery in order to save the patient that is in imminent danger for his life.
- the burden of the medical logistics system from surgery or non-surgical treatment of diseases (conservative treatment) - consumption of blood and derivative units, need for long-term surgery, surgery hospital stay for many days, need for treatment in the ICU.
- the risk of exposure to COVID-19 infection in both the patient and the medical and nursing staff.

In general, conditions should be assessed on a daily basis based on the pandemic data and the needs of the Health System, locally and nationally, with a sense of responsibility.

REFERENCES

- 1 World Health Organization. Coronavirus disease (COVID-19) situation reports. [Internet]. 2020 [cited 2020 April 6]. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>
- 2 Recommendations of HSVES regarding the management of vascular surgery patients (<https://www.vascularsociety.gr/>)
- 3 Urgent notification for COVID-19; Instructions for the management of surgical interventions (<https://exe1928.gr/gr/>)
- 4 [https://www.vascularsociety.org.uk/professionals/news/113/covid19\\_virus\\_and\\_vascular\\_surgery](https://www.vascularsociety.org.uk/professionals/news/113/covid19_virus_and_vascular_surgery)
- 5 <https://www.rcseng.ac.uk/standards-and-research/standards-and-guidance/>
- 6 <https://www.facs.org/covid-19>
- 7 Temporary Emergency Guidance to US Stroke Centers During the COVID-19 Pandemic [published online ahead of print, 2020 Apr 1]. *Stroke*. 2020;10.1161/STROKEAHA.120.030023. doi:10.1161/STROKEAHA.120.030023
- 8 Ng JJ, Ho P, Dharmaraj RB, Wong JCL, Choong AMTL, The Global Impact of COVID-19 on Vascular Surgical Services, *Journal of Vascular Surgery* (2020), doi: <https://doi.org/10.1016/j.jvs.2020.03.024>.

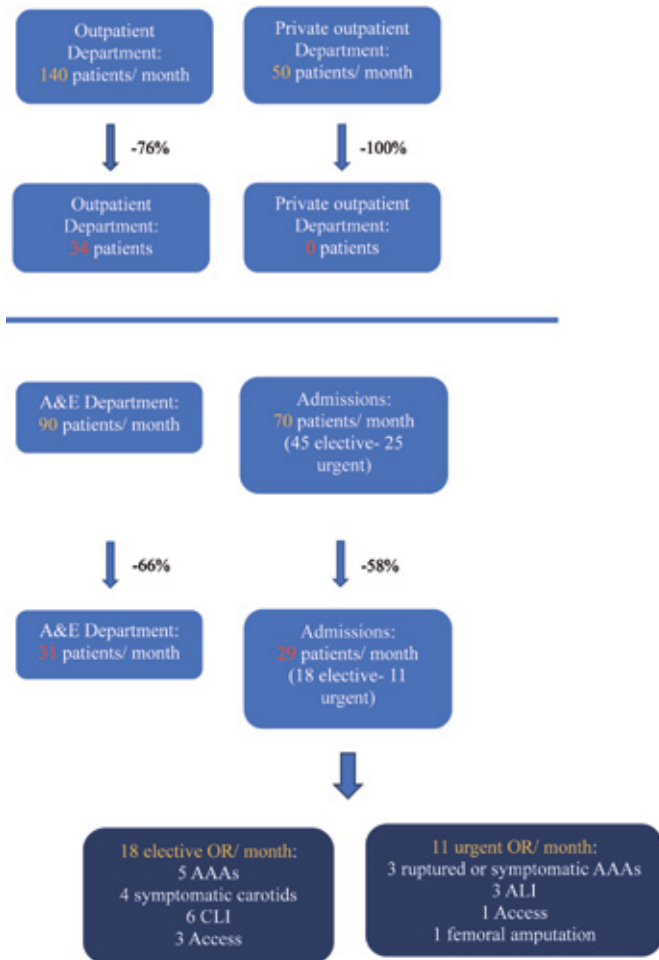


Table 2. shows the patients’ management of our Department from 06.03.20 to 06.04.20. A&E: accident and emergency; OR: operation; AAA: abdominal aortic aneurysm; CLI: critical limb ischemia.

## INVITED COMMENTARY

## COVID-19 in Vascular Surgery

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In this issue, Spanos *et al.*<sup>1</sup> have described how the sudden onset of the COReNA Virus Disease (COVID-19) pandemic in China and the global spread of the Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) have affected the provision of vascular surgery. This pandemic found the majority of the health systems unprepared, despite the alarming warnings coming from infection specialists since the epidemic of the original SARS virus in 2002-2004.

In order to cope with the expected wave of severely ill patients to be admitted in the hospitals, governments adopted different strategies, from total lockdowns to free propagation of the virus in the community aiming in achieving “herd immunity”. Along the course of the pandemic and while data from other affected countries started to pile, strategies have been completely altered or modified, something that is described by Spanos *et al.*<sup>1</sup> in his work.

Most strategies agreed in a number of points. All available resources should be used mainly in treating COVID-19 patients, other cases should be deferred in time if possible, medical personnel should be protected and rotated, and screening of suspected patients should be performed. Despite the simplicity of these points, the reality of the pandemic proved the contrary. Thus, alike the different approaches governments had, every health institution, medical association or specialty college published respective guidelines on what cases can be deferred, what should be considered urgency and emergency, and how clinics should be run.

Most COVID-19 vascular surgery guidelines seem to agree on what patients should be treated immediately; acute limb ischemia, vascular trauma and aortic aneurysm rupture.<sup>2,3</sup> As it was described in Spanos *et al.*,<sup>1</sup> these principles are reflected in the recommendations that were presented by Hellenic Society of Vascular and Endovascular Surgery (HSVES). All other cases can be deferred for later, although there is no global

consensus on the timing of these deferrals. Carotid disease seems to be the most ambiguous in terms of the procedure timing, a situation described by Spanos *et al* in their manuscript.

Some institutions have suggested that even emergency or urgent cases should be treated in ways that minimize the procedure time, the hospital stay, the need for blood products and occupancy of Intensive Care Units (ICU) or High Dependency Units (HDU). Therefore, procedures should be performed by experienced physicians to minimize the time, while the least possible staff should be present in the operation theatre to minimize personnel exposure. In some cases, treatment should be more aggressive in order to minimize length of stay, the need of readmission and follow-up clinic visits; a good example for this is diabetic foot/gangrene and surgical debridement. In cases where both open and endovascular techniques can be performed (e.g. ruptured aneurysms), the endovascular procedure should be preferred in order to minimize the procedure time, the use of blood products and the length of stay. It is interesting to note that the COVID-19 guidelines oppose guidelines issued by the same or other institutions; Royal College of Surgeons’ guidance opposes the initial NICE guidelines regarding EVAR.<sup>4</sup> A number of centers in Greece cannot strictly adhere to these principles, mainly because there is no emergency endovascular service. Minimizing theatre personnel and rotation of teams are already in place in most vascular units in Greece, as mentioned by Spanos *et al.*

Clinics cannot be run in the usual manner, since social distancing is either imposed or suggested. The UK National Health System has already introduced virtual vascular outpatient clinics where bidirectional audio and video connection between the patient and the physician is established.<sup>5</sup> The Athens Medical Association has introduced a service called “Doctor Next 2 Me”, which allows any patient can connect to a physician through a smart phone or a computer.<sup>6</sup> Although this service has attracted attention from the public, it focuses on COVID-19 related consultations. It is a promising technology and could be used for virtual vascular consultations in the future.

Apart from the clinical aspect, the pandemic also affects other parts of vascular surgery. Education and training also suffer from the imposed social distancing and travel bans. The European Society for Vascular Surgery (ESVS) is already considering an online only Annual Meeting, while other vascular meetings are already either cancelled or postponed. The

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HSVES annual and the LIVE meetings are already postponed, while other local meetings are affected, too.

Vascular training is also affected, as number of patients has decreased due to the abovementioned guidelines. Societies are researching online tools to continue providing training. The necessity of online solutions is such that ESVS is considering reintroducing vascular e-learning,<sup>7</sup> only a couple years after shutting down a promising e-learning project. HSVES has already taken advantage of novel tools and has held its first *imeeting*, receiving very positive feedback. It remains to see to what extent online activities can substitute or replace activities that previously required the physical presence of a vascular surgeon or a trainee.

This short review of the current management of patients with vascular disease,<sup>1</sup> shows that it is rather clear that the pandemic will alter all clinical, educational and training activities of vascular surgeons around the globe. The Hellenic vascular community has reacted promptly to this changing environment and has put significant efforts to address the difficulties risen from the new situation.

## REFERENCES

- 1 Spanos K, Giannoukas A, Matsagkas M. Vascular Surgery in the era of COVID-19 pandemic. *HJVES* 2020; 2:52-54
- 2 Clinical guide to surgical prioritisation during the coronavirus pandemic. <https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/C0221-specialty-guide-surgical-prioritisation-v1.pdf>. Accessed 20/04/2020.
- 3 COVID-19: Recommendations for Management of Elective Surgical Procedures. <https://www.facs.org/covid-19/clinical-guidance/elective-surgery>. Accessed 19/4/2020.
- 4 COVID-19: Good Practice for Surgeons and Surgical Teams. <https://www.rcseng.ac.uk/standards-and-research/standards-and-guidance/good-practice-guides/coronavirus/covid-19-good-practice-for-surgeons-and-surgical-teams/>. Accessed 19/4/2020.
- 5 COVID-19 virus and vascular surgery. [https://www.vascularsociety.org.uk/professionals/news/113/covid19\\_virus\\_and\\_vascular\\_surgery](https://www.vascularsociety.org.uk/professionals/news/113/covid19_virus_and_vascular_surgery). Accessed 19/4/2020.
- 6 DoctorNext2Me. <https://diplasou.dn2me.com>. Accessed 19/4/2020.
- 7 ESVS e-Library candidates. <https://www.esvs.org/esvs-e-committee-call-for-candidates/>. Accessed 19/4/2020.