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**Outcomes of vascular and endovascular interventions performed during the
COroNaVirus Disease 2019 (COVID-19) pandemic: The Vascular and
Endovascular Research Network (VERN) COvid-19 Vascular sERvice (COVER)
Tier 2 study**

Short title: Outcomes after vascular intervention in the COVID-19 pandemic

The Vascular and Endovascular Research Network VERN COVER Study
Collaborative*

**A complete list of the investigators is included in supplementary material (Appendix
I, <http://links.lww.com/SLA/C860>)*

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ISRCTN registration reference: 80453162 (registered in April 2020)

Mini Abstract

The COVER Study is a global effort to report outcomes for patients undergoing vascular interventions during the pandemic. Mortality following vascular interventions during this period was unexpectedly high, despite low reported COVID-19 prevalence. Guidelines limiting surgery to only the most at risk cases may have led to this major rise in post-procedural mortality.

Abstract

Objective

The aim of the COVER Study is to identify global outcomes and decision making for vascular procedures during the pandemic.

Background data: During its initial peak, there were many reports of delays to vital surgery and the release of several guidelines advising later thresholds for vascular surgical intervention for key conditions.

Methods

An international multi-centre observational study of outcomes following open and endovascular interventions.

Results

In an analysis of 1,103 vascular intervention (57 centres in 19 countries), 71.6% were elective or scheduled procedures. Mean age was 67 ± 14 years (75.6% male). Suspected or confirmed COVID-19 infection was documented in 4.0%. Overall, in-hospital mortality was 11.0%. (aortic interventions mortality 15.2% [23/151], amputations 12.1% [28/232], carotid interventions 10.7% [11/103], lower limb revascularisations 9.8% [51/521]). Chronic obstructive pulmonary disease (Odds ratio [OR] 2.02, 95% CI 1.30-3.15) and active lower respiratory tract infection due to any cause (OR 24.94, 95% CI 12.57-241.70) were associated with mortality, whereas elective or scheduled cases were lower risk (OR 0.4, 95% CI 0.22-0.73 and 0.60, 95% CI 0.45-0.98 respectively. After adjustment, antiplatelet (Odds Ratio [OR] 0.503, 95% Confidence Interval [CI]: 0.273 - 0.928) and oral anticoagulation (OR 0.411, 95% CI: 0.205 - 0.824) were linked to reduced risk of in-hospital mortality.

Conclusions

Mortality following vascular interventions during this period was unexpectedly high. Suspected or confirmed COVID-19 cases were uncommon. Therefore an alternative cause e.g. recommendations for delayed surgery, should be considered. The vascular community must anticipate longer term implications for survival.

Introduction

The COroNaVirus Disease 2019 (COVID-19) pandemic has impacted vascular services in unprecedented ways(1). Some national and international surgical bodies have recommended limiting surgery to only the most severe or late-stage presentations of certain vascular conditions, such as crescendo transient ischaemic attacks, ischaemic limbs with tissue loss or rest-pain, and abdominal aortic aneurysms (AAA) larger than the global standard treatment thresholds of 5.5cm (that is 6.5-7cm for asymptomatic AAA)(2–4). The reduction in hospitals' capacity to treat non-COVID-19 pathologies, coupled with staff shortages and resource limitations, have led to considerable deviations from the established gold standards of vascular surgical care(5–7).

In addition to an estimated overall mortality rate of up to 15% for those with a severe COVID-19 infection and a surgical pathology, it is now recognised that there are significant increases in 'excess deaths' due to the pandemic for patients without COVID-19 i.e. delayed treatments for cancer, or delayed presentation of patients with cardiovascular disease(8,9). Many specialities have reported vastly reduced or delayed presentation for serious pathologies such as myocardial infarctions(10). A number of international studies are currently investigating surgical interventions and clinical outcomes specifically in patients diagnosed with COVID-19(11), however, little is known about the outcomes of any patients undergoing cardiovascular surgery during the pandemic, irrelevant of COVID-19 diagnosis.

The prospective Vascular and Endovascular Research Network (VERN) COVID-19 Vascular SERvice (COVER) Study was therefore developed to prospectively document outcomes for all vascular procedures performed during the pandemic, in COVID-19 positive and negative patients worldwide. COVER is a three-tier global collaborative research project supported by multiple international vascular organisations(12,13). The primary aim of this analysis was to report in-hospital outcomes during the first months of the COVID-19 pandemic worldwide. The secondary aims were to compare in-hospital mortality to pre-pandemic rates and to establish the impact of changes to vascular care demonstrated in the tier 1 COVER report.

Methods

Study design

The Vascular and Endovascular Research Network (VERN) COVID-19 Vascular SERvice (COVER) Study is a prospective observational cohort study (ISRCTN registration reference number: 80453162). The full protocol is available online(12). The study was performed and is reported in accordance with the STROBE guidelines(14).

Any institution performing vascular procedures was eligible to participate. Invitations to participate were circulated via social media, national and multinational vascular society mailing lists, and personal communications worldwide. Appropriate sites underwent virtual site initiation via email and video conferencing with the lead investigators.

Study approvals

UK National Health Service (NHS) Research Ethics Committee (REC) and Health Research Authority (HRA) approvals were granted prior to commencing recruitment (20/NW/0196 Liverpool Central) in March 2020. International centres obtained institutional review board approval before participation as per local and national guidance/law. Study sponsorship was provided by the research and development department, University hospitals Coventry and Warwickshire (UHCW), Coventry, United Kingdom. The study is being conducted in line with the Declaration of Helsinki.

Participants

All consecutive patients with a vascular pathology undergoing any vascular or endovascular procedure over a period of twelve weeks from the study opening at each site were prospectively recorded, after providing written informed consent. All study forms were translated by the site investigators/collaborators, where necessary.

Study objectives

The primary aim was to capture procedural information on all vascular and endovascular interventions being undertaken during the COVID-19 pandemic and for a period of twelve weeks. Outcomes were in-hospital morbidity (all complications) and mortality. This included unplanned admission(s) to critical care and suspected or confirmed COVID-19 infection(s). Testing for Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection was performed and documented (prospectively) as per local hospital policy. Centres were asked to document if patients were suspected to have COVID-19 based on a clinical diagnosis with highly suspicious symptoms consistent with SARS-CoV-2 infection including cough, fever, loss of taste or smell, and myalgia(15). This definition and approach were used, based on criteria used in similar cohort studies relating to COVID-19 in other clinical areas(11).

Baseline data recorded prospectively included: demographics, type/nature of procedure, co-existing health conditions, medications being taken prior to the procedure (on admission or started acutely), American Society of Anaesthesiologists (ASA) physical status classification, and clinical frailty scale(16). Peri-procedural data collected included the time from presentation to intervention, mode of anaesthesia, type of operation, and post-operative care environment. Post-procedural data included unplanned admission to critical care, in-hospital mortality, total length of hospital stay, COVID-19 pneumonia (using centre's own practice standards), and post-operative complications. All information were recorded prospectively by each site's investigators/collaborators using a remote purpose-built care report form. Training was provided to all investigators/collaborators prior to opening each site to recruitment. Missing data were prospectively queried with the site investigators/collaborators.

Alteration to routine practice

For every case, the surgical team were asked to document if there had been any significant change in practice compared to their own standard care pre-pandemic. This

was asked, in order to link results for in-hospital mortality to the prevalence of altered practice by surgical condition. The decision on whether management of the patient constituted a change in practice was left to each centre's discretion.

Data management

De-identified data were transferred to a UK NHS server (based at the University of Birmingham) as per Health Research Authority (HRA) and NHS principles. Data sharing agreements were used for all participating institutions. Each centre was required to record local identifiers on a secure, local, General Data Protection Regulation (GDPR) compliant database to allow longitudinal data capture and linkage, overseen by the study Sponsor.

Data handling and analysis

The first patient was recruited and data were entered on the 10th of April 2020. A data lock was applied on the 16th of June 2020 to permit an interim analysis, reported here. Individual dates for surgery were not collected, to maintain de-identified datasets as per HRA rules. Data were not analysed by centre for the same reason. The data are presented as a global dataset, reflecting the picture of local/regional peaks of patient COVID-19 caseloads and impacts on vascular services even amongst countries with documented high rates of per-head infection.

Data are presented for all procedures performed during April, May and June 2020 with completed records for their inpatient stay as of the 16th June. Normally distributed data are presented as mean ($\pm$ standard deviation) and non-normally distributed data are presented as median (range) values. Binary logistic regression was used to assess risk factors for in hospital mortality, with confounder adjusted analysis performed using multivariate logistic regression. Those risk factors found to be statistically significant at the 95% confidence level in the univariate binary logistic regression analysis were taken forward to multivariate logistic regression. These included, ethnicity, co-morbidities (including COVID status), medications, ASA grade, frailty score and urgency of surgery. Statistical analysis was performed using SPSS version 26 (SPSS, IBM, Chicago, Illinois, USA). The analyses were led by a qualified medical statistician using a pre-determined analysis plan.

Role of the funding source

Funding sources and the study sponsor had no role in study design, collection, analysis or interpretation of the data.

Results

At the time of analysis (16th June 2020), records for 1,257 individual patients had been entered. Of those patients, 1,103 patients had completed records reporting in-hospital death or survival to discharge, and the results from this smaller cohort is reported here. Data were entered from 57 individual vascular units in 19 countries (supplemental data 1, <http://links.lww.com/SLA/C861>). Table 1 contains baseline characteristics of the cohort.

In hospital mortality

The overall in hospital mortality was 11.0% (121/1103 patients). Men accounted for 80.2% of deaths. More comprehensive details of post-procedural outcomes are recorded supplementary material (Supplemental table 2, <http://links.lww.com/SLA/C862>), including missing data.

Aortic surgery

Aortic interventions had a combined (open and endovascular procedures) all-cause mortality of 15.2%. Elective aortic surgery had lower mortality compared to non-elective surgery (7.4%, 5 of 68 versus 23.7%, 18 of 76, respectively). Combined elective and emergency endovascular aneurysm repairs had a mortality of 15% (14 of 93). The highest mortality rate was seen in symptomatic unruptured abdominal aortic aneurysms (38.5%, 10 of 26), followed by ruptured aneurysms (28.6%, 4 of 14), acute aortic syndromes (type B aortic dissection, aortic ulcer or transmural haematoma) (23%, 3 of 13), aneurysms meeting centre size threshold for repair (7.4%, 5 of 68), and rapid aneurysm growth (4.5%, 1 of 22).

Carotid surgery

In-hospital mortality for any carotid intervention overall was 10.7%, with a combined stroke or death rate of 13.6% (14 of 103). A third (36.9%; 38 patients) of the carotid interventions were performed for asymptomatic carotid stenosis with a 7.9% (3 patients) all-cause mortality. Symptomatic carotid interventions were associated with a 12.3% (8 of 68) all-cause mortality. The mean time from index neurological event to intervention was 26.3 ± 41.1 days. Unadjusted in hospital mortality for local anaesthetic procedures was 13.0% vs 10.0% for those performed under general anaesthetic.

Lower limb interventions

Mortality in lower limb arterial revascularisation was 9.8% overall (51/521). Open and endovascular procedures are presented as a combined group and breakdowns of these into hybrid, endovascular and open vascular surgery can be found in supplementary table 2, <http://links.lww.com/SLA/C862>. The indication for lower limb revascularisation was chronic limb threatening ischaemia (CLTI) or tissue loss in 61.8% (310 patients), with a reported in hospital mortality of 5.6% and 8.1% respectively. Acute limb ischaemia (ALI) was seen in 18.5% (93 patients) of presentations for lower limb, with a documented mortality of 20.4%. In those undergoing revascularisation for claudication, reported in hospital mortality was 8.9%.

Amputation

The overall in-hospital mortality rate following amputation at any level was 12.1% (28 of 232). The most common level of amputation was trans-femoral in 27.4% of patients (62/232), followed by trans-tibial amputation in 22.1% (50/232). In hospital mortality following 'major' amputation (including knee disarticulations), was 14.3% (17/119).

Post-operative events

The median length of stay was 5 (0 - 100) days. Seventy-three patients (6.6%) had an unplanned return to theatre. Wound infection was the most frequently recorded in-hospital complication, identified in 4.3% (46 patients), followed by limb ischaemia (3.8%, 42 patients), respiratory complications (3.4%, 38 patients), cardiac events (3.2%, 35 patients) and bleeding (2.7%, 30 patients).

Alteration to routine practice

Table 2 shows the frequency of surgical procedures that were considered a change from normal practice due to the COVID-19 pandemic for each category of major arterial intervention. Surgical procedures were recorded as a deviation in normal practice in 7.1% of procedures. The largest proportional change in practice related to type of surgical procedure performed for specific clinical presentation. In cases of amputations a change in practice occurred in 2/232 cases (9%). Procedure choice differed from normal practice in 34 lower limb interventions (8.1%, 521 patients undergoing open and/or endovascular intervention). COVID-related alterations to the anaesthetic plan for any case occurred in 21 (2.0%) surgical procedures. A change in the choice of post-operative destination made in 22 (2.0%) cases.

Adjusted risk prediction for in-hospital mortality

The results of the adjusted risk modelling are shown in figure 1. Following adjustment for confounders, urgent or emergency patients, risk of in-hospital mortality was greater in patients with a history of COPD, those with a current chest infection (not COVID-19), and patients of Caucasian ethnicity. Patients treated with antithrombotic medication (antiplatelet or anticoagulant therapy) were at lower risk of post-operative in-hospital mortality.

Discussion

This global prospective cohort study reports an overall in-hospital mortality of 11% for 1,103 vascular operations/interventions performed across 19 countries during the COVID-19 pandemic. The mortality rate is remarkably consistent across all procedural categories. This is despite the majority of patients having no evidence of SARS-CoV-2 infection.

Other teams have reported excessive mortality rates following surgery in SARS-CoV-2 infected patients of 23.8%. However, given the low rate of suspected or detected rate of SARS-CoV-2 infection among the cohort reported here, these results would suggest that high post-operative mortality rates in vascular patients during the pandemic are not limited to those with confirmed SARS-CoV-2 infection. The data presented cannot confirm the true rate of infection; only that based on swabs performed due to suspected infection. At the time of data collection, several studies documented that it was not routine practice to swab all patients admitted, only those with suspected infection(1,11).

In-hospital mortality following vascular interventions in the COVER Study cohort is considerably higher than all pre-pandemic reports from national registry data (Table 3). For example, contemporary carotid artery interventions are associated with 30-day mortality rates of 1%(17). All-cause mortality following lower limb revascularisation have been reported as between 1-5% (depending on the intervention and urgency)(18). Elective aneurysm procedures in this cohort have an in-patient mortality double that of pre-pandemic reported mortality of 3.0% for open surgery and 0.5% for endovascular aneurysm repairs, including complex repairs(19). One explanation for this was the publications of national guidelines recommending increasing threshold for aneurysm treatment to $\geq 6.5\text{cm}$ during the peak of cases (compared to 5.5cm in 'normal' practice)(2–4). Observational data suggest larger aneurysms, especially those over 6.5cm in diameter, are associated with greater 30-day post-operative mortality, even in the elective setting(20). Hence, the justification for delaying repair of aneurysms until they reach a maximal diameter of 6.5cm has been balanced against the risk of mortality now associated with post-operative COVID-19 associated respiratory complications, reported to be as high as 23.8% at 30-days, for a variety of surgical procedures(11). Therefore, if not due to COVID-19 infection, it is possible to hypothesise that alterations in established pathways of care, changes to team structures, and other structural or infrastructural changes made as a consequence of the pandemic have led to worse outcomes; as a consequence of guidelines suggesting delayed treatment, and challenges of operating within such altered practice frameworks.

The outcome of confounder adjusted predictors in this study suggest that Caucasian patients were twice as likely to die. COVID-19 infection is well documented to have worse outcomes in black and ethnic minority populations(21). We do not have a clear explanation for these findings other than in this study, the majority of patients were documented as being Caucasian, risking type 1 error. Other variables are consistent with what is known about vascular pathologies; patients with COPD, active pneumonia and undergoing urgent or emergency surgery had higher mortality rates, whilst antiplatelet and anticoagulant medication were protective, even in the short term(22).

Vascular pathology is associated with increasing age, male sex and multiple comorbidities such as smoking and systemic cardiovascular disease, all of which can be optimised with adequate resources and support(23). On the other hand, resource limitations and closure of services to reduce spread has reduced access to support systems, and guidance to delay surgery until more emergent clinical presentations may be reducing surgeons' ability to optimise their patients before surgery. This places vascular cohorts at increased risk of suffering serious surgical complications, as well as placing them in the highest risk cohort if they were to contract COVID-19 while in hospital, with reduced eligibility for admission to intensive care units in a resource-rationed setting(24).

Limitations

Participating centres were often working in challenging contexts with relative limitations in resources (including staff absence and redeployment), consequently there

are likely to have been some missed patient enrolments, confounded by the need for informed consent which may have been unachievable in emergency situations especially those with a fatal outcome. This may lead to an under-estimate of the mortality rate. However, patients were screened, recruited and consented at all centres by VERN investigators, i.e. surgical trainees or consultants who are present at each site 24/7, ensuring that as many emergencies and elective cases were captured as possible. During this study period, only 44 patients (4%) had documented confirmed or suspected COVID-19 status. It was not clear how many of the remaining patients were tested or not due to low suspicion. This limits the ability of the study to comment on rates of post-operative respiratory infections due to COVID-19. Anecdotally many regions globally, and their local hospitals have moved to testing all inpatients within the past few months. However this was not the case at the time of the analysis, therefore suspected cases were also included. Accurate reports of regional incidence of infection for vascular patients along is not currently available for comparison. Analysis has also not included comparison with local population COVID-19 rates. The vast majority of data presented here was captured in countries experiencing significant constraints on services due to the COVID-19 pandemic, and therefore closely represents vascular surgery in the pandemic era.

Conclusion

The presented data reflect contemporary overall in-hospital mortality for patients undergoing urgent vascular procedures in centres affected by the early stages of the COVID-19 pandemic. The vast majority of the patients in the present study did not have confirmed COVID-19 infection; results emphasise the second-order mortality effects of healthcare within a pandemic.

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Figure legends:

Figure 1: Adjusted model of predictors for in-hospital mortality including data from the 1103 patients with completed in-hospital recorded outcomes. As expected, urgency of surgery and active chest infection correlated strongly with reduced likelihood of survival to discharge. COPD: Chronic obstructive pulmonary disease, ASA: American Society of Anaesthesiologists.

TABLE 1: Baseline Characteristics for all patients included in analysis (n= 1103)

			In hospital mortality	Odds Ratio	95% CI
Age	Mean	66·9 +/- 13·9	119 (10·8%)	1·01	0·99-1·02
	Median	69·0 (1-104)			
	Missing: 4				
Male	Missing: 2	832 (75·6%)	97 (11·7%)	0·74	0·46-1·19
Ethnicity	Caucasian	816 (77·6%)	98 (12·0%)	0·82	0·98-6·87
	Missing: 52				
Comorbidity					
	Diabetes 1 or 2	522 (47·3%)	54 (10·4%)	0·89	0·61-1·30
	Hypertension	733 (66·5%)	85 (11·6%)	1·22	0·81-1·84
	Chronic lung disease	174 (15·8%)	31 (17·8%)	2·02	1·30-3·15
	Atrial Fibrillation	85 (7·8%)	13 (15·3%)	1·51	0·81-2·82
	(missing: 14)				
	Myocardial Infarction	253 (22·9%)	32 (12·7%)	1·24	0·81-1·91
	Chronic Kidney Disease	193 (17·5%)	23 (11·9%)	1·12	0·69-1·82
	Stroke/Transient ischaemic attack	146 (13·2%)	17 (11·6%)	1·08	0·63-1·86
	Current Smoker	206 (18·7%)	20 (9·7%)	0·85	0·51-1·41
	Cancer	78 (7·1%)	9 (11·5%)	1·06	0·52-2·19
	Dementia	27 (2·4%)	2 (7·4%)	0·64	0·15-2·75
	Peripheral Arterial Disease	424 (38·4%)	41 (9·7%)	0·80	0·54-1·19
	Current respiratory infection (any pathogen)	4 (0·4%)	3 (75·0%)	24·94	2·574-241·704
	Renal Replacement Therapy / Dialysis	95 (8·6%)	9 (9·5%)	0·84	0·41-1·71
	Confirmed COVID 19	15 (1·4%)	2 (13·3%)	1·25	0·28-5·62
	Suspected COVID 19	29 (2·6%)	7 (24·1%)	2·68	1·12-6·41
	ASA Grade 1-2	235 (21·58%)	19 (8·1%)	0·66	0·39-1·10
	ASA Grade 3-5	854 (78·42%)	101 (11·8%)	1·53	0·91-2·55
	Missing: 14				
	Frailty Score 4-9	546 (50·37%)	66 (12·1%)	1·23	0·84-1·80
	Missing: 19				
Urgency of Surgery					
	Elective	238 (22·3%)	13 (5·5%)	0·40	0·22 -0·73
	Scheduled	526 (49·3%)	47 (8·9%)	0·66	0·45-0·98
	Urgent	244 (22·9%)	48 (20·7%)	2·68	1·79-3·99
	Immediate	59 (5·5%)	9 (15·3%)	1·50	0·72-3·14
	Missing: 36				
Foot notes: ASA: American society of Anaesthesiologists.					

Table 2: Changes due to COVID 19 Pandemic

	Carotid (n=103) ¹	Lower Limb (n=521) ²	Amputation (n=232) ³	Aortic (n=151) ⁴
Choice of procedure a deviation from normal practice due to COVID pandemic?	5 (4.9%)	34 (8.1%)	20 (9%)	7 (4.8%)
Confirmed COVID Positive Patients	2 (1.9%)	7 (1.3%)	3 (1.3)	0 (0%)
Suspected COVID Positive Patients	2 (1.9%)	6 (1.2%)	13 (5.6%)	4 (2.7%)
Post-operative destination				
Ward	67 (65%)	364 (71.9%)	198 (87.6%)	70 (47.3%)
Stepdown ward from critical care unit	5 (4.9%)	44 (8.7%)	5 (2.2%)	9 (6.1%)
Level 2/High dependency unit	20 (19.4%)	47 (9.3%)	12 (5.3%)	30 (20.3%)
Level 3/Critical care	11 (10.7%)	34 (6.7%)	5 (2.2%)	36 (24.3%)
Died in theatre	0 (0%)	0 (0%)	0 (0%)	3 (2.0%)
Day case	0 (0%)	17 (3.4%)	6 (2.7%)	0 (0%)
Destination after surgery a change in practice due to COVID pandemic?	3 (2.9%)	8 (1.6%)	7 (3.1%)	3 (2.1%)
Mode of anaesthesia				
Local anaesthesia	23 (22.3%)	221 (43.8%)	23 (10.2%)	33 (22.6)
Spinal / Epidural	0 (0%)	58 (11.5%)	56 (24.9%)	11 (7.5%)
Peripheral Nerve Block	0 (0%)	3 (0.6%)	54 (24.0%)	0 (0%)
General Anaesthesia	80 (77.7%)	222 (44.0%)	92 (40.9%)	102 (69.9%)
Mode of anaesthesia a change in practice due to COVID pandemic	0 (0%)	3 (0.6%)	13 (5.8%)	2 (1.4%)

1: Carotid; Change in mode of anaesthesia: missing 1 data point (n 102). 2: Lower limb revascularisation; Procedure: missing 103 data points (n418) Mode of anaesthesia: missing 17 data points (n504) Change in mode of anaesthesia: missing 16 data points (n 505) Post-operative destination: missing 15 data points (n506) Change in postoperative destination: missing 15 (n506). 3: Amputation; Procedure missing 10 data points (n222) Mode of anaesthesia: missing 7 data points (n225) Change in mode of anaesthesia: missing 6 data points (n 226) Post-operative destination: missing 6 data points (n226) Change in postoperative destination: missing 6 (n226). 4: Aortic; Procedure missing 6 data points (n145) Mode of anaesthesia: missing 5 data points (n146) Change in mode of anaesthesia: missing 5 data points (n 146) Post-operative destination: missing 3 data points (n148) Change in postoperative destination: missing 5 (n146)

Table 3: Comparison of pre-pandemic in-hospital mortality from observational or registry data, and rates identified in the COVER tier 2 cohort. To ensure equivalent comparisons, the figure for open emergency repair excludes 4 patients who underwent open emergency revision surgery, all of whom survived to discharge. For the same reason, the figures for EVAR exclude 11 patients who underwent complex EVAR either electively or as an emergency. Of those, the 9 elective cases survived to discharge, as did the 2 cases performed non-electively.

	Pre-pandemic reported In hospital mortality	COVER reported In hospital mortality
Carotid Intervention	1% (17)	10.7%
Lower Limb Revascularisation	1.5% (18)	9.8%
Amputation	7.70% (18)	12.1%
Aortic Intervention		
Open	Elective: 3% (19) Emergency: 40.9% (18)	Elective: 10.5% Emergency: 33.3%
EVAR	Elective: 0.5% (19) Emergency: 22.6% (18)	Elective: 9.8% Emergency: 24.4%