Anaesthesia for Vascular Emergencies

An Essay

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In Anesthesiology

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List Of Abbreviation

ABC	: Airway, breathing, circulation
ABG	: Arterial blood gases
ABI	: Ankle brachial index
AMI	: Acute mesenteric ischemia
APTT	: Activated partial thromboplastin time
AVM	: Arterio venous malformation
CAD	: Coronary artery disease
CBC	: Complete blood count
CHF	: Congestive heart failure
CMI	: Chronic mesenteric ischemia
CMR	: Cerebral metabolic rate
CPAP	: Cotinous positive airway pressure
CPR	: Cardio pulmonary resuscitation
CSF	: Cerebro spinal fluid
CT	: Computerized tomography
CTPA	: Computed Tomographic pulmonary angiography
CVP	: Central venous pressure
DVT	: Deep venous thrombosis
ECG	: Electro cardio gram
EEG	: Electroencephalogram
ELISA	: Enzyme-linked immunosorbent assay
FLAIR	: Fluid attenuated inversion recovery
FMD	: Fibromuscular dysplasia
GABA	: Gamma amino benzoic acid
GCS	: Glasgow coma score
GI	: Gastro intestinal
ICA	: Internal carotid artery
ICP	: Intracranial pressure
IMA	: Inferior mesenteric artery
IVH	: Inter ventricular hemorrhage
IVV	: Intravascular volume
JVP	: Jugular venous bulb

List Of Abbreviation (Cont.)

LDL	: Low density lipoproteins
LMA	: Laryngeal mask airway
LMWH	: Low molecular weight heparin
LP	: Lumber Puncture
MI	: Myocardial infarction
MRA	: Magnetic resonance angiography
MRI	: Magnetic resonace imagine
MVT	: Mesenteric venous thrombosis
NIHSS	: National institutes of health stroke scale
NMDA	: N-methyl –D aspartate
NOMI	: Non occlusive mesenteric ischemia
PAWP	: Pulmonary artery wedge pressure
PE	: Pulmonary embolism
PEEP	: Positive end-expiratory pressure
PET	: Positron emission tomography
PICA	: Posterior inferior cerebellar artery
PIOPED	: Prospective investigation of pulmonary embolism disease
PT	: Prothrombin time
PVCS	: Premature ventricular complexes
PVD	: Peripheral vascular disease
RAA	: Renal artery aneurysm
SAH	: Subarachnoid hemorrhage
SEPs	: Somato sensory evoked potentials
SICU	: Surgical intensive care unit
SMA	: Superior mesenteric artery
SVT	: Supraventricular tachycardia
TEE	: Trans esophageal echocardiography
TIAS	: Transient ischemic attacks
V/Q	: Ventilation –Perfusion
VEDV	: Ventricular end diastolic volume
WBC	: White blood cell

INTRODUCTION

TheVascular system is the transport system that supplies substance absorbed from the Gastrointestinal tract and oxygen to the tissues, it returns Co_2 to the lungs and other products of metabolism to the kidneys , it also plays an important role in the regulation of body temperature and distribution of hormones and other agents that regulate cell function.

The blood, the carrier of these substances is pumped through a closed system of blood vessels by the heart which is a hollow muscular organ that sends blood to all parts of the body through acomplicated series of tube (arteries) that ramify in their course on branch in to minuted vessels (arterioles) , which in their turn are continuous with a closed mucked net work of microscopic vessels (capillaries) the blood from the latter is collected into minute vessels (venues), which join with one another to from vein these unite and ultimately form large vein which return blood to the heart.

Vascular emergencies constitute amajority vascular work load the patient are often elderly arteiopaths with significant co-morbidity, they are commonly smokers or ex-smokers with hypertension (71%), ischaemic heart disease (60%) heart failure ,diabetes mellitus and chronic obstructive pulmonary disease.At angiography only 80%) of patient with peripheral vascular disease have normal coronary arteries.

Emergency vascular procedures have a greater incidence of associated morbidity and mortality than elective procedures such as massive pulmonary embolism,which is one of the most common causes of unexpected death being second only to coronary artery disease as a cause of sudden unexpected natural death at any age Most clinicians do not appreciate the extent of the problem, because the diagnosis is unsuspected until autopsy in approximately 80% of cases.Although pulmonary embolism often is fatal, prompt diagnosis and treatment can reduce the mortality rate dramatically.these emergency surgeries may involve massive blood transfusion, marked fluid shifts, severe metabolic acidosis, significant post operative impairment of respiratory function and acute renal failure.Increase morbidity and mortality rate in vascular emergencies due to lack of time for adequate preoperative evaluation.

CAUSES OF VASCULAR EMERGENCIES

I- Cerebral Hemorrhage:

Intracranial hemorrhage is the pathological accumulation of blood within the cranial vault, it may occur within the brain parenchyma or the surrounding meningeal spaces.

causes include:-

Arteriovenous malformation ***(Shah and Heros, 1992)***.

- Aneurysmal rupture.
- Cerebral amyloid angiopathy ***(Ritter et al., 2005)***.
- Intracranial neoplasm.
- Coagulopathy.
- Hemorrhagic transformation of an ischemic infarct.
- Cerebral venous thrombosis.
- Sympathomimetic drug abuse.
- Sickle cell disease.
- Eclampsia or postpartum vasculopathy.
- Infection.
- Vasculitis.
- Neonatal intraventricular hemorrhage.
- Trauma.

(Shepherd, 2004).

Cerebral Aneurysm:-

Cerebral aneurysm is related inherently to structural aberrations of the cerebrovasculature .The integrity of the internal elastic lamina is compromised, with associated elastic defects in the adjacent layers of the tunica media and adventitia. Muscular defects of the tunica media and minimal support of adjacent brain parenchyma augment the pathologic potential of chronic hemodynamic stress on the arterial wall. Focal turbulence and discontinuity of the normal architecture at vessel bifurcations may account for the propensity of saccular aneurysm formation at these locations. Distal aneurysms may be smaller compared with proximal sites, yet the risk of rupture may be dissimilar due to the relatively thinner parent artery wall thickness.

The development of cerebral aneurysms remains a controversial topic. A multi-factorial etiology is most likely, reflecting the interaction of environmental factors, such as atherosclerosis or hypertension, and a congenital predisposition associated with various vascular abnormalities. Abnormalities of the internal elastic lamina may be congenital or degenerative. Multiple conditions have been associated with cerebral aneurysms; they include the following:

- Autosomal dominant inherited polycystic kidney disease.
- Fibromuscular dysplasia.
- Arteriovenous malformations.
- Osler-Weber-Rendu syndrome.
- Coarctation of the aorta.

- Other vascular anomalies.
- Marfan syndrome.
- Ehlers-Danlos syndrome, type IV.
- Other collagen type III disorders.
- Alpha1-antitrypsin deficiency.
- Systemic lupus erythematosus.
- Sickle cell anemia.
- Bacterial endocarditis.
- Fungal infections.
- Neurofibromatosis type 1.
- Tuberous sclerosis.

Environmental stressors, such as hypertension, have been associated with the presence of multiple aneurysms. A familial inheritance pattern has been noted in fewer than 2% of intracranial aneurysms ***(Juvela et al., 2001)***.

Dolichoectatic aneurysms of proximal vessels most likely have an arteriosclerotic etiology. These tortuous, elongated dilatations devoid of a true aneurysmal neck frequently contain laminated thrombus. Although aneurysmal Subarachenoid hemorrhage may occur, these lesions typically exert mass effects on adjacent parenchyma, with brainstem compression and cranial neuropathies, or result in obstruction of cerebrospinal fluid (CSF) outflow or distal thromboembolic sequelae ***(Anson et al., 1996)***.

Infectious aneurysms typically are situated in distal branches of the middle cerebral artery (MCA) (75-80% of

cases), reflecting the embolic origin of these lesions. Cardioembolism of septic material complicates the course of 4% of patients with subacute bacterial endocarditis and may affect other patients with congenital heart disease and right-to-left shunts. Direct extension from lumen to adventitia of septic emboli containing Streptococcus viridans or Staphylococcus aureus (i.e., the most common pathogens) may lead to degradation and aneurysm formation. Alternatively, diffuse infiltration from the periphery to the lumen may occur in the setting of meningitis, exemplified by aneurysms of the basal circulation associated with fungal infections. Infectious aneurysms are frequently multiple (20%) and have a greater propensity to bleed than other aneurysms.

Traumatic aneurysms may be located in peripheral cortical branches secondary to contact with the falcine edge or skull fractures associated with penetrating or closed head injury. Traumatic dissecting aneurysms due to expansion of intramural hematomas are noted most commonly at the skull base. These false aneurysms, devoid of all layers of the vessel wall, may compress cranial nerves or lead to distal embolization. Rupture of the internal carotid artery (ICA) may produce a carotid-cavernous fistula**.(Brisman JL et al. ,2006)**

Cerebral Arteriovenous Malformation (AVM):

- No genetic, demographic, or environmental risk factors for cerebral AVM have been identified clearly.

- Families with cerebral AVMs are rare, and such pedigrees have been too small to enable linkage studies. From the few family cases reported, the inheritance appears to be autosomal dominant.

- In a small minority of cases, cerebral AVMs are associated with other inherited disorders, such as the Osler-Weber-Rendu syndrome (i.e., hereditary hemorrhagic telangiectasia), Sturge-Weber disease, neurofibromatosis, and von Hippel-Lindau syndrome.

(Hofmeisteir et al., 2000).

2- Pulmonary Embolism (PE):

The causes for PE are multifactorial and are not readily apparent in many cases. The following causes have been described :

1- Venous stasis:

- Venous stasis leads to accumulation of platelets and thrombin in veins. Increased viscosity may occur due to polycythemia and dehydration, immobility, raised venous pressure in cardiac failure, or compression of a vein by a tumor.

2- Hypercoagulable states:

- The complex and delicate balance between coagulation and anticoagulation is altered by many diseases, by obesity, after surgery, or by trauma.