Research Paper

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ANESTHETIC MANAGEMENT OF CLIPING FOR CEREBRAL ANEURYSAM

Medical Science

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ABSTRACT

Intracranial aneurysm is one of the commonest vascular abnormalities requiring early attention. Management of intracranial aneurysm is challenging both for the anesthetists and surgeon because, almost all the cerebral aneurysm present with SAH. A retrospective study of outcome of anesthesia in microsurgical clipping was carried out. A total of 50 patients had their aneurysm clipped, out of which 44 had good outcome 4 severely disabled and two died..

Introduction

Intra-cranial aneurysm is one of the commonest vascular abnormalities requiring early attention. The estimated incidence of aneurysm is 8 to 10 cases per 100 000 persons. 5- 15 % of strokes are due to intra-cranial aneurysm rupture and it occurs more frequently between the ages 45 to 60 years.(1) Intracranial aneurysms are second to aortic aneurysms as the cause of vascular dilatation resulting from defects in the vascular network elasticity.(3) They are more frequent in men and the peak age-related incidence for rupture is the fifth decade of life.(2)

Etiology

Intracranial aneurysms are caused by congenital or acquired factors. Congenital defects affect the medial lining of cerebral arteries, especially the vessels composing the Circle of Willis and their bifurcations. This defect permits local distention of the vessel wall whenever blood pressure is elevated. Medial lining defects occur in 80% of the population. Acquired aneurysms account for the remaining causes of aneurysm formation. This type occurs secondary to fragmentation of the elastic lamina due to arteriosclerosis and hypertension.(4)

Pathophysiology

An intracranial aneurysm should be suspected if a patient complains of unilateral headache of sudden onset. If the occulomotor nerve is involved, ptosis and pupillary dilation may be present due to nerve root compression.' In about 70% of patients with subarachnoid hemorrhage, a history of sudden headache, meningismus or transient collapse will be elicited.(5) After an aneurysm ruptures, the clinical presentation depends on whether or not a significant subdural or intraparenchysmal hematoma develops or whether intraventricular rupture occurs. The patient may also have signs of meningeal initiation caused by the presence of blood in the subarachnoid space. Neurological deficits are common and include hemiparesis, speech and visual alterations and cranial nerve palsies. Five to 10% of patients will have a seizure at the time of rupture.' An important cerebral complication during the prerupture and postrupture periods is the development of vasospasm. Vasospasm is defined as radiographically demonstrated obstruction of cerebral arteries. Vasospasm occurs in 21 to 62% of patients with subarachnoid hemorrhage, and is the most common cause 0f Neurological deterioration after subarachnoid hemorrhage. Vasospasm can occur after closed head injury, intracranial surgery, central nervous system infections, penetrating cerebral injuries or drug therapy.(6)The cause of vasospasm is unknown; however, various factors implicated are angiotensin, serotonin, prostaglandins, norepinephrine, iron and hemoglobin fragments. The autonomic nervous system is probably closely involved, as subarachnoid hemorrhage causes a depletion of catecholamine stores in the cerebral perivascular sympathetic plexus. The vessel wall spastically constricts in the presence of circulating catecholamines.(6)

Preoperative considerations

Patients who are lethargic or obtunded due to sedation or neurologic process should not receive any preoperative medication. Those patients who are alert, or complain of headache or stiff neck may receive a light preoperative medication. Patients who have increased intracranial pressure secondary to intercerebral aneurysm rupture should not receive a narcotic preoperatively because of increased cerebral vessel dilation from CO 2 retention. An oral benzodiazepine such as lorazepam is ordered 90 minutes prior to surgery. Usually these patients are transported with oxygen by mask or nasal cannula to the operating room.

Table -1 Hunt Hess classification

Grade	Symptoms	No.of pt
	Unruptured aneurysm	0
0	Asymptomatic or minimal headache	4
1	Moderate to severe headache, nuchal rigidity and neurological deficit other than cranial nerve palsy.	18
2	Drowsiness, confusion or mild focal deficit	22
3	Stupor, moderate to severe hemiparesis, possibly early decerebrate rigidity and vegetative disturbances	6
4	Deep coma, decerebrate rigidity and moribund appearance	0

Table-2

WFNS grade	GCS score	No of patients
1	15	0
2	14-13 without motor deficit	4
3	14-13 with motor deficit	40
4	12- 7	6
	Total	50

Materials and Methods

This is a retrospective study of 50 the patients with subarachnoid haemorrhage due to rupture of aneurysm admitted in our institute. The Hospital records were reviewed and analyzed. The diagnosis was made with the history, clinical examination, and investigations which include computed tomography(CT) scan and cerebral angiogram. patients admitted in Hospital, only the cerebral angiogram positive cases for aneurysm were included for study. The patients were analyzed for age, sex, mode of presentation, Glasgow coma scale, Hunt Hess grading), site of aneurysm and post operative complications. There were a

total of fifty patients with ages ranging from 31 to 70 years with mean age of 50.5 years . Almost all the patients were admitted with severe headache and loss of consciousness with or without neurological deficit. Preanaesthetic checkup was done in all patients. During preanaesthetic visit patients were assessed for his neurological status, systemic effects like hypovolemia, cardiorespiratory abnormality and electrolyte imbalance. Correction of abnormalities and optimization were done before the schedule of operation.Besides the radiological investigation, routine investigations like full blood count, coagulationscreen, serum urea, electrolytes, blood sugar, chest radiograph and 12 lead ECG was done in all patients.Echocardiography was done only in those patients suspected with cardiac problem.

Premedication at bed side was not given to any patient because of risk of respiratory depression and further aggravation of intracranial pressure. So it was given in the operation theatre under supervision.Standard monitors like continuous ECG, Pulseoximetry, capnography, intermittent noninvasive bloodpressure, invasive intraarterial blood pressure, central venous catheter and urinary output measurement were done in all patients. Smooth induction of anaesthesia was achieved either with Sodium thiopental 3-5mg/kg iv or Propofol 2mg/kg iv and intubation was facilitated either with Vecuronium bromide 0.1 mg/kg iv. Attempt was made to avoid sudden swing in ICP and blood pressure during intubation by giving xylocard 1-2mg/kg iv. Anaesthesia was maintained with Oxygen, Isoflurane or sevoflurane and Vecuronium bromide to facilitate positive pressure ventilation. Osmotic diuretic Mannitol 0.5-1.5g/kg iv was administered to optimize brain relaxation which reduces brain bulk and help in surgical exposure for aneurysam. Both goals were achieved by providing adequate CPP and avoiding excessive hypo or hypertension.Blood pressure during operation was maintained around the baseline level. Cerebral protection during temporary clipping was achieved by the use of Thiopental 3-5mg/kg and Mannitol 0.5g/kg. The reversal was achieved by administering Neostigmine 0.05mg/kg and glycopyrolate 0.2mg The goals of anesthetic care include the preventionof rupture of the aneurysm prior to surgical access,so provision of adequate oxygen to the brain, the prevention of increases in intracranial pressure, and the rendering of a stable, bloodless field. These goals are especially challenging for the anesthetist, because the high cerebral perfusion pressure needed to ensure adequate blood flow is achieved at the cost of increased risk of aneurysm rupture.

Results

A total of 50 cases of cerebral aneurysm that underwent surgery were studied . Follow up was continued in the neuro-ICU and in the ward until the patient were discharged home. the electively ventilated six patients for those who had bad grades. Nineteen cases were extubated on operationtable. Out of fifty cases 44 (88%) recoveredfully without any neurological deficit. two (4%) casewas severely disabled and two cases (8%) died in post operative period due to severe chest infection.Both the cases were of WFNS grade IV preoperatively. The rupture of aneurysm was not related to induction or intubation. There was no intraoperative mortality.

Discussion

Ruptured phase. The goals of anesthetic care for a ruptured or unruptured cerebral aneurysm are basically the same. However, there are a few critical techniques that must be kept in mind. Because a ruptured aneurysm is a Surgical Emergency expeditious patient preparation is required. The anesthetist should attempt to maintain the degree of hypotension already present When intravenous lines are established, the blood volume should be rapidly corrected with intravenous fluids."

Unruptured phase. The first anesthetic priority is ensuring a smooth induction and endotracheal intubation. The primary problem that can occur in the periinduction period is hypertension during laryngoscopy and intubation. This can be prevented by a satisfactory level of anesthesia, adequate topical anesthesia of the trachea, and satisfactory muscle paralysis before laryngoscopy is attempted. Lidocaine has been shown to depress the sympathetic response of intubation causing less hypotension than thiopental. An important consideration during anesthetic maintenance is avoidance of rebleeding or aneurysm rupture during the operative period. This is achieved by recognizing and preventing increases in blood pressure, and avoiding hypoventilation and extreme degrees of hyperventilation. Adequatedepth of anesthesia before application of the head holder and skin incision can prevent increases in blood pressure and intracranial pressure. It has been shown that intracranial pressure increases from a mean of 13.8 mmHg to 31 mmHg (normal intracranial pressure 5-15 mmHg) with application of a pin holder or scalp incision. A main concern during surgery for intracranial aneurysms,is the reduction of intracranial pressure.The intracranial compartment is composed of three components: (1) brain tissue (85%); 2) cerebral spinal fluid (8-12%); and (3) blood (3-7%).A reduction in any of these components will cause a decrease in intracranial volume and pressure.The anesthetist can most easily control intracranial pressure by reducing cerebral blood flow.The most immediate and effective technique of reducing cerebral blood flow is hyperventilation. Reducing the PaCO2, from normacarbia to 20-25 mmHg will almost halve cerebral blood flow.Reductions below 20 mmHg produce maximal vasoconstriction and can cause cerebral hypoxia. A PaCO2 range between 25-30 mmHg is considered by many to be optimal for reducing cerebral blood flow. Venous drainage from the brain can also be improved by avoiding venous outflow obstruction caused by extreme flexion and twisting of the head. Such incidents as coughing or straining with an endotracheal tube in place may increase intracranial pressure by obstructing cerebral venous drainage. These include the administration of corticosteroids,osmotic and loop diuretics and externa lcerebral spinal fluid drainage catheters. SAH is usually accompanied by a combination of characteristic symptoms (i.e. sudden onset of severe headache, meningism,transient or persistent loss of consciousness, epileptic seizures, and focal neurological deficits).(7) Neurologicalinjury varies between unconsciousness, depressed consciousness,focal neurological deficits, and isolated cranial nervepalsy from 'jet impact' injury. Clinical grading scales such as the one of Hunt andHess(8) or the World Federation of NeurologicalSurgeons (9) are used to standardize clinical assessment and to estimate the prognosis.(10)

Postoperative management

After intracranial aneurysm surgery, the patient must be observed for wide swings in blood pressure. Episodes of hypotension must be preventedin order to lessen the occurrence of cerebral vasospasm. After consultation with the surgeon, extubation may be performed in the early recoveryperiod if the patient is medically stable and if no significant complications occurred intraoperatively.

OUT COME OF SURGERY

Outcome	Number
Good recovery	44
Severly disabled	4
Dead	2
Total	50

conclusion

The result of our anaesthetic management is comparable with the international standard. This is because of dedication of anesthesiologist, neurosurgeon, and all the concerned staff of the department.

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