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JAYPEE

2nd Edition

Self Assessment & Review of

NEUROSCIENCES

HIGHLIGHTS

- Above 750 questions given with authentic answers, latest references and important theory
- Explanatory notes for most of the questions have been given
- Recent advances have been discussed
- Concept-based MCQs have been posed
- This book is useful for MCh Neurosurgery, DM Neurology and DM Neuroradiology

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Forewords
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MULTIPLE CHOICE QUESTIONS

1. The commonest cause of subarachnoid hemorrhage is:
a. Aneurysm b. AVM
c. Trauma d. Vasculitis
Ref. Greenberg, 4th/e, p814

2. The commonest cause of aneurysmal bleed is:
a. A com artery aneurysm
b. ICA bifurcation aneurysm
c. MCA aneurysm
d. Basilar top aneurysm
Ref. Schmidek and Sweet, 4th/e, p1181

3. Most severe vasospasm is seen in:
a. Fisher I SAH b. Fisher II SAH
c. Fisher III SAH d. Fisher IV SAH
Ref. Greenberg, 4th/e, p824

4. Unilateral headache is usually found in which aneurysmal rupture?
a. MCA aneurysm
b. A com aneurysm
c. Superior cerebellar aneurysm
d. P com aneurysm
Ref. Youmans, 5th/e, p1960

5. Following are the surgical procedures for MoyaMoya disease, except:
a. STA-MCA bypass
b. Carotid endarterectomy
c. Encephalo-synangiosis
d. Encephalomyosynangiosis
Ref. Youmans, 5th/e, p1718-20

6. Following are the diseases associated with high risk for cerebral venous thrombosis, except:
a. Wegner's granulomatosis
b. Cogan's syndrome
c. Ankylosing spondylitis
d. Behcet's disease
Ref. Youmans, 5th/e, p1723-4

7. All the following are true about 'cord sign', except:
a. It is a hyperdense cortical vein on imaging
b. May be seen normally in pregnancy
c. May be seen in dehydrated individuals
d. May be seen when hemoglobin is elevated
Ref. Youmans, 5th/e, p1724

8. The commonest cause of intracerebral hematoma above 70 years is:
a. Hypertension
b. Congophilic angiopathy
c. Aneurysmal bleed
d. AVM
Ref. Greenberg, 4th/e, p882-3

9. Following are associated with high incidence of aneurysms, except:
a. Chiari malformation
b. Pseudoxanthoma elasticum
c. Autosomal dominant polycystic kidney disease
d. Marfan's syndrome
Ref. Neurosurgery Clinics, Vol 9th/ p425

10. The frequency of cardiac wall motion abnormalities in aneurysmal SAH is:
a. 70% b. 50%
c. 80% d. 1%
Ref. Neurosurgery Clinics, Vol 9th/ p599

11. What should be the minimum Lindegaard's ratio for middle cerebral artery to qualify for vasospasm?
a. > 2 b. > 3
c. > 5 d. >10
Ref. Youmans, 5th/e, p1850

ANSWERS

1. c. **2.** a. **3.** c. **4.** a. **5.** b. **6.** c. **7.** b. **8.** b. **9.** a. **10.** b. **11.** a.

12. Normal velocity of blood in middle cerebral artery is:

a. up to 20 cm/sec b. up to 50 cm/sec
c. up to 70 cm/sec d. up to 120 cm/sec

Ref. Youmans, 5th/e, p1850

13. The recommended dose of oral nimodipine for aneurysmal SAH in adults is:

a. 30 mg 6 hrly. b. 40 mg 4 hrly
c. 50 mg 6 hrly d. 60 mg 4 hrly

Ref. Youmans, 5th/e, p1852

14. Which of the following aneurysms causes maximum incidence of electrolyte disturbances?

a. P com artery aneurysm
b. Basilar top aneurysm
c. A com artery aneurysm
d. DACA aneurysm

Ref. Schmidek and Sweet, 4th/e, p1181-3

15. Which of the following aneurysm has maximum incidence of seizures?

a. DACA aneurysm
b. MCA aneurysm
c. SCA aneurysm
d. A com artery aneurysm

Ref. Youmans, p1960

16. Blister aneurysms arise from:

a. ICA
b. ECA
c. A com artery
d. Basilar top

Ref. Indian Journal of Cerebrovascular Surgery 2005;1(1):26-35

17. Following are the various embolizing/coiling agents for vascular malformations, except:

a. Onyx
b. Polyvinyl alcohol
c. Gelatin sponge
d. Methyl methacrylate

Ref. Youmans, 5th/e, p2057-77

18. Giant aneurysms are aneurysms which are:

a. $\geq$ 1 cm
b. $\geq$ 2 cm
c. $\geq$ 2.5 cm
d. $\geq$ 5 cm

Ref. Youmans, 5th/e, p2079

19. GDC for coiling of aneurysms is made of:

a. Titanium
b. Platinum
c. Steel alloy
d. Silver

Ref. Greenberg, 4th/e, p835

20. Mycotic aneurysms are:

a. Fungal aneurysms
b. Bacterial aneurysms
c. Infectious aneurysms
d. None of the above

Ref. Youmans, 5th/e, p2101-3

21. The commonest site of traumatic pseudoaneurysms of middle meningeal artery is:

a. Frontal
b. Temporal
c. Parietal
d. None of the above

Ref. Turkish Journal of Neurosurgery 2012; 22(2):239-41

22. Which chromosome is associated with mutation in cavernoma?

a. Chromosome 1 b. Chromosome 3
c. Chromosome 5 d. Chromosome 7

Ref. Youmans, 5th/e, p2299-301

23. Medusa head appearance on imaging is seen in:

a. Venous angioma
b. Meningioma
c. Cavernomas
d. Telangiectasia

Ref. Greenberg, 4th/e, p873

Answers

12. d. **13.** d. **14.** c. **15.** b. **16.** a. **17.** d. **18.** c. **19.** b. **20.** c. **21.** b. **22.** d. **23.** a.

24. Spetzler-Martin grade for cerebral AVM's takes into account all the following, except:
a. Size of the lesion
b. Venous drainage
c. Number of feeders
d. Eloquence of the cortex
Ref. Greenberg, 4th/e, p871

25. All the following phakomatosis have cutaneous manifestations, except:
a. Tuberous sclerosis
b. von Hippel Landau syndrome
c. Neurofibromatosis-1
d. None of the above
Ref. Greenberg, 4th/e, p292

26. Normal pressure breakthrough phenomenon is seen after surgeries for:
a. Aneurysm b. AVM's
c. Meningiomas d. Carotid artery
Ref. Schmidek and Sweet, 4th/e, p1370

27. Embolic agent of choice for AVM's is:
a. Gelfoam b. Onyx
c. GDC coil d. None of the above
Ref. Neurosurgery 1998;43(5):1164-72

28. What percentage of AVM's have co-existent intracranial aneurysms?
a. 3% b. 7%
c. 11% d. 24%
Ref. Greenberg, 4th/e, p870

29. Obliteration of AVM's after radiosurgery usually takes:
a. 2 months b. 2 years
c. 5 years d. 10 years
Ref. Youmans, 5th/e, p4078

30. Which of the following types of spinal AVM's is the most common?
a. Type I b. Type II
c. Type III d. Type IV
Ref. Youmans, 5th/e, p2363-5

31. Acute hydrocephalus in aneurysmal SAH is defined as ventriculomegaly in:
a. First 3 days after SAH
b. First 7 days after SAH
c. First 14 days after SAH
d. First 21 days after SAH
Ref. Neurosurgery Clinics, Vol 9th/ p531

32. The incidence of hydrocephalus is least in which of the following aneurysms?
a. A com b. P com
c. MCA d. Basilar
Ref. Youmans, 5th/e, p1959-69

33. The commonest site of ICA aneurysm is:
a. P com segment
b. Anterior choroidal segment
c. Ophthalmic segment
d. Cavernous segment
Ref. Greenberg, 4th/e, p842

34. The commonest direction of P com artery aneurysm is:
a. Medial
b. Superolateral
c. Superomedial
d. Posterolateral
Ref. Greenberg, 4th/e, p842

35. Which of the following subtypes of MCA aneurysms is the most common?
a. Proximal
b. Bifurcation
c. Distal
d. Equally all segments are affected
Ref. Youmans, 5th/e, p1959-68

36. Which of the following aneurysm sites is favored for mirror aneurysms?
a. DACA aneurysms
b. P com artery aneurysms
c. MCA aneurysms
d. Superior cerebellar artery (SCA) aneurysms
Ref. Youmans, 5th/e, p1959-68

Answers

24. c. **25.** b. **26.** b. **27.** b. **28.** a. **29.** b. **30.** a. **31.** c. **32.** c. **33.** a.
34. d. **35.** b. **36.** c.

37. Giant aneurysms are located most commonly on:

a. A com artery b. MCA
c. Basilar artery d. ICA

Ref. Youmans, 5th/e, p1959-68

38. The incidence of visual field defects is highest in:

a. A com artery aneurysms
b. Basilar top aneurysms
c. MCA aneurysms
d. DACA aneurysms

Ref. Youmans, 5th/e, p1959-68

39. Which of the following aneurysms is commoner in men than in women?

a. P-com artery aneurysm
b. MCA aneurysm
c. A-com artery aneurysm
d. Basilar top aneurysm

Ref. Schmidek and Sweet, 4th/e, p1214-18

40. Which aneurysm site is the least common for giant aneurysms?

a. DACA b. A com artery
c. PCA d. Vertebrobasilar artery

Ref. Schmidek and Sweet, 4th/e, p1214-8

41. Which of the following types of circulation at circle of Willis is the commonest?

a. Type I b. Type II
c. Type III d. Type IV

Ref. Osborn, 1st/e, p145

42. The maximum incidence of intracranial aneurysms is seen in:

a. India b. Sweden
c. South Africa d. Finland

Ref. Neurosurgery Clinics, Vol 9th/ p436

43. The risk of re-rupture of untreated aneurysm is:

a. 3–4% per year b. 7% per year
c. 10% per year d. None of the above

Ref. Greenberg, 4th/e, p822

44. All the following are true about AVM's, except:

a. It consists of large arteries and veins
b. Nidus consist of dilated tortuous vessels
c. It is usually a high flow shunt
d. There is high tissue perfusion

Ref. Youmans, 5th/e, p2147-55

45. A young alcoholic, hypertensive sustained a heady injury. On X-ray, there was a depressed fracture of temporal bone for which he was operated upon and discharged. About 1 month later, patient reports to the emergency room with history of sudden onset of loss of consciousness. His CT scan shows a large extradural hematoma on the side of previous surgery. The most likely cause of this hematoma is:

a. Alcohol induced coagulopathy and spontaneous bleed
b. Bleed from traumatic pseudoaneurysm of middle meningeal artery
c. Unrecognized trauma to head and hematoma formation
d. Uncontrolled hypertension

Ref. Turkish Journal of Neurosurgery 2012; 22(2):239-41

46. All the following are bad prognostic factors for venous thrombosis, except:

a. Neonates
b. Involvement of superficial venous system
c. Old age
d. Presence of coma

Ref. Youmans, 5th/e, p1723-30

47. Which of the following is/are predisposing factors for cortical venous thrombosis?

a. Behcet's disease
b. Ulcerative colitis
c. Protein C and S deficiency
d. All the above

Ref. Youmans, 5th/e, p1723-30

Answers

37. b. **38.** c. **39.** c. **40.** b. **41.** a. **42.** d. **43.** a. **44.** d. **45.** b. **46.** b. **47.** d.

48. The most sensitive test to detect subarachnoid hemorrhage is:
a. Spectrophotometry
b. CT angiogram
c. MR angiogram
d. Digital subtraction angiogram
Ref. Postgraduate Medical Journal 2005;81: 470-3

49. All the following features are true about traumatic lumbar puncture, except:
a. The sample does not clot
b. The RBC: WBC ratio is normal
c. The CSF pressure is normal
d. Xanthochromia is absent
Ref. Greenberg, 4th/e, p99

50. All the following about spinal hemorrhage are true, except:
a. Intradural spinal AVM type II is a cause of spinal hemorrhage
b. Spinal subdural bleed is commoner than spinal epidural bleed
c. Vertebral body tumors can also cause spinal hemorrhage
d. Patient presents with acute myelopathy
Ref. Greenberg, 4th/e, p224-5

51. All the following about anterior spinal artery syndrome are correct, except:
a. The common level involved is the mid cervical cord
b. Fox-Alajouanine syndrome is one of the causes
c. Clinically patient may have dissociated anesthesia
d. Overall prognosis is poor
Ref. Greenberg, 4th/e, p766

52. The commonest sinus which gets involved in venous thrombosis is:
a. Superior sagittal sinus
b. Inferior sagittal sinus
c. Transverse sinus
d. None of the above
Ref. Youmans, p1723-30

53. All the following are predisposing factors for cortical vein thrombosis, except:
a. Sickle cell anemia
b. Polycythemia
c. Dehydration
d. Volume overload
Ref. Youmans, 5th/e, p1723-30

54. Aneurysmal bleed causes:
a. Communicating hydrocephalus
b. Non-communicating hydrocephalus
c. Both 'a' and 'b'
d. None of the above
Ref. Greenberg, 4th/e, p823

55. The best MRI sequence to diagnose cavernoma is:
a. Gradient MRI
b. Diffusion weighted images
c. Fluid attenuation inversion recovery
d. Magnetic resonance spectroscopy
Ref. AJNR 1996;17:987-94

56. In benign perimesencephalic SAH, blood on CT scan is usually seen in:
a. Prepontine cistern
b. Chiasmatic cistern
c. Interhemispheric cistern
d. None of the above
Ref. Greenberg, 4th/e, p857

57. A 45-year-female presents with proptosis of right eye. On examination, there is restriction of eye movements also. Her thyroid hormone profile is normal. Upon auscultation a bruit is heard over the globe. The most likely diagnosis is:
a. Hemangioma of orbit
b. Orbital cellulitis
c. Optic nerve hemangioblastoma
d. Carotid-cavernous fistula
Ref. Greenberg, 4th/e, p877

Answers

48. a. **49.** a. **50.** b. **51.** a. **52.** a. **53.** d. **54.** c. **55.** a. **56.** a. **57.** d.

58. All the following conditions are indications for surgical treatment of mycotic aneurysms, except:

a. Fungal aneurysms
b. Aneurysms not responding to antibiotic therapy
c. Aneurysm which is located distally
d. Associated hematoma causing mass effect

Ref. Neurosurgery Clinics, Vol 9th/ p577-85

59. All the following statements about n-butyl-2-cyanoacrylate are true, except:

a. n-butyl-2-cyanoacrylate is a liquid embolic agent
b. It has high viscosity
c. It hardens immediately
d. It can be injected through microcatheter

Ref. Seminars in Interventional Radiology 2004;21(1):59-66

60. The following factor is/are good prognostic factors for successful radiosurgery in arteriovenous malformations:

a. Less draining veins
b. Young age
c. Hemispheric location
d. All the above

Ref. Youmans, 5th/e, p2126-8

61. The mechanism of obliteration of AVMs after radiosurgery is:

a. Direct necrosis of the nidus
b. Intimal hyperplasia with vessel narrowing and occlusion
c. Induction of thrombosis within the nidus and subsequent fibrosis
d. Induction of calcification within the nidus

Ref. Youmans, 5th/e, p2270

62. Following statements are true about direct AVF's:

a. All subtypes, i.e. Cognard type I, II and III cause subarachnoid bleed
b. Only type I causes subarachnoid bleed
c. Only type III causes subarachnoid bleed
d. Only type II and III cause subarachnoid bleed

Ref. Youmans, 5th/e, p2171-3

63. All the following are indications for surgery in brainstem cavernoma:

a. Presence of mass effect
b. Multiple bleeds
c. Progressive neurological
d. All the above

Ref. Youmans, 5th/e, p2323-7

64. In which of caroticocavernous fistula, there exists direct communication between ICA and the cavernous sinus:

a. Type A
b. Type B
c. Type C
d. Type D

Ref. Youmans, 5th/e, p2343-8

65. All the following features viz. vascular disease involving the cerebral vessels, Xenon-CT shows low CBF, EEG reveals rebuild phenomenon, association with posterior circulation aneurysms, association with primary pulmonary hypertension:

a. Fibromuscular dysplasia
b. Autoimmune vasculitis
c. Down's syndrome
d. MoyaMoya disease

Ref. Youman's 1715-17

66. The posterior circulation aneurysms have more chances of rupture than anterior circulation aneurysms. It is exactly:

a. 2 times more
b. 3 times more
c. 4 times more
d. 5 times more

Ref. Youman's p1788

67. A massive subarachnoid bleed is defined as:

a. >1000 ml
b. >150 ml
c. >200 ml
d. >250 ml

Ref. Youman's 1813

Answers

58. a. **59.** b. **60.** d. **61.** b. **62.** d. **63.** d. **64.** d. **65.** d. **66.** c. **67.** b.

68. All the factors are predisposing factors for vasospasm, except:

a. Thick subarachnoid status
b. Poor neurologic grade
c. Pre-existing hypertension
d. Hypokalemia

Ref. Youman's p1842

69. The following are the measures to reduce infarct size during temporary clipping in aneurysm surgery, except:

a. Increase systolic blood pressure by 10% of baseline
b. Reduce core body temperature to 33°C
c. Give barbiturates to cause burst suppression of EEG
d. Administer oral 5-amino-levulinic acid

Ref. Youmans p1522

70. During endovascular coiling of ruptured intracranial aneurysm:

a. Heparin is contraindicated
b. Heparin is given intravenously in a dose of about 50 IU/Kg
c. Heparin is given intra-arterially in a dose of about 50 IU/Kg
d. Heparin is given subcutaneously in a dose of 80 IU/Kg

Ref. Interv Neuroradiol. 2012;18(1):89-96

71. During femoral artery puncture for diagnostic angiography, the needle should puncture the artery:

a. About 2-3 cm below the inguinal ligament
b. About 6 cm below the inguinal ligament
c. About 2 cm above the inguinal ligament
d. None of the above

Ref. Br J Radiol. 1990;63(752):602-4

72. All the following statements about brain cavernomas are true, except:

a. These are congenital in nature
b. Bleed rates are 5% per year and rebleed rates are about 35% per year
c. Deeper seated cavernomas have higher changes of bleed than superficial
d. These do not grow in size

Ref. Neurosurgery 2013;72(4):573-89

73. During Diamox challenge test, the:

a. CBF may increase in normal area and reduce in areas liable for infarct
b. CBF may decrease in normal area and increase in areas liable for infarct
c. CBF decreases in both normal area of brain and in areas liable for infarct
d. CBF increases in both the areas

Ref. Neurosurgery focus 2011;11(5):1-5

74. Following are the sites for aneurysms which occur at non-branching sites of vessels:

a. A_1-segment
b. Dorsal wall aneurysms
c. Spinal artery
d. All the above

Ref. World Neurosurg. 2015 Oct;84(4):1178, e11-3

Answers

68. d. **69.** d. **70.** b. **71.** a. **72.** d. **73.** a. **74.** d.

EXPLANATION

1. The commonest cause of SAH is trauma. Other etiologies of SAH are: Ruptured intracranial aneurysm (75–90%), Cerebral AVM (4–57%), Vasculitis and vasculopathies, rare causes include pituitary apoplexy, cocaine use, coagulation disorders.

2. The single most common site of aneurysms presenting with SAH. Hypothalamic dysfunction is common in Acom aneurysms which includes electrolyte disturbances. CT scan: blood in anterior interhemispheric fissure and chiasmatic cistern (star sign) in most of the cases. Associated with intracerebral hematoma in 63% cases. IVH is seen in 79% cases. Frontal lobe infarcts occur in 20% cases.

3. Fisher grade

1. No subarachnoid blood detected
2. Diffuse on vertical layers <1 mm thick
3. Localized clot and/or vertical layer ≥1 mm
4. Intracerebral or intraventricular clot with diffuse or no SAH

"Vertical Layer" refers to blood within "vertical subarachnoid spaces including interhemispheric fissure, insular cistern, ambient cistern.

4. Unilateral headache is usually found in MCA aneurismal ruptures. Other features in these aneurysms include loss of consciousness at the outset, high incidence of seizures, hemiparesis, visual field defects.

5. MoyaMoya disease is a rare chronic, cerebrovascular disease → stenosis → occlusion of the bilateral ICA at their terminal portion and subsequent development of collaterals at the base of the brain. MoyaMoya – Japanese for "Puff of smoke" (appearance of collateral vasculature at base of brain on angiogram). Female: male = 1:8. Bimodal presentation, pediatric and adults. Superficial temporal arteries and renal arteries are sometimes shown to be affected by similar pathology, so MMD can be considered systemic. In children ischemic attacks are common and in adults intracranial bleeding is the usual presentation. Infarctions are observed in cortical and subcortical regions mainly in the watershed territories but basal ganglia and thalamus are usually spared. Bleeding in adults is mainly intraventricular or periventricular and not subarachnoid. Annual re-bleeding rate is 7%, often occurs at varying sites. Main causes of intracranial bleeding are: rupture of dilated and stressed perforating arteries containing microaneurysms, rupture of microaneurysms in the periventricular region, especially around superolateral wall of lateral ventricle. On MRI sulcal hyperintensity and ivy sign are suggestive of this entity, besides this T2-sequence detects microbleeding. Xenon-enhanced CT, SPECT, PET → can measure regional CBF and metabolic distribution. Reduced CBF and cerebrovascular reactivity to CO_2 on acetazolamide are seen.

6. CVT is a pathological condition accompanying thrombosis of cortical and deep cerebral veins and dural sinuses. Causes include hypercoagulable states → dysfunction of protein C, protein S, antithrombin III, plasminogen 3, Factor V mutation and prothrombin (factor II) gene mutation, Lupus anticoagulants + anticardiolipin antibodies, Behcet's disease, inflammatory bowel disease, Wegner's granulomatosis, Cogan's syndrome, Infections – cavernous and transverse sinus thrombosis associated with otitis, staphylococcus is the most frequent pathogen, neoplasms, puerperium, OC pills. 40% cases of CVT are idiopathic.

Clinical findings: headache → most common and often earliest symptoms. Focal neurological defects are present in 50–75% cases, In some patients complaints are present for days to weeks and symptoms can be fluctuating or progressive. Clinical features also vary according to site and extent of thrombosis. Thrombosis in SSS transverse sinus → isolated intracranial hypertension, If thrombosis extends to cortical veins → focal deficits and seizures may occur, bilateral deficits are late signs of SSS thrombosis. Transverse sinus thrombosis → associated with otalgia, otorrhea, cervical tenderness and adenopathy from infection. Cavernous sinus thrombosis -eyelid edema, chemosis, retro-orbital pain and exophthalmos, paralysis of III, IV, V1, V1 and V2 nerves. Thrombosis of deep venous system- patient may have akinetic mutism, coma. Cortical vein thrombosis without sinus involvement - can manifest as stroke syndrome. Cerebellar vein thrombosis → rare and often lethal.

Diagnosis

CT scan → dense vein or cord signs (20% of patients on non-enhanced scan), Cord signs and the dense triangle sign correspond to spontaneously hyperdense cortical vein or sinuses respectively, can be seen during first 1 to 2 weeks, falsely positive in neonates, dehydrated individuals.

Dense triangle: also known as delta signs - thrombus occupies SSS. On contrast enhanced CT, the empty delta sign consists of peripheral dural leaf enhancement along with a central non-opacified thrombus, occurs in 10 to 30% of patients with SSS thrombosis. CT can also show hemorrhagic infarctions as a result of poor drainage secondary to CVT. MRI/MRA/MRV → modality of choice for detecting CVT. Cerebral angiography → only in cases where MRI is uncertain or when intervention is desired, non-visualization of all or part of sinus during venous phase of angiogram, in cortical vein thrombosis, there is sudden non-visualization of occluded vein which may be surrounded by dilated collateral "corkscrew vessel".

8. Intracerebral hemorrhage is the 2nd most common form of stroke. Cerebral amyloid angiopathy (CAA) involves cerebrovascular amyloid deposition and is classified according to the amyloid protein involved. Sporadic amyloid β-protein (Aβ)-type CAA is the most common subtype found in older individuals. CAA-associated vasculopathies lead to development of hemorrhagic lesions viz. lobar intracerebral bleed, cortical microhemorrhage, and cortical superficial siderosis, ischemic lesions (cortical infarction and ischemic changes of the white matter), and encephalopathies that include subacute leukoencephalopathy caused by CAA-associated angiitis. Pathologically, CAA is seen mainly in the leptomeningeal and cortical vessels of the cerebral lobes and cerebellum. The frontal lobe is the most affected, whereas CAA is uncommon in the basal ganglia, thalamus, brainstem, and white matter. Pathologically the vessels display hyaline degeneration, microaneurysmal dilatation, and fibrinoid necrosis. Unenhanced CT is the diagnostic study of choice.

Risk factors: Age – increases after age 55 years, Gender – more common in men, previous CVA, alcohol consumption, street drugs – cocaine, amphetamines, phencyclidine, liver dysfunction.

9. The role of inheritance in the development of intracranial aneurysm is well established for disorders such as autosomal dominant polycystic kidney disease and connective tissue disorders such as Ehler-Danlos type IV, Marfan syndrome and pseudoxanthoma elasticum. Other conditions include fibromuscular dysplasia, arterovenous malformations including moyamoya disease, coarctation of aorta, Osler-Weber-Rendu syndrome, atherosclerosis, bacterial endocarditis.

10. Cardiac changes include EKG changes in over 50% of cases of SAH and include: broad or inverted T-waves, Q-T prolongation, S-T-segment elevation or depression. U-waves, premature atrial or ventricular communication, SVT, bradycardia. Takotsubo cardiomyopathy also can occur in which transient hypokinesia of the left ventricle is known to happen. Possible mechanism is supposed to be hypothalamic ischemia which leads to increased sympathetic tone and resultant catecholamine surge which may produce subendocardial ischemia or coronary artery vasospasm.

12. TCD (transcranial Doppler) works on the principle that as an artery narrows, blood flow velocity within it increases. Velocity in MCA greater than 120 cm/sec is indicative of some degree of vasospasm and those greater than 200 cm/sec is consistent with severe vasospasm. Because other factors can influence velocity including blood pressure and overall mean cerebral blood flow, therefore Lindegaard ratio i.e., velocity of blood in MCA/ICA came into place: ratio> 3 → consistent with vasospasm.

Mean MCA velocity	Lindegaard ratio	Interpretation
<120	<3	Normal
120–200	3–6	Mild vasospasm
>200	>6	Severe vasospasm

13. Nimodipine administered orally or via nasogastric tube 60 mg every 4 hourly and continued for 3 weeks is standard treatment of patient with aneurismal SAH. It prevents increases in intracellular calcium by blocking dihydropyridine-sensitive (L-type) calcium channels, hence limits the cytotoxic effect of increased calcium.

Nimodipine does not reduce vasospasm as was concluded by BRANT (British Aneurysmal Nimodipine Trial). It can cause temporary depression of blood pressure in which case dose can be reduced. If possible, given more frequently – (30 mg every 2 hours). Other side effects are headache and intestinal pseudo-obstruction (Ogilvies syndrome).

17. Embolic agents

- ❖ Cyanoacrylates
- ❖ Onyx
- ❖ Polyvinyl alcohol

1. **Cyanoacrylates:** Low viscosity, delivered quickly and infusion <1 min, High resistance to immune-biodegradation, intensive inflammatory response - vessel occlusion. N-Butyl-2-cyanoacrylate (NBCA) is the embolisation material of choice. Mixed with low viscosity oil contrast media with or without tantalum or tungsten powder for radiological visualization. NBCA polymerizes immediately on contact with free hydrogen ion, but catheter is rinsed with dextrose to prevent initiation of such polymerization.
2. Onyx → Onyx is a biocompatible non-adhesive liquid embolic agent and is comprised of EVOH (ethylene-vinyl alcohol) copolymer dissolved in DMSO (dimethyl sulfoxide), and suspended micronized tantalum powder to provide contrast for visualization under fluoroscopy. It permits more time for operator control over the volume and rate of delivery.
3. **PVA (polyvinyl alcohol):** It is a particulate agent (50 to 1000 μm), recanalization rates are higher than cyanoacrylates.

18. Minimum diameter of at least 25 mm. Giant intracranial aneurysms have a relatively morbid natural history. More than 50% of patients suffer from rupture of these aneurysms and mortality is >60%. The majority of giant aneurysms are located in the MCA and ICA regions. The MCA region is the commonest site for giant aneurysms. Most of the giant aneurysms have a distinct angioarchitecture i.e., fusiform shape, intraluminal thrombus. Many perforators and sometimes big branches also get incorporated into the aneurysms making therapy difficult. These aneurysms constitute 2 to 5% of all intracranial aneurysms, Patient becomes symptomatic in 4th to 6th decade. Clinical signs and symptoms include: SAH – 1/3rd of patients, Mass effects – 2/3rd of patients. If the aneurysm is in Acom region it presents as visual field defects, dementia, mental disturbances, epilepsy, Posterior circulation – multiple cranial nerve dysfunction, hemiparesis, partially thrombosed aneurysm → thromboembolism to distal vasculature.

19. GDC (Guglielmi detachable coil) for coiling of aneurysms is made of platinum soldered to a wire. When current is passed through it there is ionization at the junction and release of coil from the wire which is withdrawn.

20. Infectious aneurysms → Mycotic aneurysms, underlying infections are bacterial and not fungal as mycotic would suggest. Incidence is 2 to 6% in adults, 10% in children, 80% patients have endocarditis (left sided valve disease) cerebral infarction is most common – 31% patients, in 1 to 4% patients with infective endocarditis → infectious intracranial aneurysm is clinically diagnosed.

Extravascular infections: meningitis, cavernous sinus thrombophlebitis, cerebral abscess, subdural empyema, osteomyelitis of skull and sinus infections → can extend into arterial wall → arteritis → aneurysms formation. From meningitis → infectious aneurysm occur → proximally, from embolic infections → distal. Fungal or true mycotic aneurysm → immunocompromised states. Prolonged steroid use, exposure to broad spectrum antibiotics.

Most bacterial aneurysms arise as a result of intravascular embolism, nearly all fungal aneurysm find their origin in extravascular space. "True" mycotic aneurysms → large and more fusiform with higher association of occlusion of the vessel than bacterial aneurysm. Adventitia and muscularis are infiltrated initially by polymorphonuclear leukocytes, then intimal proliferation occurs. Fungal infections → aspergillosis, directly invade blood vessel wall, release elastase → digest elastic tissue → leads to intramural growth → fusiform aneurysm.

Antibiotic treatment → can alter the natural course (dynamic cycle of formation, enlargement, regression and resolution – make aneurysm tough, fibrotic and less likely to rupture. Antibiotic therapy should be started immediately in patients suspected of any infection intracranial aneurysms and continued for 4 to 6 weeks.

Relative indications for intervention/antibiotic therapy:

1. Proximal cerebral aneurysm – whenever sacrifice of parent vessel not possible.
2. Aneurysm where obliteration will result in seizure, neurological deficit
3. Regression/aneurysm or antibiotic therapy
4. Fungal aneurysm

Surgery and endovascular:
Indications:

1. Presence of symptomatic mass effect
2. Ruptured aneurysm
3. Enlargement of aneurysm on antibiotic therapy
4. Neurological deterioration on antibiotic therapy

Clipping is frequently not possible because of friable nature, so excision of aneurysm along with short segment of parent vessel → usually for distal aneurysm, for proximal aneurysms-excision with revascularization

22. It is now established that genetic mode of inheritance of familial CCM (cerebral cavernous malformation) is autosomal dominant with a high degree of penetrance. Genetic linkage analyses have mapped three CCM loci of chromosome 7.

23. Venous angiomas are low pressure vascular, malformation, Demonstrated on angiography as a starburst pattern – or sunburst or spokes of wheel: caput medusa. Other angiograph features: a long draining vein, draining an excessive amount of brain tissue.

Treatment: In general, should not be treated as they are venous drainage of normal brain.

26. Two main theories have been postulated to explain this phenomenon. On one hand, normal perfusion pressure breakthrough phenomenon" is based on the loss of cerebral vessel autoregulation due to the chronic vasodilation of perinidal microcirculation. However there are recent objections to this assumption. On the other hand, the "occlusive hyperemia" deals with thrombotic and venous obstruction phenomena that may also generate such manifestations.

30. Spinal AVMS may present with sudden subarachnoid hemorrhage, i.e. coup de poignard or gradually progressing myelopathy, i.e. Foix-Alajouanine syndrome. Symptoms such as paraparesis, gait difficulty, sphincter dysfunction and even sensory loss may be present. Symptoms may vary from months to years. The diagnosis of this syndrome is difficult as it not common. It can be confused with intramedullary tumor or polyneuropathy. The diagnosis of spinal AVMs is primarily based on imaging which includes digital subtraction angiography (DSA), CTA, and MRA. DSA is the modality of choice as it visualizes smaller vessels in detail.

54. Factors contributing to acute hydrocephalus are blood interfering with CSF flow through sylvian aqueduct, fourth ventricle outlet or subarachnoid space (non-communicating). Factors contributing to chronic hydrocephalus are due to the permanent impairment of arachnoid granulations (communicating).

55. Gradient MRI detects blood better (blooming effect).

57. Carotid-cavernous fistula

Classic triad: Chemosis, pulsatile proptosis, ocular bruit

- ❖ Type A (direct) high flow shunts between ICA and cavernous sinus.
  Traumatic/spontaneous.
- ❖ Indirect (dural) → most are shunts, from dural arteries
  Type B – between meningeal branch of ICA and cavernous sinus.

Type C – between meningeal branch of ECA cavernous sinus.

Type D – between meningeal branch of ICA and ECA.

61. The primary mechanism of AVM obliteration after radiosurgery involves hyperplasia of vascular intima with progressive narrowing and ultimately occlusion. Such obliteration takes place over 2–3 years' period.

63. Cavernomas

Conservative management: observation with repeated neuroimaging for patients whose symptom completely resolve after an acute hemorrhagic event or for patients with incidentally discovered lesion. Patient to be told that risk of hemorrhage from:

Incidentally discovered - <1%, Seizure – risk – 2% to 3%, Pregnancy → increased risk of hemorrhage, Patients should not restrict their activities or exercises based on theoretically increased risk.

Anticoagulants are not contraindicated. Patients with CM in non-eloquent location, hemorrhage rates are extensively low.

Surgical indication:

CM in ventricular system (therefore no tamponade effect on bleeding)

CM in Brainstem or thalamus

Contraindications

Medical problems, Multiple lesions.

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Self Assessment & Review of
NEUROSCIENCES

Salient Features

- Discourages rote learning
- Case-based questions have been posed
- The book provides condensed information about the CNS anatomy and physiology, and basics of Neurosciences
- The book is split into various sections to allow a student focus on a subsection and to practice the questions after going through the text
- The questions are based on understanding of the subject and practical clinical problems
- Although the book is primarily aimed to address the needs of the students going for MCh Neurosurgery entrance examinations, the book also caters to the needs of students who appear for Doctorate of Medicine (DM) courses in Neurology and Neuroradiology
- Simple language and lucid style encompassing all major and minor details expected of an exam-going Neuroscience resident
- Includes questions set in major institutions for MCh Neurosurgery.

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