

FUNDOSCOPY: AS A CLINICAL DIAGNOSTIC TOOL IN PAEDIATRIC PRACTICE

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SUMMARY

Direct fundoscopy is an easy, quick, useful, and reliable aspect of neurological examination, yielding positive clues to the diagnosis of intracranial pathologies. To ascertain its significance in paediatric practice, a prospective study was done, in the paediatric department of Postgraduate Medical Institute, Lady Reading Hospital Peshawar. The study stretched over two years 1.1.96 to 31.12.97. Total admission over the study period were 3168. Out of them, 120 cases with neurological and fundoscopic findings were included in the study. Besides routine investigations, lumbar and CAT scanning was performed in relevant cases. Fundoscopy was performed in the standard technique described by Huismans.⁴ The ages of the patients varied from 5 months to 14 years, and included 69 males and 51 females. These patients were diagnosed as septic meningitis (58 cases), aseptic meningitis (22 cases), tuberculous meningitis (20 cases), hypertensive encephalopathy (10 cases), intracranial space occupying lesions (6 cases), near drowning (2 cases) and head injury with intracranial bleed (1 case). The major fundoscopic findings included engorgement of blood vessels (57 cases), fundus hyperemia (36 cases), papilloedema (26 cases), retinal haemorrhages (10 cases), optic atrophy (3 cases) and choroid tubercle (1 case). The various fundoscopic findings, their mechanism and relation with different diseases is described in the light of available literature. Fundoscopy remains as a very useful non invasive clinical tool and it should be an integral part of all neurological evaluations done in paediatric practice.

INTRODUCTION

Direct fundoscopy is an established aspect of neurological examination, and serves as a direct reflection of the different pathologies occurring in the brain. Like the other body systems, the examiner must be acquainted with the normal anatomy of the fundus to identify normal from abnormal. Repeated exposure to fundoscopic examination is the only key to success. Similarly, the examiner must be well versed with the nomenclature of fundoscopy and should know the various pathological appearances in the fundus of the eye. To standardise and examination, the appearance of the optic disc should be described in terms

of colour, shape, size, margins and vascular pattern. The various ocular manifestations of systemic diseases include fundus colour changes, blood vessel changes, haemorrhages, papilloedema and optic atrophy etc.

To ascertain the significance of fundoscopy as a clinical diagnostic tool in paediatric practice, a prospective study was conducted in the paediatric department of Postgraduate Medical Institute, Lady Reading Hospital, Peshawar, over a period of 2 years from 1st Jan, 96 to 21st Dec. 1997. A total of 120 patients with neurological manifestations were subjected to fundoscopic examination.

MATERIAL AND METHODS

This study was conducted in the paediatric department of Postgraduate Medical Institute, Lady Reading Hospital, Peshawar. This department consists of 2 general paediatric wards, an infectious disease unit and a special care new born nursery. The total bed strength of this department is 132 beds, and it caters for a vast variety of cases referred from all over the province. The total number of admissions over the study period were 3168. Out of these, 120 cases with neurological manifestations were included in the study.

All the patients had a detailed history and thorough clinical examination recorded. Blood pressure was checked in relevant cases, using the standard cuff for the age of the patient. Blood pressure was recorded both in lying and sitting position using the mercury BP apparatus.

The clinical diagnosis of meningitis was based on the physical signs of meningeal irritation including neck stiffness, positive kernig sign and Brudzinski sign.^{1,2} Raised intracranial pressure was suspected by a bulging anterior fontanelle, diastasis of sutures, oculomotor or abducent nerve paralysis, bradycardia, apnoea, decorticate or decerebrate posturing stupor and coma.³

The ophthalmological examination of all children was performed in a standardised technique.⁴ After gross eye examination and assessment of light reflex, the pupils were dilated using Mydracyl 0.05%. Then direct funduscopy was performed using a keeler ophthalmoscope. The ophthalmoscope was positioned approximately 15 cm in front of patient's eyes and the light beam was directed into the patients pupils from a slightly temporal position. Right eye was used to examine the patient's right eye and left eye for patient's left eye. Following visualisation of the red fundus reflex, the front of the patient's eye was approached to distance of 2-3 cm. To adjust refractive

errors in the patient's or examiner's eye, the refractive power of the ophthalmoscope was changed by the lens power dial.

Details of the fundus were viewed in a systematic fashion i.e. optic disc, retinal vessels, posterior pole with macula and details of retina. Suspicious fundoscopic findings were reviewed by the local ophthalmology department.

The following investigations were selectively performed in relevant cases.

1. FBC, ESR
2. Mantoux Test
3. Urine Nalysis
4. X-ray Chest
5. C.S.F. Examination
6. CAT scan of Head

Lumber puncture was performed in aseptic condition with the patient in flexed lateral decubitus position. Styletted needle was used for all cases. The lumber puncture was done at L. 3-4 or L 4-5 position, located by the level of iliac crest. When the CSF was under high pressure, then only a small quantity was removed, and replaced by an equal amount of normal saline injected into the subarachnoid space to avoid a precipitous decline in intracranial pressure.⁵ The CSF was examined routinely for proteins, sugar, cellular content and the predominant type of cells. Blood sugar was simultaneously tested to compare with the CSF sugar.

RESULTS

The 120 cases included in the study ranged in age from 5 months to 14 years, with a mean age of 5-15 years (table-I)

Out of these 120 cases, 69(57.5%) were males and 51(42.5%) were females.

The commonest presenting symptoms were fever (92.5%), fits (75.5%), vomiting (57.5%), headaches (42.5%) and loss of

TABLE - I
AGE WISE BREAK UP OF 120 CASES

Age	No. of cases	Percentage
5-12 months	24	20
1-5 years	42	35
5-14 years	54	45

consciousness (40%). Other clinical symptoms, in decreasing order of frequency, were pain in the neck, lethargy and paralysis. Photophobia, diplopia, red eyes and dizziness were relatively uncommon symptoms (table-III).

On clinical examination, 82 cases had evidence of meningeal irritation supported by positive neck stiffness, kernigs and Bradzinski signs. Thirty cases (25%) had coma on admission. Hypotonia and hypertonia was recorded in 17.5% cases each. Paralysis, hyper reflexia, ataxia, in-coordination and spasticity were manifested in decreasing order of frequency (table-IV).

TABLE - II
PRESENTING SYMPTOMS

Symptoms	No. of cases	Percentage
Fever	111	92.5
Fits	90	75.5
Vomiting	69	57.5
Headache	51	42.5
Unconsciousness	48	40.0
Pain neck	30	25.0
Lethargy	30	25.0
Paralysis	24	20.0
Photophobia	10	8.3
Diplopia	6	5.0
Red eyes	6	5.0
Bilateral loss of vision	2	1.6
Dizziness	1	0.8

TABLE - III
NEUROLOGICAL SIGNS ELICITED

Signs	No. of cases	Percentage
Meningeal Irritation	82	68.3
Unconsciousness	30	25
Hypotonia	21	17.5
Hypertonia	21	17.5
Paralysis	18	15.0
Hyperreflexia	18	15.0
Atexia	12	10.0
Incoordination	9	7.5
Spasticity	9	7.5

After complete clinical evaluation and diagnostic work up, 100 cases (73.2%) fell in the common diagnosis of Meningitis. Amongst them 58 cases were diagnosed as acute septic meningitis, 22 cases as aseptic meningitis, and 20 cases as tuberculous meningitis. Hypertensive encephalopathy was the second commonest group accounting for 10 cases (9.8%). Intracranial space occupying lesions were diagnosed in 6 cases (5%). Out of them 4 had medulloblastoma, one had astrocytoma and one case was reported as tuberculoma. Near drowning,

TABLE - IV
DIAGNOSIS

Disease	No. of cases	Percentage
Septic Meningitis	58	48.3
Aseptic Meningitis	22	18.3
Tuberculous Meningitis	20	16.6
Hypertensive Encephalopathy	10	8.3
Space Occupying Lesion	6	5.0
Near Drowning	2	1.6
Head injury with intracranial haemorrhage	1	0.8

TABLE - V
ABNORMAL FINDINGS ON GROSS EYE
EXAMINATION

Abnormal Findings	No. of cases	Percentage
Abnormality of Pupils	14	11.6
Congestion	9	7.5
Squint	9	7.5
Nystagmus	3	2.5

acute infantile hemiplegia and head injury with intracranial haemorrhage were rare diagnoses (table-V).

On gross eye examination, 14 cases had abnormality of pupils. Congestion and squint was recorded in 9 cases each, while 3 cases had nystagmus (table-VI).

The commonest findings on fundoscopic examination were engorgement of blood vessels 57 cases (47.5%), hyperemia of fundus 36 cases (30%) and papilloedema 26 cases (21.6%). Retinal haemorrhages were noted in 8.3% cases. Optic atrophy was recorded in 3 patients (25%), while only one patient had an infected choroid tubercle, (table-VII). The different neurological disorders responsible for various fundoscopic changes are tabulated in (table-VIII).

DISCUSSION

Neurological disorders are an important cause of morbidity and hospitalization in children. Some of these disorders progress so swiftly that any delay in diagnosis and necessary treatment can prove deleterious. Children with these disorders should be hospitalized and managed briskly, applying all clinical skills and diagnostic supports. Fundoscopy is one of the very useful non-invasive diagnostic techniques yielding positive clues to the possible pathology. Fundoscopy is also considered as a pre requisite for performing lumbar punctures.

Papilloedema must be ruled out to avoid the possibility of coning during or after the lumbar puncture.

In our study the commonest of fundoscopic findings were engorgement of blood vessels (57 cases, 47.5%) and hyperemia of fundus (36 cases, 30%). They are relatively non specific findings and point to pathologies causing impedance in venous return like rising intracranial pressure and venocclusive disorders. If left unaddressed, these may progress to papilloedema.⁶

Papilloedema was the next common finding, observed in 26 cases (21.6%). Papilloedema is defined as the swelling of the optic nerve head, and it is the intraocular manifestation of raised intracranial pressures. When the pressure rises in the CSF system, it also rises in the optic nerve sheath, as the subarachnoid space extends along the optic nerve to the eyeball. The retinal artery and vein pierce this sheath a few millimetres behind the eye and then pass with the optic nerve into the eye itself. The high pressure in the optic sheath pushes fluid along the optic nerve fibres to the interior of the eyeball. Also, the pressure in the sheath impedes the flow of blood in the retinal vein, thereby also increasing the retinal capillary pressure. The tissues of the optic disc are much more distensible than

TABLE - VI
FUNDOSCOPY FINDINGS

Abnormal Findings	No. of cases	Percentage
Engorgement of blood vessels	57	47.5
Fundus Hyperemia	36	30.0
Papilloedema	26	21.6
Haemorrhages	10	8.3
Optic Atrophy	3	2.5
Infected choroid tubercle	1	0.8

TABLE – VII
DISEASES RESPONSIBLE FOR FUNDOSCOPIC FINDINGS

Disease	Fundoscopy Findings				
	Engorgement of vessels	Fundus hyperemia	Pappiloedema	Haemorrhages	Optic atrophy
Meningitis	40 (cases)	19 (cases)	14 (cases)	0 (cases)	3 (cases)
Hypertension	10	10	8	7	0
Space occupying lesions	6	6	4	2	0
Intracranial haemorrhage	1	1	0	1	0

those of the remainder of the retina, so that the disc becomes far more oedematous than the remainder of the retina and swells into the cavity of eye. The swelling of the disc, which can be observed with an ophthalmoscope, is called pappiloedema, and neurologists can estimate the CSF pressure level by assessing the extent to which the optic disc protrudes into the eyeball.⁶

The cause of pappiloedema in our study were meningitis (14 cases), malignant hypertension (8 cases) and space occupying lesion (4 cases).

The frequency of pappiloedema in meningitis seem to be very high in our study. This can, however, be explained by a very high frequency of meningitis (100 cases) in this group. Meningitis still remains as a major cause for admission into paediatric units all over the world.^{8,9} The situation is no different in our country.^{10,11,12}

Bacterial infection is among most common of the many causes of meningitis. The disease is of special concern because consequences are potentially devastating and the mortality remains high between 3 and 10% of all affected children after the neonatal period.^{13,14,15} Neurological handicap and sensori neural hearing deficit are found in 14-31% of the survivor.^{16,17,18} An early diagnosis and treatment is, therefore, vital for a good outcome.

Tuberculous meningitis was the third common disease (20 cases) (16.6%) encountered in our series. This is usually a slow growing disease and a low threshold of suspicion is required for early diagnosis. Mantoux test is negative in about 50% cases, while 20-50% children have a normal chest radiograph.

Tuberculous meningitis is a common feature of millitary tuberculosis. The pathognomonic fundoscopic manifestation of millitary tuberculosis is the choroid tubercle.¹⁸ It was seen in only one of our case. Choroid tubercles first appears as rounded yellow patches with identified margins and may be about the size of the optic disc or smaller. As they get older, the centre becomes white and the margins become clearly defined by deposition of pigment. Following treatment, the smaller ones disappear completely, but the larger ones are replaced by black pigment.¹⁹

Retinal Haemorrhages were found in 10 cases (8.3%). These haemorrhages were due to Hypertensive encephalopathy (7 cases), space occupying lesions (2 cases) and head injury with intracranial bleed in one case.

In our series malignant hypertension 10 cases (8.3%) was seen in children suffering from acutenephritis, which is a diffuse bilateral inflammatory parenchyma disease of the kidneys. It usually presents with

hematuria, proteinuria, casturia and leucocyturia without systemic hypertension, oliguria, oligosaluria, hypovolemia, hypocomplementemia and encephalopathy.²⁰

Hypertension of what ever origin tends to cause a characteristic retinopathy of hypertension. The earliest sign in the fundus is narrowing and straightening of arterioles due to constriction of the vessel walls. This is followed by "cotton wool patches" the result of retinal infarcts, and then superficial and deep haemorrhages with oedema at the posterior pole appear. The characteristic signs in fundus are the soft fluffy exudates with flame shaped haemorrhages and star figure at the macula which follows vascular oedema.^{21,22,23}

Retinal Haemorrhages were also seen in two out of 6 cases of intracranial space occupying lesions.

In our series these cases were diagnosed on the basis of persistent headache, vomiting, focal neurological signs, retinal haemorrhage papilloedema and a positive CAT scan. The various space occupying lesions encountered were medulloblastoma (4 cases), astrocytoma (one case), and a tuberculoma (one case). Medulloblastoma is the commonest type of intracranial tumour in childhood. Along with astrocytoma, it accounts for 75% of all the infratentorial tumours in childhood. It arises from the vermis of cerebellum and expands to involve the cerebellar hemispheres and fills the 4th ventricle including its lateral recesses. It is highly malignant with a pronounced tendency to metastatic seedling growths into cerebrospinal fluid pathways.

Optic atrophy was seen in 3 cases. All these cases were suffering from tuberculous meningitis. Optic atrophy is the ultimate sequela of progressive optic nerve disorder. The physiologic vial red yellow colour of the optic disc changes to white grey or yellow white in optic atrophy. In severe cases the optic disc may be stark white.

Paleness of the optic disc is due to degeneration of nerve fibres and subsequent glial proliferation with loss of minute capillaries that normally impart a pink colour to the nerve head. The disc margins may be well defined as in simple optic atrophy, or blurred as in optic atrophy following papillitis.²³

CONCLUSION

Fundoscopy is an extremely useful clinical tool. It should be an integral part of any neurological examination carried out in paediatric practice. It is a quick and non invasive method of identifying obscure diseases. All medically oriented units should lay special emphasis on formal training in fundoscopy.

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