Effects on the Neurologic System: Cranial Nerve Deficits

Authors: Ayda G. Nambayan, DSN, RN, St. Jude Children's Research Hospital
Erin Gafford, Pediatric Oncology Student, St. Jude Children's Research Hospital; Nursing Student, School of Nursing, Union University
Content Reviewed by: Judith Wilimas, MD, St. Jude Children's Research Hospital
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A cranial nerve deficit is a specific functional alteration that is due to impingement or invasion of the nerves that arise from the brain stem. Many cranial nerve deficits are associated with central nervous system malignancies (A – 1). Other contributing factors (A – 2) include surgical resection of brain tumors, radiation therapy to the brain and chemotherapy, other tumors such as neuroblastoma, rhabdomyosarcoma, nasocraniopharyngeal carcinoma and leukemia. Cranial nerve deficits that are induced by chemotherapy are usually dose–related.

Assessment

The clinical presentation of a cranial nerve deficit is specific to the cranial nerve (A – 3) affected. Patients may complain of vision loss or limited field of vision, changes in the ability to taste and smell, difficulty in chewing and an inability to hear. Associated signs may include a tendency to bump into objects, repeating what was said to them or ignoring parents and changes in eating patterns (avoiding foods that require chewing, tending to choke on foods).

Findings of the neurologic nerve assessment may be the presence of corneal abrasions (A – 4), a visual loss or deficit, facial palsy, muscle atrophy (A – 5), dysphasia and aspiration, an altered ability to taste and smell, a change in motor and sensory function (for example, an inability to shrug shoulders) and deafness. Other cranial nerve deficits that may be seen include the following: constriction of the pupils; Parinaud syndrome (A – 6), which is manifested by convergence nystagmus, a fixed upward gaze and an increased papillary reaction to accommodation to light; and Horner syndrome (A – 7), which is manifested by miosis, ptosis, exophthalmos and anhydrosis.

Nursing assessments should evaluate the extent of the deficit and its effect on the patient's function and safety, the family's ability to support the patient and the patient's learning needs. Further nutritional assessments should be done for patients who have problems with chewing, swallowing and taste changes. The effects on body image and relationships should also be appraised if patients have obvious nerve deficits such as palsy, atrophy and speech problems.

Planning

A plan of care that results in the following should be developed.

- Coping by the patient and family with the requirements of the neurologic deficit
- Protection of the patient from environmental and psychosocial threats
- Evidence by the patient of good hygiene, skin care and nutrition

Implementation

Management of a cranial nerve deficit depends on its cause. A deficit caused by disease must be evaluated with an analysis of the patient's history, a thorough neurologic examination and radiographic imaging.

The patient's vision, hearing and nutritional status should be routinely evaluated. Eye lubrication (artificial tears and eye drops) and protection (eye shield) may be necessary if the child or adolescent has a corneal abrasion. Changes in the ability to smell and taste, an inability to chew or swallow, a loss of sensation and tongue weakness can create nutritional deficits. Therefore, dietary counseling and speech therapy may be necessary. Tube feedings or total parenteral nutrition may be considered. Occupational therapy should be implemented to help the child or adolescent compensate for deficits in function.

The nurse must assist the child or adolescent in adapting to activities of daily living, provide a safe environment for the patient and provide home-care teaching to assist the family in managing potential complications and making necessary adaptations at home. The patient (especially the school-aged child) should also be protected from psychosocial hazards such as possible ridicule by other children because of his or her physiologic deficits.

Evaluation

Children and adolescents with cranial nerve deficits should be protected from possible environmental and psychosocial hazards brought on by their compromised motor and sensory functions.

Helpful Web Links

American Academy of Family Physicians/Neurologic Complications of Cancer, Shawnee Mission, KS
http://www.aafp.org/afp/990215ap/878.html

Neuroscience for kids
University of Washington
http://faculty.washington.edu/chudler/cranial.html

Related www.Cure4Kids.org Seminar

Seminar #147 Cumulative Incidence of Late Onset Sensorineural Hearing Loss Post-Radiation Therapy
Jerome W. Thompson, MD
http://www.cure4kids.org/seminar/147

APPENDIX

A – 1 Central Nervous System Malignancies Associated with Cranial Nerve Deficits

brain stem glioma
medulloblastoma
ependymoma
central nervous system leukemia
lymphoma
solid tumors that invade the cranial nerve space (for example, craniopharyngioma, rhabdomyosarcoma, neuroblastoma)

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A – 2 Treatments That Can Cause Cranial Nerve Deficits

Chemotherapeutic Agents

- vincristine
- vinblastine
- cytarabine
- cisplatin
- ifosfamide

Radiation therapy, especially that administered to the head and neck areas, for tumors such as medulloblastoma, craniophayngioma and astrocytoma

Surgery

- Intracranial surgery
- Head and neck surgery

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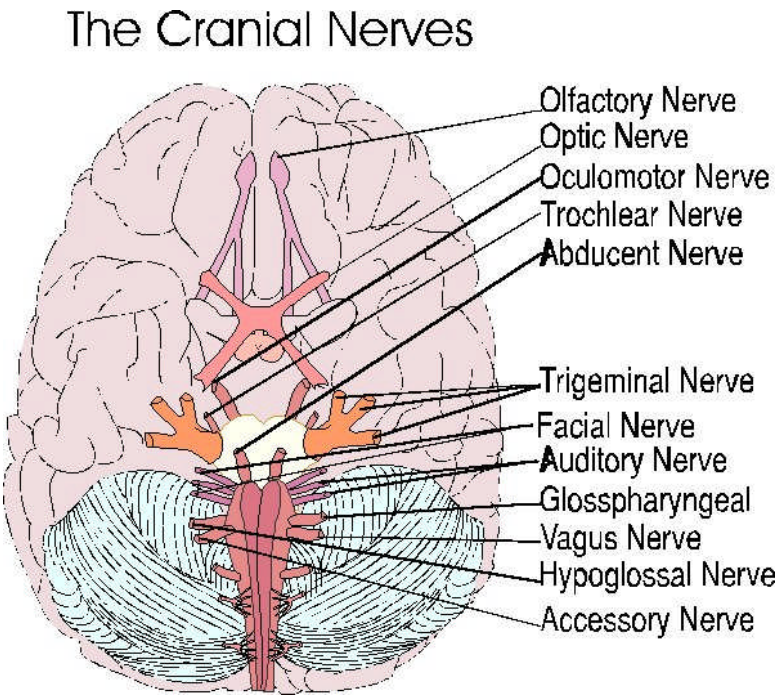
A – 3 Cranial Nerves



Chiro.org
http://www.chiro.org/chimages/diagrams/cranialn.jpg

Cranial Nerves:

CN	Name	Function (s)
I	Olfactory	Sense of smell
II	Optic	Sense of sight
III	Oculomotor	Movement of the eyeball; papillary constriction in bright light or for near vision
IV	Trochler	Movement of the eyeball
V	Trigeminal	Sensation in face, scalp, and teeth; contraction of chewing muscles
VI	Abducens	Movement of the eyeball
VII	Facial	Sense of taste; contraction of facial muscles; secretion of saliva
VIII	Acoustic (Vestibulocochlear)	Sense of hearing; sense of equilibrium
IX	Glossopharyngeal	Sense of taste; sensory for cardiac, respiratory, and blood pressure reflexes; contraction of pharynx; secretion of saliva
X	Vagus	Sensory in cardiac, respiratory, and blood pressure reflexes; sensory and motor to larynx (speaking); decrease in heart rate; contraction of alimentary tube (perstalsis); increase in digestive secretions
XI	Accessory (Spinal Accessory)	Contraction of the neck and shoulder muscles
XII	Hypoglossal	Movement of the tongue

Abbreviation: CN, cranial nerve

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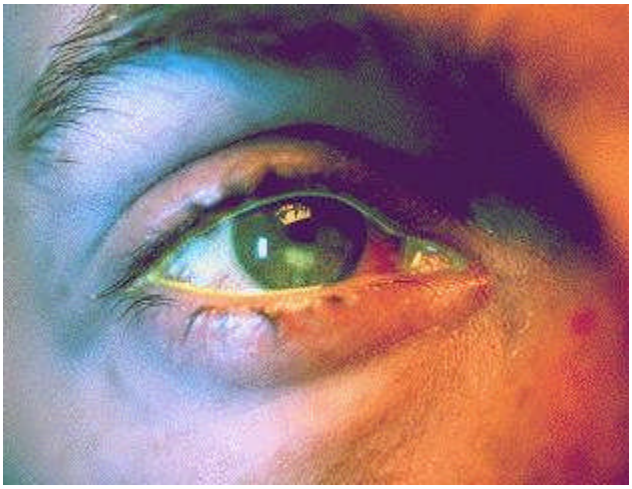
A – 4 Corneal Abrasions

In patients with cranial nerve deficits, corneal abrasions are usually due to an inability to fully close the eyes. Dryness and ulceration can also occur.



The Pathology Guy, scalpel_blade@yahoo.com
www.pathguy.com/ lectures/eye-path.htm

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A – 5 Cranial Nerve VII Palsy

Cranial nerve VII palsy is typically characterized by muscle weakness and facial paralysis.

Encyclopedia of Children's Health
http://www.healthofchildren.com/B/Bell-s-Palsy.html

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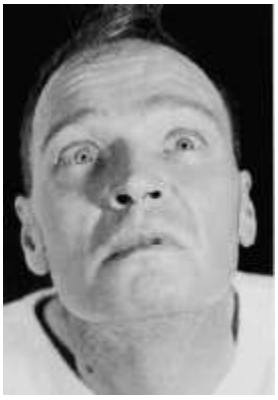
A – 6 Parinaud Syndrome



Parinaud syndrome is a fixed upward gaze that is secondary to a neoplasm in the third ventricle. In this situation the tumor has blocked the afferent and efferent connections of the midbrain structures.
For further information on this syndrome, please visit http://en.wikipedia.org/wiki/Parinaud_syndrome

From the Screening Neurologic Exam
Randall Light, MD
The Texas Brain and Spine Institute
Bryan, Texas

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A – 7 Horner Syndrome

Horner syndrome is characterized by the contraction of the pupil, partial ptosis of the eyelid, enophthalmos (recession of the eyeball into the orbit) and, in some cases, the loss of sweating on one side of the face. This syndrome is associated with paralysis of the cervical sympathetic nerve trunk secondary to a tumor.

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Edited by: Julia Cay Jones, PhD, ELS, Freelance Biomedical Editor, Memphis, TN
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Cure4Kids.org
International Outreach Program
St. Jude Children's Research Hospital
332 N. Lauderdale St.
Memphis, TN 38105-2794