Nelson Syndrome

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Risk

- Incidence: Reported in 8–44% of pts following bilateral adrenalectomy for Cushing disease
- More likely in pts with younger age and pregnancy

Perioperative Risks

- Lyte imbalances
- DI
- Vision loss
- Challenges specific to type of surgery

Worry About

- Panhypopituitarism
- Volume status imbalance
- Steroid supplementation

Overview

- The first case of Nelson syndrome was reported in 1958 by Dr. Del Nelson, who named this condition.
- It is also known as post-adrenalectomy syndrome and occurs as result of bilateral adrenalectomy performed for treatment of Cushing disease.
- It can develop as long as 24 y after a bilateral adrenalectomy, but the mean age of presentation is 15 y after the adrenalectomy.
- Nelson syndrome differs from Cushing disease in that the hypercortisolism cannot occur because of the adrenalectomy, and a pituitary tumor is known to be present.
- The pathophysiology of Nelson syndrome is poorly understood. It possibly occurs due to release of the negative feedback that would otherwise suppress high cortisol levels, in turn leading to restoration of CRH production by the hypothalamus going on to stimulate corticotroph neoplasia.
- The signs and symptoms of Nelson syndrome are due to the effects of raised ACTH (more than 154 pmol/L) and the pressure of the tumor on surrounding structures, inhibiting release of other pituitary hormones, and thereby leading to panhypopituitarism. The symptoms include hyperpigmentation, headache, and visual disturbances. Increased urine output may suggest development of DI.
- ACTH levels are markedly elevated in Nelson syndrome and because of an exaggerated ACTH response to CRH.
- Other tests for hormones to assess panhypopituitarism may be done. Thyroid-function tests, prolactin levels, and IGF-1 IGF-BP3 measurement; measure gonadotropin levels in adolescents showing pubertal arrest and urine osmolality and specific gravity to rule out DI.
- No clear guideline is provided for periop glucocorticoid replacement, although serum cortisol values less than 3.6 µg/dL should be treated with supplementation.

Etiology

- Exact pathogenesis remains unclear.
- After a bilateral adrenalectomy is performed, cortisol levels are no longer normal, and it increases CRH production.
- The loss of partial cortisol inhibition because of the adrenalectomy allows the pituitary tumor to secrete tremendous amounts of ACTH and may promote growth of the adenoma.

Usual Treatment

- Radiotherapy
- Surgical resection of pituitary tumor, transsphenoidal or transcranial
- Pharmacologic agents along with surgery: pasireotide, temozolomide, and octreotide

Assessment Points

System	Effect	Assessment by Hx	PE	Test
HEENT	Eyes	Reduced visual acuity	Ophthalmoscopy	Visual field testing
CV	Hypovolemia, hypotension, and tachycardia		Orthostatic hypotension Volume status and BP	Steroid supplementation
GI	Hyperaldosteronism	Anorexia, N/V		Hypokalemia, hyponatremia, hypovolemia
ENDO	Increased ACTH Decreased LH and FSH Decreased TSH Decreased GH	Increased pigmentation Decreased sexual function and amenorrhea Increasing weight, cold intolerance, depression, constipation, and sleep disturbances Fatigue	Diminishing secondary sexual features Myxedema	FSH, LH levels TSH, free T_3, T_4, IGF-1
CNS	Headache			MRI (brain)
RENAL	Decreased vasopressin	Increased UO	Decreased BP and hypovolemia	Hypernatremia, decreased urine specific gravity

Key References: Barber TM, Adams E, Ansorge O, et al.: Nelson's syndrome. *Eur J Endocrinol* 163(4):495–507, 2010; Mehta M, Rath GP, Singh GP: Anaesthesia for Nelson's syndrome, *Middle East J Anaesthesiol* 20(2):313–314, 2009.

Perioperative Implications

Preoperative Preparation

- Serum lyte correction
- Fluid replacement and volume status management
- Hormonal replacement to treat panhypopituitarism
- Periop steroid supplementation
- DI management, if present

Monitoring

- Invasive arterial catheter
- Frequent ABGs and lytes

Airway

- Avoid succinylcholine and hyperkalemia.

Maintenance

- Maintenance of normocarbia for pituitary surgery
- Management of hemodynamic fluctuations during transsphenoidal surgery
- Titration of anesthetic agents to prepare for early extubation

Extubation

- Before extubation, ensure the pt is fully awake and able to maintain airway reflexes.
- Blood may be present in the stomach despite pharyngeal packing.

Adjuvants

- Esmolol and labetalol during epinephrine use during nasal packing

Anticipated Problems/Concerns

- Unstable hemodynamics
- Possible lyte changes and DI
- The possibility of difficult extubation with bleeding through the nose packing

Neurofibromatosis

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Risk

- NF-1 birth incidence: 1:3000
- NF-2 birth incidence: 1:25,000
- Schwannomatosis incidence: 1:40,000

Perioperative Risks

- Depend on tumor extent and location

Worry About

- Difficult intubation
- Intraop Htn
- Intraop tachycardia

Overview

- NF-1, formerly known as von Recklinghausen disease, is a relatively common, neurologic genetic disorder with variable clinical presentation. It involves multiple organs, such as the skin and peripheral nervous system, which serve as sites for tumors and hamartomas.
- Hallmarks include café-au-lait spots (more than 6 that are >1.5 cm in diameter), Lisch nodules (benign iris hamartomas), axillary and groin freckling, and multiple neurofibromas.
- Laryngeal and tracheal compression may occur secondary to associated tumors.

- Surgery may be indicated for NF-1 pts with tumors (e.g., neurofibromas, pheochromocytoma), tibial pseudarthrosis, scoliosis, and/or vascular abnormalities.
- NF-2, also known as MISME, is a genetic disorder with bilateral vestibular schwannomas, cataracts, hearing loss, and cranial nerve, meningioma, spinal astrocytoma, and ependymoma tumors.

Etiology

- NF-1 and NF-2 are both autosomal dominant; about 50% of cases represent new mutations.
- The gene for NF-1 resides on the long arm of chromosome 17, *17q11.2*.
- The gene for NF-2 resides on chromosome 22.

Usual Treatment

- Radiation and surgical treatment for various tumors involved

Assessment Points

System	Effect	Assessment by Hx	PE	Test
HEENT*	Pharyngeal compression Laryngeal compression Vocal cord and arytenoid involvement Airway obstruction	Dyspnea, dysphonia, stridor, and voice changes	Evaluation of the airway	X-ray CT of neck
CV	Renal vascular Htn Pheochromocytoma Autonomic dysfunction	Headache and perspiration		BP/HR Urinary catecholamines
RESP*	Restrictive lung disease Cor pulmonale Interstitial lung disease Hypoxemia	Exercise tolerance	Cyanosis Clubbing	CXR ECG ABG PFTs (rare)
GI	Carcinoid tumor			
GU*	Obstruction and uremia			
CNS	Mental retardation Seizures Intracranial tumors and increased ICP Paraspinal tumors			MRI of brain and spine for neuraxial technique
MS*	Kyphoscoliosis Macrocephaly Craniofacial dysplasia Cervical dislocation Pectus excavatum			X-ray of the neck

*In severe cases.

Key References: Hirsch NP, Murphy A, Radcliffe JJ: Neurofibromatosis: clinical presentations and anaesthetic implications, *Br J Anaesth* 86(4):555–564, 2001; Fox CJ, Tomajian S, Kaye AJ, et al.: Perioperative management of neurofibromatosis type 1, *Ochsner J* 12(2):111–121, 2012.

Perioperative Implications

Preoperative Preparation

- Evaluation of the airway for laryngeal, pharyngeal, and mediastinal masses in NF-1.
- Increased skeletal abnormalities including scoliosis should be considered in NF-1.
- Frequent end-organ vasculopathies impair or alter end-organ function and reserve in NF-1.
- Controversially, NF-1 may be associated with hypertrophic obstructive cardiomyopathy.

Monitoring

- Routine
- Arterial line monitoring for pheochromocytoma and/or vascular stenoses/aneurysms

Airway

- Consider awake fiberoptic intubation or awake tracheotomy if laryngeal and pharyngeal involvement or known mediastinal mass is present.

Preinduction/Induction

- Consider potential for increased ICP.
- Consider potential of vascular stenoses and/or aneurysms, including risk of ischemic infarct.
- Consider potential of restrictive scoliotic lung disease.

Maintenance

- Maintain cardiovascular stability and optimize ventilation.

Extubation

- Routine considerations

Postoperative Period

- Pain management may be critical and challenging.

Regional Anesthesia

- Asymptomatic paraspinal neurofibromas can make identification and entry into epidural and subarachnoid spaces very difficult. Preemptively carefully examine the back.
- Paraspinal and intracranial tumors are exacerbated during pregnancy.
- Consider potential for epidural hematoma, tumor trauma, and brainstem herniation.
- Recommend MRI of brain and spine for tumor assessment before using a neuraxial technique.

Anticipated Problems/Concerns

- Difficult airway
- Presence of pheochromocytoma or vascular abnormality
- Potential for increased ICP with expanding intracranial tumor
- Difficult epidural or spinal placement; potential for complications due to tumor involvement

Neuroleptic Malignant Syndrome

Lyndsay M. Hoy | Lee A. Fleisher

Risk

- Incidence of 0.01–0.02%
- Mortality rate of 10%
- 2000 cases of NMS diagnosed annually in USA hospitals
- Pharmacologic:
  - Typical/"first generation" antipsychotic
  - Rapid dose titration/switching agents/abrupt medication withdrawal/high cumulative dose
  - IM depot/IV administration
  - Multiple concurrent antipsychotics or antipsychotic with lithium/carbamazepine
- Demographic/miscellaneous:
  - Advanced age
  - Psychiatric/medical comorbidities
  - Anemia
  - Dehydration/malnutrition
  - Pt history of NMS
  - Hot climate/high ambient temperature

Perioperative Risks

- Pulm aspiration
- Cardiovascular lability
- Rhabdomyolysis

Worry About

- Potentially life-threatening if left untreated
- Increased risk of recurrence in pts requiring chronic antipsychotic therapy with Hx of previous NMS