Review
Pituitary Apoplexy

Date: 2020.2.27
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Pituitary apoplexy is a clinical syndrome, characterized by sudden onset of headache, visual impairment and decreased consciousness caused by abrupt hemorrhage and/or infarction of the pituitary gland, generally within a pituitary adenoma.
Hormone Secretion of Pituitary Gland

- TSH
- ACTH
- LH
- FSH
- Prolactin
- GH
- Oxytocin
- ADH

Anterior pituitary gland

Posterior pituitary gland

Hypothalamus
Anatomy of Pituitary Gland

- Optic chiasm
- Pituitary gland
- Internal carotid artery
- VI cranial nerve
- III cranial nerve
- IV cranial nerve
- V1 cranial nerve
- V2 cranial nerve
- Sphenoidal sinus
Pathophysiology of Pituitary Apoplexy

2. Briet C1, Salenave S1, Bonneville JF1, et. Al. Pituitary Apoplexy Endocr Rev. 2015 Dec;36(6):622-45..
**Pathophysiology of Pituitary Apoplexy**

- **Sudden increased intrasellar pressure**
- Increased pressure on adjacent vascular and neural structure
- Neural palsy (CN.III, IV, V, VI)

Pathophysiology of Pituitary Apoplexy

Pathophysiology of Pituitary Apoplexy

Sudden increased intrasellar pressure

Increased pressure on adjacent vascular and neural structure

Pressure transmitted on brain stem/hypothalamus

Optic chiasm compression

Neural palsy (CN.III, IV, V, VI)

Consciousness impairment

Visual Defect

Pathophysiology of Pituitary Apoplexy

Sudden increased intrasellar pressure

Increased pressure on adjacent vascular and neural structure

Pressure transmitted on brain stem/hypothalamus

Optic chiasm compression

Compression of normal pituitary gland

Neural palsy (CN.III, IV, V, VI)

Consciousness impairment

Visual Defect

Hypopituitarism

2. Briet C1, Salenave S1, Bonneville JF1, et. Al. Pituitary Apoplexy Endocr Rev. 2015 Dec;36(6):622-45..
More than 80% have an underlying pituitary adenoma, but it can occur in non-adenomatous lesions, such as sellar tuberculoma, and sellar metastasis, or normal pituitary gland.

- Prevalence is about 6.2 cases/100,000 population
- Incidence is about 0.17 episodes/100,000 person-years
- Most frequent in the fifth or sixth decade
- Male : Female is about 2:1

Precipitating factors have been found in **40%** of cases. The majority of cases occur **spontaneously**.

<table>
<thead>
<tr>
<th>Precipitating Factor</th>
<th>Treatment</th>
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<tr>
<td>Systemic hypertension (26%)</td>
<td>Dopamine agonists</td>
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<td>Anticoagulation therapy (25%)</td>
<td>Radiation therapy</td>
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<tr>
<td>Major surgery, in particular Cardiac surgery (18%)</td>
<td>Dengue haemorrhagic fever</td>
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<td>Pituitary function tests with GnRH, TRH and CRH</td>
<td>Coagulopathies</td>
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<td>Pregnancy and Delivery</td>
<td>Cerebral angiopathy</td>
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<td>Estrogen therapy</td>
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<td>Head trauma</td>
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## Clinical Presentation

<table>
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<tr>
<th>Clinical manifestation</th>
<th>Frequency</th>
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<tr>
<td>Headache</td>
<td>&gt;90%</td>
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<tr>
<td>Nausea and vomiting</td>
<td>43~80%</td>
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<tr>
<td>Visual impairment</td>
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<tr>
<td>Visual fields defects or decreased visual acuity</td>
<td>36~71%</td>
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<tr>
<td>Diplopia</td>
<td>&gt;50%</td>
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<tr>
<td>Altered mental state</td>
<td>13–42%</td>
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<tr>
<td>Hyponatremia</td>
<td></td>
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<tr>
<td>ACTH deficiency</td>
<td>70~76%</td>
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<tr>
<td>Gonadotrophin deficiency</td>
<td>76~79%</td>
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<tr>
<td>Central hypothyroidism</td>
<td>50~57%</td>
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<tr>
<td>Panhypopituitarism</td>
<td>70%</td>
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<tr>
<td><strong>Hypopituitarism</strong></td>
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Nearly half (45.8%) in a retrospective series of 60 patients presented with severe acute thunderclap headache with maximum intensity at onset. Some presented with a gradual onset, unremitting headache of several weeks duration. Few cases throbbing and associated with nausea, phonophobia, and mild photophobia, mimicking migraine.
Diagnostic Evaluation

Who Should be Suspected

- Patients presenting with acute severe headache with or without neuro-ophthalmic signs
- Patients known to have a pituitary tumor
- Patients known to have a pituitary tumor when performing pituitary stimulation tests, anticoagulation therapy or undertaking coronary artery bypass or other major surgery

Role of Computerized Tomography (CT)

- To rule out SAH in patients with severe, sudden onset headache
- It shows an intrasellar mass in 80% of cases, but was diagnostic in only 21–28% of cases
- In non-hemorrhage apoplexy, CT may be non-specific
- CT provides better hemorrhage detection in hyperacute stage (few hours from onset) than MRI.
Image Findings
Non-contrast CT in Hemorrhage of Pituitary Apoplexy

Hyperdense lesion in acute hemorrhage (few hours from onset)
Diagnostic Evaluation

Role of Magnetic Resonance Imaging (MRI)

- Confirm the diagnosis of pituitary apoplexy in over 90% of the patients
- MRI can identify hemorrhagic and necrotic areas and show the relationship between the tumor and neighboring structures
- In the first few hours, hemorrhage can be missed on MRI and is better identified with CT

Diagnostic Evaluation

Image Findings
Normal Pituitary Gland in MRI

Iso-intense

Sagittal T1 Pre-contrast

Dr Mostafa El-Feky and Assoc Prof Frank Gaillard et al. Pituitary MRI. Radiopaedia. 23rd Apr 2012.
Diagnostic Evaluation

Image findings
Normal Pituitary Gland in MRI

Contrast enhanced
Hyper-intense

Sagittal T1
Post-contrast

Dr Mostafa El-Feky and Assoc Prof Frank Gaillard et al. Pituitary MRI. Radiopaedia. 23rd Apr 2012.
Diagnostic Evaluation

Image findings
Normal Pituitary Gland in MRI

Hyper-intense
Coronal T2

Dr Mostafa El-Feky and Assoc Prof Frank Gaillard et al. Pituitary MRI. Radiopaedia. 23rd Apr 2012.
Image Findings
CT and MRI in Hemorrhage Apoplexy

Modified from Dr Mostafa El-Feky and Assoc Prof Frank Gaillard et al. Timeline diagram of MRI and CT characteristics of intracerebral hemorrhage. Radiopaedia.. 19th Sep 2017
From the paper: "Diagnostic Evaluation: Image Findings MRI of Hemorrhage Apoplexy in Acute Stage (12~48 hours)." 

- **Hyper-intense Sagittal T1 Pre-contrast**
- **Hypo-intense Sagittal T1 post-contrast**
- **Hypo-intense Coronal T2**

Pradeep Goyal1, Michael Utz2, Nishant Gupta. Et.al Clinical and imaging features of pituitary apoplexy and role of imaging in differentiation of clinical mimics Vol 8, No 2 March 2018
Image Findings

MRI in Non-hemorrhage Apoplexy

- In acute phase, both hemorrhagic and non-hemorrhagic apoplexy show **high signal** on **diffusion weighted imaging (DWI)**

- After intravenous contrast, the most common finding in both hemorrhagic and non-hemorrhagic apoplexy is **peripheral rim enhancement** in acute phase
Diagnostic Evaluation

Image Findings
MRI in Non-hemorrhage Apoplexy in Hypoacute stage

Iso-intense Sagittal T1 pre-contrast
Rim enhancement Sagittal T1 post-contrast
High signal DWI
Diagnostic Evaluation

Back to Our Case

Modified from Dr. Mostafa El-Feky and Assoc Prof. Frank Gaillard et al. Timeline diagram of MRI and CT characteristics of intracerebral hemorrhage. Radiopaedia.. 19th Sep 2017
Diagnostic Evaluation

Back to Our Case

Heterogenous Hyper-intense

Axial T1 Pre-contrast
Diagnostic Evaluation

Back to Our Case

Hypo-intense

Axial T1 Post-contrast
Diagnostic Evaluation

Back to Our Case

Heterogenous
Hyper-intense

Axial T2
Differential Diagnosis

Pregnancy Hyperplasia

During pregnancy there is progressive enlargement of the pituitary gland. Patient may present with headache with visual field deficits and can have acute hypopituitarism.
Differential Diagnosis

Rathke's Cleft Cyst (RCC)

Epithelial cysts arising from remnants of the Rathke pouch in the pituitary gland. A large sellar RCC may mimic pituitary apoplexy clinically.

Coronal CT
Sellar mass with fluid debris level

Coronal T2
Heterogeneously Hypo-intense
Therapeutic strategies

- Supportive measures to ensure hemodynamic stability
- Empiric corticosteroids replacement
- Conservative treatment
- Surgical intervention
- Best approach is controversial
Empiric Corticosteroids Replacement

Corticotropic deficiency is the most life-threatening complication, potentially causing severe hemodynamic problems.

- **Indication:**
  - Haemodynamic instability, impaired consciousness and visual function

- **Treatment:**
  - Hydrocortisone bolus 100–200 mg followed by 50–100 mg every 6 hours
  - Tapered to maintenance dose of 20–30 mg/day, orally

References:
Management

Conservative Treatment

Some retrospective studies have revealed that in patient with stable visual deficits or improving, a conservative approach is safe, does not result in poor visual or endocrine outcome.

- **Indications**
  - Patients without any neuro-ophthalmic signs or improving
  - Operative high risk

- **Treatment**
  - Glucocorticoids, replacement of hormone deficits
  - Monitoring of visual function, keep fluids and electrolytes balance.

References:
4. Briet C1, Salenave S1, Bonneville JF1, et al. Pituitary Apoplexy Endocr Rev. 2015 Dec;36(6):622-45...
Surgical Intervention

- **Indications**
  - Visual fields and acuity impairment
  - Impaired consciousness
  - Deteriorating neurological signs
  - Conservative treatment failure

- **Timing**
  - Preferably within the first 7 days of onset of symptoms

- **Complications**
  - CSF leakage
  - Damage of normal pituitary

3. Briet C1, Salenave S1, Bonneville JF1, et al. Pituitary Apoplexy Endocr Rev. 2015 Dec;36(6):622-45...
Management

Best approach is still controversial

- Available literature indicates that cases without severe, progressing neuroophthalmic signs can safely be managed conservatively.
- There were selection bias to their retrospective design; the patients in the conservative group had less severe condition than those in the surgical group. Bearing this in mind, the endocrine and visual outcomes are similar in operated and conservatively managed cases.
- A randomized trial is needed for obtaining strong evidence.

3. Briet C1, Salenave S1, Bonneville JF1,et. Al. Pituitary Apoplexy Endocr Rev. 2015 Dec;36(6):622-45...
Management

Suspected pituitary apoplexy

1. Keep hemodynamic stability, fluid electrolyte balance
2. Consider empiric steroid
3. Assessment of pituitary function

Urgent MRI (or CT if unavailable)

Multidisciplinary care (endocrinologist, neurosurgeon, ophthalmologist)

Assess for
- Impairment of consciousness
- Deterioration or visual disturbance

Surgery

No improvement

Conservative treatment closely monitoring

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Impairment of consciousness
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No improvement

Conservative treatment closely monitoring
Outcome

- **Mortality**: 5–15.3%
- **Visual disturbance**
  - Complete or significant improvement in visual disturbance occurs in 57–86%
- **Endocrine**
  - Hypogonadism remains in 55–79%, hypothyroidism in 45–60%, and ACTH deficiency in 60–87%
Pituitary tumor apoplexy is a rare, potentially life-threatening clinical syndrome caused by ischemic infarction or hemorrhage, generally into a pituitary tumor.

The diagnosis should be suspected in all cases with sudden-onset severe headache, with or without neuroophthalmic manifestations.
CT imaging is the most common initial study during the acute onset symptoms

MRI having better sensitivity should always be performed in acute and subacute phase
Patient should be under the care of a multidisciplinary team including endocrinologist, neurosurgeon, and ophthalmologist.

In cases with severe, progressing visual or neurological manifestations, surgical decompression is indicated; Patients with mild, stable clinical picture can be managed conservatively.
Take Home Messages

- The visual and neurological outcomes are favorable in most cases.

- The endocrinological prognosis is less favorable with many patients requiring replacement therapy and long-term follow-up.

- The optimal treatment is debate. Prospective randomized trials are necessary.
Thank you for listening