Basal Ganglia Calcification (BGC)

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Agenda

1. Our Patient’s Clinical History
2. BGC: Generalities
   1. BGC: Differential Diagnosis
3. Anatomy of the Basal Ganglia
4. Radiologic Modalities
   1. SXR
   2. CT
   3. MRI
5. Take Home Points
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Our Patient’s Clinical History

- Female
- 57 years old

- Date of the study:
  - January 9, 2014 14:55h
  - January 11, 2014 08:49h

- The patient presented with history of R sided weakness.
- Our patient has a history of hypothyroidism and hypoparathyroidism.
Our Patient:
Calcifications in basal ganglia - Axial view

C- Axial head CT
Our Patient:
Calcifications in cerebellum - Axial view

Source:
PACS, BIDMC

Calcifications:
Cerebellum

C- Axial head CT
Our Patient:
Calcifications in basal ganglia - Coronal view
Our Patient:
Calcifications in basal ganglia - Sagittal view

C- Sagittal head CT
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BGC: Generalities

• Common: 1% CT

• Incidental & idiopathic finding
  ▫ Elderly people

• Pathological
  ▫ Less than 40 years
BGC: Differential Diagnosis

Causes of BGC

Idiopathic
- Globus pallidus
- Fahr’s disease

Toxic
- CO poisoning
- Lead poisoning
- Mineralizing microangiopathy
- RT & Chemo

Infectious
- TORCH
- TB
- AIDS
- Neurocysticercosis

Metabolic
- Parathyroid diseases
- Birth hypoxia

Inherited
- Mitochondrial diseases (MELAS)
- Cockayne Syndrome

Our Patient
<table>
<thead>
<tr>
<th>Endocrine</th>
<th>Congenital/development</th>
<th>Inflammatory/infectious</th>
<th>Toxic/anoxic</th>
<th>Degenerative/metabolic</th>
<th>Miscellaneous</th>
</tr>
</thead>
</table>

*M.F. Casanova, J.M. Araque / Psychiatry Research 121 (2003) 59–87*
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Anatomy of the Basal Ganglia

Basal Ganglia

- Putamen
- Caudate Nucleus
- Substantia Nigra
- Subthalamic Nucleus
- Globus Pallidus

Striatum
Anatomy Image of the Basal Ganglia

Source: Wikimedia Commons
Companion Patient #1: Head CT

C- Axial head CT

E, Caudate nuclei (C); lentiform nuclei (L); calcified pineal gland (solid white arrow).

There are small, punctate calcifications in the basal ganglia (white circles) and calcification of the pineal gland (solid white arrow).

**Source:**
Herring: Learning Radiology, 2e. 2012.
Companion Patient #3: Head CT

C- Axial head CT

A. Anterior Horn of the Lateral Ventricle
B. Caudate Nucleus
C. Anterior Limb of the Internal Capsule
D. Putamen and Globus Pallidus
E. Posterior Limb of the Internal Capsule
F. Third Ventricle
G. Quadrigeminal Plate Cistern
H. Cerebellar Vermis
I. Occipital Lobe

Source: Website of the University of Virginia, 2013.
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Radiologic Modalities

**SXR**
- Minimal appearance

**CT**
- 5-15 times the sensitivity of SXR
- Preferred to localize and assess the extent of cerebral calcifications

**MRI**
- Versatile to determine extent of tissue damage by different elements (iron, minerals, amount of water).
- The low proton density of calcium usually exhibits areas with low signal in T1 and T2 images, making it difficult to detect calcium in MR images.
- Hyperintense in T1 possible to happen.
Examples

Now we are going to review some examples of the different modalities in which we can identify BGC in different health conditions.
Companion Patient #3: Skull Radiograph - PA Projection

The abnormal calcifications (arrows) were observed in patient with pseudohypoparathyroidism.

Companion Patient #3: Skull Radiograph - Lateral Projection

The abnormal calcifications (arrow) were observed in patient with pseudohyopoparathyroidism.

Companion Patient #3: Pseudohypoparathyroidism - Axial Head CT

C- Axial head CT
Abnormal calcification of basal ganglia (arrows) in patient with pseudohypoparathyroidism.

Source:
Companion Patient #4: Senile BGC - Axial Head CT

Source: Dr Yuranga Weerakkody and Dr Frank Gaillard. Radiopedia.org.

Calcifications:
Basal Ganglia
Pituitary Gland
Coroidal Plexus

C- Axial head CT
Senile Basal Ganglia Calcification
Companion Patient #5:
Schizophrenia - Axial Head CT

Calcifications:
Basal Ganglia

Source:

C- Axial head CT
Basal Ganglia Calcification in patient with Schizophrenia.
Companion Patient #6: Farh’s Disease - Axial Head CT

**C- Axial head CT**


Calcifications:
- Basal Ganglia
- Frontal Lobe
- Temporal lobe
- Cerebellum
Companion Patient #6: Farh’s Disease - Axial Head MRI

Axial head MRI

A. T1 weighted image after gadolinium injection with hyperintense signal
B. FLAIR image with heterogeneous signal
C. T2 weighted gradient echo-image with strongly hypointense signal

Source:
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Take Home Points

• BGC have several causes, there is a big differential diagnosis for this radiological finding.

• If BGC is noted in a patient younger than 40 years, pathological causes should be definitely excluded.

• There are several modalities to assess BGC, but the preferred one is a head CT with no contrast.
References


• Casanova, Manuel; Araque, Julio M. Mineralization of the basal ganglia: implications for neuropsychiatry, pathology and neuroimaging. Psychiatry Research 121(2003)59–87


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