

AMSER Case of the Month: November 2022

14-year-old female presenting with altered mental
status

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Patient Presentation

- **HPI:** Patient presented as a transfer from an outside hospital for 3-4 days of altered mental status. She initially began acting strange after dinner, going to the car and trying to “take her medications”. Patient was seen in ED at an outside hospital and found to have an elevated WBC of 14 and a UTI, discharged with Keflex. Altered mental status continued at home over the next 2 days, where patient was noted to be repeating statements, having full body stiffening, eyes rolling to the back of the head, and drooling. The parents decided to bring patient back to the emergency department for further evaluation.
- **Past Medical/Surgical Hx:** None
- **Medications:** None

Patient Presentation cont.

- **Vitals:** Stable, unremarkable
- **Physical exam findings:** Dry mucous membranes, repeating statements “Is everything ok?”, and “Where am I?” despite stating she was at the hospital minutes prior. Cranial nerves II-XII grossly intact. Otherwise unremarkable.

Pertinent Labs/Findings

- Labs:

- Adenovirus positive, WBC of 20.5, CRP of 0.3
- CMP within normal limits.
- Urine drug screen negative, urinalysis negative
- **CT head w/o contrast** from outside hospital: No acute intracranial findings, some mild symmetric cerebral atrophy for age.
- Neurology recommended **further imaging, EEG**, and possible **lumbar puncture**

What Initial Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

Variant 4:

Persistent or worsening mental status change despite clinical management of the suspected underlying cause (intoxication, medication-related, hypoglycemia, sepsis, etc) or acute change in mental status of unknown cause. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRI head without and with IV contrast	Usually Appropriate	0
MRI head without IV contrast	Usually Appropriate	0
CT head without IV contrast	Usually Appropriate	☼☼☼
CT head without and with IV contrast	May Be Appropriate	☼☼☼
CT head with IV contrast	Usually Not Appropriate	☼☼☼

This imaging modality was ordered by the ER physician

Findings

- **MRI brain w/o contrast** did not show any acute intracranial abnormality.
- **EEG** showed epileptiform discharges in the R temporal region indicating cortical hyperexcitability and an increased risk of focal onset seizures. Concerning for autoimmune encephalitis vs HSV vs other viral/bacterial meningitis.
- **Lumbar puncture** revealed elevated total nucleated count w/ lymphocyte predominance. Normal glucose and protein. Anti-NMDA encephalitis considered. HSV less likely with mostly normal CSF and normal MRI. Must evaluate for **ovarian teratoma** along with other encephalitis labs.

What Additional Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

Variant 1: Clinically suspected adnexal mass, no acute symptoms. Premenopausal. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
US duplex Doppler pelvis	Usually Appropriate	○
US pelvis transvaginal	Usually Appropriate	○
US pelvis transabdominal	Usually Appropriate	○
MRI pelvis without and with IV contrast	May Be Appropriate	○
MRI pelvis without IV contrast	May Be Appropriate	○
CT pelvis with IV contrast	Usually Not Appropriate	☼☼☼
CT pelvis without and with IV contrast	Usually Not Appropriate	☼☼☼☼
CT pelvis without IV contrast	Usually Not Appropriate	☼☼☼
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☼☼☼☼

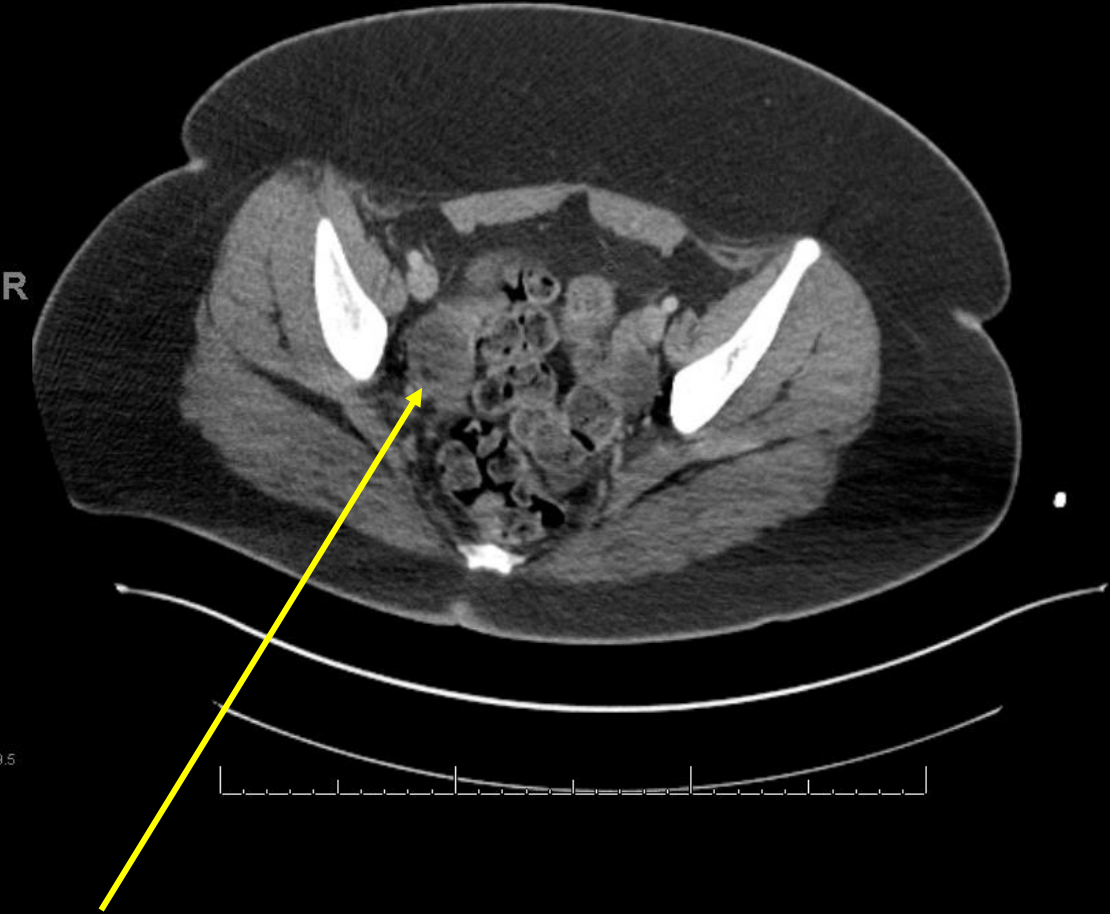
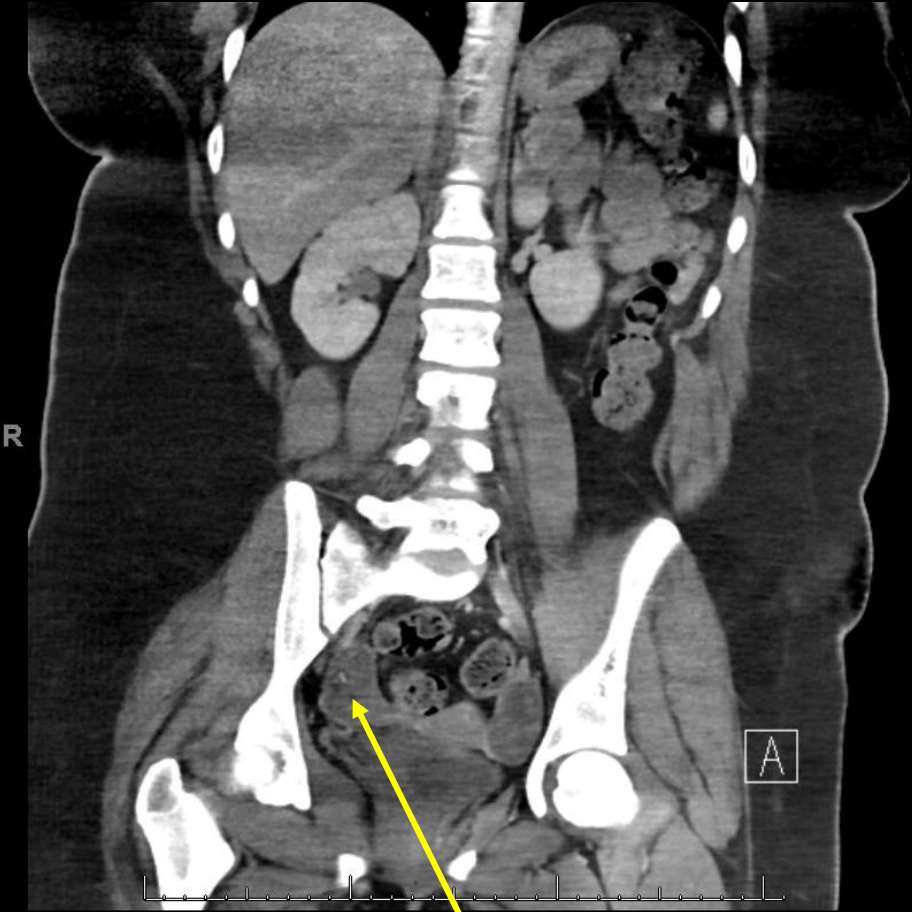
This imaging modality was ordered by the admitting physician

- OBGYN team did not want to use **transvaginal US** as patient was altered, 14 y/o, and not yet sexually active
- **Transabdominal US** would not be effective due to patient's BMI (34).
- Unable to obtain **MRI** due to altered state (unable to lie still).

Findings (unlabeled)

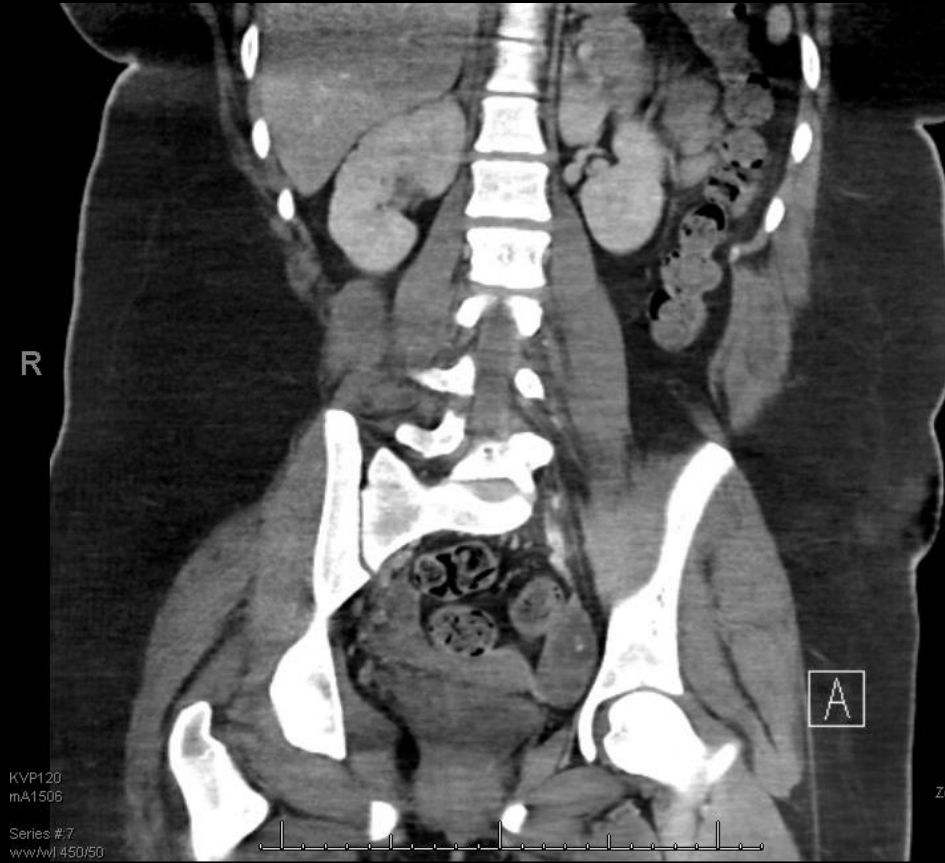


Findings (labeled)

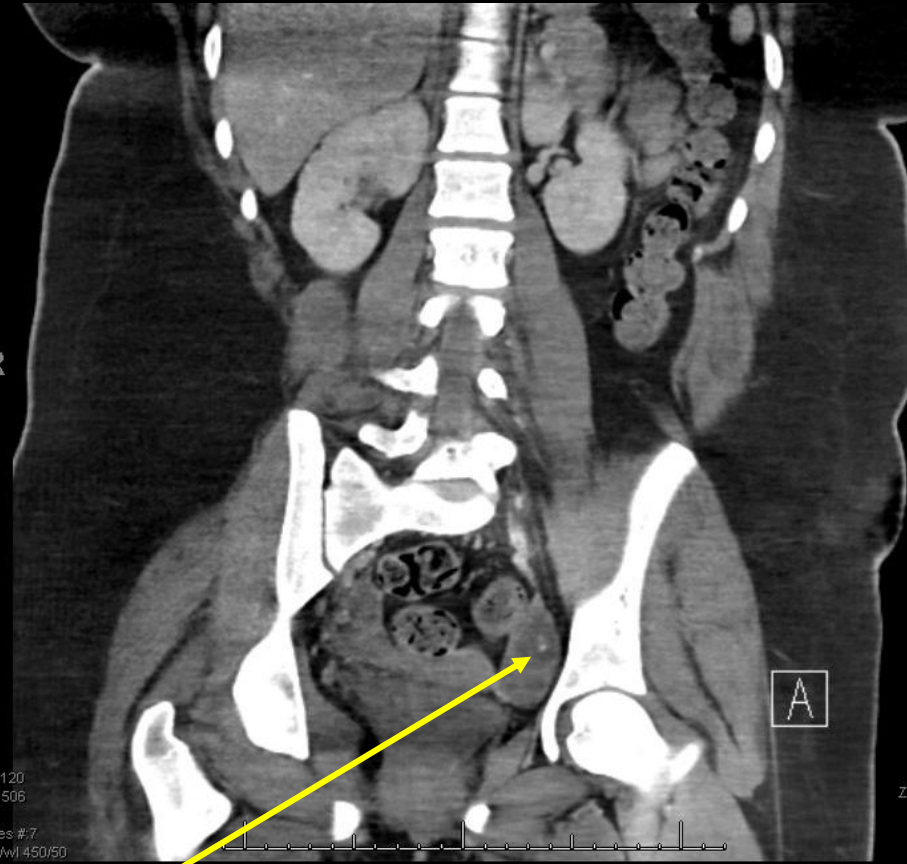


Small fat-containing area within right ovary w/ at least two punctate foci of adjacent hyperattenuation

Findings (unlabeled)



Findings (labeled)



Ovoid area of relative hypoattenuation in L ovary approximately 2.0 x 1.9 x 1.8 cm, which also contains a small amount of central hyperattenuation

Findings/Follow Up

- **Diagnostic laparoscopy** performed by OBGYN revealed 2 cysts in the R ovary and 3 cysts in the left ovary. Cysts were excised for further pathological testing.
- 1 cyst of R ovary consistent with **teratoma** (containing hair), 2 cysts of L ovary consistent with **teratoma** (containing fat and hair). Remaining cysts were simple.
- CSF fluid sent to outside lab returned positive for **NMDA-R antibody** (1:16) and negative for all other encephalitis panels.
- Patient was admitted for observation for ~1 week with significant improvement in symptoms during her stay. A telephone follow up 2 weeks later revealed patient had returned to her normal mental baseline status.

Final Dx:

Anti-NMDA autoimmune encephalitis secondary to
bilateral ovarian teratomas

Case Discussion

- Anti-N-methyl-D-aspartate receptor (anti-NMDAR) encephalitis is an autoimmune and paraneoplastic encephalitis that mainly presents with neuropsychiatric manifestations.
- The NMDA receptor is located in the forebrain and hippocampus and is key in learning and memory processing. In this disease, the NR1 subunit of the receptor is activated by antibodies, resulting in internalization of the receptor and decline of NMDAR synaptic functions, leading to a progressive decline in neurologic and psychiatric functionality (altered mental status, seizures, eventual disability/death).

Case Discussion

- Ovarian teratomas are commonly associated anti-NMDA encephalitis. It is hypothesized that these teratomas may contain neuronal elements that form the nidus for an immune response causing antibody formation against neuronal antigens, including NMDA-receptors.
- The disease mostly affects young adults with a median age of 21 and 80% of cases are linked to women. Most of the tumors are localized to the ovary, though reports have found rare mediastinal teratomas as an additional cause.
- Early excision of the teratoma(s) is associated with improved outcomes

References:

1. ACR Appropriateness Criteria <https://acsearch.acr.org/list>
2. Cellucci T, Van Mater H, Graus F, et al. Clinical approach to the diagnosis of autoimmune encephalitis in the pediatric patient. *Neurol Neuroimmunol Neuroinflamm* 2020;7:e663. doi:10.1212/NXI.0000000000000663
3. Mitra AD, Afify A. Ovarian teratoma associated Anti-N-methyl-D-aspartate receptor encephalitis: a difficult diagnosis with a favorable prognosis. *Autops Case Rep*. 2018;8(2):e2018019. Published 2018 Apr 18. doi:10.4322/acr.2018.019