An 8-year-old girl in septic shock due to necrotizing methicillin-resistant Staphylococcus aureus (MRSA) pneumonia developed signs of end-organ damage, new right hemiplegia, and left gaze preference.

Susceptibility-weighted MRI demonstrated extensive multifocal petechial hemorrhage preferentially at the gray-white matter interface ...............
On Tue, Jan 21, 2014 at 8:20 AM, Nicola Latronico <nicola.latronico@med.unibs.it> wrote:

Dear Mitchel,

I read with interest your recent case report in Neurology. Very interesting!!

Would you classify this case under the large umbrella of "septic encephalopathy". If not -I guess because of the presence of focal neurological signs - how would you define the diagnosis?

Did you perform a brain CT?

Thank you for your time.

Best regards, Nicola

Hello Nicola,

Thank-you for interest. Unfortunately given the brevity of the Neuroimage format we were not able to include the corresponding DWI images and description which showed multifocal areas of diffusion restriction.

A CT was done afterwards which showed several areas of ischemic infarct but interestingly enough the petechiae were not visualized on standard head CT.

We had difficulty classifying a diagnosis because there was a limited amount of literature with this particular finding. The most we could find was in adult patients with bacterial endocarditis with septic emboli. Based on those cases it fits best with a pyogenic arteritis especially given the presence of secondary ischemic infarcts.

Mitchel Williams, MD
Assistant Professor
Department of Pediatrics and Neurology
Children's Hospital of Michigan
ETIOLOGY OF SEPSIS-ASSOCIATED ENCEPHALOPATHY

- Microscopic brain injury
- Blood-brain barrier compromise
- Inflammatory cytokines
- Altered cerebral metabolism
- Altered cerebral microcirculation
- Altered neurotransmission

Gofton TE, Young BG. Sepsis-associated encephalopathy. Nat Rev Neurol 2012; 8: 557-566
Gofton TE, Young BG. Sepsis-associated encephalopathy. *Nat Rev Neurol* 2012; 8: 557-566

Febrile, delirious or comatose patient

Underlying infection?

Yes

CNS infection, endocarditis?

Yes

Appropriate therapy

No

Other conditions (such as neuroleptic malignant syndrome, malignant hyperthermia, thyroid storm, drug fever, hypothalamic or brainstem stroke, heat stroke, cancer, trauma, pancreatitis and seizures).

No

Endocrine disorders, drugs, alcohol withdrawal, NCSE, stroke, CNS vasculitis, renal, or liver failure?

Yes

Appropriate therapy

No

SAE diagnosis

Treat infection

Provide supportive care
A 66-year-old woman with acute chest pain was diagnosed with acute coronary syndrome in the anterior myocardial distribution. In the EP: ventricular fibrillation arrest.

At attempted angioplasty, a dissection of the left anterior descending artery occurred, and cardiogenic shock developed. She underwent emergent coronary artery bypass grafting.
Hospital Course (27 Days)

On day 4, the patient responded only to painful stimuli. An EEG was performed and revealed triphasic waves that were interpreted to be consistent with a poor prognosis. Two brain CTs revealed no focal lesions. A lumbar puncture was normal.

Throughout the course, she never regained consciousness. Continued roving eye movements were noted, and there were intermittent semipurposeful writhing motions, for which wrist restraints and sedation (lorazepam at 1 to 4 mg IV every 1 to 4 h as needed) were prescribed.

Multiple notes in the charting commented on the “doting” nature of the husband, expressing his wife’s seeming visual recognition of him without staff recognition of the same phenomena. “Appropriate” gestures, nods, and feeble hand grasps described by the husband were not witnessed by any ICU staff. The husband had a near-constant presence in the ICU.

Multiple physicians were consulted, including neurology, gastroenterology, infectious diseases, and ENT. Each physician concurred that the patient had anoxic encephalopathy and had a poor prognosis.

A second neurologic opinion was declined after repeated suggestions to withdraw care. On postoperative day 27, the patient was transferred to our institution (Mayo Foundation, Rochester, MN).
COMA?
Consultative neurological summary note:

“Asked to see by Dr. ______ for decreased mental status 28 days after cardiorespiratory failure.

Reviewed history and examined patient.

Anterior MI, bypass following PTCA, ARDS, etc → unresponsive.

Exam:


Impression: Anoxic encephalopathy—at 28 days potential for full cognitive recovery is low—
EEG and MRI should help quantify this.”
The patient was seen by an ICU team: faculty attending, four interns, four supervisory residents, and three critical care fellows. The patient was unresponsive to command, with eyes closed, and with slow writhing-like motions of all four extremities.

No change in status was apparent after two doses of 0.4 mg of naloxone. However, the patient then received flumazenil at 0.2 mg IV for five doses while the team watched.

Between the fourth and fifth doses, she regained responsiveness, opened her mouth, and protruded her tongue to command. The 0.7-mm tracheostomy tube was corked, and the cuff was deflated.

When asked her name, she responded, “Shirley. My name is Shirley Adams”.

"Shirley. My name is Shirley Adams".
Iatrogenic Delirium and Coma*
A “Near Miss”

William E. Dunn, MD, FCCP; Shirley C. Adams; and Robert W. Adams

CHEST 2008; 133:1217–1220

Shirley and Robert Adams, co-authors
An acute brain dysfunction with changes in consciousness and cognition that fluctuates during the day.


It may or may not be accompanied by agitation.

The proportion of CAM-ICU-positive evaluations decreased from 53 to 31% \((p<0.001)\) if assessments from patients at RASS -2/-3 (22 % of all assessments) were excluded. Similarly, the number of positive ICDSC results decreased from 51 to 29% \((p<0.001)\).

Apparent prevalence of delirium is dependent on how a depressed level of consciousness after sedation stop is interpreted (\textit{delirium vs persisting sedation}).

We suggest that any reports on delirium using these assessment tools should be stratified for a sedation score during the assessment.
Rapidly reversible, sedation-related delirium is fundamentally different from persistent delirium (delirium that does not abate after sedative interruption).

Degree of sedation should be considered in delirium assessments.
SEPSIS-ASSOCIATED ENCEPHALOPATHY

- altered EEG
- sub-syndromic delirium
- delirium
- stupor
- coma
- persisting sedation
Williams MT, Jiang H. Diffuse cerebral petechial hemorrhage in an 8-year-old girl with MRSA pneumonia and sepsis. Neurology 2014; 82(3): 282
SEPSIS-ASSOCIATED BRAIN INJURY

Sepsis-associated encephalopathy

meningitis
abscesses
infarction
hemorrhage
CSVT
hydrocephalus
Brain MRI in a 79-year-old woman with *Streptococcus pneumoniae* lung infection complicated by septic shock and acute respiratory distress syndrome. Multiple bright signal areas visible bilaterally at the level of the centrum semiovale indicate leukoencephalopathy.

Using diffusion tensor imaging, an advanced magnetic resonance imaging technique that is highly specific for white matter fibers, the authors demonstrated a greater duration of delirium to be associated with white matter disruption in the genu, splenium, and body of the corpus callosum and in the anterior limb of the internal capsule.

In turn, white matter alterations were associated with worse cognitive scores at 3- and 12-month follow-up.
SEPSIS-ASSOCIATED BRAIN INJURY: NECROSIS AND HEMORRHAGE

THE STORY CONTINUES
After her release from Mayo Clinic, Shirley wanted to come home instead of being sent to a rehabilitation center.

She weighed 100 lb [45 Kg] and was too weak to hold a newspaper.

Over time (approximately 12 months), the milestones were accomplished and she regained her strength and normal weight of 132 lb [60 Kg].

Now we are into senior roller skating once a week, and circuit training three times a week at the local health club.
MOF

NEUROLOGIC COMPLICATIONS

SABI

SAE

CIP & CIM ICUAW
“Ah, Gertrude, Gertrude, le sciagure non vengon mai sole, simili ad avanguardie solitarie, ma ad intere legioni!”

WILLIAM SHEAKSPEARE

Amleto Atto IV scena V, 75-79
IN CONCLUSION

Pluralitas non est ponenda sine necessitate

William of Occam, Franciscan friar (1285-1348)

Among competing hypotheses, favor the simplest one.

The Occam’s razor
Patients can have as many diseases as they damn well please.

John Hickam (1914-70)

Multiple symptoms and signs may be due to more than one disease.

Hickam’s dictum