Hemolytic Uremic Syndrome

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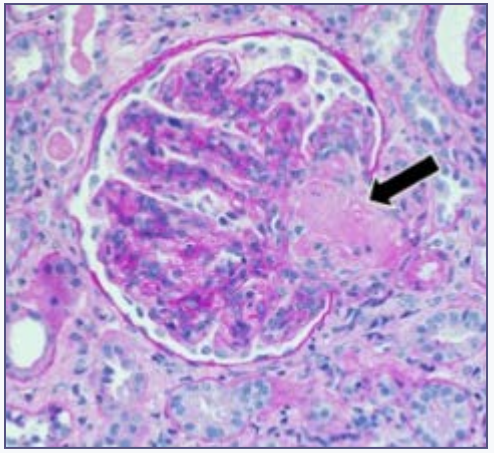
Introduction

- Thrombotic Microangiopathy Classifications often combined diagnoses that are now recognized as distinct elements
- Examples aHUS/TTP
- The term HUS is quite distinct in etiology, clinical course, and treatment from atypical hemolytic uremic syndrome (aHUS)
- This proposal aims to bring the ICD10 coding system up to date with pathological insights into the disease and increasingly available molecular diagnostics.

Hemolytic Uremic Syndrome (HUS)

Hemolytic uremic syndrome is a rare but devastating disorder affecting both children and adults.

- HUS is a thrombotic microangiopathy in which thrombi form in the smallest blood vessels, ie, capillaries and arterioles.
- It is characterized by the presence of:
  - ✓ hemolytic anemia
  - ✓ thrombocytopenia
  - ✓ acute kidney injury



Categories of HUS

There are two broad categories of hemolytic uremic syndrome.

Typical HUS (tHUS)

- Most commonly occurs in children
- Also occurs in infected adults
- Accounts for up to 90% of HUS cases, varying by region

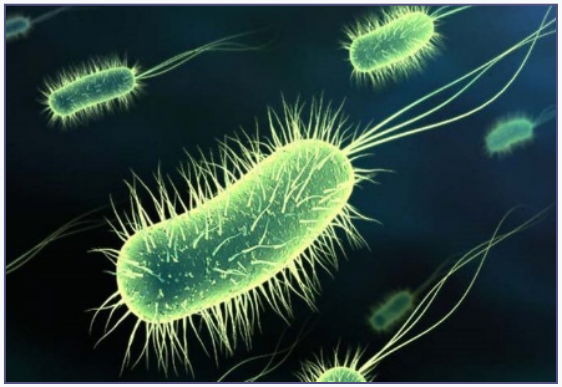
Atypical HUS (aHUS)

- Occurs in both children and adults
- Represents about 10% of HUS cases, depending on etiology

Etiology, treatment, and outcomes differ markedly between typical HUS and atypical HUS.

❶ Etiology and Features

Typical HUS

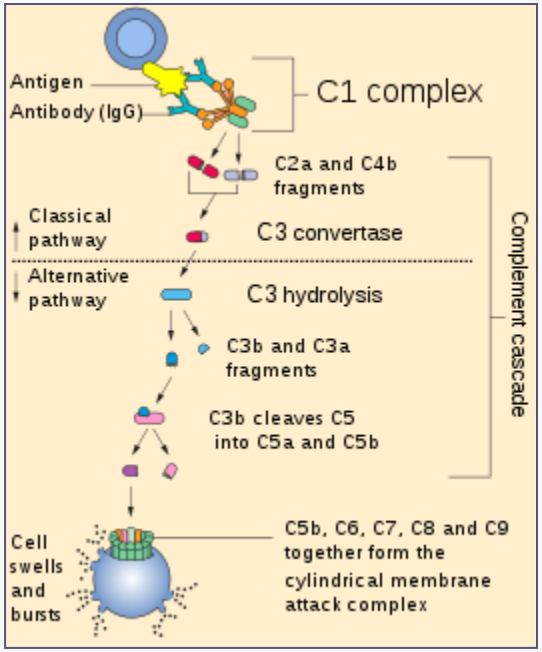


- tHUS is caused by Shiga toxin-producing *E coli* (STEC).
- Most patients have preceding illness with bloody diarrhea caused by STEC.
- About 10-15% with STEC gastroenteritis develop tHUS.
- Ischemia due to the microthrombi causes acute kidney injury in over 70% of tHUS patients.
- Microthombotic ischemia occurs in other organs, including the brain, and is a major cause of mortality.

Etiology and Features

Atypical HUS

- aHUS has multiple etiologies.
- The most common etiology is probably derangements in the complement cascade of the immune system.
- The derangement may be due to gene mutations in proteins that regulate complement or the production of autoantibodies against complement.



- Other causes of aHUS include non-STEC infection, adverse effects of drugs, other genetic disorders, bone marrow transplants, malignancy, and SLE.

❷ Treatment

Typical HUS

Treatment for tHUS consists of supportive care:

- Anemia is treated with blood transfusion as needed.
- Acute kidney injury is treated by maintaining fluid and electrolyte balance and controlling blood pressure, plus dialysis as needed.
- Parenteral nutrition may be given for gastroenteritis or pancreatitis.
- Anticonvulsants are given if seizures develop.

Antibiotics are *not* given for the underlying *E coli* infection, as some studies have suggested this may actually cause harm.

Treatment cont.

Atypical HUS

Treatment for aHUS depends on the particular underlying etiology.

Due to complement derangements caused by gene mutations

- Treatment consists of one of a few available monoclonal antibody complement inhibitors.

Due to autoantibodies directed against complement

- Treatment includes the same monoclonal antibodies.
- Immunosuppression and plasmapheresis are also used as needed.

Due to known risk of meningococcal infection with the medications, vaccines are administered and prophylactic antibiotics are given.

Treatment

Atypical HUS

Due to other causes

- Treatment varies widely depending on the cause.
- It may include treating the underlying condition, eg, SLE, or adjusting the drug causing the adverse effect.

plus

Supportive treatment

- Acute kidney injury is treated by maintaining fluid and electrolyte balance and controlling blood pressure, plus dialysis as needed.

❸ Outcomes

Typical HUS

Following treatment, tHUS resolves and does not recur, although some patients have long-term issues, including CKD.

- About 70% of patients have no major sequelae and require no further treatment or management.
- Most patients recover renal function, although some develop CKD and a small percent develop ERSD.
- ESRD post-tHUS can be treated with kidney transplant as there is almost no risk of tHUS returning.

Outcomes

Atypical HUS

Because underlying genetic abnormalities cannot be corrected or addressed, many patients with aHUS remain at significant risk after resolution of the acute episode.

- Long-term monitoring is needed to manage many aHUS patients.
- Many aHUS patients also require long-term or life-long treatment with monoclonal antibody complement inhibitors to prevent recurrence of aHUS.

Documentation Points

	Typical HUS	Atypical HUS
Abbreviation	tHUS, STEC-HUS	aHUS
Inpatient Treatment	Supportive	Antibody complement inhibitors
Inpatient antibiotics	No	Yes, with meningococcal vaccine
Follow up or continuing care for HUS	No	Yes

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Thank you!