
بسم الله الرحمن الرحيم

Other Organ Affection in HUS

Ihab El Hakim

Professor of Pediatric Nephrology

Ain Shams University

Agenda

- What is meant by “other organ”?
- How prevalent is it?
- Is it new? Any changes?
- Type of affection for each organ
- Variation with the types of HUS
- Conclusion

By other organ affection we mean either manifestations occurring in the acute stage of the disease or residual disease that may be permanent.

Pediatric Nephrology (2019) 34:1337–1348
https://doi.org/10.1007/s00467-018-4039-7

EDUCATIONAL REVIEW

Extra-renal manifestations of atypical hemolytic uremic syndrome

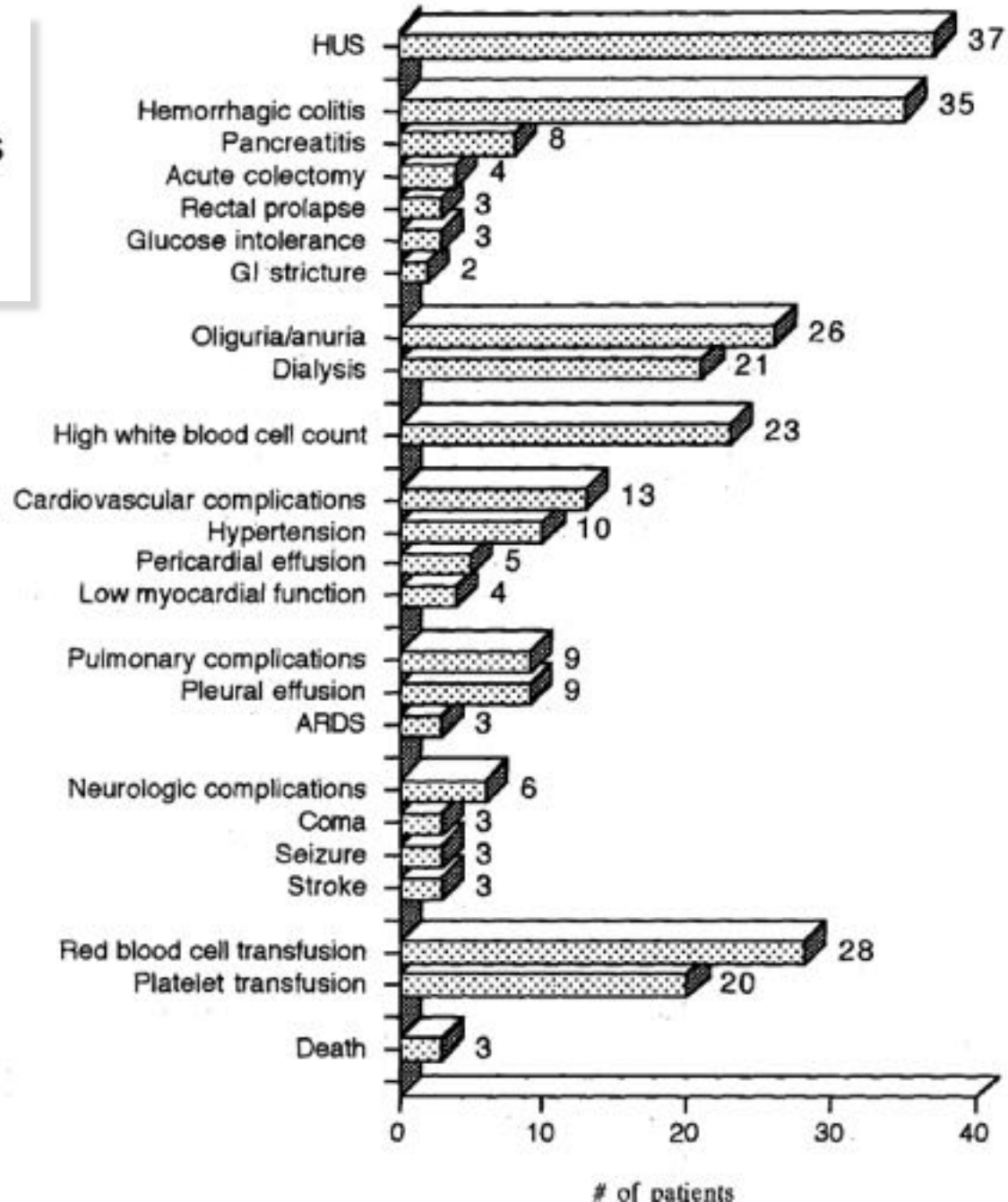
Cassandra Formeck[1] · Agnieszka Swiatecka-Urban[1]

While the kidneys are the primary target in all forms of aHUS, extrarenal involvement is present in 20–50% of patients.

Escherichia coli O157:H7–associated hemolytic-uremic syndrome after ingestion of contaminated hamburgers

J PEDIATR 1994;125:519-26

John R. Brandt, MD, Laurie S. Fouser, MD, Sandra L. Watkins, MD, Israel Zelikovic, MD, Phillip I. Tarr, MD, Valle Nazar-Stewart, PhD, and Ellis D. Avner, MD



Cells 2021, 10, 3580.

Review

Pediatric Atypical Hemolytic Uremic Syndrome Advances

Rupesh Raina [1,2,*], Nina Vijayvargiya [1], Amrit Khooblall [1], Manasa Melachuri [3], Shweta Deshpande [1], Divya Sharma [3], Kashin Mathur [1], Manav Arora [1], Sidharth Kumar Sethi [4] and Sonia Sandhu [5]

Table 3. Clinical manifestations of aHUS based on organ system.

Organ System	Clinical Manifestations	
Renal	Glomerular thrombotic microangiopathy, Arterial TMA, and Cortical necrosis	
Neurological	Seizures, Headache, Altered consciousness, Hemiparesis, Vision loss, Hallucinations, Encephalopathy	Agitation, Confusion, Reduced reflexes, Hemiplegia, Nystagmus, Diplopia, Focal neurologic deficits, Coma
Pulmonary	Pulmonary embolism, Hemorrhage, Edema, Respiratory failure	
Dermatologic	Peripheral gangrene, Ischemia, Cutaneous rashes	
Cardiovascular	Hypertrophic cardiomyopathy, Left ventricular hypertrophy, Elevated CK-MB level, Dilated cardiomyopathy, Valve insufficiency	Tachycardia, Intracardiac thrombus, Steno-occlusive arterial disease in large arterial vessels (i.e., middle and anterior cerebral artery stenosis)
Ocular	Reduced visual acuity, Ocular pain, Visual scotomas, Diplopia, Blurred vision	Optic disc edema, Bilateral flame-shaped intraretinal hemorrhage, Tortuosity, Venous stasis retinopathy
Gastrointestinal	Vomiting, Cholelithiasis, Transaminitis, Pancreatitis,	Hepatitis, Gastrointestinal bleeding, Abdominal pain

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Go to Settings t

THE JOURNAL OF PEDIATRICS • www.jpeds.com 2015 ;166(4):1022-9 ORIGINAL ARTICLES

Postdiarrheal Hemolytic Uremic Syndrome in United States Children: Clinical Spectrum and Predictors of In-Hospital Death

Rajal K. Mody, MD[1], Weidong Gu, PhD[1], Patricia M. Griffin, MD[1], Timothy F. Jones, MD[2], Josh Rounds, MPH[3], Beletshachew Shiferaw, MD[4], Melissa Tobin-D'Angelo, MD[5], Glenda Smith, BS[6], Nancy Spina, MPH[6], Sharon Hurd, MPH[7], Sarah Lathrop, DVM, PhD[8], Amanda Palmer, MPH[9], Effie Boothe, RN[2], Ruth E. Luna-Gierke, MPH[1], and Robert M. Hoekstra, PhD[1]

Table I. Causes of death for 13* patients with specific contributors to death recorded on death certificates other than those included in our D+HUS case definition

Causes	No. of patients	Specific contributions to death (not included in D+HUS case definition)†,‡
Central nervous system	7	Cerebral edema (2 patients), brain death (2 patients), cerebral herniation, cerebral infarct with diffuse edema, intracranial hypertension, unspecified encephalopathy, cerebral vasculitis, neurodevelopmental delay
Gastrointestinal	4	Acute vascular disorders of intestine, vascular insufficiency of intestine, noninfective gastroenteritis and colitis unspecified, bacterial intestinal infection, *E. coli* enterotoxin
Infectious	3	Sepsis (2 patients), septic shock, bacterial infection of unspecified site
Renal	2	Hyperkalemia (2 patients)
Hematologic	2	Hereditary hemolytic anemia, unspecified, coagulopathy
Cardiovascular and respiratory	2	Arrhythmia, pulmonary hemorrhage caused by intrathoracic hemorrhage

Clin Exp Nephrol (2014) 18:525–557
DOI 10.1007/s10157-014-0995-9

GUIDELINE

Guidelines for the management and investigation of hemolytic uremic syndrome

Takashi Igarashi · Shuichi Ito · Mayumi Sako · Akihiko Saitoh · Hiroshi Hataya · Masashi Mizuguchi · Tsuneo Morishima · Kenji Ohnishi · Naohisa Kawamura · Hirotsugu Kitayama · Akira Ashida · Shinya Kaname · Hiromichi Taneichi · Julian Tang · Makoto Ohnishi · Study group for establishing guidelines for the diagnosis and therapy of hemolytic uremic syndrome

STEC causes HUS characterized by thrombotic microangiopathy. Definitive diagnosis of STEC-HUS should be based on the following tests. [Grade of Recommendation: Not Graded]

A. Diagnostic tests

1. Hemolytic anemia (Hb <10 g/dL, positive for schistocytes, Fig. 4)
2. Thrombocytopenia (platelet count $<15 \times 10^4/\mu L$)
3. Acute kidney injury (AKI; serum creatinine 1.5 times that of age- and gender-matched standard values, according to the Japanese Pediatric Nephrology Society; Table 5)

B. Concomitant symptoms

1. Central nervous system (CNS) involvement: conscious disturbance, seizure, headache, and hemorrhagic infarction
2. Gastrointestinal involvement: diarrhea, bloody stool, abdominal pain, intestinal perforation, intestinal stenosis, rectal prolapse and intussusceptions
3. Cardiac involvement: cardiac infarction and cardiac failure due to myocardial injury
4. Pancreatic involvement: pancreatitis
5. Disseminated intravascular coagulation (DIC)

ILLUSTRATED REVIEW

Res Pract Thromb Haemost. 2022;6:e12708.

Thrombotic microangiopathies: An illustrated review

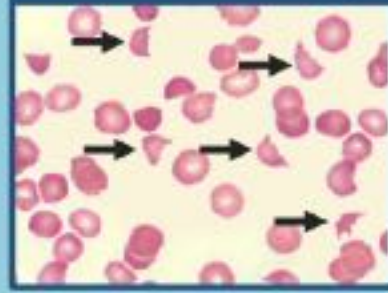
Mouhamed Yazan Abou-Ismail MD[1] | Sargam Kapoor MD[2] | Divyaswathi Citla Sridhar MD[3] | Lalitha Nayak MD[4] | Sanjay Ahuja MD, MSc[5]

Definition & Characteristics

Thrombotic Microangiopathy (TMA)
is an overarching term that encompasses a highly diverse group of disorders with unique pathophysiologies.

- Describes occlusive microvascular or macrovascular disease, often with intraluminal thrombus formation [1,2], characterized by:

Microangiopathic Hemolytic Anemia (MAHA)



Classically characterized by many of the following:

- ↑ Lactate dehydrogenase
- ↑ Indirect bilirubin
- ↓ Haptoglobin
- ↑ Reticulocytes
- Negative direct antiglobulin test

- Microangiopathy: fragmented red blood cells seen on peripheral smear (schistocytes)

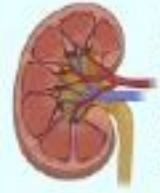
and

Non-Immune Thrombocytopenia

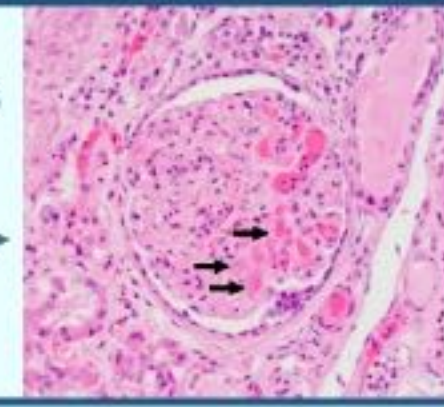
and/or

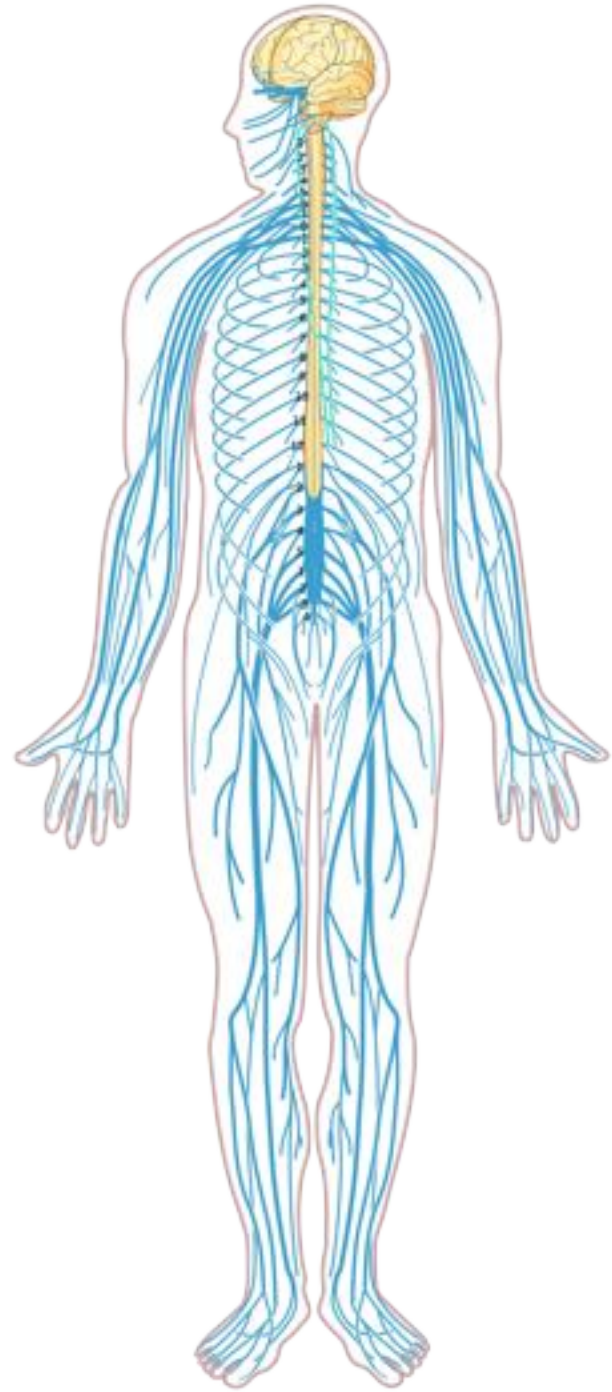
End-Organ Ischemia

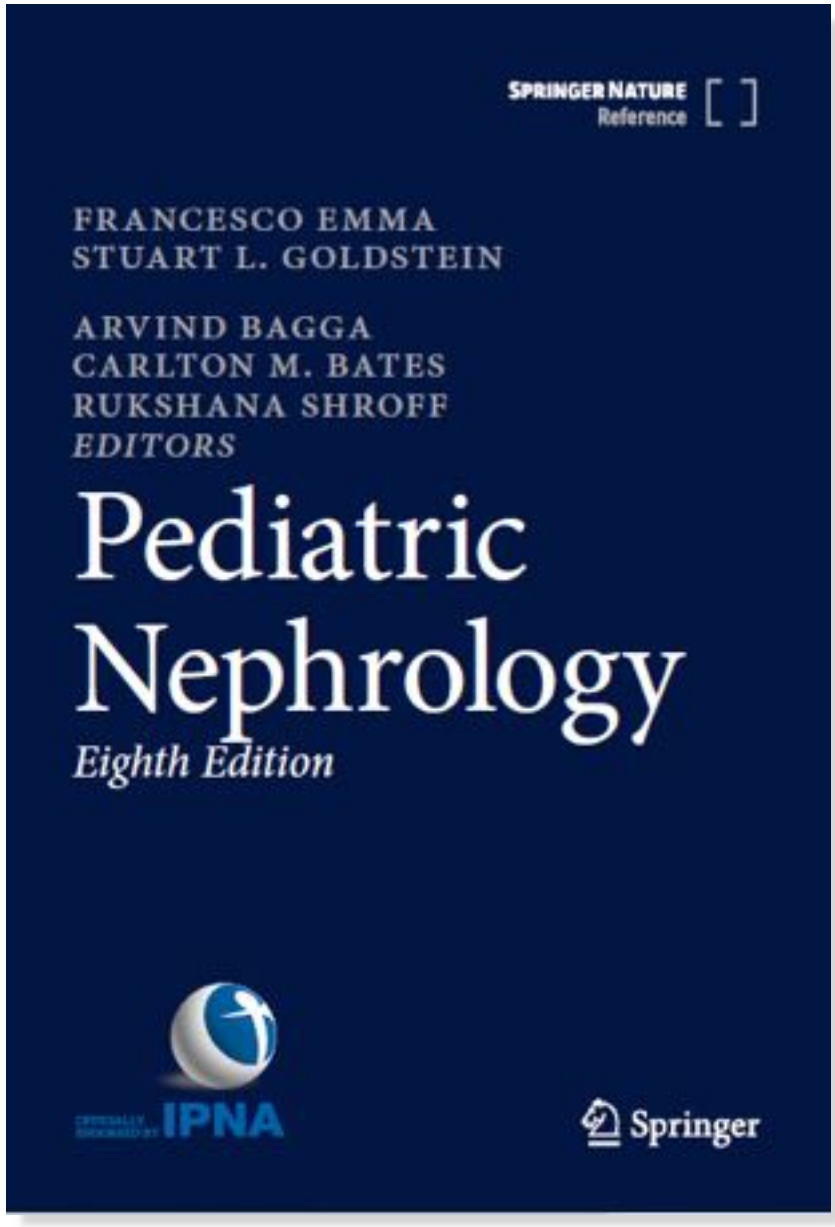
- Varying degrees of organ ischemia/infarction (e.g. brain, heart, kidneys), often associated with high morbidity or mortality



- Focal TMA refers to microvascular thrombosis seen histologicaly, without peripheral MAHA or thrombocytopenia







2022

Involvement of the central nervous system is the most life-threatening complication in HUS, and it occurs in 10–25% of patients with STEC-HUS. The mortality rate, mainly attributed to neurological complications, has been reported to be 1–3%.

Journal of Thrombosis and Thrombolysis (2021) 51:1163–1169
https://doi.org/10.1007/s11239-021-02431-5

Neurological manifestations of thrombotic microangiopathy syndromes in adult patients

Erika L. Weil[1] · Alejandro A. Rabinstein[1]

The presence of accompanying neurological symptoms was previously thought to distinguish between HUS and TTP, which is a common cause of TMA, especially in the adult population.

	TTP (n=42)	HUS (n=16)	aHUS (n=20)
Neurologic symptoms	35 (83.3%)	14 (87.5%)	7 (35%)
Encephalopathy	29 (69%)	11 (68.7%)	1 (5%)
Seizure	6 (14.3%)	8 (50%)	1 (5%)
Motor symptoms	18 (42.9%)	8 (50%)	5 (25%)
Generalized weakness	12 (28.6%)	8 (50%)	5 (25%)
Focal motor deficit	8 (19%)	0	0
Hemiparesis	5 (11.9%)	0	0
Para/quadraparesis	0	1 (6.3%)	0
Paresthesias	5 (11.9%)	0	0
Visual changes	10 (23.8%)	4 (25%)	3 (15%)
Dysarthria	5 (11.9%)	0	0
Aphasia	5 (11.9%)	1 (6.3%)	0

TTP and HUS appear to have similar clinical neurologic manifestations, though focal deficits appear more common in TTP and seizures occur more often in HUS. Neurologic involvement is overall rare in patients with aHUS. Importantly, patients with neurologic involvement in these TMA syndromes appear to have good functional recovery.

Pediatr Nephrol (2004) 19:915–916
DOI 10.1007/s00467-004-1515-z

BRIEF REPORT

Anne Durkan · Shay Menascu · Valerie Langlois

Isolated abducens nerve palsy in hemolytic uremic syndrome

A 20-month-old infant had transient bilateral isolated abducens nerve palsies in association with D+ HUS. Abducens palsies have been reported in two previous papers but always in association with other neurological features.

Case Report RADIOLOGY CASE REPORTS 18 (2023) 2268–2273

Hemolytic uremic syndrome with central nervous system manifestations, a case report and literature review ☆,☆☆

Moustafa A. Mansour, MD, MSc, MPhil[a,b,c,d,], Dyana F. Khalil, MD[e], Mohab A. Hasham, MD[d], Ahmed Youssef, MD[d], Mohamed Rashad, MD[f], Muhammad Awadallah, MD, MSc[f], Hassan Ali, MD, PhD[f,g]*

A 4-year-old girl presented to our emergency department with acute-onset bloody diarrhea, high-grade fever, severe dehydration, and decreased urine output. This was followed by episodes of unresponsiveness, generalized tonic-clonic seizures, and hypotonia.

Involvement of the dorsolateral lentiform nucleus, especially the putamen, is a characteristic feature of HUS with CNS manifestations.

The overall neurologic outcome of this illness is generally favorable in the pediatric age group

Pediatr Nephrol (2013) 28:827–830
DOI 10.1007/s00467-013-2416-9

BRIEF REPORT

Neurologic involvement in atypical hemolytic uremic syndrome and successful treatment with eculizumab

Kaan Gulleroglu · Kibriya Fidan · Veysel S. Hançer · Umut Bayrakci · Esra Baskin · Oguz Soylemezoglu

Two girls aged 11 and 6 years, developed aHUS and were treated immediately with plasma exchange (PE) and FFP infusion (PI). Although initial improvement in renal function was seen in both cases, the first patient showed progressing TMA and neurological manifestations (seizures, vision loss, loss of balance, and confusion) after 1 month. The 2nd patient developed cerebral TMA (seizures, vision loss, and nystagmus) 6 days after initial presentation and remained unresponsive to PE/PI. Neurological symptoms were similar in both patients, even though they had different complement protein mutations. Treatment with eculizumab achieved complete control of neurological, hematological and renal symptoms within 24 h in both children.

Pediatric Nephrology (2019) 34:2495-2507
https://doi.org/10.1007/s00467-018-4105-1

EDUCATIONAL REVIEW

Extrarenal manifestations of the hemolytic uremic syndrome associated with Shiga toxin-producing *Escherichia coli* (STEC HUS)

Myda Khalid[1] · Sharon Andreoli[1]

Pediatric Nephrology (2019) 34:1337–1348
https://doi.org/10.1007/s00467-018-4039-7

EDUCATIONAL REVIEW

Extra-renal manifestations of atypical hemolytic uremic syndrome

Cassandra Formeck[1] · Agnieszka Swiatecka-Urban[1]

The neurological manifestations represent a combined effect of Stx-induced vascular injury, endothelial dysfunction, hypertension, and electrolyte disorders.

Seizures can occur during the acute phase of aHUS, both in the presence and absence of hypertension.

In addition to obvious morbidity, such as stroke, hemiplegia, cortical blindness, and psychomotor retardation at the time of discharge after an acute episode of STEC-HUS, there may be milder, more subtle neuropsychological effects in children after they recover from the illness.

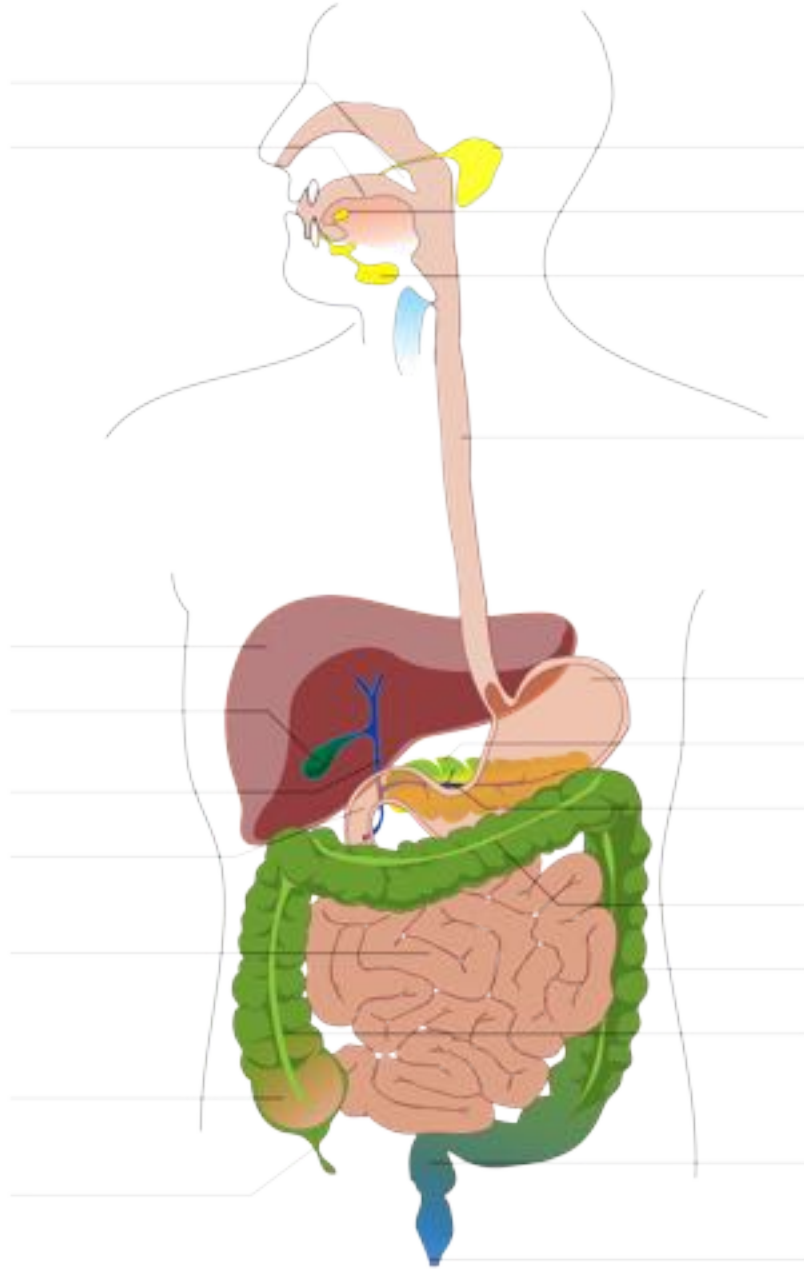
Cells 2021, 10, 3580.

Review

Pediatric Atypical Hemolytic Uremic Syndrome Advances

Rupesh Raina [1,2,*], Nina Vijayvargiya [1], Amrit Khooblall [1], Manasa Melachuri [3], Shweta Deshpande [1], Divya Sharma [3], Kashin Mathur [1], Manav Arora [1], Sidharth Kumar Sethi [4] and Sonia Sandhu [5]

Neurological	Seizures, Headache, Altered consciousness, Hemiparesis, Vision loss, Hallucinations, Encephalopathy	Agitation, Confusion, Reduced reflexes, Hemiplegia, Nystagmus, Diplopia, Focal neurologic deficits, Coma



Pediatr Infect Dis J. 1993 Mar;12(3):257-8.

PAROTITIS IN DIARRHEA-ASSOCIATED HEMOLYTIC UREMIC SYNDROME

W L Robson, A K Leung, M D Lemay, R E Putnins

A 6.5-year-old girl with HUS starts to develop a non-suppurative parotid swelling. Bacterial and viral etiologies were excluded. This is the first reported case of parotitis associated with D+HUS.

Pediatr Nephrol (2005) 20:1496–1499
DOI 10.1007/s00467-005-1996-4

BRIEF REPORT

Kouji Masumoto · Yuko Nishimoto ·
Tomoaki Taguchi · Yasushi Tsutsumi ·
Satomi Kanemitsu · Toshiro Hara · Sachiyo Suita

Colonic stricture secondary to hemolytic uremic syndrome caused by *Escherichia coli* O-157

Table 1 The clinical features of colonic stricture secondary to HUS

No.	Author	Ref	Year	Age at HUS onset	Sex	Site of stricture
1	Peterson et al	[6]	1976	5	M	Descending colon
2	Sawaf et al	[7]	1978	2	M	Descending colon. Four stricture sites observed
3	Bax et al	[8]	1981	7	F	Descending colon. Perforation (+)
4	Kirks	[9]	1982	3	M	Transverse colon
5	Kirks	[9]	1982	ND	ND	ND
6	Grodinsky et al	[5]	1990	ND	ND	ND
7	Grodinsky et al	[5]	1990	ND	ND	ND
8	Crabbe et al	[10]	1990	2	F	Descending colon
9	Crabbe et al	[10]	1990	5	F	Transverse colon
10	Gordon et al	[11]	1994	3	F	Descending colon
11	Gordon et al	[11]	1994	3	F	Transverse colon
12	Gordon et al	[11]	1994	11	F	Sigmoid colon
13	Tapper et al	[4]	1995	ND	ND	Sigmoid colon
14	Babaian et al	[12]	1997	32	F	Sigmoid colon
15	Sebbag et al	[13]	1999	1	F	Transverse colon
16	Our case	-	2004	5	F	Sigmoid colon

Pediatr Nephrol (1998) 12: 222–225
© IPNA 1998

Pediatric Nephrology

Original article

Cholelithiasis following *Escherichia coli* O157:H7-associated hemolytic uremic syndrome

John R. Brandt[1], Mark W. Joseph[1], Laurie S. Fouser[1], Phillip I. Tarr[2], Israel Zelikovic[1], Ruth A. McDonald[1], Ellis D. Avner[1], Nancy G. McAfee[1], and Sandra L. Watkins[1]

Pediatr Nephrol (2012) 27:229–233
DOI 10.1007/s00467-011-1973-z

ORIGINAL ARTICLE

Hemorrhagic colitis in postdiarrheal hemolytic uremic syndrome: retrospective analysis of 54 children

Ricardo C. Rahman · Carlos J. Cobeñas · Ricardo Drut · Oscar R. Amoreo · Javier D. Ruscasso · Ana P. Spizzirri · Angela del C. Suarez · Javier H. Zalba · Celia Ferrari · Marcela C. Gatti

Table 2 Distribution of bowel lesions in children with hemorrhagic colitis

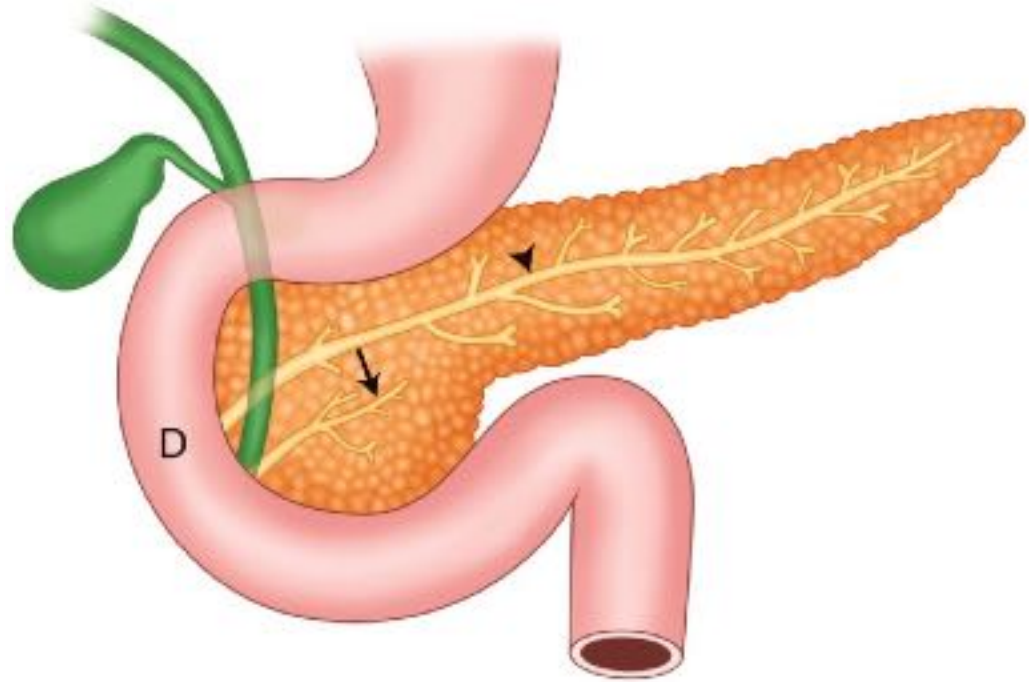
Affected site	Patients (*n* 42)
Transverse colon	24 (57.1%)
Ascending colon	21 (50%)
Descending colon	17 (40.4%)
Distal ileum	11 (26.1%)
Sigmoid	8 (19%)
Rectum	1 (2.3%)

Gastrointestinal Complications of Post-Diarrheal Hemolytic Uremic Syndrome

Eur J Pediatr Surg 2007; 17: 328–334

A. S. de Buys Roessingh[1,3], P. de Lagausie[1], V. Baudoin[2], C. Loirat[2], Y. Aigrain[1]

Case	Age (years)	Complications
1	5	Colonic necrosis
2	1.5	Rectal prolapse
3	3.7	Pancreatitis
4	4.3	Pancreatitis
5	7.4	Pancreatitis
6	1	Transient diabetes
7	3.4	Hepatic cytolysis
8	3.2	Hepatic cytolysis
9	1	Hepatic cytolysis
10	5	Pancreatitis Hepatic cytolysis Necrosis of ileum
11	4	Pancreatitis Cholestasis Necrosis of pancreas
12	3.6	Pancreatitis Hepatic cytolysis
13	9	Pancreatitis Hepatomegaly Vesicular sludge
14	10.8	Pancreatitis Hepatic cytolysis
15	4.3	Peritonitis
16	2	Enterocolitis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Pancreatic islet cell necrosis: Association with hemolytic-uremic syndrome

Jane C. Burns, M.D., Edward R. Berman, M.D., Jon L. Fagre, M.D., Robert H. Shikes, M.D., and Gary M. Lum, M.D., *Denver, Colo.*

A 3-year-old girl had HUS and persistent hyperglycemia. Autopsy revealed islet cell necrosis.

Development of insulin-dependent diabetes mellitus during the hemolytic-uremic syndrome

Three children developed hyperglycemia and ketoacidosis three, eight, and 60 days after the onset of hemolytic-uremic syndrome. During hyperglycemia, the two patients studied had dramatically low insulin concentrations. Circulating islet-cell and insulin antibodies were not detected. These studies suggest that pancreatic beta cell dysfunction may occur during hemolytic-uremic syndrome, and that the serum glucose concentration should be closely monitored during this disease.

Sharon P. Andreoli, M.D., and Jerry M. Bergstein, M.D.,* *Indianapolis, Ind.*

Exocrine and endocrine pancreatic insufficiency and calcinosis after hemolytic uremic syndrome

S Andreoli, J Bergstein

J Pediatr. 1987 May;110(5):816-7

15-year-old girl had end-stage renal disease, IDDM, and a chronic seizure disorder as a result of HUS.

1st Tx at age 10 years → acute graft rejection treated → chronic rejection → the graft was removed at age 12 years → CAPD.

2nd Tx at age 13 years → removed 6 months later because of chronic rejection.

3rd Tx age 15 years→ removed after 12 hours because of hyperacute rejection.

Children who demonstrate pancreatic involvement during the acute phase of HUS should be monitored for the development of exocrine insufficiency so that pancreatic enzyme replacement therapy can be initiated when indicated.

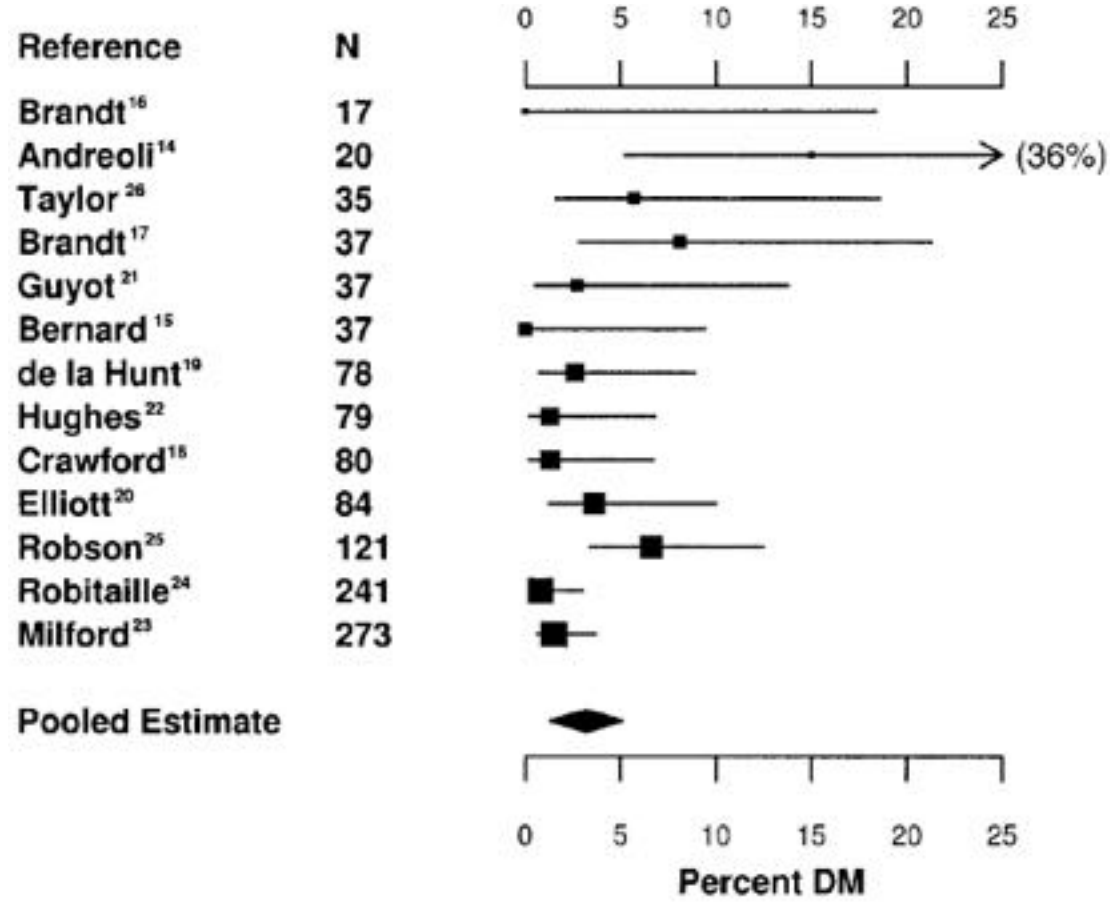
Diabetes During Diarrhea-Associated Hemolytic Uremic Syndrome

A systematic review and meta-analysis

Diabetes Care **28:2556–2562, 2005**

RITA S. SURI, MD1; WILLIAM F. CLARK MD1; NICK BARROWMAN, PHD2; JEFFREY L. MAHON, MD, MSC3,4; HEATHER R. THIESSEN-PHILBROOK, MMATH1; M. PATRICIA ROSAS-ARELLANO, MD, PHD1; KELLY ZARNKE, MD, MSC3,5; JOCELYN S. GARLAND, MD6; AMIT X. GARG, MD, MA, PHD1,3.

CONCLUSIONS— Based on the available evidence, the incidence of diabetes (hyperglycemia requiring insulin) during acute DHUS in children 16 years of age ranged from 0-15%, with pooled incidence estimated at 3.2% (95% CI 1.3–5.1). This is in contrast to the reported general population incidence of childhood type 1 diabetes of 0.013–0.040% .



Taner et al.
Egyptian Pediatric Association Gazette (2022) 70:43
https://doi.org/10.1186/s43054-022-00140-z

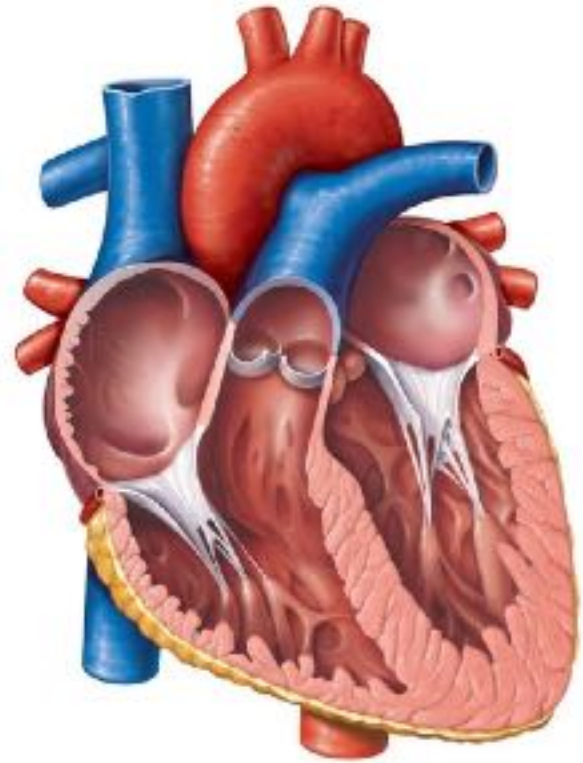
Egyptian Pediatric Association Gazette

CASE REPORT Open Access

Acute pancreatitis complicated by hemolytic uremic syndrome: a pediatric case

Sevgin Taner[1*], Işıl Ezel Taşkın Karaçay[2] and İlknur Arslan[3]

A 17-year-old girl presented to the emergency department with complaints of abdominal pain, fever, and vomiting. Abdominal CT revealed multiple stones in the hydropic gallbladder lumen and the pancreas was edematous. Acute kidney failure, cholestasis, anemia, and thrombocytopenia developed at the 2nd day of follow-up.



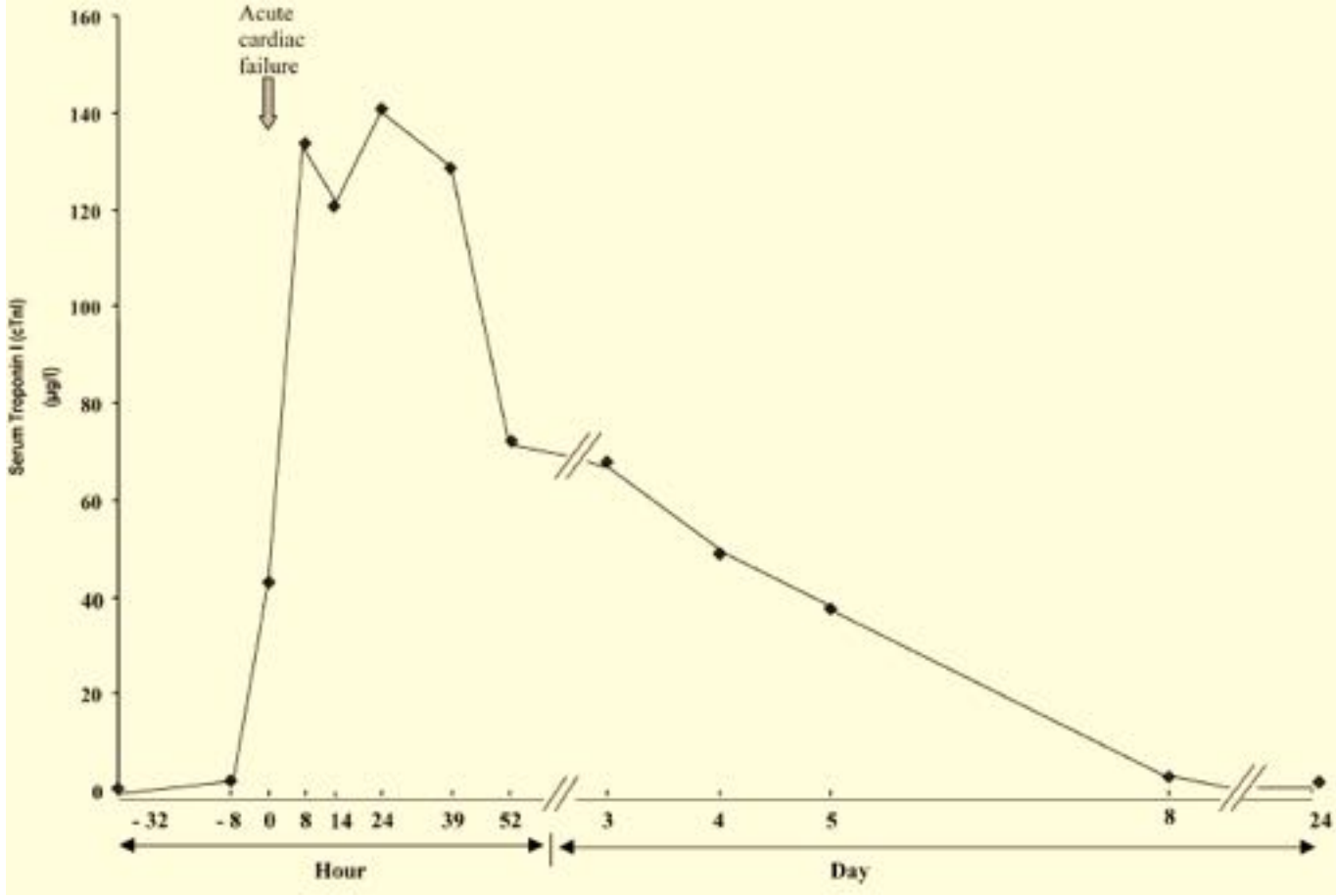
Pediatr Nephrol (2004) 19:345–348
DOI 10.1007/s00467-003-1343-6

BRIEF REPORT

Varvara Askiti · Kristine Hendrickson ·
Alfred J. Fish · Elizabeth Braunlin · Alan R. Sinaiko

Troponin I levels in a hemolytic uremic syndrome patient with severe cardiac failure

A previously healthy, 22-month-old girl presented with typical HUS and stool cultures positive for Escherichia coli O157:H7. She required dialysis, blood and platelet transfusions, and insulin for HUS-related diabetes mellitus. On the 6th hospital day she had sudden circulatory collapse with a blood pressure of 70/40 mmHg and an oxygen saturation of 88%. She responded rapidly to emergency resuscitation but had diminished left ventricular function (ejection fraction 18%).



It should not be concluded from this report that cTnI measurements are warranted in most HUS patients. However, measurements obtained in particularly severe cases of HUS with multiorgan involvement may be useful in providing a warning of impending cardiac injury.

Nephrol Dial Transplant (2010) 25: 2028–2032
doi: 10.1093/ndt/gfq160
Advance Access publication 19 March 2010

Myocardial infarction is a complication of factor H-associated atypical HUS

Marion Sallée[1], Laurent Daniel[2], Marie-Dominique Piercecchi[3], Dominique Jaubert[1], Veronique Fremeaux-Bacchi[4], Yvon Berland[1] and Stephane Burtey[1]

This is the first report (43-year-old woman that ended fatally), to our knowledge, of a case of cardiac injury in aHUS due to genetic mutation in factor H gene with a poor outcome.

OPINION

Cardiovascular complications in atypical haemolytic uraemic syndrome

Marina Noris and Giuseppe Remuzzi Nat. Rev. Nephrol. 10, 174–180 (2014)

Acute and chronic CV events have been reported in 3–10% of patients with adult-onset or pediatric-onset complement-related aHUS. Patients with CFH mutations, anti-CFH antibodies, gain of function C3 or CFB mutations are particularly susceptible to CV disorders.

Pediatr Nephrol (2014) 29:1103–1106
DOI 10.1007/s00467-013-2709-z

BRIEF REPORT

Eculizumab in atypical haemolytic uraemic syndrome with severe cardiac and neurological involvement

Hushi Hu · Arvind Nagra · Mushfequr R. Haq · Rodney D. Gilbert

In summary, we report the early use of eculizumab as effective first-line therapy in pediatric aHUS (19-month-old girl) complicated by severe extrarenal involvement, with reversibility in cardiac (dilated cardiomyopathy), neurological and renal dysfunction.

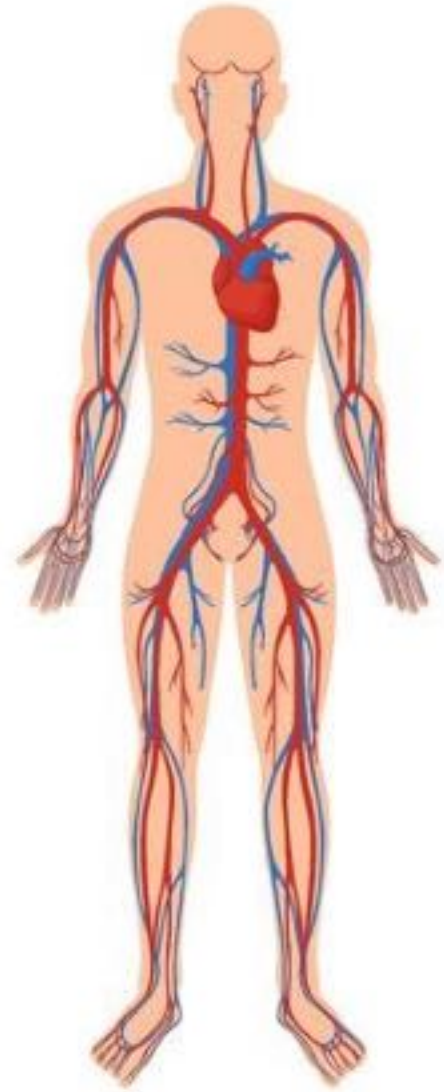
ORIGINAL ARTICLE

Eur J Pediatr. 2016 Dec;175(12):1927-1931

Direct cardiac involvement in childhood hemolytic-uremic syndrome: case report and review of the literature

Davide Rigamonti[1] · Giacomo D. Simonetti[1,2]

4.5-year-old Swiss son had D+HUS but shiga toxin negative. Approximately 6 h after diagnosis, signs of severe hemodynamic compromise suddenly developed. An echocardiogram ruled out an effusion and disclosed a very severely impaired ventricular function. the child died approximately 90 min later.



Nephrol Dial Transplant (2010) 25: 3421–3425
doi: 10.1093/ndt/gfq319
Advance Access publication 8 June 2010

Preliminary Communications

NDT
Nephrology Dialysis Transplantation

Non-atheromatous arterial stenoses in atypical haemolytic uraemic syndrome associated with complement dysregulation

Chantal Loirat[1], Marie-Alice Macher[1], Monique Elmaleh-Berges[2], Theresa Kwon[1], Georges Deschênes[1], Timothy H.J. Goodship[3], Charles Majoie[4], Jean-Claude Davin[5], Raphael Blanc[6], Julien Savatovsky[7], Jacques Moret[6] and Véronique Fremeaux-Bacchi[8]

Pediatr Nephrol (2011) 26:155–157
DOI 10.1007/s00467-010-1608-9

LETTER TO THE EDITORS

Prevention of large-vessel stenoses in atypical hemolytic uremic syndrome associated with complement dysregulation

Jean-Claude Davin · Charles Majoie · Jaap Groothoff · Valentina Gracchi · Antonia Bouts · Timothy H. J. Goodship · Chantal Loirat

Pediatr Nephrol (2014) 29:1273–1277
DOI 10.1007/s00467-013-2713-3

BRIEF REPORT

Macrovascular involvement in a child with atypical hemolytic uremic syndrome

Karolis Ažukaitis · Chantal Loirat · Michal Malina · Irina Adomaitienė · Augustina Jankauskienė

Nephrol Dial Transplant (2013) 28: 2899–2907
doi: 10.1093/ndt/gft340
Advance Access publication 5 September 2013

Eculizumab in an anephric patient with atypical haemolytic uraemic syndrome and advanced vascular lesions

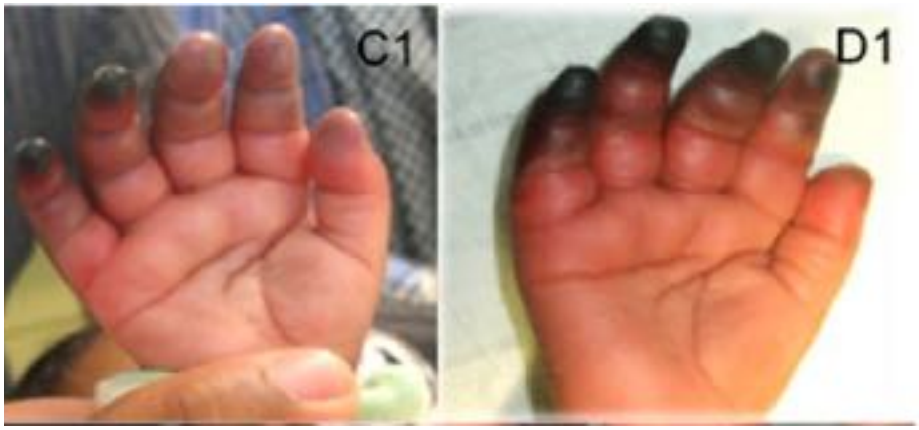
Zivile D. Békássy[1], Ann-Charlotte Kristoffersson[1], Mats Cronqvist[2], Lubka T. Roumenina[3,4,5], Tania Rybkine[3,4,5], Laura Vergoz[3,5], Christophe Hue[3,4,5], Veronique Fremeaux-Bacchi[3,6] and Diana Karpman[1]

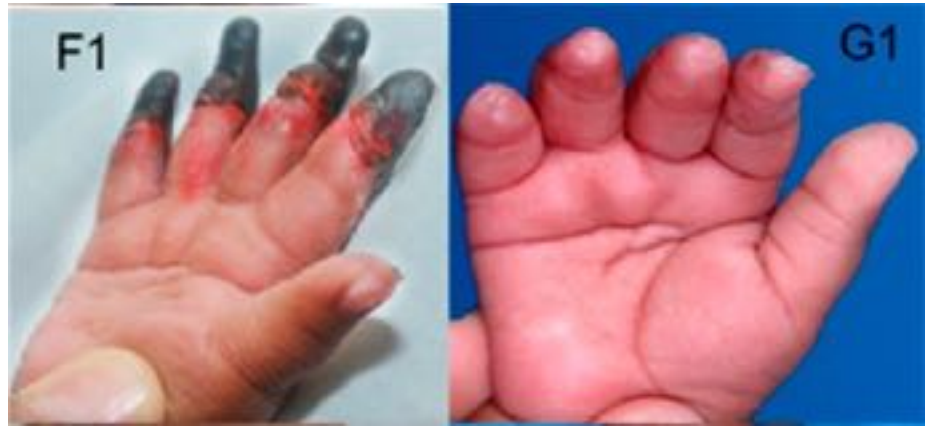
Those 4 cases from France, Netherlands, Lithuania and Sweden suggest that aHUS with complement dysregulation, a disease of microvascularization, may also involve large arteries, especially when patients have to face long periods of dialysis when plasma therapy is not used.

PEDIATRICS Volume 131, Number 1, January 2013 CASE REPORT

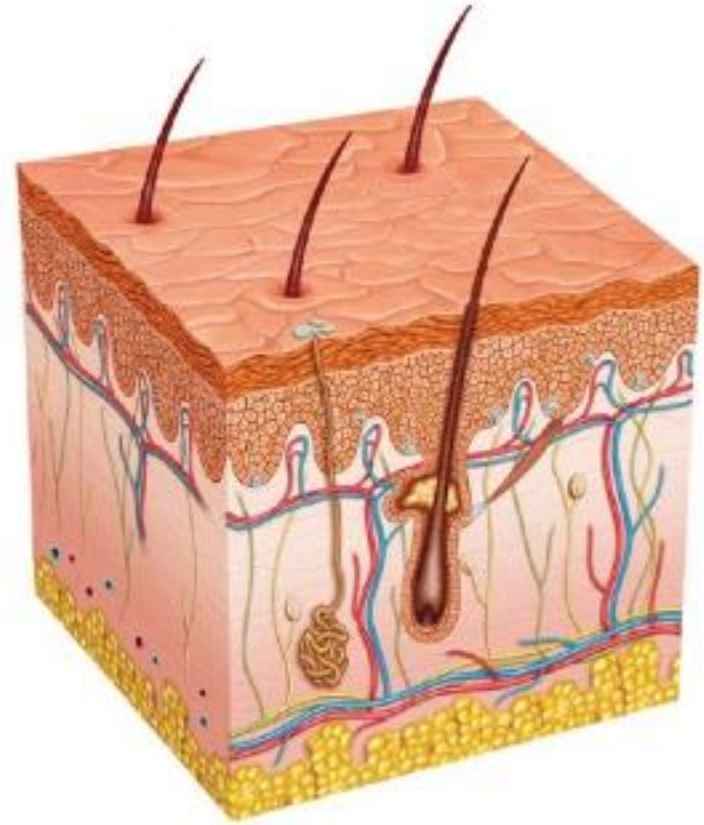
Peripheral Gangrene in Children With Atypical Hemolytic Uremic Syndrome

Michal Malina, MD,a,b Ashima Gulati, MD,c Arvind Bagga, MD,c Mohammad A. Majid, MD,d Eva Simkova, MD,d and Franz Schaefer, MDa





aHUS can include thrombotic macroangiopathy of small peripheral arteries. Eculizumab appears effective in preserving tissue viability if administered before gangrene occurs and should be considered first-line rescue therapy in such cases.



Clin Kidney J (2013) 6: 655–656
doi: 10.1093/ckj/sft114
Advance Access publication 26 September 2013

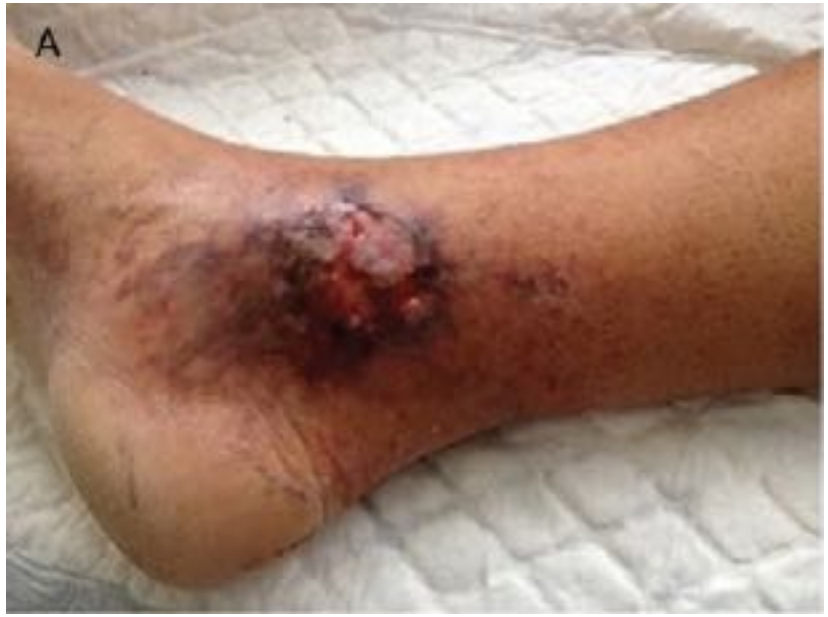
Images in Nephrology
(Section Editor: G. H. Neild)

CKJ

Cutaneous involvement in haemolytic uraemic syndrome

Clara Santos[1], Daniela Lopes[1], Ana Gomes[1], Ana Ventura[1], David Tente[2] and Joaquim Seabra[1]

A 35-year-old woman with aHUS complained of three painful leg skin lesions which progressed to ulcers, with some necrotic areas of the base and edges. Skin biopsy showed fibrin thrombi in the small blood vessels, with discrete inflammatory infiltrate of lymphocytes and plasma cells.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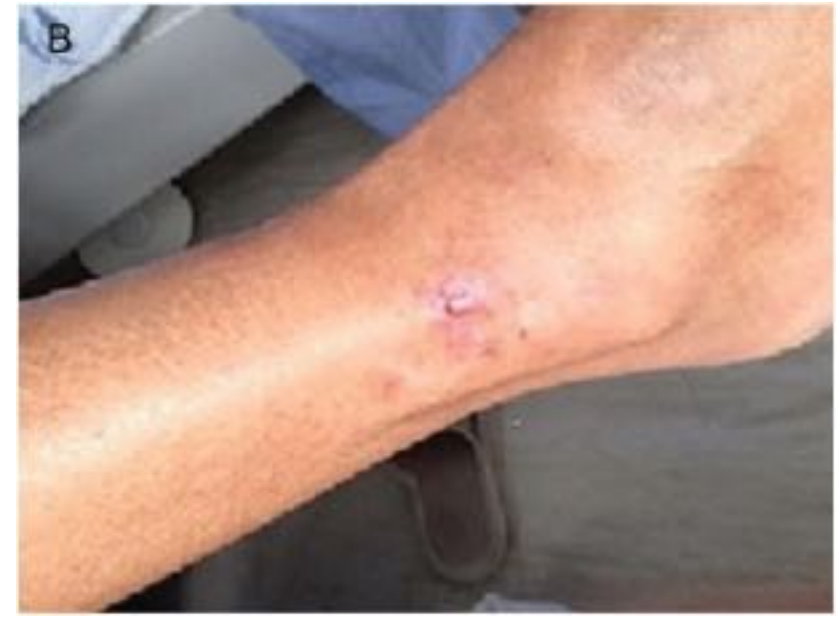
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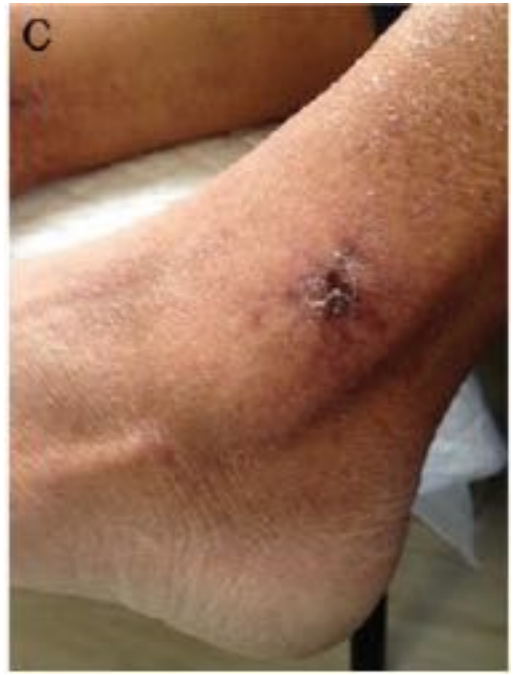
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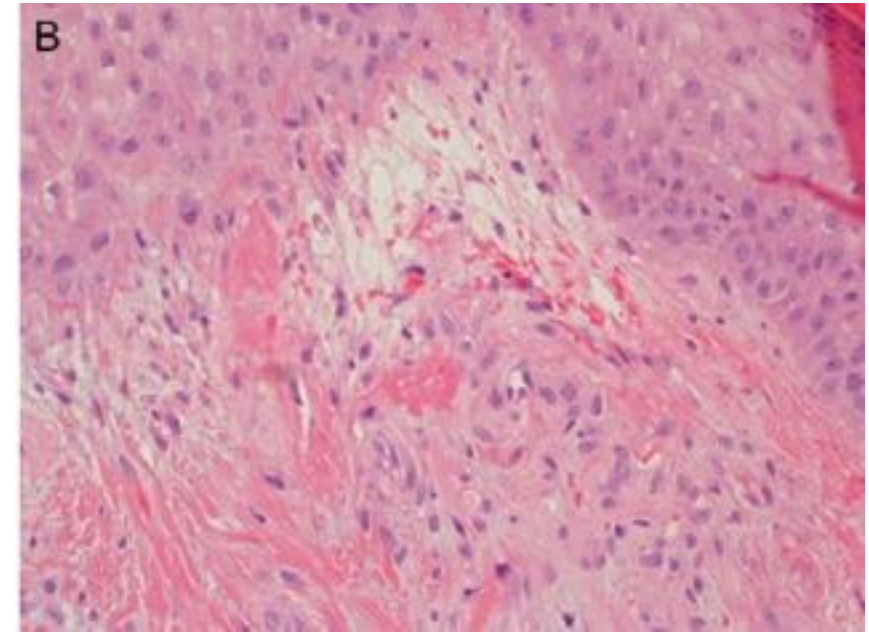
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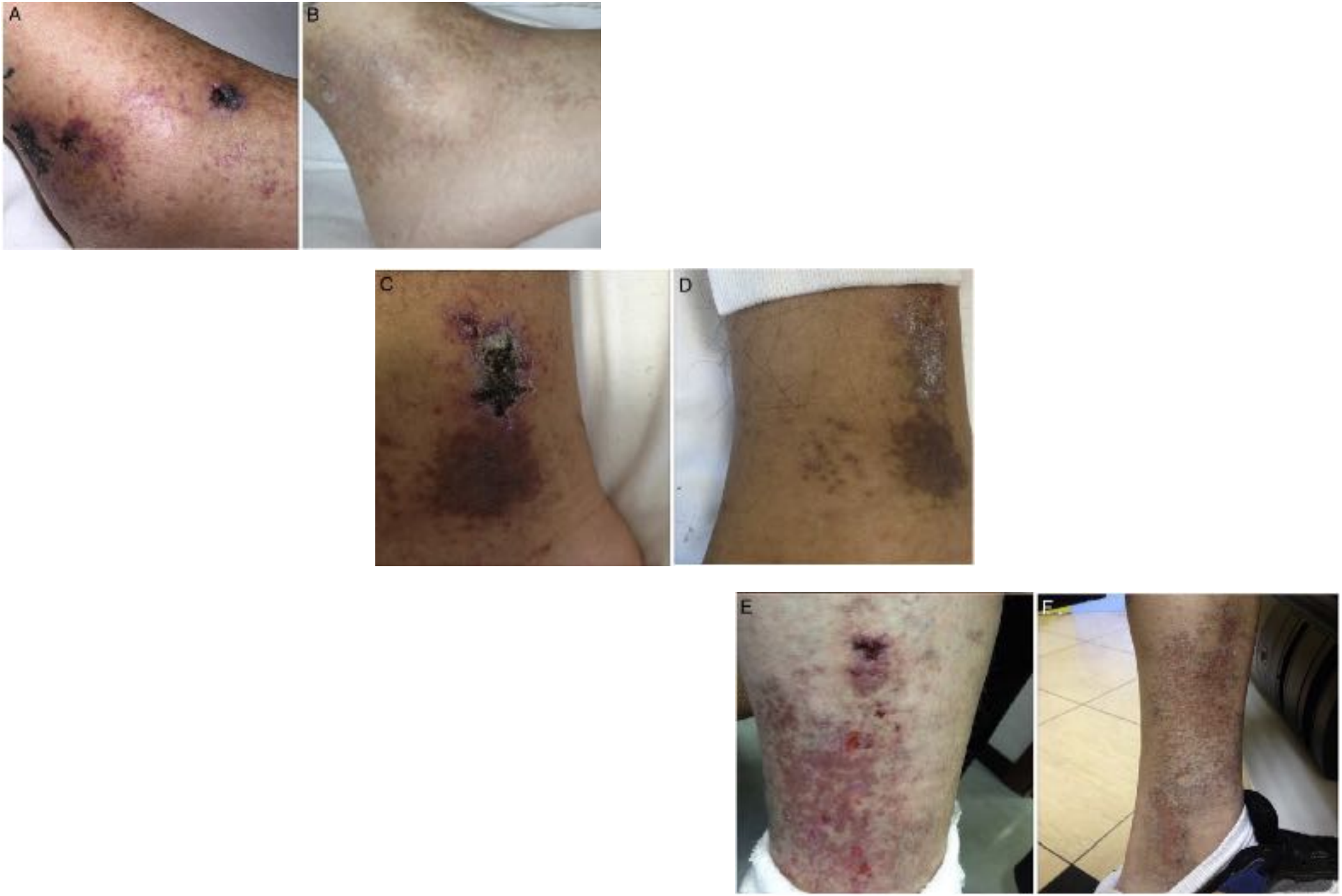
Skin Involvement in Atypical Hemolytic Uremic Syndrome

Gianluigi Ardissino, MD, PhD,[1] Francesca Tel, MD,[1] Sara Testa, MD,[1] Angelo Valerio Marzano, MD,[2] Riccardo Lazzari, MD,[2] Stefania Salardi, BS,[1] and Alberto Edefonti, MD[1]

Am J Kidney Dis. 2014 Apr;63(4):652-5.

We describe 3 cases of patients (32, 19 and 19-year-old) with complement factor H (CFH)-associated aHUS who developed persistent and otherwise unexplained skin lesions that were treated successfully by means of CFH-specific treatment.

In conclusion, we describe what to our knowledge are the first cases of skin involvement associated with (and possibly caused by) CFH-associated aHUS.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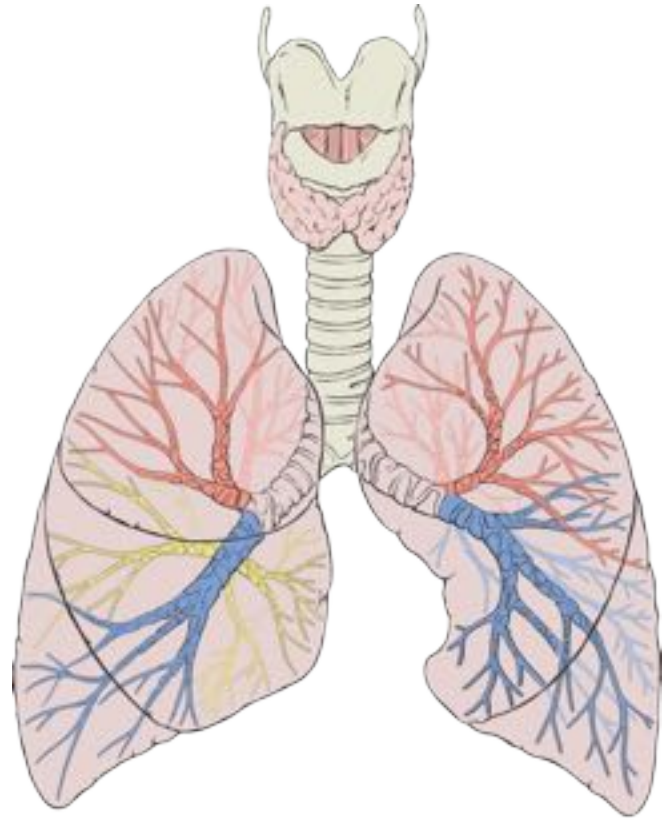
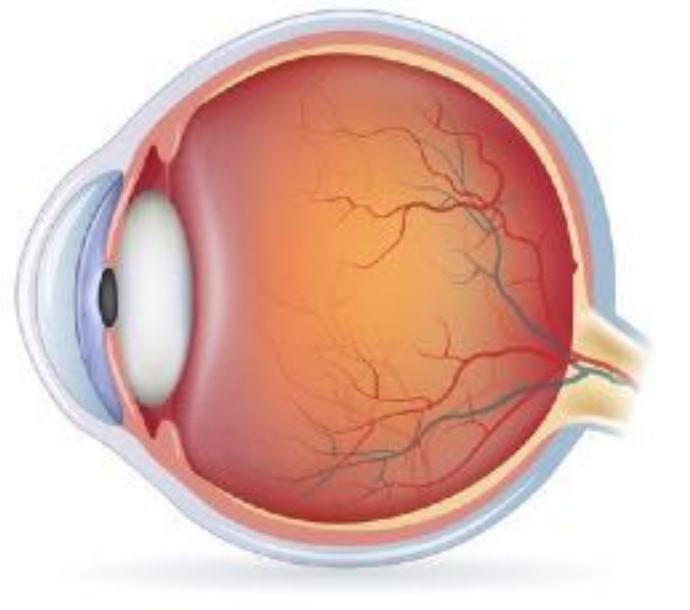


- Pulmonary edema associated with cardiac dysfunction and/or systemic volume overload.
- Pulmonary hemorrhage
- Pulmonary embolism
- Pulmonary arterial hypertension in a 6-month-old infant, who had anti-factor H antibody-associated disease and ended fatally.
- Respiratory failure requiring mechanical ventilation.



Pediatr Nephrol (2007) 22:1967–1970
DOI 10.1007/s00467-007-0540-0

BRIEF REPORT

Ocular involvement in hemolytic uremic syndrome due to factor H deficiency—are there therapeutic consequences?

Anis Larakeb · Sandrine Leroy · Véronique Frémeaux-Bacchi · Marta Montchilova · Béatrice Pelosse · Olivier Dunand · Georges Deschênes · Albert Bensman · Tim Ulinski

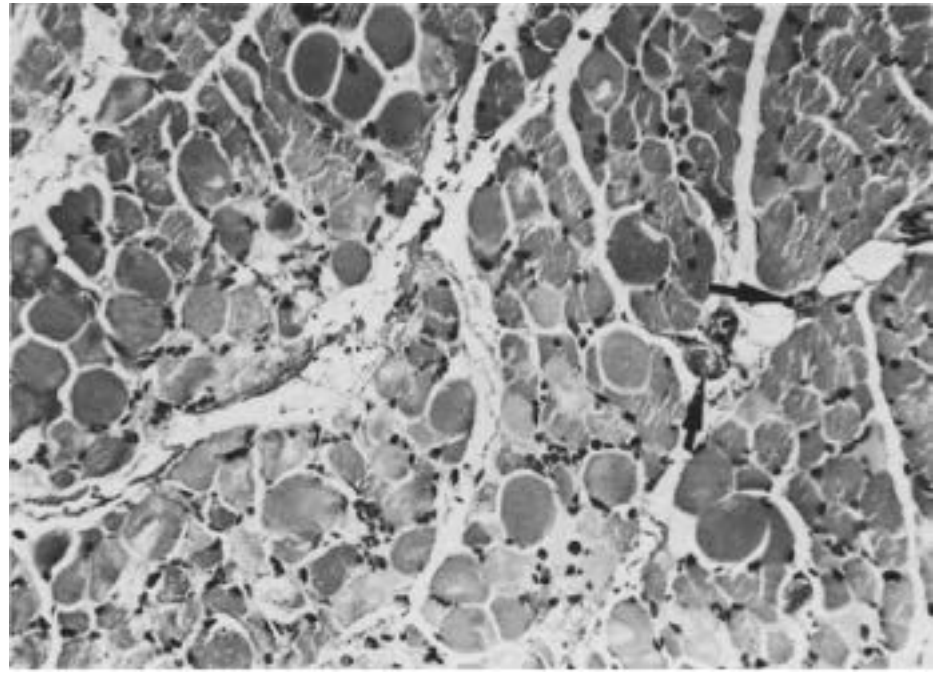
A 7-month-old boy with factor H deficiency HUS developed unilateral ocular pain and progressive visual deterioration. Ophthalmologic examination found vitreous bleeding and elevated IOP. Ultrasound biomicroscopy (UBM) revealed a choroidal hemorrhage; left retinal ischemia was seen on fluorescein angiography. He received daily PE with FFP for 10 days. Progressive reduction of ocular pain and improvement in visual acuity was noted after the 4^{th} week. Ophthalmologic examination revealed progressive resorption of the vitreous hemorrhage, and funduscopic examination showed a retinal hemorrhagic spot localized to the retinal periphery.

Acute rhabdomyolysis associated with hemolytic-uremic syndrome

The Journal of Pediatrics 1983; 103(1): 78

Sharon P. Andreoli, M.D., and Jerry M. Bergstein, M.D. *Indianapolis, Ind.*

We report HUS and acute rhabdomyolysis in a 3-year-old girl. Muscle biopsy demonstrated fibrin thrombi in the muscle microvasculature. She presented with generalized muscle tenderness, profound muscle weakness. CPK was 2665 IU/L; then 3840 IU/L. Over the following 10 days, muscle tenderness resolved and muscle strength improved.



Complement Factor H–Related Protein 1 Deficiency and Factor H Antibodies in Pediatric Patients with Atypical Hemolytic Uremic Syndrome

Johannes Hofer, Andreas R. Janecke,*† L.B. Zimmerhackl,*‡ Magdalena Riedl,* Alejandra Rosales,* Thomas Giner,* Gerard Cortina,* Carola J. Haindl,* Barbara Petzelberger,* Miriam Pawlik,* Verena Jeller,* Udo Vester,‖ Bettina Gadner,§ Michael van Husen,‖ Michael L. Moritz,¶ Reinhard Würzner,§ and Therese Jungraithmayr,* for the German-Austrian HUS Study Group*

Clin J Am Soc Nephrol 8: 407–415, 2013

CFH antibody–positive patients had significantly less CNS involvement at disease onset compared with patients without CFH antibodies (P=0.02). No differences were found for oliguria/anuria, arterial hypertension, pancreatic involvement, cardiac involvement, hepatopathy, gastrointestinal tract involvement, or need for dialysis or erythrocyte or platelet infusions.

Pediatric Nephrology (2019) 34:2495-2507
https://doi.org/10.1007/s00467-018-4105-1

EDUCATIONAL REVIEW

Extrarenal manifestations of the hemolytic uremic syndrome associated with Shiga toxin-producing *Escherichia coli* (STEC HUS)

Myda Khalid[1] · Sharon Andreoli[1]

Although the range of extrarenal organs affected in patients with aHUS closely overlaps with that reported for patients with STEC HUS, yet macrovascular, microvascular and cutaneous and pulmonary affection were reported in aHUS far more frequently.

Conclusions

- **Other organ affection is now a part of HUS definition.**
- **Consider detecting affection in organs other than the kidney in every case of HUS particularly if the clinical context suggests.**
- **Little difference in the spectrum of organ affection exists between various HUS etiologies.**
- **Genetic defect might have an impact on the spectrum of organ affection.**
- **Most cases respond to the specific treatment of HUS and have a relatively good prognosis.**