Supplementary Material: Quality Analysis

Joanna Briggs Institute Critical Appraisal Checklist for Case Reports.

Question 1: Were patient's demographic characteristics clearly described?
Question 2: Was the patient's history clearly described and presented as a timeline?
Question 3: Was the current clinical condition of the patient on presentation clearly described?
Question 4: Were diagnostic tests or assessment methods and the results clearly described?
Question 5: Was the intervention(s)or treatment procedure(s)clearly described?
Question 6: Was the post-intervention clinical condition clearly described?
Question 7: Were adverse events (harms) or unanticipated events identified and described?
Question 8: Does the case report provide takeaway lessons?

Case	Literature	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
1	Dierickx, 2010	Y	N	Y	Y	Y	Y	Y	Y
2	Diekrickx, 2010	Y	N	Y	Y	Y	Y	Y	Y
3	Thomas, 2011	Y	Y	Y	Y	Y	Y	Y	Y
4	Trivioli, 2022	Y	Y	Y	Y	Y	Y	N	Y
5	Yamazaki, 2007	Y	Y	Y	Y	Y	Y	Y	Y
6	Asamiya, 2010	Y	Y	Y	Y	Y	Y	Y	Y
7	Badiola, 2018	Y	Y	Y	Y	Y	Y	N	Y
8	Manabe, 2017	Y	Y	Y	Y	Y	Y	Y	Y
9	Shah, 2023	Y	N	Y	Y	Y	Y	Y	Y
10	Agrawal, 2010	Y	Y	Y	Y	Y	Y	N	Y
11	Mehmood, 2021	Y	Y	Y	Y	Y	Y	Y	Y
12	Al-Toma, 2005	Y	Y	Y	Y	Y	Y	N	Y
13	Arad, 2011	Y	Y	Y	Y	Y	Y	Y	Y
14	Farshad, 2019	Y	Y	Y	Y	Y	Y	Y	Y
15	Crummy, 1970	Y	Y	Y	Y	Y	Y	Y	Y
16	Duong, 2020	Y	Y	Y	Y	Y	Y	Y	Y
17	Patrick, 2022	Y	Y	Y	Y	Y	Y	N	Y
18	Docci, 1997	Y	N	Y	Y	Y	Y	Y	Y
19	Fehr, 2001	Y	Y	Y	Y	Y	Y	N	Y
20	Cao, 2017	Y	Y	Y	Y	Y	Y	N	Y
21	Cavero, 2017	Y	N	Y	Y	Y	Y	N	Y
22	Cavero, 2017	Y	N	Y	Y	Y	Y	Y	Y
23	Nimura, 2024	Y	Y	Y	Y	Y	Y	Y	Y
24	Kitamura, 2022	Y	Y	Y	Y	Y	Y	N	Y
25	Mandal, 2022	Y	Y	Y	Y	Y	Y	Y	Y
26	Jha, 2022	Y	Y	Y	Y	Y	Y	N	Y
27	Jabr, 2003	Y	Y	Y	Y	Y	Y	Y	Y
28	Lim, 1998	Y	Y	Y	Y	Y	Y	N	Y
29	Green, 1988	Y	Y	Y	Y	Y	Y	Y	Y
30	Hirsch, 1995	Y	Y	Y	Y	Y	Y	Y	Y
31	Kuroda, 1986	Y	Y	Y	Y	Y	Y	Y	Y
32	Manenti, 2013	Y	N	Y	Y	Y	Y	Y	Y
33	Manenti, 2013	Y	N	Y	Y	Y	Y	Y	Y
34	Fukui, 2015	Y	Y	Y	Y	Y	Y	N	Y
35	Moronti, 2023	Y	Y	Y	Y	Y	Y	Y	Y
36	Nada, 1990	Y	Y	Y	Y	NA	NA	Y	Y
37	Nagai, 2008	Y	Y	Y	Y	Y	Y	N	Y
38	Naina, 2009	Y	Y	Y	Y	Y	Y	Y	Y
39	Torun, 2022	Y	Y	Y	Y	Y	Y	Y	Y
40	Pagnaux, 2010	Y	Y	Y	Y	Y	Y	Y	Y
41	Patel, 2021	Y	Y	Y	Y	Y	Y	Y	Y
42	Perrin, 2016	Y	Y	Y	Y	Y	Y	Y	Y
43	Person, 2020	Y	Y	Y	Y	Y	Y	Y	Y
44	Charney, 1999	Y	Y	Y	Y	Y	Y	N	Y
45	Ross, 1996	Y	Y	Y	Y	Y	Y	Y	Y
46	Ross, 1996	Y	Y	Y	Y	Y	Y	Y	Y
47	Muñoz, 2021	Y	Y	Y	Y	Y	Y	Y	Y
48	Yamauchi, 2010	Y	Y	Y	Y	Y	Y	Y	Y
49	Shukla, 2022	Y	Y	Y	Y	Y	Y	Y	Y
50	Stefanidis, 1998	Y	Y	Y	Y	Y	Y	Y	Y
51	Strobel, 2014	Y	N	Y	Y	Y	Y	Y	Y
52	Sugimoto, 2007	Y	Y	Y	Y	Y	Y	N	Y
53	Syeda, 2013	Y	Y	Y	Y	Y	Y	Y	Y
54	Yamasaki, 2001	Y	N	Y	Y	Y	Y	Y	Y
55	Watanabe, 2010	Y	Y	Y	Y	Y	Y	Y	Y
56	De-Leon-Bojorge, 2006	Y	Y	Y	Y	Y	Y	N	Y
57	Yoshioka, 2006	Y	Y	Y	Y	Y	Y	N	Y
58	Zahiri, 2003	Y	Y	Y	Y	Y	Y	Y	Y
59	Filler, 1997	Y	Y	Y	Y	Y	Y	Y	Y
60	Sathe, 2016	Y	Y	Y	Y	Y	Y	N	Y
61	Torun, 2024	Y	Y	Y	Y	Y	Y	Y	Y

N: No, NA: Not applicable, Q: Question, Y: Yes

Supplementary Material: Search Strategy

Search Strategy

In the systematic literature review the following terms were utilized: "vasculitis"(MeSH Unique ID: D014657),"giant cell arteritis"(MeSH Unique ID: D013700),"temporal arteritis"(MeSH Unique ID: D013700),"Takayasu arteritis"(MeSH Unique ID: D013625),"polyarteritis nodosa"(MeSH Unique ID: D010488),"Kawasaki disease"(MeSH Unique ID: D009080),"ANCA associated vasculitis"(MeSH Unique ID: D056648),"microscopic polyangiitis"(MeSH Unique ID: D055953),"MPA", "Churg Strauss"(MeSH Unique ID: D015267),"allergic granulomatous angiitis"(MeSH Unique ID: D015267),"EGPA"(MeSH Unique ID: D015267),"eosinophilic granulomatosis polyangiitis"(MeSH Unique ID: D015267),"eosinophilic granulomatosis with polyangiitis"(MeSH Unique ID: D015267),"Wegener granulomatosis"(MeSH Unique ID: D014890),"granulomatosis with polyangiitis"(MeSH Unique ID: D014890),"granulomatosis polyangiitis", "GPA", "Behçet disease"(MeSH Unique ID: D001528),"Behçet's disease"(MeSH Unique ID: D001528),"Behçet syndrome"(MeSH Unique ID: D001528),"Behçet's syndrome"(MeSH Unique ID: D001528),"Henoch Schönlein purpura",(MeSH Unique ID: D011695),"IgA vasculitis"(MeSH Unique ID: D011695),"urticarial vasculitis", "hypocomplementemic urticarial vasculitis", "cryoglobulinemic vasculitis", "cryoglobulinemia"(MeSH Unique ID: D003449), "leukocytoclastic vasculitis"(MeSH Unique ID: D018366),"Cogan syndrome"(MeSH Unique ID: D055952),"Relapsing polychondritis"(MeSH Unique ID: D011081),"IgG4 related disease"(MeSH Unique ID: D000077733),"Immunoglobulin G4 related disease"(MeSH Unique ID: D000077733),"immune complex vasculitis", "aortitis"(MeSH Unique ID: D001025),"retroperitoneal fibrosis"(MeSH Unique ID: D012185),"primary central nervous system vasculitis"(MeSH Unique ID: D020293),"primary central nervous system angiitis"(MeSH Unique ID: D020293),"rheumatoid vasculitis"(MeSH Unique ID: D056653),"lupus vasculitis"(MeSH Unique ID: D020945),"sarcoid vasculitis", "Goodpasture syndrome"(MeSH Unique ID: D019867),"Anti glomerular basement membrane disease"(MeSH Unique ID: D019867),"Anti GBM"(MeSH Unique ID: C051951),"Anti GBM disease",(MeSH Unique ID: D019867),"Anti C1q vasculitis", "Thrombotic microangiopathy"(MeSH Unique ID: D057049),"microangiopathic hemolytic anemia", "schistocyte".

The Boolean operators applied were AND and OR.

For each database, the following search string was used.

"vasculitis" OR "giant cell arteritis" OR "temporal arteritis" OR "Takayasu arteritis" OR "polyarteritis nodosa" OR "Kawasaki disease" OR "ANCA associated vasculitis" OR "microscopic polyangiitis" OR "MPA" OR "Churg Strauss" OR "allergic granulomatous angiitis" OR "EGPA" OR "eosinophilic granulomatosis polyangiitis" OR "eosinophilic granulomatosis with polyangiitis" OR "Wegener granulomatosis" OR "granulomatosis with polyangiitis" OR "granulomatosis polyangiitis" OR "GPA" OR "Behçet disease" OR "Behçet's disease" OR "Behçet syndrome" OR "Behçet's syndrome" OR "Henoch Schönlein purpura" OR "IgA vasculitis" OR "urticarial vasculitis" OR "hypocomplementemic urticarial vasculitis" OR "cryoglobulinemic vasculitis" OR "cryoglobulinemia" OR "leukocytoclastic vasculitis" OR "Cogan syndrome" OR "Relapsing polychondritis" OR "IgG4 related disease" OR "Immunoglobulin G4 related disease" OR "immune complex vasculitis" OR "aortitis" OR "retroperitoneal fibrosis" OR "primary central nervous system vasculitis" OR "primary central nervous system angiitis" OR "rheumatoid vasculitis" OR "lupus vasculitis" OR "sarcoid vasculitis" OR "Goodpasture syndrome" OR "Anti glomerular basement membrane disease" OR "Anti GBM" OR"Anti GBM disease", OR "Anti C1q vasculitis"	AND	"Thrombotic microangiopathy" OR "microangiopathic hemolytic anemia" OR "schistocyte"

Supplementary Table 1. Excluded publications and reasons for exclusion	
Name of first author, year of publication	Reason for exclusion
Malipatel, 2018	Thrombotic microangiopathy preceded the onset of systemic vasculitis.
Krishnamurthy, 2017	Thrombotic microangiopathy preceded the onset of systemic vasculitis.
Karaivanov, 2018	Thrombotic microangiopathy preceded the onset of systemic vasculitis.
Ardalan, 2008	Thrombotic microangiopathy preceded the onset of systemic vasculitis.
Mandai, 2011	Clinical features incompatible with thrombotic microangiopathy criteria.
Ohhashi, 2000	Clinical features incompatible with thrombotic microangiopathy criteria.
Sakai, 2017	Clinical features incompatible with thrombotic microangiopathy criteria.
Reichart, 2000	Insufficient information concerning thrombotic microangiopathy features.
Wu, 2013	Insufficient information concerning thrombotic microangiopathy features.
Chua, 2019	Insufficient information concerning thrombotic microangiopathy features.
Martis, 2021	Insufficient information concerning thrombotic microangiopathy features.
Chua, 2015	Insufficient information concerning thrombotic microangiopathy features.
Hollenbeck, 1998	Insufficient information concerning thrombotic microangiopathy features.
Fukui, 2016	Insufficient information concerning thrombotic microangiopathy features.
Yu, 2014	Insufficient information concerning thrombotic microangiopathy features.
Zhang, 2009	Insufficient information concerning thrombotic microangiopathy features.
Daisley, 2021	Insufficient information concerning thrombotic microangiopathy features.
Tasaki, 2024	Insufficient information concerning thrombotic microangiopathy features.
Kobayashi, 2009	Insufficient information concerning thrombotic microangiopathy features.
Beaufils, 1990	Full text could not be accessed.
Fujisaki, 2005	Full text could not be accessed.
Benitez, 1964	Full text could not be accessed.
Sato, 2002	Full text could not be accessed.
Suzuki, 2004	Full text could not be accessed.
Fujimura, 2006	Full text could not be accessed.

Supplementary Table 2. Clinical features of cases of thrombotic microangiopathy in patients with vasculitis

Case number	Age, sex	Type of vasculitis, clinical and laboratory findings of vasculitis, and activity of vasculitis at the time of thrombotic microangiopathy	Clinical and laboratory features of thrombotic microangiopathy	Histopathological findings of thrombotic microangiopathy	Possible etiology of thrombotic microangiopathy	Treatment of thrombotic microangiopathy and outcome
Case 1: Dierickx, 2010	34, F	- Eosinophilic granulomatosis with polyangiitis, clinical and laboratory findings of vasculitis and the activity of vasculitis at the time of thrombotic microangiopathy are not available	- Levels of ADAMTS13 were within normal ranges (>100%). - High LDH level (1420 U/L), - Hemoglobin: 8.6 g/dL, - Thrombocytopenia (platelet count: 37×10⁹/L), - Peripheral blood smear: 12-15 schistocytes/100 erythrocytes, - Normal renal function, - No neurological symptoms.	- Not available	Intestinal transplantation, tacrolimus treatment, presumed vasculitic activity.	Tacrolimus was stopped, plasma exchange was performed, complete remission of TMA occurred, but severe graft rejection occurred.
Case 2: Dierickx, 2010	43, M	- Antiphospholipid syndrome, clinical and laboratory findings of antiphospholipid syndrome, and the activity of vasculitis at the time of thrombotic microangiopathy are not available.	- Levels of ADAMTS13 were within the normal range. - High LDH level (5277 U/L) - Hemoglobin: 7.5 g/dL - Thrombocytopenia (platelet count: 89×10⁹/L) - Deteriorated renal function (not specified) - Neurological symptoms	- Not available	Multivisceral transplantation, tacrolimus treatment, presumed vasculitic activity.	- Tacrolimus was stopped, plasma exchange was performed, and complete remission of TMA occurred, but severe graft rejection occurred.
Case 3: Thomas, 2011	62, M	- Granulomatosis with polyangiitis diagnosed 15 years earlier by means of lung biopsy, treated with 2 courses of cyclophosphamide and corticosteroids followed by maintenance immunosuppression with mycophenolate mofetil and prednisone. - GPA in remission at the time of TMA, anti-PR3 and anti-MPO negative, and renal biopsy not demonstrating GPA activity.	- Creatinine 1.5 mg/dL (increased from baseline 1.3 mg/dL). - 2.16 g/day proteinuria - Urine microscopy: more than 100 red blood cells/HPF, of which 25% were dysmorphic; 31-40 white blood cells/HPF and occasional granular casts - Bilateral pulmonary infiltrates - Bronchoalveolar lavage: 9% hemosiderin-laden macrophages, - Right pleural effusion, - Hemoglobin: 8.4 g/dL, - Platelet count: 198×10⁹/L, - LDH: 320 U/L, - No schistocytes on peripheral blood smear.	Kidney biopsy: Seventeen glomeruli, 3 of which were globally sclerotic. Glomeruli showed moderate mesangial expansion with mesangiolysis and a mild increase in mesangial cellularity due to a few mononuclear cells. Glomerular capillary walls showed thickening of capillary loops, subendothelial expansion with fluffy material, and double contouring with new basement membrane formation. Some capillary loops were collapsed with thickening and wrinkling of the capillary walls, and thrombi were absent. Glomeruli did not show evidence of crescents, necrotizing lesions, or significant endocapillary proliferation. IF microscopy: Segmental staining for IgM and C3 was present in 3 glomeruli, and there was scattered staining for fibrinogen in the interstitium. Vessels showed focal staining for C3. Electron microscopy: Capillary loops showed collapse and thickening of the glomerular basement membrane. There was extensive effacement of visceral epithelial cell foot processes; electron-dense deposits were absent. The mesangium also showed increased matrix without electron-dense deposits.	Secondary to gemcitabine and carboplatin chemotherapy.	- Discontinuation of the triggering chemotherapy regimen. - Discontinuation of the patient's maintenance immunosuppression for GPA, prednisone therapy was initiated for the pulmonary process believed to be secondary to gemcitabine toxicity. Vancomycin therapy was added for staphylococcus aureus infection. - Extensive surgical resection of the invasive urothelial malignancy. Patient underwent 4 cycles of adjuvant chemotherapy with paclitaxel and cisplatin locally and subsequently died 9.5 months after surgery.
Case 4: Trivioli, 2022	42, M	- Adenosine deaminase 2 deficiency, with PAN-like presentation: Fever, Raynaud phenomenon, and leg purpura with ulcers, which had recurred since childhood despite several courses of cyclophosphamide and other immunosuppressive therapies. He had also experienced bowel infarction and an ischemic lacunar stroke at the ages of 36 and 38 years, respectively, and he had a microaneurysm of the hepatic artery. ADA2 activity was found to be low, and next-generation sequencing detected compound heterozygosity for 2 previously unreported variants in ADA2 [c.1079C>T p.(Thr360Ile), c.1448G>T p.(Ser483Ile)] - Disease was stable under etanercept treatment with prompt recovery of skin lesions.	- Decreased kidney function (eGFR declined from 82 mL/min to 62 mL/min) - Proteinuria increased from 500 mg/day to 1580 mg/day.	**Kidney biopsy:** Shrinking of the tuft and capsular thickening in some glomeruli, along with mild interstitial inflammatory infiltrate and fibrosis:a severe arteriolar wall hypertrophy resembling chronic TMA, along with ischemic glomerular lesions. Immunofluorescence and Congo red staining were negative, and electron microscopy did not find deposits. There was marked expression of the type I interferon-induced protein MXA within endothelial cells, especially in vessels with TMA, and in infiltrating T cells.	Small vessel vasculopathy (with possible involvement of type I interferon and contribution of hypertension).	- Clinicians decided not to modify etanercept and continued losartan. - Six months after biopsy, the patient's renal parameters were stable.
Case 5: Yamazaki, 2007	61, F	Granulomatosis with polyangiitis, - Fatigue, appetite loss, and fever. - Neutrophilic leukocytosis, low hemoglobin (9 g/dL), normal platelet count, creatinine: 7.62 mg/dL, elevated CRP (156.2 mg/L), albumin: 1.9 g/dL, anti-PR3: 55 EU. - Urlnalysis: 2+ proteinuria, 3+ hematuria, urine sediment: >100 erythrocytes and 10-19 leukocytes/ HPF, - Two pulmonary nodules in computed tomography, - Kidney biopsy: Of the 11 glomeruli obtained, 3 showed global sclerosis. Cellular crescents were observed in 8 glomeruli. Necrotizing granulomatous glomeruli with dissolution of Bowman's capsule were seen. Massive CD68-positive cell infiltration was detected in the granulomatous lesions. Renal interstitium showed moderate fibrosis and inflammatory cell infiltration. Tubular atrophy and necrosis of tubular epithelial cells were also seen. There were no signs of vasculitis at the levels of the arteriole and interlobular artery. - Patient was treated with hemodialysis and prednisolone. Clinical response achieved, and anti-PR3 titers decreased. - Vasculitis in remission at the time of TMA.	- Depression and excitement. - Platelet count and hemoglobin gradually decreased to 21×10⁹/L and 7.8 g/dL, respectively. - Schistocytes in blood smear. - Total bilirubin value was elevated to 3.0 mg/dL. - LDH: 770 U/L, and haptoglobin was <10 mg/dL.	- Not present.	- Micafungin, cytomegalovirus infection (patient received ganciclovir for cytomegalovirus colitis); although granulomatous polyangiitis activity was also suspected by the authors for TMA, we believe it is unlikely due to negative anti-PR3 titers at the time of TMA onset.	- Patient continued to receive ganciclovir. Plasma exchange with 40 units of fresh frozen plasma was performed 8 times between day 82 and day 100. The authors suspected that the micafungin sodium had caused the TTP and thus discontinued it on day 90. Patients continued to receive high-dose steroids during these treatment modalities.
Case 6: Asamiya, 2010	59, F	Microscopic polyangiitis, diagnosed in 2002. - Rapidly progressive renal impairment (creatinine level: 1.56 mg/dL, proteinuria and microscopic hematuria, interstitial pneumonia, and an elevated MPO level of 490 EU. Patient treated with high-dose oral prednisolone. Prednisolone was gradually tapered, and she was treated with a maintenance dose of prednisolone of 10 mg/day, and her serum creatinine level was 2.50-2.87 mg/dL in 2008. - In 2009, the patient presented with lack of appetite, fever, and respiratory distress. Leukocytosis, hemoglobin level: 8.9 g/dl, platelet count within normal range, elevated CRP 164 mg/L, MPO: 119 EU, creatinine level: 3.89 mg/dL normal LDH, intense proteinuria, and microscopic hematuria; chest X-ray image showed a diffuse alveolar pattern, and bronchoscopy revealed severe alveolar hemorrhage. Pulse methylprednisolone therapy (500 mg/day for 3 days) started, followed by 40 mg/day of oral prednisolone. On the seventh day of treatment, chest CT revealed improvement in pulmonary hemorrhage, and CRP decreased to 4 mg/L. - TMA emerged at the time of active vasculitis undergoing treatment with vasculitis under partial remission and MPO 14 EU.	- Fever, headaches, emotional disturbance, and personality disorder. - Elevated LDH, - Thrombocytopenia (50-80×10⁹/L), hemoglobin decreased from 11.2 g/dL to 9.2 g/dL, - Haptoglobin undetectable, direct Coombs test negative, - Schistocytes in peripheral blood smear. - Creatinine progression to 4.3 mg/dL with fluid overload, - DIC ruled out. - ADAMTS13 activity: 37.8%, ADAMTS13 inhibitor level of <0.5 Bethesda Units/mL. - Melena.	Not available.	- Presumed vasculitic activity.	Plasma exchange was started on day 21, which was replaced with 25-30 units of fresh-frozen plasma three times a week, together with glucocorticoids. - Because the activities of TTP and ANCA associated vasculitis were not suppressed by the steroid therapy and PE, intravenous pulse cyclophosphamide was administered. - Due to the progression of thrombocytopenia under this treatment regimen, intravenous infusions of rituximab (200 mg, 150 mg/m²) were administered. - One week after initiation of rituximab administration, PE was tapered to twice a week, and 12 days after initiation of rituximab administration, PE was stopped. Although she remained dependent on dialysis, her critical care status improved, and she achieved a complete clinical remission. Platelet count increased to 175×10⁹/L at 90 days after rituximab treatment.
Case 7: Badiola, 2018	57, M	Eosinophilic granulomatosis with polyangiitis (EGPA), - Malaise, fever, symmetrical arthritis of the wrists and the proximal and distal interphalangeal joints, generalized stiffness and myalgias, paresthesia in the fourth and fifth fingers of the left hand, and a worsening of his usual dyspnea, commencing the week before. One day prior to admission, the patient presented with palpable purpura in the legs. - Patient subfebrile (37.8 °C), wheezing over the entire lung field. - Chest x-ray showed pulmonary infiltrates in both lung fields, which were confirmed in a chest CT with ground-glass opacities, especially in the lower lobes. - Laboratory results: Leukocytosis (18.830×10⁹/L, eosinophilia (8.850×10⁹/L, hemoglobin and platelet count initially normal, creatinine normal, CRP: 95 mg/L, ESR: 81 mm/hour, slightly elevated LDH (345 U/L), urinalysis revealed no proteinuria and 3+ hematuria, anti-MPO: 126.8, - Intravenous methylprednisolone (40 mg/day) treatment, after which the fever and musculoskeletal symptoms disappeared concomitantly, with an improvement of the skin rash, dyspnea, and pulmonary infiltrates. - Skin biopsy: Vasculitis with an eosinophilic perivascular inflammatory infiltration without granulomas. -EMG: Signs of moderate sensory-motor axonal neuropathy. - Vasculitis active at the time of TMA.	On the fifth day of treatment, TMA findings appeared: -Hemoglobin: 8.2 g/dL, platelets: 59×10⁹/L, elevated LDH: 739 U/L, reticulocytes: 2.3%, -Schistocytes in peripheral blood smear, -Negative direct antiglobulin test, haptoglobin undetectable, -Elevated creatinine 1.4 mg/dL, 2.4 g/day proteinuria, -ADAMTS13 activity was 73% (normal range 6-100%), and the ADAMTS13 inhibitor was absent. -No pathological variants of the 14 genes associated with complement-mediated TMA, however the patient was carrying a risk haplotype, CFH (H3) heterozygosis, for complement-mediated TMA. Additionally, a heterozygous variant of uncertain significance was identified in exon 4 of CFHR5 (c.432A>T), which causes the substitution of an amino acid from lysine to asparagine in position 144 (p.Lys144Asn).	- Kidney biopsy was carried out 1 month after the clinical onset with the following findings (12 glomeruli): interstitial inflammation with eosinophils, some thickened arterioles with fibrinoid occlusion, and no proliferative changes or glomerular thrombi. The immunofluorescence studies showed sparse IgA deposits, C3, and C4d in some arterioles and in the glomerular basement membrane of some glomeruli.	aHUS (triggered by EGPA activity).	-Pulse methylprednisolone (500 mg/day for 3 consecutive days), a single pulse of cyclophosphamide (1 g), and plasmapheresis on 4 consecutive days. -Soon after the treatment, the eosinophilia and the schistocytes disappeared, hemolytic anemia, thrombocytopenia and proteinuria improved, and renal function normalized.
Case 8: Manabe, 2017	59, M	- Anti-PR3 ANCA-positive anti-glomerular basement membrane antibody disease, - Low-grade fever, weight loss, malaise, and hemoptysis, - Physical examination: Pallor, bilateral coarse crackles, - Anti-PR3 ANCA 133 EU/mL, anti-GBM 291 EU/mL, elevated creatinine (38.77 mg/dL), elevated CRP: 64.6 mg/L, low C3 (78.1 mg/dL), urinalysis: massive hematuria, red blood cell casts, 13.5 g/day proteinuria. - Vasculitis active at the time of TMA.	- Hemoglobin 4.5 g/dL, - Platelet: 45×10⁹/L, - LDH 555 U/L, - Creatinine: 38.77 mg/dL, - Large number of schistocytes in peripheral blood smear, - ADAMTS13 level 19.8%, - ADAMTS13 inhibitor: negative	Kidney biopsy: 22 glomeruli with 6 globally sclerotic glomeruli. Most of the remaining glomeruli revealed circumferential cellular crescents, and some showed tuft necrosis and rupture of Bowman's capsules. Immunofluorescent examinations of glomeruli revealed linear deposition of immunoglobulin G, and electron microscopic examination excluded electron-dense deposition. The globally sclerotic glomeruli revealed segmental occupation of Bowman's space. Some arterioles revealed arteritis with fibrin deposition and disruption of the internal elastic lamina. Other arterioles revealed mild fibrin deposition, partial distortion of the internal elastic lamina, and endothelial swelling with luminal narrowing. Interstitial necrotizing granulomatous inflammation was not detected. Hemosiderin was scattered in the interstitium. Based on these findings, physicians diagnosed the patient with anti-GBM disease associated with intrarenal arteritis and thrombotic microangiopathy.	- Presumed vasculitic activity.	- Continuous renal replacement therapy and antibiotics urgently administered. The day after admission, respiratory failure deteriorated, and the patient required mechanical ventilation. Since anti-GBM antibody and PR3-ANCA became evident on hospital day 4, plasma exchange treatment was initiated. While plasma exchange effectively reduced the anti-GBM antibody and PR3-ANCA titers, alveolar hemorrhage and thrombocytopenia were not sufficiently resolved. Urgent methylprednisolone pulse therapy was considered; however, because of the concomitant sepsis, PE was repeated. Hemorrhage gradually worsened, and a 3-day course of methylprednisolone 1 g pulse therapy was initiated on hospital day 8. The alveolar hemorrhage and thrombocytopenia improved after the initiation of corticosteroid therapy, and a kidney biopsy was performed to confirm the diagnosis of pulmonary-renal syndrome and hemolytic uremic syndrome. - The patient was weaned from mechanical ventilation after the 3-day course of methylprednisolone pulse therapy, and oral prednisolone of 40 mg/day was continued. Clinical symptoms, except for anuric renal failure, improved, and chest radiography revealed resolution without interstitial fibrosis. Although dialysis treatment in outpatient setting was required, the patient was discharged in a good general physical status. Intravenous cyclophosphamide 500 mg/month after, continued every month for three treatments, and then an additional three treatments at 3-months intervals. Oral prednisolone was successfully reduced to 5 mg per day without any disease recurrence.
Case 9: Shah, 2023	32, M	Granulomatosis with polyangiitis (triggered by COVID 19), - Unilateral conjunctival injection, sinus congestion, migratory polyarthralgia, non-productive cough, and purpura on both hands and feet. for 1 week, which started with multiple tiny red spots on his legs and gradually increased in size. He reported associated splinter hemorrhages of multiple fingernails, significant night sweats, body aches, fatigue, headache, migratory arthralgias, and poor appetite for a few days. - The purpuric rash was a diffuse leukocytoclastic rash with macular erythema distributed on both hands and feet - Patient SARS-CoV-2 antigen and PCR positive. - Laboratory results: Elevated creatinine (5.5 mg/dL, decreased glomerular filtration rate (14 mL/min), and elevated ESR, CRP, LDH, D-dimer, and ferritin. Chest X-ray: Mixed density perihilar opacities in both lungs. Chest CT: extensive airspace opacities in both lungs, suggesting COVID-19 multifocal, multilobar pneumonia. - c-ANCA was positive. - Vasculitis active at the time of TMA.	Not available.	Kidney biopsy: Limited thrombotic microangiopathy and tubulointerstitial nephritis.	- Presumed vasculitic activity (however, renal TMA was not accompanied by GPA involvement in kidney.)	He was initially started on broad-spectrum antibiotics (cefepime and vancomycin) for sepsis and underwent extensive workup for concomitant infections, which were negative, including a transthoracic echocardiogram. He also had to undergo intermittent hemodialysis briefly for acute renal failure. After renal biopsy results were obtained, he was started on steroids, and his renal functions gradually improved. - The rash worsened initially for a few days and improved gradually after the immunosuppressive therapy was started. - Then, patient developed a non-occlusive thrombus in the proximal segment of the left superficial femoral vein, and he was initiated on a heparin infusion. - Two days later, left renal hemorrhage with active extravasation was noted on CT angiogram. His left renal hematoma occurred most likely secondary to renal biopsy. Heparin was discontinued, and he was given protamine zinc. Embolization was performed by interventional radiology. Repeat venous Doppler did not show any further evidence of deep venous thrombosis. A repeat renal ultrasound did not show hematoma. - Patient's creatinine improved during the hospital course. His acute kidney injury was thought to be due to interstitial nephritis from recent antibiotic use or an immunologic reaction. The patient had a confusing picture, and the exact cause of his vasculitis or nephritis was unknown. His inflammatory markers improved throughout the hospital course, and he was cleared for discharge on a steroid taper for nephritis. - Once the taper reached less than 10 mg/day, he developed acute scleritis and a new pulmonary cavitary lesion of 6 cm. The biopsy via bronchoscopy revealed acute inflammatory cells with hemosiderin-laden macrophages and negative cultures, including bacterial, fungal, and acid-fast bacilli. He was restarted on systemic steroids for scleritis after failing topical steroids, which incidentally also reduced the size of the cavitary lesion, indicating an immune component.
Case 10: Agrawal, 2010	17, F	- Microscopic polyangiitis, - Syncope, non-bloody diarrhea, easy fatigability, - Microangiopathic hemolytic anemia, - Acute kidney injury (creatinine 2.3 mg/dL), - Urinalysis: 2.8 g proteinuria, hematuria: 20 erythrocytes/HPF, - Urine microscopy: normal appearing red blood cells, rare acanthocytes, many fine and coarse granular casts, and a rare red blood cell cast. - Stool negative for *E. coli* O167:H7, - ANA positive (>1/1600 speckled pattern), - MPO: 100 U/mL, p-ANCA 1/640 positive. - Vasculitis active at the time of TMA.	- Hemoglobin: 3.8 g/dL, - Thrombocytopenia: 7×10⁹/L, - LDH: 1217 U/L, - Low haptoblobin, - Negative Coombs test, - Schistocytes in peripheral blood smear, - Acute kidney injury, with proteinuria and microscopic hematuria, - ADAMTS13 enzyme activity level prior to therapeutic plasma exhange was severely depressed, while ADAMTS13 inhibitory antibodies, assessed by functional assay, were not elevated.	Kidney biopsy: 19 glomeruli with proliferative changes (in 15 glomeruli), cellular crescents (in 4 glomeruli), segmental necrosis (in 2 glomeruli) with no glomerular thrombi. Tubulointerstitium contained a mild lymphoplasmacytic infiltrate with mild acute tubular injury. Several interstitial arterioles had fibrinoid occlusion, without necrosis or neutrophilic infiltration of the muscularis layer. Immunofluorescence studies demonstrated sparse, finely granular deposits in mesangial areas and peripheral capillary loops for IgG (2+), C3 (trace), kappa (trace-1+), lambda (trace), IgA (trace), and negative for IgM and C1q. Fibrinogen stained positive in several interstitial vessels corresponding to areas of fibrinoid necrosis. Electron microscopic study demonstrated areas with endocapillary proliferation and occlusion of capillary loops with abundant fibrin and cellular debris. Sparse, small electron-dense deposits were present in subepithelial and paramesangial locations, but no subendothelial deposits or tubuloreticular structures were identified.	TTP (secondary to MPA).	Over the next 48 hours of supportive therapy, there was no change in thrombocytopenia or renal dysfunction. - Pulse methylprednisolone (1,000 mg intravenous daily for 3 days) was initiated along with daily therapeutic plasma exchange using fresh frozen plasma, which improved hemoglobin and platelet count. After three PE sessions, kidney biopsy was performed. - Kidney biopsy findings were unusual for lupus nephritis, but owing to the presence of vasculitic damage and the severity of renal injury, immunosuppression with mycophenolate mofetil (1,000 mg/day) and prednisone (60 mg/day) was initiated. - After completion of six PE treatments and detection of anti-MPO, standard induction therapy with daily oral cyclophosphamide (2 mg/kg) and prednisone 60 mg was started. Renal injury improved over the next 2 months (creatinine was 1 mg/dL, although she still had glomerular hematuria (numerous dysmorphic erythrocytes), proteinuria (4.4 g/day), and a high p-ANCA titer (1/640). ADAMTS13 activity measured at this time became normal (129%). - Over the subsequent 4 months on cyclophosphamide and a tapering dose of prednisone, there was a gradual improvement in her hematuria (10 erythrocytes/HPF), proteinuria (0.86 g/day), p-ANCA titer (1/160), and ANA (1/100). She was then switched to maintenance immunosuppression with daily azathioprine only (2 mg/kg), and she remains in remission 1 year later.
Case 11: Mehmood, 2021	40, F	Renal-limited vasculitis, - Gradual onset of body swelling, dyspnea, and cola-colored urine progressing to anuria for the last 10 days. - Physical examination: Patient was tachypneic, hypertensive, pale, and edematous. - Patient's initial hemoglobin: 7.5 g/dL, platelet: 160×10⁹/L, creatinine: 4.1 mg/dL. - Urinalysis: 3+ proteinuria, 3+ hematuria, urine sediment: 142 to 150 erythrocytes/HPF, and no casts. - Over 5 days, creatinine progressed to 12 mg/dL. - C3 low and C4 borderline to low, - ANA, c-ANCA, p-ANCA were negative. - Kidney biopsy: 20 glomeruli, 18 showing cellular crescents, 1 globally sclerotic, moderate arteriosclerosis, hyalinosis, and focally fibrinoid necrosis. On the basis of the biopsy, diagnosis was ANCA negative renal-limited crescentic glomerulonephritis, - Immunosuppressive therapy (IV methylprednisolone 1 g/day for 3 days followed by oral prednisolone 1 mg/kg/day and cyclophosphamide 750 mg/m²), and plasmapheresis was initiated alternating with hemodialysis. - Vasculitis probably active at the onset of TMA.	- One month later, patient presented with TMA. - Hemoblobin: 8.7 g/dL, - Platelets: 80×10⁹/L, - LDH: 1600 U/L, - Schistocytes: 9%, - Creatinine: 7.1 mg/dL, - ADAMTS13 levels, complement factor H, and I could not be evaluated due to the unavailability of the tests.	Patient was advised a second biopsy to confirm the diagnosis of aHUS, but she refused.	- Presumed vasculitic activity.	- Patient treated with plasmapheresis alternating with hemodialysis and immunosuppressive therapy (steroids together with three doses of cyclophosphamide given fortnightly). - Patient's kidney functions did not improve. She was discharged on maintenance hemodialysis.
Case 12: Al-Toma, 2005	40, F	- Henoch-Schönlein purpura (IgA vasculitis), - Fever, lower abdominal pain, nausea, vomiting, and diarrhea, - CRP: 62 mg/L, hemoglobin: 10.8 g/dL, platelet: 302×10⁹/L, - Ultrasound : A pathologically thickened terminal ileum over 25-30 cm, surrounded by inflammatory infiltration. Abdominal CT confirmed the ultrasound findings and showed no abscess formation or bleeding. Ileoscopy revealed a picture of terminal ileitis. Ileal biopsies showed an inflammatory infiltrate, but no granuloma. Immunoflourescent staining showed leukocytoclastic vasculitis. - Palpable purpuric rash on the lower extremities around the ankle and knee joints and the buttocks. Skin biopsy: leukocytoclastic vasculitis, and immunofluorescence showed granular deposits of IgA and C3c in the subepidermal blood vessels. - Vasculitis active at the onset of TMA	- Hemoglobin: 4.6 g/dL, - Reticulocytes: 7.2%, - Platelet: 67×10⁹/L, - LDH: 2495 IU/L, - Haptoglobin: 0.8 g/dL, - Rapidly worsening renal function, - Urinalysis: Non-nephrotic range proteinuria and microscopic hematuria. - Cultures for *Escherichia coli* serotype O157:H7 negative.	Not available	- Presumed vasculitic activity.	- Blood transfusion and daily plasma exchange and high-dose steroid therapy were started. - The patient was admitted to the intensive care unit because of worsening hemodynamic instability and respiratory failure. Mechanical ventilation and continuous venovenous hemofiltration in addition to the measures mentioned earlier were necessary. - During her eighth in-hospital week, the patient developed a high fever and severe abdominal pain. A CT scan of the abdomen showed diffuse small intestine pathology, with an inflammatory infiltrate and induration of the mesenteric fat. Extensive clinical, radiological, and laboratory assessment did not reveal any infection as a cause for the worsening clinical situation. She was managed conservatively, and after 4 months, she improved gradually and left the hospital with stable, but impaired, renal function. - The patient was seen for follow-up 4 months after discharge. She was still symptom-free, with relatively stable renal function.
Case 13: Arad, 2011	69, F	- Microscopic polyangiitis accompanying diffuse cutaneous systemic sclerosis, - Weakness of 2 weeks' duration accompanied by mild abdominal pain, microscopic hematuria, and new-onset renal failure, hypertension (180/95), - Features of systemic sclerosis: Mild induration of the skin over the face and digits with telangiectasia, bilateral pulmonary crackles, Raynaud phenomenon, - Creatinine: 3.6 mg/dL, urinalysis: broad granular and hyaline casts and remnants of erythrocyte casts. - Chest X-ray: Bilateral basilar interstitial infiltrates - Homogeneous ANA positivity, anti-Scl 70 positive, p-ANCA, and MPO also positive. Renal biopsy: 14 glomeruli, of which 1 was sclerotic, and 10 contained epithelial crescents with fibrin deposits, and mixed lymphocytic and neutrophilic interstitial infiltrates. Blood vessels appeared normal. Kidney biopsy demonstrates AAV but no features of TMA. - Vasculitis active at the onset of TMA.	- Hemoglobin level dropped from 12.3 g/dL to 10 g/dL, and schistocytes were seen on blood smear. - Hypertension persisted.	Not present.	- Presumed vasculitic activity.	- For AAV, IV methylprednisolone for 3 consecutive days, followed by high-dose oral prednisone and IV CYC (500mg/m²), was initiated. - During the following days, she developed progressive respiratory failure. Chest CT showed diffuse alveolar infiltrates. Despite an adequate diuretic response to IV furosemide, hypoxia and pulmonary infiltrates worsened. Broad-spectrum antibiotic therapy was added. For technical reasons, lung biopsy was not performed at this stage, but since pulmonary vasculitis with or without diffuse alveolar hemorrhage was highly suspected, plasmapheresis was initiated, followed by the administration of high-dose IVIG. Despite this treatment, the patient's condition continued to deteriorate, and she died on the 32nd day of hospitalization.
Case 14: Farshad, 2019	33, F	- SLE with accompanying small vessel vasculitis and p-ANCA positivity - Epigastric pain, vomiting, subjective fever, arthralgias, and a petechial rash on palms and soles - Physical exam: acute severe hypertension with blood pressure of 187/116 mmHg, normal heart rate, and normal temperature. She was drowsy with an altered sensorium. She had a palpable purpuric rash over the palmar and plantar surfaces, as well as the sternum. There was diffuse abdominal tenderness. - ESR: 80 mm/hour, CRP: 56 mg/L leukocytes: 5500×10⁹/L, PLT: 25×10⁹/L (then dropped to 9×10⁹/L), - Creatinine: 0.83 mg/dL, urinalysis >300 mg/dL, 3+ erythrocytes, >50 erythrocytes/HPF. - ANA 1/1280, anti-dsDNA: 1021 IU/mL (0-99.9), C3:53 mg/dL (80-200), C4: 7 mg/dL (12-43), intermediate anticardiolipin IgM positivity. - SLE active at the onset of TMA.	- Hemoglobin: 12.4 g/dL, - Platelets initially 25×10⁹/L, then dropped to 9×10⁹/L. - LDH: 1139 U/L, total bilirubin: 1.8 mg/dL, direct bilirubin: 0.6 mg/dL. - Haptoglobin <8 mg/dL, - Peripheral blood smear: 3-5 schistocytes/HPF, - ADAMTS13 activity <10%.	- Patient passed away. - Autopsy revealed TMA throughout internal organs and vasculitis in the small vessels of the heart, small and medium vessels of the intestines, and the myometrium. Diffuse proliferative glomerulonephritis was also reported.	- TTP secondary to SLE flare/ presumed vasculitic activity and/or malignant hypertension.	- She was started on methylprednisolone 500 mg intravenous once a day for lupus nephritis. - During follow-up patient's blood pressure increased to 196/139 mmHg, and she was transferred to the medical intensive care unit for further management. - The next day, she became increasingly lethargic with labored breathing; arterial blood gas showed severe metabolic acidosis, and she became profoundly hypotensive. The patient acutely decompensated, requiring vasopressors and intubation. She then developed pulseless electrical activity cardiac arrest and was unable to be resuscitated.
Case 15: Crummy, 1970	55, M	- Wegener granulomatosis (granulomatosis with polyangiitis), - Bilateral deep thrombophlebitis of legs, epistaxis, history of attacks of paroxysmal dyspnea and wheezing (which became persistent 5 weeks before admission and abruptly cleared two weeks before admission) - Physical examination: Patient subfebrile, nasal mucous membranes hyperemic - Superficial thrombophlebitis of upper extremities was detected within 24 hours of admission; epistaxis, right periorbital swelling, purulent sinusitis, and bilateral nasopharyngeal airway obstruction developed between the fourth and sixth days of admission. - ESR: 52 mm/hour-initial hemoglobin: 12.6 g/dL initial platelet count: 1235×10⁹/L. - Initial urine sediment: 5-10 erythrocytes, 3-8 leukocytes, - Nasal mucosal biopsy specimen obtained on the ninth day was consistent with Wegener's granulomatosis. - Recurrent thrombophlebitis of all extremities associated with isolated and confluent petechial lesions on both legs was noted on the morning of the tenth day. Bilateral flank and presacral edema, a prominent increase in blood urea nitrogen, with creatinine clearance decreasing from 102 mL/min to 52 mL/min. - Fourteenth day, further deterioration was manifested by progressive gangrene of the right leg, more numerous and extensive petechial lesions of both legs, persistent sinusitis, and progressive renal failure. - Pathologic examination of the amputated leg confirmed the clinical impression of vasculitis - Vasculitis active at the onset of TMA.	- Hematocrit decreased to 29 %. -Platelet count decreased to 140×10⁹/L. - Peripheral blood smear: many burr, helmet (schistocyte), and triangular red blood cells. - Decrease of creatinine clearance from 102 to 52 mL/min, telescoped urinary sediment.	Not available	- Presumed vasculitic activity.	- Heparin was initiated on day of admission. - On the tenth day of admission, the heparin dose increased and prednisone treatment was initiated. - On fourteenth day of admission due to clinical deterioration, azathioprine initated and heparin dose increased - On the sixteenth day, the route of heparin administration was changed to continuous intravenous infusion with a variable speed syringe pump. - After the sixteenth day sustained gradual improvement was noted in the patient's general condition, sinusitis, and renal function. The vasculitis in both arms and in the left leg diminished. The distal right leg was gangrenous. - On the twenty-fourth day, an above-the-knee amputation of the right leg was performed. The procedure was uncomplicated. Pathologic examination of the amputated leg confirmed the clinical impression of vasculitis. - Six hours postoperatively, the left leg was again swollen and tender; new petechial and ecchymotic lesions were noted. Heparin infusion was reinstituted, and within two days, the swelling and the cutaneous lesions had resolved. - Further improvement in renal function was noted, and the sinusitis cleared completely. Four days after the institution of warfarin therapy, the dosage of heparin was gradually reduced, and reduction in prednisone dosage was begun. - On the ninety-fourth hospital day the patient was discharged. Medications were warfarin, prednisone 30 mg every other day, and azathioprine. - The dosages of warfarin and prednisone were subsequently reduced and discontinued. As of sixth month, the patient only continued azathioprine.

Case 16: Duong, 2020	82, F	- Microscopic polyangiitis, - Malaise, nausea, vomiting, fatigue, lower extremity pain, shortness of breath, cough, and oliguria. - ANA: 1/80, - ANCA IgG: 1/1280, - MPO: 173 AU/mL, - CRP: 31 mg/L, - Elevated creatinine: 8.35 mg/dL, - Urinalysis: microscopic hematuria and proteinuria. - Thorax CT: pulmonary fibrosis pattern and multifocal areas of consolidation in the upper lung, - Extensive lower extremity DVT, - Vasculitis active at the onset of TMA.	- Hemoglobin: 14.5 g/dL, - Platelet: 18×10^9/L, - LDH: 1627 U/L, - Haptoglobin <20 mg/dL, - ADAMTS13 activity: 65% (50-160%), - Peripheral blood smear: schistocytes consistent with microangiopathic hemolytic anemia. - Elevated creatinine: 8.35 mg/dL, - Urinalysis: microscopic hematuria and proteinuria.	- Kidney biopsy was done following the resolution of her thrombocytopenia. - Light microscopic examination of the kidney specimen revealed 23 glomeruli, of which six were globally sclerotic, one demonstrated early glomerular capillary thrombosis, and another demonstrated a cellular crescent. There was no evidence of vasculitis, but moderate arteriosclerosis was present. Mild interstitial fibrosis and tubular atrophy were found in the tubulointerstitium, involving 10% to 15% of the renal cortical tissue. - Electron microscopy showed no electron-dense immune-type deposits or organized deposits. - Immunofluorescent staining (IgG, IgA, IgM, C3, C1q, kappa, and lambda) of the glomeruli was negative.	- Presumed vasculitic activity.	- Steroids and plasma exchange were utilized. - Heparin was given for lower extremity DVT. - Once ANCA positivity was detected, rituximab was given. - Improvement in creatinine and thrombocytopenia - However, the patient developed an acute bowel perforation and passed away.
Case 17: Patrick, 2022	47, F	- Cryoglobulinemic vasculitis and a history of marginal zone lymphoma, both secondary to untreated Sjögren syndrome - Petechial rash of the lower extremities, as well as a headache and blurred vision for the prior two days and hypertension, subjective submandibular swelling, and marked weight loss. - Chronic dry eyes and dry mouth even before lymphoma diagnosis, - PET scan: Diffusely increased reticuloendothelial activity, - Bone marrow biopsy: No residual lymphoma activity, - Skin biopsy: Leukocytoclastic vasculitis, - Cryoglobulin positivity, - CRP: 7.6 mg/L, - Creatinine: 2.3 mg/dL, proteinuria: 2133 mg/day - RF: 227 IU/mL, low C4, ANA, anti-Ro were positive. - Elevated serum free kappa/lambda ratio - Vasculitis active at the onset of TMA.	- Hypertension, - Creatinine: 2.3 mg/dL, proteinuria: 2133 mg/day.	Kidney biopsy: Acute thrombotic microangiopathy, acute tubular injury, and moderate interstitial fibrosis with 30% tubular atrophy.	- Presumed vasculitic activity.	- Prednisone 40 mg initiated - Almost a month after her initial admission to her cancer hospital, her cryocrit was tested and was negative. - She received her first dose of 1 g intravenous rituximab while admitted to the academic teaching center, and a follow-up was scheduled in the rheumatology clinic for ongoing treatment. -Her anemia, hypocomplementemia, renal insufficiency, and leukocytoclastic vasculitis improved by the time of her hospital discharge.
Case 18: Docci, 1997	32, M	- Behcet's disease, - Patient had neurologic involvement of Behcet's disease, was treated with cyclosporine, - He presented with dyspena and oliguria. - Physical examination: Patient was somnolent and pale. He had mild prétibial edema, as well as palpable purpura of both thighs. A 2/6 systolic murmur was audible at the apex radiating to the axilla, and generalized crackles were present in the lungs - Chest X-ray: Pulmonary venous congestion and mild bilateral pleural effusion. - Creatinine: 6.1 mg/dL, ESR: 73 mm/hr, - Urinalysis: Proteinuria-300 mg/dL, numerous dysmorphic erythrocytes and occasional granular and hyaline casts were present. - Cyclosporin level was 350 ng/mL, the drug was discontinued. - Vasculitis not active at the onset of TMA.	- Hemoglobin: Initial 9.6 g/dL, later dropped to 6.2 g/dL; initial platelet count was 102×10^9/L, which later dropped to 40-10^9/L. - LDH: 1410 IU/L. - Creatinine was initially 6.1 mg/dL, later progressed to 7.5 mg/dL, - Peripheral blood smear revealed schistocytes, - Direct and indirect Coombs tests were negative. - Coagulation tests remained normal. - Urinalysis: Proteins 300 mg/dL, numerous dysmorphic erythrocytes and occasional granular and hyaline casts were present.	- Kidney biopsy was not performed because of lack of consent. - Skin biopsy: Capillary lumen filled with finely granular material, there was no evidence of vasculitis.	- TMA secondary to cyclosporine.	- Cyclosporine was discontinued. - The day after admission, the patient's renal function deteriorated further, with creatinine increasing to 7.5 mg/d and blood urea nitrogen increased to 112 mg/dL, urine flow rate was 15-20 mL/h despite large doses of furosemide. Hemodialysis was started. - Patient received multiple transfusions of packed erythrocytes and was treated with fresh frozen plasma infusion, antiplatelet drugs (acetylsalicylic acid and dipyridamole), and steroids -Three weeks after admission, hemoglobin level was 9.7 g/dL, platelet count was 134×10^9/L, and indices of intravascular hemolysis had completely normalized. -Renal function remained impaired: daily urine output ranged between 500 and 800 mL. Patient continued to be treated with hemodialysis.
Case 19: Fehr, 2001	30, F	- Antiphospholipid syndrome with concomitant SLE-induced vasculitis, - Patient had APS with history of deep venous thrombosis and stroke at age of 25. She received oral anticoagulation, which was dropped in favour of acetylsalicylic acid after 4 years. - During 15th week of pregnancy, under acetylsalicylic acid treatment, patient presented with diarrhea, vomiting and epigastric pain after eating spoiled food. - Gastroscopy: No abnormalities - Ultrasound: Death of fetus, curettage was performed. - After curettage, abdominal discomfort persisted, patient had fever and arhralgia. - Hemoglobin: 9.9 g/dL, normal reticulocyte count and no schistocytes, platelet: 33×10^9/L, leukocytosis - CRP: 338 mg/dL, AST: 401 U/L, LDH:739 U/L, creatinine was normal. -CT: multiple hypodense liver lesions - Butterfly rash, bilateral pleural effusions, - Urinalysis: 15-25 erythrocytes/HPF, 75% dysmorphic erythrocytes, non-nephrotic proteinuria, - ANA 1/320 positive and anti-double DNA antibody, anti-cardiolipin IgG and anti-beta 2 glycoprotein IgG positive, low C3 and C4, - Skin biopsy from 5 years ago demonstrated positive lupus band test. - Diseases were active at the onset of TMA.	- Intrauterine fetal demise, - Hemoglobin: 9.9 g/dL, normal reticulocyte count and no schistocytes. - Platelet: 33×10^9/L, - AST: 401 U/L, LDH: 739 U/L, creatinine normal, - Coombs test negative, - Urinalysis: 15-25 erythrocytes/HPF, 75% dysmorphic erythrocytes, non-nephrotic proteinuria. - Creatinine normal.	Liver biopsy: periportal necrosis with fibrin deposits and accumulation of sinusoidal granulocytes, a finding compatible with thrombotic microangiopathy resembling that of pre-eclampsia.	- Presumed vasculitic activity of SLE and APS.	- Initially, anticoagulation with heparin and a broad-spectrum antibiotic therapy was installed without clinical amelioration. - Pulse methylprednisolone therapy followed by 1 mg/kg prednisone/day started with an immediate clinical response (resolution of fever and abdominal pain, and consecutive normalization of thrombocytopenia and liver enzymes, and preservation of renal function.
Case 20: Cao, 2017	50, M	- EGPA, - History of asthma, recurrent nasal polyposis and chronic sinusitis for 3 years. - History of progressive creatinine increase (up to 1.5 mg/dL) with mild proteinuria (500 mg/day), hematuria and low C3. - Renal biopsy: Suggestive of TMA, - Retinal hemorrhage found on fundoscopy, - Treatment initiated for malignant hypertension, - Current presentation: Dyspnea (acute hypoxic respiratory failure, likely due to flash pulmonary edema), weakness, malaise, high blood pressure (160/100 mmHg), acute renal failure (creatinine: 6.49 mg/dL, with 1.68 g/day proteinuria), eosinophilia (3.79×10^9/L), initial platelet count normal, LDH normal, no features suggested hemolysis. - ANCA negative - Treatment with high-dose intravenous steroids (500 mg for 3 days) and cyclophosphamide (0.5 g/m^2) was initiated, which yielded a decrease in eosinophil count and clinical improvement. Yet, renal function did not recover; hence, permanent hemodialysis was initiated, creating an upper-arm native arteriovenous fistula. - Vasculitis active at the onset of TMA.	- Progression in creatinine to 6.49 mg/dL, proteinuria 1.68 g/day, - Pulmonary edema, - Hematologic features that emerged at the time of arteriovenous fistula creation. - Hemoglobin: 7.5 g/dL, platelet: 44×10^9/L, - LDH: 808 U/L, - Peripheral blood smear: Schistocytes - At that time new onset neurologic symptoms: aphasia, vision loss, somnolence and stupor. Brain CT scan showed a right parietal lobar hematoma with ipsilateral ventricle collapse and a minor left temporal lobe hematoma. - Complement factor H mutation: a risk polymorphism in CFH in heterozygosis (c. 1231T > To; p. Ser411Thr) in exon 9 was detected. This mutation is not defined in the Exome Sequencing Project. This mutation implies the loss of signal in exon 6 of CFHR1 and gain of signal in exon 23 of CFH. This mutation confers a poor prognosis, since CFHR1 acts as a competitive antagonist of Factor H and amplifies the degree of CFH's dysregulation.	-First kidney biopsy: TMA features (Glomerular ischemic changes; glomerular lumen reduction, basement membrane double contours, and aneurysmatic dilatation of some capillary loops, Vascular lesion, concentric thickening of the intima, with concentric reduction of the luminal area) -Second kidney biopsy: diffuse interstitial eosinophilic infiltration that was not present in the previous biopsy. Chronic TMA changes. IF microscopy: diffuse and widespread granular type IgM deposition in mesangium and capillary walls. C3 deposits were less intense. Deposits of C4 were present in arterial segments of focal and segmental type. C1q deposits were similar to C3 and followed the same distribution.	- Atypical HUS (triggered by EGPA).	- Following several daily plasma exchange procedures, the patient suffered from aphasia, vision loss, somnolence, and stupor; therefore, ICU admission was required. A brain CT scan showed a right parietal lobar hematoma with ipsilateral ventricle collapse and a minor left temporal lobe hematoma. - Due to the high risk of cerebral hemorrhage while under PE treatment, eculizumab was initiated (900 mg every week). 48 hours after the first dose of eculizumab, neurological symptoms dramatically improved. After the second dose, renal function began to improve. Hemodialysis was discontinued after the third dose, and hemolysis parameters had normalized at the fourth dose. Maintenance therapy of 1200 mg every 2 weeks was prescribed. - After administration of only one bolus of cyclophosphamide (0.5 g/m^2), and low doses of steroids (10 mg/day) the patient did not have eosinophilia nor respiratory tract manifestations. Complete neurological recovery was achieved after 6 months, and only residual abnormalities were detected on the CT scan. - After 18 months of follow-up, hematological parameters were normal and the patient remained hemodialysis-free. (creatinine clearance was 25-30 mL/min).
Case 21: Cavero, 2017	52, M	- EGPAi - Highest creatinine:3.5 mg/dL patient did not require hemodialysis. - Information regarding vasculitic activity was not present in the text.	- Microangiopathic hemolytic anemia, - Thrombocytopenia, - Renal dysfunction.	Kidney biopsy: histological signs of vasculitis (fibrinoid necrosis in glomerular capillaries and arterioles with eosinophilic granulomas and interstitial infiltration by eosinophils) in addition to TMA	- Presumed vasculitic activity.	- Patient received steroid and cyclophosphamide before eculizumab treatment. - Five days after aHUS diagnosis, patient received eculizumab. - Patient received eculizumab for 16 weeks, for 10 doses. - Patient's creatinine was 2.3 mg/dl, did not require hemodialysis as of 4.3 months of follow-up.
Case 22: Cavero, 2017	49, M	- EGPA, - Highest creatinine: 6.5 mg/dL, patient initially required hemodialysis - Information regarding vasculitic activity was not present in the text.	- Microangiopathic hemolytic anemia - Thrombocytopenia - Renal dysfunction - Mutation analysis: two pathogenic changes in CFHR1 (L290S and A296V) resulting in a mutant FHR-1 protein that competes with FH regulation on endothelial surfaces.	Kidney biopsy: histological signs of vasculitis (fibrinoid necrosis in glomerular capillaries and arterioles with eosinophilic granulomas and interstitial infiltration by eosinophils) in addition to TMA.	- aHUS (secondary to EGPA).	- Patient received steroid, cyclophosphamide, and 2 sessions of plasma exchange before eculizumab treatment. - Fifteen days after aHUS diagnosis, patient received eculizumab. - Patient received eculizumab for 130 weeks. - Patient requires hemodialysis as of 29.5 months of follow-up.
Case 23: Nimura, 2024	61, F	- MPA, - Fatigue, mild fever, right lung consolidation on CT that did not improve with antibiotics. - Acute onset of bilateral hearing impairment due to bilateral otitis media, - Acute kidney injury (increasing from 1.9 mg/dL to 3.52 mg/dL with accompanying glomerular hematuria, with excessive red blood cell casts and a proteinuria of 3.42 g/day), - MPO positive (71.6 IU/mL), CRP: 25.2 mg/dL, - Control CT: Bilateral interstitial lung disease enlarged kidneys. - BVAS score: 23, - Patient was given IV 500 mg pulse methylprednisolone, followed by oral prednisolone and antibiotics. Patient needed to commence hemodialysis due to anuria, but CRP and MPO improved. - Vasculitis active at the time of TMA.	- On the 17th day of steroid treatment, alteration of consciousness. - PLT: 15×10^9/L, - Hemolytic anemia, schistocytes in peripheral blood smear, low haptoglobin, - Normal coagulation tests, - Negative direct Coombs test, - Antiphospholipid antibodies negative, - ADAMTS13 activity normal, ADAMTS13 inhibitor negative.	Kidney biopsy: 5 weeks after ganciclovir initiation: 30 glomeruli, and 24 of them showed cellular or fibrocellular crescent formation. The walls of the renal arterioles were thickened due to subendothelial edema, and the lumens were narrow and occluded. An immunofluorescence test showed no deposition of IgG or IgA. Although IgM, C3c, and fibrinogen were focally positive, this was considered to be due to non-specific findings of glomerular sclerosis; these pathological findings were consistent with the clinical diagnosis of AAV and TMA. In addition, immunostaining for anti-CMV antibody was negative in the crescentic glomeruli, tubular epithelial cells, and vascular endothelial cells.	- CMV infection.	- Initially AAV activity was thought to cause TMA. - The dosage of prednisone was maintained at 30 mg per day, and eight sessions of plasma exchange were performed. However, no improvement was observed in the TMA findings, and she continuously developed a fluctuating consciousness disorder. - On the 32nd day, CMV was positive. - After initiation of ganciclovir, platelet count, hemolytic anemia, and consciousness disorder improved; CMV positive cell count decreased, and the consciousness disorder ceased after the initiation of the treatment. - Hemodialysis was discontinued on the 76th day after admission, and her serum creatinine level ultimately decreased to 1.1 mg/dL. However, her bilateral hearing impairment showed no improvement. She was discharged on the 121st day after admission. - Steroid was tapered, MPO-ANCA titer decreased to 16.6 IU/mL, patient did not exhibit any specific or worsening pulmonary symptoms during her clinical course.
Case 24: Kitamura, 2022	84, F	- MPA, - General fatigue, subfebrile body temperature, and deteriorating bilateral leg numbness and symmetrical glove and stocking sensory loss. - Creatinine: 1.66 mg/dL, urinalysis: 20-29 erythrocytes and 10-20 leukocytes/HPF, 1.6 g/day proteinuria, ESR: 79 mm/hr - MPO positive (153 U/mL), - Nerve conduction study: sensory damage to bilateral peroneal nerves. The sensory nerve conduction velocity test showed an absence of sensory nerve action potentials in the bilateral sural nerves and a mildly decreased sensory nerve action potential amplitude in the bilateral median and ulnar nerves. - Kidney biopsy: Necrotizing glomerulonephritis with crescents with negative immunofluorescence, consistent with pauci-immune ANCA-positive vasculitis, - After administering methylprednisolone pulse therapy, followed by 40 mg/day prednisolone, 500 mg rituximab, and IVIG (0.4 g/day for 5 days), the patient's mental state deteriorated, presenting signs of TMA with posterior reversible encephalopathy syndrome. - Vasculitis active at the time of TMA.	- Deterioration in mental status - Slightly elevated blood pressure - Creatinine progression to 2.7 mg/dL, - Hemoblogin: 8.6 g/dL, platelets: 45×10^9/L, LDH: 2152 U/L, haptoglobin <10 mg/dL, schistocytes in peripheral blood smear. - ADAMTS13 activity 39%, ADAMTS13 inhibitor negative - Low C3, normal C4. - Cranial MRI: Mild hyperintensity with an increased signal of an apparent diffusion coefficient map of the bilateral occipital, parietal, midbrain, frontal cortex, and subcortical white matter, which indicated vasogenic edema in these regions. Fluid-attenuated inversion recovery-MRI findings showed an increased signal intensity in these regions, suggestive of posterior reversible encephalopathy syndrome. - Stool culture negative for *E. coli* O157. - Complement regulatory genes negative.	Not present.	- Presumed vasculitic activity.	- After administering methylprednisolone pulse therapy, followed by 40 mg/day prednisolone, 500 mg rituximab, and intravenous immunoglobulin (0.4 g/day for 5 days), the patient's mental state deteriorated, presenting signs of TMA with posterior reversible encephalopathy syndrome. - After the onset of TMA, intermittent hemodialysis and plasma exchange were initiated; however, her condition did not improve, and eculizumab administration was initiated thereafter. The patient's symptoms showed a remarkable response to eculizumab; thrombotic microangiopathy findings, kidney function, and neurological symptoms improved, and C3 levels normalized after only two doses of eculizumab, and she achieved sustained remission. - Steroid doses decreased rapidly; the prednisolone dose was tapered to 5 mg/day at day 53 after admission. A follow-up MRI examination at 56 days after admission revealed that the PRES findings in the brain had resolved.
Case 25: Mandal, 2012	23, F	- MPA, - One-month history of fever, loss of appetite, and fatigue. - Advanced uremia (serum creatinine 9.8 mg/dL) with active urinary sediment and normal-sized kidneys on ultrasound, as well as severe anemia (hemoglobin 5.2 g/dL). - She was started on hemodialysis through an internal jugular catheter and a packed red cell transfusion was given. - MPO titer >500 IU/mL - Renal biopsy revealed necrotizing glomerulonephritis with crescent formation of the pauci-immune type with severe chronic glomerular and tubulointerstitial changes. Of 14 glomeruli, 11 were completely sclerosed. - On the sixth day dyspnea and sudden-onset anemia, thorax CT revealed bilateral pleural effusion with ground glass and nodular opacities without cavitation. - Respiratory distress progressed, requiring mechanical ventilation. Bronchoscopy revealed diffuse hemorrhage. She was started on plasma exchange. Due to continuous bleeding from the endotracheal tube, recombinant factor VII given, resulting in stopping of bleeding, respiratory improvement in the next 12 hours and extubation in 72 hours. - Plasma exchange was continued, and mycophenolate mofetil was started. She received five sessions of plasma exchange. - During the hospital stay, she received heparin-free dialysis, antibiotics, prednisolone, and mycophenolate mofetil. - Vasculitis active at the time of TMA.	- Platelet counts showed a downward trend, evaluation of which revealed evidence of TMA: fragmented red blood cells on peripheral smear, high LDH (3000 U/L), and normal prothrombin time). - She also had an episode of generalized tonic-clonic seizure. MRI showed features suggestive of PRES.	- Not present.	- Presumed vasculitic activity.	- She was restarted with plasma exchange for TMA and continued steroids and mycophenolate for MPA. - She was started on levetiracetam. There was gradual improvement in her general condition and hematological parameters; she was discharged and put on maintenance hemodialysis program.
Case 26: Jha, 2022	26, F	- SLE, - Generalized edema, elevated blood pressure, albumin: 2.5 g/dL, serum creatinine: 0.9 mg/dL. - Further laboratory tests revealed anemia, thrombocytopenia, hypoalbuminemia, azotemia, elevated LDH, urinalysis 3+ protein, and numerous erythrocytes in urine sediment. - Chest x-ray: Bilateral pleural effusion, - Abdominal ultrasound: Splenomegaly, ascites, portosystemic and splenorenal collaterals suggestive of portal venous thrombosis. - ANA 1/100 homogeneous, anti-dsDNA positive, C3 and C4 low, ANCA and antiphospholipid antibodies negative. - She became oliguric, hemodialysis was initiated. Empirical broad-spectrum antibiotics, intravenous loop diuretics, unfractionated heparin, oral antihypertensives, and co-trimoxazole and hydroxychloroquine were administered. - On the 11th day of admission dyspnea and hemoptysis developed with CT demonstrating diffuse alveolar hemorrhage. - SLE active at the time of TMA.	- Anemia, thrombocytopenia, elevated LDH, - Peripheral blood smear: suggestive of microangiopathic hemolytic anemia with schistocytes. - Azotemia, urinalysis: 3+ protein, numerous erythrocytes in urine sediment.	Kidney biopsy: Fifteen glomeruli, non-globally sclerosed. Eight crescentic glomeruli (seven cellular, one fibrocellular); two glomeruli have secondary segmental tuft necrosis. Tubular atrophy and interstitial fibrosis in 10-12% of the sampled cortex. Several arterioles and occasional arteries with necrotizing lesions, erythrocyte fragmentation, and fucsinophilic deposits in the walls. Direct immunofluorescence: full house pattern. Class IV lupus nephritis activity index 18/24, chronicity index 2/12.	- Presumed vasculitic activity of SLE.	After renal biopsy, pulse methylprednisolone was initiated, followed by oral prednisolone, 6 cycles of intravenous cyclophosphamide administered every 14-21 days over a period of 16 weeks. - Sixteen sessions of PE performed over a period of 6 weeks for persistent thrombocytopenia and microangiopathic hemolytic anemia. - IVIG administered for 5 days (0.4 g/kg/day), every 21 days. -Hemodialysis, plasma exchange, immunosuppressives and supportive measures gradually improved alveolar hemorrhage - Urine output started to improve over 4 weeks. - TMA improved after 3 months. - Heparin was switched to warfarin after 2 months and stopped after about 6 months once albumin became normal. - At six months creatinine became 1.1 mg/dL, no ascites but persistent proteinuria (800 mg/day, with 3-4 erythrocytes/HPF); complements normalized, but anti-ds DNA remained positive. - Patient discharged with 10 mg/day prednisolone, 2×1 g MMF, hydroxychloroquine, furosemide, spironolactone, telmisartan, and calcium supplements.
Case 27: Jabr, 2003	25, F	- Behcet's disease, - Generalized weakness, fever, jaundice, anorexia, and decreased concentration. - Anemia, thrombocytopenia, reticulocytosis, indirect bilirubinemia, elevated LDH, schistocytes in peripheral blood smear, direct Coombs test negative, normal coagulation tests, normal creatinine (0.9 mg/dL), ESR: 105 mm/hour, - Lower extremity deep vein thrombosis - Recurrent oral and genital ulcers, acneiform lesions, - Disease active at the time of TMA.	- Hemoglobin: 5 g/dL, hematocrit: 14%, platelet count: 11×10^9/L, reticulocyte: 3%, - LDH: 870 U/L, total bilirubin: 7.3 mg/dL, direct bilirubin: 3.1 mg/dL, negative direct Coombs test, - Peripheral blood smear: Schistocytes, - Coagulation tests negative.	- Not present.	- Presumed vasculitic activity of Behcet's disease.	- The patient received blood products and multiple plasma exchange transfusions. - Within 3 weeks, she improved completely. The hemoglobin level was 15 mg/dL, the platelet count was 160×10^9/L, and indices of hemolysis had completely normalized (LDH 134 IU/liter). - The patient was maintained on colchicine, warfarin, and prednisone. Thereafter, she did not have a relapse of TTP but had recurrent major venous thrombosis in the hepatic vein and the inferior vena cava, suggestive of vascular thrombotic complications related to Behçet disease.
Case 28: Lim, 1998	66, F	- GPA, - Abdominal pain, sudden deafness, facial palsy, and oliguria. 3 weeks history of nasal congestion. - Physical examination: Red eye, nasal ulceration, - Creatinine: 6.2 mg/dL, urinalysis: 300 mg/dL proteinuria, many eryrhrocytes. - ESR: 47 mm/hour, CRP: 209 mg/L, neutrophilic leukocytosis, hemoglobin: 9.9 g/dL, platelet: 201×10^9/L, - Maxiallary sinusitis in MRI, - c-ANCA 1/640 positive, - Nasal septal biopsy: necrotizing granulomatous vasculitis, - Under immunosuppressive treatment, dyspnea developed, hemoglobin dropped to 5 g/dL, platelet:157×10^9/L, - Five days after alveolar hemorrhage, TMA developed. - Vasculitis active at the time of TMA.	- Hemoglobin: 6 g/dL, platelet: 28×10^9/L, - Elevated LDH: 902 U/L, - Coombs test and antiplatelet antibody negative, - Reduced haptoglobin, - Peripheral blood smear: Schistocytes.	- Not present.	- Presumed vasculitic activity.	- Hemodialysis initiated. - Pulse methylprednisolone for 3 days followed by 1 mg/kg/day prednisolone and oral CYC 2 mg/kg/day was given. - After alveolar hemorrhage onset, erythrocyte transfusions were given, pulse methylprednisolone was repeated for 3 days, followed by 1 mg/kg/day prednisolone and oral CYC was continued. - After onset of TMA, plasmapheresis was performed. After plasmapheresis, hemoglobin was 9.2g/dL, platelet count was 141×10^9/L without further transfusion, the follow- up titer of c-ANCA was 1/40, ESR: 6mm/hr, CRP was normal. Oliguria and all systemic symptoms were resolved. - She remains on maintenance oral CYC and tapering doses of prednisolone.
Case 29: Green, 1988	18, F	- Small vessel vasculitis (probably AAV), - Hemoptysis and dyspnea, easy fatigability, diffuse abdominal pains, fever, reduced urine output. - Hemoglobin: 5.5 g/dL, PLT: 400×10^9/L, normal leukocyte count. - Urinalysis: 4+ red blood cells, 2+ protein, red blood cell and granular casts, and oval fat bodies. - Creatinine: 8.2 mg/dL, ANA negative, anti-GBM negative, C3-C4 normal. - Chest x-ray: Bilateral alveolar infiltrates. - Hemodialysis initiated, pulse methylprednisolone for 3 days, followed by 60 mg/day oral prednisolone, oral cyclophosphamide, red blood cell transfusions, and oxygen with dramatic improvement of patient's condition and resolution of alveolar infiltrates. - However, the patient remained oligoanuric. - Kidney biopsy: Crescentic glomerulonephritis (90% of glomeruli crescentic, and 50% of crescents were sclerotic), without immune deposits - Patient was discharged with steroids, and cyclophosphamide and was put on chronic dialysis program. - Two months later, the patient presented with weakness and looked pale. - Vasculitis was in remission at the time of TMA.	- Elevated blood pressure (170/100 mmHg), - Hemoglobin: 4 g/dL, reticulocytes 27%, low, haptoglobin, Coombs tests negative, platelets: 30×10^9/L. - Peripheral blood smear: Severe red blood cell fragmentation, - Excessive amount of von Willebrand factor multimers. - Clinical course complicated by excessively hypertensive periods, with one episode where blood pressure was 210/130 mmHg, and one of these episodes causing hypertensive encephalopathy, with grand mal seizures and coma. Intensive antihypertensive treatment with sodium nitroprusside was initiated, which was replaced by minoxidil and metoprolol once the patient regained consciousness.	- Not present.	TTP (secondary to presumed vasculitic activity).	- Treatment with fresh frozen plasma was initiated, but it did not improve hematological parameters. - Plasmapheresis was initiated, carried out every two days with four liters removed and replaced by albumin and fresh frozen plasma. Two weeks later, a dramatic response with rise of hemoglobin, cessation of microangiopathic hemolysis and platelets increasing to 110×10^9/L, - Clinical course complicated by excessively hypertensive periods, with one episode where blood pressure was 210/130 mmHg, and one of these episodes causing hypertensive encephalopathy, with grand mal seizures and coma. Intensive antihypertensive treatment with sodium nitroprusside was initiated, which was replaced by minoxidil and metoprolol once the patient regained conscousness. - Following this hospitalization, the patient was readmitted four more times in the same year due to recurrent episodes of alveolar hemorrhage complicated by hypoxemic respiratory failure. The patient responded each time to pulse methylprednisolone treatment, cyclophosphamide, plasmapheresis and respiratory assistance, requiring mechancial ventilation with positive-end expiratory pressure on the last two occasions. - Two years later patient was in good condition, continuing hemodialysis and continuing to receive steroid and CYC.
Case 30: Hirsch, 1995	66, F	- Microscopic polyangiitis, - Four-week history of dry cough, night sweats, poor appetite, and weight loss. - Hypertension (160/80 mmHg), acute kidney injury creatinine progressing from 1.1 to 3.8 and then to 10.7 mg/dL. Urinalysis: Many red blood cells, heme-pigmented granular casts, and significant proteinuria (1.4 g/day). Ultrasonography showed normal-sized kidneys. - p-ANCA 1/320+, MPO positive, ANA 1/100 positive, anti-dsDNA negative, anti-GBM negative. - IV pulse steroid, followed by high-dose oral prednisolone and oral CYC given. TMA developed under this regimen. Vasculitis active at the time of TMA	- Hemoglobin: 6.7 g/dL, PLT: 98×10^9/L, LDH: 700U/L, low haptoglobin, - Peripheral blood smear revealed schistocytes. - Acute congestive heart failure with early repolarization in all electrocardiogram leads and minor increases in creatinine kinase MB (myocarditis).	**Kidney biopsy:** Fifteen glomeruli present, all of which were slightly enlarged and showed thickening of capillary loops, diminution of lumina, and mesangial expansion. Five glomeruli had epithelial crescents. There was a moderate interstitial mixed cellular infiltrate. The blood vessels showed marked widening of the subendothelial space, which was occupied by fibrillary-mucoid material and scattered inflammatory cells. Ultrastructurally, the main changes were irregular widening of subendothelial spaces with deposits of fluffy and fibrillar material; cytoplasmic fragments were also present. There was intermittent flattening of foot processes. No electron-dense deposits were observed.	- Presumed vasculitic activity.	- Intravenous pulse methylprednisolone 1 g/day for 3 days, followed by prednisone 100 mg/day orally. Oral CYC 125 mg/day. - Acetylsalicylic acid 325 mg/day and plasmapheresis (plasma exchange with fresh frozen plasma for 4 sessions) performed. Hemodialysis initiated 3 times a week. - After this treatment, platelet count was normal, and hemoglobin was stable at 100 g/L without further transfusions. Congestive heart failure had resolved, with normalization of the electrocardiogram. Oliguria of less than 400 mL/day persisted. - The patient remains on maintenance hemodialysis, acetylsalicylic acid, cyclophosphamide, and tapering doses of prednisone. All systemic complaints other than renal failure have resolved.
Case 31: Kuroda, 1986	70, F	- Polyarteritis nodosa (with multiple cranial nerve involvement), - Fever, decreased vision in the left eye, hearing loss in the right, hoarseness, and difficulty swallowing. - Patient received steroid twice for left retrobulbar optic neuritis. Visual symptoms recurred a third time together with fever. Although corticosteroid therapy was administered, patient's vision in his left eye did not improve. Meanwhile, his right-sided hearing loss persisted. Then he began experiencing daily fever, nausea, and vomiting, and he developed a hoarse voice and swallowing difficulties, which gradually worsened. - Physical examination: Mild exophthalmos and marked bulbar conjunctival congestion were observed in the left eye. Eye movements were normal. Sensation was decreased in the first division of the left trigeminal nerve, and the left corneal reflex weakened. Severe sensorineural hearing loss on the right side. Paralysis of the right soft palate and vocal cords, as well as difficulty swallowing and hoarseness, were noted. Laboratory results: elevated CRP and ESR, normal creatinine; urinalysis: proteinuria, hematuria; urine sediment: red blood cells, white blood cells, and granular casts. - During the follow-up, right bulbar conjunctival hyperemia and impaired left eye upward movement also developed. During the follow-up, TMA features emerged. - After fresh frozen plasma treatment, the patient suffered from hemoptysis and, convulsion leading to "status epilepticus". - Autopsy: Polyarteritis nodosa features were present. Macroscopically, beaded changes were observed in some of the small arteries around the stomach and transverse colon. Histologically, vasculitis characterized by fibrinoid necrosis was observed in small arteries, particularly in the small arteries of the kidneys, adrenal glands, and jejunum, as well as in the small arteries around the stomach and colon. Aneurysms were observed in some areas. In the kidneys, many small arteries showed wall thickening and luminal narrowing due to granulation and scar tissue accompanied by glomerular degeneration. - Cranial nerves: The main finding was marked inflammatory cell infiltration in the epineurium and intraneuron, and cranial nerve degeneration was also observed. Similar inflammatory cell infiltration was also observed in the extraocular muscles in the same area. - Vasculitis active at the time of TMA.	- Anemia (hemoglobin: 7.4 g/dL), - Thrombocytopenia (23×10^9/L), - Reticulocytosis (3.2%), - Schistocytes in peripheral blood smear, - Coombs test negative. - Normal coagulation tests, - Creatinine increased to 2.4 mg/dL, - Convulsion.	- Gingival biopsies revealed two hyaline microthrombi. - Autopsy results: - In the kidneys, many small arteries showed wall thickening and luminal narrowing due to granulation and scar tissue. - Bleeding tendency. Multiple hemorrhagic foci were observed in the right temporal lobe cortex, right atrial wall, liver, left upper lobe of the lung, superior mediastinal connective tissue, and skin. - Hyaline microthrombi were observed in small blood vessels in the myocardium and both adrenal glands.	- Presumed vasculitic activity.	- Fresh frozen plasma given for TMA. - One day later, the patient had hemoptysis, with bloody pleural effusion on the left lung. - Then, the patient had convulsions, which led to a "status epilepticus". - Anticonvulsants were given for convulsions, but the patient's impaired consciousness persisted, and visual hallucinations developed. - Dexamethasone treatment was administered, resulting in rapid improvement of the bulbar conjunctival congestion and right soft palate paralysis. - Renal dysfunction gradually worsened, leading to oliguria, and the patient died.
Case 32: Manenti, 2013	66, M	- Granulomatosis with polyangiitis, - Diagnosed 2 years ago, without renal involvement. - Vasculitis active at the time of TMA.	- Acute renal failure, nephrotic-range proteinuria, - Hemolysis, thrombocytopenia - No mutations of CFH, MCP, and CFI were identified, but the patient carried the aHUS-predisposing CFH-H3 risk haplotype in homozygosity.	- Kidney biopsy: A kidney biopsy confirmed the presence of necrotizing extracapillary proliferative glomerulonephritis with signs of TMA (illustrating extracapillary proliferation, fibrinoid necrosis, and intracapillary thrombi). - Immunofluorescence showed intense and diffuse C3 deposition.	- Presumed vasculitic activity.	- Plasma exchange, steroids, and cyclophosphamide - After 32 days, the laboratory signs of TMA disappeared; renal function only partially recovered (serum creatinine decreased from 10.95 to 4.98 mg/dL). - After 20 months, he was started on hemodialysis, although no aHUS recurrence occurred, and 10 months after the beginning of hemodialysis, he died of sepsis.
Case 33: Manenti, 2013	32, M	- Henoch-Schönlein purpura (IgA vasculitis), - Nephrotic syndrome (proteinuria 10 g/day), palpable purpura involving the lower extremities, abdominal pain, and diarrhea. - Kidney biopsy: Crescentic glomerulonephritis with IgA and intense C3 deposition on immunofluorescence. - Steroids and oral cyclophosphamide given. - Vasculitis active at the time of TMA.	- Despite steroid and cyclophosphamide treatment, nephrotic syndrome persisted and was complicated by insidious hemolysis with rapidly progressive kidney failure (serum creatinine rose from 1.39 to 3.31 mg/dL). - No mutations of CFH, MCP, and CFI were identified, but the patient carried the aHUS-predisposing CFH-H3 risk haplotype in homozygosity - 1 year later patient developed TMA features with severe thrombocytopenia, anemia, and renal failure.	Repeat kidney biopsy: Extracapillary proliferation associated with intracapillary thrombi and arteriolar thrombosis.	- Presumed vasculitic activity.	- The clinical picture was unresponsive to high-dose steroids, and the patient refused plasma exchange. Rituximab (375 mg/m^2/weekly for 4 weeks) administered. Signs of hemolysis disappeared, but renal failure and nephrotic-range proteinuria persisted. One year later the patient developed overt TMA features, he finally accepted to start plasma Exchange, and hemolysis subsided after 14 days. However, renal function did not improve, and he had to start hemodialysis.
Case 34: Fukui, 2015	71, M	- EGPA and SLEi - Patient with a history of bronchial asthma diagnosed 11 years ago and had a history of operation for bilateral maxillary sinusitis - Thrombocytopenia (initially 80×10^9/L, which later dropped to 20×10^9/L, with petechia and purpura emerging on legs. - Patient was subfebrile, had dyspnea, tachypnea, and wheezing over the entire lung field. There was pitting edema, petechia, and palpable purpura on both legs. - Eosinophilia (9.97×10^9/L), normal serum creatinine, CRP: 23.8 mg/L, anemia and thrombocytopenia, low haptoglobin, and schistocytes. - Immunoglobulin E: 3017 IU/mL, MPO: 10.2 EU/mL, anti-dsDNA: 27.4 IU/mL, ANA negative, C3 and C4 low, urinalysis: microscopic hematuria and proteinuria (0.74 g/day), - CT: Maxillary sinusitis, - Chest CT: Peripheral ground glass opacity, dilated heart, and large amount of pleural effusion. - Cardiac MRI: intraventricular thrombus and thin endocardium with high-intensity signal. - Bone marrow specimen: prominent eosinophilia, - Diseases active at the time of TMA.	- Hemoglobin: 7.5 g/dL, platelet: 16×10^9/L, - Low haptoglobin, - Peripheral blood smear: Schistocytes. - ADAMTS13 activity low, ADAMTS13 inhibitor negative.	-Skin biopsy: Fragmentation of the internal elastic lamina, immunohistochemical staining of complement 3 deposition in the vessel wall.	- TTP secondary to presumed vasculitic activity.	- Pulse intravenous methylprednisolone (1000 mg/day) for 3 consecutive days and plasmapheresis. - After these treatments, the eosinophils disappeared, and the patient's dyspnea was improved. Regarding the TMA, the schistocytes disappeared, and hemolytic anemia improved. Plasmapheresis finished after only 2 consecutive days. - After pulse steroids, 55 mg/day of prednisolone was administered, and the patient's MPO-ANCA titer and anti-dsDNA antibody declined gradually. The high-intensity signal in endocardium on MRI was diminished 3 weeks after the start. of pulse steroid. Patient's hypocomplementemia also improved. Eosinophils remained negative.
Case 35: Moronti, 2023	67, M	- Microscopic polyangiitis, - Patient received the third dose of the anti-SARS-CoV2 vaccine mRNA-1273 three weeks before the onset of symptoms. - Anuria, fatigue, anorexia and nausea, hypertension, - Creatinine 21.23 mg/dL, - P-ANCA positive, 394.9 MPO IU/mL, low C3, normal C4. - Thorax CT: Paraseptal emphysema, abdominal CT: mild hepatomegaly, - Seven days later TMA features became evident: hemoglobin:10.1 g/dL, platelets: 132×10^9/L, LDH:369 U/L, low haptoglobin. - Twelve days after admission, due to hypoxemia, patient required high-flow oxygen therapy. chest CT demonstrated bilateral dependent pleural effusio and areas of reduced ventilation in the perihilar area with some patchy areas of consolidation. Findings compatible with initial interstitial-alveolar edema with inflammation, but the patient never experienced hemoptysis during the hospital stay. - Vasculitis active at the time of TMA	- Seven days later TMA features became evident: hemoglobin: 10.1 g/dL, platelets: 132×10^9/L, LDH: 369 U/L, low haptoglobin. - Peripheral blood smears: schistocytes, - Anuria, elevated creatinine 21.23 mg/dL, - ADAMTS13 activity normal, - Genetic tests for aHUS predisposition: a polymorphic deletion of CFHR3/CFHR1, frequently mutated in the general population, and absence of hybrid genes associated with the increased risk of aHUS.	-Kidney biopsy: Evidence of intraglomerular thrombi, fibrinoid necrosis with neutrophilic granulocyte infiltrate and fibrocellular crescents, tubular atrophy, and presence of intratubular hyaline cylinders. Interstitial mild edema alongside a moderate inflammatory infiltrate in the periglomerular area consisting of small lymphocytes, neutrophil granulocytes, histiocytes and some plasma cells. -Findings were consistent with microscopic polyangiitis, with features of microthrombotic glomerulopathy	- Presumed vasculitic activity.	- Patient treated with pulsed methylprednisolone (1000 mg/d for 3 consecutive days) and subsequently with 1 mg/kg prednisolone for 7 days, with improvement of the renal and hematological parameters. - Plasma exchange was performed, leading to partial hematological response (schistocytes disappeared), however, anemia, low platelet count, and end-stage renal disease persisted. - Twenty-one days after hospitalization, due to the worsening of the hematological pictures, eculizumab was initiated. A normalization of haptoglobin levels and platelet count was observed after 6 weeks of therapy and the patient was eventually discharged. - Three months after ematological parameters stabilized, glucocorticoid therapy was tapered until withdrawal 4 weeks after discharge, and p-ANCA were negative. Eculizumab therapy was maintained with no aHUS flare. - Three months after discharge, renal function did not return to normal, and the patient still required hemodialysis.
Case 36: Nada, 1990	71, M	Small vessel vasculitis, - Chronic history of chronic obstructive pulmonary disease, - One month history of progressive dyspnea, fatigue, myalgia, weight loss, - Chest x-ray: bilateral basilar interstitial infiltrates and pleural effusions. Thoracentesis revealed that the effusion was exudate. - Pulmonary function tests showed lung volumes that were decreased from an earlier study and substantially reduced carbon monoxide diffusing capacity. - Open-lung biopsy: Interstitial fibrosis and dense fibrosis of the pleura. - Creatinine: 1.2 mg/dL, grade 1 proteinuria but without microscopic hematuria, - Therapy with prednisone, 40 mg orally every other day, was initiated. - One month later creatinine progression to 1.8 mg/dL, grade 3 microscopic hematuria, - Despite treatment of the patient with an alternate-day prednisone regimen, continued deterioration of renal function necessitated dialysis 2 weeks later; he died 3 months after his initial examination. - A review of the initial open lung biopsy demonstrated active small-vessel pulmonary vasculitis was found. - Vasculitis active at the time of TMA.	- Creatinine: 1.8 mg/dL and proteinuria, renal dysfunction later progressed, requiring dialysis.	Autopsy: An autopsy revealed pulmonary fibrosis and a thrombotic microangiopathy of the kidneys, consistent with a healed vasculitis. No deposition in immunofluorescence.	- Presumed vasculitic activity.	Not available, because the TMA detected in autopsy.
Case 37: Nagai, 2008	77, F	- Microscopic polyangiitis, - Fever and general fatigue, serum level creatinine: 2.80 mg/dL, urinalysis revealed microscopic hematuria and proteinuria - Due to reduced urine output, the patient required dialysis. - Physical examination: Slight pitting edema in the lower limbs. Coarse crackles in both lower lung fields. Purpura in the left lower limb. Paralysis and sensory disturbance of the left lower limb. - Platelets: 1.41×10^9/L, hemoglobin: 12 g/dL, LDH: 539 U/L, reticulocytosis, low haptoglobin. - Creatinine: 3.95 mg/dL, 3+ hematuria >100 erythrocytes/ HPF, 2+ proteinuria, - MPO: 238 EU, CRP:42.4 mg/L, - Vasculitis active at the time of TMA.	- Platelets: 1.41×10^9/L, hemoglobin: 12 g/dL, LDH: 539 U/L, reticulocytosis, low haptoglobin. - Creatinine: 3.95 mg/dL, 3+ hematuria >100 erythrocyes / HPF, 2+ proteinuria, - Peripheral blood smear: Schistocytes, - Moderately decreased ADAMT3 13 activity.	Renal biopsy could not be performed because of patient's general condition.	- Presumed vasculitic activity.	High-dose methylprednisolone (1 g, 3 days) was initiated, followed by 60 mg/day of prednisolone. Although serum CRP and the titer of MPO-ANCA rapidly decreased, hemoglobin and PLT gradually decreased. She was diagnosed with TTP, and plasma exchange was initiated. - Although red blood cell fragmentation disappeared 10 days after the initiation of PE, thrombocytopenia continued for more than a month. PE was performed two or three times a week during the first 8 weeks after its initiation. PLT gradually increased, and the serum haptoglobin level returned to normal. ADAMTS13 activity increased to 68%. ADAMTS13 activity increased to 68%. Her clinical and laboratory findings were improved, hemodialysis was discontinued on the 67th hospital day, and prednisolone tapered to 27.5 mg/day.
Case 38: Naina, 2009	58, F	- Necrotizing vasculitis, - Patients presented with progressive fatigue and pain in both feet. She was diagnosed with peripheral neuropathy, had a monoclonal protein (IgG lambda), bone marrow biopsy: 5%, with no sign of amyloidosis. - Sural nerve biopsy: Necrotizing vasculitis, - Creatinine: 0.9 mg/dL, 393 mg/day proteinuria, total complement, C3 and C4 were all low. ANA, ANCA negative. - She was treated for systemic vasculitis with prednisone. 60 mg a day. After 4 weeks of prednisone, monoclonal protein fell by more than 25%, however, proteinuria and creatinine progressed. A renal biopsy showed mesangial and segmental endocapillary proliferative glomerulonephritis. Monoclonal protein was felt to play a role in her underlying renal disease and peripheral neuropathy. - Patient received prednisone 60 mg for 6 weeks and then tapered gradually. Then for preparation for autologous hematopoietic stem cell transplantation with granulocyte colony stimulating factor. - Vasculitis probably in remission at the time of TMA.	- Hemoglobin decreased to 8.1 g/dL, - Platelets decreased to: 28×10^9/L, - LDH increased to 378 U/L, - Peripheral blood smear: Schistocytes >2%, - Creatinine increased to 1.6 mg/dL, - C3 and C4 decreased, - ADAMTS13 activity before therapeutic plasma exchange was normal.	Not present.	- Peripheral blood stem cell mobilization with G-CSF.	- Started on once-a-day therapeutic plasma exchange with cryo-poor plasma and 3 weekly doses of rituximab (375 mg/m^2). - Seven weeks following the diagnosis of TMA, she successfully underwent HSCT. Her prednisone was discontinued before HSCT. She was started on GM-CSF 500 mcg per day from Day 6 following HSCT for a total of 7 days. She has been monitored for 5 years and has not had a recurrence of her TMA; creatinine is 1 mg/dl, and monoclonal protein is undetectable by immunofixation. She has had a moderate improvement in her peripheral neuropathy.
Case 39: Torun, 2022	20, F	- Takayasu arteritis, - A 20-year-old woman presented with pain in the right arm that increased with movement. Physical examination demonstrated weak pulses in the right radial artery and right brachial artery. - Complete blood count was normal, creatinine: 0.8 mg/dL, but ESR: 50 mm/hour and CRP 35 mg/L. Magnetic resonance angiography revealed total occlusion of a 15 cm segment extending from the distal part of the subclavian artery to the right axillary artery and to the proximal part of right brachial artery, and collaterals extending to the distal part of the right brachial artery. - Diagnosis of Takayasu arteritis was established. She was treated with prednisolone, azathioprine, and acetylsalicylic acid. During follow-up, pancytopenia occurred, which rapidly normalized upon discontinuation of azathioprine. After discontinuation of azathioprine, she was treated with methotrexate, which did not cause cytopenias. - Three years later, the patient presented to our department with elevated blood pressure. Blood pressure was 170/110 mm Hg in the left arm and 130/100 mm Hg in the right arm. Fundoscopic examination revealed bilateral grade 1 hypertensive retinopathy. Creatinine was 1.1 mg/dL, and CRP was 30 mg/L. Abdominal CT angiography demonstrated reduced calibration of the aorta and increased wall thickness at the level of renal arteries, almost total occlusion of the lumen of the proximal 1.5 cm segment of the left renal artery starting from the level of the ostium and almost total occlusion of the lumen of the proximal 3 cm segment of the right renal artery starting from the level of the ostium. She received 32 mg methylprednisolone (with a gradual tapering regimen). Methotrexate was discontinued, and she received the first dose of IV tocilizumab. She received nebivolol, amlodipine, and doxazosin as antihypertensive medications and was discharged from the hospital. - One month later, she presented with blurred vision in the left eye. Fundoscopic examination revealed bilateral grade 3 hypertensive retinopathy and serous detachment of retina in the left eye. - Blood pressure was 190/100 in the left arm and 150/90 in the right arm. Laboratory features demonstrated TMA. - Vasculitis partially active at the time of TMA.	- Hemoglobin: 9.82 g/dL, - Platelets: 88×10^9/L, - LDH: 706 U/L, - Low haptoglobin, - Peripheral blood smear revealed 2-3 schistocytes in every field. - Elevated creatinine (1.4 mg/dL.	- Not available.	Malignant hypertension with the contribution of presumed vasculitic activity.	In order to adequately control the disease activity, a second dose of IV tocilizumab was administered, and the methylprednisolone dose was maintained at a dose of 20 mg/day. Dose of the antihypertensives was increased, and new antihypertensives were initiated. Despite treatment with maximum doses of carvedilol, doxazosin, amlodipine, IV furosemide, isosorbide mononitrate, and moxonidine, blood pressure was not controlled adequately. Creatinine increased to 1.8 mg/dL, and hypervolemia developed. Hemoglobin decreased to 7.65 g/dL, and platelet count decreased to 58×10^9/L, - Until the intervention, she had undergone 7 sessions of ultrafiltration in 10 day. This modality had effectively removed the excess fluid from the patient, causing her weight to drop from 87 to 77 kg. The interventional radiology department considered the right renal artery inappropriate for intervention. Balloon dilation was performed in the left renal artery, and a stent was placed there. - After the intervention, blood pressure was under control with carvedilol, amlodipine, and 4 mg/day of doxazosin. The creatinine level dropped to 0.7 mg/dL, and the hemoglobin and platelet count increased. - Two years after the discharge, the patient is normotensive on carvedilol, amlodipine, and a low dose of doxazosin. Blood count, CRP, creatinine, and LDH levels are normal. She continues to receive tocilizumab, 4 mg/day methylprednisolone, and acetylsalicylic acid.
Case 40: Pagnaux, 2010	25, F	- Patient with a history of GPA. diagnosed at the age of 24, - GPA features: Fever, arthralgia, renal failure (creatinine 5.65 mg/dL, kidney biopsy: necrotizing glomerulonephritis), and alveolar hemorrhage. PR3 positive - Patient treated with corticosteroids, plasma exchange, ad 6 doses of intravenous CYC. For maintenance, patient switched from CYC to azathioprine. - Patient in remission with normal blood pressure, a creatinine of 1.7 mg/dL, proteinuria of 2.5 g/day, and negative ANCA, she was receiving 12. 5 mg/day prednisolone and 125 mg/day azathioprine. - Antepartum hemorrhage at 23 weeks, due to posterior placenta praevia. - Vasculitis in remission at the time of TMA.	-At 27 weeks (under 10 mg/day prednisolone and 125 mg/day azathioprine treatment), renal function deteriorated with hypertension (180/100 mmHg), proteinuria 7 g/day, and creatinine progreesion to 5.91 mg/dL, leading to a caesarean at the 32nd week and kidney biopsy. Newborn 1690 g (63rd percentile) and in good health.	- **Kidney biopsy:** thrombotic microangiopathy but no vasculitis.	- Preeclampsia. TMA caused severe renal insufficiency in a patient with persistent vasculitis-related renal impairment.	- Plasma exchange and anti-hypertensive drugs. - End-stage renal disease with definitive dialysis since the 7th month post-delivery. - At the 14th month, at the last visit after delivery, the prednisolone dose was 5 mg/day and the azathioprine dose was 100 mg/day.
Case 41: Patel, 2021	34, M	- IgA vasculitis, - Abdominal pain, nausea, vomiting, and loose stools; received one dose of non-steroidal anti-inflammatory drug, but the pain did not respond to it. - Imaging revealed diffuse duodenitis. - Then bloody stools started. The patient was treated with antibiotics. - Creatinine was initially normal but started to increase. Urinalysis revealed 1.64 g/day proteinuria, rare granular casts, and white cell casts. - Anemia and thrombocytopenia developed, and LDH and haptoglobin were abnormal. C3 and C4 were low. - Biopsy of his papular rash: leukocytoclastic vasculitis with IgG, IgA, and fibrinogen staining of capillary loops. - Duodenal biopsies: vascular fibrinoid necrosis with neutrophilic infiltrate and IgA staining of the lamina propria, though visualization was limited due to high background staining. Helicobacter pylori staining was negative on stomach biopsy. - Together, these biopsies supported a diagnosis of systemic IgA vasculitis, for which he was started on methylprednisolone. - Vasculitis active at the time of TMA	- Anemia, thrombocytopenia, - Abnormal LDH and haptoglobin, - C3 and C4 low, - Creatinine which was initially normal, started to increase. Urinalysis revealed 1.64 g/day proteinuria, rare granular casts, and white cell casts, - Creatinine progression continued, and patient became anuric, necessitating hemodialysis. - ADAMTS13 activity 53%, - Genetic evaluation of complement regulatory factors: unrevealing.	- **Kidney biopsy:** TMA with glomerular fibrin thrombi and diffuse tubular injury, without glomerular crescents. -Immunofluorescence of limited kidney tissue returned as 2 + IgA, C3, and fibrinogen staining with 1 + IgG and C1q staining of the mesangium and capillary loops, suspicious for IgA nephropathy. - Electron microscopy revealed mesangial and subepithelial immune complex deposits with rare capillary fibrin tactoids.	- Presumed vasculitic activity.	- Patient received prednisone for IgA vasculitis and eculizumab for TMA. - Within one week of discharge, the patient had an increase in urine output, rapid improvement in serum creatinine, and normalization of serum C3 and C4. - He stopped dialysis within 20 days. - Steroids are being tapered, and given the negative aHUS genetic testing, eculizumab has been discontinued.

Case 42: Perrin, 2016	70, F	- PAN, - Patient hospitalized for investigation of etiology of acute oligo-anuric renal failure and malignant hypertension. - Patient had fever, constitutional symptoms (history of weight loss), blood pressure: 200/110 mmHg, livedo reticularis of the lower limbs, right orchitis, and bilateral painful ulnar sensory deficit, which was initially mild, then progressively worsening. Laboratory: Hematological features of TMA, CRP: 100 mg/L, creatinine: 14.7 mg/dL, proteinuria of 5 g/day, pyuria (urine culture positive for *E. coli*). - CT angiography: Kidneys of preserved size, with homogeneous contrast enhancement, and no microaneurysms. - Kidney biopsy performed. Thirty-six hours after the biopsy, the patient presented with hemorrhagic shock, with active leakage of contrast medium on arteriography at the lower pole of the right kidney. Embolization was performed, followed by drainage, without the need for nephrectomy. The patient was hospitalized for seven days in intensive care. - Review of the arteriography performed for renal embolization: multiple millimeter-sized renal microaneurysms, with a dead-tree appearance of the intraparenchymal vasculature. - Upon his return to the nephrology department, ecchymotic purpura appeared in the right ulnar territory. - Vasculitis active at the time of TMA.	- Hemoglobin: 8.9 g/dL, reticulocytosis, platelet: 89×10^9/L, low haptoglobin, schistocytes 2.3 %, - Creatinine: 14.7 mg/dL, proteinuria: 5 g/day.	Kidney biopsy: 22 glomeruli, including 3 apoplectic, 2 ischemic, and 2 fibroblastic glomeruli. There was significant interstitial fibrosis with tubular atrophy. The arterioles showed myocyte proliferation with wall enlargement and intimal edema, without thrombi.	- Malignant hypertension secondary to PAN+presumed vasculitic activity of PAN.	- Hemodialysis was initiated urgently, and antihypertensive treatments allowed for control of blood pressure and the disappearance of signs of thrombotic microangiopathy. Antibiotic therapy with ceftriaxone was started, resulting in the elimination of fever but without resolution of the inflammatory response. - Oral corticosteroid therapy at 2 mg/kg was initiated, along with intravenous cyclophosphamide treatment. The patient returned home after one month of hospitalization, still dependent on dialysis, with a corticosteroid tapering program. He died suddenly at his home 10 days later.
Case 43: Person, 2020	55, M	- Immune checkpoint inhibitor-induced vasculitis - Patient was diagnosed with a melanoma of the anal mucosa 8 months before his referral to the department of nephrology. - A radical excision was performed with a tumor-free margin, followed by watchful waiting with frequent restaging. Five months after the surgical removal of the primary tumor, imaging studies revealed multifocal hepatic metastases, and combined immune-checkpoint inhibitor therapy with nivolumab (1 mg/kg) and ipilimumab (3 mg/kg) was initiated. The treatment protocol called for 4 cycles every 3 weeks. - He had a history of activated protein C resistance and was on oral anticoagulation with phenprocoumon, a coumarin derivate. - After administration of the first cycle of nivolumab/ipilimumab, the patient developed fever, chills, and malaise. Dermatologists initiated a systemic therapy with glucocorticoids (methylprednisolone 100 mg/day). Because of the side effects, the second therapy cycle was delayed until 8 weeks following the first cycle. Steroid therapy was weaned 6 days before the application of the second therapy cycle. Ten days after administration of the second course of nivolumab/ipilimumab, more severe symptoms developed with a fever of up to 39 °C, rash, shortness of breath, and a dry cough. Because of his worsening clinical condition, he was admitted to the dermatology department where he was receiving his cancer therapy. He presented there with an elevated creatinine of 1.7 mg/dL (baseline of 1.2 mg/dL 3 weeks earlier). - Thorax CT: bilateral patchy opacities with a reticular pattern, leading to the diagnosis of therapy-associated (immune-related) pneumonitis. No granuloma or other evidence of sarcoidosis was apparent on CT. A systemic therapy with IV methylprednisolone 200 mg/day was reinitiated because of the severe organ manifestations. Besides pneumonitis, other immune-related adverse events that occurred before admission to the clinic included rash and uveitis. Because of a further decline in kidney function with oliguria, he was referred to the nephrology department. - Urinalysis: mild leukocyturia of 5 leukocytes/HPF, without cellular casts. Culture of the urine grew a few colonies (1000/mL) of *Escherichia coli*. - At the time of referral, the patient had abdominal pain, tenderness, and diarrhea. Sigmoidoscopy led to the diagnosis of immune-related colitis, upon which a rescue therapy with mycophenolic acid 720 mg 2 times a day and a single infusion of infliximab 5 mg/kg in a total dose of 400 mg was administered. Random biopsies of the colon showed no thrombi, and a bacterial cause was ruled out. Gastrointestinal symptoms resolved with treatment. -Vasculitis active at the onset of TMA.	- Progressive acute kidney failure, - ADAMTS13 activity normal, no ADAMTS13 inhibitors, - No anti-factor H antibodies and normal levels of complement factor H-related protein 1 (CFHR1) were found. - Blood smear showed no fragmentocytes, while the blood count showed a hemoglobin level of 11.9 g/dL and a platelet count within the normal range. - Patient displayed no neurologic symptoms.	**Kidney biopsy:** A total of 12 glomeruli were sampled, of which 3 were globally sclerosed, while the preserved ones displayed an ischemic collapse. One interlobular artery and several arterioles exhibited pronounced fibrinoid necrosis of the walls, some wall-adhering and infiltrating mononuclear cells, and massive fibrin thrombi in the lumens. About 50% of the tubulointerstitium showed irreversible damage with tubular rarefication, interstitial fibrosis with a pronounced mononuclear cell infiltrate, and multiple epithelioid cell granulomas with multinucleated giant cells. - In summary, the kidney biopsy presented a combination of severe granulomatous interstitial nephritis and an arteriolar vasculitis with multiple thrombotic microangiopathy-like thrombi and subsequent ischemic glomerular collapse.	Drug induced-immune checkpoint inhibitor (nivolumab and ipilimumab) TMA, possible contribution of presumed vasculitic activity.	- Because of persistent oliguria and volume overload, renal replacement therapy was started. - Despite combined rescue therapy including high-dose systemic glucocorticoids, mycophenolic acid, and infliximab, renal function did not recover, while extrarenal manifestations including colitis, pneumonitis, and rash resolved completely. - Six months after initiating renal replacement therapy, the patient is still dialysis-dependent. - The melanoma therapy was switched to pembrolizumab, another immune-checkpoint inhibitor. After 7 courses of therapy, the last staging showed progressive disease.
Case 44: Charney, 1999	43, F	- SLE with possible vasculitic involvement and TMA in kidney. - Patient had a history of hypertension. SLE was under control with hydroxychloroquine and prednisone. - Patient presented to emergency department with pneumonia symptoms. - Physical examination: Fever, lower extremity edema (which had been present for 5 days before admission), and right arytenoid/subglottic inflammation, but no skin rash. - Chest x-ray: Right lower lobe infiltrate and right pleural effusion. - Laboratory results: Hemoglobin: 10 g/dL, leukocytosis, platelet count normal, ESR: 102 mm/hour, creatinine: 2.6 mg/dL, albumin: 2 g/dL, urinalysis: 4+ proteinuria, numerous erythrocytes, 5-10 leukocytes, 1-2 hyaline casts, 2-3 granular casts/HPF. - Proteinuria 5.59 g/day, - Low C3, normal C4. ANA 1/640 homogeneous, anti-ds DNA: 1/80 positive. - SLE active at the time of TMA.	- Creatinine: 2.6 mg/dL, albumin: 2 g/dL, - Urinalysis: 4+proteinuria, numerous erythrocytes, 5-10 leukocytes, 1-2 hyaline casts, 2-3 granular casts/HPF. - Proteinuria 5.59 g/day, - Low C3, normal C4.	- Kidney biopsy: Diffuse proliferative glomerulonephritis with necrotizing lesions, crescents, and features of TMA - Twenty eight glomeruli per section, most showing either necrosis, crescent formation, or both. In addition, all glomeruli displayed intracapillary hypercellularity. There was a moderate interstitial inflammatory infiltrate consisting mostly of lymphocytes but with some neutrophils and eosinophils. Some small arteries and arterioles displayed luminal thrombi, suggestive of a thrombotic microangiopathy. A few small arteries also contained a few subendothelial mononuclear cells, neutrophils, and apoptotic cellular debris within their intima. (possibility of vasculitis) - IF microscopy performed on frozen tissue containing five glomeruli showed only segmental glomerular staining for IgM and fibrinogen, although a thrombosed arteriole stained brightly with fibrinogen. There was very mild segmental (probably non-specific) glomerular capillary loop staining for IgG, C1q, C3, kappa, and lambda. IgA staining was negative. - Tissue submitted for electron microscopy contained two glomeruli, one with a large cellular crescent. Ultrastructurally, only a few scattered subepithelial electron-dense deposits and vague mesangial densities were noted. A few endothelial tubuloreticular inclusions and widespread podocyte foot process effacement were also seen.	- Presumed vasculitic activity of SLE.	- Cefotaxime and erythromycin in the emergency room for her pneumonia, which resolved relatively rapidly. - For her newly diagnosed renal insufficiency, she received 100 mg intravenous methylprednisolone. - Kidney biopsy performed due to non-responsiveness of patient. - After biopsy, patient was begun on daily CYC, which was discontinued after 4 days. She additionally received 4 days of 100 mg intravenous methylprednisolone, which was tapered to prednisone after 4 days. She was discharged after her creatinine had stabilized to its baseline value of 1.2 mg/dL.
Case 45: Ross, 1996	66, F	- Granulomatosis with polyangiitis, - One-month history of reduced hearing, bilateral parotid gland swelling and hemoptysis. - Physical examination: mild fever, scleromalacia, bilateral middle ear effusions and bilateral non-tender parotid gland swelling. - CRP: 222 mg/L, - Urinalysis showed 3+ hematuria and 1+ proteinuria, - Chest X-ray showed a left mid-zone opacity consistent with pulmonary hemorrhage. - Parotid gland biopsy: a small cell. Infiltrate and fibrinoid necrosis of small arteries. - ANCA positivity, PR3 positivity. - Vasculitis probably active at the time of TMA.	- Features of microangiopathic hemolytic anemia and thrombocytopenia.	TMA features were not specified in biopsy or autopsy material.	- Presumed vasculitic activity.	- For GPA, 900 mg pulse of intravenous CYC and a 1000 mg pulse of methylprednisolone, followed by oral prednisolone, 30 mg/day were administered. - Although the fever, parotid swelling, and pulmonary opacity resolved, renal function deteriorated, and 10 days after initiating treatment, the serum creatinine was 4.52 mg/dL. Despite a course of plasma exchanges with human albumin solution, and further 500 mg intravenous pulses of both cyclophosphamide and methylprednisolone, the patient had two further episodes of pulmonary hemorrhage and became dialysis dependent. - MAHA was treated with a course of plasma exchanges with fresh frozen plasma, with an improvement in the platelet count. The patient's condition initially stabilized with no evidence of active disease, but subsequently her clinical condition deteriorated. - MAHA was again diagnosed, and a further course of plasma exchange with FFP was started with antibiotic therapy for a proven Gram-negative infection. Four days later, death was immediately preceded by an acute abdomen with melena. Macroscopic post-mortem examination demonstrated pulmonary hemorrhage, grossly normal kidneys, and multiple small bowel perforations. All these organs showed histological evidence of small-vessel vasculitis.
Case 46: Ross, 1996	68, F	- Microscopic polyangiitis, - One week history of peripheral dysesthesia, bilateral foot drop, diplopia, and dysphagia, - Urinalysis: 3+ hematuria, 1+ proteinuria, - A diagnosis of Guillain-Barré syndrome was considered, and the patient received plasma exchanges with human albumin solution. - Ten days later, treatment was started with an intravenous heparin infusion for a mismatched perfusion defect on a lung scan. - After 3 days, the patient experienced abdominal pain, became rapidly shocked, and a mass was noted in the right hypochondrium. Following resuscitation, abdominal ultrasonography and CT scanning demonstrated a large right perirenal hematoma. - The activated partial thromboplastin time was within the therapeutic range, and arteriography showed no visceral artery abnormality. - Serum creatinine progressed to 2.26 mg/dL (it was normal initially), - ANCA was positive with MPO positivity, - Vasculitis active at the time of TMA.	- Features of microangiopathic hemolytic anemia with schistocytes, - Platelet: 45×10^9/L, - Serum creatinine progressed to 2.26 mg/dL (it was normal initially), - Urinalysis: 3+ hematuria, 1+ proteinuria.	Not available.	- Presumed vasculitic activity.	- For MPA, the patient was treated with 100 mg/day oral CYC and 60 mg/day oral prednisone. - One week later, the patient had evidence of MAHA with schistocytes and thrombocytopenia. The patient's clinical condition progressively deteriorated, and she died shortly after becoming dialysis-dependent.
Case 47: Muñoz, 2021	45, F	- Microscopic polyangiitis associated with systemic sclerosis after systemic exposure to silicone. - Medical history: At age 40, she underwent silicone breast implantation for cosmetic reasons. Three years later her implant accidentally burst. - She was diagnosed with systemic sclerosis at age 44, after development of chronic fatigue, polyarthralgia, and Raynaud phenomenon. Treated with prednisone and methotrexate, which she discontinued 1 month prior to her current hospitalization. Previous renal function was normal. - Current symptoms: lower extremity edema, oliguria, fever, and hypertension, - Physical examination: Hypertension (204/101 mmHg) and peripheral edema. - Laboratory: Serum creatinine: 17 mg/dL, CRP 157 mg/dL and a normal platelet count. MPO: 97 IU/mL, - Imaging: Bilateral pleural and pericardial effusion as well as free liquid in the abdomen and enlarged lymph nodes in the right armpit and internal right mammary chain. - Alveolar hemorrhage and pericardial tamponade developed 72 hours later. - After stabilization: Right armpit node excision was performed, demonstrating foreign body granulomatosis with silicon inclusions. - Vasculitis active at the time of TMA.	- Hematologic features of TMA lacking. - Acute kidney injury with creatinine: 17 mg/dL.	Kidney biopsy: Necrotizing capillaritis, circumferential cellular extracapillary proliferation in 100% of glomeruli, 50% tubular atrophy and vascular endothelial damage, showing proliferation and thickening of the tunica intima in arcuate and interlobular arteries, causing narrowing and obliteration of the vascular lumen.	- Presumed vasculitic activity, malignant hypertension may also have contributed.	- Initial treatment consisted of hemodialysis and antihypertensive medications, followed by methylprednisolone pulses, rituximab, and plasmapheresis. Cyclophosphamide was added due to the worsening of alveolar hemorrhage and polyserositis. The pleural and pericardial effusions resolved and ANCA decreased. However, 6 months later, the patient continued to be dependent on hemodialysis, with maintenance treatment of mycophenolic acid.
Case 48: Yamauchi, 2010	59, F	- Microscopic polyangiitis, - Patient presented with fever and leg edema. The patient had no prior history of kidney disease. - Physical examination: Fever, pretibial pitting edema and purpura in both legs. Neurological examination revealed sensory disturbance of the lower limbs. - Laboratory examination: Hemoglobin: 8.1 g/dL, white blood cell count, 19 300×10^9/L, platelet count, 340×10^9/L, serum creatinine level, 2.82 mg/dL, CRP: 170 mg/L, MPO: 95 EU, - Urinalysis: 2+ proteinuria, 3+ hematuria, urine sediment: 100 erythrocytes/HPF, 800 mg/day proteinuria, - CT: Bilateral pleural effusion and ground-glass opacity. - Kidney biopsy: Light microscopy revealed 10 glomeruli-one with global sclerosis and two with cellular crescent formation. The remaining glomeruli exhibited segmental proliferation of mesangial cells and a moderate increase of the mesangial matrix. The renal interstitium exhibited inflammatory cell infiltration and focal atrophic tubules. Severe vasculitis and necrotic lesions were observed in small vessels. Immunofluorescence staining yielded negative results. The histology was compatible with that of ANCA-related vasculitis. - A few days after initiation of MPA treatment TMA features emerged. - Vasculitis active at the time of TMA.	- Hemolytic anaemia (Hemoglobin, 64 g/dL) with RBC fragmentation and thrombocytopenia (61×10^9/L) developed. LDH: 680 U/L and low haptoglobin. - ADAMTS13 activity reduced: 41%. Anti-ADAMTS13 IgG autoantibodies were not detected. A few days later, psychosis (delirium) and pyrexia developed. The diagnosis of TTP was confirmed.	- Not present.	TTP (secondary to MPA).	- Pulse steroid therapy with methylprednisolone at a dose of 0.5 g/day for 3 days was initiated, and prednisolone at a dose of 50 mg/day was subsequently administered intravenously. Hemodialysis was initiated because of progressive renal dysfunction. Immediately after steroid therapy was initiated, the patient's condition, including fever and general fatigue, improved, and the serum CRP and MPO-ANCA values gradually decreased to <0.2 mg/dL and <10 EU, respectively. - After the emergence of TTP, plasma exchange was initiated with fresh-frozen plasma as the replacement fluid. - A total of 17 consecutive plasma exchange sessions were conducted. Thereafter, the clinical and laboratory findings gradually improved. Steroid therapy proved effective against MPA, and the disease activity was reduced such that hemodialysis was not warranted, even after the steroid dose was tapered. Finally, the patient was discharged without any significant complications and eventually resumed work.
Case 49: Shukla, 2022	36, M	- Granulomatosis with polyangiitis, - Presenting symptoms: Intermittent fever for 6 months and dry cough with intermittent epistaxis for 2 months. Thorax CT: multiple bilateral nodules. He received empirical antibiotics and dexamethasone (4 mg/day) for 2 weeks, with no relief. - Physical examination: Patient was hypertensive (150/90 mmHg) and had pitting edema in both legs and nasal septum ulceration. - Laboratory results: Hemoglobin: 10 g/dL, platelet: 80×10^9/L, total bilirubin: 1.9 mg/dL, direct bilirubin: 0.9 mg/dL, serum creatinine: 6 mg/dL, C4 low, C3 normal, PR3: 14 IU/mL, 2+ albuminuria, 650 mg/day proteinuria, 20-30 erythrocytes/HPF, 15-20 leukocytes/HPF, urine culture: positive for Klebsiella pneumoniae. - Intravenous antibiotics for pyelonephritis and hemodialysis for uraemic symptoms. Due to pyelonephritis, kidney biopsy postponed. - IVIG administered (2 g/kg over 5 days), but there was no improvement in kidney function. On day 6, he developed a left occipitoparietal hemorrhage. The neurosurgeon recommended conservative care. - Then TMA features emerged. PR3 at that time: 67.8 IU/mL, C3 low, C4 at lower limit. - Vasculitis active at the time of TMA.	- Hemoglobin: 5.4 g/dL, platelet: 39×10^9/L, schistocytes: 5%, creatinine: 7.8 mg/dL, LDH: 670 U/L, total bilirubin: 3.91 mg/dL, direct bilirubin: 2.21 mg/dL, plasma haptolgobin low, - ADAMTS13 level: 70%, - Anti-complement factor H: negative, - Multiplex ligation-dependent probe amplification: Duplication of CFHR3 (exons 1, 2, 3 and 6 and intron 4) and CFHR1 (intron 3 and exons 5 and 6).	- Autopsy material: Kidney- pauci-immune glomerulonephritis with crescents and thrombotic microangiopathy Lung- pulmonary haemorrhage.	- aHUS associated with GPA.	- Daily plasma exchange with fresh frozen plasma and methylprednisolone pulse (15 mg/kg for 3 days), followed by oral prednisolone (1 mg/kg). There was no improvement in hematological and renal parameters after 1 week of plasma exchange. - Financial constraints refrained physicians from using eculizumab . On day 27 he succumbed to his illness due to a worsening intracranial hemorrhage.
Case 50: Stefanidis, 1998	68, F	- Granulomatosis with polyangiitis, Current symptoms: Progressive azotemia and dyspnea. Patient had been well until 4 weeks earlier, when she noted weight loss (7 kg in 4 weeks), fatigue, and pretibial edema. Four days prior to admission, she developed nausea, vomiting, progressive exertional dyspnea, and declining urine production. - Physical examination: Patient was pale and in respiratory distress with bilateral crackles. Blood pressure: 170/80 mmHg. Marked pretibial edema is present. Laboratory results: Creatinine: 9.19 mg/dL, urinalysis: microscopic hematuria and pyuria, 6 g/day proteinuria, hematological features of TMA, CRP: 84 mg/L, c-ANCA: 1/1024 positive. PR3: 71 U/mL, - Ultrasound: Normal-sized kidneys, increased renal parenchymal echogenicity. - Chest x-ray: Left pleural effusion, - Vasculitis active at the time of TMA.	- Hemoglobin: 8.4 g/dL, platelet: 62×10^9/L, LDH: 1043 U/L, elevated total bilirubin: 2.98 mg/dL low haptoglobin, - Peripheral blood smear: 10-15% schistocytes, - Creatinine: 9.19 mg/dL, urinalysis: microscopic hematuria and pyuria, 6 g/day proteinuria, - Direct and indirect Coombs' tests are negative, - *E. coli* O157:H7 antibody negative, -Headaches.	**Kidney biopsy:** Focal and segmental tuft necrosis and cellular or fibrotic extracapillary crescents in all glomeruli. In addition, preglomerular arterioles showed a marked subendothelial edema, infiltrated by fragmentocytes and fibroblasts, narrowing their lumina. - Immunofluorescence microscopy exhibited diffuse granular deposits of immunoglobulin M and of fibrin/fibrinogen in the necrotic lesions of the Bowmann's space. Fibrin deposits were also found within the vascular walls. - Electron microscopy demonstrated thickening and wrinkling of the glomerular basement membrane with several ruptures. Glomerular capillaries showed cell infiltration and fibrin precipitates. The findings were consistent with the diagnosis of remittent intra- and extracapillary RPGN followed by the characteristic lesions of TMA.	- Presumed vasculitic activity.	- Plasma exchange with fresh frozen plasma administered. - In addition, 100 mg acetylsalicylic acid and an IV prostacyclin analogue (CG-4203) administered. - On the first seven days after admission, the patient required a transfusion of 5 units of packed erythrocytes with hemoglobin remaining at the same level (8-9 g/dL). - Patient's headaches, for which no alternative neurological explanation could be found, disappeared within 2 days of treatment. - On the 12th day after admission, the patient was treated with 150 mg/day oral CYC and 100 mg/day prednisolone. - Despite this immunosuppressive therapy, the course of the kidney disease finally terminated in end-stage renal failure.
Case 51: Strobel, 2014	39, F	- Buerger's disease (Thromboangiitis obliterans), - Patient had a history of amputations and also had a history of strokes. - Medications: Acetylsalicylic acid, and she started clopidogrel therapy in the week prior to presentation. - Current symptoms: Left arm tingling, shortness of breath, chest pain, and dizziness as well as new-onset confusion in the last 24 hours. - Physical examination: Blood pressure: 177/108 mmHg, anxious, diaphoretic, and confused, but awake and following commands with a non-focal neurologic exam. Blood glucose: <10 mg/dL - Hypoglycemia was treated with oral orange juice until intravenous access could be obtained. Then multiple doses of 25 g of 50% dextrose and eventually placed on a continuous 10% dextrose infusion. Blood glucose stabilized at 135 mg/dL only after administration of 100 mcg of subcutaneous octreotide and continuous 10% dextrose infusion. - Laboratory tests: TMA features and serial troponins revealed a non-ST elevation myocardial infarction - CT angiography: CT angiography of her chest demonstrated multifocal pneumonia without evidence of pulmonary embolism. - Echocardiography: Moderate mitral stenosis and regurgitation, left atrium dilatation, 45% ejection fraction, non-focal wall motion abnormalities, and a small pericardial effusion. - Information regarding the activity of vasculitis at the time of TMA not available.	- Hemoglobin: 7.4 g/dL, platelets: 9×10^9/L, reticulocytosis: 6.79%, - Peripheral blood smear: Schistocytes, - LDH: 5498 U/L, haptoglobin <10 mg/dL, - Coagulation parameters normal, - Creatinine: 1.4 mg/dL (basal creatinine: 1.2 mg/dL), - ADAMTS13 activity <10%, - Elevated troponin suggesting non-ST elevation myocardial infarction.	- Not present.	- TTP (triggered by infection or clopidogrel).	- Patient admitted to the intensive care unit. - Patient received empirical antibiotics. - Patient had episodic recurrent hypoglycemia when 10% dextrose infusion was withdrawn. - Plasmapheresis planned for TTP. - Upon receiving platelets and fresh frozen plasma as pre-treatment for placement of central venous access, she developed acute worsening respiratory distress and subsequent pulseless electrical activity arrest. A new electrocardiogram revealed an inferolateral ST elevation myocardial infarction. During the resuscitation efforts, a hemoglobin value of 3.2 g/dL was obtained. After several cycles of cardiopulmonary resuscitation with episodic but non-sustained return of spontaneous circulation, the family requested a do-not-resuscitate order. - Patient passed away, an autopsy was performed. - Autopsy: cardiomegaly with four-chamber dilatation, Libman-Sacks thrombotic vegetations (non-vegetative endocarditis), small pericardial effusion, and a hypercoagulable state. The cause of death is documented as myocardial infarction.
Case 52: Sugimoto, 2007	49, F	- Amyopathic dermatomyositis with interstitial lung disease who developed features of small vessel vasculitis/vasculopathy - Initial symptoms: Fatigue, fever, arthralgia, and erythema of the fingers and face. The patient had heliotropic rashes, Gottron's papules, and no muscle weakness. Laboratory examination revealed moderate inflammatory anemia with normal counts of white blood cells and platelets, mild elevations of transaminases and creatine kinase (556 IU/L), and normal urinalysis and renal function tests (creatinine: 0.49 mg/dL). ANA and anti-Jo-1 antibody were negative. EMG: myopathic abnormalities. Chest CT: a mild alveolar and interstitial pattern in the lower lobes of both lungs. Intravenous pulse methylprednisolone, followed by 50 mg/day oral prednisolone and cyclosporine A. As the patient improved, the prednisolone dose was gradually tapered to 20 mg/day. - During follow-up, dermatomyositis-related cutaneous vasculopathy gradually developed, resulting in digital cyanosis, periungual erosions, and digital pitting scars. Later, the patient's interstitial lung disease worsened, and the dose of prednisolone was reincreased to 60mg/day. At that time, spontaneous pneumomediatinum developed. Gradually the prednisolone dose was tapered. - Then the patient presented with TMA features. -V asculitis active at the time of TMA.	- Patient presented with fever, thrombocytopenia, hypertension, and renal dysfunction that developed gradually. Cyclosporine A was stopped, but these clinical abnormalities were worse. - Platelets: 41×10^9/L, blood pressure: 176/124 mmHg and creatinine: 1.41 mg/dL). Marked anemia (hemoglobin: 8.2 g/dL) also developed, associated with red blood cell fragmentation and an undetectable serum haptoglobin level. The direct Coombs test was negative. ADAMTS13 activity: 45%. Plasma renin activity was high. - The patient's digital cutaneous manifestations worsened, and ulcerative lesions on the buttock developed, which pathologically showed fat necrosis with small artery vasculitis. - Further, visual blurring also developed, and ophthalmologic examination disclosed cotton-wool spots, capillary obstruction, macular edema, and capillary leakage. - Therefore, the patient had TMA associated with thrombocytopenia, hemolytic anemia, high-renin hypertension, renal dysfunction, retinopathy with an occlusive vasculitic process, and cutaneous vasculopathy/vasculitis. Authors speculated that initial pneumomediastinum may also have been due to vasculitis/vasculopathy.	- Not available.	- Presumed vasculitic activity and hypertension.	- Patient was initiated on captopril (37.5 mg/day) for hypertension and azathioprine (50 mg/day) for vasculitis. - These treatments gradually improved the patient's hypertension (130/85 mmHg), renal dysfunction (creatinine: 1.13mg/dL), microangiopathic hemolytic anemia, thrombocytopenia (150×10^9/L), retinal lesions, and digital cutaneous lesions. Surgical debridement of ulcerative lesions on the buttock was performed, and the patient was discharged.
Case 53: Syeda, 2013	68, F	- Anti-glomerular basement membrane antibody positivity with concomitant MPO positivity. - Present symptoms: Progressive weakness and anuria that started 3 weeks ago. She started having malaise, loss of appetite, nausea, joint pain, and low-grade fever 3 weeks ago. Her symptoms of nausea and vomiting worsened during the week prior to admission. - Medical history: Mild coronary artery disease, with irregular use of acetylsalicylic acid and metoprolol at the time of admission. - Physical examination normal. - Laboratory features: Creatinine: 11.3 mg/dL, CRP: 174 mg/L, ESR: 45 mm/hr, albumin: 2.4 g/dL, anti-GBM: 1/160 positive, P-ANCA: 1/160 positive, MPO: 48 IU, urine results initially absent due to anuria. - Patient initially treated with intravenous fluid without improvement in urine output. Creatinine decreased to 7.3 mg/dL following hydration. Renal replacement therapy with hemodialysis was instituted on day 3 of her hospitalization. - Kidney biopsy: Twenty glomeruli were detected, with almost all of them demonstrating endocapillary proliferative activity with crescentic glomerulonephritis. Immunofluorescence demonstrated linear staining of the glomerular basement membrane for IgG and C3. Electron microscopy: Distorted glomerular basement membrane structure with normal thickness. - Vasculitis active at the time of TMA.	- Hemoglobin and platelet count initially normal. During follow-up, hemoglobin:8.7 mg/dL, platelet: 34×10^9/L, - Elevated LDH (304 IU/L), - Low haptoglobin (<15 mg/dL), - Negative direct Coombs test, - Schistocytes in peripheral blood smear, - ADAMTS13 activity <5%. - Patient remained anuric despite alternate days of hemodialysis and plasmapheresis.	- Not present.	TTP (secondary to anti-GBM antibody disease).	- Therapy with intravenous methylprednisolone initiated on day 3 of her hospitalization (1000 mg/day for 3 days) followed by oral prednisone at 1 mg/kg/day. - Plasmapheresis was initiated on day 4 of her hospitalization and continued on alternating days with hemodialysis. - CYC was started on day 7 of her hospitalization at a dose of 2 mg/kg/day. On day 10, hemoglobin and platelet counts began to decrease. CYC was stopped after 5 days of treatment due to worsening anemia and thrombocytopenia. - After TTP diagnosis, the patient was restarted on daily plasmapheresis and continued on prednisone at 1 mg/kg/day with gradual improvement of her thrombocytopenia, but she remained anemic and neutropenic. She required a blood transfusion on day 18 of her hospitalization. - She had a reccurrence of genital herpes that was treated with IV acyclovir. - Rituximab therapy was initiated on day 28 of her hospitalization once active genital herpes was resolved and was administered using a weekly regimen of 375 mg/m² for 4 weeks. Daily plasmapheresis was discontinued on stabilization of her platelet count and undetectable levels of anti-GBM antibodies. She remained dialysis-dependent and developed no further complications with rituximab therapy. - Patient never recovered renal function, but anti-GBM antibody titers and ANCA levels remained undetectable, and her platelet count remained above 130×10^9/L, 24 months post-rituximab without evidence of reccurrence of her TTP.
Case 54: Yamasaki, 2001	56, F	- Polyarteritis nodosa, - Diagnosis was reached after a skin biopsy. She initially presented with erythema on her arms and legs, fever, and weight loss. Tender masses were palpable on her right abdomen. Small erythematous lesions and livedo reticularis are present on the arms and legs. Skin biopsy: fibrinoid necrosis and infiltration of polymorphonuclear cells into medium- and small-sized arteries - Laboratory: Patient initially anemic (hemoglobin: 7.3 g/dL) with neutrophilic leukocytosis, CRP: 88.6 mg/L, creatinine clearance: 39 mL/min, MPO: 201 EU - Abdominal CT: Bilateral perirenal hemorrhages. - Autopsy: Small and medium-sized polyarteritis in the kidney, uterus, pulmonary hilum, hepatic hilum, adrenal gland, ileum, and ascending colon. Several stages of vasculitis existed, which was a typical finding of classic polyarteritis nodosa. No vasculitis affecting arterioles, venules, or capillaries. Duodenal bleeding was from peptic ulcers, which were not associated with arteritis. - Vasculitis active at the time of TMA.	- Thrombocytopenia, - Hemolytic anemia, - Renal failure, - Loss of consciousness, - Peripheral blood smear: Schistocytes, - Fibrinogen at lower limit: 160 mg/dL.	- TMA features not described histopathologically.	- Presumed vasculitic activity.	- Patient treated with 1000 mg of pulse methylprednisolone for three successive days, followed by 500 mg IV CYC. Plasma exchange was also performed. Within three days, treatment had reduced the body temperature to normal and lowered the C-reactive protein concentration (<10 mg/L). - During follow-up, TMA features emerged. - First disseminated intravascular coagulation was suspected and a treatment of nafamostat mesilate and infusion of fresh-frozen plasma were administered. This treatment produced a marked increase in fibrinogen concentration but failed to improve the platelet count. - Then TTP was suspected, and the patient was treated with plasma exchange with 2700 mL fresh-frozen plasma. - Within one week of treatment the platelet count returned to normal, and consciousness level improved dramatically. However, renal failure was irreversible, and she continued to undergo dialysis. The patient died from a hemorrhage from a duodenal ulcer. - Autopsy was performed.
Case 55: Watanabe, 2010	61, F	- Anti-glomerular basement membrane disease with MPO positivity - Patient hospitalized for rapidly declining kidney function. Two weeks before admission, she had developed abdominal pain, cough, and sputum. - Physical examination: Fine crackles in both lower fields. - Urinalysis: 1+ proteinuria, 3+ hematuria, 100 erythrocytes/HPF. - Hemoglobin: 8.1 g/dL, platelet count initially normal, albumin: 2.6 g/dL, creatinine: 6.02 mg/dL, CRP: 259 mg/L, rheumatoid factor: 1437 IU, anti-GBM: 920 EU, MPO: 66 EU. - Chest CT: Mild interstitial pneumonia in both lower lung fields. - When the patient passed away, an autopsy was performed. The kidney pathology demonstrated that all 13 glomeruli exhibited evidence of fibrotic crescent formation. Within the glomeruli, no increases in mesangial cells or matrices were observed. The presence of shrinking glomeruli with irregular glomerular basement membranes and moderate to severe patchy atrophy of the interstitial areas with mononuclear cell infiltration and fibrotic changes suggested chronic ischemia. Immunofluorescence revealed that IgG, IgM, C3, kappa, and lambda displayed 1+ positive staining along the glomerular capillary walls. - Vasculitis active at the time of TMA	- Platelet count decreased to 20×10^9/L, - Then the patient exhibited moving disturbances in her right upper extremity and speech disturbances. After these transient neurological abnormalities, a small cerebral infarction was detected on MRI. - Hemolysis with fragmentation of red blood cells was detected on a peripheral blood smear, and haptoglobin levels were decreased. - ADAMTS13 activity decreased: 35%.	Not present.	TTP (secondary to anti-GBM disease).	- On the second day of hospitalization, 500 mg/day pulse intravenous methylprednisolone for 3 days to treat the rapidly progressive glomerulonephritis. Following methylprednisolone pulse therapy, 30 mg/day prednisolone was administered orally. - After detection of anti-GBM and MPO positivity, plasma exchange was performed on days 4, 6, and 9 of hospitalization. Hemodialysis was initiated on day 5 because of oliguria and impaired renal function. Plasma exchange effectively decreased the anti-GBM and MPO-ANCA antibody titers. - On day 11 TMA features emerged. - After TTP diagnosis, plasma exchange WAS reinitiated promptly. Her platelet counts fluctuated between 2.0×10^9/L and 4.5×10^9/L despite plasma exchanges. - On the 36th day of hospitalization, she had bloody stools, prompting physicians to start ganciclovir for presumed CMV infection based on positive CMV antigenemia with approximately 88 positive cells in 150,000 white blood cells. On day 45, the patient died from respiratory distress and perforation of the alimentary tract. - An autopsy was performed.
Case 56: De-Leon-Bojorge, 2006	17, F	- SLE with vasculitic involvement, - Initial presentation 3 years ago with arthritis, oral ulcers, hemolytic anemia, leukopenia, lymphopenia, and hypocomplementemia. She also had ANA, anti-dsDNA, anti-β2-glycoprotein □, and anti-cardiolipin antibody positivity. - Initial treatment consisted of azathioprine, acetylsalicylic acid and prednisone with stabilization of symptoms. - Two years ago, hematuria and proteinuria developed. - Oral CYC was started with improvement in her renal function. - One year ago, she developed right quadrant abdominal pain, and an abdominal ultrasound revealed microlithiasis and cholecystitis. The abdominal pain spontaneously resolved, and dietary modifications were initiated. - Current presentation: presented with hypertension, autoimmune hemolytic anemia, and marked proteinuria. - Current laboratory results: Proteinuria of 7.2 g/day, serum creatinine 1.6 mg/dL, Coombs positivity, hemoglobin:9.3 g/dL, leukopenia, lymphopenia, normal platelet count, hypocomplementemia, anti ds DNA, anti-β2-glycoprotein I, and anticardiolipin antibodies positive. -Kidney biopsy: Renal biopsy: Class IV+V lupus nephritis without thrombosis. During this hositalization, the patient developed right upper quadrant pain, Murphy positivity, elevated liver enzymes, amylase, and lipase. Abdominal ultrasound: Cholelithiasis, cholecystitis and pancreatitis, - A cholecystectomy was performed. - SLE active at the time of TMA.	- Systemic features of TMA not present.	- **Cholecystectomy material:** Segmental necrotizing vasculitis and vascular occlusion with fragmented erythrocytes	- Presumed vasculitic activity of SLE (with possible contribution of accompanying antiphospholipid antibodies).	- Patient received methylprednisolone and cyclophosphamide for SLE. - Anticoagulation therapy was started with subsequent resolution of the proteinuria and normalization of the laboratory values, including the creatinine level.
Case 57: Yoshioka, 2006	78, F	- Microscopic polyangiitis, - Cough, numbness in the lower limbs, congestion of the conjunctiva, jaw claudication, and headache. - Symptoms began 1 year ago, when cough and numbness in the lower limbs first appeared. During the following year, congestion of the conjunctiva and headache appeared, and numbness in the lower limbs became more severe. She was diagnosed with bronchiectasis and treated with oral antibiotic therapy, with no improvement. - Physical examination: Patient initially normotensive. Bulbar conjunctiva congested, compatible with scleritis, bibasilar inspiratory crackles, asymmetrical hypoesthesia and weakness in lower limb, compatible with mononeuritis multiplex, and livedo reticularis in lower limbs. - Initial laboratory results: CRP:126 mg/L, creatinine: 0.95 mg/dL, urinalysis: 1+ proteinuria, 1+ hematuria, urine sediment: 5-9 erythrocytes, 10-19 leukocytes, MPO: 493 U/mL. Chest CT: Old inflammatory changes with no apparent active interstitial pneumonia. - She was treated with prednisolone (40 mg/day) and oral CYC (50 mg, 3 times a week). Her general condition improved after treatment, and CRP levels returned to normal on day 10. - At that point, her blood pressure began to increase, and 4 mg of benidipine therapy was initiated. Then thrombocytopenia emerged. Drug-induced thrombocytopenia was suspected, and all medications except for prednisolone and benidipine were discontinued. Thrombocytopenia persisted and blood pressure increased to 200/100 mmHg despite treatment, and TMA features emerged. - Vasculitis probably in remission at the time of TMA.	- Platelet count: 39×10^9/L, - Increased LDH and total bilirubin, - Reduced haptoglobin, - Negative direct and indirect Coombs test, - Peripheral blood smear lacked schistocytes, - Urinalysis: 2+ proteinuria, but creatinine remained normal.	- Not available.	Malignant hypertension (due to corticosteroid therapy).	- She was treated with an angiotensin-converting enzyme inhibitor (ACEI), and her platelet count and haptoglobin level gradually increased and serum LDH levels decreased toward normal. The results of a urine test also became normal. - She was discharged on day 63 while receiving 20 mg of prednisolone, and no thrombocytopenia or recurrence of MPA was noted.
Case 58: Zahiri, 2003	25, M	-Behçet disease, - Diagnosed when he was 22 years old with oral aphthous ulcers, genital scars, and ocular involvement of the left eye. Patient was treated with a combination of oral prednisone and cyclophosphamide, which decreased flares of the disease. Two years later during an ocular flare, cyclosporine A was initiated at a dose of 6 mg/day, without monitoring of blood cyclosporine A levels. - Ten months later, the patient was hospitalized with proteinuria, renal failure, and generalized tonic-clonic seizures. The cranial CT and lumbar puncture were normal. Creatinine: 15.27 mg/dL, an opthalmological examination revealed persistent foci of uveitis and retinitis in the left eye. Proteinuria: 1.3 g/day and microscopic hematuria. - Disease probably active at the time of TMA.	- Creatinine: 15.27 mg/dL, proteinuria of 1.3 g/day and microscopic hematuria. - Blood pressure: 260/130 mmHg, - Generalized tonic clonic seizures. - LDH: 600 IU/L, - Decreased haptoglobin: 0.1 IU/L.	**Kidney biopsy:** Glomerular thrombotic microangiopathy with arteriolar lesions and moderate tubulointerstitial involvement with bands of fibrosis surrounding atrophic tubules, most likely secondary to cyclosporine.	TMA secondary to cyclosporine A (with contribution of malignant hypertension)	- Cyclosporine stopped. - Patient treated with antihypertensives and dialysis. - Patient died during his third hemodialysis session from a sudden cardiorespiratory arrest that could not be reversed despite resuscitation efforts.
Case 59: Filler, 1997	10, F	- Patient has a history of Henoch-Schönlein purpura without renal involvement at the age of 6. - Seven weeks ago, the patient received the first dose of the early summer meningococcal vaccine and experienced facial edema two days later, which was treated with rectal methylprednisolone. Nine days later, the patient received the vaccine's second dose, which deteriorated her condition. - Physical exam: Weak, pale, jaundiced, multiple facial and palatal petechiae, several hematomas on her arms and body. - Laboratory features demonstrated marked hemolytic anemia, thrombocytopenia, elevated bilirubin, low complement, elevated creatinine (2.31 mg/dL), macrohematuria, and non-selective glomerular proteinuria (3 g/L). - Vasculitis in remission at the time of TMA.	- Packed cell volume decreased: 25%, platelet cound: 44×10^9/L,fragmentocytes 16%, elevated LDH: 3960 U/L, elevated bilirubin: 5.09 mg/dL, - Low C3 (0.45 g/L), - Elevated creatinine (2.31 mg/dL), macrohematuria, and non-selective glomerular proteinuria (3 g/L). - *Escherichia coli* O157:H7 negative.	**Kidney biopsy:** - Light microscopy: Glomeruli show a segmentally accentuated increase of endocapillary and mesangial cells, fibrin-like material is seen in the vascular pole of glomeruli. Afferent arterioles exhibited endothelial necrosis and thrombotic material inside the lumen. The interstitium showed focal round cell infiltration. - Immunohistology: Fibrin is positive in glomeruli and arterioles. - Electron microscopy: Dense deposits in the mesangium and in intramembranous and subepithelial locations. Granulocytes and monocytes in glomerular capillaries with an increase in mesangial matrix. - Thrombotic microangiopathy (light microscopy) and endocapillary immune complex glomerulonephritis (electron microscopy).	- TMA possibly triggered by the vaccine against early summer meningoencephalitis - Diarrhea-negative HUS here is a complication of post-vaccination immune complex glomerulonephritis.	- Initial management: Blood transfusion, administration of thrombocytes, fresh frozen plasma, and prednisolone. Her condition did not improve in 3 weeks; she was transferred to another department. - Thrombocytopenia normalized after initiation of plasmapheresis, but renal function deteriorated and the patient went into terminal renal failure. Continuous ambulatory peritoneal dialysis started 2 months after the first admission. Patient is on the waiting list for renal transplantation 1 year after onset of disease.
Case 60: Sathe, 2016	12, M	- Microscopic polyangiitis - Intermittent self-limiting purpuric rash over lower extremities with painful large joint swelling involving wrist and ankle, scrotal edema, and mild intermittent fever over a period of one year. - ESR: 90 mm/hour, - P-ANCA positive, - Creatinine: 1 mg/dL, Urinalysis: 2+ albuminuria, urine sediment: 35-40 erythroytes/HPF, 6-8 leukocytes/HPF - Kidney biopsy: glomerular hypertrophy, focal mesangial proliferation with partial cellular crescent in one glomerulus, tubular dilation, and necrosis with normal vessels and interstitium. IF was negative for immune deposits, which was consistent with a diagnosis of focal proliferative pauci-immune glomerulonephritis. - Over the next few months, there was a waxing and waning course with recurrence of gross hematuria and renal dysfunction, which was promptly treated with IV steroid pulses, IV cyclophosphamide, and oral mycophenolate mofetil. - About six months after his first presentation, while being on maintenance immunosuppression of oral prednisolone and mycophenolate mofetil, his condition deteriorated with the occurrence of hypertension, gross hematuria, and respiratory distress. - Disease course complicated by creatinine progression to 5.2 mg/dL and TMA features. - Vasculitis probably active at the time of TMA.	- Hemoglobin: 4.9 g/dL, thrombocytopenia, - Peripheral blood smear: Schistocytes, - LDH: 930 U/L, - Low serum C3, - Factor H autoantibody positive.	- TMA features were present in the first kidney biopsy. - Second biopsy at the time of TMA not performed.	- Atypical HUS (secondary to MPA).	- Complete renal recovery was documented following treatment with intravenous rituximab, steroids, cyclophosphamide, and plasmapheresis.
Case 61: Torun, 2024	36, M	- GPA, - Patient presented with dyspnea and reduced urine output. - Physical examination: Bibasilar fine crackles, - Creatinine: 8.32 mg/dl, albumin: 24.2 g/L, CRP: 137.7 mg/l, ESR: 39 mm/hour, urine sediment: 234 erythrocytes, 27 leukocytes, 1275 mg/day proteinuria, PR3 ANCA >200 IU/mL, - Urinary ultrasound: normal kidney sizes and increased renal parenchymal echogenicity. - Kidney biopsy: pauci-immune crescentic glomerulonephritis. - Paranasal sinus CT: bilaterally increased soft tissue density and decreased aeration in mastoid cells, in the mastoid antrum, and in both middle ear cavities. - Thorax CT: bilateral pleural effusion, atelectatic changes in the lung areas neighboring the effusion, and two subpleural nodules in the right lung - Ear-nose-throat department evaluation: bilateral sensorineural hearing loss. - Induction treatment of pulse methylprednisolone (1000 mg/day for three days) and intravenous cyclophosphamide were initiated, and plasma exchange with fresh frozen plasma was performed for a total of eight cycles. During this period, the anuric patient underwent intermittent hemodialysis three times a week. After two doses of cyclophosphamide, which were administered in doses of 750 mg/day within an interval of two weeks, the control PR3-ANCA titer was still >200 IU/mL. Three weeks after the second cyclophosphamide infusion, rituximab treatment was initiated as 2x1000 mg intravenous infusion within an interval of two weeks. - Two months after the initiation of induction treatment and 15 days after the second dose of rituximab, TMA features emerged. - Vasculitis active at the time of TMA.	- Hemoglobin: 8.4 g/dL, platelets:116×10^9/L, - Reticulocytes: 5.28%, low haptoglobin, - Peripheral blood smear: 5-9 schistocytes in every field. - ADAMTS13 activity within normal range.	- TMA features not present in kidney biopsy.	- Presumed vasculitic activity.	- The patient was under follow-up for TMA by checking his hematological parameters once a week. -Since alternative causes of TMA were excluded and the patient had already received a potent immunosuppressive regimen (three days of 1000 mg methylprednisolone pulses, 8 cycles of plasmapheresis, two doses of 750 mg cyclophosphamide, and two doses of 1000 mg rituximab), no additional treatment was given for TMA. The prednisolone dose was maintained at 15 mg/day. Plasma exchange was not reinitiated. - Two months later, at the third month of rituximab treatment, an increase in hemoglobin and platelet values was observed. Hemoglobin was 16.7 g/dL, platelet was 158 10^9/L, reticulocyte percent and haptoglobin were within normal limits - Patient received IVIG during a period of catheter infection. - Patient's prednisolone dose was gradually tapered to 5 mg/day. The patient's hearing loss has completely recovered, and control CT images revealed normal mastoid cells, mastoid antrum, and middle ear as well as bilaterally normal lung parenchyma without any nodules or pleural effusion. He continued 3/7 hemodialysis program, and his follow-up as an outpatient is continuing. His final PR3-ANCA titer is 53 IU/mL.

AAV: Antineutrophil cytoplasmic antibody associated vasculitis, ADAMTS13: A disintegrin and metalloproteinase with a thrombospondin type 1 motif, member 13, aHUS: Atypical hemolytical uremic syndrome, ANA: Antinuclear, antibody, ANCA: Antineutrophil cytoplasmic antibody, Anti-dsDNA: Anti double stranded deoxyribonucleic acid, Anti-GBM: Anti glomerular basement membrane antibody, APS: Antiphospholipid syndrome, AST: Aspartate transaminase, AU: Arbitrary unit, BVAS: Birmingham vasculitis activity score, C3: Complement 3, C4: Complement 4, c-ANCA: Cytoplasmic antineutrophil cytoplasmic antibody, CMV: Cytomegalovirus, COVID-19: Coronavirus disease of 2019, CRP: C-reactive protein, CSA: Cyclosporine A, CSF: Cerebrospinal fluid, CT: Computed tomography, CYC: Cyclophosphamide, DIC: Disseminated intravascular coagulation, DNA: Deoxyribonucleic acid, DVT: Deep vein thrombosis, eGFR: Estimated glomerular filtration rate, EGPA: Eosinophilic granulomatosis with polyangiitis, EMG: Electromyography, ENT: Ear, nose and throat, ESR: Erythrocyte sedimentation rate, ESRD: End stage renal disease, EU: Enzyme linked immunosorbent assay units, F: Female, FFP: Fresh frozen plasma, FLAIR: Fluid-attenuated inversion recovery hyperintensity, GBM: Glomerular basement membrane, G-CSF: Granulocyte colony stimulating factor, GM-CSF: Granulocyte macrophage colony stimulating factor, GPA: Granulomatosis with polyangiitis, HCQ: Hydroxychloroquine, HPF: High power field, HSCT: Hematopoetic stem cell transplantation, HUS: Hemolytic uremic syndrome, IF: Immunolfluoresence, IV: Intravenous, IVIG: Intravenous immunoglobulin, IU: International unit, LDH: Lactate dehydrogenase, MAHA: Microangiopathic hemolytic anemia, M: Male, MMF: Mycophenolate mofetil, MPA: Microscopic polyangiitis, MPO: Myeloperoxidase, MRI: Magnetic resonance imaging, PAN: Polyarteritis nodosa, p-ANCA: Perinuclear antineutrophil cytoplasmic antibody, PE: Plasma exchange, PET: Positron emission tomography, PCR: Polymerase chain reaction, PLT: Platelet PR3-anti proteinase 3, pt(s): Patient(s), PRES: Posterior reversible encephalopathy syndrome, RLV: Renal limited vasculitis, RPGN: Rapidly progressive glomerulonephritis, SARS-CoV2: Severe acute respiratory syndrome coronavirus-2, SLE: Systemic lupus erythematosus, TMA: Thrombotic microangiopathy, TTP: Thrombotic thrombocytopenic purpura