

First author	Countr y/Years	Gender /Age	Personal history	routine medication	Type of COVID-19 vaccine	Timing of Symptom Onset	Symptoms	Hepatotropic viruses	Peak laboratory values	Autoantibodies Positive	Liver biopsy	Treatment	Outcome
Garrido [1]	Portugal /2021	F/65	Polycythemia vera	Acetylsalicylic acid; Sertraline; Esomeprazole; Pegylated interferon	Moderna	Day 14 after 1st does	Jaundice; Choluria; Abdominal pain;	HIV;HAV;HBV;HCV; HEV;CMV;EBV;HSV	ALT:1092 U/L AST:1056 U/L ALP:24 U/L TBL:1.14 mg/dl GGT:329 U/L IgG:2000 mg/dl	ANA	Intense plasma cells infiltrate in the portal; Severe interface hepatitis; Multiple confluent foci of lobular necrosis;	Prednisolone	Improved
Avci[2]	Turkey/ 2021	F/61	Hashimoto’s thyroiditis; Hypertension; Infected COVID-19	Valsartan; Levothyroxine	Pfizer	Day 14 after 1st does	Jaundice; Malaise; Fatigue; Anorexia; Nausea;	HAV;HBV;HCV; CMV;EBV	ALT:455 AST:913 TBL:11.8 GGT:292 IgG:4260	ANA ASMA	Intense lymphocyte infiltrate in the portal and periportal; Periseptal interface hepatitis; Spotty necrosis; Fibrosis	Prednisolone; Azathioprine;	Improved
Bril [3]	USA/20 21	F/25	Postpartum; gestational hypertension	Labetalol	Pfizer	Day 7 after 1st does	Pruritus; Choluria; Jaundice	HIV;HAV;HBV;HCV; CMV;EBV;HSV	ALT:2001 AST:754 ALP:170 TBL:4.8 IgG:1081	ANA; ds-DNA.	Intense lymphoplasmacytic, eosinophils and plasma cells infiltrate in the portal; Scattered necrotic hepatocytes	Prednisone	Improved
Ghielmetti. [4]	Switzerl and/2021	M/63	Type 2 diabetes; ischemic heart disease	Metformin; Acetylsalicylic acid; Rosuvastatin	Moderna	Day 7 after 1st does	Jaundice; Fatigue; Anorexia;	anti-HAV IgM; HBV;HCV;HEV;	ALT:1038 AST:1127 ALP:192 TBL:2.32 GGT:536 IgG:19.96	ANA; ASMA	Intense lymphoplasmacytic and plasma cellular infiltrate with scattered eosinophils; Interface hepatitis; Centrilobular necrosis;	Prednisone	Improved
Rocco[5]	Italy/20 21	F/80	Hashimoto's thyroiditis; acute glomerulonephritis	Levothyroxine; Corticosteroids; Pravastatin; Aspirin	Pfizer	Day 7 after 1st does	Choluria; Jaundice	HIV;HAV;HBV;HCV; ;CMV;EBV;HSV	ALT:1186 AST:1401 ALP:243 TBL:10.5 GGT:524 IgG:3500	ANA;	Lymphoplasmacytic infiltrate; Multiple confluent foci of lobular necrosis and councilman bodies;	Prednisone	Improved
Tan[6]	Singapo re/2021	F/56	NA	Rosuvastatin	Pfizer	Day 1 after 1st does	Malaise; Fever; Fatigue; Anorexia Jaundice	HAV;HBV;HCV; HEV;CMV;EBV;HSV	ALT:1701 AST:1124 ALP:298 TBL:1.15 IgG:3260	ANA; ASMA;	Intense plasma cells, lymphocytes and few eosinophils aggregation in portal tract; interface hepatitis; fibrosis;	Budesonide	Improved
Glayton [7]	Australi a/2021	M/36	Hypertension; Laser eye surgery;	Olmesartan; Acetaminophen; Ibuprofen;	AstraZeneca	Day 26 after 1st does	Pruritus	HIV;HAV;HBV;HCV; HEV;CMV;EBV;HSV	ALT:2550 AST:633 ALP:118 TBL:45 GGT:136 IgG:1280	ANA;	Intense predominantly lymphocytic in the portal tract; severe interface hepatitis; fibrosis;	Prednisolone	Improved
Zin[8]	UK/2021	M/47	NA	NA	Moderna	Day 3 after 1st does; within day 7 after 2nd does	Malaise; Jaundice; Abdominal pain;	HAV;HBV;HCV; HEV ;CMV;EBV;	ALT:1048 ALP:229 TBL:41 IgG:2510	ANA;	Lymphoplasmatic inflammation including eosinophils, ballooned hepatocytes, multinucleated giant cells, and emperipolesis; marked interface hepatitis; minimal fibrosis;	Prednisolone	Improved
Lodato [9]	Italy/20 21	F/43	Hyperlipidemia;	Ginkgo-biloba	Pfizer	Day 15 after 1st does; day 2 after 2nd does	Malaise; Jaundice; Abdominal pain;	HIV;HAV;HBV;HCV; HEV;CMV;EBV;	ALT:171 AST:132 TBL:29.15 mg/dl	Negative	Moderate lymphocytes infiltrate in the portal; interface hepatitis; spotty necrosis; focal moderate steatosis; no fribrosis	N-acetylcysteine; Methylprednisolone	Improved

Ehelfi [10]	Germany/2021	F/36	Primary sclerosing cholangitis; Ulcerative colitis	Ursodeoxycholic acid; Endoscopic biliary intervention;	Moderna	Day 11 after 1st does	Jaundice; Pruritus; Fatigue;	HAV;HBV;HCV;HEV; CMV;EBV;	ALT: 588 AST: 581 ALP: 1077 TBL: elevated GGT: 757 IgG: 2475	ANA; ds-DNA	Intense lymphoplasmacellular, plasma cells, few eosinophils infiltrate in the portal small bile ducts; interface hepatitis;scatter rosette formation and apoptotic hepatocytes;	Prednisone	Improved
Mahalingham[11]	UK/2021	F/32	Orthotopic liver transplantation for autoimmune hepatitis; Hypertension;	Tacrolimus; Azathioprine; Prednisolone; Aspirin; Vitamin D; Atenolol;	Pfizer	Day 26 after 2nd does	NA	HAV;HBV;HCV;HDV; HEV;CMV;EBV;	NA	Soluble liver antigen; Liver pancreas antibody positive	Intense lymphoplasmacytic, plasma cells, rare eosinophils infiltrate in the portal; interface activity with focal rosetting and emperipolesis; No documented fibrosis;	Methylprednisolone; Prednisolone; Azathioprine	Improved
Fimiano [12]	Italy/2021	F/63	postmenopausal hypothyroidism; Familial autoimmune conditions;	NA	Pfizer	Day 53 after 1st does	Abdominal pain; Anorexia; Choluria; Jaundice	HIV;HAV;HBV;HCV; HEV;CMV;EBV;HSV;HHV;	ALT:1778 AST:1625 ALP:273 TBL:18.6 GGT:419 IgG:1760	ANA;	Intense plasma cells infiltrate in the portal/periportal and lobular; interface activity, focal confluent necrosis, scattered apoptotic bodies;	methylprednisolone; Azathioprine	Improved
Erard [13]	France/2021	F/80	NA	NA	Pfizer	Day 10 after 1st does	Fatigue; Pruritus; Jaundice;	HIV;HAV;HBV;HCV;HEV; CMV;EBV;HSV	ALT:541 AST:583 TBL:0.88 IgG:2090	ANA;	Intense lymphoplasmacytic infiltrate in the lobular and portal; interface hepatitis; hepatocyte necrosis;	Steroids	Improved
		F/73	NA	NA	Moderna	Day 21 after 1st does	Fatigue; Pruritus; Jaundice;	HIV;HAV;HBV;HCV;HEV; CMV;EBV;HSV	ALT:1027 AST:1163 TBL:3.78 IgG:1800	ANA;	Intense lymphoplasmacytic infiltrate in the lobular and portal; interface hepatitis; hepatocyte necrosis;	Steroids	Improved
		F/68	NA	NA	AstraZeneca	Day 20 after 1st does	Fatigue; Pruritus; Jaundice;	HIV;HAV;HBV;HCV;HEV; CMV;EBV;HSV	ALT:2029 AST:2314 TBL:8.5 IgG:1850	ANA;	Intense lymphoplasmacytic infiltrate in the lobular and portal; interface hepatitis; hepatocyte necrosis;	Steroids	Died
Kang [14]	Korea/2021	F/27	None	None	BioNTech	Day 7 after 2nd does	Jaundice;	HIV;HAV;HBV;HCV;HEV; CMV;EBV;HSV	ALT:1478 AST:1004 ALP:182 TBL:8.6 IgG:1641	ANA;	Intense lymphocytes, clusters of plasma cells and few eosinophils infiltrate in the portal tract and lobules; mild cholestasis with hepatocytic rosettes; interface hepatitis; mild cholestasis with hepatocytic rosettes; moderate periportal fibrosis;	Prednisolone	Improved
Shahrani[15]	Malaysia/2022	F/59	Dyslipidemia	NA	AstraZeneca	Day 12 after 2nd does	Jaundice	HAV;HBV;HCV;HEV	ALT:1178 AST:962 IgG:1740	NA	Lympho-plasma-cells infiltrate in the portal;	Prednisolone	Improved
		F/63	Ulcerative colitis; Primary sclerosing cholangitis ;	NA	AstraZeneca	Day 14 after 1st does	Jaundice	HAV;HBV;HCV;HEV	ALT:354 AST:505 IgG:2030	NA	Presence of interface and lobular hepatitis; Bridging fibrosis;	Prednisolone	Died

		F/72	NA	NA	Pfizer	Day 10 after 1st does	Jaundice	HAV;HBV;HCV;HEV	ALT:2280 AST:254 IgG:1940	NA	Intense of lymphocytes and plasma cells in the protal; hepatocyte necrosis;	Prednisolone	Improved
Bjornsson [16]	Italy/2022	F/52	lung adenocarcinoma; HBV with normal liver function test	Carboplatin; Pemetrexed; Pembrolizumab	Pfizer	Day 10 after 1st does	Diarrhea	HAV;HCV;HDV;HEV	ALT:229 AST:147 ALP:161 TBL:1.98 GGT:139 IgG:1400	ANA ASMA	Portal inflammation;	Prednisone	Improved
Goulas [17]	Greece/2022	F/52	None	None	Moderna	Day 14 after 1st does	Malaise; Jaundice	HAV;HBV;HCV;HEV;CMV;EBV;	ALT:936 AST:350 ALP:169 TBL:9.06 GGT:810 IgG:2396	ANA; ASMA	Intense lymphocytes, plasmacytes, histiocytes, few eosinophiles and neutrophils infiltrate in the portal; mild periportal hepatitis; apoptotic bodies;hepatocytes with feathery degeneration of the cytoplasm and rosette formation	Prednisolone Azathioprine	Improved
Pinazo [18]	Spain/2022	F/77	None	Bromazepam; Losartan; Omeprazole	Pfizer	Day 2 after 2nd does	NA	Undocumented	ALT:552 AST:474 ALP:159 TBL:3.1 IgG:Normal	ANA; AMAs	Compatible with AIH	Prednisone; Azathioprine; Budesonide	Died
		M/23	None	None	Moderna	Day 10 after 2nd does	NA	Undocumented	ALT:587 AST:702 ALP:202 TBL:2.3 IgG:1647	NA	Compatible with AIH	Prednisone	Improved
Bjornsson [19]	Singapore/2022	M/34	Drank socially	None	Moderna	Day 16 after 2nd does	Pruritus; Fever; Jaundice	HAV;HBV;HCV; HEV;CMV;EBV;	ALT:223 AST:111 ALP:149 TBL:1.49 GGT:98 IgG:1460	Negative	Mild portal inflammation with scattered eosinophils, cholestasis, scattered eosinophils;	Ursodeoxycholic acid;	Improved
Londono[20]	Spain/2022	F/41	Premature ovarian failure	Substitutive hormonal therapy	Moderna	Day 7 after 2nd does	Abdominal pain; Nausea Choluria; Jaundice	"HIV;HAV;HBV;HCV;HEV;CMV;EBV;HSV"	ALT:1312 AST:993 ALP:190 TBL:2.3 GGT:209 IgG:2080	ANA; ASMA; anti-SLA; anti-LC1	Intense lymphocytes and plasma cells infiltrate in the portal tracts; severe interface hepatitis; apoptotic bodies; perisinusoidal fibrosis;	Prednisone	Improved
Mesher[21]	Ireland/2021	F/71	left total hip replacement; osteoarthritis of the knees; HAV IgG(+)	None	Moderna	Day 10 after 1st does	Jaundice	"HIV;HBV;HCV; HEV;CMV;EBV;HSV"	ALT:1143 AST:1469 ALP:237 TBL:3.76 IgG:2177	ANA; ASMA	Intense plasma cells, lymphocytes, eosinophils, neutrophils infiltrate in the portal; interface hepatitis; rosettes formed; bridging necrosis;	Prednisolone	Improved
Rela [22]	India/2021	F38	Hypothyroidism	Levothyroxine	AstraZeneca	Day 20 after 1st does	Fever; Fatigue; Jaundice	HAV;HBV;HCV; HEV	ALT:1025 AST:1101 TBL:14.9 IgG:1650	ANA	Intense lymphocytes, plasma cells and rare eosinophils infiltrate in the portal; multiacinar hepatic necrosis; diffuse portal/periportal neocholangiolar proliferation;	Prednisolone	Improved

		M/62	Jaundice	None	AstraZeneca	Day 16 after 1st does	Fever; Anorexia; Jaundice	HAV; HBV; HEV; HCV;	ALT:1094 AST:1361 TBL:25.6	Negative	Moderate lymphocytes; plasma cells, eosinophils and polymorphs infiltrate in the portal; porto-central bridging necrosis; mild fibrosis;	Prednisolone	Died
Palla [23]	Greece/ 2022	F/40	Sarcoidosis	None	Pfizer	NA	NA	HIV;HAV;HBV;HCV;HEV; CMV;EBV;HSV	ALT:4X upper limit of normal AST:4X upper limit of normal IgG:2400	ANA;	Intense lymphocytes; plasma cells infiltrate in the portal and lobular interface hepatitis; Portal and periportal fibrosis;	Prednisolone	Improved
Vuille [24]	Switzerl and/202 1	F/76	COVID-19 infected; Hashimoto thyroiditis; urothelial carcinoma;	Levothyroxine, Midodrine; Zolpidem	Moderna	Day 3 after 1st does	NA	HAV;HBV;HCV; HEV;CMV;	ALT:579 AST:811 ALP:124 TBL:0.74 GGT:361 IgG:3940	ANA ASMA ANCA	Intense plasma cells infiltrates in the protral; interface hepatitis; apoptotic bodies; pseudorosettes	Prednisolone; Azathioprine	Improved
Shroff [25]	USA/20 21	M/46	Nonalcoholic fatty liver disease; Drug-induced liver injury	Amoxicillin	Pfizer	Day 10 after 1st does	NA	Viral serologies negative	ALT:594 ALP:197 TBL:3.9	ASMA	Mixed infiltrate in the portal; Mild ductular proliferation; portal and peri-portal fibrosis;	Endoscopic biliary dilation	Improved
		F/61	None	Nitrofurantoin	Pfizer	Day 34 after 1st does	NA	Viral serologies negative	ALT:2331 ALP:160 TBL:3.7	ASMA	Lymphocytes and plasma cells in the portal and lobular;	Prednisone	Improved
		F/42	None	None	Pfizer	Day 42 after 1st does	NA	EBV(+)	ALT:1735 ALP:287 TBL:1.5	ANA	Intense mixed infiltrate in the portal;Neutrophilic peri-cholangitis;	Prednisone	Improved
		F/33	AIH (treated) Compensated cirrhosis	None	Pfizer	Day 28 after 1st does	NA	None documented	ALT:173 ALP:46 TBL:2.1	NA	Intense plasma cells in the portal and lobular; interface hepatitis; cirrhosis;	Prednisone	Improved
		M/68	Diagnosis of solitary hepatocellular carcinoma	None	Pfizer	Day 19 after 1st does	NA	Viral serologies negative	ALT:245 ALP:55 TBL:0.9	NA	Intense plasma cells in the portal and lobular;interface hepatitis; cirrhosis;	Prednisone	Improved
		F/66	AIH (treated)	Received shingles vaccine	Moderna	Day 5 after 1st does	NA	Viral serologies negative	ALT:1199 ALP:352 TBL:5.9	NA	Intense plasma cells in the portal and lobular;interface hepatitis; central perivenulitis;	Prednisone	Improved

		F/68	Urinary tract infection	Ceftriaxone	Moderna	Day 15 after 1st does	NA	Viral serologies negative	ALT:2367 ALP:176 TBL:25	Negative	Intense inflammtion in the portal and lobular; interface hepatitis; severe bile; ductular rection	steroids; N-acetylcysteine	Improved
		F/59	None	Tylenol	Moderna	Day 31 after 1st does	NA	EBV(+); Viral serologies negative	ALT:869 ALP:367 TBL:14.7	ANA	Intense Lymphocytes in the portal and lobular; Ductular reaction;	Methylprednisolone	Improved
		M/59	None	Tylenol	Moderna	Day 46 after 1st does	NA	Viral serologies negative	ALT:2664 ALP:2252 TBL:22.3	ANA; ASMA	Mild Lymphocytes in the portal; bile duct injury;	None	Improved

Abbreviations: M, male; F, female; AIH, autoimmune hepatitis; ALT, alanine aminotransferase; AST, aspartate aminotransferase; ALP, alkaline phosphatase; TBL, total bilirubin; GGT, gamma glutamyl transferase; IgG, immunoglobulin G; ANA, anti-nuclear antibodies; ASMA, anti-smooth muscle antibodies; ds-DNA; anti-double stranded DNA; anti-SLA, antibodies against soluble liver antigen; anti-LC1, anti-liver cytosol type 1.

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