

**Table S1** Clinical characteristics, imaging manifestations, complications and therapies of hepatic hemangioma in utero (comparative summary)

Study	Type	Patient	First detection (gestation week)	Size (cm)	Fetal ultrasound	Fetal MRI	Echocardiography	Complications	Treatments	Pregnant outcome
Liu 2023 (31)	Case report	Fetus to newborn	32	5.2×4.1×3.7	Peripherally hypoechoic and centrally hyperechoic, prominent vascularity both within and surrounding	A clear, hypointense T1 and hyperintense T2	NC	NO	NO	Live birth
Schmitz 2009 (11)	Case report	Fetus to newborn	28+1	6.3×3.7×5.8	Well-vascularized and hemodynamically relevant tumor	NO	Moderate TV insufficiency and cardiomegaly	NC	Dexamethasone orally	Live birth
Cabrita 2009 (7)	Case report	Fetus to newborn	26	7.3×5.1	Hypoechoic texture with peripheral Doppler blood flow	NO	Normal heart with vena cava displacement by the hepatic mass	None	None	Live birth
Morris 1999 (35)	Case report	Fetus to newborn	17	4.5×4.3×2.4	Cystic lesion, arterial and venous flow and a large draining vessel entering the heart	T2: hyper intense with flow void, surrounded by multiple vessels	Cardiomegaly	Polyhydramnios	Oral dexamethasone	Live birth
Chou 2005 (30)	Case report	Fetus to newborn	33	3.7×3.0	Hyperechoic mass without blood flow	NO	NO	Normal	None	Live birth
Morimura 2003 (14)	Case report	Fetus to newborn	36+5	9.6×8.6	Heterogeneous, hypoechoic, well-circumscribed	NO	NO	reassuring pattern (NST)	None	Live birth
Sepulveda 2021 (17)	Case report	Fetus	33+3	8.9×8.4×6.9	Well-delineated, hypoechoic, little blood flow	T2: extensive hyper intense with an exophytic component	NO	Normal	None	Fetal demise
		Fetus to newborn	30	8.1×6.4×6.3	Well-delineated, irregular hypoechoic area in the center, vascularity with AV shunts	T2: extensive heterogeneous, necrotic center	NO	Normal	None	Live birth
		Fetus to newborn	34	6.0×6.0	Calcifications, vascularity with AV shunts	T2: heterogeneous hyper intense,	Normal	Normal	None	Live birth
Tenkumo 2017 (28)	Case report	Fetus to newborn	29+3	4.5×4.0×2.3	Well-defined, mixed solid tumor with cystic lesions and punctate calcification, moderate blood from celiac artery	Well-defined, hypervascularized	NO	None	None	Live birth
Ling 2018 (9)	Research article	Fetus to newborn	36	8.6×8.1×10.3	Well-defined, hypoechoic, nonuniform internal echo, ring of blood flow, supplied by hepatic artery and drained by hepatic veins	T1: low SI; T2: high SI; flow voids	Normal	Fetal heart rate slows down	None	Live birth
			31+6	9.2×5.6×8.0	Well-defined, hypoechoic, nonuniform internal echo, central necrotic hypoechoic area, cystic cavity; ring of blood flow and supplied by hepatic artery and drained by hepatic veins	T1: low SI; T2: high SI; flow voids; multiple low-signal-intensity nodules	Cardiothoracic ratio was high (<0.33)	Cardiothoracic ratio was high (<0.33)	None	Live birth
			36	4.5×2.3×4.1	Well-defined, hypoechoic, nonuniform internal echo, central necrotic hypoechoic area; ring of blood flow and supplied by hepatic artery and drained by hepatic veins	T1: low SI; T2: high SI; flow voids	Normal	None	None	Live birth
			34+2	5.6×4.2×4.1	Well-defined, hypoechoic, nonuniform internal echo, central necrotic hypoechoic area and calcifications; strip of blood flow and supplied by hepatic artery and drained by hepatic veins	T1: low SI; T2: high SI; flow voids	Normal	None	None	Live birth
			36+3	5.0×4.7×4.3	Well-defined, hypoechoic, uniform internal echo; supplied by hepatic artery and drained by hepatic veins	T1: low SI; T2: high SI; flow voids	Cardiothoracic ratio was high (<0.33), TV regurgitation, little PE	None	None	Live birth
			37+1	5.2×4.8×5.5	Well-defined, hypoechoic, uniform internal echo; supplied by hepatic artery and drained by hepatic veins	T1: low SI; T2: high SI; flow voids	Cardiothoracic ratio was high (<0.33), little PE	None	None	Live birth

Table S1 (continued)

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Study	Type	Patient	First detection (gestation week)	Size (cm)	Fetal ultrasound	Fetal MRI	Echocardiography	Complications	Treatments	Pregnant outcome
Zhang 2019 (10)	Research article	Fetus to newborn	38	4.3×3.2×3.5	Well-defined, hypoechoic, nonuniform internal echo, central hypoechoic area; ring blood flow and branch into tumor	T1: low SI; T2: nonuniform high SI	Normal	None	None	Live birth
			37	4.2×4.1×4.3	Well-defined, nonuniform internal echo, central hypoechoic area; ring blood flow	T1: low SI; T2: nonuniform high SI	Normal	None	None	Live birth
			31	3.8×3.8×3.2	Well-defined, hypoechoic, nonuniform internal echo; ring blood flow	T1: high/low SI in center and high SI of peripheral tissues; T2: nonuniform high SI	Normal	None	None	Live birth
			34	5.7×4.8×5.0	Well-defined, nonuniform internal echo, central hypoechoic area; ring blood flow	T1: low SI; T2: high SI	Normal	None	None	Live birth
			35	0.9×0.6×0.7	Well-defined, hypoechoic; no blood flow	NO	Normal	None	None	Live birth
			38	2.4×2.0×1.6	Well-defined, hypoechoic; little blood flow	T1: low SI; T2: high SI	Normal	None	None	Live birth
Chuileannain 1999 (18)	Case report	Fetus to newborn	33	12×9×9	Encapsulated heterogeneous, cystic and solid area; blood in mass and the existence of turbulent flow (arteriovenous malformations)	No	Pericardial effusion	abnormal fetal heartrate	None	Live birth
Shen 2018 (27)	Research article	Fetus to newborn	33	4.4×4.1×4.3	Not well-defined, cystic and solid area; blood in and surrounding the mass	NC	NC	NC	NC	Live birth
Chen 2021 (29)	Research article	Fetus to newborn	29.5±3.6	8.4 ×5.4×4.0	8 hypoechoic; 7 mixed echo; 12 well-defined; ring blood flow and branches in the mass, 8 vessels drained into hepatic veins	T1: low SI; T2: high SI	NC	None	None	Live birth
Yang 2022 (12)	Research article	Fetus to newborn	28–39	3.2–5.8	NC	NC	NC	NC	None	Live birth
Tang 2023 (36)	Case report	Fetus to newborn	23	6.4	Mixed echo and well-defined; filled by vessels and drained into middle hepatic vein	T1: low SI; T2: high SI	Cardiothoracic ratio was high (0.5)	Cardio thoracic ratio 0.5, pericardial and pleural effusion	Corticosteroids and β-blockers through placenta	Live birth
Xie 2022 (8)	Research article	Fetus to newborn	30–40	4.2–9.9	10 mixed echo, 10 hypoechoic, 1 hyperechoic and 1 equal echo; surrounding blood flow	T1: low/high/nonuniform SI; T2: equal/nonuniform/high SI	NC	7 intra uterine distress	None	Live birth
Long 2020 (23)	Research article	Fetus to newborn	33 gestational week to 2 days neonate	1.9–7.8	3 mixed echo, 1 hypoechoic; ring blood flow with or without vessels in the mass	NC	NC	None	None	Live birth
Li 2023 (37)	Research article	Fetus to newborn	22–39	2.9–6.9	Well-defined; 7 nonuniform internal echo with central hypoechoic; 5 solid echo; ring blood flow with AV shunts	NC	2 cardiomegaly	2cardiomegaly and 1 pleural effusion	None	Live birth
Wang 2020 (38)	Case report	Fetus to newborn	27	NC	Mixed echo	NC	Cardiothoracic ratio was high	Cardiothoracic ratio was high	None	Live birth
			15 days neonate	NC	NC	NC	NC	NC	NC	Live birth

TV, tricuspid valve; AV, arteriovenous; cm, centimeter; NST, non-stress test; PE, pleural effusion; SI, signal intensity; NC, not clear; T1.

**Table S2** Clinical characteristics, imaging manifestations, complications and therapies of hepatic hemangioma after birth (Comparative summary)

Study	No. of patients	Ultrasound	Echocardiography	Other radiology features	Clinical symptoms	Laboratory data	Medication	Interventional therapy	Time of endpoint	Endpoint
Zenzen 2009 (13)	1	Complex heterogeneous hepatic mass, foci of calcification, high-flow vessels, right and middle hepatic veins, upper abdominal aorta, celiac, hepatic and phrenic arteries were dilated; a portosystemic shunt between right portal vein and the hepatic veins	3 days: patent ductus arteriosus, biventricular hypertrophy; 20 days: right ventricular dilatation and atrial septal defect	Chest radiograph: an enlarged heart, prominent pulmonary vascularity; CT: low-attenuation hepatic mass with avid peripheral enhancement in the arterial and portal venous phases. The central portion of the lesion did not enhance on delayed imaging	Respiratory distress, tachypnea, bronzed skin, hepatomegaly and systolic murmur; cyanosis and apnea	Thrombocytopenia, leukocytosis, liver functions test progressively deteriorated	Conservative treatment with prednisolone	Selective catheterization and coil embolization of the right and left hepatic and right phrenic arteries	10 months	Liver transplantation rapidly involuting congenital hemangioma (RICH) was confirmed with follow-up
Liu 2023 (31)	1	Calcifications within it	NC	CT and MRI: heterogeneous, early peripheral enhancement	NC	Mild anemia, AFP was higher than normal	NO	NO	2 months and 10 days	Resection with laparotomy
Prokurat 2002 (32)	17	NC	NC	NC	12 anemia, 15 hepatomegaly, 7 congestive heart failure, 4 consumption coagulopathy	NC	3 steroids	3 embolization	NC	7 were arteriovenous malformations or hamartomatoid component; of the HH, 4 lobectomy, 6 segmental hepatectomy; all survival
Boon 1996 (33)	39	Inhomogeneous echogenicity or predominantly hypoechoic; calcifications; enlargement of aorta, celiac trunk, hepatic artery, superior mesenteric artery or hepatic veins	NC	Decreased signal on T1 and increased signal on T2; flow-voids	NC	NC	Corticosteroid, interferon alfa-2a	embolization	13 weeks to 14yr	7 died, 23 alive and well, 9 without follow-up or with NC outcome
Zhang 2010 (34)	12	NC	NC	CT: ill-defined region, hypoattenuated mass with a well-defined contour with calcifications	Asymptomatic, palpable, upper abdominal mass	Leukocytosis, anemia, thrombocytosis, hyperbilirubinemia, abnormal liver function and increased $\alpha$ -fetoprotein	NO	NO	1 to 9 yr	10 well alive with biopsy or complete resection and 2 fetal demise
Schmitz 2009 (11)	1	Normal	Cardiomegaly	None	Kasabach-Merritt Syndrome	Thrombocytopenia	Platelets transfusion; corticosteroids; prednisolone	Hepatic arterials partly occlusion	2 yr	Survival
Cabrita 2009 (7)	1	Heterogeneous lesion showing marked hepatportal blood flow	NO	MRI: T1 low SI, T2 high SI; peripheral enhancement, slow wash-out	Thoracoabdominal circulation, abdominal distension, palpable liver	Elevated liver and cholestatic enzymes	prednisolone; subcutaneous $\alpha$ -2a-interferon	NO	2 yr	Asymptomatic with a 1.5cm lesion
Morris 1999 (35)	1	Complex vascular mass with central spherical vascular structure or varix	Dilated right ventricle, slightly depressed function, low-normal left ventricular function	MRI: increased T2 signal and a dilated, proximal abdominal aorta	Liver was palpable 2 cm below the right costal margin	Normal	Prednisone	NO	7 months	Detectable on sonography
Chou 2005 (30)	1	Heterogeneous solid mass	NO	CT: fairly well-defined mass	NA	High AFP level	Interferon	NO	7 days	NC
Morimura 2003 (14)	1	NO	NO	CT: enhanced mass, large vascular channels	NA	Anemia and thrombocytopenia	$\alpha$ -interferon, pledonine	NO	2 days	Died for DIC

**Table S2** (*continued*)

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Study	No. of patients	Ultrasound	Echocardiography	Other radiology features	Clinical symptoms	Laboratory data	Medication	Interventional therapy	Time of endpoint	Endpoint
Sepulveda 2021 (17)	3	NO	NO	NO	NA	NA	NA	NA	36+1 gestational week	Fetal demise
		NO	NO	CT: heterogeneous with central necrosis, celiac trunk enlargement	Kasabach-Merritt syndrome, urinary sepsis, multiple cerebrovascular accidents	NA	Vasoactive drugs, corticosteroids, blood transfusions	Transcatheter embolization	4 yr	Complete regression
		Heterogeneous solid mass, calcifications, blood flow	NO	NO	None	NA	NO	NO	7 yr	Normal (with tumor or not is unclear)
Tenkumo 2017 (28)	1	Diagnosed as hepatic hemangioma	NO	NO	NA	NA	NA	NA	2 months	spontaneous regression
Ling 2018 (9)	6	Clear border, excentric growth pattern, internal grid-shaped region and bypassed the left hepatic vein	NC	CT: centripetal enhancement	NC	Liver function, thyroid function, AFP, NSE and VMA: normal	oral propranolol with dexamethasone	NO	2 yr	Tumor shrinkage and calcification plaques
		Clear border and internal grid shaped region	NC	CT: heterogeneous low density, centripetal enhancement, no enhancement in low-density zone	NC	Liver function, thyroid function, AFP, NSE and VMA: normal	oral propranolol with dexamethasone	NO	2 yr	Tumor shrinkage, calcification plaques
		NC	NC	CT: centripetal enhancement	NC	Liver function, thyroid function, AFP, NSE and VMA: normal	oral propranolol with or without dexamethasone	NO	2 yr	Tumor shrinkage, calcification plaques
		Less clear, nonuniform density and calcifications	NC	CT: nonuniform density, punctate calcifications, centripetal enhancement	NC	Liver function, thyroid function, AFP, NSE and VMA: normal	oral propranolol with dexamethasone	NO	6 months	Tumor shrinkage, calcification plaques
		NC	NC	CT: centripetal enhancement	NC	Liver function, thyroid function, AFP, NSE and VMA: normal	oral propranolol, dexamethasone	NO	6 months	Tumor shrinkage, calcification plaques
		NC	NC	CT: centripetal enhancement	NC	Liver function, thyroid function, AFP, NSE and VMA: normal	NO	pingyangmycin	6 months	Tumor shrinkage, calcification plaques
		NC	NC	NC	NC	NC	NO	NO	NC	Tumor shrinkage
Zhang 2019 (10)	6	NC	NC	NC	NC	NC	Oral propranolol	NO	NC	Tumor shrinkage
		NC	NC	NC	NC	NC	NO	NO	NC	No growth of tumor
		NC	NC	NC	NC	NC	Oral propranolol	NO	2 yds	Complete regression
		NC	NC	NC	NC	NC	NO	NO	NC	Survival with tumor
		NC	NC	NC	NC	NC	NO	NO	NC	Tumor shrinkage
		NC	NC	NC	NC	NC	NO	NO	NC	Tumor shrinkage
Chuileannain 1999 (18)	1	NC	NC	NC	Pale, petechial rash, abdominal distention, dyspnea	Hemoglobin level 7.0 g/dL	NO	intravenous -interferon	16 days of delivery	Died for hemorrhage
Shen 2018 (27)	1	Diffuse calcifications	NC	NC	NC	NC	NO	NO	5 days	Surgery
Chen 2021 (29)	15	NC	NC	NC	NC	NC	1 glucocorticoid	3 intravenous alpha-interferon	NC	1 surgery, 3 complete regression, the others reductions in size
Yang 2022 (12)	14	NC	2 cardiac insufficiencies	NC	None	NC	1 propranolol, 2 propranolol with glucocorticoid	NO	24 months	4 complete regressions, 2 unchanged, and the others reductions in size

Table S2 (continued)

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Study	No. of patients	Ultrasound	Echocardiography	Other radiology features	Clinical symptoms	Laboratory data	Medication	Interventional therapy	Time of endpoint	Endpoint
Tang 2023 (36)	1	Mixed echo, supplied by hepatic arterial-venous fistula	NC	CT: arterial-venous fistula	None	Platelet: 249×10 <sup>9</sup> /L; hemoglobin: 74 g/L	NO	NO	1 yr	Normal (with tumor or not is unclear)
Xie 2022 (8)	22	NC	NC	NC	Dyspnea, abdominal distension, emesis	NC	Propranolol, dexamethasone and rapamycin	2 accept interventional therapy	1.2–7.0 yr	3 complete regression, 19 partial regression
Long 2020 (23)	4	NC	NC	NC	NC	NC	NO	NO	6–24 months	reductions in size with calcification
Li 2023 (37)	12	NC	NC	NC	NC	AFP and thyroid function: normal	Oral medicine	NO	3–29 months	10 complete regression, 1 partial regression, 1 unchanged
Wang 2020 (38)	2	Well-defined, cystic with division	ASD, patent ductus arteriosus and pulmonary arterial hypertension	MRI: cystic mass; CT: centripetal enhancement, no enhancement in low-density zone	Cardiac failure	AFP: 110,850. 00 ng/mL, HCG: 35.1 nIU/mL	Methylprednisolone, hydrochlorothiazide, milrinone	NO	2 months	Survival with surgery of mass
		Well-defined, hyperechoic, dilated hepatic veins	ASD, pulmonary arterial hypertension	CT: low density; enhanced mass, dilated hepatic vascular	Respiratory embarrassment and cardiac failure	NC	Milrinone and hydragogue	Hepatic artery embolization	17 days	Died for respiratory and cardiac failure
Shen 2017 (39)	3	Hyperechoic or hypoechoic, dilated hepatic veins	PDA, ASD, pulmonary arterial hypertension	CT: low density; centripetal enhancement	Respiratory embarrassment and cardiac failure	NC	Propranolol, milrinone and sildenafil	Hepatic artery embolization	57 days to 1 year	1 died for cardiac failure, 2 tumor shrinkage

NC, not clear; NA, not applicable; cm, centimeter; AFP, alpha fetoprotein; NSE, neuron specific enolase; VMA, vanillylmandelic acid; ASD, atrial septal defect; PDA, patent ductus arteriosus; T1, tension one; T2, tension two; CT, computerized tomography; yr, year; DIC, disseminated intravascular coagulation.