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Surgical Approach to Lung Hydatid Cysts in Children

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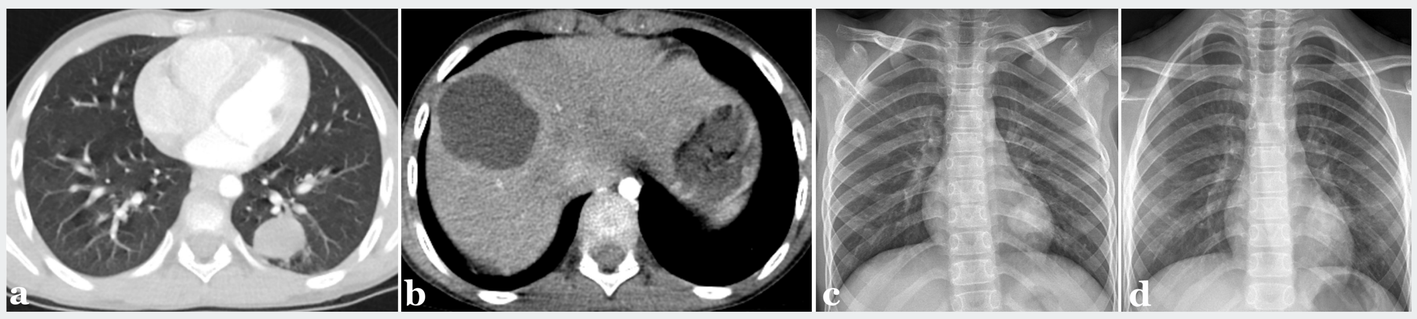
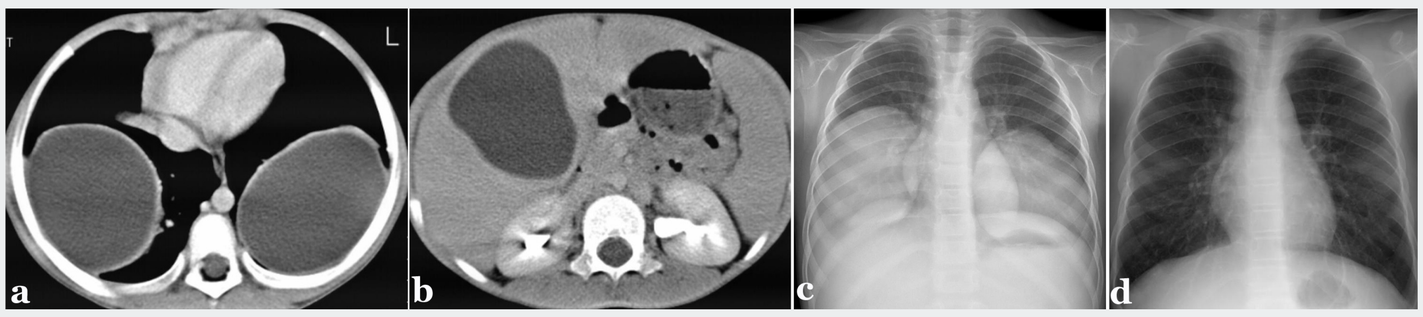
Purpose: While international guidelines provide recommendations for the management of hepatic hydatid cyst (HC) in children, the literature on pulmonary HCs is scarce, and a standardized approach has not been fully established. In this context, we sought to assess our management strategy and clinical outcomes in pediatric patients with pulmonary HCs treated at a high-volume tertiary pediatric surgery center. The aim of this study was to determine the treatment options for pulmonary HCs in children based on cyst size, anatomical location, and clinical presentation.

Methods: Children with pulmonary HC treated between 2004-2022 were evaluated. Patients were grouped according to the size of the HC and those with ruptured and intact cysts at the time of admission, and the data were compared. ROC curve was created to determine the HC size limit in operated patients. P<0.05 was considered statistically significant.

Results: A total of 72 patients with a mean age of 8.9±3.4 years were included in the study. HC sizes 2.5-18 cm, and half of the patients had bronchial/pleural ruptures at presentation. Forty-six patients (64%) underwent surgery. Bronchial ruptured HCs were smaller in size (p=0.021). In cases where the cyst contents were evacuated by opening the bronchus, improvement in clinical and radiological findings was observed with anthelmintic treatment (n=17, 81%). The cutoff point on the ROC curve was determined as 6.1cm.

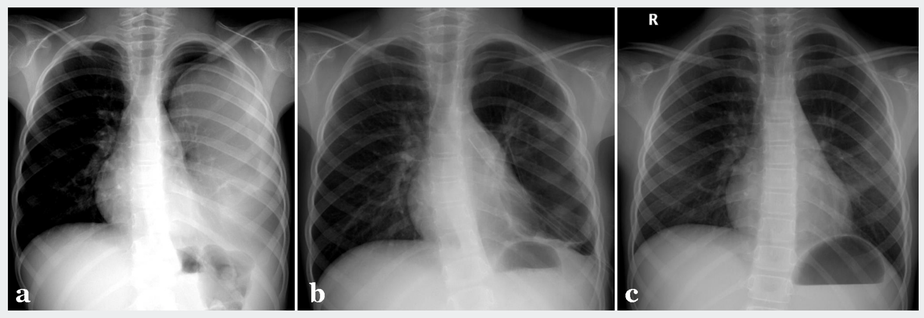


A 7-year-old boy with a 3 cm HC in the left lower lung lobe (a) and a 5 cm HC in segment VIII of the right hepatic lobe (b) on CT. The hepatic HC was treated with PAIR, followed by antihelminthic therapy. On the initial chest X-ray, the pulmonary HC appears as an opacity behind the cardiac silhouette on the left side (c), which becomes a faint shadow ten months later.



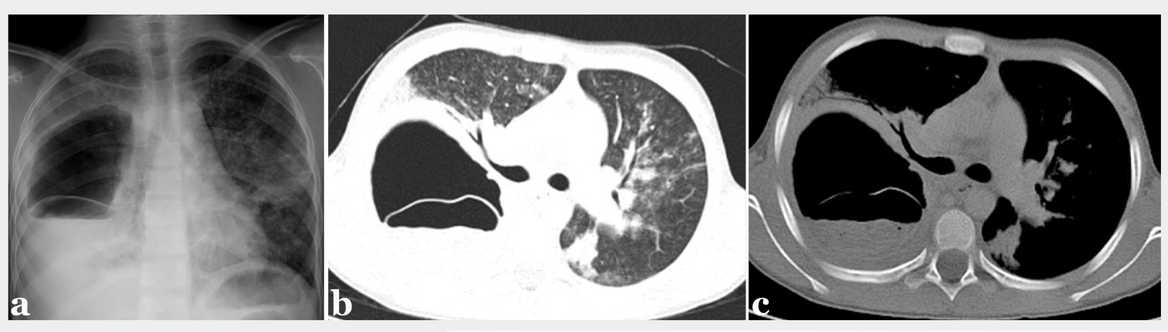
A 5-year-old girl with HCs in both lungs and liver (a,b,c). Bilateral lung HC surgery was performed, and PAIR was performed for the liver HC. Six years later, both lungs are ventilated normally on the chest X-ray (d).

Hydatid Cyst Characteristics		Number of Patients (n=72)
Location of pulmonary hydatid cyst	Right	46 (64%)
	Left	21 (29%)
	Bilateral	5 (7%)
Number of pulmonary hydatid cysts [median (min-max)]		1 (1-6)
Largest pulmonary hydatid cyst size (cm) [median (min-max)]		7 (2,5-18)
Extrapulmonary cysts (n,%) (n=25, 34.7%)	Liver	23 (31.9%)
	Spleen	3 (4.2%)
	Kidney	1 (1.4%)
	Pelvis	2 (2.8%)
Largest extrapulmonary cyst size (cm) [median (min-max)]		5 (1-8)
Type of presentation (n, %)	Bronchial rupture	21 (29.2%)
	Pleural rupture	15 (20.8%)
	Intact cyst	36 (50%)
Indirect hemagglutination (IHA) (n=57, 79.2%)	Positive	30 (52.6%)
	Negative	27 (47.4%)

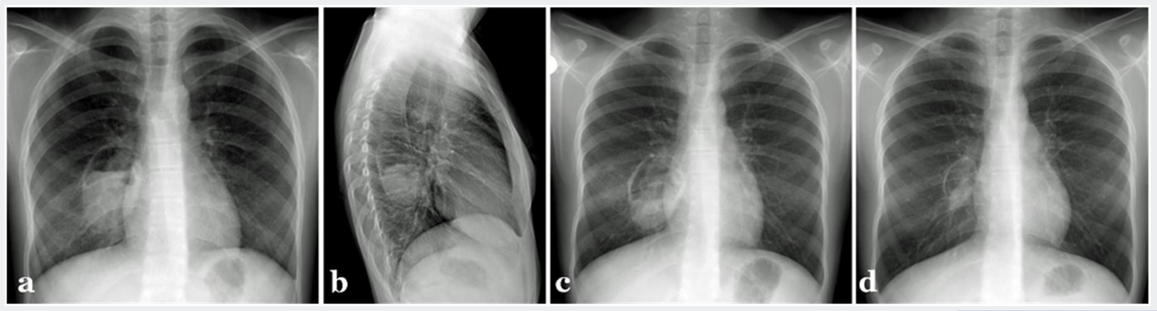


A 6-year-old girl with a giant HC (15 cm) in the left lower lung lobe. Preoperative (a) and early postoperative chest X-ray (b, with chest tube) are shown. On the follow-up chest X-ray one year later (c), both lungs demonstrate normal ventilation.

Patients Undergoing Surgery		Number of Patients (n=46,%64)
Age at presentation (years)		8.9±3.4
Gender (n,%)	Male	25 (54.3%)
	Female	21 (45.7%)
Duration of surgery (min)		130 (70-275)
Side of lung where cyst is located	Right	32 (69.6%)
	Left	11 (23.9%)
	Bilateral	3 (6.5%)
Largest cyst size in the lung (cm) [median (min-max)]		8 (4-18)
Hydatid cyst status (n, %)	Bronchial rupture	4 (8.7%)
	Pleural rupture	13 (28.3%)
	Intact cyst	29 (63%)
Number of hydatid cysts [median (min-max)]		1 (1-6)
Number of bronchial fistulas [median (min-max)]		4 (1-10)
Tube thoracostomy duration (days) [median (min-max)]		6 (2-29)
Postoperative complications (n,%)	Reoperation	2 (4.3%)
	Tube thoracostomy (2nd tube)	2 (4.3%)
	Contralateral cyst rupture	2 (4.3%)
Length of hospital stay (days) [median (min-max)]		12 (3-64)
Postoperative follow-up (months) [median (min-max)]		14.5 (5-96)



A 10-year-old girl presents with a 9.7 cm hydatid cyst located in the middle and lower lobes of the right lung (chest X-ray (a) and thorax CT (b)), causing hydrotorax due to pleural rupture (c). Widespread infiltrations are observed in both lungs, secondary to bronchial fistulas opening into the cyst.



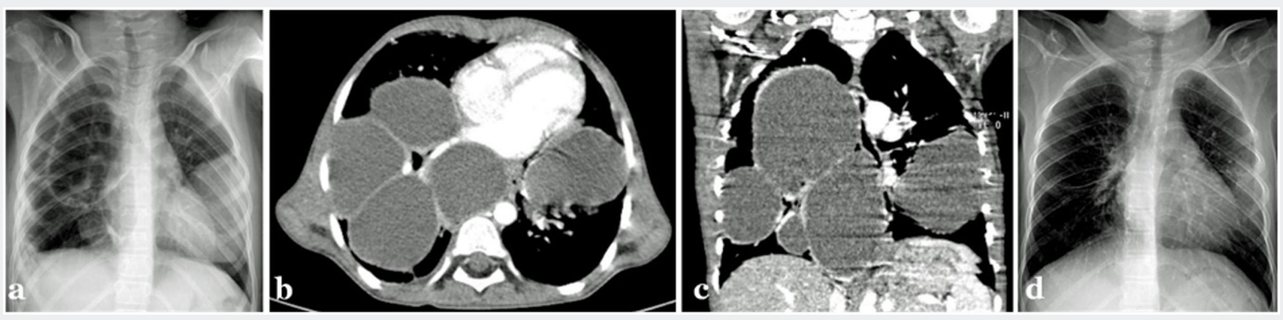
A 12-year-old girl with a right lung hydatid cyst complicated by bronchial rupture. At presentation, PA (a) and right lateral (b) chest X-rays show air–fluid levels. One week later, the hydatid cyst cavity began to decrease in size (c), and after two months, it had markedly regressed with disappearance of the air–fluid level (d).

Pulmonary hydatid cyst		Bronchial rupture (*n*=21, 29.2%)	Others (*n*=51, 70.8%)	*p* value
Age at presentation (years)		8.7±4	8.9±3.3	0.848*
Gender (M/F) (n,%)		15 M (71.4%) 6 F (28.6%)	28 M (54.9%) 23 F (45.1%)	0.194+
Side of lung where cyst is located (n,%)	Right	8 (38.1%)	38 (74.5%)	**0.012+**
	Left	11 (52.4%)	10 (19.6%)	
	Bilateral	2 (9.5%)	3 (5.9%)	
Hydatid cyst size (cm)		6 (3-10)	7,2 (2,5-18)	**0.021∞**
Number of hydatid cysts	1 (53, 73.6%)	15 (71.4%)	38 (74.5%)	0.787+
	2-6 (19, 26.4%)	6 (28.6%)	13 (25.5%)	
Hydatid cyst in other organs		7 (33.3%)	18 (35.3%)	0.874+
Duration of symptoms (days)		7 (1-300)	7 (1-365)	0.951∞
Operation (n,%)		4 (19%)	42 (82.4%)	**<0.0001+**
Complication (n,%)		1 (4.8%)	5 (9.8%)	0.664×
Length of hospital stay (days)		9 (2-36)	11.5 (3-64)	0.066∞
Follow-up period (months)		18 (3-108)	16.5 (3-96)	0.954∞

*Student t-test, +chi-square test, ∞Mann-Whitney U test, ×Fisher's exact chi-square test

Medical treatment:
-Pulmonary HCs 1-3 cm in diameter (asymptomatic)
-Centrally located pulmonary HCs that have completely emptied their contents following rupture into a bronchus

Surgical treatment:
-Elective surgery: for 4–6 cm pulmonary HCs
-Emergency surgery: for pulmonary HCs larger than 6 cm or those ruptured into the pleural cavity



An 8.5-year-old girl with multiple HCs in both lungs and the posterior mediastinum (a, b, c). Four days after surgery for the right lung and posterior mediastinal HCs, a bronchial rupture developed in the left lung HC, which was managed medically. On the chest X-ray obtained nine months later (d), both lungs appear normally aerated.

Conclusion: In conclusion, in pediatric pulmonary HCs, the absence of symptoms until the cyst reaches a very large size and the fact that patients usually present after the cyst becomes complicated have prevented the development of a standardized follow-up and treatment guideline. In endemic regions, chest radiography remains a key diagnostic tool for children presenting with cough or dyspnea. We believe that surgical intervention should be planned without delay for pulmonary HCs larger than 6 cm. For centrally located pulmonary hydatid cysts that have ruptured into the bronchial tree and emptied their contents, conservative management with antihelminthic therapy following the improvement of acute symptoms may represent a rational alternative to surgical intervention, given the possibility of spontaneous reduction and disappearance of the residual cavity. Future research should incorporate non-operated bronchial rupture cases to refine management strategies and validate these findings in larger patient cohorts.