

ACADEMIC: CASE REPORT

Radiologic features of hepatic echinococcosis in New Zealand, a case report

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Abstract

This case report details an incidental radiological diagnosis of hepatic echinococcosis in an otherwise well and asymptomatic patient. Hepatic echinococcosis is uncommonly diagnosed in New Zealand (NZ) and is caused by contact with the *Echinococcus granulosus* parasite. This report reviews features of hepatic echinococcosis on computed tomography (CT) and ultrasound imaging. The report aims to prompt clinicians to consider hepatic echinococcosis in the differential of imaged hepatic cysts in patients with risk factors for this disease.

Introduction

Hydatid disease, also known as cystic echinococcosis, caused by *E. granulosus* species, is a zoonotic, parasitic tapeworm infection. Hydatid disease manifests as cystic lesions most commonly identified in the liver, although it may involve any anatomical structure.¹ While endemic to NZ, the Ministry of Agriculture and Forestry declared NZ provisionally free of hydatid disease in 2002.² Cystic echinococcosis is currently a notifiable disease in NZ.

The definitive hosts for *E. granulosus* are dogs, with intermediate hosts consisting of sheep, cattle, goats, and other ruminants. Adult tapeworms exist in the gastrointestinal tract of definitive hosts. Eggs present in the faeces of definitive hosts may be ingested by an intermediate host and then develop into hydatid cysts in various tissues of the intermediate host. The *E. granulosus* life cycle continues through definitive host ingestion of larvae present in intermediate hosts. This usually involves dogs killing and eating infected intermediate hosts or being fed uncooked intermediate hosts. Humans can be infected through accidental ingestion of eggs present in the faeces of infected dogs.³

The most common site of hydatid cyst formation in humans is the liver, accounting for 75% of presentations.³ Less common sites of cyst formation include the lungs (10%), spleen (5%), brain (2%), kidneys, and other locations. Up to 80% of hepatic hydatid cysts involve the right hepatic lobe. The vast majority of hydatid cysts are asymptomatic at diagnosis, as all primary infections are asymptomatic and may remain as such permanently.⁵ Some studies suggest up to 60% of cases are asymptomatic on diagnosis.¹¹

This case report demonstrates the characteristic 'water lily sign' of hydatid disease as seen on computed tomography (CT) and ultrasound imaging in an otherwise asymptomatic patient.

Case presentation

Mr M is a previously fit and well 58-year-old NZ European male who electively presented for the removal of left pelvic fixation metalware due to femoral nerve syndrome. Postoperatively, Mr M developed a *Morganella morganii* urinary tract infection which was cured by treatment with meropenem. Despite this, the patient remained febrile and new liver function tests demonstrated a gamma-glutamyl transpepti-

dase (GGT) level of 580 and an alkaline phosphatase (ALP) level of 364. Other biochemical investigations were within normal limits.

A contrast-enhanced portal venous phase CT scan was sought to identify alternative sources of intra-abdominal infection to explain the patient's ongoing fevers and abnormal liver function tests. A 48 mm (transverse) by 22 mm (antero-posterior) by 97 mm (cranial-caudal) minimally rim-enhancing collection in the anterolateral left abdominal wall deep to the skin incision was identified and was surgically managed. The same CT incidentally identified multiple cystic structures within the right lobe of the liver as shown in figure 1. The largest of the cystic structures measured 84 mm (transverse) by 74 mm (antero-posterior) by 62 mm (cranial-caudal) in hepatic segment six. These cysts demonstrated non-enhancing soft tissue rims with serpiginous soft tissue filaments identified within, interpreted as the 'water lily sign' (Figures 1 and 2). No prior CT imaging was available for comparison. A previous upper abdominal ultrasound in 2021 was available for comparison, demonstrating no evidence of hepatic cysts or hydatid disease.

Further history revealed extensive occupational travel to Egypt, Jordan, Iraq, and Switzerland without significant contact with canines since his previous ultrasound in 2021. The cysts identified on CT underwent further investigation by upper abdominal ultrasound. Undulating internal septations within most hepatic cysts were demonstrated with no internal vascularity identified on Doppler ultrasound assessment (Figures 3 and 4). The largest cysts identified on CT measured 183 mL in volume. Serological testing for antibodies to *E. granulosus*, using indirect haemagglutination, revealed a titre of 640 units (normal <80). Titres of 320 units or greater are considered diagnostically indicative of hydatid disease.

Follow-up

Once clinically stable, the patient was discharged. Mr M remained asymptomatic from echinococcosis and was reviewed as an outpatient by the infectious diseases and general surgical services. He was commenced on albendazole 400 mg twice daily for a duration of six months with monthly reviews. He is currently pending treatment by cyst puncture, aspiration, instillation of a scolical agent and re-aspiration (PAIR) under general surgical management. Mr M remained asymptomatic on follow up and initial liver function (LFT) derangement was felt unlikely to be secondary to hydatid echinococcosis once they improved prior to PAIR treatment. LFT derangement is not specific for echinococcosis and are deranged only in 40% of patients, most commonly an isolated ALP rise.⁶

Imaging findings



Figure 1: Selected axial image of contrast-enhanced portal venous phase CT imaging demonstrating non-rim-enhancing hepatic cysts (black arrows) with serpiginous soft tissue filaments within (white arrow) which represent a mobile ruptured endocyst wall.

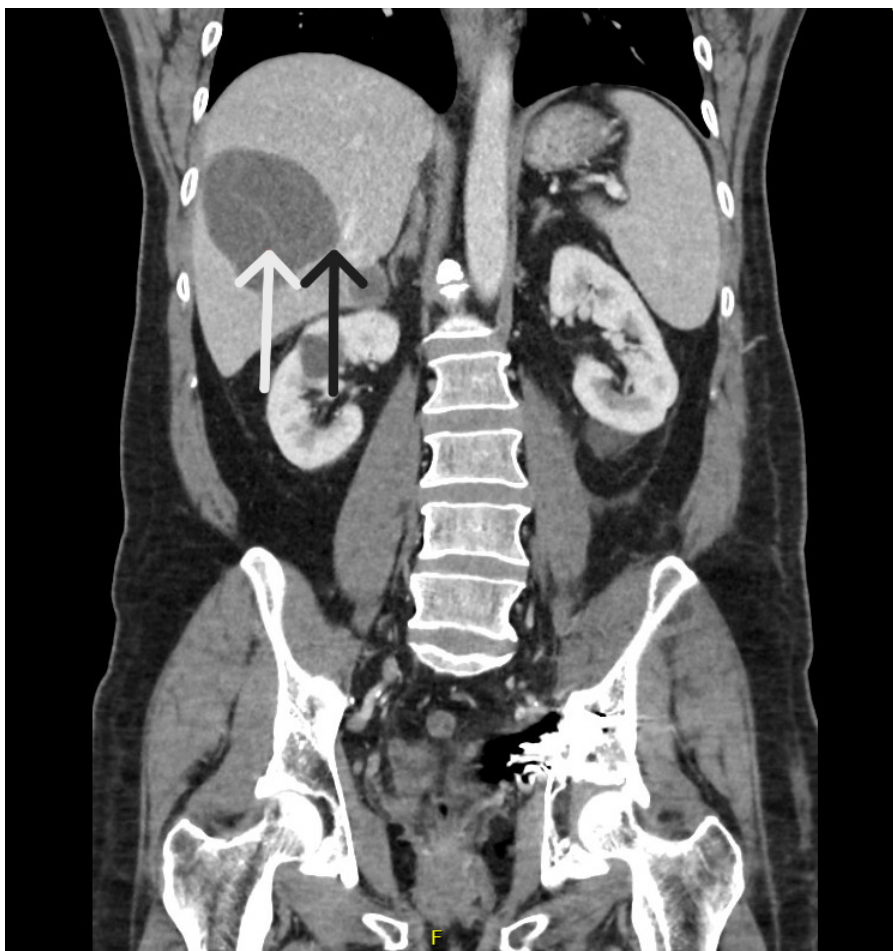


Figure 2: Selected coronal image of contrast-enhanced portal venous phase CT imaging demonstrating non-rim-enhancing hepatic cysts (black arrow) with serpiginous soft tissue filaments within (white arrow).



Figure 3: Selected transverse hepatic ultrasound image demonstrating undulating internal septations (white arrow) within hepatic cysts (WHO CE3).

Discussion

This case study examines the characteristic CT and ultrasound features diagnostic of type 4 hepatic hydatid cysts in a clinically stable and asymptomatic patient.

Hydatid cysts can be broadly classified into four subtypes. Type 1 cysts are simple and demonstrate no internal architecture. Type 2 cysts are multivesicular cysts with multiple internal septae representing walls of daughter cysts. Type 3 cysts represent calcified cysts. Type 4 are complicated cysts, often secondary to rupture or superinfection. Hydatid cysts are three layered structures, consisting of a pericyst, ectocyst, and endocyst. This represents a fibrous adventitial capsule, a laminated acellular mucin-based membrane, and a germinative layer producing daughter vesicles containing protoscolices respectively.¹

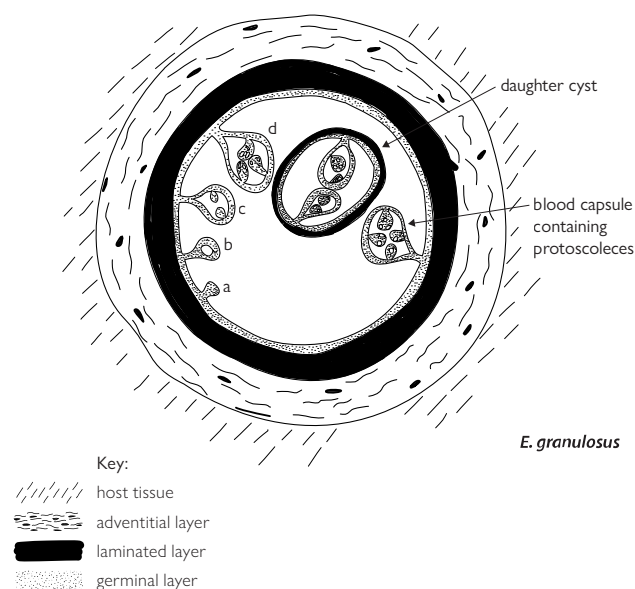


Figure 5: Hydatid cyst wall structure adapted from World Health Organisation echinococcosis manual.¹¹

Up to 35% of hydatid cysts are complicated by rupture. This may result in three patterns of disease, with communicating rupture being the most common type (15%), then contained rupture (12%) and direct rupture (6%).⁵ Rupture of the cyst into the biliary system is known as a communicating rupture, whereas rupture into other viscera or body cavities is known as a direct rupture. The rates of direct and communicating rupture tend to be higher in multi-lobar hepatic hydatid cysts, and the cystic fluid appears to be immunogenic, with dissemination into the host having the potential to cause anaphylaxis.¹⁷

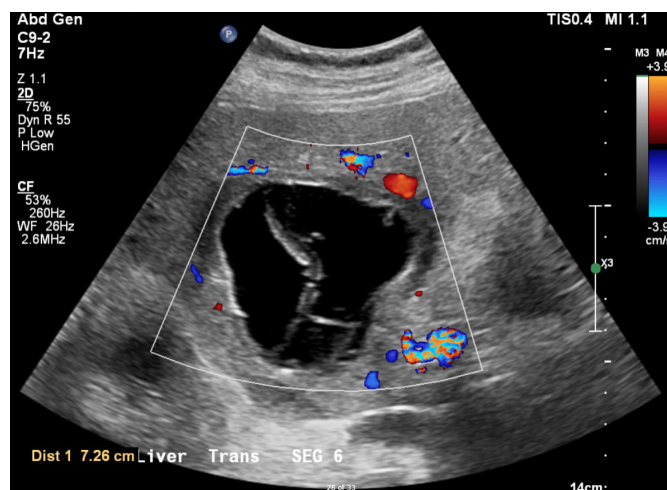


Figure 4: Selected transverse hepatic colour Doppler ultrasound image demonstrating no intracystic vascularity.

Furthermore, the risk of superinfection is up to 25% in ruptured hepatic cysts, with a higher risk for communicating ruptures compared to contained ruptures.⁶

This case demonstrates a contained rupture wherein there is rupture of the endocyst with preservation of the pericyst. As a mobile endocyst wall on ultrasound imaging can be identified while the outer rounded pericystic structure is maintained, this implies dissection of the two cystic membranes. This classifies the cysts seen in Mr M's imaging as complicated cysts (type 4) with contained internal rupture. Potential mechanisms in this pattern of rupture involve a progressive collection of hydatid fluid between the endocyst and pericyst. This may occur secondary to cyst degeneration or trauma, causing increased intracystic pressure and leading to dissection of the membranes as seen in this case.¹⁵ On CT, magnetic resonance (MR) or ultrasound imaging, a curvilinear structure within the hydatid cyst can be identified as the 'water lily sign' or 'serpent sign', which represents sections of mobile endocyst wall within a contained cyst. The detached membrane may demonstrate variable attenuation on CT, with possible features of hyperattenuation and calcification seen in the context of rupture secondary to natural degeneration or treatment.⁵ Ultrasound imaging of hydatid cysts may be stratified by the 2001 World Health Organisation (WHO) hepatic hydatid cyst classification.⁸ The appearances of this case on ultrasound are consistent with WHO CE3, which suggests a transitional stage of infection with possibility for either further cyst degeneration or daughter cyst formation. Ultrasonographic features of CE3 cysts are characterised by detachment of the endocyst wall, pathognomonic of hepatic echinococcosis.⁸

While some hepatic cysts show characteristic features on imaging, Type 1 hepatic hydatid cysts lack internal architecture and have near water levels of attenuation, which may be difficult to differentiate from simple hepatic cysts on CT imaging.¹ Similarly, Type 1 cysts on ultrasound (WHO CL) are not diagnostic and require further investigation.⁸ Of note, evaluation of CT compared to ultrasound differentiation of cysts demonstrated that ultrasound had higher sensitivity and specificity than CT. Consequently, ultrasound is the recommended modality of evaluation.^{8,10} Diffusion weighted magnetic resonance (MR) imaging has been utilised in the differentiation of cysts, with hydatid cysts demonstrating higher signal intensity compared to simple hepatic cysts.¹⁹ Additionally, serological testing can be conducted as an adjunct to confirm the radiological diagnosis, as was done in this case.

Conclusion

This case demonstrates the pathognomonic 'water lily sign' seen in complicated (type 4) hydatid echinococcosis on CT and ultrasound imaging. The literature suggests ultrasound as the preferred modality of assessment for hydatid echinococcosis. This case serves as a re-

minder that hydatid disease should be included in the differential of hepatic cysts despite its low prevalence in NZ. There is a risk of sequelae such as rupture and superinfection from hepatic echinococcosis, therefore, diagnosis in an asymptomatic patient allows for prompt intervention and treatment.

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Ethical approval/patient consent

Written patient consent was obtained for this report and the images reproduced.

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