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Hepatic Echinococcosis: Updates and the Role of the PAIR Technique

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Introduction

- The **liver is the most common organ** which is infected by cystic echinococcosis (CE, 50–70%) which is caused by tapeworms of the species of the Echinococcus granulosus sensu lato complex.

- The rate of incidence is annually **more than 50 out of 100,000** persons according to the report of the World Health Organization (WHO)

- Three known treatments including **open surgery, PAIR** (Puncture, Aspiration, Injection and Re-aspiration) and **laparoscopic surgery** (Lap) for liver hydatid cysts

- For selected cysts, PAIR is an effective minimally invasive alternative when performed by a **trained team.**

- The **non-treated mortality rate** within 10-15 years of diagnosis for patients with hepatic CE (HCE) is **2%-4%.**

Yi Tao. World J Gastroenterol 2024 October 7; 30(37): 4115-4131

Epidemiology

- Cystic echinococcosis is present worldwide, except for Antarctica.

- The most affected areas of the world include

  Western China, Central Asia, the Mediterranean, South America and East Africa

- The prevalence, incidence and burden of human cystic echinococcosis are **difficult to estimate** due to underdiagnosis of both asymptomatic and symptomatic cases

Diagnosis

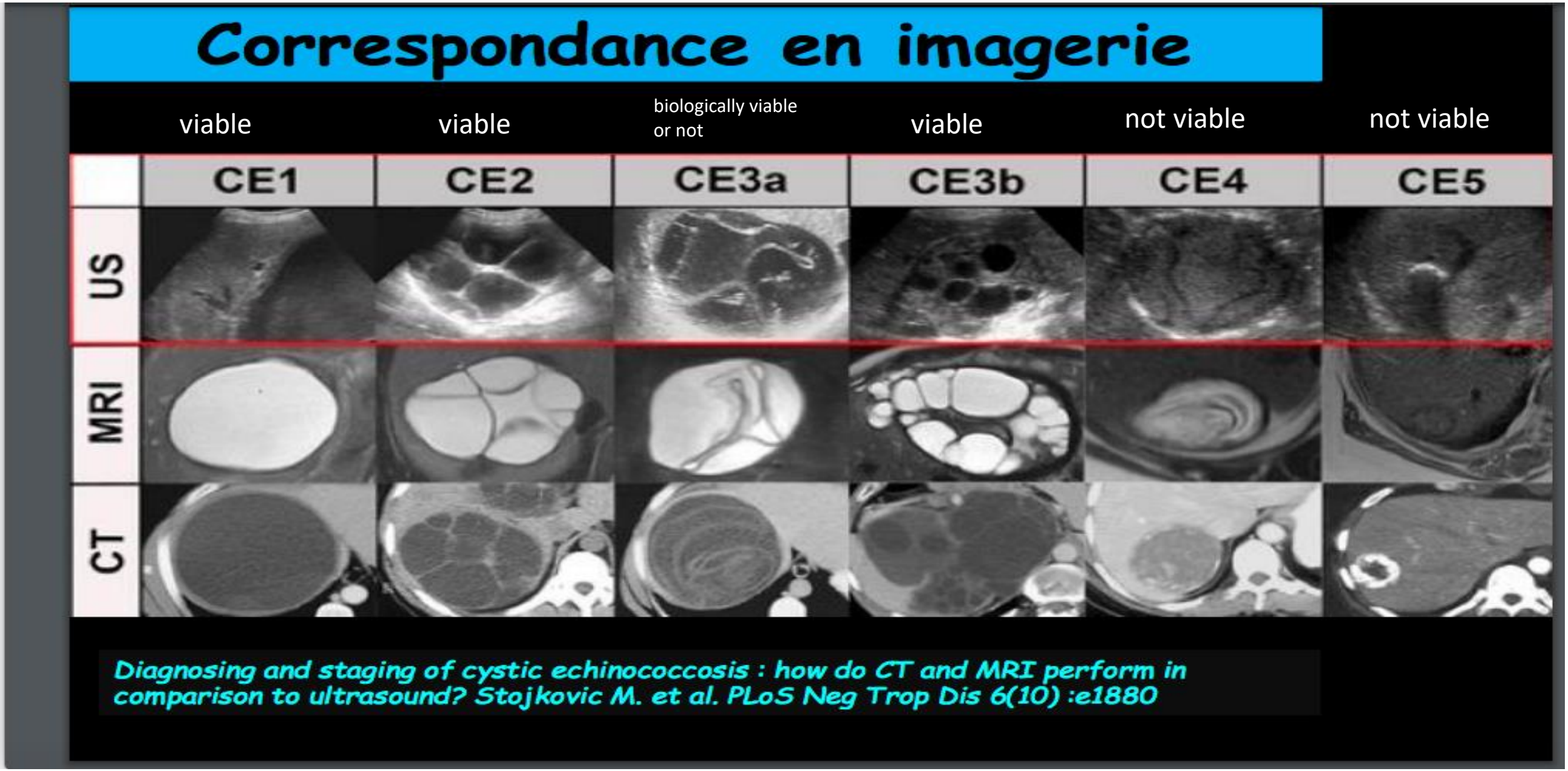
- The diagnosis of CE **is based on imaging techniques**,
  Primarily ultrasound
  Or magnetic resonance imaging (MRI),
  Computed tomography (CT) is less reliable,

- Complemented by **serology when imaging is not conclusive.**

- Serology :
  - Guides the diagnosis in 80–90% of cases, provided that **a qualitative technique** (detection of the arc 5) and a **quantitative technique** (ELISA) are performed
  - Allows monitoring of therapeutic efficacy.

N. ZAGHBA revue des maladies respiratoires2017

Classification and viability of the cyst



Classification and viability of the cyst

- In terms of viability,
  - CE1, CE2 and CE3b stages are viable;
  - CE3a stages can be biologically viable or not (transitional cyst);

  - CE4 stage is most likely not viable (especially if this inactive stage is reached spontaneously);
  - CE5 stage is not viable.

- **Radiological stages guide therapeutic decisions**

- Yi Tao. World J Gastroenterol 2024 October 7; 30(37): 4115-4131; Kuehn R. Cochrane Database of Systematic Reviews 2024

Treatment

- Treatment can be difficult and **varies across countries**

- Treatment options depend on the **characteristics of the cyst** (stage, number, size, location)

  The health resources available

  The general health of the patient

Kuehn R. Cochrane Database of Systematic Reviews 2024

Medical treatment

- **Albendazole (ALB):** antiparasitic drug
  - In patients with **non-complicated hepatic cyst (HC)** **types CE1 or CE3a** < 5 cm Recommendation **with very low certainty evidence.**

  - In patients with non-complicated hepatic cyst types CE2 or CE3b ≤ 5 cm, initial **treatment with ALB alone.**

  - **In patient with** HC **type CE4 or CE5**

- **Praziquantel** combined with ALB post-percutaneous/ surgical procedures for hepatic cyst types CE1, CE2, CE3a, CE3b

  ➔ In patients undergoing percutaneous or surgical interventions, **when spillage is suspected** or **has occurred**,

Radical surgery

- **Radical surgery**:

  .Total cystectomy , **Complete removal of a CE cyst**,

  - **Including the content** (fluid, protoscoleces and daughter cysts if present)
  - **And all layers of the cyst** (germinal and laminated parasite layers and host tissue adventitial layer).

  . Anatomical resection (Segmentectomy, hepatectomy and lobectomy)

- **Indication**:

  - Non-complicated hepatic cyst **types CE1 or CE3a 5–10cm**

    ➔ surgery combined with ALB , **effective and safe**

  - Uncomplicated hepatic cyst types **CE2 or CE3b > 5 cm,**

    ➔ surgery combined with ALB (This can be open surgery or laparoscopy).

  - **Cysts with any complications**

PAIR

- **Acronym PAIR** : Puncture-Aspiration-Injection-Re-aspiration.

- **Minimally invasive therapeutic percutaneous drainage** of echinococcal cysts located in the liver and other abdominal locations that aims to **destroy the germinal layer**.

- Under/local anesthesia or light sedation

- It involves: - **Percutaneous puncture** of cysts using **ultrasonographic guidance**,
  - **Aspiration of cyst fluid**,
  - **Injection of a protoscolecidal** agent for 10–20 min
  - Re-aspiration of the fluid .

- Equipment includes: fine sterile puncture needle,
- Protoscolecidal hypertonic saline or absolute alcohol
- Ultrasound / CT scanner
- Albendazole pre-/post-procedure.

Indication of PAIR

- In patients **with non-complicated hepatic cyst Types CE1 or CE3a, 5–10 cm** Combined with ALB .
- Non-complicated hepatic cyst **types CE1 or CE3a > 10 cm**, with ALB.
- Cyst recurrence
- Refusal of surgery
- **PAIR should not be used if biliary communication** is present.

Résultats cliniques

- **Efficiency** : **cure rate / favorable outcome** **comparable** in numerous series to **surgical treatment for selected cysts**

- **Mortality associated** with the PAIR procedure is very low (0.047%),

- **Complications** :
  - Moderate pain at the puncture site
  - Fever in the hours following the procedure
  - Rare allergic reaction
  - **Severe Complication <1%**
    . Bile leak
    . Cholangitis,
    . Hypernatremia (according to the scolicide),
    . Recurrence

- **Success rate > 90%** in the simple active forms (CE1, CE3a) with good tolerance

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Complications and how to avoid them

- Prevention :
  - Pre-therapeutic assessment (imaging (MRI), serology),
  - Prophylaxis with albendazole,
  - Choice and concentration of the scolicide,
  - Technique under guidance,
  - Electrolyte monitoring if hypertonic saline is used

Specific comparisons (PAIR vs surgery)

- Strong point of the PAIR :
  - Less invasive ,
  - Shorter hospitalization
  - Lower morbidity for selected patients

- Boundaries :

  Potentially higher recurrence rates in certain subgroups

  Need to select cysts is essential

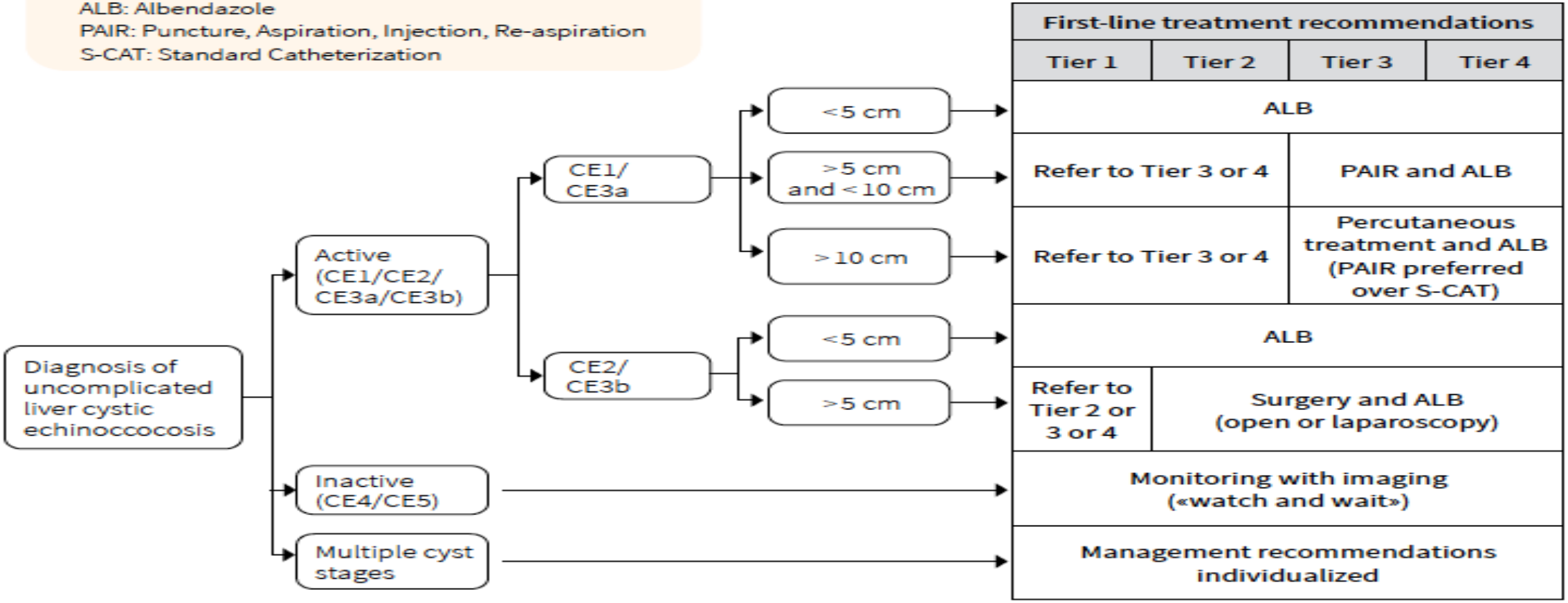
Recent developments / technical modification

- **Mo-CAT** (modified catheterization technique), prolonged catheters, percutaneous drainage for CE2/3b,

- Combination of percutaneous treatment + antiparasitic treatment.

- Promissing results published recently.

Decision-making algorithm proposed by WHO



Footnotes: Tiers (for full details see Table 2, p.7):
Tier 1: Medical doctor, basic laboratory capacity, ultrasound referral availability.
Tier 2: Tier 1 plus general surgeon, anaesthetic and operating theatre capacity, on-site ultrasonography.
Tier 3: Tier 2 plus laparoscopic surgeon, physician trained in PAIR, S-CAT, CT and fluoroscopy capacity.
Tier 4: Tier 3 plus thoracic surgery and interventional radiology capacity, MRI and MRCP capacity, advanced laboratory capacity.

Fig. 1. Algorithm for first-line treatment of uncomplicated liver CE cysts according to different health tiers based on health provider resources and capabilities

Conclusions

- PAIR is a valid option for selected cysts
- In practice, choose PAIR if the stage is appropriate and the team is experienced.
- New technical variants extend its indications
- Mo-CAT is a **safe and effective treatment technique** ➔ for liver CE2/CE3b. should be a first choice treatment instead of surgery,
- More evidence is needed in the literature for this suggestion to be acceptable.

Conclusion

- Surgery remains indicated in complicated cases and recurrence .
- It is essential to provide robust imaging evidence and practical guidance to **enhance early diagnosis, clinical decision-making**, and postoperative follow-up in regions with a **high disease burden.”**
- Multidisciplinary decision is needed.
- The best treatment, however, is prevention.”

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O.Akhan. Cardiovasc Intervent Radiol (2025) 48:503–511

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Thank you