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THE ROLE OF WHO-IWGE ULTRASOUND CLASSIFICATION AND CYST MORPHOLOGICAL CHARACTERISTICS IN THE CHOICE OF TREATMENT STRATEGY FOR HEPATIC CYSTIC ECHINOCOCCOSIS

Background. Hepatic cystic echinococcosis (CE), caused by *Echinococcus granulosus sensu lato*, remains a significant medical challenge requiring an individualized treatment approach. Despite advances in modern hepatology, there is currently no single universal standard for choosing between surgical methods and minimally invasive interventions for patients with active and transitional forms of the disease [1]. The primary clinical uncertainty lies in the so-called "gray zone," encompassing stages CE1–CE3b, where both radical surgeries and percutaneous techniques are technically feasible [2].

Various modalities demonstrate variable efficacy and safety profiles, often depending not only on institutional resources but also on the morphological characteristics of the parasitic cyst. In this context, the ultrasound (US) classification by the World Health Organization Informal Working Group on Echinococcosis (WHO-IWGE) serves as a key tool for risk stratification and standardization of clinical decision-making [3].

Objective. To analyze the influence of hepatic CE stage according to the WHO-IWGE classification (CE1–CE3b), as well as cyst size and localization, on the choice between surgical management and minimally invasive percutaneous techniques for the standardization of clinical decision-making.

Materials and Methods.

The study was conducted as a narrative literature review. A search for relevant

sources was performed in the PubMed/MEDLINE, Scopus, and Cochrane Library databases, covering the period from 2000 to 2025. The search strategy employed the following keywords: "cystic echinococcosis", "liver", "WHO-IWGE", "PAIR", "surgery", "laparoscopic", as well as specific terms for stages ("CE1", "CE2", "CE3").

The inclusion criteria were publications reporting comparative data on the outcomes of surgical treatment and ultrasound (US)-guided percutaneous interventions (Puncture-Aspiration-Injection-Reaspiration – PAIR; catheterization) for hepatic cysts of stages CE1–CE3b. Studies focusing on inactive cysts (CE4–CE5) or extrahepatic localizations were excluded from the analysis. Data synthesis was conducted thematically, focusing on efficacy (recurrence rate, achievement of cyst inactivation) and safety (complications, biliary fistulas).

Results and Discussion. Analysis of the literature indicates that the morphological structure of the cyst, determined by WHO-IWGE criteria, is a fundamental predictor of treatment success. US visualization serves as the first-line method for staging, while computed tomography (CT) and magnetic resonance imaging (MRI) provide additional information regarding topography and complications [4].

For unilocular cysts (CE1) and cysts with a detached membrane (CE3a), the evidence base confirms the high efficacy of the PAIR technique, which consists of sequential puncture, aspiration of content, injection of a scolicidal agent, and reaspiration, in combination with adjuvant albendazole therapy. These forms are morphologically "simple," which ensures adequate aspiration of the content and effective action of scolicidal agents [5]. Compared to surgical interventions, PAIR demonstrates lower invasiveness, reduced hospitalization time, and lower cost, provided there is no cystobiliary communication [6].

For multivesicular (CE2) and solid (CE3b) cysts, the situation is more complex. The presence of septa and daughter cysts complicates the complete evacuation of content during a single puncture, increasing the risk of recurrence. For these stages, PAIR is often insufficient. Long-term catheter drainage techniques (involving drain placement for daughter cyst evacuation and cavity irrigation) are considered an alternative to surgery; however, surgical treatment (particularly radical pericystectomy) remains the priority in many medical centers as it allows for reliable elimination of the cyst matrix and prevention of biliary complications [7].

In addition to the stage, cyst size and localization are critical factors in the selection process. Large cysts (over 10 cm) and those located in central liver segments (near the hilum) have a significantly higher risk of occult cystobiliary

fistulas [8]. In such cases, blind percutaneous intervention may lead to sclerosing cholangitis upon injection of the scolicide. Surgical techniques allow for intraoperative detection and repair of the fistula, making them safer for "complex" localizations. Furthermore, subcapsular location increases the risk of cyst rupture into the peritoneal cavity, which may argue in favor of a controlled surgical approach (laparoscopic or open) [9].

Conclusions. Based on the analysis of the literature, it can be concluded that for uncomplicated hepatic echinococcal cysts of WHO-IWGE stages CE1 and CE3a, preference is given to minimally invasive techniques (predominantly PAIR). For stages CE2 and CE3b, both minimally invasive long-term catheter drainage techniques and surgical interventions are applicable, given the morphological complexity of matrix evacuation and the risk of disease recurrence. Conversely, for all active (CE1, CE2) and transitional (CE3a, CE3b) forms in the presence of complications, large dimensions, central cyst localization, or a high probability of cystobiliary communication, surgical treatment is exclusively indicated to ensure reliable control of the cavity and patient safety. Thus, the standardization of clinical protocols based on WHO-IWGE ultrasound criteria is a key condition for improving long-term outcomes and reducing the recurrence rate of hepatic CE.

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