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Literature Review

# Muscular Hydatid Cyst: Report of a Rare Case in the Quadriceps and Literature Review

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## Abstract

Hydatid cyst (HC), or hydatidosis, caused by *Echinococcus granulosus,* is a parasitic anthropozoonosis representing a major public health problem, particularly in rural livestock farming areas. While the liver and lungs are the most common sites, rare localizations exist. Skeletal muscle involvement, the focus of this study, is unusual (1-5% of cases). We report a case of primary muscular HC of the quadriceps in a 14-year-old girl and provide a literature review of this entity. Symptomatology is often subtle (pain, swelling) and presents late. Diagnosis is suspected based on imaging (ultrasound, MRI) and confirmed by postoperative histopathological examination. Muscle is considered an unfavorable environment for larval development (contractility, lactic acid). The standard treatment is complete surgical resection (pericystectomy without rupture). Perioperative medical treatment with Albendazole is often associated to reduce the risk of recurrence. Prevention remains essential for controlling this parasitic endemic disease.

**Keywords:** Hydatid Cyst; Muscle; *Echinococcus granulosus*; Quadriceps; Soft Tissue Mass; Parasitic Disease

## Introduction

Hydatid cyst (HC), or human hydatidosis, is a cosmopolitan parasitic infection caused by the development of the larval form of the cestode Echinococcus granulosus. It constitutes a significant public health problem in many regions of the world, particularly developing countries where sheep farming is prevalent [1]. Humans are accidental intermediate hosts in the parasitic cycle involving the dog as the definitive host and the sheep (mainly) as the usual intermediate host. Human infection occurs through ingestion of parasite eggs present in the environment contaminated by canine feces, or by direct contact with infected dogs.

After ingestion, the hexacanth embryo released in the intestine crosses the mucosal barrier and enters the portal circulation. The liver acts as a first filter, explaining its predominant localization (approximately 60% of cases). The lung constitutes the second filter (approximately 30%). More rarely (approximately 10% of cases), the embryo can bypass these two filters and reach the systemic circulation, potentially localizing in any organ or tissue [2].

Skeletal muscle involvement is a rare, even exceptional, localization, with its frequency estimated between 1 and 5% of all hydatidosis cases [3]. This rarity is attributed to several factors: muscle contractility and local lactic acid production are thought to create an environment unfavorable for the implantation and growth of the hydatid larva [4]. Muscular HC is most often primary and isolated. Clinically, it manifests insidiously as a painless or slightly painful swelling, slow-growing, which can mimic a benign or malignant soft tissue tumor [2,5]. Symptoms often appear when the cyst reaches a significant size.

Imaging, particularly ultrasound and magnetic resonance imaging (MRI), plays a key role in the preoperative diagnostic orientation, while histopathological examination of the surgical resection specimen provides definitive confirmation.

The objective of this work is to report a rare case of primary muscular hydatid cyst located in the quadriceps muscle of an adolescent girl, and to discuss, through a literature review, the diagnostic and therapeutic particularities of this unusual localization.

## Material and Methods

We report the case of a 14-year-old female patient with no significant medical history, originating from a rural area, who presented with pain associated with swelling of the left thigh evolving over several weeks. Clinical examination revealed a firm, slightly mobile mass, tender on palpation of the anterosuperior aspect of the left thigh.

A soft tissue ultrasound was performed (Figure 1.a). It showed a well-defined, anechoic fluid collection measuring 60 x 38 mm, located intramuscularly within the quadriceps muscle. This lesion was avascular on color Doppler mode and exerted a slight mass effect on adjacent structures. The ultrasound appearance was suggestive of a hydatid cyst (Type I of the Gharbi classification). A staging workup including a chest X-ray and an abdominopelvic ultrasound did not reveal any other hydatid localization.

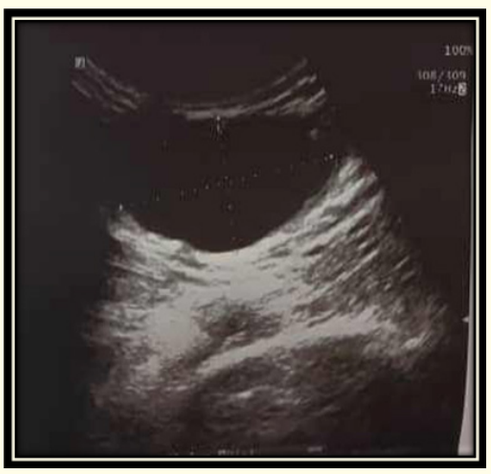

**Figure 1a:** Ultrasound of the left thigh showing the anechoic intramuscular cystic lesion.

Given the suspicion of an isolated muscular hydatid cyst, surgical intervention was indicated. A total pericystectomy, removing the cyst without rupture (Figure 1.b), was performed under general anesthesia. Perioperative medical treatment with Albendazole (10-15 mg/kg/day) was administered for 1 month before and 3 months after surgery to prevent potential recurrence.

Informed consent was obtained from the legal guardians for the publication of this case report and associated images, ensuring patient anonymity. The surgical specimen was sent to the pathology laboratory for diagnostic confirmation.

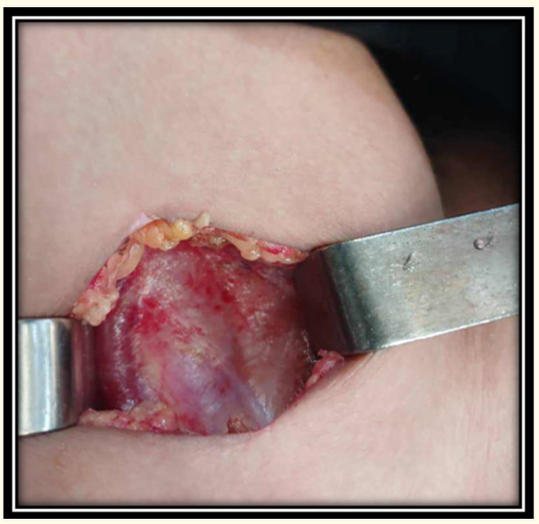

**Figure 1b:** Intraoperative view showing the pericystectomy of the hydatid cyst.

## Results

Gross examination of the surgical specimen received at the pathology laboratory showed a whitish cystic structure measuring 5.5 cm x 3.5 cm adjacent to fragments of muscle tissue (Figure 1.c). The specimen was fixed in 10% buffered formalin.

**Figure 1c:** Gross surgical specimen after fixation, showing the opened cyst and the wall.

After paraffin embedding, histological sections were prepared and stained with hematoxylin and eosin. Microscopic examination revealed a cystic structure whose wall consisted of a thick, laminated, eosinophilic, acellular membrane, characteristic of the hydatid cuticle (laminated layer). This structure was bordered by striated skeletal muscle tissue without signs of malignancy or major specific inflammatory reaction. The germinal layer (proligerous membrane) and scolices were not clearly identified on the examined sections. These findings confirmed the diagnosis of muscular hydatid cyst (Figure 2).

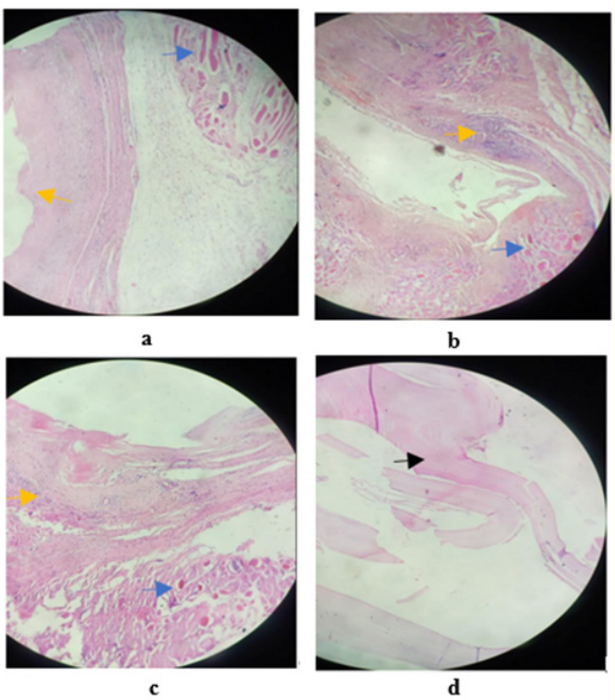


**Figure 2:** Microscopic appearance of the HC: a-b-c) The muscle (blue arrow) contains a cystic formation with no visible epithelium; a fibrous capsule is present (orange arrow), d) Evidence of anuclear eosinophilic layers corresponding to the hydatid lamellae, also known as the cuticle (black arrow).

Postoperative follow-up at 18 months was favorable, with no clinical or ultrasound signs of local or distant recurrence.

## Discussion

Muscular hydatidosis is a rare entity, accounting for only 1 to 5% of all localizations of hydatid disease [3], even in endemic areas [6,7]. Our case illustrates a localization within the quadriceps muscle, which is considered even more exceptional compared to other muscles such as the psoas, diaphragm, or limb muscles [4,8,9]. The rarity of this localization is explained by local factors unfavorable to the development of the hexacanth embryo: the high vascularization of the muscle could paradoxically facilitate its rapid passage, while repeated muscle contractions and the biochemical environment rich in lactic acid could inhibit its implantation and growth [4].

Epidemiologically, hydatidosis can affect all ages, with a peak frequency in young adults. A slight female predominance is sometimes reported, possibly related to greater involvement of women in agricultural activities and contact with dogs in some endemic rural areas [10]. Our patient, an adolescent girl from a rural background, fits this epidemiological profile.

The clinical presentation of muscular HC is often misleading. Development is slow and insidious, with the lesion remaining asymptomatic for a long time. Revealing signs are usually progressive swelling, functional discomfort, or pain, as in our case, occurring when the cyst reaches a considerable size [5]. Complications can arise: compression of adjacent neurovascular structures [2,11], bacterial superinfection [9], fissuring or spontaneous or traumatic rupture which can lead to a local inflammatory reaction, or even a potentially fatal anaphylactic shock [12].

Diagnosis relies heavily on imaging. Standard radiography is of little value except in cases of old calcified cysts or to rule out associated bone involvement [13]. Ultrasound is a key examination, inexpensive and non-invasive. It typically shows an anechoic fluid collection (Gharbi type I), sometimes with membrane detachment or the presence of daughter vesicles (types II, III), but atypical appearances (pseudo-tumoral, solid, or mixed) can exist, making diagnosis difficult [14]. Computed Tomography (CT) can specify relationships and look for parietal calcifications [15]. MRI is often considered the most effective examination for studying soft tissue localizations. It specifies the cystic nature, morphology (possible multiloculated appearance), extent, and relationships with surrounding structures (vessels, nerves), which is essential for surgical planning [6,13,14]. Peripheral enhancement after Gadolinium injection may be observed. In our case, ultrasound strongly suggested the diagnosis, which was confirmed by surgery and histopathology.

Biological tests are of limited value. Hypereosinophilia is inconsistent. Hydatid serology (ELISA, IHA) has limited sensitivity for extrahepatic and extrapulmonary localizations, particularly muscular ones, and is often negative in the absence of fissuring [14,16]. However, it is useful for post-treatment follow-up: a progressive negativation indicates treatment effectiveness, while a re-increase in titers may suggest recurrence [17-19].

The main differential diagnosis for muscular HC is soft tissue tumors, whether benign (lipoma, synovial cyst, encapsulated hematoma, cold abscess) or malignant (sarcomas) [5]. Origin from an endemic area should systematically raise the suspicion of hydatidosis when faced with an unexplained soft tissue mass.

The treatment of choice for muscular hydatid cyst is surgical [20]. The objective is the complete excision of the cyst without rupturing its wall (pericystectomy) to avoid parasitic seeding and local recurrence [21]. If total pericystectomy is not possible due to adhesions to noble structures, cystectomy after inactivation of the parasitic content can be performed, but with a higher risk of recurrence. The use of scolicidal solutions (hypertonic saline, hydrogen peroxide) must be cautious in muscle due to the risk of tissue necrosis.

Perioperative medical treatment with benzimidazole derivatives (mainly Albendazole) is widely recommended [20]. Administered preoperatively, it aims to reduce the viability of scolices and intracystic pressure, reducing the risk of dissemination in case of intraoperative rupture. Postoperatively, it helps treat possible microscopic contamination and prevent recurrences. Medical treatment alone is reserved for inoperable patients, multiple cysts, or in cases of recurrence not amenable to surgery [18]. Percutaneous treatment (PAIR: Puncture, Aspiration, Injection, Re-aspiration), well-established for certain liver cysts [22], is generally not recommended for muscular localizations due to the risks of fistulization and dissemination into tissue planes [11].

Prolonged follow-up (clinical, imaging, and serological) is essential to detect possible local recurrence or the appearance of other localizations [18,19]. Serological monitoring is recommended every 3 to 6 months for at least 2 to 3 years.

## Conclusion

Human hydatidosis remains a significant public health problem in endemic regions such as Algeria and the Maghreb, preferentially affecting rural populations in close contact with the parasite's hosts. Muscular hydatid cyst is a rare manifestation of this disease, with the quadriceps muscle being a particularly exceptional location. Although benign, this pathology can pose diagnostic challenges by mimicking a soft tissue tumor and cause complications through compression or rupture. The diagnosis should be considered in any patient from an endemic area presenting with an unexplained muscle mass. Imaging (ultrasound and MRI) is essential to suspect the diagnosis, confirmed by histopathological analysis. Treatment relies on complete surgical excision (pericystectomy), ideally without rupture, often combined with perioperative medical treatment with Albendazole to prevent recurrences. Serology has a limited role in the initial diagnosis but remains useful for post-therapeutic follow-up. Prevention, based on hygiene, veterinary control, and health education of populations at risk, remains the most effective measure to combat this parasitosis.

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