



Received: 2016.03.08
Accepted: 2016.03.13
Published: 2016.10.07

Authors' Contribution:

- A** Study Design
- B** Data Collection
- C** Statistical Analysis
- D** Data Interpretation
- E** Manuscript Preparation
- F** Literature Search
- G** Funds Collection

A Classic Case of Subcutaneous Cysticercosis: A Rare Case with Sonological Findings and Review of Literature

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Summary

Background:

Cysticercosis is a parasitic infection caused by the larval stages of the pork tapeworm, *Taenia solium*. The subcutaneous form of the disease is a relatively rare clinical entity. Despite its rarity, it is imperative for a radiologist to be aware of this subcutaneous form of the disease and its various radiological patterns while evaluating any subcutaneous swelling. In this paper, we aimed to describe a typical case of 'subcutaneous cysticercosis involving the left anterior chest wall' with high resolution ultrasound findings. We also discussed the role of other imaging modalities in a case of subcutaneous cysticercosis. To the best of our knowledge, our case is only the second documented case report of sonological evaluation of subcutaneous cysticercosis involving the left anterior chest wall and the first case with high resolution ultrasound images of the lesion.

Case Report:

An 11-year-old male presented with a painless, subcutaneous swelling over the left anterior chest wall for the last 2 months. High resolution ultrasound showed a well-defined, thin-walled, cystic lesion with an eccentric, echogenic focus in the subcutaneous plane. On change of the posture of the patient, this focus showed mobility. The hypoechoic area surrounding this cyst showed significant exudative fluid collection with diffuse, floating echoes and thin, incomplete internal septations. The adjacent soft tissues were thickened and irregular, suggestive of edema. This was followed by an excision biopsy. Histopathological examination revealed cysticercus cellulose parasite with an extensive mixed inflammatory cell infiltrate in the surrounding tissue. The patient was also administered oral antihelminthic therapy. Repeat ultrasound examination at the end of this management regimen showed complete healing with no e/o any remnant or recurrent cystic lesion, abscess or edema in the subcutaneous plane.

Conclusions:

Subcutaneous cysticercosis is a relatively rare form of cysticercosis but should always be born in mind during the evaluation of subcutaneous swellings. High resolution ultrasound is a valuable, safe, nonionizing, cost-effective, widely-available, and easily-reproducible imaging tool for diagnosis of subcutaneous cysticercosis. There is a wide spectrum of ultrasound patterns of subcutaneous cysticercosis. In classic cases with a cyst containing a scolex within and with a surrounding abscess, high resolution ultrasound should always be the primary mode of diagnosis, thus avoiding unnecessary fine needle aspiration cytologies.

MeSH Keywords:

Cysticercosis • *Taenia solium* • Ultrasonography

PDF file:

<http://www.polradiol.com/abstract/index/idArt/898408>

Background

Cysticercosis is a parasitic infection caused by the larval stages of the pork tapeworm, *Taenia solium*. Though it is

endemic in virtually all developing countries in Central and South America, Asia, and Africa, the subcutaneous form of the disease is a relatively rare clinical entity. Despite its rarity, it is imperative for a radiologist to be aware of this



Figure 1. Clinical photograph showing a swelling (white arrow) over the left anterior chest wall.

subcutaneous form of the disease and its various radiological patterns while evaluating any subcutaneous swelling. High resolution ultrasound is a valuable, safe, nonionizing, cost-effective, widely-available, and easily-reproducible imaging tool for diagnosis of subcutaneous cysticercosis. In this paper, we aimed to describe a typical case of 'subcutaneous cysticercosis involving the left anterior chest wall' with high resolution ultrasound findings. We also discussed the role of other imaging modalities in a case of a subcutaneous cysticercosis. To the best of our knowledge, our case is only the second documented case report of sonological evaluation of subcutaneous cysticercosis involving the left anterior chest wall and the first case with high resolution ultrasound images of the lesion.

Case Report

An 11-year-old male presented to the Department of General Surgery with a painless, subcutaneous swelling over the left anterior chest wall for the last 2 months. He gave a history of gradually increasing size of this swelling over the last 1 month. There was no history of fever or trauma. At physical examination, there was a soft, non-tender, ovoid, sessile, non-pulsatile, subcutaneous swelling measuring 4.5×3.0 cms approximately over the left anterior chest wall, around 2.5 cms inferior to the medial end of the left clavicle (Figure 1). The skin over the swelling appeared tense and glossy. There was no e/o similar swelling elsewhere in the body. Preliminary laboratory investigations revealed high sedimentation, C-reactive protein (CRP) and leukocytosis. The clinical differential diagnoses included a subcutaneous lipoma and an abscess. He was referred to our Radio-Diagnosis Department for high resolution ultrasound evaluation of the swelling.

High resolution ultrasonography was performed on GE VOLUSON 730 PRO machine (GE healthcare, Milwaukee, USA) equipped with a 7.5–12 MHz high frequency linear array transducer. The images were examined on real-time two-dimensional gray-scale and Doppler imaging. All sonograms obtained were saved in a picture-archiving and communication system. Ultrasound showed a 9×8-mm, well-defined, thin-walled, cystic lesion with an eccentric, echogenic focus measuring around 1.5 mm in diameter in



Figure 2. Gray scale ultrasound image of the swelling in a longitudinal section showing a well-defined, thin-walled cyst (white, filled arrows) with an eccentric, echogenic focus (white, unfilled arrow) in the subcutaneous plane. The hypoechoic area surrounding this cyst shows significant exudative fluid collection (asterisk) with diffuse, floating echoes and few floating, echogenic foci. The adjacent soft tissues appear thickened and irregular, suggestive of edema (black arrows). The underlying rib is denoted as 'R' in the image.

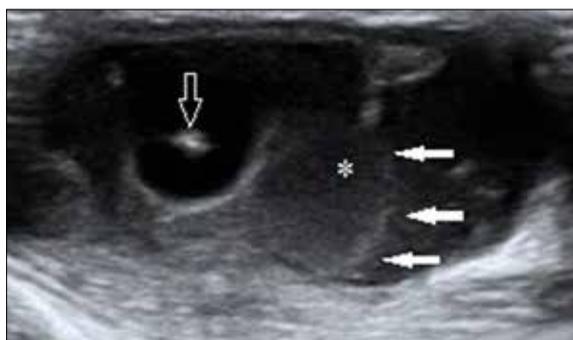
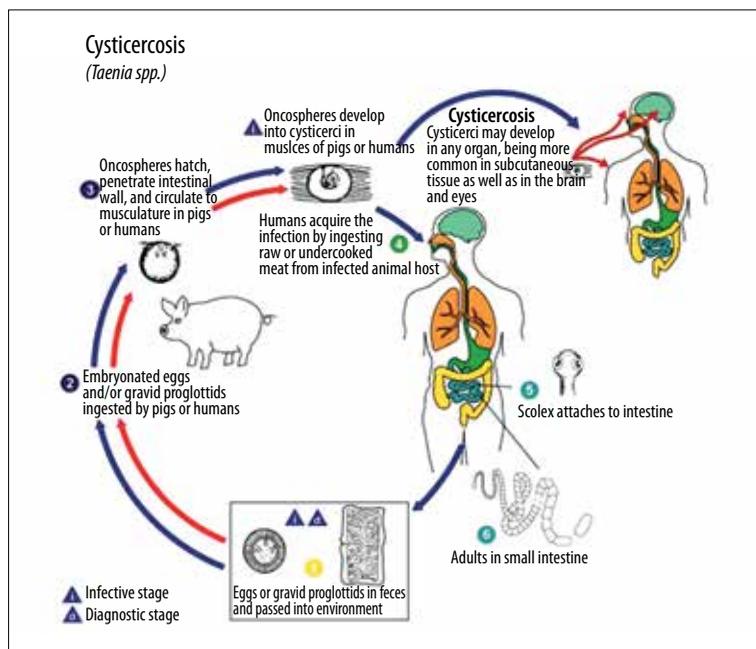


Figure 3. Gray scale ultrasound image of the swelling in a longitudinal section showing change of position of the echogenic focus (white, unfilled arrow) within the cyst on change of the posture of the patient. The surrounding exudative collection (asterisk) shows diffuse, floating echoes and thin, incomplete internal septations (white, filled arrows) with few floating, echogenic foci.

the subcutaneous plane (Figure 2). On change of the posture of the patient, this focus showed mobility. However, the echogenic focus did not cast any distal acoustic shadowing (Figure 3). The hypoechoic area surrounding this cyst showed significant exudative fluid collection with diffuse, floating echoes and thin, incomplete internal septations. There were also few (around 3), floating, echogenic foci within this pericystic collection, the largest measuring around 4.1 mm in diameter. The adjacent soft tissues were thickened and irregular, suggestive of edema. There was no e/o internal vascularity on color Doppler imaging. The radiological diagnosis given was a typical subcutaneous cysticercosis with a pericystic abscess. Magnetic resonance imaging (MRI) evaluation of the brain and plain radiographic evaluation of the upper and lower extremities and the abdomen which were obtained to look for disseminated cysticercosis revealed normal studies.

Fine needle aspiration cytology (FNAC) was further performed using a 22-G needle and 10-mL syringe. There were

Figure 4. Life cycle of *Taenia solium*.

fragments of bluish, fibrillary material with interspersed small nuclei. Mixed inflammatory cells comprised of neutrophils, eosinophils, lymphocytes and histiocytes were seen surrounding the fibrillary material. A diagnosis of parasitic infection was made on cytology. An elective excision biopsy was performed. Histopathological examination revealed cysticercus cellulose parasite in the tissue section with an extensive mixed inflammatory cell infiltrate in the surrounding tissue. A final diagnosis of subcutaneous cysticercosis was made. The patient was also administered oral antihelminthic therapy. Repeat ultrasound examination at the end of this management regimen showed complete healing with no e/o any remnant or recurrent cystic lesion, abscess or edema in the subcutaneous plane.

Discussion

Cysticercosis is a parasitic infection caused by the larval stages of the pork tapeworm, *Taenia solium* [1,2]. The disease is endemic in virtually all developing countries in Central and South America, Asia, and Africa, with the exception of Muslim countries where pork is not consumed [3-9]. The perpetuation of this parasitic disease is related to poor sanitation and hygiene [10,11].

Cysticercosis usually occurs as a result of consumption of food or water contaminated by human faeces containing *Taenia solium* eggs. Humans are the only definitive host in the lifecycle of *Taenia solium* (Figure 4) (Step 1) [9,12,13]. Humans can become infected by consuming gravid proglottids either through feco-oral route or by autoinfection (Step 2) [2,14,15]. There is also a high risk of infection by reverse peristalsis resulting in internal regurgitation of the eggs into the stomach when the intestine harbours a gravid worm [7]. The oncospheres penetrate the intestinal mucosa (Step 3) and develop into cysticerci after getting carried to various parts of the body including brain, eyes, striated muscles, liver, heart, lungs, peritoneum, breast and subcutaneous tissues. Ingestion of the undercooked

pork containing these cysticerci is the exclusive path to the development of human intestinal *Taenia solium* tapeworms (Step 4). By means of a single scolex or head, these cysts attach to the small intestine (Step 5). Adult tapeworms develop and reside in the small intestine for a period varying from months to years (Step 6). Basically, all the clinical symptoms can be attributed to the vigorous granulomatous inflammatory reaction that occurs when the larvae die [3,14].

Cysticercosis is commonly seen in the brain and eyes, which together constitute 86% of these cases [12,16,17]. The remainder is mainly located in the muscles, heart, lungs, peritoneum and breast [3,7,8,18,19]. Subcutaneous cysticercosis is a relatively rare form of cysticercosis but should always be born in mind during the evaluation of subcutaneous swellings. It can be confused with other clinical entities depending upon the location of the swelling like a lipoma, ganglion cyst, sebaceous cyst, dermoid, abscess, pyomyositis, tuberculous lymphadenitis, neuroma, sarcoma, myxoma, neurofibroma or fat necrosis [3,4,10,13,15,20]. The clinical features of subcutaneous cysticercosis depend on the location of the cyst, the cyst burden, and the host reaction [14,21,22]. It may cause painless or painful subcutaneous nodules [15]. Lymphadenopathy is a rare mode of presentation of cysticercus infestation [18]. Very few previous studies have mentioned the entity of subcutaneous cysticercosis involving the chest wall. To the best of our knowledge, our case is only the second documented case report of sonological evaluation of subcutaneous cysticercosis involving the left anterior chest wall and the first case with high resolution ultrasound images of the lesion. Lohra S. et al. first documented a case of subcutaneous cysticercosis involving the left anterior chest wall with ultrasound evaluation [4].

The diagnosis is relatively difficult to make solely on a clinical basis because the manifestations are not specific, and visualization of the organism usually is not feasible [23].

High resolution ultrasound is a valuable, safe, nonionizing, cost-effective, widely-available, and easily-reproducible imaging tool for diagnosis of subcutaneous cysticercosis. Naik, et al. in their study involving the evaluation of soft tissue cysticercosis observed that the most common ultrasound appearance was that of a cyst containing a scolex within and with a surrounding abscess [16,24]. The ultrasound appearance in our study fits into this pattern. This appearance may be due to chronic intermittent leakage of fluid from the cyst due to degeneration of the cyst, resulting in a chronic inflammatory response with a fluid collection around the cyst [14,25–27]. The other common ultrasound appearance is that of a cyst containing a scolex within and with a surrounding edema but without an obvious abscess. Less commonly, it can also present as an irregular cyst with no scolex within but just with a surrounding edema [24]. Plain radiographs rarely show cysticerci except in chronic cases when they calcify. Plain radiography in a case of subcutaneous cysticercosis can reveal single or multiple radio-dense foci giving a characteristic rice grain appearance [10,28]. However, in case of subcutaneous cysticercosis involving the chest wall, any underlying pulmonary or pleural lesions can superimpose over these tiny foci in the subcutaneous plane and obscure the subcutaneous involvement. Also, radiographs are insensitive in few cases of cysticercosis, where only an irregular cyst with a surrounding edema but no scolex within is seen. Computed tomography (CT) and magnetic resonance imaging (MRI) scans are the other imaging modalities used for evaluating subcutaneous cysticerci. They help in showing the location, number, and relationship of the cysticerci to the surrounding structures. The diagnosis in our case report was suggested on the basis of sonographic findings. Although CT is sensitive in the visualization of tiny calcific foci, it has an inherent drawback of exposing the patient to ionizing radiation. MRI is a useful imaging adjunct to diagnose soft tissue and subcutaneous cysticercosis. It is a nonionising imaging tool and is more sensitive than CT as it identifies scolex and the cyst [29]. Cysticercosis is seen as a cystic lesion that appears hyperintense on T2-weighted images and hypointense on T1-weighted images [10]. Peripheral rim enhancement of the cyst wall is also known. Intramuscular cysts are oriented in the direction of the muscle fibers. The scolex is also appreciated as a tiny hypointense speck within the hyperintense cyst [30].

Serological tests for detecting antibodies against cysticercosis are used to confirm the diagnosis. Enzyme-linked immunoblot assay is more sensitive and specific

than ELISA (Enzyme linked immune sorbent assay) [31]. However, sensitivity of serological tests tends to be high for patients with multiple cysts (94%), but substantially lower for patients with a single cyst or calcified cysts (28%) [1,32].

The diagnosis of cysticercosis can be confirmed by fine-needle aspiration cytology (FNAC) or biopsy, which shows the detached hooklets, scolex, and fragments of the spiral wall of cysticercosis cellulosae [3,8,18,20,33,34]. Sometimes, the larval parts may not be seen in the specimen, but an inflammatory reaction consisting of large numbers of eosinophils and histiocytes can still be seen [1,2,7,9,16,21]. Although FNAC is an important tool for evaluation of subcutaneous lesions, it is painful, incurs health care costs, and contains the risk of infection and bruising [35]. There is also a remote chance of hypersensitivity reaction in susceptible individuals [21]. Thus, in typical cases with a cyst containing a scolex within and with a surrounding abscess, high resolution ultrasound should always be the primary mode of diagnosis.

Treatment of subcutaneous cysticercosis depends on the location of the cysts [22]. Surgical excision is done for isolated soft tissue cysticercosis associated with an abscess [36]. Cysts that are not associated with an abscess can be treated with antihelminthic medications such as albendazole or praziquantel [10,16,27,36]. Follow-up ultrasound study is usually performed after three weeks of antihelminthic medication to look for resolution of the lesion [15].

Conclusions

Subcutaneous cysticercosis is a relatively rare form of cysticercosis but should always be born in mind during the evaluation of subcutaneous swellings. High resolution ultrasound is a valuable, safe, nonionizing, cost-effective, widely-available, and easily-reproducible imaging tool for diagnosis of subcutaneous cysticercosis. There is a wide spectrum of ultrasound patterns of subcutaneous cysticercosis. In classic cases with a cyst containing a scolex within and with a surrounding abscess, high resolution ultrasound should always be the primary mode of diagnosis, thus avoiding unnecessary fine needle aspiration cytologies.

Conflicts of interest

None.

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