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Intramuscular Cysticercosis; 2 Cases

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Abstract
Taenia solium infestation is a worldwide neglected tropical zoonotic disease caused by intestinal infection with adult pork tapeworm due to ingestion of undercooked pork which contains the larval stage in the skeletal muscles. Rarely, ingestion of worm eggs results in the encysted larva of *T. solium* infecting human tissues such as central nervous system, skeletal muscle, subcutaneous tissue and orbit and producing symptoms due to its location and associated inflammation called cysticercosis. Diagnosis can be confirmed by imaging studies, immunological investigations and histopathology. Treatment includes albendazole, praziquentel in conjunction with steroids and surgical excision. A diagnosis of cysticercosis warrants a search for NCC which may be asymptomatic.

Keywords: Intramuscular Cysticercosis, Neurocysticercosis, *Taenia solium*

1. Introduction
Intestinal infestation by adult pork tapeworm or *Taenia solium* is a common zoonosis in which human beings are the definitive hosts and pigs which harbor the larval stage of the worm in the skeletal muscles are the intermediate hosts. In taeniasis infection occurs when the larval stage of the worm is ingested with undercooked pork and grows into the adult tapeworm in the human intestine. The adult worm reproduces with development of proglottids each containing about 50,000 eggs which pass out in human feces and contaminate the soil and water and are consumed by the pigs along with vegetation thus infecting other humans. Rarely, eggs are accidentally consumed by humans due to water, soil or food contamination or by auto ingestion by unclean hands. The onchospheres then hatch in the intestine, the larvae penetrate the intestinal wall and migrate to various tissues such as the brain, skeletal muscle, subcutaneous tissue and orbit where they become encysted in form of cysticercus cellulose and survive for up to ten years. Upon their death symptoms are produced to the location, larval burden and inflammatory reaction surrounding the dying tapeworm larva [1]. In 2003 the World Health Assembly declared T.solium to be an important eradicable disease of worldwide public health importance. WHO included it in the list of 17 major neglected tropical diseases (NTDs) in 2010 (2). Neurocysticercosis which accounts for 8.7-50% of all patients presenting with seizures of recent onset in India is more common than intramuscular and intraorbital cysticercosis. Patients of NCC have solitary Cysticercal granuloma in 60-70% of cases [2]. Here we present a series of 2 cases of intramuscular cysticercosis which were found to have Neurocysticercosis on neuroimaging with MRI.

Case 1: Intramuscular cysticercosis presenting as a painful mass in the anterior compartment of arm.
A 30 yr old married female presented to medical OPD with history of pain and swelling of the anterior aspect of right arm for 6 months. Pain was aggravated by movement and lifting heavy objects. The patient denied any history of injury, fever, headache malaise weight, loss, dizziness or seizure. Her past and family history was not significant. She was vegetarian and water was supplied by tube well at her home. There was no history suggestive of passage of worms in stool. On examination there was a firm tender lump 3cm X 2 cm with restricted mobility in the belly of the right biceps. The circumference of the right arm was increased by 1.0 cm. Fundus was normal. Rest of the general physical examination and systemic examination was normal. Pulse was 84bpm, BP =120/80mm Hg, Temp=98 deg F. Investigations revealed hb-11.4g%, TLC-9200/cmm, DLC-Polys48, lymphos48, eosin-02 and mono-02%. Platelet count-2.3 lakh/cmm. Random blood sugar-104mg/dl, blood urea-18mg/dl, s. creat-0. s64mg/dl, serum uric acid-3.5mg/dl, Na-132meq/l, k-3.4meq/l.Serum bilirubin-0.33mg/dl, direct-0.15mg/dl, SGOT-25U/L, SGPT-34U/L, s. Alkaline phosphatase-86U/l, total prot-8.3g/l.Serum Albumin-3.9g/l. MRI right arm showed a multilobulated irregular cystic lesion13 by 8.3by 14 mm in the anterior compartment of arm in the biceps muscle appearing hypo intense on T1W and hyper intense on T2W/STIR image with an eccentric hyper intense focus suggestive of a scolex with surrounding inflammation. MRI Brain showed a calcified granuloma in the right parietal parafalcine region suggestive of Neurocysticercosis stage IV. On the basis of history, examination she was diagnosed as having intramuscular cysticercosis mass type and neurocysticercosis stage IV. She was managed conservatively with steroids, albendazole and symptomatic treatment. She responded with reduction in pain and size of the swelling with four weeks of therapy.

Case 2: Disseminated cysticercosis presenting as pseudohypertrophy of biceps muscle.
30 yr old gentleman, from north India, presented to our outpatient department with complaints of abnormal bumpy growth of his right biceps muscles since last 2 months. He had noticed similar bumpy nodules on his shoulder and torso. There was no history of fever, muscle pain, seizures headache, vomiting or any focal neurological deficit. On examination, he had multiple cystic nodules in right biceps (Figure 1A) resembling pseudohypertrophy. His neurological examination

revealed bilateral papillodema. Cranial magnetic resonance imaging (MRI) showed disseminated well defined cerebrospinal fluid signal intensity cystic lesions with eccentric hypointense nodule (suggestive of scolex) in the paraspinal muscles, tongue, brain parenchyma and ventricles (Figure 1B, C, D). His serum Cysticercal antibodies (IgG) done by ELIZA were positive. Patient responded to albendazole therapy along with a short course of oral steroids [1].

This case depicts that pseudo hypertrophy of isolated muscle can be a presenting feature in a disseminated cysticercosis in an endemic region.

Case 1

Fig 1 A): Intramuscular cysticercosis presenting as painful mass of biceps muscles.

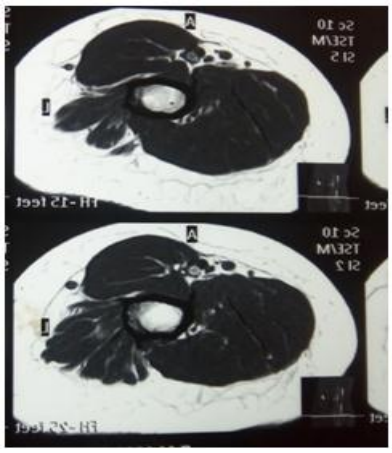

Fig 1 B): MRI right arm showing typical appearance of cysticercus with scolex inside.

Fig 1 C): Ultrsonogram of biceps muscle showing cysticercus with scolex.

Fig 1 D): MRI brain showing calcified granuloma suggestive of Neurocysticercosis stage IV in right parafalcine region.

Case 2

Fig 2 A): Intramuscular cysticercosis presenting as pseudohypertrophy of the biceps muscle.

Fig 2 B): USG shows typical appearance of cysticercus with scolex in the center.

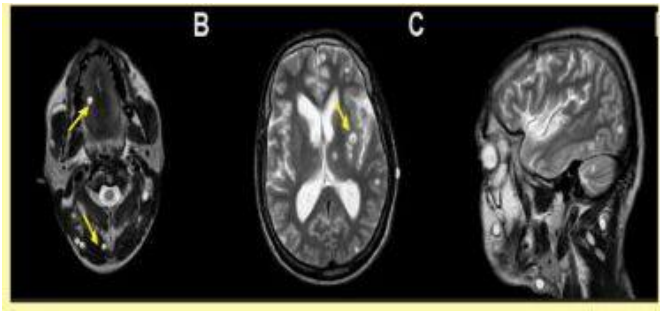

Fig 2 C): MRI brain showing cysticerci in parenchyma, ventricles, tongue and paraspinal muscles.

2. Discussion

Taeniasis or intestinal colonization by the adult stage of *Taenia solium* or Pork Tapeworm is a common zoonotic infection of humans. Rarely, due to contamination of water and food humans ingest the eggs of the tapeworm with development of the larval stage (called cysticerci cellulose) in various tissues of the body e.g. brain, eye, subcutaneous tissues and intramuscular compartments producing symptoms due to larval burden, location and host inflammatory reaction caused by the dying worm [1]. Vohra *et al* found the seroprevelence of cysticercosis to be 22.4% in rural Goa and the prevalence of taeniasis estimated by stool sampling to be 9.7%.Persons with taeniasis were three times more likely to have cysticercosis but no relation could be established between cysticercosis and pork consumption or religion [3]. Neurocysticercosis is more common than ocular and intramuscular cysticercosis. Disseminated cysticercosis is rare. Poor sanitation, poor personal hygiene with autoingestion of eggs, open defecation and immigration predispose to cysticercosis [2]. Due to this reason it can also occur in vegetarians. Intramuscular cysticercosis is a rare presentation, produced when the larvae which get encysted in the intramuscular compartment as cysticerci cellulose and remain viable for years. When they die there is development of surrounding edema due to granulomatous inflammation. Intramuscular infection may present as mass like, myopathic type, nodular, abscess like or pseudo hypertrophic picture [4-8]. In our series mass like and pseudo hypertrophic presentation could be seen. Cysticercosis should be suspected in any person with symptoms in an endemic zone [1]. The diagnostic investigations include imaging studies i.e. MRI which shows a well-defined soft tissue mass with a cystic lesion with an eccentric echogenic structure suggestive of a scolex inside. There may be surrounding inflammation or calcification.T1W images show hypoinensity and hyperintensity is seen on T2W imaging. Histopathology may demonstrate the presence of the larva and is confirmatory. Ultrsonography has also been used to diagnose subcutaneous and intramuscular cysticercosis [9]. The management varies with clinical presentation. Options include antihelminthic agents usually Albendazole and Praziquentel along with steroids to limit inflammatory edema, antiepileptic agents in case of neurocysticercosis. Patients are followed up clinically. Surgical excision of skeletal muscle cysts can be considered if they are painful [10]. All patients should be subjected to ophthalmologic examination and neuroimaging to rule out orbital cysticercosis and NCC [1]. In our series both patients presented with skeletal muscle cysticercosis and were found to have NCC on further evaluation. They were managed conservatively and improved. Marshall Lighthouse *et al* have demonstrated the affectivity of recombinant vaccine active against the onchospheres of several cestodes including T. solium conferring 100% protection [11].

3. Conclusion

Cysticercosis is a rare form of *Taenia solium* infection caused by accidental ingestion of pork Tapeworm eggs by humans and characterized by presence of encysted larvae in brain, skeletal muscles, subcutaneous tissues or orbit. The presentation depends on larval burden, site of larvae and resulting inflammation. It should be suspected in any symptomatic person living in an endemic area. A search for other sites of Cysticercal infection especially NCC is warranted. Treatment includes antihelminthic drugs with a short course of oral steroids and if necessary surgical excision.

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