Case Report

Lack of restricted diffusion in MR imaging as a potential differentiating tool of reactive lymph node in cat scratch disease from lymphoma or abscess

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Cat scratch disease is an infection caused by Bartonella Henselae with characteristic presentation of lymphadenopathy. Despite self-limited nature of the disease in most cases, it accounts for many lymph node biopsies performed since its imaging features can mimic lymphoma in appearance, thus requiring additional invasive procedures. Lack of restricted diffusion may be helpful in distinguishing imaging feature of reactive lymph nodes with caseating necrosis seen in cat scratch disease from lymphoma or abscess. We present a case of 12-year-old female, who presented with an arm swelling, MRI of which demonstrated absence of restricted diffusion in the subcutaneous enlarged lymph nodes. She then underwent excisional biopsy with final diagnosis of reactive lymph node and cat scratch disease based on biopsy results and immunoglobulin titer.

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Introduction

Cat scratch disease is mostly a self-limited infection caused by Bartonella Henselae. Most common clinical presentation of cat scratch disease is lymphadenopathy. One study based on 1733 patients with cat scratch disease demonstrated 100% of lymphadenopathy, of which half of them presented with lymphadenopathy as the only sign, 28% presented with fever, and 29% with malaise and fatigue [5]. The diagnosis of cat scratch disease is based on serology and polymerase chain reaction as Bartonella Henselae is difficult to culture [4]. Most cases demonstrate elevated IgG level greater than 1:128 and IgM level greater than 1:20 [1]. Indirect immunofluorescence assay (IFA) demonstrates sensitivity of 88% and specificity of 97% for IgG and IgM antibodies [1]. IgM antibody is not always present and IgG level greater than 1:64 usually suggests recent infection [1].

Once the diagnosis of cat scratch disease is made, treatment with antibiotics is reserved for severe cases as majority of cases are self-limited. Four efficacious antibiotics including rifampin, ciprofloxacin, trimethoprim-sulfamethoxazole,
**Fig. 1** – Predominantly hypoechoic collection in the subcutaneous soft tissue in the medial left arm with fusiform hypoechoic solid component in the center of collection. A linear echogenic structure (in A) was seen traversing the solid component with possible vascular flow (B, C).

**Fig. 2** – Axial DWI, ADC (A B), T1, T2 (C, D), T1 fat saturated pre and post contrast sequences (E, F), and coronal T2 sequence (G) of the medial left arm. A fluid collection is seen with nodular enhancing central component which is iso to hyper-intense to muscle on T1WI, hyper-intense to muscle on T2WI, and no restricted diffusion. The fluid collection surrounding the solid component demonstrates peripheral enhancement but no restricted diffusion. Multiple enlarged lymph nodes were also seen in the axilla and along the medial arm.
and gentamicin have been traditionally used. More recently, in one placebo-controlled study, azithromycin was found to have more rapid decrease in size of lymph nodes [5].

Imaging features of cat scratch disease has been reported on multiple modalities, with some imaging features similar with lymphoma or abscess. Muenzel et al presented 3 cases of patients with Bartonella Henselae infection with restricted diffusion and low ADC value in MR imaging, mimicking malignant disease [3]. Ultrasound findings specific to cat scratch disease include mass asymmetry and hyperechoic hilum [6].

**Case report**

We present a case of a 12 years old female with 2.5 weeks history of medial left arm increasing swelling, and pain along with fever. Patient was initially told to have infectious mononucleosis and started on amoxicillin. However worsening swelling, daily fever, and loss of appetite resulting in 8lb weight loss during the illness warranted visit to our institution. At this time, differential diagnoses included viral or bacterial infection and malignancy more probably lymphoma.

Initial white blood cell (WBC) count was high normal 11,000/μL, mildly elevated eosinophil count 0.53, elevated ESR 53 mm/hr, normal C-reactive protein (CRP) of 6.7ugm/L. Initial Epstein-Barr virus (EBV) nuclear antigen level was +2.39, EBV Barr viral capsid antigen (VCA) IgG p18 antibody +0.08, Epstein-Barr VCA IgG p18 antibody +5.03, Bartonella henselae IgG level was 1:128, without detectable IgM, Bartonella quintana negative with IgG and IgM, negative Lyme IgG and IgM. Based on serology, the differential diagnoses were narrowed down to cat scratch disease and lymphoma. On further query on social history, a household cat was identified.

Multimodality imaging was performed. Initial radiograph demonstrated no osseous abnormality other than soft tissue swelling in the left arm. United States demonstrated predominantly hypoechoic collection in the subcutaneous soft tissues of the distal medial left arm with fusiform hypoechoic solid component in the center of collection. A linear echogenic structure was seen traversing the solid component with possible vascular flow within. At this time, fine needle aspiration (FNA) was performed as non-diagnostic US features and serology. MRI of left arm revealed a fluid collection along the medial aspect of distal left arm with nodular enhancing central component demonstrated no restricted diffusion. The fluid collection surrounding the solid component also did not demonstrate restricted diffusion.

Initially, the FNA showed yellowish thick fluid and solid component demonstrated lymphatic tissue with atypical lymphocytes. Gram stain and culture of fluid did not reveal any organism. Subsequently, patient underwent excisional biopsy which revealed granulomatous inflammation without evi-

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**Fig. 3** – Hematoxylin and eosin (H&E) stain of 4x (A), 10x (B), and 20x (C, D) magnification of the core needle biopsy in the medial left arm lymph node. Small lymphocytes and secondary follicles are seen, features consistent with reactive lymphoid hyperplasia (A, B). Additionally, acute inflammatory cells within a vessel and cluster of histiocytes are seen (C, D) prompting additional stains for specific organisms including Warthin Starry stain for spirochetes which were all negative (not shown).
idence of any malignancy. Again, Gram stain and culture of fluid did not reveal any organism.

Diagnosis of cat scratch disease was made and patient was placed on a course of azithromycin post excisional biopsy and her swelling and redness improved on a follow up visit.

Discussion

In our case, the diagnosis of cat scratch disease was made based on combination of excisional biopsy findings, serology titer, MRI findings, clinical history and course. However, the initial FNA findings, serology and diagnostic imaging findings were nonspecific and not conclusive enough in excluding the differential diagnosis of lymphoma, primary worrisome differential to be considered in children with lymphadenopathy.

Initial ultrasound imaging can be nonspecific demonstrating fluid collection and enlarged hypoechoic lymph nodes which makes it difficult to differentiate between reactive lymph nodes or abscess or lymphoma. Diffusion sequences in MRI has been postulated as a tool for differentiating abscess and malignancy from non-infected fluid collection and reactive lymph nodes. Many studies suggest restricted diffusion in MR imaging as an indicator of malignant involvement of lymph nodes [2,7,8]. As such, when MR imaging demonstrates restricted diffusion, the benignity of lymph node becomes difficult to elucidate from MR imaging [3]. Our case demonstrated lack of diffusion restriction, rendering low probability of malignant involvement or abscess formation of the enlarged lymph node.

Literature has also suggested that malignant involvement of lymph nodes demonstrate low apparent diffusion coefficient (ADC) on MR imaging [7]. One study showed sensitivity of 100% and specificity of 92.9% in mean ADC value threshold less than $1.03 \times 10^{-3}$ mm$^2$/s for malignant lymph node hence differentiating benign vs malignant disease [8]. Our case demonstrated ADC value of $1.11 \times 10^{-3}$ mm$^2$/s, consistent with benign pathology. Therefore, lack of restricted diffusion in MR imaging can be useful in differentiating reactive lymph nodes (in our case cat scratch disease) from abscess or malignant involvement of lymph nodes (Figs. 1-3).

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