Computed Tomography and Magnetic Resonance Imaging of Uncomplicated Cat-Scratch Disease with Regional Lymphadenitis

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Cat-scratch disease is a benign lymphadenopathy that usually occurs in children and young adults. It is probably underdiagnosed clinically due to lack of history of being scratched or bitten by a cat or kitten. Awareness of the radiological features of cat-scratch disease may facilitate noninvasive diagnosis of this condition. We report five cases of cat-scratch disease with tender palpable masses. Cross-sectional imaging with computed tomography (CT) (n = 4) and magnetic resonance (MR) imaging (n = 1) showed a mass or clustered nodules with surrounding edema in an area of lymphatic drainage. We discuss the clinical manifestations, radiological features and differential diagnosis based on imaging study.

Key words: Cat-scratch disease; lymphatic system, infection; computed tomography(CT); Magnetic Resonance(MR)

Case Reports

Case one

A previously healthy 42-year-old man was admitted due to a 2-week history of fever associated with a tender palpable mass in his left arm. Physical examination was unremarkable except for a 3 × 3 × 5 cm solid, tender mass with mild local heat at the medial aspect of his left arm near the elbow. The peripheral white blood cell count was slightly increased (10,300/mm³). Plain film of the left arm showed soft tissue swelling around the medial side of the elbow. Computed tomography (CT) of the left upper extremity (Fig. 1) showed a round mass lesion at the epitrochlear region adjacent to the ulnar nerve. The lesion had similar attenuation to that of muscle in its periphery and had a low attenuation in...
its center. The adjacent cutis and subcutis showed slightly streaky infiltration. Under the impression of neurilemmoma, excision biopsy was performed. The surgical specimen showed a multi-nodular tumor made up of three nodules with size ranging from 2 to 4 cm at the medial aspect of the distal arm, partly enclosed by the ulnar nerve. Microscopic study (Fig. 1c) demonstrated several lymph nodes with lymphoid follicular hyperplasia and histiocytic proliferation. Granuloma reaction and central necrosis with neutrophilic aggregations were found. These microscopic findings were consistent with cat-scratch disease. Further investigation of past history disclosed that a wild cat had scratched the patient 2 weeks ago. The post-operative follow-up was uneventful.

**Case two**

A 24-year-old man presented with a two-week history of swelling over the right axillary region and medial aspect of the right upper arm with tenderness, redness and local heat. Fever off and on was noted for one week but there was no cough, sore throat, rhinorrhea, diarrhea, or abdominal pain. Physical examination revealed multiple lymph nodes in the right axillary region. The peripheral blood white cell count showed leukocytosis with elevation of eosinophils. There was erythematous change with crust formation in his right ring finger. CT scan of the chest (Fig. 2) demonstrated several enlarged nodules at the right axillary region with mild streaky perifocal infiltration. He subsequently reported having been scratched at his right wrist by a cat 2 months before. The symptoms and signs subsided after oral medication with erythromycin.

**Case three**

A previously healthy 21-year-old female complained of progressive right neck swelling with local heat and tenderness for 3 weeks. She also had mild fever and chills. Physical examination

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**Figure 1.** Computed tomography (CT) of left upper extremity in case 1. **a.** A 3 × 3 × 5 cm round mass (arrow) at the epitrochlear region adjacent to the ulnar nerve. It is isodense to muscle with a hypoattenuated center. **b.** The mass shows strong rim-enhancement after the injection of contrast medium. Focal strands of infiltration are seen in the adjacent cutis and subcutis (arrowhead). **c.** Microscopic study shows small foci of suppuration coalescing to form an abscess. Macrophages and epithelioid cells have aggregated around the abscess (hematoxylin and eosin).
was unremarkable except enlargement of multiple lymph nodes in the right posterior cervical and the supraclavicular regions. Routine laboratory study showed increased ESR-1hr (46mm/hr), a nonspecific sign of infection. CT scan of the neck (Fig. 3) revealed clusters of nodules in the carotid space, posterior cervical space and supraclavicular space of the right neck. There was focal streaky infiltration at the adjacent cutis and subcutis. She had a pet cat, but could not recall a specific history of a cat scratch. CSD was suspected. The right neck swelling subsided rapidly after treatment with oral erythromycin.

Case four
A previously healthy 40-year-old woman complained of one-month history of a tender palpable mass in her right elbow. Physical examination was unremarkable except for a 3x3x4 cm solid mass at the medial aspect of her right elbow. Plain film of the right arm showed soft tissue swelling in the medial side of the elbow. MR imaging of the right arm (Fig. 4) showed a round mass with heterogeneous signal intensity at the epitrochlear region. There were streaky linear infiltrations indicating edema at the adjacent subcutaneous layer. Tracking the past history, she had a cat pet and was scratched at her forearm about a month ago. Under the impression of CSD, she was treated with erythromycin. The mass subsided 2 weeks after treatment.

Case five
A 24-year-old female presented with painful lumps at her right axillary region recently. There is no fever and other complains. She had the history of cat contact one month before. Physical examination was unremarkable except for clustered nodular lesions at her axillary region. No tenderness, local heat or erythematous change was found. CT scan of the right shoulder (not shown) showed a cluster of nodular mass with surrounding streaky infiltration at the right axillary region. The lesion was solid with attenuation similar to that of the muscle. There is no necrosis or cystic part in the lesion. The picture was

Figure 2. Chest CT of case 2 shows multiple enlarged nodular lesion at the right axillary region (arrows) associated with adjacent focal strands of infiltration (arrowhead).

Figure 3. CT of right neck in case 3. a. Clusters of nodules in the carotid space (thin arrow), posterior cervical space (thick arrow) and supraclavicular space (thick arrow) of the right neck. Focal strand of infiltration (thick arrowhead) is seen in the adjacent cutis and subcutis.
Cat-scratch disease

compatible with inflammatory lymphadenitis and CSD was suggested. The lesion subsided 10 days later after oral medication with erythromycin.

The clinical data and the radiographic findings are summarized in the Table 1.

**DISCUSSION**

Cat-scratch disease (CSD) is a common cause of benign lymphadenopathy in children and young adults. The most common causal organism is Bartonella henselae, also called Rochalimaea henselae [1]. Most patients have a history of exposure to a cat, with only a few reported cases developing CSD following exposure to a dog [2]. Following an incubation period averaging three to ten days, one or multiple nonpruritic papules or pustules may develop at the inoculated site, resembling an insect bite, and usually resolve spontaneously in days to weeks [3]. Only few cases show the lesion of inoculation site while coming to hospitals (only case 2 in our study). From three to six weeks after inoculation, most patients develop painful regional adenopathy in specific

**Figure 4.** MR imaging of right arm in case 4. a. A round mass at the epitrochlear region associated with adjacent focal strands of infiltration. The lesion (arrow) shows similar intensity to the muscle on T1WI. b. The lesion (arrow) shows slightly hyperintense to the muscle on T2WI. There is a central necrosis with bright signal on T2WI (arrowhead). c. Heterogeneous enhancement of the lesion is noted after injection of contrast medium.
Mass at the involved lymph nodes (case 1, 2, 3 and 4). Computed tomography (CT) shows a soft tissue mass (central necrosis) with adjacent linear infiltrate, LT epiorchlear region. Central necrosis is usually of little help in the assessment of CSD. Plain radiography to the site of inoculation [8]. Plain radiography in the distribution of lymphatic drainage proximal to the site of inoculation. Plain radiography is usually of little help in the assessment of CSD. Computed tomography (CT) shows a soft tissue mass at the involved lymph nodes (case 1, 2, 3 and 5). Central necrosis can be seen as an area of low attenuation and is common when the lymphadenitis in the extremity (case 1 and 4). Magnetic resonance (MR) imaging reveals regional lymphadenopathy as heterogeneous masses surrounded by edema, sometimes with hyperintense fluid collection in the center representing central necrosis (case four). The surrounding edema is better seen in MR imaging (case four) than CT scan, showing hyperintense streaky infiltration on T2-weighted images [9]. Although radiological study reveals nonspecific lymphadenitis, it may be useful in providing the anatomical details of the involved lymphadenitis, and detecting atypical manifestation (10%), such as osteomyelitis, or systemic CSD in immunocompromised patients (2%) [9].

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Age (y) /sex</th>
<th>Skin lesions</th>
<th>CT</th>
<th>MR imaging</th>
<th>Cat exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>42/M</td>
<td>NF</td>
<td>A 3 × 3 × 5 cm soft tissue mass (central necrosis) with adjacent linear infiltrate, LT epiorchlear region</td>
<td>NA</td>
<td>2 weeks before</td>
</tr>
<tr>
<td>2</td>
<td>24/M</td>
<td>RT ring finger tip (crust)</td>
<td>Clusters of nodules with mild streaky infiltrate, RT upper arm and axillary region</td>
<td>NA</td>
<td>2 months before</td>
</tr>
<tr>
<td>3</td>
<td>21/F</td>
<td>NF</td>
<td>Clusters of nodules with adjacent streaky infiltrate, RT neck</td>
<td>NA</td>
<td>A pet cat</td>
</tr>
<tr>
<td>4</td>
<td>40/F</td>
<td>NF</td>
<td>A 3 × 4 mass with heterogeneous signal intensity and heterogeneously enhancement, with associated central necrosis and adjacent subcutis edema, RT arm</td>
<td>NA</td>
<td>One month before</td>
</tr>
<tr>
<td>5</td>
<td>24/F</td>
<td>NF</td>
<td>Cluster of nodules with streaky infiltrate, RT axillary region</td>
<td>NA</td>
<td>One month before</td>
</tr>
</tbody>
</table>

Note: M = male, F = female, NF = not found, LT = left, RT = right, NA = not applicable
Cat-scratch disease

Chemotherapy [11]. Besides, soft tissue lymphoma and metastasis occur mainly in elderly people. Other causes of enlarged lymph nodes showing low attenuation center (necrosis) and adjacent streaky infiltration include inflammatory lesions, such as tuberculosis or pyogenic infection. It is hard to make the diagnosis of CSD without clinical information or serologic data.

In conclusion, CSD should be suspected in young patients with lymphadenopathy of the upper extremity or head and neck regions who have a history of exposure to a cat. Imaging generally does not play a determinate role in the differential diagnosis, but the findings of a mass with an inflammatory appearance are supportive. Early consideration of these features and tracking any past history of cat contact will often identify the condition and thus, avoid an unnecessary surgical procedure.

REFERENCES

貓抓病之電腦斷層及磁振造影的影像學表徵

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貓抓病是好發生在小孩及年輕人的良性淋巴結病變。在不知有被貓抓或咬到的病例個案，臨床上可能不會想到這個診斷，以至於要靠侵襲性的方法，例如外科手術，才能正確診斷。近來文獻特別強調此病之影像學表徵，期能提升醫界認出此病及以非侵襲性的方法作出診斷。吾等報告五個病例個案，其臨床表現為具疼痛感的腫塊，此篇報告特別強調電腦斷層及磁振造影其影像學表徵及影像上的鑑別診斷。

關鍵詞：貓抓病；淋巴系統；感染；電腦斷層；磁振造影