CASE REPORT

Acute appendicitis as the first presentation of Kawasaki Disease in a 5-year-old boy: case presentation and review of the literature

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ABSTRACT

While Kawasaki Disease (KD) related mortality has been reduced due to the early recognition of its classic clinical features, acute abdomen remains a seldom KD presentation. Acute appendicitis in the context of KD is even rarer. Here, we present an interesting case of KD, demonstrated with appendicitis and a review of the existing literature. A 5-year-old boy was transferred to our hospital due to acute appendicitis and phlegmon, which did not respond to the conservative antibiotic treatment. He was constantly febrile and had demonstrated a maculopapular rash of the trunk and extremities, as well as hand, feet and eyelids' edema/conjunctivitis. KD was diagnosed and intravenous g-globin was administered to the patient, who demonstrated complete remission. Acute appendicitis in KD is an extremely rare entity, which may fatally delay the diagnosis. Pediatricians and surgeons should be aware of it, as its favorable course lies upon their clinical judgment.

Keywords: acute appendicitis, Kawasaki Disease, acute abdomen, phlegmon, vasculitis

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INTRODUCTION

Acute appendicitis is one of the rarest manifestations of Kawasaki Disease (KD) in children. Very few cases have been reported in the literature. As a multisystemic vasculitis, KD may affect every part of the body. Here we present one of the uncommon cases of appendicitis in a young boy, who was eventually diagnosed with KD.

CASE PRESENTATION

A 5-year-old boy was urgently transferred to our department by a regional hospital due to acute appendicitis that was non-responsive to the conservative antibiotic treatment. The boy's symptoms had arisen five days ago, when he presented a fever of 39.5^{o}C and a vague abdominal pain which then migrated to the right iliac fossa. Inflammation markers were elevated (WBC 11000/μl, PMN 70%, CRP 81mg/l) and the abdominal ultrasound demonstrated an edematous

appendix of 0.95cm in diameter and several regional lymph nodes with maximum dimensions 1.2x0.6cm. Antibiotic treatment was initiated. However, two days later the patient was still febrile and he developed a maculopapular rash of the trunk and extremities, hand, feet and eyelids' edema and conjunctivitis, as well as neck lymphadenopathy. He then presented cheilitis (Figure 1.) and glossitis. The patient was urgently transferred to our hospital for further investigation and treatment.

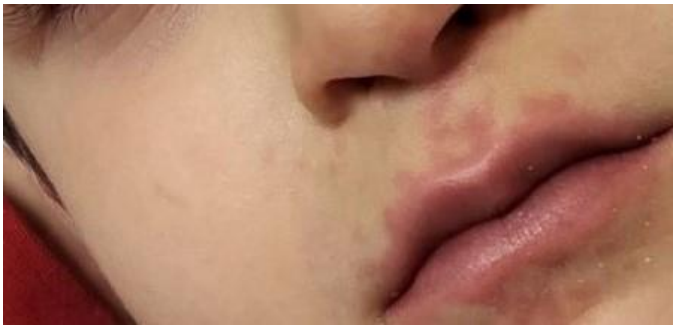

Figure 1. Cheilitis in our patient.

At clinical examination he was febrile (T: 39.8^{o}C), BP was 95/60mmHg and HR 121/min. He had a generalized maculopapular rash (Figure 2) and his abdomen was diffusely tender, mainly at the right iliac fossa.

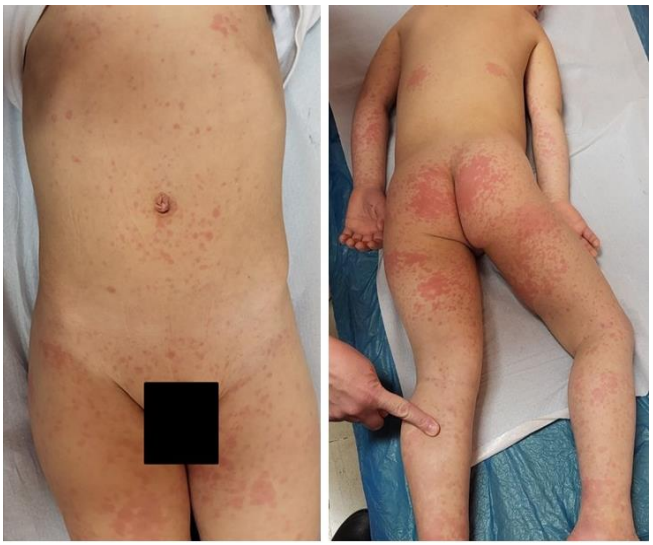

Figure 2. Generalized maculopapular rash in our patient.

The PCR test for COVID-19 was negative. McBurney sign was positive, and the boy displayed slight rebound tenderness. The abdominal ultrasound depicted an edematous appendix of 1.1cm in diameter, with increased vasculature and free peritoneal fluid around it. The rigidity of the mesenteric fat was lost and several mesenteric lymph nodes of 1.2cm in diameter were noted, all signs aligned with the diagnosis of acute appendicitis.

The consultant general surgeon recommended conservative treatment of the appendicitis, mainly by identifying and treating the underlying systemic cause that seemed to be a type of vasculitis. Due to the age and the clinical presentation of the patient, Kawasaki Disease was thought to be the most likely diagnosis. The boy was started in intravenous immunoglobulin and aspirin in standard doses.

As the course of his treatment could not be predicted, he was transferred to a referral pediatric hospital in case he needed surgery. However, the symptoms subsided a few days after the initiation of treatment and the little boy was discharged without any complications.

COMMENT

We conducted a research on PubMed database using the algorithm "acute appendicitis AND Kawasaki disease". Eventually, 11 articles were included in the study. We provide the PubMed algorithm below.

Overall, 15 cases of acute appendicitis in the context of KD have been described in the literature [1-11]. Their mean age was 4.96 years

Table 1. Patients' demographics.

Researcher	*Patient No.*	*Age (years)*	*Sex (Male/ Female)*
Salehi et al.[1]	1	4	F
Fujita et al.[2]	2	5	M
Chiba et al. [3]	3	6	M
Chiba et al.	4	0,5	M
Maggio et al.[4]	5	4	M
Garnett et al. [5]	6	3	M
Garnett et al.	7	7	F
Kuroda et al. [6]	8	6	M
Chang et al. [7]	9	8	F
Huang et al.[8]	10	5	M
Choi et al. [9]	11	5	M
Velez et al.[10]	12	5	M
Velez et al.	13	NOT PROVIDED	NOT PROVIDED
Velez et al.	14	NOT PROVIDED	NOT PROVIDED
Song et al.[11]	15	6	M

Table 2. Clinical and laboratory findings.

Patient No.	*Fever (°C)*	*WBCs (/μL)*	*CRP (mg/l)*	*Imaging study confirming appendicitis*	*Skin rash*	*Other organs affected*
1	39.8	NOT PROVIDED	117	US	NO	dilation of the left anterior descending coronary artery (with a Z-score of 4 -small aneurysm-)
2	YES	13200	155.4	CT SCAN	YES	bilateral conjunctival injection, strawberry tongue, erythema on the trunk and extremities, and edematous changes in the peripheral extremities

3	38	21300	111	US	YES	conjunctival ecchymosis, swelling of the lips and maceration and peeling of the skin of the feet and scrotum, cardiac echo showed normal findings
4	38	12600	70	US	YES	conjunctivitis, cervical adenopathy, desquamation of hand
5	39	NOT PROVIDED	NOT PROVIDED	US	YES	twosacciform coronary artery aneurysms (diameters, 3.1 mm and 2.9mm) in the proximal part of the common trunk. Oedema of the hands and periungual peeling of the fingers
6	YES	NOT PROVIDED	NOT PROVIDED	CT SCAN	YES	pericardial effusion, and dilatation of the coronary arteries, peripheral edema involving the hands, fingers, and feet, conjunctival injection, and dry, cracked lips
7	YES	NOT PROVIDED	NOT PROVIDED	CT SCAN	YES	Bilateral non-exudative conjunctivitis, a medium-sized aneurysm of the left anterior descending coronary artery.
8	39.8	13700	141	US	YES	lip swelling, mucositis, and bilateral conjunctival injection
9	39.7	19800	306.7	CT SCAN	YES	bilateral bulbar non-exudative conjunctival injection, Swelling and erythematous change in digits were also noted (Figure 1). Echocardiography showed a decrease in systolic function with the use of dopamine anddobutamine, ejection fraction 54.4%, pericardial effusion and mitralregurgitation
10	40	10300	117.8	CT SCAN	YES	bilateral bulbar conjunctival injection, cracked lips, peripheral edema involving four limbs
11	39.4	13800	137	CT SCAN	YES	bilateral nonexudative conjunctival injection, mild ectasia of the left main coronary artery
12	39.7	3400	80	US	YES	cerebral edema, conjunctival hyperemia, upper and lower extremities edema and desquamation
13	YES	NOT PROVIDED	NOT PROVIDED	NOT PROVIDED	YES	conjunctival hyperemia, upper and lower extremities edema and desquamation
14	YES	NOT PROVIDED	NOT PROVIDED	NOT PROVIDED	YES	conjunctival hyperemia, upper and lower extremities edema and desquamation
15	YES	7700	177	CT SCAN	YES	NOT PROVIDED

Table 3. Treatment choice

Patient No.	*Surgery*	*Systemic treatment*
1	YES	Intravenous immunoglobulin (IVIG) (1gr/kg single dose) and aspirin (100 mg/kg/d)
2	NO	NOT PROVIDED
3	YES	IVIG
4	YES	IVIG
5	NO	IVIG (2 g/kg) and aspirin (100mg/kg per day in four divided doses)
6	YES	IVIG and aspirin
7	YES	IVIG and aspirin
8	YES	IVIG and aspirin
9	YES	IVIG (1 g/kg)andaspirin (4 mg/kg/d)
10	YES	IVIG (2 g/kg) and a medium dose of aspirin (30 mg/kg/d)
11	YES	IVIG (2 g/kg) and aspirin (50 mg/kg/d)
12	YES	IVIG (2 g/kg) and aspirin (50 mg/kg/d)
13	YES	IVIG (2 g/kg) and aspirin (50 mg/kg/d)
14	YES	IVIG (2 g/kg) and aspirin (50 mg/kg/d)
15	YES	IVIG (2 g/kg) and aspirin (50 mg/kg/d)

(MEDIAN 5, range 0.5-8), while they were mainly males (11/13) (Table 1). All patients demonstrated high fever (mean temperature 39.3oC), elevated White Blood Cell Count (WBC) and C- reactive protein (CRP), and signs of vasculitis with multiple organs affected (Table 2.) All but one demonstrated a skin rash, earlier or later in the course of the

disease. Five out of the fifteen patients demonstrated abnormal findings on the cardiac echocardiography, with either valves affected, pericardial effusion, or coronary arteries' aneurysms.

Thirteen patients were treated surgically, either by the open approach or laparoscopically. Appendectomy was the operation in all cases. However, the symptoms of the disease were controlled only after the administration of intravenous g-immunoglobin and acetylsalicylic in various doses and treatment courses. (Table 3.)

KD is the most common vasculitis of medium-sized vessels in children, that affects multiple organ systems through a generalized inflammatory response. [12] As a clinical entity KD contains variable signs and symptoms, most commonly high fever, a maculopapular skin rash, edema of the extremities, lymphadenopathy, conjunctivitis, erythema of the lips and oral mucosa.

It is extremely seldom for a child suffering from KD to be presented in the pediatrician with acute appendicitis. The pathophysiologic mechanism is not completely understood, although researchers claim that the inflammatory cascade that is triggered via autoimmune mechanisms results in increased levels of Il-6 and 8, as well as TNF-alpha. These inflammatory cytocines increase vessels permeability and result in a vasculitis that may affect any medium-sized vessels of various organs, including the appendix. [13]

Approximately one third of the cases reported in the literature were presented in the Emergency Department with signs of peritonaism and surgery revealed peritonitis. A possible explanation for this may be the fact that KD was not initially suspected in the differential diagnosis, therefore leading to an undertreatment of the young patients.

Systemic treatment with administration of intravenous g-immunoglobulin and aspirin in appropriate doses, depending on the severity of the symptoms and the patient treated, seems to be mandatory. All patients reported in the current review, including ours, did not achieve healing until they were started on intravenous immunoglobulin, highlighting the importance of our observation.

The past few years, during the COVID-19 pandemic, a new entity has risen: the MIS-C (Multi-System Inflammatory Syndrome in Children), an inflammatory response caused by the COVID-19. Its symptoms vary, but mainly contain fever, cutaneous manifestations, abdominal cramps and cardiovascular collapses [14]. Hence it is sometimes mistaken for KD or other similar disorders. MIS-C should always be part of the initial diagnosis in cases of severe multi-systemic inflammation and testing for SARS-COVID-19 should be a standard of care for these children.

To conclude, acute appendicitis is an extremely rare first presentation of KD in children. However, the pediatrician should always keep it in mind, especially when the symptoms are not controlled by traditional therapies and/or the clinical findings point to a systematic cause of inflammation rather than a local one.

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ΠΑΡΟΥΣΙΑΣΗ ΠΕΡΙΣΤΑΤΙΚΟΥ

Οξεία σκωληκοειδίτιδα ως πρώτη εκδήλωση νόσου Kawasaki σε αγόρι 5 ετών: περιγραφή περίπτωσης και ανασκόπηση της βιβλιογραφίας

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ΠΕΡΙΛΗΨΗ

Παρότι η θνησιμότητα που σχετίζεται με τη Νόσο Kawasaki (ΝΚ) έχει μειωθεί λόγω της έγκαιρης αναγνώρισης των κλασικών κλινικών της χαρακτηριστικών, η οξεία κοιλία παραμένει μια σπάνια εκδήλωση της ΝΚ. Η οξεία σκωληκοειδίτιδα στο πλαίσιο της ΝΚ είναι ακόμα σπανιότερη. Παρουσιάζουμε μια ενδιαφέρουσα περίπτωση ΝΚ, με πρώτη εκδήλωση την εμφάνιση σκωληκοειδίτιδας και γίνεται ανασκόπηση της υπάρχουσας βιβλιογραφίας. Αγόρι 5 ετών προσκομίστηκε στο Νοσοκομείο μας λόγω οξείας σκωληκοειδίτιδας και φλέγμονα, που δεν ανταποκρινόταν στη συντηρητική αντιβιοτική αγωγή. Το παιδί συνέχιζε να πυρέσσει και εμφάνισε κηλιδοβλατιδώδες εξάνθημα του κορμού και των άκρων, καθώς και οίδημα παλαμών/πελμάτων και οίδημα βλεφάρων/ένεση επιπεφυκότων. Τέθηκε η διάγνωση της ΝΚ, χορηγήθηκε ενδοφλέβια γ-σφαιρίνη και ο ασθενής οδηγήθηκε σε πλήρη ύφεση των συμπτωμάτων. Η οξεία σκωληκοειδίτιδα στη ΝΚ είναι μια εξαιρετικά σπάνια οντότητα, η οποία μπορεί να προκαλέσει πολύ σοβαρή καθυστέρηση στη διάγνωση. Τόσο οι παιδίατροι όσο και οι χειρουργοί θα πρέπει να το γνωρίζουν αυτό, καθώς η ευμενής έκβαση της πορείας των ασθενών επαφίεται στην κλινική τους κρίση.

Λέξεις ευρετηρίου: οξεία σκωληκοειδίτιδα, Νόσος Kawasaki, οξεία κοιλία, φλέγμων, αγγειίτιδα

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