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67 **ABSTRACT**

68 Appendicitis after barium administration occurs rarely and its underlying pathology
69 remains undetermined. We present a case where acute appendicitis presented as an
70 allergic reaction to barium sulfate. A 55-yearold man presented with nausea and
71 severe right lower abdomen and right groin pain seven days after a barium swallow
72 study. Computer tomography revealed retained barium in the appendix without any
73 signs of inflammation. Patient underwent a laparoscopic appendectomy with
74 resolution of his symptoms. Histopathologic examination demonstrated eosinophilic
75 infiltration of the muscularis propria, consistent with acute eosinophilic appendicitis
76 as a result of type I hypersensitivity reaction to barium. Recognition of the potential
77 risk of barium-induced allergic appendicitis is important for timely diagnosis

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79 **Keywords:** NOT GIVEN

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99 **INTRODUCTION**

100 Barium-induced appendicitis is a rare complication after enteric barium examinations
101 and was first reported as a case in 1954 [1]. The time span between barium study
102 and onset of appendicitis ranges from a few hours to a few years [2] with the highest
103 risk being within 2 months after barium administration [3]. Although the retained
104 barium in the appendix is generally thought to form a barium-coated fecalith
105 (barolith) leading to luminal obstruction and appendicitis [4], the pathophysiology of
106 barium-induced appendicitis remains unclear. We present our experience with this
107 rare surgical scenario in this report.

108

109 **CASE REPORT**

110 A 55-year-old man with dysphagia underwent an outpatient barium swallow study at
111 an outside institution. A few hours later he developed nausea and severe pain in the
112 right lower quadrant of the abdomen, prompting him to present at the same outside
113 institution's emergency department for an evaluation. He was admitted for overnight
114 observation after a computed tomography scan of the abdomen and pelvis which
115 was unable to provide a diagnosis.

116 Six days later, the patient presented to our emergency department with nausea and
117 severe right lower quadrant abdominal pain radiating into the right groin. Physical
118 examination revealed significant tenderness in the right lower quadrant of the
119 abdomen and over the right groin, without any evidence of groin hernias. Patient was
120 afebrile, with normal leucocyte counts.

121 A computed tomography scan of the abdomen and pelvis was obtained and showed
122 retained barium in the appendix without any signs of appendicitis (Figure 1).

123 After the patient was evaluated by consultant surgeons, he was taken immediately to
124 the operating room for a laparoscopic exploration of the abdomen with the
125 presumptive diagnosis of barium-induced appendicitis.

126 At surgery, only minimal serosal hyperemia of the body of the appendix was found
127 and an appendectomy was performed. Post-operatively, patient reported immediate

128 and complete relief of his right lower quadrant and right groin pain. He was
129 discharged to home 12 hrs after the surgery and had an unremarkable recovery.
130 Pathologic examination of the appendix showed a dilated appendiceal lumen without
131 fecaliths, barium crystals in the mucosa of the appendix (Figure 2), absence of
132 neutrophils in the muscle layer, and eosinophilic infiltration of the muscularis propria
133 (Figure 3) with 150 eosinophils per high power field.

134

135 **DISCUSSION**

136 Here, we report the case of a patient with barium-induced appendicitis, with
137 symptoms starting hours after barium administration and correct diagnosis and
138 treatment delayed for seven days. This indicates the importance of maintaining a
139 high index of suspicion for barium-induced appendicitis in patients who present with
140 symptoms of appendicitis after recent barium imaging.

141 Eosinophils are normally present in the lamina propria and submucosa, but not in the
142 muscularis propria of the appendix [5]. The eosinophilic infiltration of the muscularis
143 propria in our patient suggests a type I hypersensitivity reaction to barium or to any
144 of the additives contained in the barium sulfate solution, including deflocculation
145 agents, suspending agents, and flavoring agents [6].

146 If the mucosal injury caused by the eosinophils becomes infected by bacteria it leads
147 to acute suppurative appendicitis, whereas in the absence of infection acute
148 eosinophilic appendicitis (AEA) occurs [5].

149 AEA is a known rare variant of appendix inflammation. The histologic hallmark of this
150 entity is eosinophilic infiltration of the muscularis propria without neutrophilic
151 infiltration [5, 7], as was the finding in our patient. A count of > 10 eosinophils per
152 high power field at microscopic examination is found in AEA [8]. In our case there
153 were about 150 eosinophils per high power field.

154 AEA has been related to multiple parasites including *Strongyloides Stercoralis* [9],
155 *Schistosoma Japonicum* [10], and *Entamoeba Histolytica* [11].

156 This case report is very significant because, to the best of our knowledge, it
157 represents the first reported evidence of an acute eosinophilic appendicitis caused
158 by retention of the barium sulfate solution in the appendix.

159

160 **CONCLUSION**

161 Barium-induced appendicitis is a very rare clinical entity, but given the pervasive use
162 of barium for enteric radiographic studies clinicians should recognize this potential
163 risk to avoid delayed diagnosis and treatment. Histopathology is the gold standard
164 for diagnosis of this rare condition.

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166 **CONFLICT OF INTEREST**

167 NOT GIVEN

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169 **AUTHOR'S CONTRIBUTIONS**

170 NOT GIVEN

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172 **REFERENCES**

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202 FIGURE LEGENDS

203

204 Figure 1: Axial CT scan of the abdomen with IV contrast demonstrates barium
205 retained in the appendix without edema of the appendix or inflammation in the
206 periappendiceal fat. The tip of the appendix contains no barium and is normal
207 (arrow).

208

209 Figure 2: Polarized barium crystals deposits in the mucosa of the appendix.

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211 Figure 3: Eosinophilic infiltrate with degranulation (arrows) in muscularis propria.

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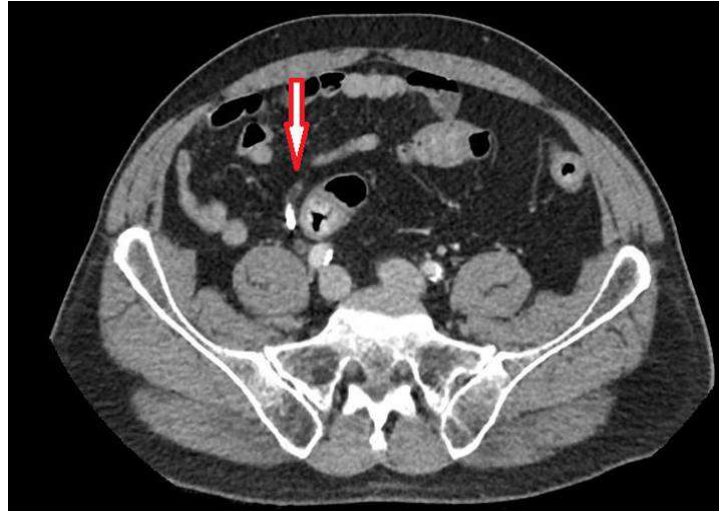
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223 **FIGURES**

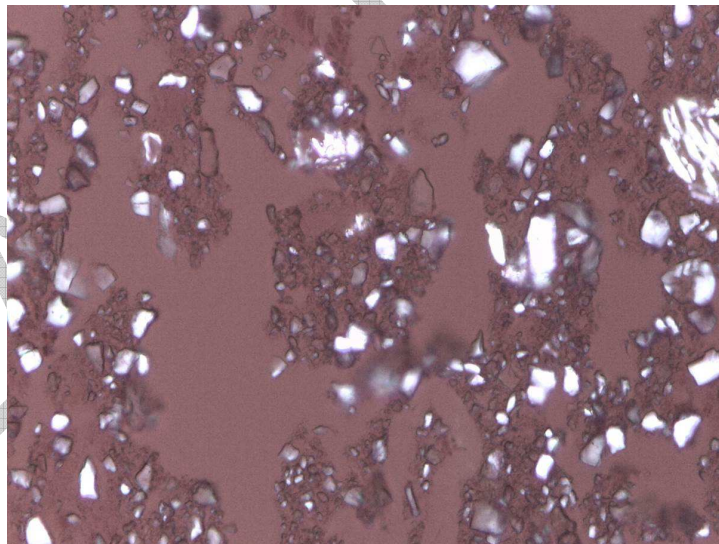
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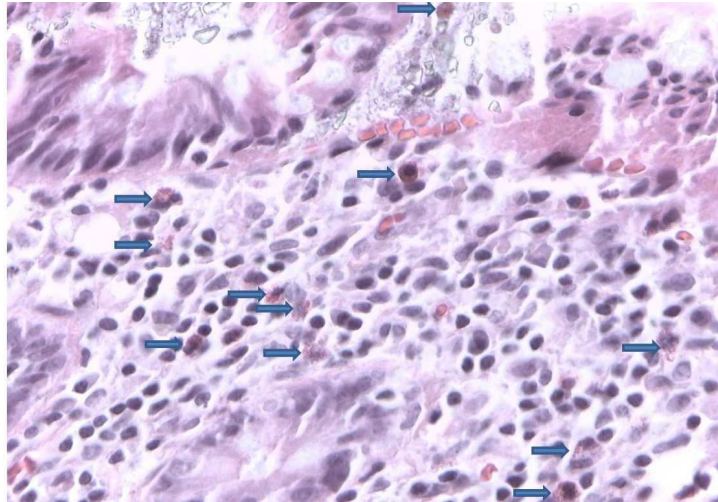
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