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1 **TYPE OF TITLE:** Case Series

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3 **TITLE:** Spontaneous splenic rupture secondary to lymphoma: Report of two cases

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5 **AUTHORS:**

6 Semih Güllü¹, Dilek Kuzukıran³, Emin Taşkıran¹, Sümeyye Ekmekci³, Harun Akar¹

7

8 **AFILIATIONS:**

9 ¹Tepecik Research and Training Hospital, Division of General Internal Medicine,
10 Izmir, Turkey

11 ²Tepecik Research and Training Hospital, Division of General Surgery, Izmir, Turkey

12 ³Tepecik Research and Training Hospital, Division of Pathology, Izmir, Turkey

13

14 **CORRESPONDING AUTHOR DETAILS**

15 Semih Güllü, MD

16 Tepecik Education and Research Hospital, Division of General Internal Medicine,
17 Izmir, Turkey

18 E-mail: semih.gulle@hotmail.com

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20 **Short running title:** Splenic rupture due to primary splenic lymphoma

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23 submission.

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33 **ABSTRACT**

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35 **Introduction**

36 Spontaneous splenic rupture (SSR) is a dramatic abdominal emergency that
37 requires immediate diagnosis and prompt surgical intervention to ensure the survival.
38 The most common causes of SSR are infections, hematologic malignancies and
39 cystic disease of the spleen. Although the spleen is often involved in hematological
40 malignancies, splenic rupture is a rare condition.

41

42 **Case report**

43 We present two cases of non-traumatic splenic rupture secondary to B-cell
44 lymphoma infiltration.

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46 **Conclusion**

47 Emergency splenectomy is the basis for treatment of splenic rupture.

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49 **Keywords:** splenic rupture, splenectomy, lymphoma.

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65 INTRODUCTION

66 Spontaneous splenic rupture (SSR) is associated with high morbidity and mortality
67 rate in patients without trauma, resulting in atypical clinical features and delayed
68 onset of rarity. The complaints of the patients are located in a wide variety of venues
69 and rarely are confronted with the acute abdomen. Appropriate imaging methods
70 have an important place in the differential diagnosis of these cases.

71 SSR is rarely seen histologically in conditions that have proven to be sparse, and
72 spontaneous rupture is usually seen in a diseased spleen and is called "pathological
73 spontaneous rupture", while such cases are called "true spontaneous rupture" [1].

74 Diseases that commonly cause SSR are often hemato-oncologic diseases. In
75 addition, various clinical tables such as infectious diseases (infectious
76 mononucleosis and malaria), congenital splenic lesions, acute and chronic
77 pancreatitis, hamartoma, hemangioma, cyst, autoimmune diseases, hemolytic
78 anemia, pregnancy, amyloidosis and portal hypertension may cause SSR [2].

79 The frequency of SSR due to hematological diseases has been reported as 1% in
80 the literature. Primer splenic lymphoma is the first order of hematological causes of
81 spontaneous splenic rupture. In this article we wanted to present two patients who
82 had spontaneous splenic rupture due to primary splenic lymphoma following different
83 clinical manifestations.

84

85 CASE SERIES

86

87 CASE 1

88 A 77-year-old woman was admitted to our clinic with complaints of increased
89 consciousness and abdominal pain in the last 24 hours after the last 6 months of
90 weight gain, swelling in her stomach and increased complaints of loss of appetite.

91 She did not identify any complaints about defecation and urinary tract changes.

92 Lately, she did not describe any trauma or fall story. She was diagnosed with
93 hypertension and used amlodipine (10 mg) and nebivolol (5 mg) once a day. On

94 physical examination, the patient was pale, alert and tachypneous. Blood pressure

95 was 85/45 and heart rate was above 140 beats per minute. The patient had deep

96 palpitation pain in the left lower quadrant of the abdomen and spread to the left

97 shoulder. Electrocardiogram and chest x-ray was found normal. Biochemical tests
98 performed were normal except LDH (1520 U/L; Normal value: 95-195 U/L). In the
99 complete blood count; WBC: 14,2 (4.0 – 10.0 x 10³/mm) Hgb: 11 gr/dL (12.3 – 15.7
100 g/dL) and PLT: 110,000 (130 – 400x 10³/mm³) were detected. Peripheral blood
101 smear was performed for the bicytopenia, no schistosome or atypical cells. Coombs
102 tests were all negative.

103 It was observed that there was increase in volume in the spleen, heterogeneous
104 appearance and free fluid in the abdomen in the USG examination due to the patient
105 having abdominal pain and pain on the upper left side. Contrast-enhanced computed
106 tomography (CT) taken to clarify the diagnosis of the patient showed a solid mass
107 appearance in the spleen and concurrent rupture (Figure 1 and Figure 2).

108 Considering the SSR in the patient, emergency operation was performed after taking
109 her consent. During the operation, a mass of 6*8 cm and a laceration of 4 cm were
110 observed in the posterolateral part of the spleen. Splenectomy was applied to the
111 patient who had aspirated 1500 cc blood content from the abdomen.

112 Appropriate antimicrobial prophylactic vaccines (depot penicillin, acti-Hib®, Pneumo
113 23®) for prophylactic treatment were administered to the single-dose patient at 24
114 hours postoperatively. Severe sepsis and acute respiratory distress syndrome
115 (ARDS) developed in the postoperative period in our intensive care unit.

116 The patient died on the 7th day after the operation. Pathologic evaluation reported
117 that the primary spleen lymphoma is diffuse large B-cell lymphoma, filling the entire
118 spleen. Immunohistochemistry revealed that CD20, CD79a, MUM1, BCL6, FOXP1
119 and p53 (partially) were positive, while CD3, CD10 and BCL2 were negative. (Figure
120 1, Figure 2)

121

122 **CASE 2:**

123 A 66-year-old male patient was admitted to our outpatient clinic for the last 1 month
124 of fatigue, fever and nausea. During the last 15 days, he had fever and nausea rising
125 with trembling at intervals, and his appetite decreased. It was learned that the patient
126 had a left knee prosthesis connected to the accident that happened 10 years ago
127 and has been using metformin 1000 mg 2 * 1 for 4 years.

128 The physical examination of the patient showed exhaustion and pale appearance.
129 Blood pressure was: 125/70, pulse: 100 beats / min and fever as 38.6⁰C. There was
130 pain with deep palpation in the upper left abdomen. In the biochemical tests
131 performed, LDH 450 U / L (Normal value: 95-195 U/L), AST (155 IU/L; Normal value:
132 0-35 U/L) and ALT (144 IU/l; Normal value: 3–36 U/L) were found to be increased by
133 4 times.

134 Viral hepatitis markers were negative. In the full blood count WBC: 10,300 PLT:
135 195,000 and Hgb 11,2 gr/dL detected. There was no evidence of active infection in
136 the physical examination, laboratory and imaging studies on the patient having
137 recurrent fevers after admission. Patient peripheral blood cultures were obtained.
138 There was no positivity in these cultures. The abdomen USG was performed; spleen
139 dimensions were 19*10 cm and heterogeneous appearance in spleen.

140 The cause of the heterogeneous appearance of the spleen with recurrent fevers and
141 cardiac involvement with primary diagnosis of septic embolism of the spleen.
142 Transthoracic echocardiography (TTE) and transesophageal echocardiography
143 (TEE) were applied to the patient. There was no vegetation finding compatible with
144 endocarditis.

145 Contrast-enhanced abdominal CT was performed to exclude a possible infarct,
146 abscess, or bleeding in the spleen after a 24-hour Hgb decline of 2 gr / dL. Abdominal
147 CT revealed that the spleen capsule of the patient could not be clearly distinguished.
148 The appearance that could be compatible with hemorrhage was common (**Error!**
149 **Reference source not found.** and **Error! Reference source not found.**) SSR was
150 considered together with these findings in a patient who had no history of trauma to
151 the abdominal region.

152 Emergency splenectomy was performed with the consent of the patient. During the
153 operation, it was observed that the patient was ruptured on the spleen and
154 widespread bleeding was observed in the abdomen. It was stated that no pathology
155 was observed in other abdominal organs.

156 The vital signs of the patient improved after the operation and there was no
157 deterioration of blood values in the follow-up. A single dose of appropriate
158 antimicrobial prophylactic vaccines (depot penicillin, acti-Hib®, Pneumo 23®) was

159 administered to the patient at 12 hours. After the operation the patient was
160 discharged by healing on the 6th day.

161 The spleen material of the patient was evaluated as diffuse large B-cell lymphoma.
162 The patient was followed up by a hematology clinic. At the moment, follow-up to the
163 4th dose R-CHOP chemotherapy protocol is continued without progression. (Figure
164 3, Figure 4)

165

166 **DISCUSSION**

167 Spontaneous spleen rupture (SSR) is a very rare cause of acute abdomen that leads
168 to serious clinical consequences [3, 4]. It often occurs as a congestion that develops
169 after the infective and hematological infiltration of the spleen. It is rarely seen in
170 patients with anticoagulant therapy or bleeding disorders [5]. The frequency of
171 spontaneous splenic rupture is not clearly known. There are few cases in the
172 literature with the case report. The vast majority of these patients have benign and
173 infectious disorders. Other causes include hematologic malignancies and other rare
174 diseases [6, 7].

175 SSR is a life-threatening complication that requires early diagnosis and treatment.
176 The incidence is not known precisely because it is a rare clinical condition. The
177 spleen is one of the first organs in hematological malignancies, with the reason that it
178 is an important organ of the immune system [6].

179 Older age, male sex, and splenomegaly are the most common causes of spleen
180 rupture. Especially splenomegaly is accused as the main factor causing rupture. It is
181 noteworthy that our patients have rupture without serious splenomegaly. Coagulation
182 disturbances due to lymphoblastic infiltration, spleen infarction, coagulation disorders
183 causing intrasplenic and/or subcapsular haemorrhage, thrombocytopenia are the
184 most frequently blamed factors in the etiopathogenesis of hematologic causes of
185 SDR [8].

186 The rate of development of splenomegaly also increases the risk of rupture with a
187 sudden increase in capsule distention. Early diagnosis of pathological spleen rupture
188 is a very important factor in determining the prognosis of the patient. On the basis of
189 the physical examination, the history is structured to be recognized by imaging
190 methods such as USG and CT, after an initial suspicion of this diagnosis, helps to

191 reach early diagnosis [9]. Sudden onset of stomach, left upper quadrant and left
192 shoulder pain (Kehr sign) without trauma are the most common clinical complaints.
193 The fact that one of our patients has complaints of fever and fatigue for the last one
194 month is important in that we anticipate that SSR can come with quite different
195 clinical entities. Proper treatment with high mortality rates should be planned as soon
196 as a spleen rupture is detected.

197 Although rare cases with conservative treatment according to the clinical status of
198 the patient are reported, early consideration of surgical intervention should be
199 considered as a rational approach considering the benefit / loss ratio [10]. In
200 addition, the most important point that should not be missed in postoperative period
201 is to provide appropriate prophylaxis against infections that may develop after
202 splenectomy [11]. It is recommended that the prophylactic agents (depot penicillin,
203 encapsulated bacterial vaccines) be administered within 72 hours after surgery.

204 SSR is the first symptom of a hematologic malignancy and can be confronted as a
205 life-threatening complication. If SSR is considered as a possible diagnosis in
206 appropriate clinical conditions, we recommend early diagnosis and as soon as
207 possible splenectomy, as well as pathological evaluation, promptly.

208

209 **CONFLICT OF INTEREST**

210 There is no conflict of interest.

211

212 **AUTHOR'S CONTRIBUTIONS**

213 S.G., D. T., E.T. studied on patient's diagnosis. S.E investigated pathologic survey of
214 splenectomy materials. All authors contributed equally to this work and all authors
215 contributed extensively to the work presented in this paper. Thank Professor Akar H.
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251 **FIGURE LEGENDS**

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253 Figure 1: The spleen is normally large and heterogeneity in the parenchyma is
254 evident. Subcapsular field compatible with hematoma and solid mass (yellow arrows)

255

256 Figure 2: It is noted that the subcapsular hematoma in the vicinity of the paracolic
257 loja extends (yellow arrow) and pelvic free fluid (red arrows)

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259 Figure 3: The spleen is normally seen as large and heterogeneous (blue arrow) and
260 pleural cannulae reaching 1.5 cm in the left hemithorax and in the vicinity of the
261 atelectasis in the vicinity (yellow arrows).

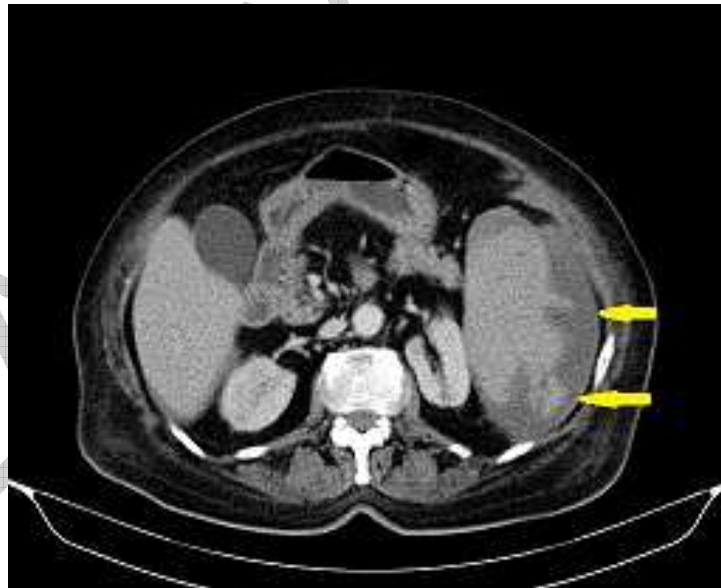
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263 Figure 4: Splenic ven is present in the tortuous as far as possible and there is
264 hypodense area near the upper left pole in the parenchyma (green ring).
265 Subcapsular hematoma is remarkable (red arrow).

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267 FIGURES

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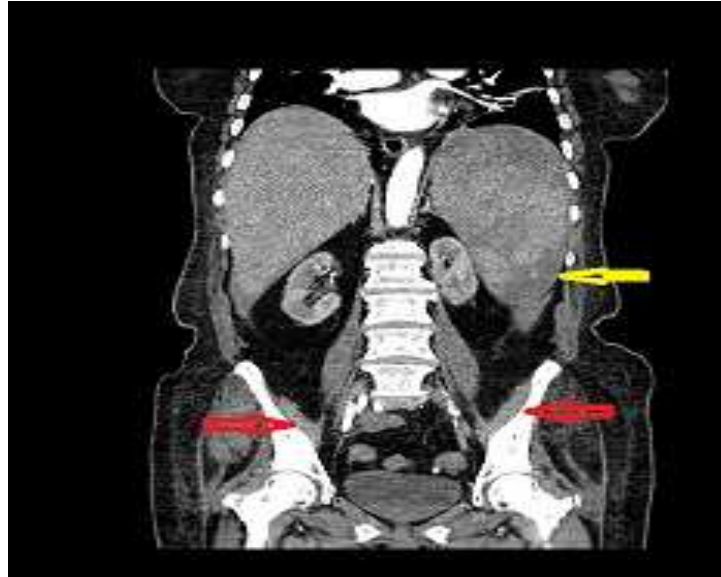
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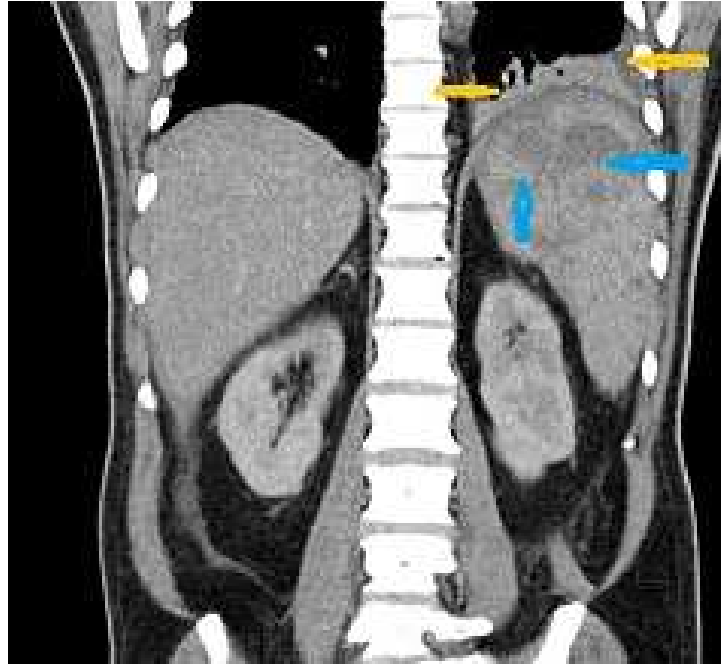
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299 pleural cannulae reaching 1.5 cm in the left hemithorax and in the vicinity of the
300 atelectasis in the vicinity (yellow arrows).

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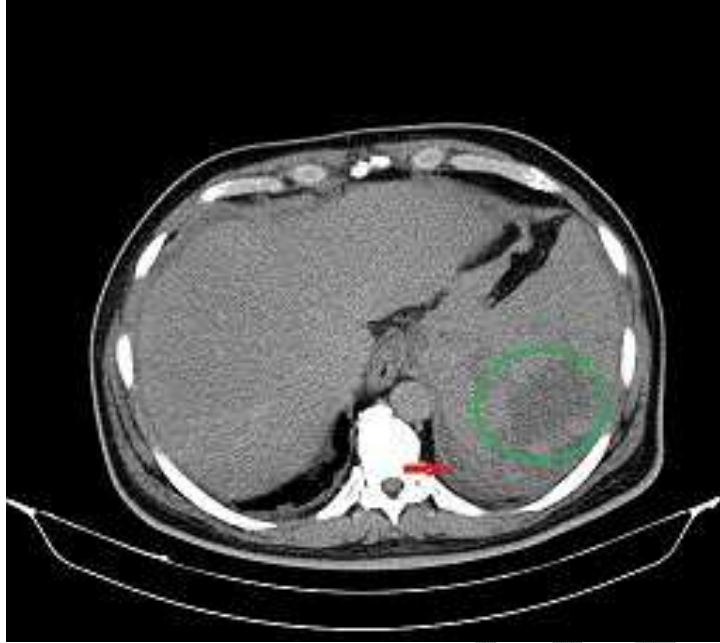
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318 Figure 4: Splenic vein is present in the tortuous as far as possible and there is
319 hypodense area near the upper left pole in the parenchyma (green ring).

320 Subcapsular hematoma is remarkable (red arrow).