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1 **Title Page**

2 **Type of the article:** Case Report

3 **Title of the article:** An unusual presentation of perforated appendix mimicking a liver
4 abscess in an Aboriginal male

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15 Springs with an unusual presentation of perforated appendix mimicking a liver abscess.

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20

1 **Abstract**

2

3 *Introduction*

4

5 A perforated appendix presents as an atypical right-sided subphrenic, subcapsular hypodense
6 collection on the computed tomography (CT) scan, mimicking a subcapsular liver abscess.

7

8 *Case*

9

10 A 26-year-old Aboriginal male presented to Alice Springs Hospital with a one-month history
11 of right-sided abdominal pain, as well as weight loss of 16 kg following treatment with three
12 courses of antibiotics for a suspected sexually transmitted infection. Radiological findings on
13 CT revealed a mild right pleural effusion with right lower lobe partial atelectasis and a right-
14 sided subphrenic, subcapsular hypodense collection with an air-fluid level in the right lobe of
15 the liver. A diagnostic laparoscopy showed a suspected perforated appendix, which was later
16 managed by laparoscopic drainage. This was followed by an open interval appendicectomy
17 with abscess drainage. After one further ultrasound-guided drainage and a 6-week course of
18 antibiotics, he was discharged and had a good recovery.

19

20 *Discussion*

21

22 This case report aims to highlight the importance of a high grade of clinical suspicion for
23 atypical presentations of perforated appendix, as well as the role of exploratory laparoscopy
24 in managing uncertain diagnoses.

25

26 *Learning points*

27

- 28 1. Atypical presentations of a perforated appendix
- 29 2. Differential diagnosis of a subphrenic abscess
- 30 3. Challenges for the Aboriginal population predisposing to delayed treatment

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1 Introduction

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3 Perforated appendices, one of the complications of acute appendicitis, may present atypically,
4 leading to misdiagnosis and delayed treatment. Furthermore, findings of radiological
5 modalities, such as with computerised tomography (CT), do not always point to the diagnosis
6 of the abscess. In this case, we report an Aboriginal patient in Northern Territory with a
7 perforated appendix presenting with an atypical right-sided subphrenic, subcapsular
8 hypodense collection on the CT scan, initially imitating a subcapsular liver abscess. Northern
9 Territory has an estimated population of 245,562 persons, where 30% of the population is
10 Aboriginal [1]. The patient lived in a small community of 199 people in Mount Liebig,
11 locally known as Watiyawanu, a region 325 km west of Alice Springs [2]. In view of the
12 limited local medical facilities, he was transferred to Alice Springs hospital by the Royal
13 Flying Doctor Service. A subcapsular liver abscess was diagnosed on an abdominal CT scan
14 and managed by laparoscopic imaging and drainage due to the unavailability of an
15 interventional radiologist at the time. He needed two further interventions by way of an open
16 appendicectomy with abscess drainage and radiological drainage before being discharged.
17

18 Case

19
20 A 26-year-old Aboriginal male presented to Alice Springs Hospital with a one-month history
21 of right-sided abdominal pain and weight loss of 16 kg. These symptoms occurred following
22 treatment with three courses of antibiotics for a suspected sexually transmitted disease in a
23 community outreach clinic in outback Central Australia. This provisional diagnosis was made
24 given the ongoing abdominal pain and limited investigations available at the outreach health
25 centre. Following treatment, he had unresolved pain, new coughing, and intermittent
26 vomiting. He reported no other significant relevant background medical or surgical history.
27 His vital signs on admission were within normal range. On examination, there was a dull
28 percussion note at the right lung base with decreased air entry. His abdomen was firm, with
29 slight distension and tenderness over the right upper quadrant region and audible bowel
30 sounds.
31

32 **Table 1. Laboratory investigations upon admission to Alice Springs Hospital.**

Test Result	Reference Range	Indication
Sodium: 123 mmol/L	135-145 mmol/L	Low
White cell count: 18.9 x 10 ⁹ /L	4.0-11.0 x 10 ⁹ /L	High
Bilirubin: 22 umol/L	< 21 umol/L	High
Alkaline phosphatase: 155 U/L	30-110 U/L	High
Gamma-glutamyl transpeptidase: 117 U/L	< 61 U/L	High
Albumin: 32 g/L	39-50 g/L	Low
Plasma lipase: 485 U/L	23-300 U/L	High

33
34 A CT scan of the abdomen with contrast was carried out, showing the presence of a mild
35 right pleural effusion with right lower lobe partial atelectasis. It also showed a right-sided
36 subphrenic, subcapsular hypodense lesion with an air-fluid level in the right lobe of the liver,
37 as shown in Figures 1 and 2. Other than the subcapsular collection (132.7 x 38.7 x 141.3mm),
38 no evidence of hepatobiliary abnormalities, appendicitis, or peri-appendiceal abscess was
39 reported. Due to the unknown origin and unavailability of interventional drainage during this
40 time, a diagnostic laparoscopy was performed, revealing that the collection had most likely
41 resulted from a suspected perforated appendix. The patient was managed with laparoscopic

1 drainage of the abscess, washout and placement of drain (Figure 3). Further dissection
2 inferiorly towards the caecum was not performed to avoid inadvertent iatrogenic bowel
3 perforation.

4
5 Following index laparoscopic drainage, the patient was managed with intravenous antibiotics
6 and drain removal on the fourth post-operative day with minimal output. He declined further
7 medical advice upon drain removal, choosing to take own leave, a culturally respectful
8 practice by Aboriginal Australians to return to their community. He represented almost one
9 month later with fevers and recollection of the abscess on repeat CT. Following this, an open
10 interval appendicectomy with abscess drainage was performed via midline laparotomy. A
11 remnant appendix was found in the right iliac fossa with the caecum intact and no obvious
12 site of perforation. Post-operatively, he required one further ultrasound-guided drainage of an
13 abscess with interventional radiology and a further six-week treatment of intravenous
14 antibiotics under the guidance of the infectious disease team. During his inpatient stay he
15 required regular drain flushes and aspirates into the abscess cavity. The drain was eventually
16 removed in an outpatient setting, once there were minimal aspirates and no further collections
17 on repeat ultrasound imaging. He has since been discharged home and has made a good
18 recovery.

19 20 **Discussion**

21
22 Common aetiologies of a subphrenic abscess include amoebic liver abscess, empyema,
23 pylephlebitis, pulmonary collapse, and perforated appendix [3]. A perforated appendix is a
24 potentially fatal complication of appendicitis. If left untreated, it can result in peritonitis,
25 abscess or phlegmon formation and, in some cases, septicaemia [4]. Urgent surgical
26 intervention is often required and is associated with a higher effective rate and lower relapse
27 rate compared to conservative treatment with antibiotics [5]. Given its variable and
28 sometimes atypical clinical presentations, misdiagnosis is not uncommon and occurs in up to
29 30% of cases [6]. Common misdiagnosed conditions mimicking appendicitis include;
30 Crohn's disease, urolithiasis, pyelonephritis, ovarian torsion, pelvic inflammatory disease,
31 and ectopic pregnancy [7]. Known risk factors of appendiceal perforation include male sex,
32 advanced age, lower literacy, longer pre-admission period, history of abdominal surgery,
33 immunosuppression, and the presence of atypical presentations (for example, diarrhoea and
34 pain in the epigastric region or right lower quadrant of a longer duration) [6,8]. In this case,
35 the patient was considered at high risk of developing perforation according to the matched
36 risk factors.

37
38 This case is deemed unusual for a perforated appendix due to its atypical presentation, the
39 absence of distinctive radiological signs of appendiceal inflammation, and the uncommon
40 location of the collection mimicking a liver abscess. While the migration of pain from the
41 periumbilical region to the right iliac fossa presents only in 50% of cases, common signs and
42 symptoms such as abdominal pain and anorexia present in almost all cases [9]. Other signs,
43 including the psoas sign, rebound tenderness, and low-grade fever are less common [9]. This
44 explains why atypical presentations can occur in up to 34% of appendicitis cases [10].
45 Further, appendicitis at the subhepatic region accounts for only 0.08% of all appendicitis
46 cases [11]. Nanjaraj *et al.* reported a similar case where a 19-year-old female with a
47 perforated subhepatic appendix which was first identified by the presence of a peripherally
48 enhancing subcapsular collection via a CT scan of the abdomen [11]. Similarly, a 45-year-old
49 male with perforated retrocecal appendix reported by Nizamani *et al.* was also shown to have
50 three subcapsular subhepatic abscesses with peripherally enhancing and centrally non-

1 enhancing necrosis on a CT scan [12]. The appendiceal origin of the collection in both cases
2 was confirmed by laparoscopy. Also noteworthy is the presence of pleural effusion in this
3 case. A similar one was also reported by Ku *et al.* regarding a 14-year-old male who
4 developed a pleural effusion as a rare complication of ruptured appendicitis [13].

5
6 While there remains no consensus on the definitive treatment for complicated appendicitis
7 with abscess, it is primarily categorised into surgical interventions, with either immediate or
8 interval appendicectomy, or non-surgical intervention with antibiotics followed by
9 percutaneous drainage. A systematic review by Darwazeh *et al.* of 21 studies including a total
10 of 1943 patients concludes that nonsurgical treatment is associated with 12.4% higher risks of
11 recurrence, 2.9% of higher morbidity and 4.6 days longer hospital stays than an interval
12 appendicectomy [14]. In contrast, another study by Guida *et al.* reviewed the cases of six
13 ruptured appendixes with abscesses and supports the management of initial antibiotic therapy
14 followed by interval appendicectomy. This approach is typically reserved for generally well
15 patients with contained perforation, due to a lower chance of developing postoperative
16 abdominal abscess, organ damage, and complicated wound infections [15].

17
18 Lastly, this case provides some insights into the obstacles Aboriginal Australians encounter
19 which contribute to delayed treatments and unfavourable prognoses. Firstly, Aboriginal
20 Australians may have their own set of cultural beliefs, faiths, and values [16], and may be
21 more reluctant to seek medical attention from mainstream healthcare services [16]. Secondly,
22 within the Northern Territory, there are more than 100 dialects spoken by Aboriginal people
23 and only 2.1% speak only English at home [16]. With interpreters sometimes difficult to
24 obtain, communication barriers between Aboriginal Australians and healthcare workers
25 impose a hardship on trust building, further hampering access to the healthcare system. In this
26 case, the patient's limited proficiency in English may have contributed to his delayed
27 presentation and suboptimal post-operative care. Lastly, due to poorer access to education in
28 Aboriginal communities and poorer health literacy [16], compliance issues are not
29 uncommon and may affect a patient's prognosis. All these factors may have played a role in
30 this case.

31
32 This case highlights the importance of having a high grade of clinical suspicion for atypical
33 presentations of perforated appendix and how diagnostic laparoscopy plays a role in guiding
34 the management of an uncertain diagnosis.

35 36 **Consent Declaration**

37 Informed consent was obtained from the patient for publication of this case report and
38 accompanying figures.

39 **Conflicts of Interest**

40 None declared.

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Authors Contribution

Justin Ng and Martha Hui are the shared primary authors. Dr Shaveen Kanakarathne and Dr Jayantha Senarathne guided and supervised the work.

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