



Case Report

Adult omental alveolar rhabdomyosarcoma: An unusual site. A case report and literature review



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ARTICLE INFO

Keywords:

Alveolar
Rhabdomyosarcoma
Omentum
Case report
Review of literature
Laparotomy
Adults

ABSTRACT

Introduction and importance: Omental alveolar rhabdomyosarcoma (ARMS) in adults is a rare tumor and is not a common presentation of abdominal pain. We aim to report the eighth case of omental ARMS and perform a review of all publications that pertains to this topic.

Case presentation: we show a case of a Mediterranean 52 year old smoker male, complaining of unbearable dull pain in the right iliac fossa. He had no relevant medical history other than general abdominal pain in the past several months.

Clinical Discussion: the chief complaint was abdominal pain mimicking appendicitis. Physical examination showed a palpable mass in that region. Ultrasound and CT scan revealed a mass arising from the omentum. At this point we excluded the diagnosis of appendicitis and a laparotomy with biopsies sampling had been performed. The microscopical examination led to the diagnosis of alveolar rhabdomyosarcoma (ARMS). Treatment involved multidisciplinary care but the patient died during chemotherapy.

Conclusion: Adult rhabdomyosarcomas (RMS) are rare tumors that can arise from any soft tissue including omentum and should be taken into consideration when dealing with primary tumors that originate from the omental area. The studies and our understanding for this neoplasm are still very limited and should be expanded widely.

1. Background

Rhabdomyosarcoma (RMS) is the number one soft tissue sarcoma in children. It is divided depending on histological appearance into alveolar, embryonic, pleomorphic and spindle cell subtypes. However, it does not exceed 1% of all adult tumors. The tumor can originate from any soft tissue, mostly from the deep extremities and paraspinal region. The omental origin in adults was only mentioned in seven cases before; six of them were alveolar and the recent one, the pleomorphic case.

Alveolar Rhabdomyosarcoma (ARMS) accounts for 20% of the cases. But, it has the worst prognosis [5]. Until today, this topic is still poorly discussed as all of the previous reviews discussed RMS as one entity with no deep study into its properties and treatment options of each one of the individual subtypes.

Here we report a case of omental ARMS in a 52 year old male who presented with symptoms similar to appendicitis. We followed the guidelines and criteria of the SCARE 2020 checklist [22], we also conducted a review of literature on the topic of omental alveolar rhabdomyosarcoma in adults.

2. Case Presentation

A 52 year old Mediterranean male with no significant medical or surgical history other than being a heavy smoker presented to our department with general abdominal pain for several months which had become more dull and localised in the right iliac fossa in the last two days. The pain was accompanied by constipation. He had lost approximately 20 kg in the last couple of months although his appetite was

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<https://doi.org/10.1016/j.amsu.2022.104464>

Received 10 July 2022; Received in revised form 14 August 2022; Accepted 14 August 2022

Available online 18 August 2022

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normal.

The patient seemed uncomfortable; his abdomen was tender and hard on palpation. Appendicitis was suspected as the main differential diagnosis. On physical examination the patient had a palpable nodular mass in the right iliac fossa and a single palpable axillary lymph node.

Abdominal ultrasonography (US) showed a 12.2cmx3.6cm mass with cecal distention and grade I hydronephrosis in the right kidney. A non-contrast CT abdominal scan showed a small mass that measures 7cm × 4cm × 3cm (Fig. 1), arising from the abdominal wall and adhering to the cecum. A colonoscopy showed external compression and a massive ringed ulcer on the cecal area. Biopsies had been taken and were negative for colorectal cancer.

The patient underwent a laparotomy. On exploration, a small mass was found in the right lower quadrant arising from the omentum and adhering to the anterior abdominal wall. No metastasis or suspected lymph node was seen. An excisional biopsy 9cmx6cm was obtained from the colonic omentum. The biopsy appeared yellow, soft, rubbery in consistency and attached to many encapsulated nodules. Microscopically, the mass had a fibrous septa, circling neoplastic small blue round cells forming alveolar nests. The cells lack a discriminant cytoplasm and have a high mitotic rate. In the lumen of the alveoli, there were clusters and individual neoplastic cells.

Immunohistology was negative for CD3, CD19, CD20, LCA, CK, CHROMOGRANIN, SYNAPTOPHYSIN, CD99, DOG1, MYOD1 but was positive for DESMIN (Fig. 2).

Based on the results of the immunostaining and the histological picture, alveolar rhabdomyosarcoma was diagnosed.

A bone scan (Fig. 3) showed multiple focal areas of increasing tracer uptake around the orbit, multiple ribs bilaterally, vertebrae, inferior angle of left scapula, and manubrium sterni. Thus, the tumor was classified as stage 4 or group IV according to the Intergroup Rhabdomyosarcoma Study.

The patient did well after surgery. The pain was gone and the constipation subsided. He was discharged after scheduling chemotherapy

sessions and ordering a full body CT to identify if there were any metastases to other organs. However, it was delayed due to the war's circumstances.

When the patient was readmitted two months later, he had developed neurological symptoms including lethargy and anterograde amnesia. Lumbar puncture (LP) showed the presence of neoplastic cells in cerebrospinal fluid (CSF). Chest, abdomen and brain CT did not show metastases to any organs other than the bones. Firstly, the patient was put on palliative radiotherapy for the hip area (multi-fraction regimen 5 × 4 Gy on linear accelerator) for 5 consecutive days to control his pain that was caused by the metastasis and to prevent any fractions. Then, the radiotherapy was succeeded by an imperfect chemotherapy regimen; consisting of vincristine 1.7mg with cyclophosphamide 1200mg/m² and doxorubicine 80mg, followed by a second cycle after 21 days. Actinomycin D was not given because it was not available. After the first dose of the chemotherapy, the patient's neurological symptoms faded away and the pain was reduced. Sadly, the patient died two weeks after the second chemotherapy cycle. Causality is still unknown.

3. Discussion

Soft tissue sarcomas (STSs) are an unusual finding, mainly affecting the pediatric population [1]. Rhabdomyosarcomas account for over half of them [2]. This percentage drops significantly in adults where it doesn't exceed 2–5% [3].

Rhabdomyosarcoma is believed to originate from any immature mesenchymal cells, regardless of what it was going to become (a muscle, cartilage, bone, etc ...) [2].

Its pathogenesis is still poorly understood. Mutations in macrophage inhibitory factor (MIF) and p53 are responsible for tumor progression [1]. Compared to pediatric RMS, which has clear risk factors such as prenatal drug exposure and radiation exposure, there are not any published studies regarding the aetiology of RMS in adults [4].

Stout et al., in 1946 were the first to classify Rhabdomyosarcoma

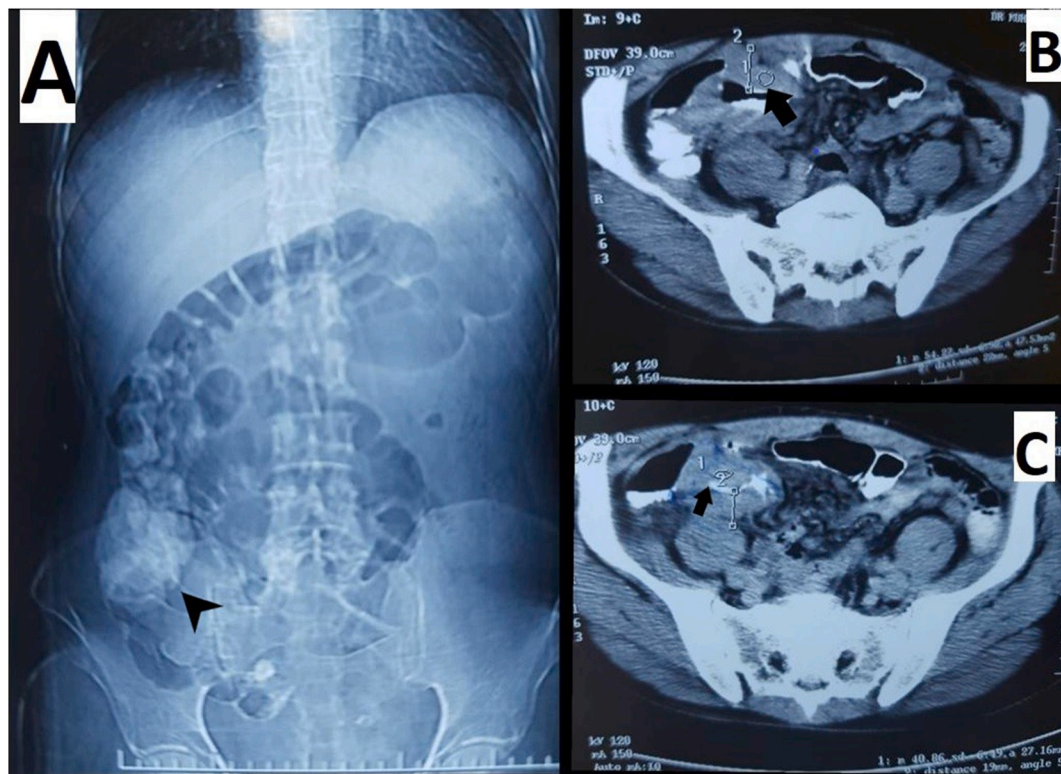


Fig. 1. A non-contrast MSCT of the abdomen (A) coronal view showing a well-defined irregular mass in the left lower quadrant (A head arrow). (B),(C) show a homogeneous mass with clear boundaries emerging at the expense of the abdominal wall and adhering to cecum (black arrows).

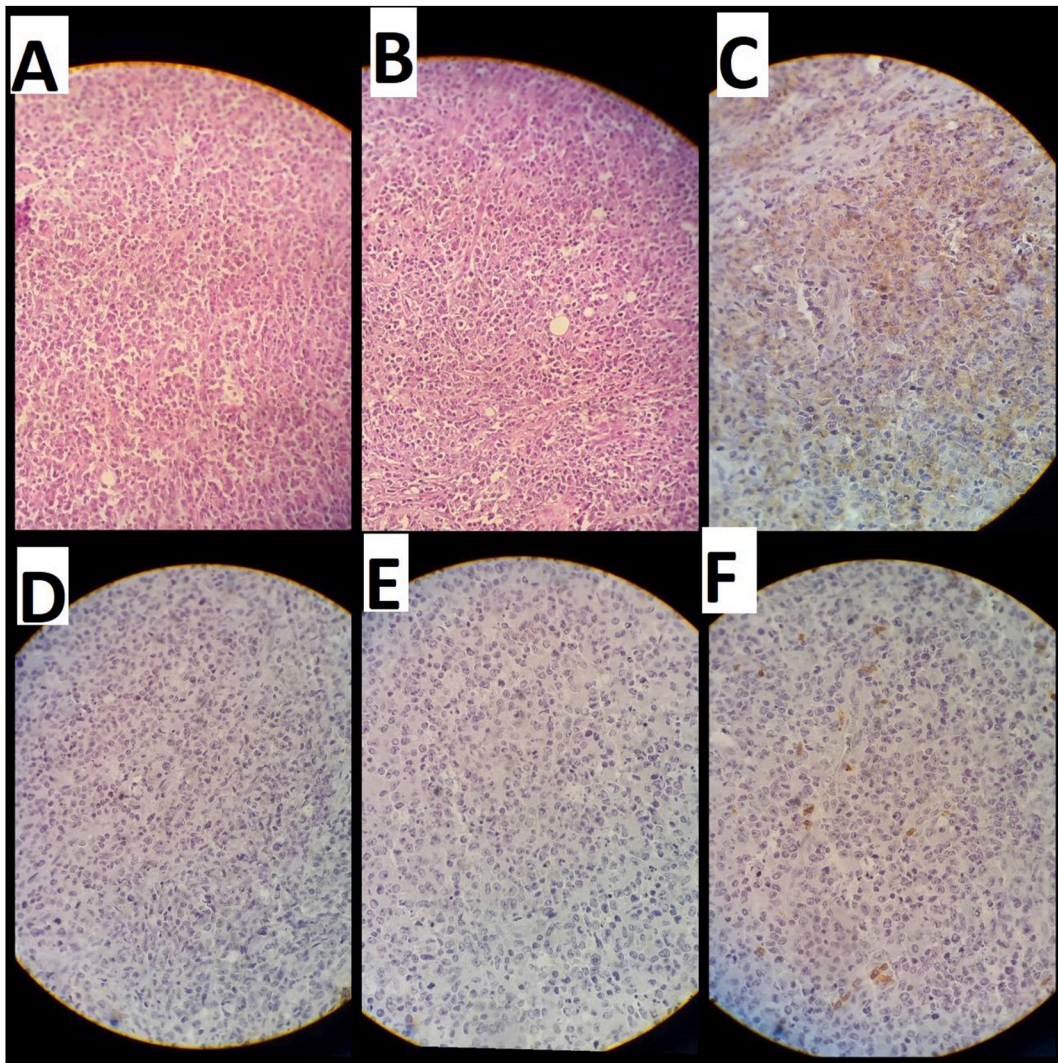


Fig. 2. (A) and (B) H&E stain of the mass: The figure exhibits fibrous septa enclosing alveolar nests of neoplastic small blue round cells. Neoplastic cells can be seen in the lumen nests. (C) Desmin immunostaining showing positivity. (D), (E), (F) Immunostaining for ck, MYOD1 and CD99 ordinarily showing negativity. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

tumors [6]. However, in 1956 Horn et al. proposed the widely-used classification which comprises the embryonal, botryoid (a subtype of embryonal), alveolar (20% of cases and the worst prognosis [5]) and pleomorphic types [2]. WHO classifies this tumor into embryonal, alveolar, pleomorphic, and spindle cell/sclerosing RMS [1]. The first well described ARMS case was reported by Riopelle et al., in 1956 [7].

Alveolar RMS constitutes for 20%–30% of RMS in patients, whose ages are 15–20 years old [8]. It mostly arises from the deep soft tissue of the extremities, paraspinal, perineal regions and the paranasal sinuses [8].

Omental rhabdomyosarcoma in adults is a rare tumor. Also, the omentum is very rare as a primary site [9]. All previous cases were alveolar [10]. Here we perform a literature review of alveolar rhabdomyosarcoma of omentum. We have excluded two cases as they were not published in English.

Consequently, six cases were studied before our case which is the seventh. Five of the seven cases were males. Ages ranged between 21 and 85 years old [Table 1].

Symptoms of omental tumors including ARMS are nonspecific and mass related. This was reported by all of the seven cases including this study. The most common findings were: abdominal discomfort (45.5%), abdominal mass (34.9%), and abdominal distention (15.2%) [9]. Other symptoms depending on our review were constipation (42.8%) followed

by nausea and vomiting (28.5%), weight loss (28.5%) and pyrexia was a reported complaint in one case [11]. The primary site of the mass was unique in each case.

Ultrasonography (US) is usually the first performed investigation for abdominal complaints [12]. The tumor is reported as a well-defined mass with mixed echogenicity in most of the studies reviewed including ours. MRI is the gold standard for RMS in the abdominal region [13]. The mass appears hyperintense on T2, hypointense on T1 with heterogeneous enhancement [13].

Computed Tomography (CT) was widely used in most reviewed cases [1]. RMS was described as a large, well defined and solid mass [1]. Although no clear pattern of enhancement was found in the literature, one case mentioned mild enhancement [2].

PET scan defines the success of treatment by detecting residual tumor, local recurrence and metastatic spread [1].

Metastatic cells most commonly affect the lungs [1], but can also spread to the bone - as in our case - subcutaneous tissues, lymph nodes, liver, myocardium, kidney, adrenal glands, and the brain [14].

Definitive diagnosis cannot be made on the basis of imaging studies as it has no pathognomonic signs thus diagnosis is made on the light microscopy and immunostaining results [9]. The differential diagnoses encompass blue small round cell tumors: Ewing Sarcoma or primitive neuroectodermal tumor, Non-Hodgkin lymphoma (particularly B-cell



Fig. 3. Bone scan with ^{99m}Tc -MDP (A) Anterior view (B) posterior view. Showing increased tracer uptake around the orbit, multiple ribs bilaterally, Vertebrae, inferior angle of left scapula, manubrium sterni with secondary neoplastic skeletal changes (metastasis).

lymphomas), neuroblastoma, desmoplastic small round cell tumor, epithelioid sarcoma, poorly differentiated monophasic synovial sarcoma, clear cell sarcoma (previously known as malignant melanoma) [15].

The gross appearance of ARMS is similar to all rhabdomyosarcomas. It appears as well-circumscribed nodular firm masses ranging in consistency and size [2]. Cystic degeneration and areas of necrosis were reported in many studies [9,11,14]. V Sennu et al. had reported an increased vascularity within the tumor [11]. Histologically, the tumor appears as an irregular alveolar space made of sheets of predominantly small round cells with abundant eosinophilic cytoplasm, small oval nuclei and prominent nucleoli separated by a fibrous septa [16]. Mitotic figures and spindle cell myoblasts can also be seen.

Cross-striations, which are the standard for RMS diagnosis, can only be seen in 50–60% of cases [2]. However, we could not see this in our case. Furthermore; among the six cases in the literature regarding the alveolar type, only Sanjay Kumar Yadav et al. mentioned it [2]. On electron microscopy, Z-bands could be identified. Immunohistochemistry reveals positivity for desmin, Myogenin, MYOD-1, and Vimentin. Monoclonal antibodies against desmin, muscle specific actin, sarcomeric actin and myoglobin have a high specificity and sensitivity to diagnosing the myogenic nature of the tumor [2].

Treatment of RMS should be multidisciplinary according to the Intergroup Rhabdomyosarcoma Study (IRSG) [17]. Complete resection is essential and further excision is indicated if microscopic extensions are found [2]. The approach of RMS in adults is generally similar to that in children [21]. Concerning chemotherapy, all patients must receive combination therapy of Vincristine, Actinomycin-d, Cyclophosphamide,

Etoposide or Ifosfamide and Irinotecan to attain long term control of the tumor [2]. Chemotherapy also improves survival and should be administered right after diagnosis or after resection to prevent any metastasis [2]. Nonetheless, Hawkins et al. recommended against this as they had not seen any increase in survival rate in the adult population [19]. Finally, radiotherapy which has been used widely for the treatment of RMSs in infants has a significant role in treating residual disease. Doses between 36 and 54 Gy are usually utilized [9].

A follow up should be scheduled every 3 months in the first year, then every 6 months for the next two years and then once every year [9].

Prognostic factors for RMS in adults (regardless of the subtypes as they were insignificant prognostically) include: age, tumor size, extent of disease, and margin status [18]. On the other hand, in the study published by Esnaola et al. in the same year, indicated the absence of association between these factors and survival rate in patients who underwent multimodality treatment [19]. Mostly, adults had significantly worse outcomes than children (5-year overall survival rates: $27\% \pm 1.4\%$ and $61\% \pm 1.4\%$, respectively; $P < .0001$) [20]. In our review, 3 out of 7 patients died shortly after presentation, including the one in our case. Poor response to chemotherapy is a predictor of unfavourable outcomes [19].

4. Conclusion

ARMS is still a controversial topic due to its rarity from one side and the lack of clinical attention surrounding it. Moreover, omental neoplasms should be taken into consideration in all acute abdominal complaints regardless of site or origin.

5. Limitations

1. MRI or full body CT could not be performed as the patient died before his scheduled scan dates.
2. We could not obtain images from the laparoscopy nor the previous endoscopy. Why? Need to give a reason
3. Further immunostaining examinations could not be conducted due to shortage of these resources.
4. FDG-PET-CT is a much better tool for initial staging and response evaluation but we could not perform this because the patient died.
5. In our review we excluded two cases: "Alveolar rhabdomyosarcoma originating from the greater omentum" by H Svanholm and "Alveolar Rhabdomyosarcoma: apropos of a rare location" by Petit ML et al. due to the search criteria being limited by studies published in English only.
6. We could not determine the direct cause of death.

Abbreviations

ARMS: alveolar rhabdomyosarcoma; STS: soft tissue sarcoma; US: ultrasonography; CT: computed tomography, MRI: magnetic resonance imaging, LP: lumbar puncture; CSF: cerebrospinal fluid; Gy: gray is the international system of units (SI) equivalent of 100 rad.

Ethics approval

Ethical approval from Aleppo University Hospital had been obtained.

Sources of funding

There were no external sources of funding.

Author contribution

MSSH, ABK made major contributions to manuscript writing. MSSH is also the correspondent. ACH diagnose d the case and performed a critical revision of the manuscript. MN and AM helped with the

Table 1
Overview of all published studies of omental alveolar rhabdomyosarcoma.

Case Number	Author/Date	Topic	Patient's Age	Patient's Sex	Symptom	Primary Location in the abdomen	Size of tumor
Case 1	V SEENU, M C MISRA et al. 1995	Omental Rhabdomyosarcoma Presenting with Pyrexia	45	Male	Pyrexia, night Sweats, no chills or rigor, no localizing Symptoms and a palpable lump in the lumbar region	behind the urinary bladder	10 cm × 8 cm
Case 2	Samer H. Dbouk, Hussein Mcheimeche et al. 2020	A Very Aggressive Case of Adult Omental Rhabdomyosarcoma: Case report and Literature Review	54	Female	Acute right upper quadrant abdominal pain, Nausea, postprandial vomiting, constipation and increasing abdominal girth	mid-lower abdomen	12cm × 9 cm
Case 3	Priyank Pathak , Mayank Nautiyal et al. 2015	Omental rhabdomyosarcoma (primary rhabdoid tumor of greater omentum): a rare case report	21	Male	Dull abdominal pain with palpable lump in the hypochondriac region extending up to the epigastric	left hypochondrium	9.8 cm × 7.4 cm
Case 4	L. C. J. van Rensburg 1980	ALVEOLAR RHABDOMYOSARCOMA OF THE GREATER OMENTUM: A CASE REPORT	84	Female	anorexia, loss of weight, lassitude, constipation, constant pain in the epigastrium, and a palpable movable mass above the umbilicus	Epigastric region	Two masses one is 8.0 cm in diameter in the omentum. The second mass is 2.0 cm in diameter present on the lesser curve of the stomach
Case 5	Sanjay Kumar Yadav & Dipendra Kumar Sinha et al. 2015	Primary Intra-Abdominal Rhabdomyosarcoma in an Adult: an Unusual Presentation and Review of Literature	65	Male	Vomiting, abdominal distention and total constipation	Subhepatic region and extending upto the right iliac fossa	23 × 20 × 15 cm
Case 6	ARTHUR PURDY STOUT, J. HENDRY et al. 1963	PRIMARY SOLID TUMORS OF THE GREAT OMENTUM Case NO.23	53	Male	Left upper quadrant and left lumbar pain with occasional radiation towards the chest	left upper quadrant	Not mentioned
Case 7	Our Study	Adult Peritoneal Alveolar Rhabdomyosarcoma: an unusual site. A case report and literature review.	52	Male	generalized abdominal pain, bowel habit changes and weight loss	Right iliac fossa	7*4*3 cm

Case number	Laboratories	Radiology	Histology	Treatment	Prognosis
Case 1	Not mentioned	U.S. well defined mass with mixed echogenicity CECT. well defined mass with solid and cystic areas with moderate enhancement and necrotic areas	Globular, well defined, smooth, nontender mass extreme vascularity, friability, and gelatinous and cystic degeneration Mitotic figures were common and ranged from 5 to 30/10 HPF	Complete resection with doxorubicin as adjuvant chemotherapy	No symptoms after 38 months follow-up
Case 2	Leukocytosis with neutrophilia. C.E.A, CA19-9, AFP, CA 125 were within normal range	U.S. acute calculus cholecystitis CT revealed a mass located at the level of left mid-lower abdomen	Gross appearance: large, hard and nodular Mass. Immunohistochemistry revealed strong staining for Desmin, Myogenin, CD34 and MYOD-1	Chemotherapy on VAC-IE regimen	Died on the tenth day of chemotherapy
Case 3	Normal values	UUSonography guided FNAC from the left hypochondriac region showed deposits of adenocarcinoma. CT revealed a large well defined mass lesion in the left hypochondrium, causing displacement of the bowel loops	On cross section examination, cut surface was homogenous grayish white, areas of hemorrhage and necrosis. poorly differentiated malignant round cell tumor with metastasis in regional lymph nodes and perinodal extension. . On microscopy, tumor cells have round to mildly pleomorphic nuclei, with coarse chromatin and indistinct cell borders. Immunohistochemistry revealed strong staining for Vimentin, EMA, and desmin	Complete excision via omentectomy. chemotherapy (4 cycles) vincristine, dactinomycin, and ifosfamide regimen	Good, No signs of recurrence.
Case 4	Normal values	A barium enema showed that the mass had pushed the transverse colon downwards	In the section, the tumor was solid. with a tan color, and showed irregular areas of necrosis, involved the muscle coats of both the large bowel and the stomach. On microscopical examination, alveolar growth pattern. The alveolar spaces were lined by large pleomorphic cells with abundant eosinophilic cytoplasm. No crossstriations could be demonstrated. Up to 6 mitoses per high power field, many of which were atypical. Much of the tumor had undergone necrosis. The reticulin stain	partial gastrectomy and partial transverse colectomy with a fairly deep removal of the transverse mesentery.	good post-operative recovery

(continued on next page)

Table 1 (continued)

Case number	Laboratories	Radiology	Histology	Treatment	Prognosis
Case 5	Not mentioned	X ray erect abdomen was done which showed multiple air fluid levels. CECT abdomen showed a large, solid, mildly enhancing mass arising from the subhepatic region and extending upto the right iliac fossa, pushing and compressing the adjacent bowel loops	showed the alveolar pattern of the tumor clearly. sheets of predominantly small and round cells with abundant and eccentric eosinophilic cytoplasm, small oval nuclei with prominent nucleolus. Few spindle cell myoblasts with prominent tapered fibrillar eosinophilic cytoplasm and cross striations were also present. Highly cellular areas around blood vessels alternating with parvocellular mucoid regions (resembling normal embryonic myogenesis) were seen. Cells stained for myogenin on immunohistochemistry	Due to unresectability of the mass, incisional biopsy was taken and ileostomy was made.	Not mentioned
Case 6	Not mentioned	A roentgenogram showed a mass in the left upper quadrant with displacement of stomach and Descending colon. Intravenous and retrograde pyelograms showed distortion of the pelvis and calyces of the left kidney from outside pressure.	Microscopically, the tumor was composed of masses of rather large amorphous cells that were sometimes elongated. They had acidophile cytoplasm and many were vacuolated. An occasional spider-web cell was found. In the cytoplasm of some cells, elongated fibrils were detected but there were no cross striations. The nuclei were all well-preserved and showed large nucleoli. There was no pyknosis, and mitoses averaged 22 in 50 high power fields.	At operation, a lobular, grayish semi-firm tumor was removed from the great omentum.	died 5.5 weeks after operation
Case 7	Elevated LDH and Uric acid	U.S. showed a mass with cecal distention and grade I hydronephrosis of the right kidney CT showed a small mass measuring 7*4*3 cm rising from abdominal wall and adhering to cecum	Gross appearance: yellow, soft and rubbery in consistency and attached to many encapsulated nodules Immunohistology was negative for CD3, CD19, CD20, LCA, CK, CHROMO, SYNAPTO, CD99, DOG1, MYOD1 but it came positive for DESMIN	Incomplete resection with chemotherapy consisting of vincristine and cyclophosphamide	Died during his second chemo cycle

diagnosis and they provided us with the study materials. RA helped us with pathology and immunostaining. All authors read and approved the final manuscript.

Registration of research studies

1. Name of the registry:
2. Unique Identifying number or registration ID:
3. Hyperlink to your specific registration (must be publicly accessible and will be checked).

Guarantor

None.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

The authors declare that they have no conflicts of interest to declare.

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