Half abdomen tumor – giant retroperitoneal lipoma: a case report and review of the literature

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Abstract
The pure retroperitoneal lipoma is a sporadic benign tumor originating from the mesenchymal tissue. There are only a few data in the literature. This study presents the case of a 53-year-old man presenting computed tomography (CT) and magnetic resonance imaging (MRI) findings that revealed a giant retroperitoneal fatty tumor of 365/210/165 mm dimensions, suspected of malignancy. The patient’s medical history, clinical data, and blood tests are more likely inclined to a benign condition. Liposarcoma couldn’t be excluded preoperatively. The patient underwent an open surgical procedure respecting the oncological principles, with complete resection of 6400 g of retroperitoneal adipose tumor that also affected the surrounding organs’ normal abdominal anatomy. The tumor was relatively well delimited without any signs of local invasion or infiltration. Three solid masses described on the MRI were identified upon dissection and sent separately for histological examination. The result indicated a giant retroperitoneal lipoma with benign characteristics. Facing imagistic difficulties to distinguish lipoma from liposarcoma clearly, and the inconclusiveness of fine-needle biopsies, oncological resection remains the only option as a diagnostic method and curative treatment.

Keywords: giant retroperitoneal lipoma, rare tumor, benign adipose tumor, adipocyte stem cell.

Introduction
Retroperitoneal tumors represent a rare pathological condition and are usually classified based on their origin. Different tissues like muscular, lymphatic, nerve, connective, or adipose, and the urogenital tract can represent the primary developing point for retroperitoneal masses. Even though it represents a small part from 0.1% to 0.2% in all the diagnosed neoplasms, it is generally accepted that almost 80% of tumors originating from this area are malignant [1]. According to histopathological (HP) characteristics, lipomas are typically classified into conventional lipoma, angiolipoma, myelolipoma, spindle cell lipoma, myxolipoma, chondroid lipoma, fibrolipoma, and pleomorphic lipoma [2].

Pure lipomas represent a rare benign finding in retroperitoneal masses, and they should be carefully distinguished from liposarcomas. Their etiology is unclear, and subcutaneous lipomas are traditionally associated with hypercholesterolemia. Recent studies consider that the mechanism can be explained by a positive turnover of the adipocyte stem cell [3]. Usually are subdermally located on the trunk or neck. Still, fat-containing masses can also have their origin in the adrenals, kidney, or pancreas and a deep retroperitoneal source is an extremely unusual finding [4]. Most of these tumors are diagnosed when they attain a high volume.

The symptomatology is poor. The unspecific symptoms are secondary to tumor compression on the surrounding anatomical structures [2]. The great dimensions of the mass are correlated with the generous space in which it develops. Liposarcomas represent the most frequently identified masses in the retroperitoneal area. It is essential to consider well-differentiated liposarcoma for the differential diagnosis [5]. The clinical aspects and the abdomen’s ultrasound (US) evaluation can give valuable information. The diagnosis algorithm should be further completed with the imagistic assessment of a magnetic resonance imaging (MRI) or computed tomography (CT) scan. There is no specific MRI and CT evidence in evaluating retroperitoneal fatty tumors characterized as well defined. Important features like heterogeneity, irregular shape, margins, and necrosis areas may help differentiate a low-grade liposarcoma from a nonaggressive lipoma [2, 5].

Lots of controversies in the diagnostic algorithm are related to percutaneous biopsies. So many factors make these guided biopsies not only inconclusive but also associated with increased risk for dissemination. Therefore, the surgeon must practice the entire tumor excising for diagnostic and curative reasons regarding the oncological outcome. Further therapeutic expectations are set after anatomopathological evaluation that established the mitotic activity, necrosis, morphological atypia, or invasion. Retroperitoneal fatty tumors are considered extremely rare, with less than 35 cases reported in the specific literature on this topic.
Aim

We aim to present the case of a giant pure retroperitoneal lipoma and also to review previous reports.

Case presentation

A 53-year-old Caucasian man without associated comorbidities was admitted to the Clinic of Urology, Prof. Dr. Theodor Burghele Clinical Hospital, Bucharest, Romania. A previous medical evaluation indicated a retroperitoneal tumor. The patient complained of progressively gaining weight without a specific reason, abdominal distension, and occasional constipation. The anamnesis excluded dietary changes, loss of appetite, or abdominal pain at any level. The patient also denied any personal or familial neoplastic history.

The clinical examination showed an apparently normal 180 cm height man, with a calculated body mass index (BMI) of 27.46 kg/m², in a good shape condition, with low represented fatty tissue excepting the abdominal area. The abdomen’s dorsal decubitus examination revealed some asymmetries of the abdomen, which was more distended on the left side. Abdominal palpation demonstrated a slightly mobile palpable tumor about 30/15 cm with fibroelastic consistency, extending from the left flank to the umbilicus line. Patients’ blood showed a low increased level of triglycerides in the regular tests. The cardiovascular function was normal, raising no need for chronic treatment. On the abdominal US, a high-volume retroperitoneal tumor with a heterogeneous aspect was assessed. It could not specify the origin.

Both CT and MRI revealed a large, well-represented retroperitoneal tumor, highly defined by fatty tissue, measuring about 365/210/165 mm. The mass extended from the colon’s left splenic flexure to the whole abdomen having the lower pole in the left ischiorectal fossa without involving the left kidney or the adrenal. The impact on the surrounding organs indicated the medial displacement of the left colon (Figure 1, A and B; Figure 2, A and B). The MRI also identified three small fatty spots with irregular margins and contrast enhancement (Figure 3, A and B). The imagistic findings could not exclude the possibility of a liposarcoma. Because of the unclear advantage of percutaneous biopsies, after discussing and obtaining the patient’s informed consent, we decided to choose an exploratory laparotomy under general anesthesia for diagnostic and therapeutic approaches.

The first step was to endoscopically place a stent to protect the left ureter during surgery. Opening the abdominal cavity confirmed the left colon displacement to the umbilicus line without any adhesions. We identified a sizeable lipomatous structure occupying the retroperitoneal space. It measured 400/200/200 mm and had mostly well-represented margins. The left kidney, the adrenal and spleen, presented a good cleavage plan. The main blood vessels and the ureter were carefully dissected without any unplanned incidents. Complete excision respecting the oncological goals was practiced (Figure 4, A and B; Figure 5).

The tumor was relatively well delimited from the adjoining structures without any signs of local invasion or infiltration. Upon dissection, the three solid masses described on MRI were identified and separately sent for HP examination (Figure 4B).
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The patient was discharged after eight days without any postoperative events. After analysis, the anatomopathological exam established that all the structures had the same pattern.

HP result indicated a giant intermuscular lipoma tumor with cystic spots, lipogranuloma, fibro sclerotic, and chronic inflammatory areas, as well as lobules of mature adipocytes (Figure 6, A–C).

The immunohistochemical (IHC) technique we used had the following steps: dewaxing, delimitation of the tissue with Dako hydrophobic marker, dehydration in alcohol with decreasing concentrations (100%, 96%, 90% and 70%), rehydration in distilled water 3×5 minutes, antigenic exposure in Citrate solution pH 7 or Ethylenediaminetetraacetic acid (EDTA) pH 9, seven cycles ×3 minutes, washing in distilled water, inhibition of endogenous peroxidase with 3% hydrogen peroxide solution for 30 minutes, washing in distilled water and phosphate-buffered saline (PBS) solution, revealing specific antigenic sites in a 3% dust milk solution for 30 minutes. The primary antibody (Table 1) was then applied for 18 hours at 4°C.

The next day, the slides were left at room temperature for 30 minutes, washed in PBS, the secondary antibody [mouse/rabbit anti-immunoglobulin G (IgG) antibody, VC002-025, R&D Systems, VisUCyte Horseradish peroxidase (HRP) Polymer] was applied for one hour, the slides were washed in PBS, developed with 3,3’-Diaminobenzidine (DAB) (Dako), nuclei were labeled with Hematoxylin, the slides were then dehydrated in increasing alcohol concentrations (70%, 90%, 96%, 100%) for 5 minutes, clarified in xylene for 30–45 minutes and mounted with Canada balsam.

Microscopic examination showed that the tumor had a poor vascular network and a low cell proliferation index (Ki67) (Figure 6, D and E).

At 12 months follow-up, the MRI showed no signs of recurrences (Figure 7, A–C).

An informed written consent was obtained to publish his case (including publication of images).

 Discussions

Lipomas are a class of benign tumors of the adipose tissue frequently affecting, same as liposarcoma, the anatomical extremities. Retroperitoneum and the abdominal cavity are considered to be unusual, growing locations for this kind of pathology [4, 5]. The pathological characteristics subclassify fatty tumors into conventional lipoma, fibrolipoma, angiolipoma, fusiform cell lipoma, myelolipoma, fibrolipoma, and pleomorphic lipoma. Still, it is considered that retroperitoneal adipose masses are mostly angiolipomas with renal origin [6]. The extrarenal source is rarely identified in the literature. In 2009, Ukita et al. firstly described a retroperitoneal lipoma originating from the urinary bladder [1]. Moriki et al. signaled an originating pancreatic lesion, the first case like this to be published [7]. Few data exist on this topic. Thus, it can’t be established sex or age predisposition even though Cavazza et al. identified in their study that most cases affect females, with a higher incidence over 50 years [8]. The age and sex distribution significantly vary in the available literature, ranging from a 3-year-old boy, as Awais et al. reported in 2018 [9] to 73-year-old female published by Weniger et al. in their review [10] (Table 2).

The retroperitoneal area’s generous space offers the possibility of growing and reaching impressive dimensions. It is responsible for the poorly presented clinical symptoms initially. The local anatomy can be abnormally modified with increasing abdominal distension and lumbar pain being the most reported first signs while gaining volume.

![Figure 4 – Gross appearance of the whole tumoral tissue demonstrating a yellow, greasy cut surface (A) and a section through one of the suspect nodules (B) described by the radiologists. The pathologists separately examined the nodules having a different consistency.](image1)

![Figure 5 – Intraoperative aspect after excising the 6.4 kg giant retroperitoneal mass. The intra-peritoneal and retroperitoneal organs were entirely preserved.](image2)

| Antibody | Manufacturer | Clone | Antigenic exposure | Antibody manufacturer | Dilution | Labeling |
|----------|--------------|-------|--------------------|-----------------------|----------|----------|
| Anti-CD34 | Dako | QBEnd 10 | Citrate | Monoclonal mouse anti-human CD34 Class II | 1:50 | Endothelial cells |
| Anti-Ki67 | Dako | MIB-1 | EDTA | Monoclonal mouse anti-human Ki67 | 1:50 | Cells in division in the G1, S, G2 and M phase |

CD34: Cluster of differentiation 34; EDTA: Ethylenediaminetetraacetic acid; IHC: Immunohistochemical.
Figure 6 – Microscopic aspects of the lipoma tumor:
(A) Adipocytes with variable size separated by conjunctive septa with variable thicknesses; (B) Thick fibrous septa with moderate chronic inflammation; (C) Area of conjunctival septa with nonspecific granulomatous inflammation and vascular congestion; (D) Tumor tissue with a poor vascular network; (E) Tumor tissue with low Ki67 proliferation index. HE staining: (A–C) ×100. Immunolabeling with anti-CD34 antibody: (D) ×100. Immunolabeling with anti-Ki67 antibody: (E) ×100. CD34: Cluster of differentiation 34; HE: Hematoxylin–Eosin.

Figure 7 – Axial (A) and coronal (B) CT scan sections at 12 months follow up reveals no signs of tumor recurrence. On the 3D reconstruction (C), it can be observed that even though all the organs regained their anatomical positions, the ureter still presents some deformations with normal renal function. 3D: Three-dimensional; CT: Computed tomography.
Table 2 – Summary of reported retroperitoneal lipomas: concise systematic meta-analysis

| Author                | Year | Age [years] | Sex | Tumor size [cm] | Symptoms                  | Weight [g] | Outcome                                                                 |
|-----------------------|------|-------------|-----|-----------------|---------------------------|------------|-------------------------------------------------------------------------|
| Ukita et al. [1]      | 2009 | 61          | F   | 15 (diameter)   | Gluteal pain              | NA         | Less gluteal pain and no complications, with uneventful recovery in the postoperative period |
| Awais et al. [9]      | 2018 | 3           | M   | 15.7×14.3×11    | Abdominal distension      | NA         | NA                                                                      |
| Weniger et al. [10]   | 2015 | 73          | F   | 55×40×10        | Abdominal swelling, pain, and constipation | 8950       | Postoperative prolonged paralytic ileus and intestinal distention successfully treated on the 18th postoperative day |
| Al-Ali et al. [11]    | 2019 | 34          | F   | 45×48×13        | Abdominal distension and back pain | 12 000     | No complication on regular follow up                                   |
| Chen et al. [12]      | 2019 | 57          | M   | 28×17.5×33      | Abdominal distention      | 5700       | Complicated postoperative recovery due to pancreatic leakage managed conservatively |
| Bibi et al. [13]      | 2018 | 26          | F   | 10×8×17         | Abdominal swelling and recurrent pain | NA         | No complication on regular follow up                                   |
| Duran et al. [14]     | 2015 | 39          | F   | 6×13×15         | Left leg pain and walking difficulty | NA         | NA                                                                      |
| Hardy & Goliath [15]  | 2015 | 13          | M   | 19.5×16.6×8.8   | Vomiting, constipation, abdominal and back pain | NA         | Uneventful postoperative period and no recurrence of symptoms at follow up |
| Saito [16]            | 2013 | 65          | M   | 30 (diameter)   | Left flank pain and hematuria | NA         | No gross hematuria or left flank pain after 10 years follow up          |
| Wei et al. [17]       | 2013 | 25          | F   | 20×12×10        | Painless tumor in the left pelvis and abdomen | 1650       | NA                                                                      |
| Chander et al. [18]   | 2012 | 36          | F   | 13.6×11.2×9.1   | Urinary retention         | 1300       | NA                                                                      |
| van der Byl et al. [19]| 2012 | 45          | F   | 6×3.8           | No symptoms               | NA         | NA                                                                      |
| Singh et al. [20]     | 2011 | 65          | M   | 25×12           | Left inguinal swelling, Occasionally abdominal pain and vomiting | NA         | No events at 18 months follow up                                        |
| Singaporewalla et al. [21] | 2009 | 44          | M   | 15.6 (diameter) | Acute abdominal pain      | NA         | No complication on regular follow up                                   |
| Ida et al. [22]       | 2008 | 65          | M   | 22×14×5         | NA                        | NA         | No recurrent disease or metastases in 30-month period follow up        |
| Peitsidis et al. [23] | 2009 | 12          | F   | 8×6            | Pelvic pain and dysuria   | 300        | No complication on regular follow up                                   |
| Constantinou et al. [24]| 2009 | 51          | NA  | 40×35           | Abdominal distension      | 14 000     | NA                                                                      |
| Kansakar et al. [25]  | 2007 | 50          | F   | 30×20×25        | Abdominal distension and early satiety | 5100       | No complication on regular follow up                                   |
| Yildirim et al. [26]  | 2005 | 61          | F   | 30×26×17        | Left flank pain           | 4390       | Uneventful recovery                                                    |
| Drop et al. [27]      | 2003 | 60          | F   | 13×12          | Abdominal pain and gastrointestinal symptoms | NA         | No complication on regular follow up                                   |
| Drop et al. [27]      | 2003 | 72          | F   | 12×9×4         | Abdominal pain and sickness | NA         | NA                                                                      |
| Martinez et al. [28]  | 2003 | 32          | F   | 20×13×10       | Painless tumor in the iliac fossa and right flank | 3400       | NA                                                                      |
| Raftopoulous et al. [29]| 2002 | 62          | M   | 20×15×10       | Right flank pain          | 790        | Uneventful recovery                                                    |
| Foa et al. [30]       | 2002 | 52          | M   | 10.5×9.5×2     | NA                        | 145        | No recurrent disease in the five months follow up                       |
| Forte et al. [31]     | 2002 | 61          | M   | NA             | Urinary frequency, urgency, and nocturia | NA         | Irritative urinary symptoms were treated                               |
| Marshall et al. [32]  | 2001 | 47          | M   | NA             | Acute abdominal pain in the right upper quadrant and point tenderness in the mid quadrant | 4990       | Acute appendicitis was treated                                         |
| Matsubara et al. [33] | 2000 | 65          | M   | 12×13          | Triple tumors in the abdomen – colon and stomach cancer and retroperitoneal lipoma | NA         | NA                                                                      |
| Acheson et al. [34]   | 1997 | 76          | F   | 20×20×12       | Swollen right leg caused by a large mass in the iliac fossa | 596        | Absence of thigh discomfort a progressive reduction in right leg swelling |
| Zhang et al. [35]     | 1987 | 65          | M   | 50 (diameter)  | Gaining weight – 25 kg, abdominal distension and leg edema | 19 500     | No complication in the 4-year postoperative follow up                  |
| Deppe et al. [36]     | 1985 | 26          | F   | 11×8×3         | Intermenstrual bleeding   | NA         | NA                                                                      |
Our patient was complaining of occasional constipation also. The close relationship with adjoining anatomical structures offers the possibility of developing various clinical manifestations. In their report, Duran et al. presented leg pain and associated moving difficulties in a 39-year-old woman in which the lipoma mimicked sciatic hernia symptoms [14]. It was an incidental diagnosis based on the MRI performed for the disc herniation suspicion [11–15] (Table 2).

Saito described hematuria and associated flank pain as the atypical first presentation for a retroperitoneal fatty tumor in a 65-year-old male. The patient showed normal abdominal US and intravenous urography [16].

The CT scan revealed a nutcracker-like phenomenon caused by a 3 cm adipose tumor surrounding the left renal pedicle. The tumor was extracted with a 3-port retroperitoneal laparoscopic technique [16–20] (Table 2).

An emergent situation was also described with acute abdominal pain registered in a 44-year-old man after a left adrenal lipoma started to bleed. Open surgery with a pedicle. The tumor was extracted with a 3-port retroperitoneal laparoscopic technique [16–20] (Table 2).

A certain imagistic preoperative diagnosis is hard to achieve. The clinical and abdominal US examination must be correlated with CT and MRI evaluation. Performing several needle biopsies for the HP interpretation is still controversial. Many centers presented their experience on preoperative biopsies [21–24] (Table 2).

Moreover, these are often inconclusive and apparently do not bring more valuable information than CT and MRI imaging, as the follow up decision is to remove the tumor mass respecting oncological principles both for diagnostic and treatment. On CT scan, the retroperitoneal adipose tissue density is between 65–120 Hounsfield units, which is similar to the subcutaneous fat. An intense signal is produced on MRI in T1 [25–39] (Table 2).

Metabolic factors, including hypercholesterolemia and obesity, are generally associated with an increased risk of developing subcutaneous lipomas. Still, there are no data to link it to an increased risk for the retroperitoneal area [40–42]. Aust et al. also reported traumatic events related to subdermal location [43].

Initially, before surgery, our patient had a calculated BMI of 27.46 kg/m², indicating an overweight person. The BMI correlated to normal weight after extracting the 6400 g of a tumor. The slightly increased level of triglycerides without indication for statin administration after cardiac evaluation could also not explain the massive growing tumor.

The absence of certain characteristics that differentiate a lipoma from a malignant pathology indicates a surgical exploration with complete resection, implying negative margins for a better outcome in a liposarcoma case. Macroscopic evaluation of the specimen reveals an encapsulated yellow tumor, presenting a multilobed aspect caused by white-colored fibrous septa [44].

| Author              | Year | Age [years] | Sex | Tumor size [cm] | Symptoms      | Weight [g] | Outcome     |
|---------------------|------|-------------|-----|-----------------|---------------|------------|-------------|
| Emmrich [37]        | 1979 | 49          | F   | NA              | NA            | 12 500     | NA          |
| McCarthy et al. [38]| 1977 | 60          | M   | NA              | NA            | 4990       | NA          |
| Mellin et al. [39]  | 1977 | 74          | F   | NA              | NA            | 9100       | Recurrence  |

A challenging situation is the differential diagnosis between low-grade malignancy liposarcoma (grade I) and benign lipoma. Usually, during surgery, it is easier to differentiate a high malignancy liposarcoma (grade III and IV) because of the infiltrative aspect, leading to a difficult resection. The “gold standard” diagnosis is the HP examination of the possible invasion, the presence of necrotic areas or atypia, irregularity, is absolutely necessary to differentiate a liposarcoma.

Many scientific studies tried to genetically establish a differentiation limit between well differentiated liposarcoma and lipoma over the recent decades. Several genes, such as mouse double minute 2 (MDM2), carboxypeptidase M (CPM), sense–antisense (SAS), cyclin-dependent kinase 4 (CDK4), deoxyribonucleic acid (DNA) damage inducible transcript 3 (DDIT3) (CCAAT-enhancer–binding protein (C/EBP) homologous protein (CHOP)), and high mobility group AT-hook 2 (HMGA2) reveal valuable information on molecular genetics and IHC level to differentiate these two entities. Literature findings range the weight of lipoma between 145 g to 19.5 kg even though many data are missing from the case reports. The weight aspect creates controversies because high volume lipomas of more than 1 kg usually raise malignancy suspicion. In their study, Celik et al. consider that liposarcoma should be suspected when it is higher than 10 cm and developed a rapid growth within months [45].

Also discussing in terms of the microscopic differential diagnosis of this giant retroperitoneal lipoma, it should be emphasized probably the most important differential diagnosis, especially when it comes to deep-seated lipomas, namely the one with low-grade liposarcoma.

Montgomery states that well differentiated liposarcoma generally has sclerotic bands containing cells with bizarre, hyperchromatic nuclei and occasional lipoblasts, whereas deep lipomas are composed only from mature adipocytes that do not demonstrate hyperchromasia or nuclear enlargement [46].

Furthermore, the microscopic differential diagnosis with certain hemangiommas may be discussed, the latter may have a prominent fatty component that can simulate certain lipomas, but in this case, vessels are present in addition to mature adipose tissue [46].

In many cases, a close postoperative follow up is necessary because several problems can appear in regaining normal function, considering the long-time of compressed surrounding organs. Weinger et al. presented 18 days postoperative time for paralytic ileus management [10]. Pancreatic leakage for two months was also described by Chen et al. after injuring the pancreas during lipoma dissection [12].

Conclusions

Pure lipomas developed in the retroperitoneal space are an infrequent finding. They are always a challenging...
situation for presurgical differential diagnosis. Surgery, respecting the oncological principles, is the elective approach for both diagnostic and curative treatment. HP examination is still the “gold standard” for a definitive diagnostic, even though genetic analyses promise to play a more important role in the near future.

Conflict of interests
The authors declare that they have no conflict of interests.

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Received: April 30, 2022
Accepted: August 4, 2022