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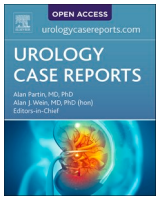

Oncology

Surgical removal of a giant non-functional adrenal mass: A case report

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ABSTRACT

This case report describes the surgical management of a giant left adrenal mass (27 x 26 × 27 cm, 9.370 kg) in a 69-year-old female. We review the multidisciplinary decision-making process for pre-operative preparation, embolization, resection feasibility, and strategies to mitigate intra-operative complications. This is the largest adrenal adenoma removal reported to date. The case highlights the importance of meticulous surgical planning and execution in managing rare and challenging cases, with significant implications for patient outcomes.

1. Introduction

The surgical management of giant adrenal masses poses a critical challenge due to their rarity, potential malignancy, hormonal hypersecretions, and potential intra- and post-operative complications. While adrenal masses are common, those of exceptional size present unique clinical and surgical dilemmas. This case study highlights the extraordinary challenge posed by a significantly large left adrenal mass, emphasizing its rarity and the critical considerations in its surgical approach.

2. Case presentation

A 69-year-old female presented to our facility with complaints of abdominal distension and difficulty breathing for the past few weeks. Upon examination, a large abdominal mass was palpated predominantly on the left side, extending across the midline, above the 12th rib, and reaching the lower pelvis (Fig. 1). The mass exhibited a hard consistency, was non-tender, and no ascites were noted. Laboratory investigations, including biochemical tests and hemogram parameters, were within normal ranges.

Triphasic abdominal and pelvic contrast-enhanced computed tomography (CT) revealed a well-demarcated massive solid mass with faint enhancement and a few small calcifications measuring about 27 × 26 × 27 cm, identified as a giant left adrenal tumor (Fig. 2). The mass occupied more than half of the abdominal cavity, displacing the pancreas, stomach, bowels, and major vessels to the right side. Additionally, the spleen was displaced anteriorly against the abdominal wall, and the left kidney was severely compressed into the lower pelvis.

A preoperative endocrinological assessment confirmed the mass to be hormonally non-functional. A multidisciplinary team meeting was formed. The advantages and disadvantages of taking a percutaneous biopsy and selective embolization of the arterial supply of the mass, as well as surgical removal of the mass with all associated risks and benefits, were discussed in detail. Due to the severe compressive effect of the mass and possible further deterioration of the patient's condition, the committee did not support a biopsy. Additionally, the committee agreed that any biopsy result would not change the plan or the final outcome.

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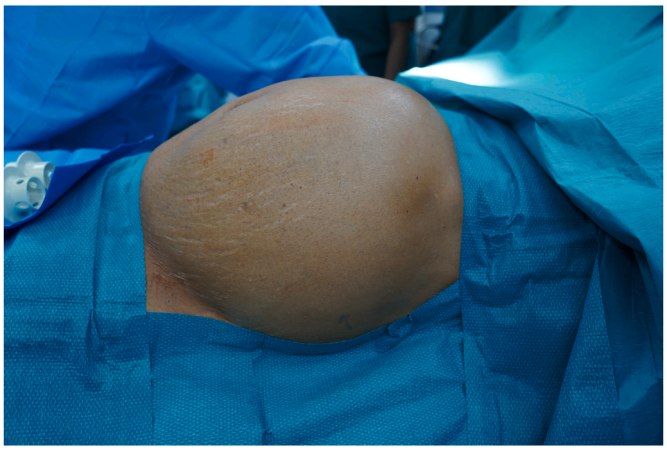

Fig. 1. Large mass causing significant abdominal distension.

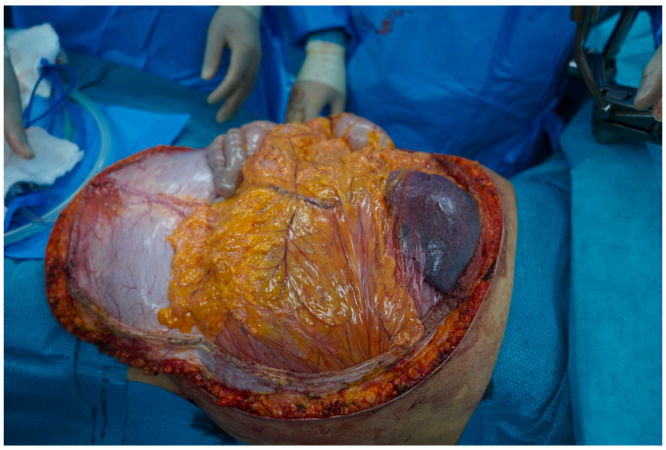

Fig. 3. Chevron skin incision and anterior abdominal organs.

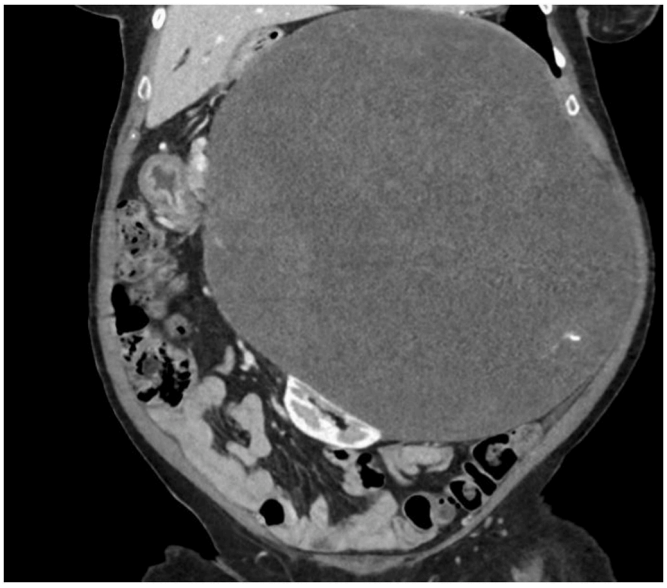

Fig. 2. CT scan showing the huge left adrenal mass compressing the left kidney to the lower pelvis and the spleen to the anterior abdominal wall.

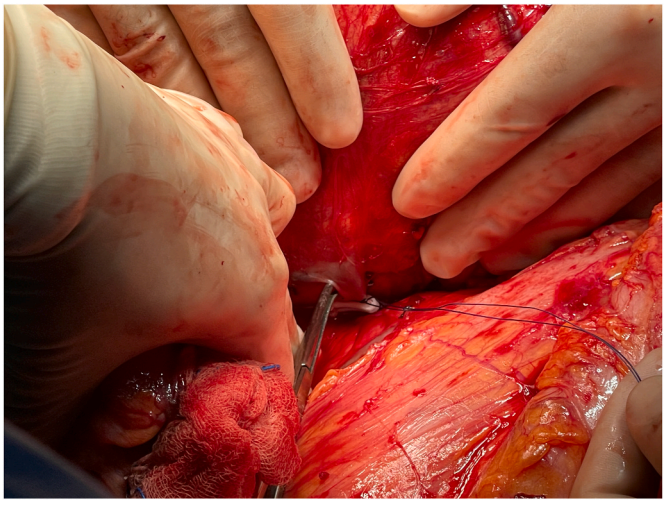

Fig. 4. Main adrenal vein occluded with Hem-*o*-lok clips.

Given the severe compression and resulting respiratory distress, surgical intervention was deemed necessary. To reduce the risk of any intraoperative bleeding, initial management involved attempted selective embolization via angiography; however, due to mass compression, only the splenic artery could be embolized.

The patient was counseled regarding the risks associated with the procedure, including severe bleeding, incomplete mass removal, and injury to surrounding organs. Under general anesthesia, a Chevron skin incision was made, extending nearly to the iliac crests bilaterally. Intraoperatively, the omentum and spleen were visualized on the anterior abdominal wall (Fig. 3). Splenectomy was performed, and meticulous dissection revealed a well-encapsulated mass with clear borders.

Identification of the main adrenal vein, which was widely collapsed and compressed by the mass, was followed by careful isolation, clipping with Hem-*o*-Lok clips, and division (Fig. 4). Elongated left renal vessels, along with severe adhesions between the upper pole of the left kidney and the lower part of the mass, were managed cautiously to prevent bleeding or injury. Given possible infiltration of the mass into the upper pole of the kidney, nephrectomy was deemed necessary. Subsequently, the renal vessels were occluded and divided, allowing complete separation of the mass from surrounding structures without major bleeding or injury.

The removed mass, including the kidney, weighed 9.440 kg. The kidney was separated from the mass in the pathology department and weighed about 70 g. Accordingly, the total mass of the adrenal gland was 9.370 kg, distinguishing it as the largest adrenal adenoma ever successfully removed, according to our extensive review of the literature. The operation took about 4 h, and the patient tolerated the procedure well. The post-operative period was uneventful. A thorough histopathological work-up confirmed a well-encapsulated adrenal hemorrhagic mass with massive infarction, extensive necrosis, and nonviable tissue component, likely an infarcted adenoma, with no evidence of any malignant changes (Fig. 5). The capsule was fibrotic and free of any significant lesion. The attached kidney showed ischemic changes due to compression effect. The histopathology work-up was thoroughly reviewed by two different histopathologists, and multiple slides were investigated, with both arriving at the same result. The patient was followed up with physical examination, ultrasound, and blood tests at the 1st and 2nd postoperative months, all of which were unremarkable.

3. Discussion

Adrenal adenomas are common, benign adrenocortical tumors, typically measuring 3–3.5 cm in diameter and with an incidence of 2.86 %.[1] Distinguishing a very large adenoma from a carcinoma can be

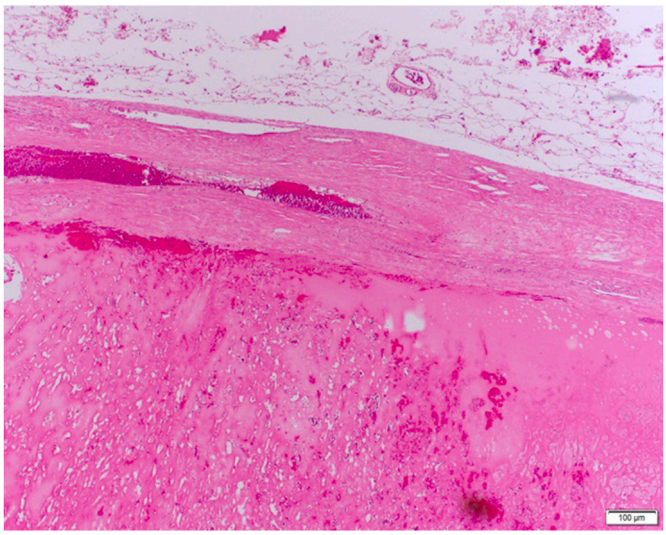

Fig. 5. Capsule with underlying hemorrhagic tumor. H&E stain, 4x.

challenging before surgery. Following the initial discovery of an adrenal mass, subsequent evaluation should determine whether it is benign or malignant and whether it is functional or nonfunctional, to guide treatment options. The criteria for malignancy include distant metastases and/or local invasion, which were not present in our patient.

The management of giant adrenal masses presents a formidable challenge, necessitating a multifaceted approach due to their rarity, potential for malignancy, and intricate anatomical considerations. Collaboration among various specialties within a multidisciplinary team is indispensable in navigating the complexities of pre-operative assessment and decision-making.[2,3]

Each team member, including endocrinologists, radiologists, oncologists, vascular surgeons, general surgeons, anesthesiologists, and urologists, plays a distinct role in characterizing the mass, evaluating its hormonal activity, and determining the most appropriate course of action.[4] In our case, the preoperative endocrinological assessment confirmed the non-functional nature of the mass, guiding subsequent treatment decisions.

Biopsy is not helpful in patients with unilateral adrenal incidentaloma due to its low negative predictive value in ruling out malignancy.[5]

While selective embolization may be considered as a preoperative adjunct to reduce vascularity and facilitate surgical resection, its efficacy and necessity remain subjects of debate.[6] In our experience, attempted embolization was constrained by mass compression, underscoring the need for tailored treatment strategies based on individual patient characteristics.

Surgical excision of giant adrenal masses necessitates meticulous planning and precise intraoperative techniques to minimize potential complications. In our case, a Chevron incision provided optimal exposure for thorough dissection and preservation of adjacent structures. The identification and careful management of critical anatomical landmarks, such as the main adrenal vein and renal vessels, are imperative to prevent intraoperative hemorrhage and ensure complete mass removal.[7]

Histopathological examination of the excised mass is essential for confirming the diagnosis, assessing for malignancy, and guiding postoperative management. Our findings, which revealed massive infarction, extensive necrosis, and nonviable tissue components consistent with an infarcted adenoma, underscore the importance of histological analysis in guiding subsequent care.[8,9]

Chatzoulis G. et al.[10] and Li B. et al.[11] reported the successful surgical removal of giant non-functional adrenal masses, the largest weighing 7.500 kg. To the best of our knowledge, our case represents the largest non-functional adrenocortical adenoma successfully removed to date. While this case is a significant achievement in managing an exceptionally large adrenal mass, several considerations warrant further investigation, including refining surgical techniques, optimizing preoperative evaluation protocols, and exploring novel treatment modalities for giant adrenal masses. Long-term follow-up and surveillance are imperative to monitor for recurrence or metastasis, particularly in cases where malignancy cannot be definitively excluded.[12–14]

In conclusion, the management of giant adrenal masses requires a collaborative and multidisciplinary approach, encompassing meticulous surgical technique and individualized treatment strategies. Our case contributes to the growing body of evidence supporting the efficacy of surgical intervention in achieving favorable outcomes for patients with exceptionally large adrenal masses. Continued research and clinical innovation are essential to further advance our understanding and management of these challenging clinical entities.

4. Conclusion

Giant adrenal masses are exceedingly rare, warranting an individualized approach to their management. Surgical removal of the mass is typically considered the optimal treatment. Collaboration among multidisciplinary teams and precise intraoperative maneuvers are crucial to minimize potential complications. Our case, representing the largest adrenal adenoma removed to date, underscores the feasibility of successful surgical intervention for extraordinarily large adrenal masses, marking it as a significant achievement in the field.

CRediT authorship contribution statement

Fariborz Bagheri: Writing – original draft. **Elham Mahjoor Azad:** Writing – review & editing. **Kais Kotiesh:** Supervision. **Abdulmunem Alsadi:** Methodology. **Shaima Marwan:** Project administration. **Amr Elmekresh:** Formal analysis. **Mohammad Alhamad:** Software. **Ahmad Carim Bacor:** Data curation. **Khalid Saleh Abuamra:** Resources. **Alaaeldin Bashier:** Investigation. **Ayman Saleh:** Methodology. **Hassan Hotait:** Supervision.

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