Skeletal Muscle Metastases Arising from Renal Cell Carcinoma in a 58-Year-Old Male: A Case Report

Sybill Sue M. Moser[1], Edwin Joseph R. Guerzon[1], John Christopher R. Ragasa[1]

Abstract

Introduction: Renal cell carcinoma (RCC) is the most common malignant kidney tumor, commonly metastasizing to the lung, lymph nodes, bones, and brain. Here, we present a rare case of renal cell skeletal muscle metastases (SMMs), accounting for only <1% of all RCC metastases.
Methods: This is a descriptive report on the clinical course, diagnostic investigations, and surgical treatment of a case of SMM in a patient previously diagnosed with RCC.
Results: This is a 58-year-old male who previously underwent radical nephrectomy for RCC, presenting with a 5-month history of a rapidly enlarging left gluteal mass. The mass was confirmed to be renal clear cell metastasis through percutaneous biopsy. On magnetic resonance imaging, two heterogeneously enhancing lesions in the left gluteal muscle and right paralumbar muscles at the level of L4 and L5 were noted. Positron emitted tomography scan confirmed no other metastases. He underwent wide excision of the right paraspinal mass and buttockectomy for the left gluteal mass.
Conclusion: SMM in RCC is rare, thus tissue diagnosis and imaging is deemed necessary to rule out any other primary sarcoma. In these cases, patients may benefit from metastasectomy. Regular follow-up and surveillance are recommended for these patients to rule out recurrence.
Keywords: Renal cell carcinoma, metastases, extraskeletal, buttockectomy.

Introduction

H1>Introduction

Renal cell carcinoma (RCC) is the most common form of kidney malignancy in adults. It is derived from the lining of the proximal convoluted tubules and is usually hypervascularized. It is the 14th most common malignancy worldwide, with an overall prevalence of 2–3% of new cases per year. Its incidence is at 15/100,000 and is more common in males than in females [1].

It usually has an unpredictable metastatic pattern despite undergoing curative nephrectomy. The most common sites of RCC metastases are the lungs, lymph nodes, bones, liver, and brain [1]. Skeletal muscle metastases (SMMs) in RCC are considered rare, accounting for <1% of metastases. In documented cases, they have been detected several years after radical nephrectomy [2].

We describe a case of SMM of RCC in a male patient 3 years after undergoing radical nephrectomy.

Case Report

This is a case of a 58-year-old male who previously diagnosed with Stage IV RCC who underwent right radical nephrectomy and right hemicolectomy for gastrointestinal metastatic disease 3 years before consult. He also finished 1 cycle of chemotherapy and 5 cycles of immunotherapy 1 year before admission. The patient underwent regular follow-ups for the past 3 years and was declared disease free.

He consulted due to the left gluteal discomfort for 5 months before admission. He described the pain as intermittent, aching pain, worse when sitting, and with direct pressure. He also noted a slowly enlarging, minimally tender, palpable mass on the superolateral aspect of the left gluteal area. This prompted consult 1 month before admission.

The patient is able to ambulate independently, but noted to have antalgic gait. On palpation, there was a 15 × 15 cm, well-demarcated, doughy, non-movable, tender, round mass covering the entire left gluteal area (Fig. 1). There were no noted gross skin changes, ulcerations, or erythema. There was noted full range of motion of the left hip, but with discomfort toward the end range of the left hip extension. There were no sensory deficits, with full pulses on the left lower extremity. There were no palpable masses on the right paralumbar area. No noted motor and sensory deficits at the levels of L2-S1, bilaterally.

He underwent magnetic resonance imaging

[1]Department of Orthopedics, Institute of Orthopedics and Sports Medicine, St. Luke's Medical Center - Quezon City, Manila, Philippines.

Address of Correspondence:
Dr. Sybill Sue M. Moser
2632 Molave St. United Hills Village,
Parañaque City, Metro Manila, Philippines.
E-mail: sybillsuemoser@gmail.com


Dr. Sybill Moser


Dr. Edwin Guerzon


Dr. John Ragasa

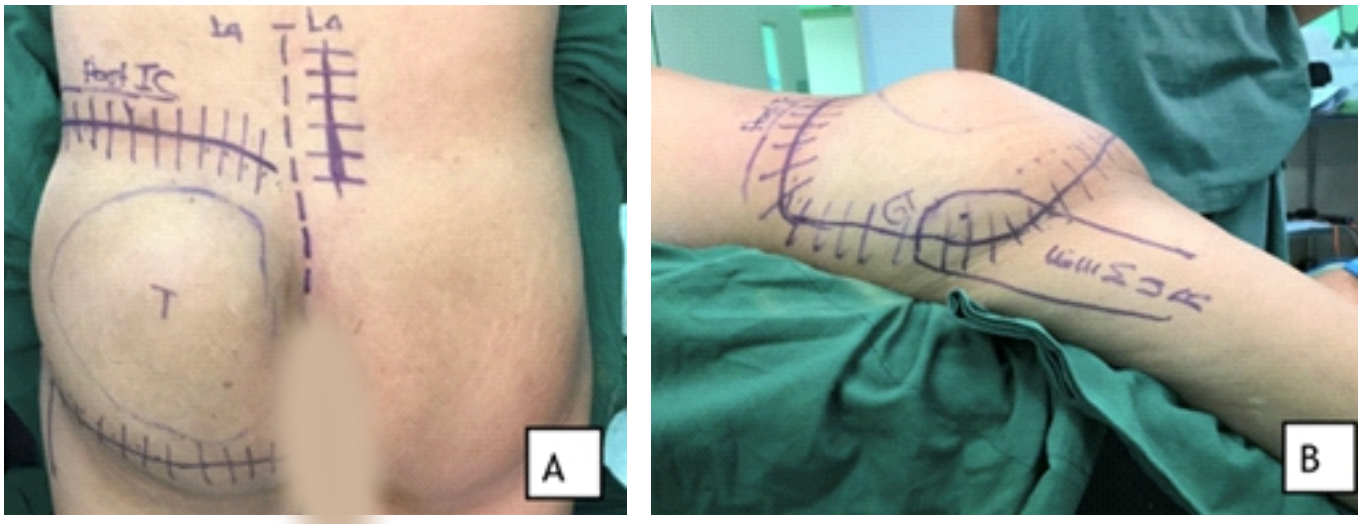

Figure 1: (a) Surgical markings for planned incision; circular marking demonstrating extent of palpable mass left gluteal area (T), (b) lateral view of the left gluteal and proximal femur.

(MRI). T2-weighted MRI sequence of the lumbosacral spine showed a heterogenously enhancing, well-demarcated mass contained on the left gluteal muscle, measuring 8.2 × 9.0 × 8.3 cm. Hyperintense signals on its periphery highly suggest presence of hypervascularity in the left gluteal mass. This mass was seen as a homogenous, isointense signal on T1-weighted MRI images (Fig. 2). There is also note of a hyperintense signal on the right paralumbar muscles at the level of L4 and L5, measuring 1.7 × 1.6 × 1.3 cm (Fig. 3). No noted infiltration of the surrounding bony structures, such as the iliac bone and lumbar spine. Computed tomography (CT)-guided core needle biopsy of the left gluteal mass was done, with histopathology results consistent with renal cell metastatic disease.

After confirming presence of metastases, positron emitted tomography (PET) scan was done to evaluate for the presence of other metastatic lesions. There were no other areas with increased uptake aside from the previously mentioned left gluteal and right paralumbar masses. There was no noted recurrence of the primary lesion on PET scan. Preoperatively, he underwent angiogram of the left gluteal mass, followed by embolization of the arterial branches of the inferior gluteal artery, which was noted to be the main vascular supply of the lesion.

He then underwent left buttockectomy and wide excision of the right paraspinal mass. The patient was placed on prone position under general anesthesia. A curvilinear incision was done from the medial border of the posterior iliac spine, going laterally, then curving inferiorly to the posterolateral border of the proximal femur, extending superomedially up to the gluteal crease.

A fasciocutaneous flap was developed by dissecting through the plane between the subcutaneous and fascial layers of the left gluteal area, starting laterally, extending medially (Fig. 4a). The origin of the left gluteus maximus muscle in the posterior iliac crest and its insertion to the iliotibial band and proximal femur were exposed and released (Fig. 4b). The gluteus maximus was then lifted from the external rotators. The mass was noted to be adherent to the superior gluteal artery and was dissected free. Some branches of the superior gluteal artery were ligated and cut. The left sciatic nerve was then identified and isolated from its attachment to the pseudocapsule of the tumor (Fig. 4c). The gluteus muscle was then released completely from these landmarks. Exposed areas of the sciatic nerve were protected by fixing the most proximal part of the semimembranosus to the iliotibial band (Fig. 4d). A Prolene mesh, measuring 15 × 5 cm, was applied to cover the gluteal space, acting as a fascia (Fig. 4e). Two Jackson-Pratt drains were placed superficially over the mesh (Fig. 4). Intraoperatively, a well-circumscribed, doughy mass, measuring 7 × 9 × 4 cm mass, was fully excised, including the entire gluteus maximus, measuring 14 × 15 × 4 cm (Fig. 5a). A right paramedian incision was done over the area of L4 to S1, confirmed through image intensifier. The paralumbar muscles were

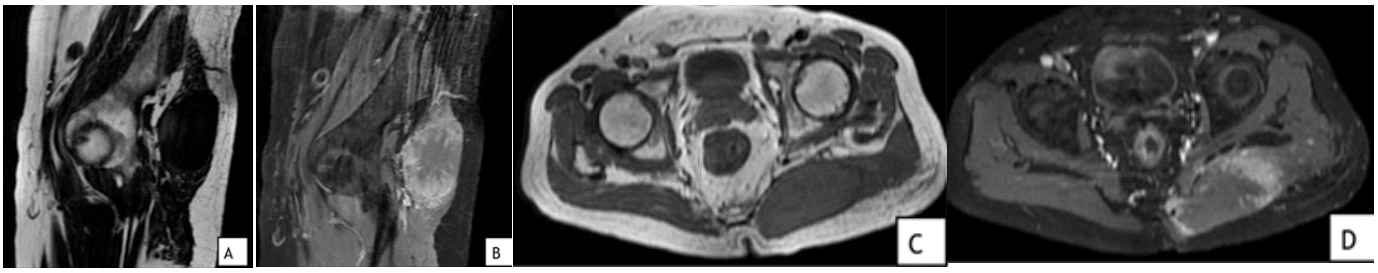

Figure 2: (a) Sagittal T1W view pelvic magnetic resonance imaging (MRI) showing an isointense, well-demarcated mass contained in the left gluteus maximus (b) noted on sagittal T2W view pelvic MRI as a heterogeneously enhancing mass with hyperintense borders, measuring 8.2 × 9.0 × 8.3 cm, (c) axial T1W view MRI, (d) axial T1W view.

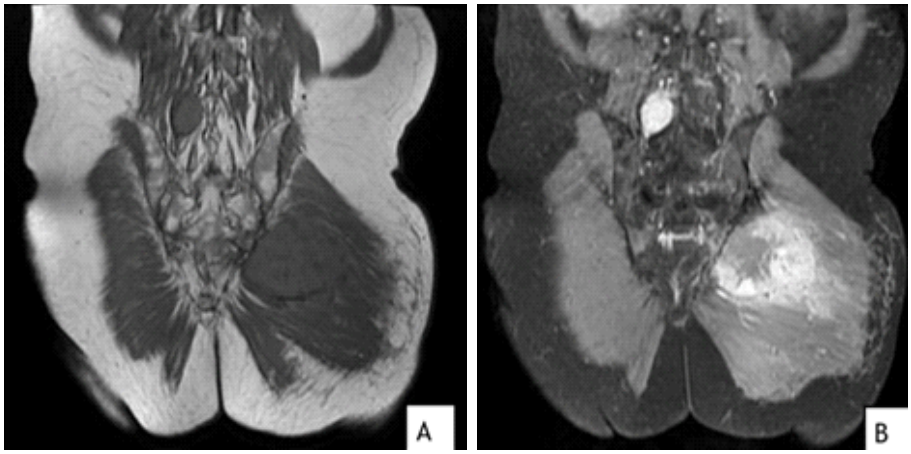

Figure 2: (a) Coronal T1W lumbosacral magnetic resonance imaging (MRI), (b) T2W lumbosacral MRI showing the right paraspinal mass at the level of L4 and L5, measuring 1.7 × 1.6 × 1.3 cm. The left gluteal mass was also evident on these views.

elevated from their spinal attachments and completely excised, including the lumbodorsal fascia extending from L4 to S1. There was a well-circumscribed, doughy mass, measuring 2 × 2 × 2 cm, noted on the excised portion of the paralumbar muscles, grossly resembling the excised mass on the left gluteal area (Fig. 5b).

Histopathology revealed metastatic clear cell renal carcinoma, with positive tumor margins noted on the volar aspect of the excised left gluteal mass (Fig. 6). The paralumbar mass margins tested negative for tumor. The wound was regularly inspected for signs of necrosis or infection. The patient was continued on antithrombotics to facilitate blood flow and healing. Direct pressure was avoided over the left gluteal area by the use of a donut pillow and by encouraging right lateral decubitus.

During the 5th day postoperatively, there was noted hyperpigmentation over lateral aspect of the flap (Fig. 7a). Debridement was done on the 8th day post-buttockectomy. Intraoperatively, epidermolysis was noted, with intact fasciocutaneous flap. Regular wound care done using silver sulfadiazine (Flamazine) cream (Fig. 7b and c). The patient was then discharged. He underwent regular monthly follow-ups. Wound care continued using wound healing cream (Dermlin) and hydrogel wound dressing (SoloSite) applied daily. On the 3rd month post-surgery, thick granulation tissue was removed and continued on the previous wound regimen (Fig. 8a, b). We noted progression of reepithelialization during interim. Five months after the surgery, we noted healing with hypertrophic scar on the superolateral aspect of the surgical site (Fig. 8c, d).

Postoperatively, the patient was independently ambulating without any need for assistive devices. There were no recurrences of any wound complications on the surgical site. He underwent regular follow-up with his medical oncologist for surveillance.

One year after the surgery, the patient reported bilateral lower extremity weakness, described as difficulty ambulating, especially during stair negotiation. He also reported constipation and poor appetite. The patient was admitted for work-up. Repeat whole abdominal CT scan was done which showed dilated stomach, duodenum, and jejunum segments with noted nodularities along the posterior retroperitoneum, causing partial bowel obstruction. Interval development of confluent masses was noted on the right paravertebral region at L4 and L5 levels and left iliacus and gluteal masses, extending to the left sacral wing and iliac wings, suggestive of metastatic recurrence on the previous surgical sites (Fig. 9). There were also multiple pleural-based nodular masses at both lower lung lobes, consistent with metastatic lung disease. He was then given alectinib as palliative chemotherapy. While admitted, he was referred to physical therapy and was able to tolerate wheelchair transfers and wheelchair rides. He was then sent home after nutritional build up and chemotherapy.

A week after, he was then readmitted for hematemesis and generalized body weakness. He was treated as a case of small bowel obstruction secondary to metastatic colon disease. He was also given antibiotics for obstructive pneumonia secondary to metastatic lung disease. The patient had persistent difficulty of breathing during admission and eventually expired from septic shock and obstructive pneumonia.

Discussion

Metastatic disease occurs as a sequential process through hematogenous or lymphatic dissemination of cancer cells from the primary lesion. Malignant solid tumors rarely metastasize in skeletal muscles alone. Although skeletal muscle is highly vascular, metastasis is unlikely in these areas due to the following hypotheses: (1) High hydrostatic pressure related to exercise-induced blood flow, making it a poor environment for tumor growth, (2) inhibition of tumor genesis due to the presence of lactic acid, muscle-derived peptidic factors, and protease inhibitors, and (3) antitumor activity of lymphocytes and natural killer cells [6]

A retrospective study by Surov et al. in 2010

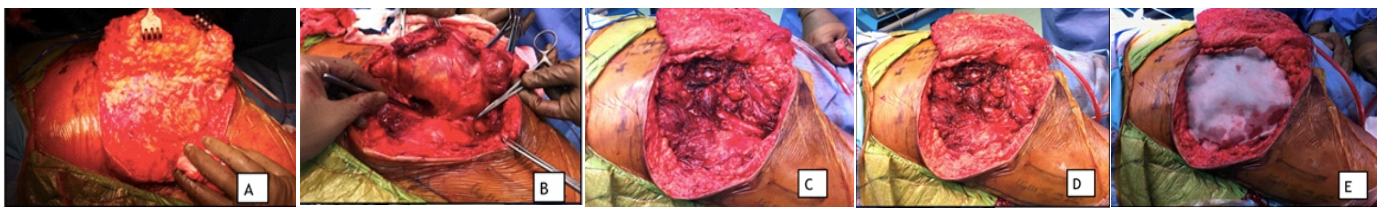

Figure 4: (a) Fasciocutaneous flap, (b) gluteus maximus completely released from its insertion and elevated, (c) sciatic nerve identified, (d) sciatic nerve protected by the semitendinosus, (e) Prolene mesh covering the gluteal space.

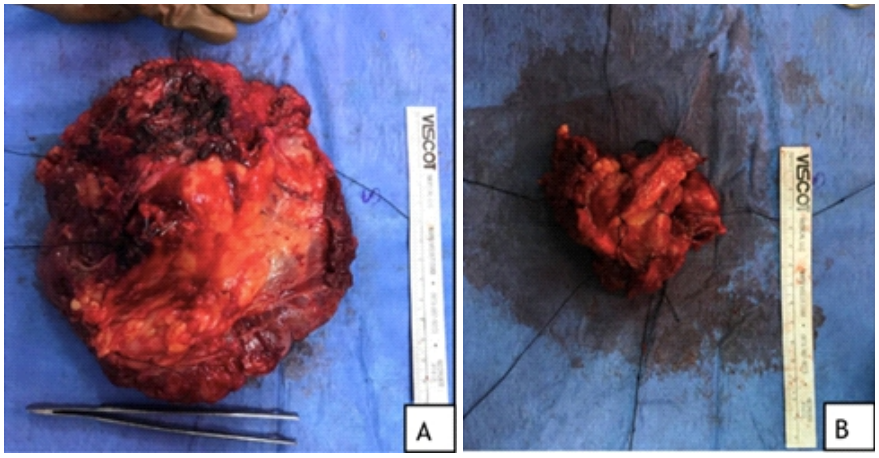

Figure 5: (a) Well-circumscribed, doughy mass, measuring 7 × 9 × 4 cm mass entire gluteus maximus, measuring 14 × 15 × 4 cm (b) excised, doughy, well-circumscribed paraspinal mass measuring 2 × 2 × 2 cm, including surrounding muscle tissue, measuring 6 × 5 × 3 cm.

included 5170 patients with metastatic solid tumors confirmed by CT scan. Only 61 cases (1.2%) among the subjects presented with SMMs. In 5 cases (<0.01%), skeletal muscles were the only metastatic sites. RCC was listed as the 4th most common primary malignancies associated with SMMs (3.2%). Overall, the most common site of SMMs for RCC is the iliopsoas muscle (27.5%) followed by paravertebral muscles (25%) and gluteal muscles (16.3%). This pattern was similar to our case.

Moreover, the pattern of metastases in RCC is unpredictable, attributing to its complex lymphatic drainage. Several experimental studies show peculiar metastatic pattern in mice, wherein migration of cancer cells was noted in preselected organs to establish an optimal environment for the tumor cells to grow [4]. This model was postulated as a possible cause of the unusual pattern of metastases in RCC [4]. About 20–30% of patients with RCC treated by nephrectomy were noted to develop distant metastases [5]. The common areas of metastases of RCC include the lungs, lymph nodes, gastrointestinal organs, bones, and brain.

RCC rarely metastasizes to skeletal muscles (<1%). Current studies consist of autopsy studies and case reports. The largest study to date was a comprehensive literature review including 37 patients obtained from case reports, combined with a retrospective review of 21 patients with SMMs arising from RCC [7]. They described the demographics, clinical course, radiographic presentation, and outcome of patients with RCC who presented with SMMs. The average age of the subjects on diagnosis of the first SMMs was 58.1 years. Most of them were male (86%), with clear cell RCC as histopathological subtype (81%). In both groups, they analyzed a total of 116 muscle metastases. However, distribution of location and symptoms was different between the two groups. In the study group, majority of SMMs were incidental findings on CT scan, most commonly seen in trunk muscles followed by upper extremities and lower extremities. In the literature review group, most were seen in the lower extremities and initially presented as painful masses on the onset. Only seven reports showed pure muscle metastases as initial complaint without a concomitant primary tumor. In the retrospective group, however, most of the lesions were only incidental findings only on CT scan. Our case

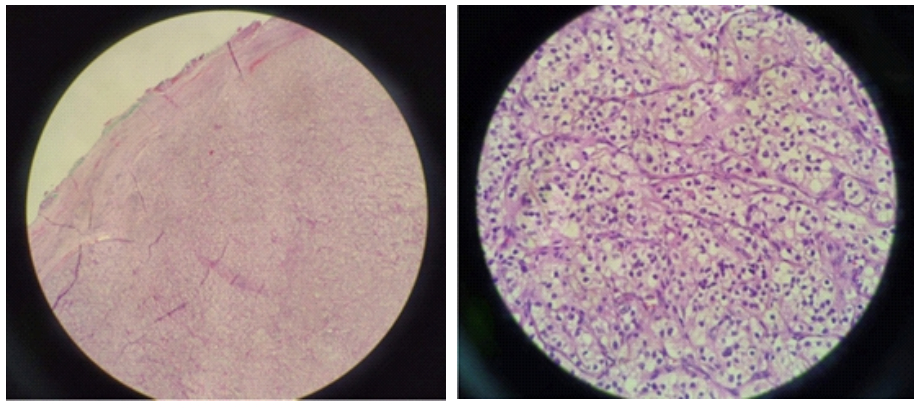

Figure 6: (a) Low-power magnification of gluteal mass, (b) high-power magnification of gluteal mass showing clear, lipid-rich cytoplasm, consistent with renal clear cell carcinoma

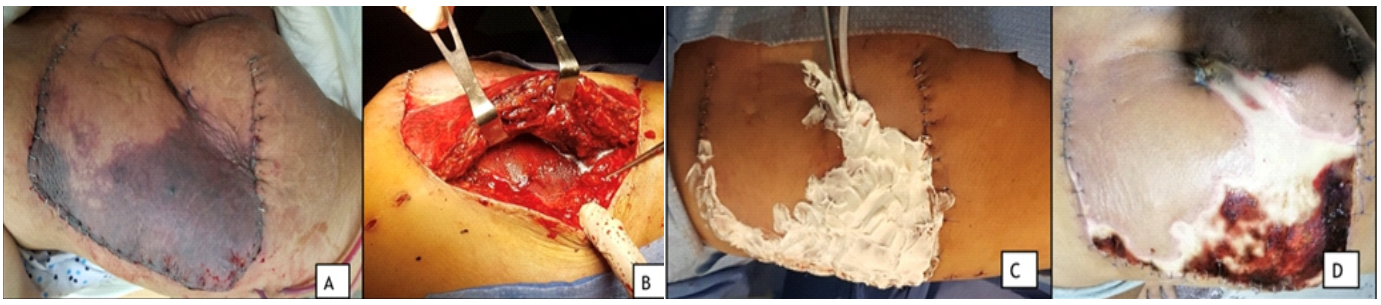

Figure 7: (a) Noted discoloration at the lateral aspect of the flap 5-day postoperatively, (b) debridement of the flap at 8 days post-buttockectomy, (c) wound care using silver sulfadiazine cream, (d) 1 month after debridement.

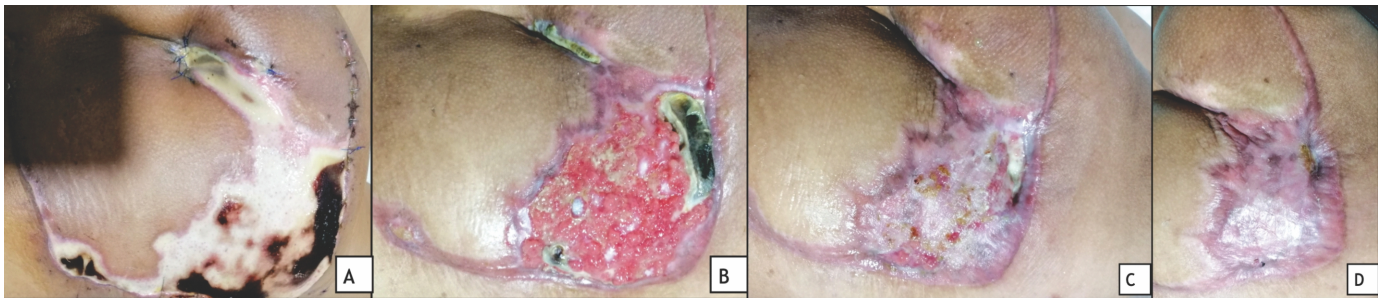

Figure 8: (a) Two months after debridement, (b) 3 months after debridement, thick whitish granulation removed, (c) 4 months post-debridement, (d) 5 months post-debridement, noted complete healing with hypertrophic scar.

falls similarly to the described subsets of patients in terms of age, histopathology findings. He initially presented with a painful, rapidly growing mass without recurrence of the primary tumor, similar to the literature group. They postulated that the cohort represent typical findings of RCC patients undergoing routine monitoring, whereas the literature group, consisting of case reports, describes unusual presentations of SMM [7]. Furthermore, the study identified that cases of SMMs in RCC may be underreported, as these may only be incidental findings [4].

Establishing a tissue diagnosis of a skeletal mass is important, as a new-onset benign tumor may have a different treatment approach compared to a metastatic lesion or a new primary malignant mass. An open or percutaneous needle biopsy may be necessary before treatment planning. In the case presented, this was deemed important, given a previous history of RCC, and a new growth located in an atypical location.

Imaging studies may also aid in accurate and timely diagnosis. In a study by Sakamoto et al. (2007), they described MRI findings that may be helpful in distinguishing metastatic RCC to skeletal muscles from other tumors. They usually present with regular borders, with hyperintensity in both T1- and T2-weighted images. In contrast, primary soft-tissue tumors usually present with iso or hypointense lesions on T1-weighted images. However, this study emphasized that doing MRI alone may only be beneficial in distinguishing between benign soft-tissue masses from malignant tumors, as metastatic RCC may resemble other sarcomas (clear cell, alveolar soft part) and that a tissue diagnosis is still recommended. These findings were also seen in another study [3] and added that other skeletal metastases typically present with iso or hypointense signals on T1-weighted images compared to the hyperintensity in RCC SMM. In our case, the presence of a hyperintense signal on T2, correlated with a hypointense appearance on T1, may mimic other SMMs, or even primary sarcomas. Hence, tissue diagnosis is still vital, with imaging as adjunct in pre-operative planning, as well as in checking for the presence of other metastatic lesions.

In CT scan, contrast is required because SMMs are very subtle on plain CT and may resemble normal surrounding skeletal muscle tissue. SMMs usually present with peripheral enhancement (83%), but may present either with homogenous or heterogeneous pattern, without predominance of one over the other [7]. PET scan may be of great value to evaluate presence of other asymptomatic metastatic lesions that are small or too deep.

In general, RCC is relatively resistant to chemotherapy. The mainstay of the treatment of RCC is nephrectomy followed by immunotherapy. Nephrectomy is useful in reducing tumor load, decreasing the tumor-derived factors and T-cell inhibitory factors. By doing nephrectomy for RCC alone, survival may be improved by 3–6 months [8]. In cases of Stage IV RCC with oligometastatic site, as in our case, the recommended primary treatment is nephrectomy combined with surgical metastectomy [9]. In a study by Russo et al., excision of solitary RCC metastasis was deemed useful for relatively young patients with solitary, non-central nervous system lesions detected more than 12 months after initial diagnosis, with a 5-year survival of 30% [10]. Factors identified as predictive of poor response to metastectomy include hypoalbuminemia, elevated lactate dehydrogenase levels, tumor Stage T3 and above, liver metastasis, and retroperitoneal or supradiaphragmatic lymph node involvement. Patients satisfying at least four of these factors were shown to not benefit from metastasectomy [10]. Based on these factors, our patient is a good candidate for wide excision of metastases.

Based on the existing evidence, radiotherapy is not yet established as part of the treatment

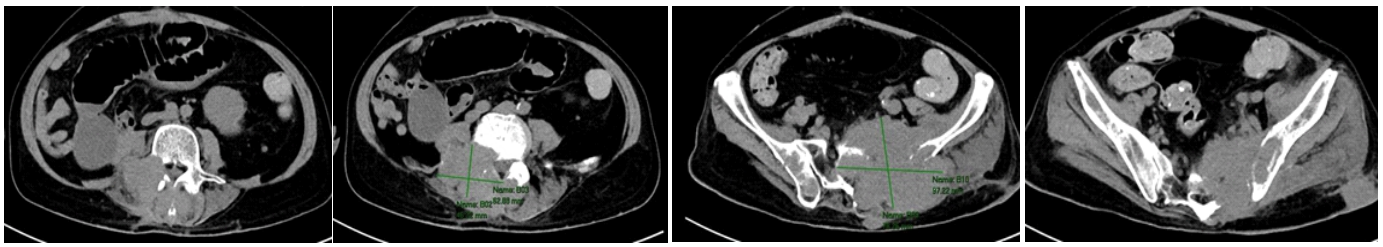

Figure 9: Computed tomography scan images at 1 year post-surgery, (a) noted recurrence of the right paraspinal mass at L4 (b) and L5 involving the lamina, spinous processes, and extending into the spinal canal, (c) recurrence of the mass on the left iliacus muscle extending to the left iliac wing, (d) and left gluteal muscles extending into the left sacral ala.

regimen for metastatic RCC. In a recent meta-analysis, post-nephrectomy radiotherapy reduced risk of local or regional recurrence significantly by 53% [11]. However, this did not translate to disease-free survival or overall survival. Stereotactic body radiotherapy is a new technique, utilizing short courses of intensive, but highly focused radiation delivered locally to metastatic lesions. It is associated with excellent local tumor control, as seen on PET scan as lack of tumor activity, or <20% expansion of tumor size on follow-up imaging [12]. For our case, this is the planned regimen after noting positive tumor margin on the volar aspect of the gluteal specimen. Ideally, this should have been done earlier on the post-operative course. However, due to the problems related to wound healing, planned radiotherapy was delayed until a satisfactory post-surgical site was achieved.

For follow-up of patients with metastatic RCC, regular history and physical examination every 6–16 weeks is recommended [9]. CT scan with contrast of the thorax and abdomen, as well as the previous metastatic site, is the most frequently used imaging modality [13]. MRI is also an acceptable alternative for patients with contraindication to IV contrast. There have been multiple conflicting guidelines with regard to imaging follow-up. However, it is recommended to do intensive imaging follow-up during the first 3 years. Based on the current guideline of the National Comprehensive Cancer Network, CT or MRI of the chest, abdomen, and pelvis is recommended at baseline, then follow-up imaging may be done in 6–16 weeks intervals. However, frequency of follow-up may be altered, depending on the discretion of the surgeon and clinical status of the patient. One of the most widely accepted guidelines is from the American College of Radiology, which recommends the following regimen for a Stage T4 RCC (such as in our case): Chest radiography every 6–12 months and abdominal CT with contrast every 3–6 months for the first 3 years then annually up to 5 years. No specific guideline was provided for patients presenting with atypical distal metastases.

Conclusion

We present a case of a 58-year-old male diagnosed with metastatic RCC to the left gluteal and right paraspinal muscles 3 years after initial diagnosis and nephrectomy. He underwent wide excision of the right paraspinal muscle and left buttockectomy and presented with signs of flap epidermolysis postoperatively within the 1st week. Biopsy is still the gold standard in diagnosis to distinguish if a skeletal muscle mass is benign or malignant, primary, or metastatic. Imaging studies are also important to aid in pre-operative planning and to check for other areas of metastases. In cases of oligometastases or solitary metastatic lesions, metastasectomy may improve survival. Post-surgical radiotherapy may be of benefit to prevent local metastatic recurrence. Furthermore, regular imaging follow-up is recommended for cases of metastatic RCC to monitor recurrence.

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