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Case Report
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Metastatic Prostate Cancer Presenting as a Rapidly Increasing Gluteal Muscle Mass at an Intramuscular Injection Site

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Abstract

Prostate cancer is the second commonest male cancer globally. However, diagnosis may be delayed or missed due to atypical presentations such as metastases to unusual sites. The axial skeleton, lymph nodes, and viscera are the common sites for prostate cancer metastasis with skeletal muscles being uncommonly affected, and until now there has been no report of metastasis to the gluteal muscles from the disease. We present the case of a 78-year-old man with no lower urinary tract symptoms who presented with a 2-year history of a right supra-gluteal mass at the site of an intramuscular injection hematoma/abscess that rapidly increased in size 5 months prior to presentation and an abnormal gait. CT and MRI scans were suggestive of a malignant mass (possibly a rhabdomyosarcoma) and enlarged multinodular prostate with bilateral lymphadenopathy. A biopsy of the gluteal mass confirmed metastatic adenocarcinoma with the colon or the prostate being possible primaries. His serum PSA was markedly elevated (3441 ng/ml) but his other tumor markers were normal. Prostate biopsies confirmed a Gleason 4+3=7 prostate cancer and ADT was commenced. He responded well and remains in good health 15 months into his treatment with a marked reduction in the size of his gluteal mass and a restoration of a normal gait. His serum PSA and Testosterone are presently 2.4 ng/ml and 0.3 mmol/L respectively.

Keywords: Prostate cancer; Atypical metastasis; Gluteal mass; Muscle injury; Cancer imaging

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Introduction

Carcinoma of the Prostate (CaP) is the second most frequent cancer and the fifth leading cause of cancer death among men in 2020 [1]. It is the most commonly diagnosed male cancer in the United States and Nigeria [2,3]. Interestingly, despite its frequency of occurrence, the biology of CaP is still relatively unclear as few risk factors for its development have been established and fewer still for its progression. Known risk factors for its occurrence are age, family history, black ancestry, and genetic mutations [4]. On the other hand, there is increasing evidence that obesity, smoking, and a high-fat diet are epigenetic factors that may increase the risk of progression to advanced disease [5]. Known clinical features of CaP include lower urinary tract symptoms, hematuria, and weight loss, but the disease may be asymptomatic until advanced stages [6]. CaP most commonly metastasizes to the axial skeleton, distant lymph nodes, abdominal viscera, and lungs [7]. Metastasis to other sites is uncommon, but there are reports in the literature of atypical deposits to the chest wall, brain, skin, eye, palate, penis [8-13]. Skeletal muscle metastases from cancers were previously reported as being rare from autopsy studies [14]. However recent reports from newer imaging studies (CT/PET/MRI scans) have shown that they occur more frequently than previously thought [15,16]. The relative rarity of cancer metastases to skeletal muscles as compared to other organ systems is thought to be due to the presence of several protective mechanisms against metastatic invasion which not only make skeletal muscles resistant to tumor invasion but also directly damage tumor cells that invade the muscle environment [17-21]. Skeletal muscle metastasis occurs most frequently from cancers of the lung, breast, gastrointestinal and urinary systems [15,16]. Metastases from different

cancers also seem to have a predilection for different muscle groups as cancers of the lung, breast, urothelium, and stomach were found more frequently in the extremities, extraocular muscles, iliopsoas, and gluteal muscles respectively [16]. However, we could not find any reports of prostate cancer metastasizing to the gluteal muscles in the literature. We present the case of an elderly male who presented with a supra-gluteal muscle mass at a site of an intramuscular injection that was later diagnosed as CaP metastases.

Case Summary

A 78-year-old male was referred to the Orthopedics and Trauma Outpatient Clinic with a 2-year history of painful right gluteal swelling and an abnormal gait. The swelling occurred after an intramuscular injection and had initially remained small but rapidly increased in size 5 months prior to presentation. He had no lower urinary tract symptoms or other symptoms suggestive of systemic disease and had no known medical co-morbidities. Examination revealed a 20 cm by 18 cm firm, non-tender, right supra-gluteal mass (Figure 1A), but no lower limb weakness or palpable peripheral lymph nodes. His abdominal and groin examination was normal. Digital rectal examination revealed an enlarged hard and irregular prostate with obliterated median grove and lateral sulci. CT and MRI scans done prior to presentation had shown a large ill-defined multilobulated heterogeneously enhancing mass involving the right group of gluteal muscles and iliacus with infiltration of the right iliac bone and sacroiliac joint and right iliac and para-aortic lymphadenopathy (Figures 2-4). Overall features were considered suggestive of an infiltrating rhabdomyosarcoma. Prostate MRI showed an enlarged prostate with multiple nodules and no extra-prostatic infiltration, but with bilateral pelvic lymphadenopathy (Figure 5, 6). Core needle biopsy of the gluteal mass was suggestive of a metastatic adenocarcinoma with the colon or prostate being likely sites of the primary cancer (Figure 7). A diagnosis of a metastatic gluteal mass possibly from a primary prostatic malignancy was made and serum tumor markers were ordered. He was then referred to the Urology Clinic for further management. At presentation at the Urology Clinic, his serum PSA was 3441 ng/ml, whilst his serum AFP and CEA were normal as were his chest and thoracolumbar spine radiographs. TRUS-guided prostate biopsy confirmed adenocarcinoma of the prostate gland,

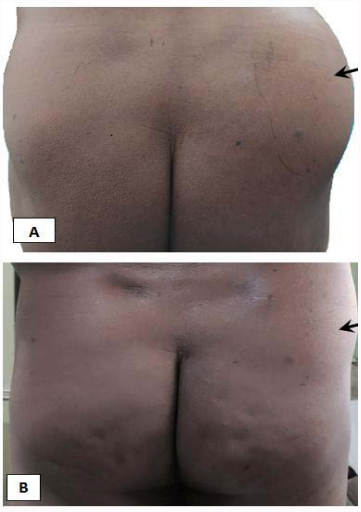

Figure 1: Clinical Photographs: **A**) Showing a large gluteal mass (arrowed) at presentation, **B**) Showing marked reduction in the size of the mass (arrowed) 15 months post-androgen deprivation treatment.

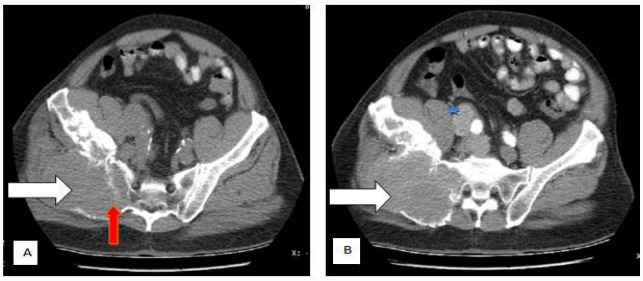

Figure 2: Computed Tomography Images: **A**) Pre-contrast axial CT, **B**) Post-contrast axial CT. A large ill-defined isodense to muscle mass (White arrow) is seen in the right gluteal region. It shows mild contrast enhancement. Bony infiltration of ipsilateral iliac bone and Sacroiliac joint (Red arrow). Enlarged iliac lymph node (Blue star).

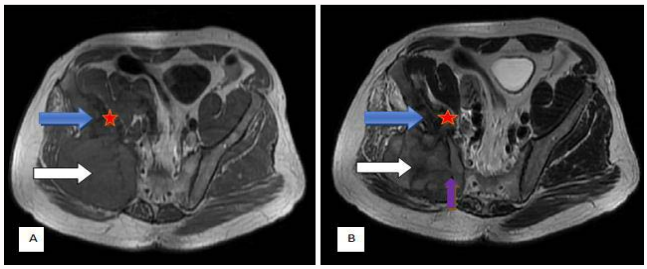

Figure 3: Magnetic Resonance Images: **A**) Pre-Gadolinium axial T1W. **B**) Axial T2W. A large T1W isointense (to muscle) and T2W heterogenous hyperintense mass (White arrow) in the right Gluteal group of muscles (involving the Maximus, Medius and Minimus muscles). Bony infiltration of the ipsilateral iliac bone (Blue arrow) and Sacroiliac joint (Purple arrow). The iliacus muscle (Red star) is also infiltrated.

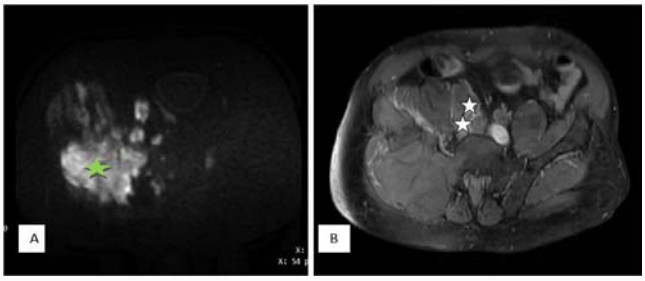

Figure 4: Magnetic Resonance Imaging: **A**) Diffusion Weighted Image (DWI). **B**) Post Gadolinium axial T1W. The mass shows moderate heterogenous restricted diffusion on DWI (Green star) and enhancement on Post-Gadolinium T1W image. Enlarged right iliac lymph nodes (White stars).

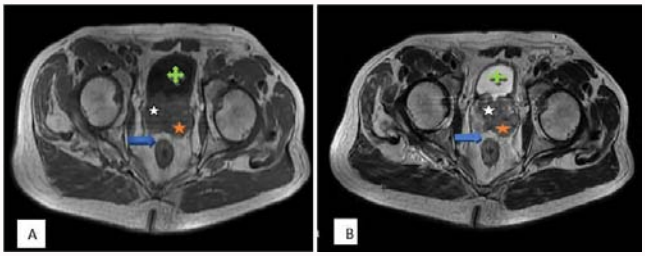

Figure 5: Magnetic Resonance Images of the Prostate gland. **A**) Axial T1W, **B**) Axial T2W. Enlarged Prostate gland (White star) with peripheral zone preponderance (Red star). An ill-defined T1W and T2W hypointense lesion is seen in the left half of the peripheral zone (Red star) with a capsular breach, it measures 2.6 cm in the widest diameter. The perirectal fat space (Blue arrow), urinary bladder (Green cross) and seminal vesicle (not shown) are preserved.

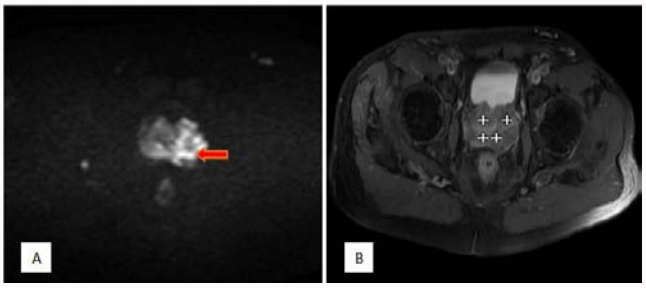

Figure 6: Magnetic Resonance Images of the Prostate gland: **A**) Diffusion Weighted Image (DWI), **B**) Axial PostGadolinium T1W. The peripheral zone lesion in the left half shows heterogenous restricted diffusion on DWI (Red arrow) and no significant enhancement on the Post-Gadolinium T1W image. Multiple mildly enhancing nodules (White cross) are seen in the central gland.

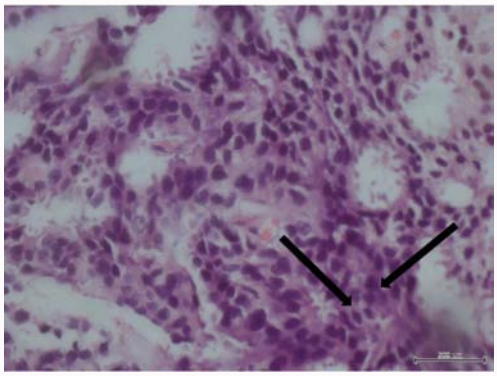

Figure 7: Photomicrograph of the gluteal biopsy showing a malignant epithelial neoplasm composed of moderately pleomorphic cells having large hyperchromatic nuclei and moderate cytoplasm. The tumor cells are disposed in glandular patterns. The malignant glands (arrows) are irregular and fused in areas. Overall features are consistent with a metastatic adenocarcinoma from the prostate. (Hematoxylin and Eosin, x400).

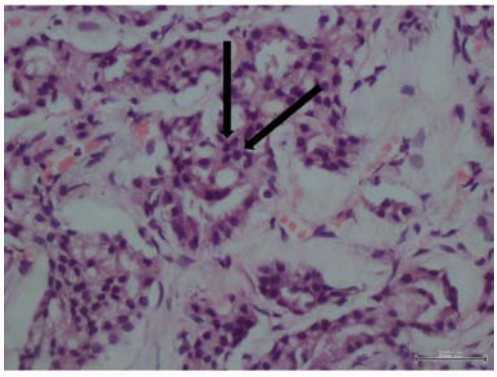

Figure 8: Photomicrograph of the needle biopsy of the prostate gland showing a malignant epithelial neoplasm composed of moderately pleomorphic cells disposed in cribriform glands (arrows). These features are consistent with acinar adenocarcinoma of the prostate, Gleason score 7 (4+3). (Haematoxylin and Eosin stains, x100).

Gleason score 4+3=7 with involvement of the right apex and left mid prostatic zones (Figure 8). A diagnosis of prostate cancer with gluteal muscle metastasis was made. His serum testosterone was 29.9 nmol/L and he was commenced on Androgen Deprivation Therapy (Bicalutamide 50 mg daily followed by 3-monthly Goserelin 10.8 mg) at the time of writing this report, he had received 4 doses of Goserelin, and his serum PSA and Testosterone are 2.4 ng/ml and 0.3 nmol/L respectively). He remains in good health 15 months after commencement of treatment with marked reduction of the glutealmass (Figure 1B) and he now walks with a normal gait.

Discussion

Despite the protective mechanisms which make skeletal muscle relatively resistant to invasion by cancer cells, metastases to these tissues do occur and are thought to develop through three pathophysiological pathways, *viz.* the arterial and venous routes, and *via* intramuscular aberrant lymph nodes [22-24]. These metastases are mostly solitary but may be multiple and have been described in several muscles. Although, of cancer metastases to the muscle, that to the gluteus is third in frequency, yet no case of prostate cancer metastasis to this muscle has been reported previously [16]. Magee and Rosenthal have reported that trauma may alter skeletal muscle physiology and increase their susceptibility to developing metastasis at the affected site [25]. The 8 cases they studied were all known cancer patients on chemotherapy who had significant trauma resulting in hematoma or muscle tears at which site metastases later occurred at a minimum interval of 16 months. They postulated that the trauma-induced hematomas and muscle tears breached the protective anti-cancer mechanisms in these muscles and this enabled circulating cancer cells to lodge at these injured sites. Importantly, none of the patients in their cohort had prostate cancer. This patient had had a small swelling following an intramuscular injection 24 months earlier which began to rapidly increase in size after 17 months and resulted in his presentation. We believe that this swelling was probably a hematoma or abscess which caused the breach in the intrinsic protective mechanism of the muscles, and postulate that, given his age and the final diagnosis, circulating CaP cells at the time of injury invaded the muscle at this site resulting in the development of the metastasis. Gluteal muscle prostate cancer metastases have a high chance of misdiagnosis as there has been no previous report of a case in the literature. It is noteworthy that the index case had no lower urinary tract symptoms or features that suggested advanced prostatic malignancy, and had been referred to the Orthopedic Surgeons with a presumed diagnosis of a sarcoma. In this regard, prostatic biopsies and the use of high-resolution imaging techniques like CT and MRI scans should be employed to determine the definitive diagnosis of a male with an unusual skeletal muscle mass. Indeed, this case was identified by the clinical features of the prostate, the findings on MRI, and the histology of the biopsies of the muscle mass and prostate. High-grade prostate cancers are more likely than low-grade cancers to metastasize (due to their aggressive phenotype) [26]. They are also more commonly associated with atypical metastases [8]. Metastatic CaP is also less responsive to treatment and therefore has higher mortality [26,27]. Interestingly, this patient has responded well to androgen deprivation treatment with a marked reduction in the size of the gluteal mass and a marked decline in his serum PSA. These observations are reassuring as they confirm the metastasis is of prostatic origin, and that the disease is of intermediate aggressive phenotype (in keeping with the Gleason score of 4+3=7) that may have exploited the breach in muscles defenses to metastasize to this previously unreported atypical site.

Conclusion

This maybe the first report of prostate cancer metastasizing to the gluteal muscles and it appears that trauma may have contributed to the development of metastasis at this unusual site. The case illustrates that prostate cancer can metastasize to any group of skeletal muscles

and highlights the importance of a high index of suspicion of unusual diagnoses while evaluating elderly men who present with lumps that suddenly appear or rapidly expand in size.

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