Gluteal lesions: imaging findings

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Learning objectives

Because the gluteal region consist of different tissue types (skin, subcutaneous and deep fat, blood vessels, anorectal canal, muscles, neural tissue and bones), many varied lesions can be encountered.

In this presentation, we aim to review the computed tomography (CT) and magnetic resonance imaging (MRI) findings of gluteal lesions on the basis of case examples.
Background

The imaging findings on CT and/or MRI in asymptomatic patients or in patients with pain, palpable lump or erythema in the gluteal region were evaluated.

The lesions located in or extending into the gluteal region in our patients:

- Gluteal arteriovenous malformation
- Superior gluteal artery aneurysm
- Hidradenitis suppurativa
- Abscess
- Perianal fistula
- Invasion of anal cancer
- Sebaceous cyst complicated with sinus
- Hematoma
- Lipoma
- Liposarcoma
- Dystrophic calcifications secondary to intramuscular injections
- Myositis ossificans
- Malignant mesenchymal tumor
- Ewing’s sarcoma
- Metastasis
- Lymph node metastasis
Findings and procedure details

Gluteal arteriovenous malformations (AVM) (Figure 1): AVM’s are congenital vascular lesions that arise secondary to a developmental defect in the vascular system in the 4-6th gestational weeks. There is a direct connection between the artery and the vein, but no capillary bed exists. AVM's contain tortuous dilated feeding arteries and draining veins. AVM's can cause cosmetic defects, and compression to the peripheral nerves leading to pain and functional disorders. Eventually, this abnormal hemodynamic cause steal phenomenon, venous hypertension and ischemic ulcers, dermatitis due to venous stasis and progress to gangrene, dangerous bleeding and cardiac insufficiency. Imaging studies play an important role in differential diagnosis. Angiography is the gold standard technique in precise diagnosis and also it is a very important tool in planning the therapy. MRI is especially valuable for evaluating the extent of the lesion and for detecting the relationship between the lesion and the adjacent anatomic structures.

Superior gluteal artery (SGA) aneurysm (Figure 2): Aneurysm of SGA is rare, and can be detected after pelvic trauma, fracture, penetrating injuries and iatrogenic causes (e.g., bone marrow biopsies). For this reason most of them are pseudoaneurysms. Apart from this, true aneurysms may arise secondary to atherosclerosis, connective tissue disorders (PAN, Ehlers-Danlos, etc), infections (septic emboli and bacterial endocarditis). Symptoms include gluteal pain, pulsatile mass, findings mimicking degenerative disk disease, sciatic nerve palsy, and gluteal compartment syndrome.

Hidradenitis suppurativa (HA) (Figure 3): HA is a chronic suppurative disease of the skin characterized with occlusion of the apocrine sweat glands. Common sites of occurrence include axilla, umbilicus, mammary, perineal, gluteal, inguinal regions where the regions rich in apocrine sweat glands. Usually, HA manifests by recurrent abscess, multiple sinus tracts, acute folliculitis, infection of contiguous glands and subcutaneous fatty tissue. Squamous cell carcinoma is rare but the most serious complication.

Gluteal abscesses (Figure 4): Abscesses are usually encountered in immunocompromised patients. Staphylococcus aureus, tuberculosis, Brucella, Salmonella can be identified in the gluteal region abscesses. Usually clinical history and physical examination are sufficient for abscess diagnosis, however with the help of cross sectional imaging methods like CT or MRI, the extension of the abscess can be evaluated easily. And also if necessary, percutaneous drainage can be made under CT guidance.

Perianal fistula (Figure 5): Fistula is defined as an abnormal connection between two structures or organs or between an organ and the surface of the body. Perianal fistula is a connection between anal canal and the skin of perineum. Because of its
significant morbidity, it is a serious problem. It predominantly affects young males. Pain and discharge are the most common presenting symptoms. Although most of the cases are idiopathic, fistulas occur secondary to Crohn's disease, tuberculosis, pelvic infections and malignancies, diverticulitis, traumatic labor, and radiotherapy. MRI is superior to other imaging modalities for detection of the type of the fistula, for evaluation of the anatomic relationship between the fistula and the adjacent structures, and for identification of secondary fistulas and abscess formations.

**Invasion of anal cancer (Figure 6):** Anal canal cancers account for 1.5% of all gastrointestinal tumors. Histologically, most of them (85%) are squamous cell type. Previous radiation, Crohn disease, chronic anal fistulas, etc are predisposing factors. Anal canal cancers are locally extensive lesions, so invasion of adjacent tissues may be seen on imaging methods.

**Sinus complicated with a sebaceous cyst (Figure 7):** Sebaceous cysts are subcutaneous lesions filled with oily material. They may become infected and form abscesses.

**Hematoma (Figure 8):** Hematoma in the gluteal region may occur due to blunt or penetrating-perforating traumas, antithrombotic therapy, coagulation disorders, and iatrogenic injuries. Clinically, patients present with palpable lump, pain, and skin discoloration. Massive hematomas may cause gluteal compartment syndrome. In chronic phase it can be confused with soft tissue tumors. MRI is a valuable method in differential diagnosis of complicated cases.

**Lipoma (Figure 9):** Lipoma is the most common mesenchymal soft tissue tumor in adults, composed of mature fat cells. It usually presents as a painless soft tissue mass, although larger ones can be painful when they compress peripheral nerves. Most of them are subcutaneous, but sometimes can be located deeply (intra-intermuscular). There is no need to therapy in asymptomatic patients. However in case of mobility restriction, pain and cosmetic problems, or if features suggesting malignancy (old age, large size, presence of thick septa, presence of nodular and/or globular nonadipose mass like areas, and decreased percentage of fat composition) exist, surgery must be planned.

**Liposarcoma (Figure 10):** Liposarcoma is the second most encountered soft tissue tumor in adults. It is frequently seen in males in 4th to 6th decades. It arises from multipotential primitive mesenchymal cells. Usually it occurs in the extremities, retroperitoneum and inguinal regions. One of the most prognostic factors is its anatomic location. Prognosis is better in superficial lesions than the lesions located deeply such as in retroperitoneum or in mediastinum.
Dystrophic calcifications secondary to intramuscular injections (Figure 11): These calcifications are seen very frequent on plain films and on CT's. They are also known as injection granulomas. It forms due to making the injection subcutaneously instead of intramuscular. Then on injection site, fat necrosis, scar formation and calcium deposition occurs. Its appearance and location are characteristic, and usually does not cause any diagnostic confusion. Differential diagnosis is made whether the lesion is calcified or not. If it is noncalcified soft tissue sarcoma, subcutaneous metastasis, and if calcified infections (e.g., cysticercosis), neoplasms (e.g., osteosarcoma, tumor necrosis), autoimmune diseases (e.g., dermatomyositis, scleroderma) and trauma (heterotopic ossification) must be considered in the differential diagnosis.

Myositis ossificans (MO) (Figure 12): MO is a nonneoplastic, heterotopic ossification of soft tissues (skeletal muscle, tendon, fascia, aponeuroses, etc). MO tends to be solitary, localized, and self-limited. In its pathogenesis, generally there is a trauma inducing the differentiation of mesenchymal cells into fibroblasts and osteoblasts. These cells make osteoid and deposits osteoid in the lesion moving towards centrally. As the lesion gets matured, lamellar bone forms in its periphery. At early phase, it may be confused with osteosarcoma. Most of them (approximately 80%) develop in thigh and arm. Besides it can occur in the intercostal space, pectoral muscle and gluteal region as well.

Malignant mesenchymal tumor (Figure 13): Pelvic malignant soft tissue tumors can infiltrate and extend into adjacent structures and can cause destruction in the bones.

Ewing's sarcoma (Figure 14): Ewing's sarcoma is the second most encountered primary malignant bone tumor in children and adolescents. The most common sites are pelvis and lower extremities. In 12.5% of the patients iliac bone is involved. In general, it is accompanied by a soft tissue component. Extraosseous extension is frequent, and the lesion is usually lytic. Prognosis is poor in tumors located in pelvic bones.

Metastasis (Figure 15): Although it is not frequent, metastatic disease as single or multiple nodules can be seen in the gluteal region.

Lymph node metastasis (Figures 16, 17): Lymphoproliferative disorders, and infectious-inflammatory and neoplastic pathologies of anorectal canal, perineum, gluteal tissues, can cause enlargement of gluteal lymph nodes.
Fig. 1: Gluteal arteriovenous malformation (AVM): On T1W (A) and contrast-enhanced fat suppressed T1W (B) MR images of a 20-year old male patient presented with palpable mass in the gluteal region demonstrate dilated and tortuous vascular structures extending to the skin compatible with AVM in the right gluteal region.

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**Fig. 2:** Oblique coronal reformated CT image shows aneurysms of internal iliac artery and superior gluteal artery (arrows).

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Fig. 3: On coronal STIR image, irregular tiny abscess formations, sinuses on the left rectoscutral and perineal region extending into the subcutaneous fat tissue and cellulitis are demonstrated (hidradenitis suppurativa).

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**Fig. 4:** On axial CT image of 56-year-old female patient with Hodgkin's disease who presented with pain and palpable mass in both gluteal regions, demonstrate fluid collections with enhanced wall and containing air compatible with abscesses in both gluteus maximus muscles.

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**Fig. 5:** On fat-suppressed T2W MR image, on the left, in the middle segment of the anal canal, a fistula tract which begins in the intersphincteric space and proceeds caudally and opens to the skin is shown.

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Fig. 6: On this contrast-enhanced fat suppressed axial MR image of a 60-year-old male patient with ulcer and discharge in the anal region, a lesion with irregular contour located in the posterior aspect of anal canal and extending to the skin surface is demonstrated (histopathology: squamous cell Ca).

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Fig. 7: On fat-suppressed T2W MR image (A), a hyperintense lesion confined to the subcutaneous fat tissue that covers the gluteus maximus muscle at the posterolateral aspect is demonstrated. After gadolinium injection (B), the lesion enhances peripherally. And a blind-ended sinus tract which is contiguous with the lesion and proceeds superomedially is also seen (arrow).

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Fig. 8: Axial CT image of a 53-year-old female patient after a car accident shows a displaced fracture in the posterior portion of the right iliac bone, and thickening and increased density in the gluteal muscles compatible with hematoma.

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**Fig. 9:** On axial CT image, a 2 cm nodular lesion with fat density in the gluteus maximus muscle is demonstrated (lipoma).

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Fig. 10: On axial T1W (A) and contrast-enhanced fat-suppressed T1W (B) MR images of a 52-year-old male patient presented with puffiness at his left leg, a fat containing mass filling the pelvis is demonstrated. The mass passes through the left sciatic foramen and extends to the gluteal muscles anteriorly.

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Fig. 11: On axial CT image subcutaneous calcifications are shown in both gluteal regions (dystrophic calcifications).

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**Fig. 12:** On axial (A) and coronal reformatted (B) CT images, massive calcifications in the gluteal muscle groups on the right extending to the obturator foramen are shown. This patient has a car accident history 2 years ago.

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**Fig. 13:** On axial T1W (A) and contrast-enhanced fat-suppressed T1W (B) MR images, a mass lesion with a large soft tissue component is demonstrated at the left iliac bone. The patient is a 34 year-old male and presented with buttock and leg pain. The iliac bone is almost entirely involved and the iliacus and the gluteus muscles are infiltrated by the mass lesion.
Fig. 14: On axial CT image of 17-year-old male patient with right buttock pain indicates a malignant lesion in the right iliac bone with massive soft tissue component. The iliac bone is destructed. The centrally necrotic mass extends medially into the pelvis, and infiltrates the gluteal muscles laterally.
Fig. 15: Axial CT images of 32 year-old male patient who was operated for malignant melanoma lesions on his face and right lower extremity indicate metastatic nodules in subcutaneous fat tissue on both right and left gluteal regions.

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Fig. 16: CT image of 70-year-old female patient with chronic lymphocytic leukemia demonstrates metastatic enlargement of the inferior gluteal lymph node on the left (white arrow). Also, lymphadenopathies exist in the external iliac region (blue arrow).

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**Fig. 17:** Axial CT image of 85-year-old male patient, who was operated for renal cell cancer, shows a 1 cm metastatic lymph node in the right gluteus maximus muscle planes.

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Conclusion

Pathologic entities in the gluteal region reflect the diversity of tissue types present. These pathologies can be infectious, inflammatory, traumatic, and benign or malignant neoplasms. Cross-sectional imaging methods, such as CT and MRI, are useful for defining the extent of disease and may show pathognomonic features, enabling a precise diagnosis.
References


