Sonography of buttock region

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Learning Objectives

This review describes the sonographic technique used, the relevant sonographic anatomy and the appearances on sonography of pathology either common to or unique to the buttock region.

Background

The buttock is a quite common site of pathology. Sonography is increasingly the first line investigation for soft tissue lesions of the buttock region, yet there is no review available detailing the sonographic features of common buttock pathologies.

Imaging Findings OR Procedure Details

Technique:

Most buttock lesions are best examined with the patient in a prone position though when examining tendons in and around the gluteal region the decubitus position can also be used as this allows the hamstring and gluteal tendons to be put on stretch when the ipsilateral hip is flexed. Patients with suspected sacroiliac pathology should be examined in both supine and prone positions to inspect both the anterior and posterior margins of the joint.

The choice of probe depends on body habitus. A high frequency linear probe (>10MHz) is used for superficial lesions while a lower frequency probe (5-10MHz) is used for deeper lesions. The buttock region, however, is particularly variable in depth. In general, it is best to use the highest resolution probe that can comfortably examine the area under investigation. For obese patients, a low frequency probe (such as a 3-5MHz curvilinear) may be needed to fully examination the gluteal tissues while in thin patients with sparse subcutaneous fat and poor muscle bulk, one can visualize all of the tissues down to the bone with a high frequency probe. Examining the contralateral normal buttock area is useful to familiarize oneself with normal anatomy.

The sonographic parameters of any focal mass or lesion should be determined on grayscale imaging initially supplemented with color Doppler sonography (4-7). Particularly for superficial lesions, color Doppler sonography should be performed with minimal skin pressure to maximize sensitivity. This 'pressure-free' status can be achieved by placing copious amount of sonographic gel between the skin and the transducer.
Anatomy:

Anatomically, the buttock region extends from the iliac crest proximally to the perineum distally (1). Anterolaterally, the buttock is bounded by a line extending from the greater trochanter through the anterior inferior and anterior superior iliac spines. At the upper part of the buttock region, there are symmetrical para-spinal skin depressions, known as the dimples of Venus which correspond to the posterior superior iliac spines. The natal cleft divides the lower half of the buttock. During sonography, the dermis is seen as a thin echogenic layer above the subcutaneous tissues (Fig. 1a). Normal subcutaneous tissue thickness of the buttock varies considerably. In obese patients, the subcutaneous layer can be 5-10cm centimeters thick while in thin patients it is only 1-2cm thick. When the subcutaneous tissues are thick, it is important not to confuse lesions even quite deep beneath the dermis as being intramuscular rather than subcutaneous in location. The likely diagnosis of any lesion depends heavily on the tissue layer in which it is contained. One should pay close attention to recognizing the appearances of subcutaneous fat, which is composed of hypoechoic variably-sized fat lobules separated by thin hyperechoic fibrous septae (Fig. 1a) (4). Subcutaneous fat is separated from the gluteal muscle by a thin echogenic investing fascia (Fig 1a). The gluteal muscles have a different sonographic appearance to subcutaneous fat being hypoechoic with either short echogenic lines or dots depending on whether the transducer is oriented parallel to or at right angles to the long axis of the muscle (4).

The main anatomical structures seen on sonography of the buttock are the gluteal muscles (gluteus maximus, medius and minimus), the attachment of the hamstring tendons, the ischial tuberosity, the sciatic nerve and the greater trochanter. The gluteal muscles are obliquely oriented, originating medially and proximally on the posterior cortex of the sacrum and iliac bones and inserting distally and laterally on the greater trochanter (gluteus medius and minimus) and iliotibial tract of fascia lata / linea aspera of upper femur (gluteus maximus). Gluteus maximus, which is the largest and most superficial gluteal muscle arises from the sacrum and medial aspect of the ilium and inserts as a thick tendinous lamina to the iliotibial tract of the fascia lata and linea aspera of the posterolateral aspect of the proximal femoral shaft (1). The gluteus medius (deeper) and gluteus minimus (deepest) arise from the posterior aspect of the ilium and insert into the greater trochanter (1) (Fig. 1c). The greater trochanter has four facets (anterior, lateral, superolateral and posterior) (8). The gluteus minimus tendon attaches to the anterior facet while the gluteus medius tendon attaches to the lateral and superolateral facets. The trochanteric bursa lies at the posterior facet. The hamstring tendons (biceps femoris, semitendinosus and semimembranosus tendons) attach proximally to the ischial tuberosity. The biceps femoris and semitendinosus tendons share a common tendon origin and arise the inferomedial aspect of the tuberosity while the semimembranosus tendon arises from a broader attachment on the superolateral aspect of the tuberosity (1) (Fig. 1b). The sacrotuberous ligament attaches to the medial aspect of the ischial tuberosity though is not readily appreciated on sonography (9). Thickening of this ligament is associated with pudendal nerve entrapment (9). The ischial bursa lies between the hamstring tendons and the gluteal muscle and is not visible when normal.
Close proximity between the ischial tuberosity and the lesser trochanter of the femur can lead to ischiofemoral impingement (Fig 1b) (10).

The sciatic nerve is derived from L4 to S3 nerve roots and enters the buttock from the pelvis via the greater sciatic notch, which is located 2 - 3cm inferolateral to the ischial tuberosity below the piriformis muscle (11). The piriformis muscle originates from anterior surface of the upper two sacral segments and inserts into the superomedial border of greater trochanter (11). The piriformis muscle lies between sacrum and the greater trochanter deep to the gluteus maximus muscle (12). The sciatic nerve may be compressed by hypertrophied or inflamed piriformis muscle in piriformis syndrome which is an uncommon cause of buttock pain and sciatica (12).

After exiting the greater sciatic notch, the sciatic nerve descends inferolateral to the ischial tuberosity (Fig. 1c). One can readily appreciate how inflammation around the ischial tuberosity can also affect the sciatic nerve. On transverse scanning, the sciatic nerve is an ovoid echogenic structure, 5-9mm wide, with punctated echoes; while on longitudinal scanning, it is tubular echogenic structure with parallel linear internal echoes (13). It needs to be followed distally or proximally to avoid confusion with the adjacent piriformis and obturator internus tendons. The sciatic nerve descends through the gluteal region deep to gluteus maximus to the posterior thigh region. The sciatic nerve overlies the distal edge of the femoral neck, the lesser trochanter and the mid-femoral shaft. These are useful landmarks since the sciatic nerve is often best identified distally in the thigh and traced proximally to the buttock.

The buttock is mainly supplied by superior and inferior gluteal arteries. The superior gluteal artery, the largest branch of the internal iliac artery, arises from the posterior division and exits the pelvis through the superior part of the great sciatic foramen above the piriformis. The inferior gluteal artery is the largest branch of the anterior division of the internal iliac artery and exits the pelvis through the inferior part of the great sciatic foramen along with the sciatic nerve.

The dorsal aspect of the sacrum, iliac bone and sacroiliac joint can be visualized (14). The anterior part of the SI joint is not as reliably seen as the posterior part of the joint. The sacroiliac joints are seen as 5mm wide clefts between the posterior cortices of the sacrum and iliac bones about 5cm lateral to the mid-line (15). The joint may be less than 5mm or apparently fused in osteoarthrosis and spondyloarthropathies. The posterior sacroiliac ligament stabilizes the sacroiliac joint and can be consistently see on sonography spanning between the posterior superior iliac spine and the third sacral segment (16). The posterior hip joint should be evaluated as hip joint pathology can present as buttock pain while paralabral cyst can present as buttock masses.

**Conclusion**
Nowadays, sonography is often the first line investigation for soft tissue lesions in the buttock region. This pictorial essay describes the anatomy of the buttock region and the typical sonographic appearances of lesions common to or peculiar to this region. Sonography is the investigation of choice for most lesions allowing a definitive diagnosis to be made in the majority and narrowing the differential diagnosis in the remaining cases. Sonographically-guided aspiration or biopsy is helpful in those lesions which still require a more definitive diagnosis.

**Personal Information**

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