Bipartitite Piriformis Giving Rise to Sciatic Nerve Entrapment

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Piriformis syndrome is a lesser-known condition that can cause pain in the buttocks, often accompanied by leg pain. It was first described in 1928 by Yeomen. The primary symptom is buttock pain, with or without leg pain, worsened by sitting or lower limb activity. Other common findings include pain in the buttocks extending from the sacrum to the greater trochanter, tenderness of the piriformis muscle during a rectal or pelvic examination, and worsening of symptoms with prolonged hip flexion, adduction, and internal rotation, in the absence of low back or hip issues. Additionally, leg length discrepancy, weak hip abductors, and pain during resisted hip abduction while sitting may also be present. Piriformis syndrome may be caused by pressure on the sciatic nerve by the piriformis muscle, and myofascial involvement of related muscles and lumbar facet syndromes may also be present.

A definitive diagnosis of piriformis syndrome is primarily based on clinical evaluation, as no conclusive diagnostic tests have been reported. In general, bone scans and electrodiagnostic studies are not helpful, although there have been a few isolated reports of their usefulness.

Bipartite piriformis syndrome is a rare variation of piriformis syndrome that can cause pain and other symptoms in the buttock and down the leg. In this condition, the piriformis muscle is divided into two parts, and the sciatic nerve passes between them, resulting in compression of the sciatic nerve and symptoms like those of classic

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K. M. Iyer (ed.), *Piriformis Syndrome*,
https://doi.org/10.1007/978-3-031-40736-9_12

piriformis syndrome. Diagnosing bipartite piriformis syndrome can be challenging and requires careful evaluation of imaging studies such as MRI or CT scans. Treatment options include conservative measures such as stretching, physical therapy, and anti-inflammatory medications, and in severe cases, injection therapy or surgical intervention may be necessary.

It is essential to note that bipartite piriformis syndrome is rare, and most cases are not associated with this anatomical variation. If you are experiencing buttock or leg pain symptoms or suspect that you have piriformis syndrome (Hopayian and Danielyan 2010; Pecina and Bojanic 2008; Lutz and Burkhard 2021).

1 Epidemiology

Entrapment of the sciatic nerve by the piriformis nowadays has become a common diagnosis due to the emergence of high- quality case studies and evidence showing a prevalence of anatomic variation between the piriformis and sciatic nerve (Figs. 1, 2, and 3).

The anatomical variations of the piriformis and sciatic nerve found were described following Beaton and Anton's classification. As we understand this classification, true bipartite piriformis falls in types B (Fig. 2), D & E of the above classification.

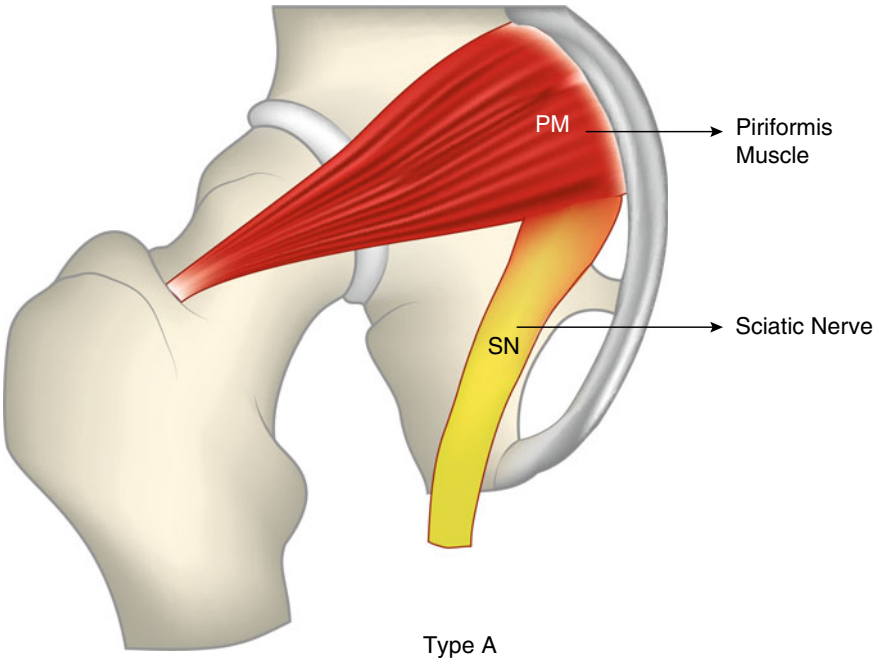


Fig. 1 Beaton and Anton's classification type A

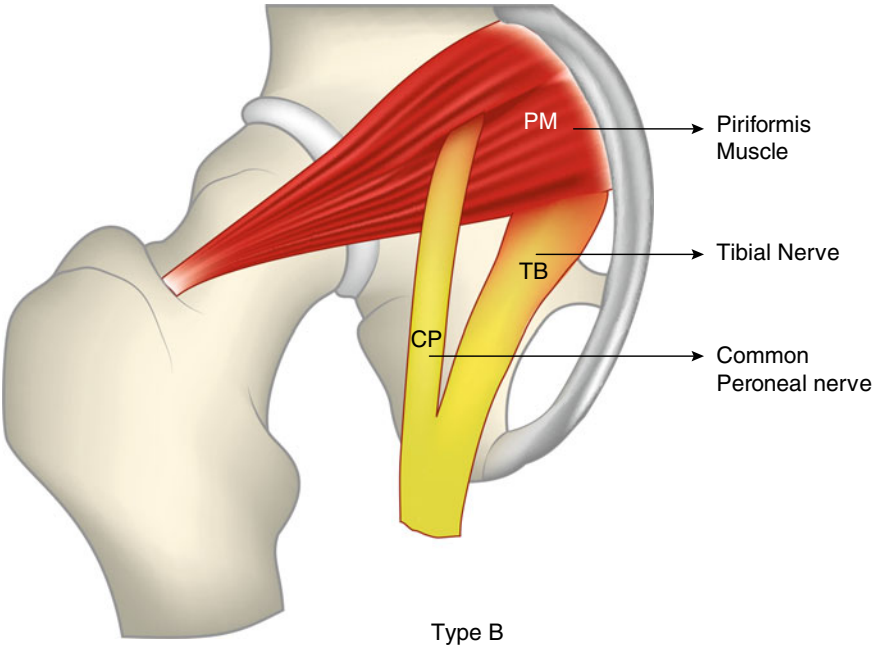


Fig. 2 Beaton and Anton's classification type B

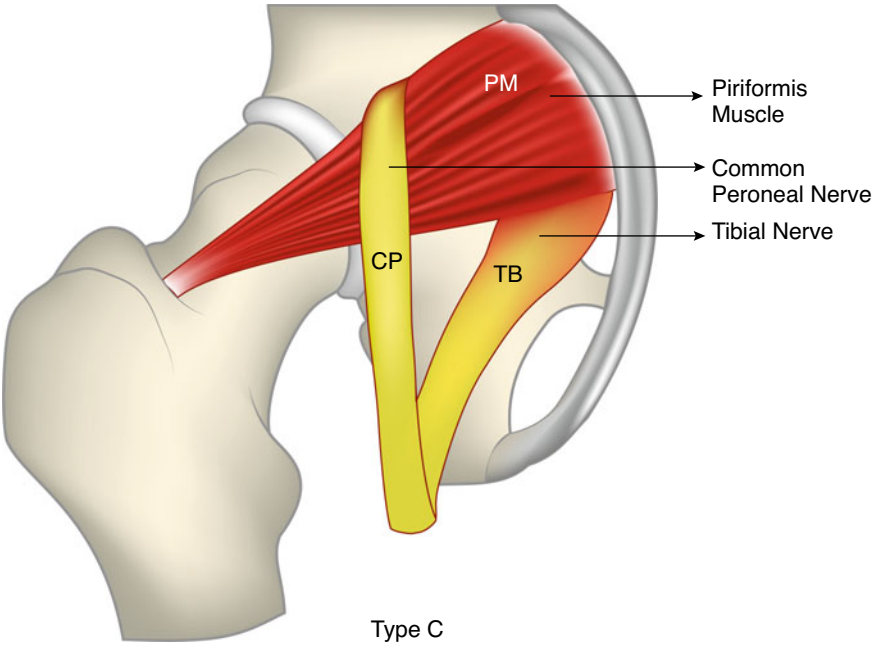


Fig. 3 Beaton and Anton's classification type C

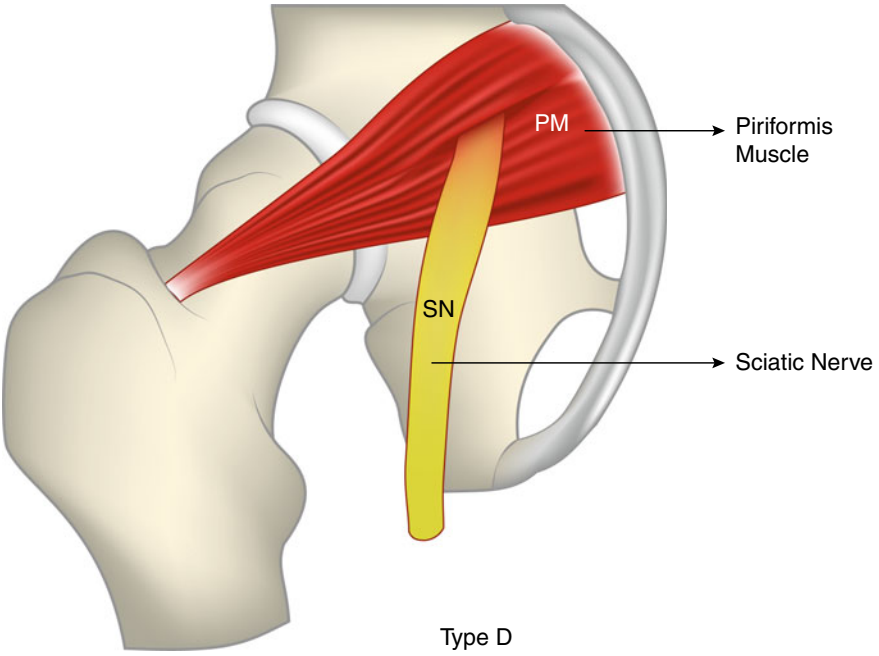


Fig. 4 Beaton and Anton's classification type D

No other classification singularly describes the bipartite piriformis alone, considering the prevalence of bipartite piriformis mentioned in studies using the classification mentioned above, states that type B which is the passage of one division of sciatic nerve through and the other division of sciatic nerve lying anteriorly to the bipartite piriformis muscle has around 8% prevalence with significantly higher prevalence in east Asia (24%) compared to Europe (9%), USA (4%) and Africa (3%). Type B is more prevalent in females than males due to the proximity of the sciatic nerve to the reproductive organs. Type D (Fig. 4) and E (Fig. 5) constitute ever lesser prevalence in the population (1%) (Fig. 6).

2 Clinical Presentation and Examination

The bipartite piriformis is an uncommon anatomical condition, so its existence does not cause any novel symptoms. Symptoms of piriformis syndrome and lumbar vertebra diseases are very similar, and differentiation between these is often tricky (Kosukegawa et al. 1976). All the findings corroborate the sciatic nerve entrapment picture like pain spreading from the buttocks through the sciatic territory radiating

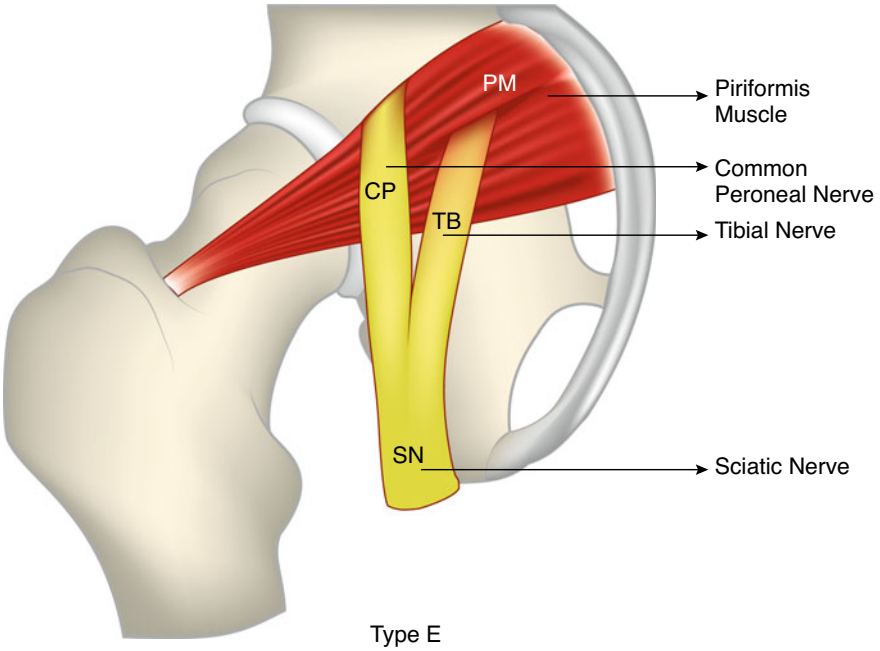


Fig. 5 Beaton and Anton's classification type E

down the limb. The intensity might vary along with some specific aggravating conditions that might or not be present. Aggravating conditions might be sitting on a hard surface or sitting cross- legged.

Localisation of the condition can be confirmed by elicitation of exact symptoms, i.e., radiating pain to the lower leg by pressure over the piriformis muscle and passive internal rotation of the hip inducing radiating pain to the lower leg Freiberg's sign (Freiberg and Vinke 1934) also Pace's test (Frost 1881) i.e., pain and weakness with resisted hip external rotation and abduction. The different manoeuvers aim to reproduce the pain experienced by the patient: buttock pain and sciatic tingling or numbness in the limb affected and accompanied in some cases by distal paresthesia (Kosukegawa et al. 1976). Other special tests that can be applied are Beatty's maneuver (Beatty 1994) and Fishman's FAIR test (Flexion—Adduction—Internal Rotation test) (Fishman et al. 2002). But a high degree of clinical suspicion is needed to diagnose the condition solely on special tests as none of these particular tests has been validated for specificity and sensitivity (Steiner et al. 1987). Pace's test and Freiberg's sign were reported to be present in only 65% of patients (Michel et al. 2013). A definitive diagnosis is often impossible because of the lack of an established imaging method for image diagnosis.

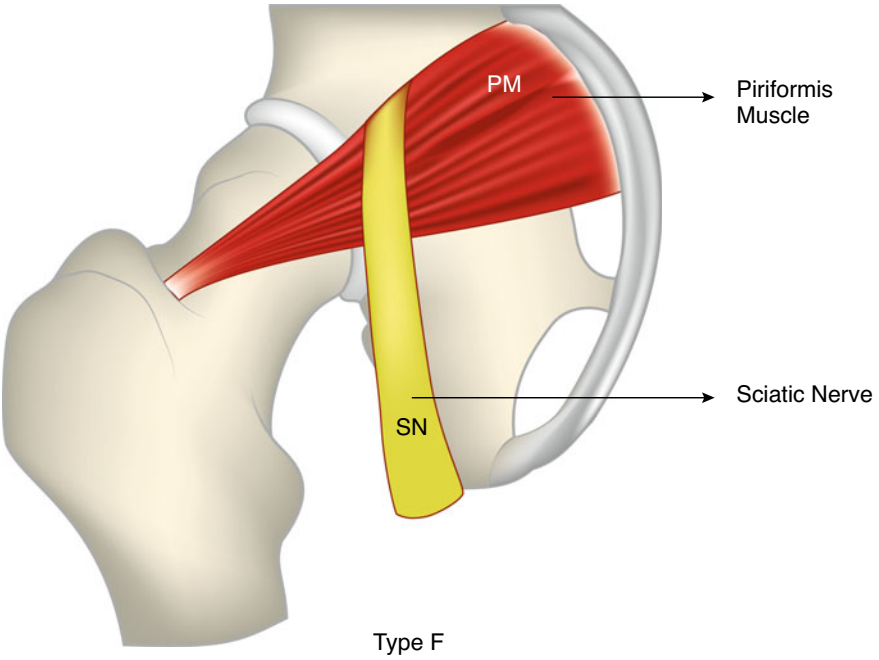


Fig. 6 Beaton and Anton's classification type F

3 Diagnosis

Sciatic nerve entrapment is an elusive clinical entity itself. Bipartite Piriformis is eventually an anatomical extraspinal cause of sciatic nerve entrapment. Its mere presence does not indicate sciatic nerve entrapment. As described in the earlier section, a high index of clinical suspicion is needed to determine the concerned condition, which means ruling out all the other causes that can mimic sciatic nerve entrapment. Systematic clinical assessment will generally lead to the correct diagnosis. Apart from that, when a differential of extraspinal sciatica is in play, imaging comes in handy. Dynamic scans can be beneficial in the clinical scenario. With the emergence of musculoskeletal USG usage in pain clinics or rehabilitation facilities, piriformis muscle anomalies can be easily demonstrated.

A definitive diagnosis is often impossible because of the need for an established imaging method for image diagnosis. Apart from musculoskeletal USG, Pelvic MRI (Fig. 7) and peri neurography of the sciatic nerve followed by CT is very useful for determining the anatomic association between the piriformis muscle and the sciatic nerve (Kosukegawa et al. 2006). There have been a few reports on the prediction of anatomic variation based on findings of hypertrophy of the piriformis muscle obtained by using pelvic CT and MRI (Pamela 1991; Ozaki et al. 1999; Paolo et al. 2001).

One can use the proposed algorithm by the authors to establish the condition.

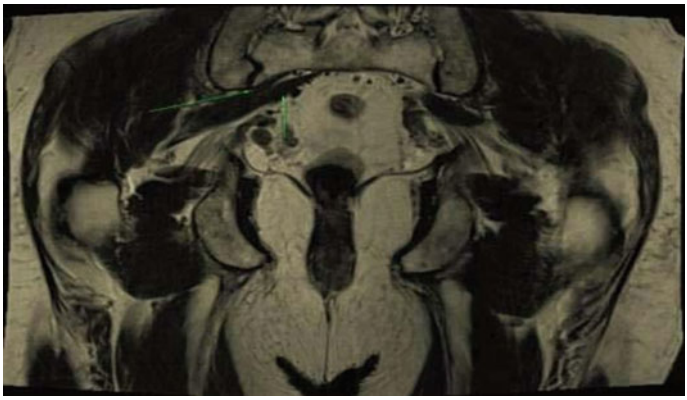


Fig. 7 Showing coronal section of Male pelvis bi partite piriformis muscle. The piriformis is identified with a green arrow. (Joshi M, Agrawal H, Sukhani P. Bipartite piriformis: a rare case of sciatic nerve entrapment. Int. J. Heal. Clin. Res. [Internet]. 2020 Nov.10];3(9):45–8.)

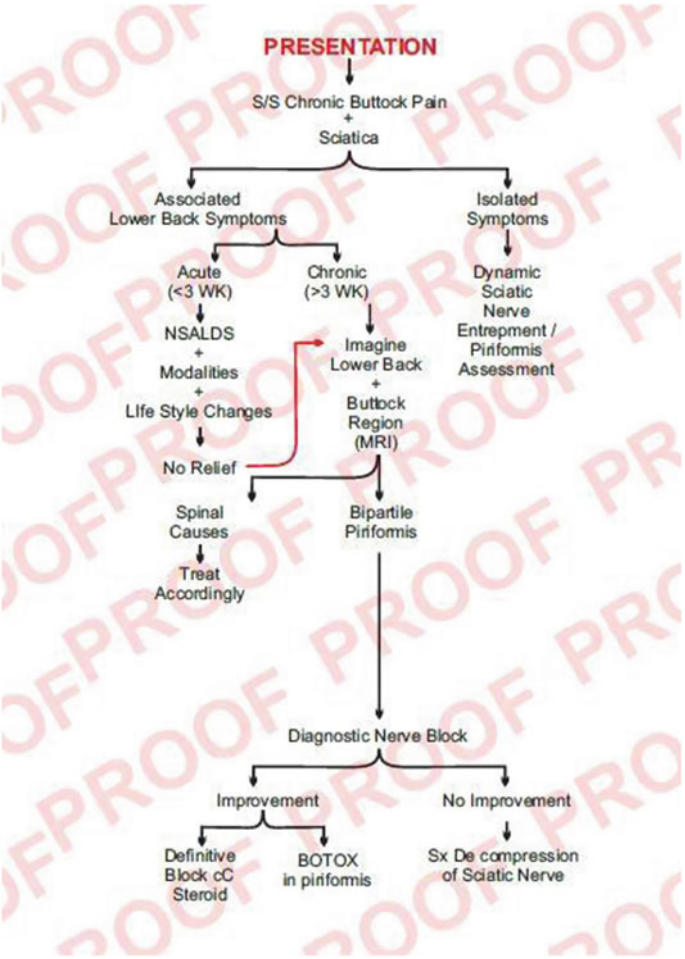
4 Differential Diagnosis

The symptoms of piriformis syndrome can be like those of other conditions, and a proper differential diagnosis is essential to ensure the appropriate treatment is administered. Here are some situations that may be considered in the differential diagnosis of piriformis syndrome, along with references for further information:

A. Deep gluteal syndrome: Obturator internus and Gemelli complex might also be potential causes of neural compression. Pain arising in the buttock and hamstring region can also indicate entrapment of the posterior cutaneous nerve of the thigh rather than the sciatic nerve alone (Filler et al. 2005).
B. Sciatic Notch Syndrome: Sciatic nerve entrapment in the ischial tunnel adjoining hamstring muscle attachment mimics the symptom of piriformis syndrome.
C. Wallet neuritis/Fat wallet Syndrome: Placement of the patient's wallet in the back pocket of their attire, precisely behind the piriformis muscle, has the potential to constrict the sciatic nerve on the same side (Siddiq et al. 2018).
D. Lumbar radiculopathy: This condition involves compression of the spinal nerves in the lower back, which can cause pain, numbness, and weakness in the buttock and legs. It can sometimes be difficult to distinguish from piriformis syndrome, but a thorough physical exam and diagnostic imaging can help differentiate between the two conditions (Maugars et al. 1996).
E. Sacroiliac joint dysfunction: Dysfunction of the sacroiliac joint, which connects the sacrum to the pelvis, can cause pain in the lower back, buttock, and leg. This condition may be considered in the differential diagnosis of piriformis syndrome (Bernard and Kirkaldy-Willis 1987).
F. Ischial bursitis: Inflammation of the ischial bursa, a fluid-filled sac near the sit bones in the buttock, can cause pain radiating down the leg and is sometimes mistaken for piriformis syndrome (Regan and Cohen 2010).

G. Spinal tumors: Although rare, tumors in the spine or surrounding tissues can compress the sciatic nerve, leading to symptoms resembling piriformis syndrome.
H. Hamstring muscle tear: A tear in one of the hamstring muscles can cause pain in the buttock region, similar to the pain experienced in piriformis syndrome.
I. Hamstring tendonitis: Hamstring tendonitis involves inflammation of the tendons at the back of the thigh, near the buttock region. It can cause pain and tenderness in the area, which may resemble the symptoms of piriformis syndrome.

5 Treatment Algorithm



6 Treatment

The disease must be approached conservatively in the early stages of the symptomatic bipartite piriformis, i.e., clinically sciatic nerve entrapment. The prescription of NSAIDs, dynamic stretching of the piriformis muscle, and modalities such as iontophoresis should be started. If unresponsive to conservative management, targeted intervention like USG-guided steroid injection or Botox can be taken up (Cass 2015).

For recalcitrant cases piriformis tenotomy and decompression of the sciatic nerve can be done (Cass 2015; Dezawa et al. 2003). Case reports have been published where arthroscopically release of piriformis muscle was done for definitive treatment (Pierce et al. 2017) as well case reports were published for resection of the anterior and posterior lobe of piriformis muscle for type D Beaton's variant (Kosukegawa et al. 1976).

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