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REVIEW

BUTTOCK CLAUDICATION, AN UNCOMMON FORM OF INTERMITTENT CLAUDICATION: A NARRATIVE REVIEW OF ITS REHABILITATIVE MANAGEMENT

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ABSTRACT

Background: Buttock claudication is an uncommon but disabling manifestation of peripheral arterial disease, caused by stenosis or occlusion of the internal iliac artery. It results in exertional buttock pain and impaired ambulation. Diagnosis is often challenging, since symptoms overlap with orthopedic and neurological conditions, frequently delaying appropriate management. While revascularization remains the standard of care, conservative treatments are required when surgical management is not feasible or indicated.

Objective: To review and synthesize the available evidence on conservative treatment approaches for buttock claudication, with a focus on rehabilitative strategies.

Methods: A narrative review of the literature was conducted. Studies investigating non-surgical treatment of buttock claudication were identified, with emphasis on exercise therapy, pharmacological interventions, and risk factor modification.

Results: The review identified a critical paucity of evidence specific to conservative management of buttock claudication. No published studies explicitly investigated rehabilitative protocols or structured exercise interventions in this population. Available data are limited to extrapolations from distal peripheral arterial disease, where supervised exercise therapy, cardiovascular risk factor modification, and pharmacological optimization (e.g., antiplatelet agents, statins, vasodilators) have demonstrated efficacy. Based on these findings, a preliminary conceptual framework for conservative care in buttock claudication is proposed.

Conclusion: Evidence supporting conservative treatment of buttock claudication is virtually absent. Dedicated clinical studies are urgently needed to establish and validate rehabilitation-oriented protocols and optimize non-invasive management strategies for this condition.

KEYWORDS

Buttock, claudication, peripheral arterial disease, rehabilitation

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INTRODUCTION

Peripheral artery disease (PAD), a progressive condition driven primarily by atherosclerosis, is characterized by impaired arterial perfusion to the lower extremities. Its cardinal manifestation is intermittent claudication (IC), an ischemic muscle pain that occurs during physical activity when metabolic demand outstrips the compromised arterial oxygen supply[1]. Typically, patients can walk a certain distance before pain forces them to rest; once the pain diminishes, they can walk a comparable distance again. Numbness, tingling, tightness, or fatigue are also commonly experienced. All these symptoms have an aching quality that intensifies with continued physical activity[2]. While IC most commonly affects the calf muscles, its presentation in more proximal regions poses distinct diagnostic challenges[3]. A distinct and often under-recognized manifestation is buttock claudication (BC), which results from insufficient perfusion of the gluteal musculature[4]. The underlying pathophysiology is typically stenotic or occlusive disease within the aortoiliac segment, specifically compromising the internal iliac artery and its main branches, such as the superior and inferior gluteal arteries[5–7] *(Fig. 1)*.

The clinical severity of BC can range from mild exertional discomfort to debilitating pain, dictated by the extent of the occlusive burden and the adequacy of collateral circulation[8]. This condition is often associated with other signs of severe aortoiliac disease, such as thigh or calf claudication and vasculogenic erectile dysfunction, depending on the location and severity of the arterial stenosis[7,9] *(Fig. 2)*. Patients with this condition often seek the specialist's attention because pain and the progressive reduction in the ability to walk significantly impair their quality of life[9]. Since these symptoms can resemble common musculoskeletal disorders, patients often first consult specialists such as orthopedists, physiatrists, neurologists, or rheumatologists instead of vascular surgeons. Therefore, a high index of suspicion and knowledge in the differential diagnosis of BC are essential for the non-vascular specialist.

Differentiating vascular from neurogenic claudication is paramount. Neurogenic claudication, which originates from lumbar spinal stenosis (LSS), often presents with similar exertional pain involving the buttock, thigh, and leg, with a marked postural dependence. Symptoms are typically exacerbated by ambulation or lumbar extension and alleviated by sitting or forward flexion, a presentation often referred to as the "shopping cart sign"[10]. In contrast to vascular claudication, neurogenic claudication is not associated with impaired peripheral pulses and typically exhibits a fluctuating course over time, with variable walking distances[10]. Lumbar magnetic resonance imaging (MRI) or computed tomography (CT) is the preferred diagnostic modality for documenting canal or lateral recess narrowing, while electrodiagnostic studies may clarify nerve root involvement. Another less common cause of buttock pain includes non-discogenic and extrapelvic entrapment of the sciatic nerve, such as deep gluteal syndrome (GDS). The clinical presentation is characterized by buttock pain, often with radiation to the posterior thigh, which is typically exacerbated by prolonged sitting or specific hip movements but not strongly related to ambulation[11]. This syndrome encompasses several subtypes, including piriformis syndrome, ischiofemoral impingement, and proximal hamstring syndrome[12]. Diagnosis is primarily clinical, guided by provocative maneuvers like the FAIR (flexion, adduction, internal rotation) test, and may be supported by pelvic MRI to identify muscle pathology or structural anomalies. A cornerstone of the diagnostic algorithm is the use of image-guided injections; symptomatic relief following the administration of a local anesthetic to the suspected site of entrapment serves as a powerful diagnostic confirmation (criteria *ex adiuvantibus*)[11,12]. Additionally, buttock pain represents a common symptom that may originate from orthopedic conditions affecting

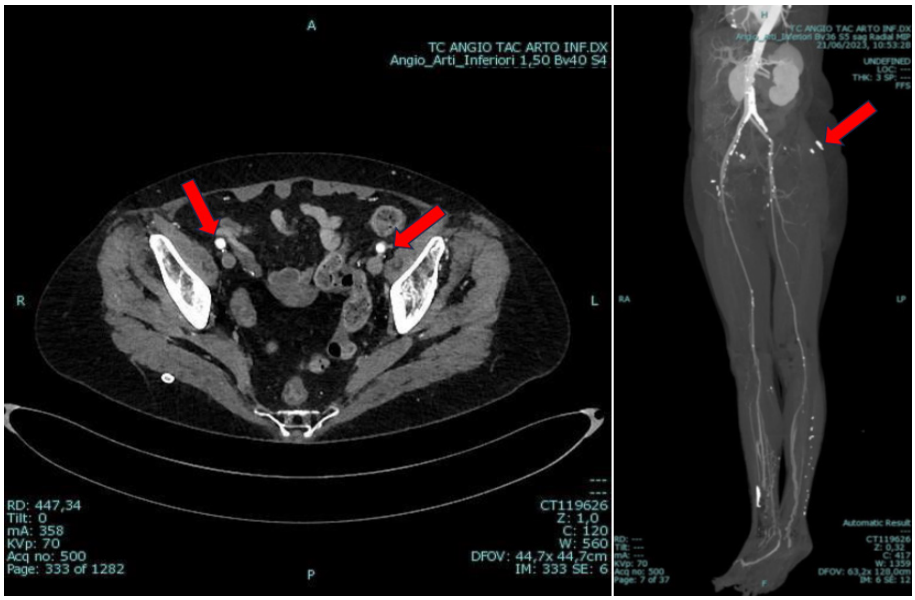


Figure 1. *Lower limb computed tomography angiography (CTA). Left: occlusion of both hypogastric arteries in the axial plane; right: occlusion of the left hypogastric artery in the sagittal plane.*

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the hip and pelvis[10-12] and myofascial disorders[13]. An overview of the principal differential diagnoses for buttock pain and claudication is presented in *Table 1*. Regarding treatment options, while endovascular revascularization is the established first-line treatment for hemodynamically significant buttock claudication due to its favorable risk-benefit profile[5-8], conservative management remains essential for patients who are not surgical candidates. A significant disparity exists, however, in the evidence supporting such approaches. Whereas structured exercise therapy is a cornerstone of management for intermittent claudication affecting the lower leg[1,2,14], similar evidence for buttock claudication is conspicuously absent. Our narrative review of the topic confirms this critical void in the literature, revealing that there is almost no dedicated research on rehabilitative strategies. Therefore, there is a compelling need for the musculoskeletal and rehabilitation communities to engage with this diagnostic and therapeutic challenge and develop evidence-based conservative management protocols.

MATERIAL AND METHODS

Search strategy

The study adheres to the SANRA criteria (Scale for the Assessment of Narrative Review Articles) guidelines[15]. A comprehensive literature search was conducted to identify relevant studies addressing conservative treatment approaches for buttock claudication, including both pharmacological and physiotherapeutic interventions. The search was conducted across multiple electronic databases, including PubMed, Scopus, and Web of Science, which cover articles published in English within the last 20 years. The search terms included: ("buttock claudication" OR "gluteal claudication") AND ("conservative treatment" OR "exercise therapy" OR "physical therapy" OR "supervised exercise" OR "physiotherapy"). Boolean operators and Medical Subject Headings (MeSH) were applied to optimize sensitivity and specificity. Additional articles were identified through reference lists of key studies and relevant reviews. Two authors screened titles and abstracts for relevance (CM, CC), and then reviewed the full-text articles to extract information about conservative management.

RESULTS

We identified four studies relevant to our research question *(Table 2)*. Cochrane reviews by Hageman et al.[16] and Jansen et al.[17] focused on exercise therapy for managing PAD, specifically for IC, supporting a similar approach for the BC subtype. One study examined the effect of self-directed walking exercise on reducing functional decline in PAD, which may suggest a similar benefit in BC[18]. They found that patients who walk for exercise three or more times weekly experience less annual functional decline than those who walk less often, especially among patients with issues in their legs or buttocks while walking. One case report described how a nonrevascularizable buttock claudication case improved with Sildenafil[19].

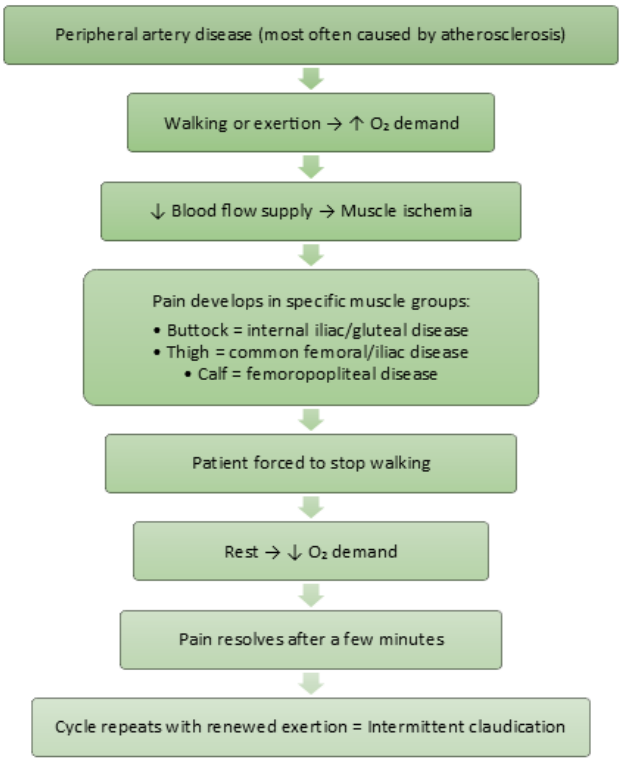


Figure 2. *Pathophysiology and clinical correlates of peripheral artery disease.*

DISCUSSION

Claudication is the primary clinical indicator of PAD, often leading patients to seek evaluation from musculoskeletal specialists. Buttock claudication, though an infrequent manifestation, is a crucial diagnostic consideration in this patient population. The main clinical challenge is its potential to be misdiagnosed as an orthopedic or spinal condition. Early diagnosis and appropriate management are crucial for improving outcomes, enhancing quality of life, preventing complications, and reducing the costs associated with public health services, as is the case for most time-dependent chronic diseases[20]. Vice versa, misclassification leads to fruitless operations or missed revascularization. In the case reported by Shields et al.[21], a patient's "claudication" was initially treated as LSS until iliac stenting alleviated her symptoms, highlighting how vascular and neurogenic patterns can overlap and mimic each other. For non-surgical candidates, conservative management is paramount. Treatment for BC aims to improve blood flow to the gluteal muscles and alleviate symptoms. In clinical practice, endovascular revascularization is often considered a favorable first-line intervention due to its immediate effectiveness and relatively low complication rates[22,23]. However, some patients may not experience improvement in their symptoms or may not be candidates for the surgical approach, so conservative treatment should be offered. As for PAD, the treatment of BC often involves multiple components designed to reduce the

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Condition	Symptoms/key features	Common pitfalls	How to avoid mistakes (clinical and imaging)
Vascular claudication (peripheral arterial disease)	- Buttock, hip, thigh, calf pain with walking (distance-limited, reproducible) - Relieved quickly by rest (not posture) - May have cold limbs, cramps	Misdiagnosed as spinal stenosis or hip disease if ABI is normal at rest; proximal ischemia may be missed	- Vascular exam: palpate pulses, check bruits - ABI (<0.9 = PAD), exercise ABI/Ex-$TcPO_2$ for proximal disease - 6MWT to reproduce symptoms - Duplex Doppler, CT/MRI angiography to confirm stenosis - *Ex adiuvantibus*: relief after stenting supports the vascular cause
Neurogenic claudication (lumbar spinal stenosis)	- Low back, buttock, thigh, calf pain with standing/walking - Worse with lumbar extension, relieved by sitting/forward flexion - Possible numbness/weakness	Mistaken for vascular claudication; unnecessary vascular workup or delayed spine diagnosis	- Posture-dependent history is key - Normal pulses (differentiates from vascular) - MRI/CT of the lumbar spine shows canal narrowing - Electrodiagnostics if root involvement is suspected - *Ex adiuvantibus*: relief after decompression supports neurogenic
Deep gluteal syndrome (piriformis, ischiofemoral, hamstring entrapments)	- Deep buttock pain, radiating to the thigh (sciatica-like) - Worse with sitting, hip flexion, internal rotation - Tenderness on palpation of gluteal landmarks - Usually unilateral	Misdiagnosed as lumbar radiculopathy or vascular disease; imaging is often normal	- Careful buttock palpation (ischial tuberosity, greater trochanter, piriformis) - Provocative tests: FAIR, seated piriformis stretch, ischiofemoral impingement test - Diagnostic local injections - MRI of the pelvis for nerve entrapment or variant anatomy - *Ex adiuvantibus*: improvement after targeted injection supports DGS
Hip osteoarthritis/ femoroacetabular impingement	- Groin, buttock, thigh pain - Stiffness, limited ROM - Pain with activity, relieved by rest	Mistaken for DGS or lumbar disease	- Hip exam: limited ROM, positive impingement tests (FADIR) - X-ray/MRI of the hip shows joint changes - *Ex adiuvantibus*: relief after intra-articular hip injection
Sacroiliac joint dysfunction	- Buttock pain near PSIS, may radiate to thigh - Worse with prolonged sitting or single-leg loading	Mistaken for DGS or lumbar pathology	- Provocative sacroiliac joint maneuvers (Gaenslen, FABER, compression test) - Exclude lumbar/vascular causes with MRI/ABI - *Ex adiuvantibus*: diagnostic sacroiliac joint injection
Coccygeal syndrome (coccydynia)	- Pain localized to the coccyx, worse with sitting - Trauma history is common	Misattributed to lumbosacral radiculopathy	- Direct palpation reproduces pain - X-ray of the coccyx may show fracture/misalignment - *Ex adiuvantibus*: relief after coccygeal injection supports diagnosis
Myofascial pain syndromes	- Localized buttock tenderness, trigger points - Referred pain patterns mimic radiculopathy	Mistaken for nerve entrapments	- Careful palpation to elicit trigger points - Exclude radicular/vascular by imaging/ABI - *Ex adiuvantibus*: relief with trigger point injection
Thoracolumbar fascia dysfunction	- Pain in buttock, lower back, possibly extending to upper back - Related to dysfunctional force transmission	Misinterpreted as isolated muscle injury	- Consider in chronic, multi-regional pain - Functional testing and fascial release may help - *Ex adiuvantibus*: relief with fascial/manual therapy supports role
Referred intra-abdominal and pelvic causes	- Buttock or pelvic pain plus systemic genitourinary, gastrointestinal, or gynecologic symptoms	Overlooked if focus only on the spine/hip	- Careful systemic history - Pelvic/abdominal imaging as indicated

Table 1. *Representative differential diagnoses of buttock pain and claudication.*

Abbreviations: ABI, akle–brachial index; Ex-$TcPO_2$, exercise transcutaneous oxygen pressure measurement; 6MWT, 6-minute walk test; CT, computed tomography; MRI, magnetic resonance imaging; DGS, deep gluteal syndrome; FAIR, flexion, adduction, internal rotation in side-lying test; FADIR, flexion, adduction, internal rotation test; FABER, flexion, abduction, external rotation; PSIS, posterior superior iliac spine.

risk of future cardiovascular events and related mortality while also alleviating claudication symptoms[24,25]. Medical management typically includes risk factor modification (such as smoking cessation, blood pressure control, lipid management, and diabetes management), antiplatelet therapy, and, in some cases, vasodilators like Cilostazol and Sildenafil[25,26]. Cilostazol inhibits platelet aggregation and increases blood flow, thus improving oxygen delivery to the muscles. Several randomized controlled trials have demonstrated its effectiveness in improving walking capacity in patients with intermittent claudication; however, they did not explicitly address BC[27]. A particularly interesting finding is the potential benefit of Sildenafil, a phosphodiesterase inhibitor commonly used to treat erectile dysfunction, in improving walking distance in a patient with nonrevascularizable BC[19]. Sildenafil's mechanism of action involves increasing blood flow by relaxing smooth muscles in the blood vessels. While

Study	Focus/intervention	Condition	Key findings	Relevance to BC
Hageman et al., 2018[16]	SET vs. home exercise vs advice	PAD/IC	Supervised exercise superior to home or advice-only programs	Suggests structured rehab is preferable in BC
Jansen et al., 2020[17]	Exercise training modes	PAD/IC	Walking and resistance training improve symptoms and functional capacity	Conceptually applicable to BC
McDermott et al., 2006[18]	Walking and performance in PAD	Elderly with IC/BC	Higher walking activity correlates with slower functional decline	Encourages walking-based rehab in BC
Omarjee et al., 2017[19]	Sildenafil therapy	Non revascularizable BC case	Improved walking distance in a BC patient	Rare pharmacological case directly on BC

Table 2. *Summary of literature review findings on buttock claudication and rehabilitation.*

Abbreviations: PAD, peripheral arterial disease; IC, intermittent claudication; BC, buttock claudication; SET, supervised exercise therapy.

the initial observation is promising, further research is crucial to confirm these findings and to establish the long-term efficacy and safety of Sildenafil for this indication. Thermotherapy has also shown promise in improving leg blood flow and reducing blood pressure in patients with PAD, potentially providing additional symptomatic relief even in patients with BC[28].

Concerning rehabilitation, while managing IC in PAD through exercise therapy has gained attention due to its potential benefits in improving muscle strength and overall function, the knowledge in managing BC is scant[14,16,17]. In the literature review we conducted, no article explicitly focused on the rehabilitative treatment of BC, indicating a lack of knowledge and attention to the issue. However, considering the evidence supporting exercise therapy in treating claudication in PAD, a rehabilitation approach can be recommended.

Supervised exercise therapy (SET) is widely recommended as a first-line treatment for intermittent claudication[16,17,22,29,30]. Studies demonstrate that SET can significantly improve maximal walking distance and pain-free walking time, as well as enhance muscle mitochondrial capacity[17,31]. The positive effects extend beyond the purely physical realm, impacting quality of life and potentially reducing the need for more invasive interventions[26]. Supervised programs often include a structured exercise plan to meet patients' needs and capabilities. This encompasses gradual increases in walking intensity and duration, along with education on proper walking techniques and pain management strategies[16]. Specifically, the programs generally consist of a systematic regimen of walking until claudication symptoms arise, followed by rest periods, repeated over several weeks. In summary, the approach involves performing interval walking training, which consists of alternating between walking and resting, followed by another walking session. The duration of exercise should be at least 30-45 minutes per session, three times a week, for at least 12 weeks[32]. While interval walking is the suggested exercise mode for claudication, many patients with IC are elderly and may have other health issues that make walking painful or even unfeasible. Thus, in addition to walking, alternative modes of SET, such as cycling, upper-extremity cycle ergometer exercise, and progressive resistance training, have emerged as promising options. Specifically, the latter approach seems to facilitate the development of a compensatory collateral circle, enhance strength and muscle mass, and improve connective tissue strength, as improvements in leg muscle function are often accompanied by improvements in walking ability[19]. Beyond the effectiveness of SET, factors like cost, transportation challenges, and a limited number of available programs hinder access to these valuable resource interventions[22]. This disparity in access underscores the need for alternative strategies to expand the reach of rehabilitation services. Home-based walking programs can provide a more accessible and cost-effective approach, though they may not achieve the same level of improvement as their supervised counterparts[16]. The effectiveness of this approach is likely influenced by factors such as patient adherence and individual motivation. Modern technology, such as telemonitoring and telerehabilitation, could enhance patient adherence and outcomes. Indeed, wearable activity monitors have been shown to boost physical activity in patients with IC[17]. Furthermore, telerehabilitation at home, featuring real-time exercise instruction, is both feasible and equally effective as center-based rehabilitation for patients with chronic heart failure[33]. Typically, in strength training, it is recommended to participate in at least two, and preferably three, sessions each week on non-consecutive days. Patients should aim for 3 sets of 8-12 repetitions, incorporating rest intervals of 1-2 minutes between sets. Patients should focus on progressive whole-body resistance training that includes 6-8 exercises targeting the primary muscle groups involved in walking, such as the gastrocnemius, tibialis anterior, quadriceps, hamstrings, and gluteal muscles[1,14,16,17].

CONCLUSIONS

Buttock claudication (BC), a result of ischemic gluteal pain from iliac artery disease, is frequently misdiagnosed as a musculoskeletal condition. While revascularization is a primary treatment, effective conservative strategies

are vital for non-surgical patients. To define these, we reviewed the current literature and found the evidence base to be critically deficient. Specifically, there are no dedicated studies on the role of rehabilitation in BC. This starkly contrasts with established exercise therapies for distal peripheral artery disease. Our findings highlight a significant gap in patient management and signal an imperative for future research to demonstrate the efficacy of conservative and rehabilitative interventions for buttock claudication.

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