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REVIEW

Iliac Artery Compression in Cyclists: Mechanisms, Diagnosis and Treatment

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Abstract *Objectives:* To review the mechanisms, diagnosis and treatment options for symptomatic iliac artery compression in cyclists.
Methods: Pubmed, Medline, Embase and Google were searched using combinations of the terms 'iliac artery disease', 'iliac artery compression', 'iliac artery stenosis', 'cyclists' and 'athletes'.
Results: Tethering of the iliac artery by the psoas arterial branch and fibrous tissue, and muscular hypertrophy predispose the vessel to kinking and compression during cycling. Symptoms may only be present on maximal exercise in the cycling position. Provocative exercise tests using a cycling ergometer with ankle brachial pressure index measuring has a sensitivity of 85% to detect arterial insufficiency. Magnetic resonance imaging is increasingly being used as the investigation of choice to confirm the diagnosis, although digital subtraction angiography and colour duplex ultrasonography may also help. Conservative measures including adjustments to the cycling posture and bicycle setup should be recommended to all patients. The evidence for surgical and endovascular treatments is limited and the use of prosthetic graft should be avoided.
Conclusions: Iliac artery compression should be recognised as an important differential diagnosis in competitive cyclist presenting with lower limb symptoms. Although the optimal treatment strategy remains unclear, early diagnosis may reduce unnecessary investigations, and enable the cyclist to make appropriate adjustments and decisions in treatment management.

Introduction

Iliac artery compression in athletes was first described in 1984[1] and the majority of patients are competitive cyclists (90%),[2] although similar disease in runners,[2–4] cross-country

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skiers,[2] rugby players,[5] footballers[6] and body builders[7] have also been reported. As competitive cyclists usually have a high level of fitness, diseases of musculoskeletal, neurological or general deterioration in performance are usually considered before arterial insufficiency.[8,9] Consequently, the mean delay to diagnosis of iliac artery compression/endofibrosis in competitive cyclists is 2 years[10,11] from initial presentation.[12–18] It is likely that many patients have been forced to give up competitive cycling, without a diagnosis.[13,15–19]

Methods

We searched Pubmed, Medline, Embase and Google™ using combinations of the search terms 'iliac artery disease' or 'iliac artery compression' or 'iliac artery stenosis' and 'cyclists' or 'athletes'. To increase our search results, we then searched the Google™ using the phrases ''iliac artery disease'' cyclists, ''iliac artery disease'' athletes, ''iliac artery compression'' cyclists, ''iliac artery compression'' athletes, ''iliac artery stenosis'' cyclists, and ''iliac artery stenosis'' athletes. Articles and webpages that had no mention of iliac artery compression syndrome in athletes were excluded.

Results

A total of 24 articles were found using Pubmed, Medline and Embase. All of them were reviewed. A further search in Google™ identified 99 webpages, of which 65 mentioned iliac artery compression syndrome in athletes and assessed.

How Common is Iliac Artery Compression in Cyclists?

Although the true prevalence of iliac artery compression secondary to cycling is unknown, vascular insufficiency may account for up to 10–20% of leg symptoms in top-level competitive cyclists.[20–22] There were more cases reported in men than women.[11] Patients usually present at a much younger age (average of 25 years; range 16–42 years)[11] than those with atherosclerosis. It has been reported that of those who developed the problem, 15% were professional, 48% top amateur, and 28% recreational cyclists.[2,10] The reported level of cycling is 8000–35,000 km per year[11,14] or about 150,000 km in a lifetime.[10,23,24] The external iliac artery is most commonly involved (90%), although multiple segments of the artery may be diseased in about 10% of cases.[10] The condition is bilateral in around 15%,[10] but there seems to be a left iliac artery predominance.[2,10,14,17,18,25] Rarely, patients may also present with associated dissection of the iliac artery.[26]

What Are the Mechanisms Contributing to Iliac Artery Compression in Cyclists?

Numerous anatomical, mechanical and postural factors are likely to contribute to the development of iliac artery disease (Figs. 1 and 2). Recurrent exposure to these factors (from repetitive competitive cycling), inflammatory and remodelling processes in the artery are thought to result in a stenotic intravascular lesion, known as endofibrosis.[19,27] Specific contributory factors may be:

Posture

The aerodynamic posture that involves hip hyperflexion is characteristic in competitive cyclists[10] and it has been estimated that this movement may be repeated up to 8 million times a year.[14] Repetitive hyperflexion of the hip causes bending and stretching of the external iliac artery (Fig. 2), which may damage the arterial wall, most commonly seen at its greater curvature.[11,19,27]

Anatomical predisposition and kinking of artery

The longitudinal elasticity and excess length of the iliac artery are usually able to compensate for stretching and

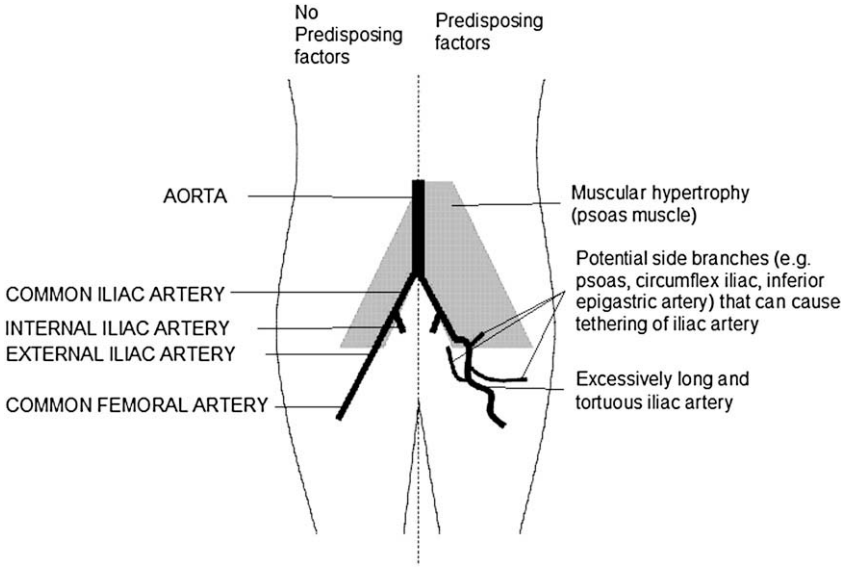

Figure 1 Anatomical predisposing factors that may contribute to iliac artery compression syndrome during cycling.