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## Case Report

# MR imaging findings in perineal nodular induration (“cyclists’ nodule”): A case report <sup>☆</sup>

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## ABSTRACT

Perineal nodular induration (PNI) is a rare condition related to sports linked to the use of a saddle, mostly cycling, thought to be caused by the compression of the soft tissue between the saddle and the ischial tuberosity. We report a case of a 59-year-old amateur cyclist male who presented with 2 bilateral nodular perineal lesions that were evaluated with ultrasound and magnetic resonance imaging (MRI). MRI findings, along with the history of a strong cycling habit, led to the diagnosis of PNI, and a conservative management was adopted. MRI features of PNI are characteristic, and may provide the diagnosis in the proper clinical setting.

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## Introduction

Perineal nodular induration (PNI), also known as cyclists’ nodule, ischial hygroma, third testicle or accessory testicle, is an uncommon entity caused by repetitive trauma associated with “saddle sports” [1], that almost exclusively affects male patients who are either professional or very active amateur cyclists [2,3]. On histological evaluation, PNI shows a predominant fibrous component [4–7]. On physical examination this condition has a characteristic appearance, which typically consists of solitary or bilateral nodular lesions in the perineum or groin, that may allow the diagnosis in the appropriate clinical setting [7], which highlights the importance of a specific questioning about patients’ habits when this particular condition is suspected. However, although it is a rel-

atively well-known condition in sports medicine, it may be under-recognized among nonsports related specialists. Therefore, imaging techniques may be required in order to assess the diagnosis, with magnetic resonance imaging (MRI) being especially helpful. We describe the ultrasound (US) and MRI findings in a case of PNI diagnosed in a 59-year-old recreational cyclist man.

## Case report

A 59-year-old male, with no relevant medical history, was referred to the urology specialist because of 2 perineal bulges that had slowly developed over several months. Physical examination revealed 2 nodular lesions at both sides of the per-

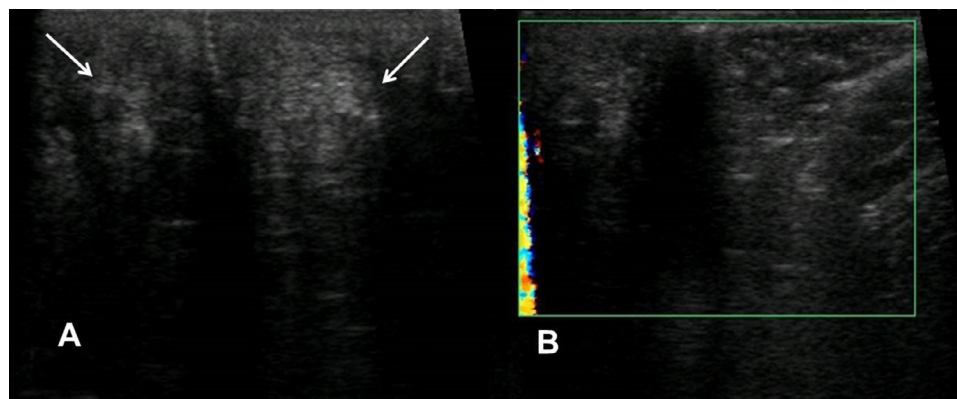
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**Fig. 1 – Axial US image (A) and Doppler examination (B) show two predominantly hyperechogenic superficial lesions (arrows) with no increased vascularity.**

ineal raphe, immediately behind the scrotum, both covered by redundant, but otherwise normal-looking skin, with no external signs of inflammation or infection. Palpation showed mobile, painless lesions, with a relatively elastic consistency.

US examination showed hyperechogenic superficial lesions with no increased vascularity (Fig. 1). As US findings were inconclusive, MRI was performed. MRI showed 2 bilateral, ill-defined, subcutaneous soft tissue lesions with cranial extension towards the root of the penis, thicker in the left side where showed reticular appearance, whereas on the right side it presented as a thinner, plaque-like, lesion. On fast spin-echo T2 weighted image both lesions showed low to intermediate signal intensity, with a slight hyperintensity on fat suppressed T2 weighted image (Fig. 2). On DWI the lesion showed low signal intensity, with high apparent diffusion coefficient (ADC) value, findings consistent with no restricted diffusion (Fig. 3). On postcontrast MRI study (Fig. 4) we found a very subtle diffuse enhancement, more conspicuous on the delay phase. There was no lymphadenopathy.

On the basis of the MRI findings, patient was specifically questioned about sport habits and he confirmed that he practiced cycling regularly.

The diagnosis of PNI was made based on the clinical history and imaging findings, and a conservative management was adopted taking into account patient preference. After a reduction in cycling activity and readjusting saddle fitting conditions, the lesions remained stable over a clinical observation period of 1 year.

## Discussion

PNI or cyclists nodule is a rare condition related with “saddle sports”, almost exclusively seen in professional or amateur cyclists, but also can be linked to horse riding [1]. The vast majority of patients are males, with only a few female cases reported in the literature [2,3].

It is thought to be the result of repeated microtrauma caused by the compression of the superficial perineal fascia and soft tissue between the saddle and the ischial tuberosity,

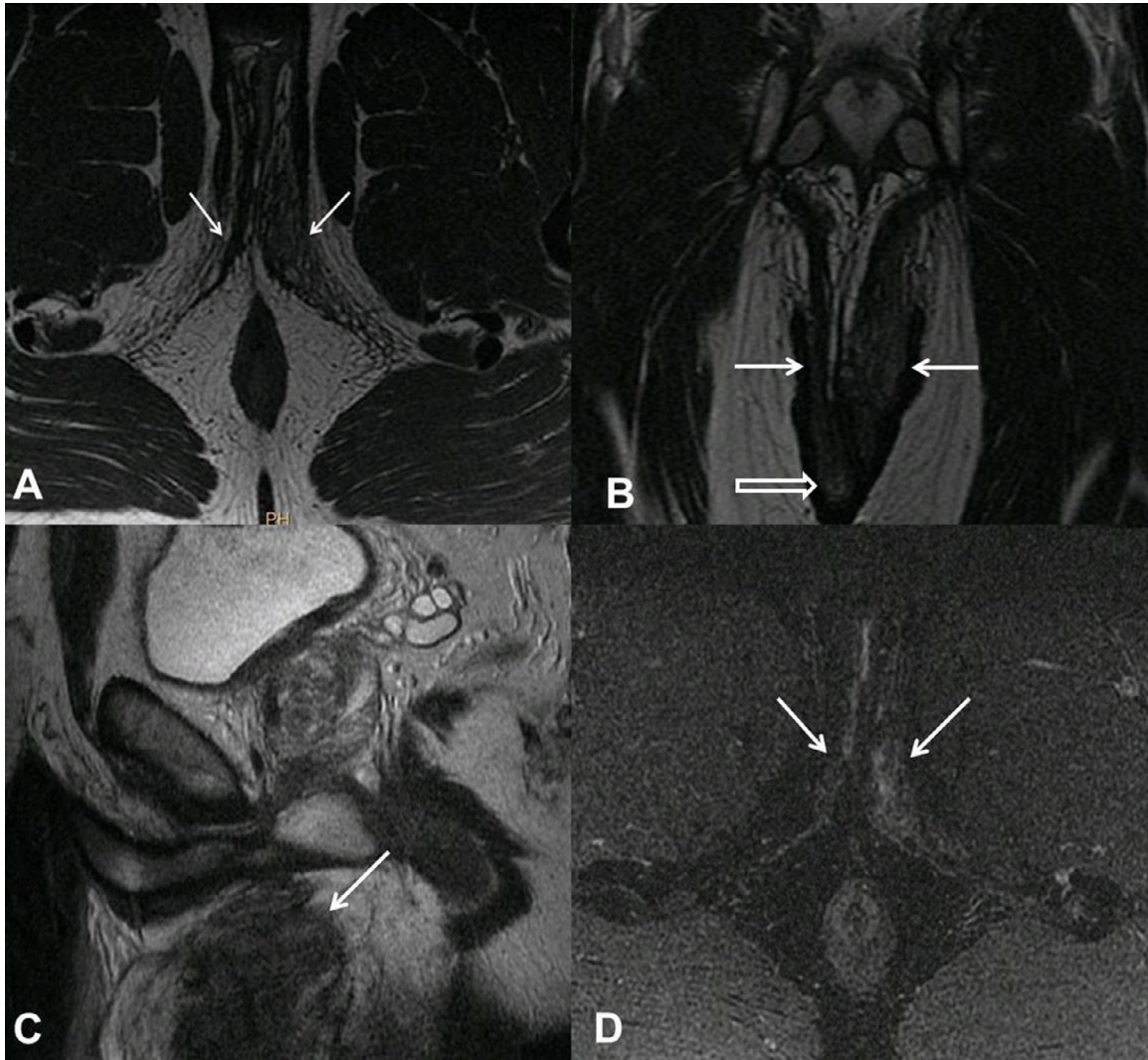
along with the vibration exerted by the saddle on the perineal region [4,5].

Histological features include pseudocyst formation surrounded by dense hyalinized fibrous tissue with adjacent areas of aseptic necrosis, edematous fibrous tissue containing fibroblast-like spindle cells, thick collagen bundles, degenerative elastic fibers, clusters of capillaries, and hemorrhagic foci [5-7].

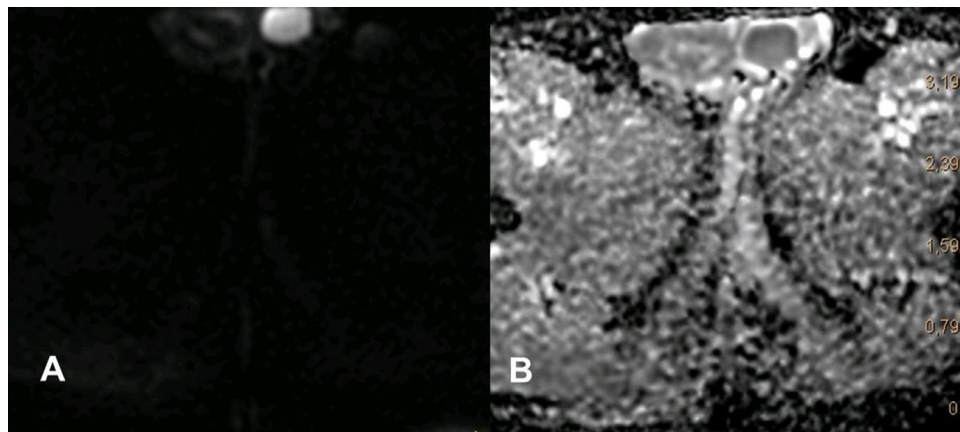
Clinically, it usually manifests as a nodular protruding lesion in the groin or, most commonly, in the perineum immediately posterior to the scrotum, covered by redundant, but otherwise normal appearing skin. It may present as a solitary lesion, lateralized or centrally located (also known as third or accessory testicle), or as bilateral paramedian lesions, that may be fixed to the adjacent connective tissue [1,5,6] or, as in our case, be mobile [7]. The typical appearance and location of the lesion along with the proper clinical setting can allow the diagnosis [7]. However, as this is a rare entity that may be poorly recognized, imaging techniques may be required in order to assess the diagnosis and also to exclude other pathologies. Among the imaging modalities, we found MRI to be especially helpful, as it not only provides precise information regarding the extent of the lesion, but also shows features that are closely related to the mainly fibrotic, hypovascular, nature of the PNI.

At US examination, PNI may appear as a hypoechoic ill-defined mass without hypervascularization at color Doppler [8,9]. On MRI, the lesion is usually hypointense on T1WI and T2WI [1,5,10]. However, it may also show iso to slightly hyperintensity on the T2WI [9]. Furthermore, Van de Perre et al reported no enhancement of the lesion on the postcontrast MRI [9]. Additionally, we found PNI to exhibit low intensity signal on DWI with high ADC value consistent with no restricted diffusion, a MRI finding related to PNI that has not been previously reported to the best of our knowledge.

Differential diagnosis for soft tissue tumors that preferentially occur in the perineal area include angiomyofibroblastoma (AMF)-like tumor and aggressive angiomyofibroblastoma. AMF-like tumor presents as a well-defined subcutaneous lesion with low signal intensity on T1WI, usually with increased signal intensity on T2WI but it may be decreased because of the fibrous component, and with an avid

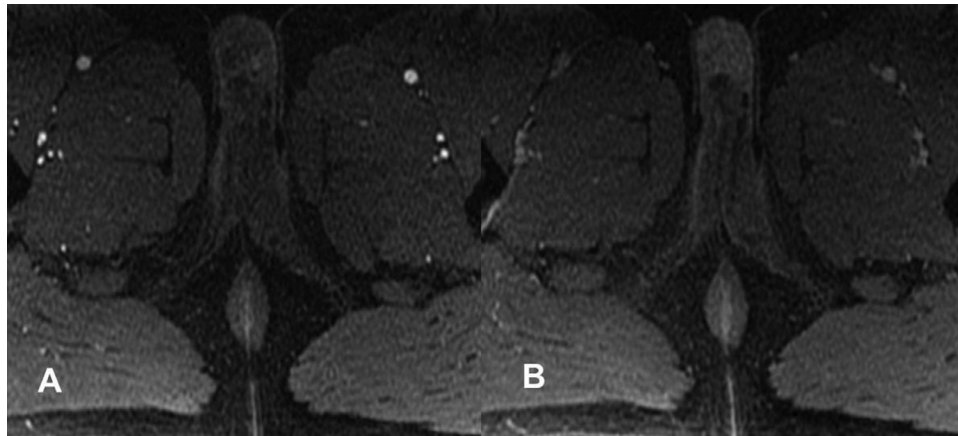


**Fig. 2** – Axial (A), coronal (B) and sagittal (C) fast spin-echo T2 weighted images; Axial (D) fat suppressed T2 weighted image. MRI shows two ill-defined subcutaneous perineal lesions (arrows), with low to intermediate signal intensity on T2WI and slight hyperintensity on F-S T2WI. Note the symmetric nodular formations protruding from the perineum, also known as “accessory testicles” (open arrow in B).



**Fig. 3** – Axial diffusion-weighted image (b-value of  $800 \text{ s/mm}^2$ ) (A) and corresponding ADC map (B), show low signal intensity lesions on DWI with high ADC value, findings consistent with no restricted diffusion.





**Fig. 4 – Axial gadolinium-enhanced fat suppressed T1-weighted GE images obtained at 30 seconds (A) and 5 minutes delay (B) show a subtle diffuse enhancement that becomes more conspicuous on the late phase.**

enhancement on contrast-enhancement images [11,12]. Aggressive angiomyxomas affects mostly women, usually has a typical laminated appearance on T2WI, and shows intense enhancement [13].

Other abnormalities are also thought to be saddle related. Frauscher et al found at US examination a higher prevalence of scrotal disorders in extreme mountain bikers compared with nonbikers [14]. These abnormalities included scrotal calculi, epididymal cyst and calcifications, testicular calcifications, hydroceles, and varicoceles.

Conservative management may be considered as an initial approach for PNI, which consists of reduction of the causative factor by decreasing in the cycling activity and improving individual saddle fitting. Local corticosteroids or hyaluronidase injection may be helpful, particularly in small nodules. Surgical excision should be also considered, especially in large lesions that restricts the patients' daily activity [1,4,5,7].

In conclusion, PNI is a rare, poorly recognized condition, almost exclusively seen in highly active male cyclists, with a typical appearance on physical examination. MRI is an excellent option when further characterization is required, as PNI shows distinctive features that may provide the diagnosis in the proper clinical setting.

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