New Sonographic Aspects of Peyronie Disease

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Objective. The aim of this study was to evaluate the role of sonography in the identification of several types of lesions seen in patients with Peyronie disease (PD). ***Methods.*** A total of 78 patients were examined. Penile lesions were counted, classified, and categorized according to their anatomic location and sonographic presentation. ***Results.*** The classic sonographic presentation, as well as less common and novel findings, are described and correlated with clinically relevant data and physical examination findings. ***Conclusions.*** Sonography can precisely assess the size and location of the plaques found in PD and can also aid in treatment. ***Key words:*** impotence; induratio penis plastica; penile induration.

Peyronie disease (PD) is a relatively uncommon disorder characterized by the development of a fibrous plaque or scar in the fibrous sheaths covering the corpora cavernosa and tunica albuginea of the penis. This inelastic area usually does not permit lengthening of the affected surface during erection, causing the erect penis to bend in its direction, leading to erectile dysfunction. The bend of the penis results in a deformity known as a chordee. The disease, also called induratio penis plastica, was first described in 1743 by the French surgeon François Gigot de la Peyronie, also the founder of the Académie Royale de Chirurgie (Royal Academy of Surgery).

Natural History, Etiology, and Clinical Diagnosis

Peyronie disease is a chronic benign fibrotic alteration of the penis of unknown etiology, characterized by the development of plaques or nodules. In the early stages of the disease, penile erection may be accompanied by pain in the involved area. Occasionally, the patient may be asymptomatic, and the lesion will only be detected by physical examination. In some cases, erectile dysfunction may occur as a result of pain, veno-occlusive dysfunction, or bending of the penis.[1,2]

Abbreviations
PD, Peyronie disease; PGE_1, prostaglandin E_1

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The condition affects men between the ages of 40 and 60 years,[3] and it is not associated with malignant degeneration. It can be associated with other fibrotic conditions, such as Dupuytren contracture and Ledderhose disease, as well as other diseases, such as diabetes mellitus and gout.[4] Dupuytren contracture is a genetically inherited disorder that primarily involves the palmar fascia, whereas Ledderhose disease involves retraction of the plantar aponeurosis, known as fibromatosis plantaris.

According to the literature, the penile plaques in PD are usually found on the dorsal surface of the penis (77%), but they can also occur on the ventral and lateral surfaces, such as in the intercorporeal septum.[5] Almost half of them (47%) occur in the distal segment of the axis of the penis, 36% in the medial segment, and 17% in the proximal portion.[6,7] Before the plaque calcifies, PD can occasionally spontaneously regress.[8,9] The disease can be treated clinically (oral medication), topically (local application of medication), and with laser radiation therapy, shock wave lithotripsy, or surgery.[4,9,10]

Diagnosis is obtained by anamnesis and by visual evidence of penile curvature during erection, which can be documented with photography of the erect penis provided by the patient.[11] Soft tissue radiography of the penis, obtained using conventional x-ray equipment, can detect calcification of the plaques in 20% of cases. Penile radiography performed with the same equipment used in mammography is the method of choice for characterizing calcified plaques.[12]

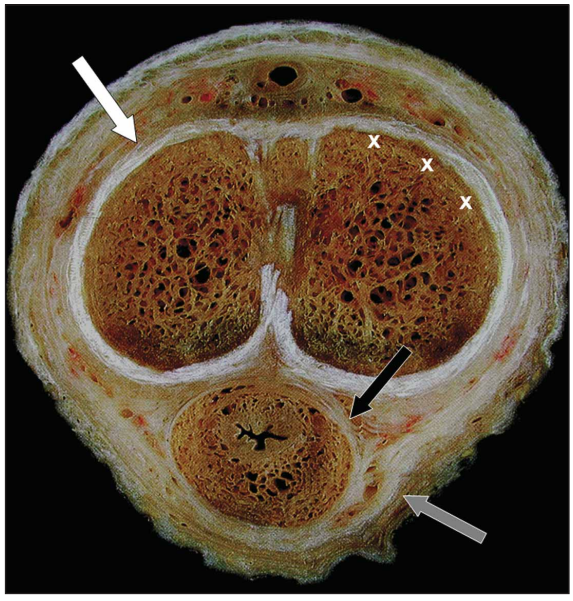
Penile sonography is more useful than radiography because it also provides identification of smaller and nonpalpable lesions and can show the extent of the fibrosis. It also provides information about the number of plaques, their dimensions, and the exact topography of the lesions in the penis.[3,8,12,13–15] This method can also be used to follow patients who have undergone clinical or surgical treatment and can verify regression of the plaques.[16] Calcified plaques are strongly echogenic and show pronounced posterior acoustic shadowing. In association with fibrotic nodules and plaques, a thickening of the septum may occur on its dorsal aspect, along the penile shaft.[3]

Sonography can precisely assess the size and location of the plaques for preoperative evaluation and may also be used to follow patients undergoing medical treatment to evaluate disease progression.[4,12,17]

Anatomy and Pathologic Characteristics

The penis is composed of a proximal portion, hidden in the perineal region (penile root), which continues as the distal free pendulous portion. It consists of 3 cylindric structures of cavernous tissue, 2 dorsal corpora cavernosa, and a single ventral corpus spongiosum. The urethra travels in the center of the corpus spongiosum. Distally, the glans penis is formed by an expansion of the corpus spongiosum, which fits over the blunt terminations of the corpora cavernosa. Each corpus is enclosed in a fascial sheath called the tunica albuginea, and all are surrounded by a thick fibrous envelope known as the Buck fascia (Figure 1).

Figure 1. Anatomic axial view of the normal penis. The 2 corpora cavernosa and the corpus spongiosum are enveloped in a white and firm fascial sheath, the tunica albuginea, that is thick around the corpora cavernosa (white arrow) and relatively thinner surrounding the corpus spongiosum (black arrow). All 3 bodies are surrounded by a thick fibrous envelope known as the Buck fascia (gray arrow). The Smith space (×) is situated between the tunica albuginea and the spongy erectile tissue and has a concentric topography.



The tunica albuginea is composed of 2 layers, each with a different structure and function.[18] The outer layer is composed of collagen fibers positioned longitudinally. The inner layer is composed of circular fibers surrounding and separating the corpora cavernosa. Along the sagittal plane of the penis, the inner layers are at close proximity to each other and form the septum, which is contiguous at the proximal portion of the penis. The septum is rich in fenestrations at the medial and distal segments of the organ.

The plaques and nodules first develop as an inflammatory infiltrate in the areolar layer of connective tissue situated between the spongy corporeal matrix and the tunica albuginea called the "Smith space" (Figure 1).[10,19,20] They are vascular in nature, consisting of a perivascular lymphocytic and plasmacytic infiltrate. The plaques undergo eventual progression to dense fibrous connective tissue that extends into the spongy corporeal matrix to the tunica albuginea. The plaques frequently become sclerotic and calcify.[20] Extension to the intercorporeal septum is also frequently present. In the cicatricial stage, the lesion results in bending of the penis during erection (Figure 2) as well as pain or difficulty with intercourse. During the later stages, the lesions can occasionally undergo ossification.[8,16,20]

Materials and Methods

Informed consent was waived by the Institutional Review Board for the data analysis of this retrospective study. A total of 78 patients (average age, 44.7 years; Table 1) were examined from 2001 to 2007. All patients agreed to sonographic evaluation of the penis. Only 8 patients underwent penile radiography using standard mammographic equipment. Fifteen patients underwent sonography with pharmacologic induction of an erection. Within this group, 12 patients also underwent sonography of the penis, in both the flaccid state and after injection of intracavernous vasoactive agents, to provide a Doppler color flow evaluation of the cavernous arteries.

The penile sonographic examination was performed with the patient supine, using the dorsal, ventral, and lateral approaches (Figure 3). The penile shaft was examined by scanning in 3 planes, always starting from the fixed portion of

Figure 2. Effect of plaques on the erectile tissue of the corpora cavernosa in PD. Painful curvature of the penis shaft toward the inelastic plaque occurs in this disease. The bending results in an inability to have satisfactory intercourse. **A**, Dorsal plaque. **B**, Ventral plaque. **C**, Right lateral plaque and consequent right bending.

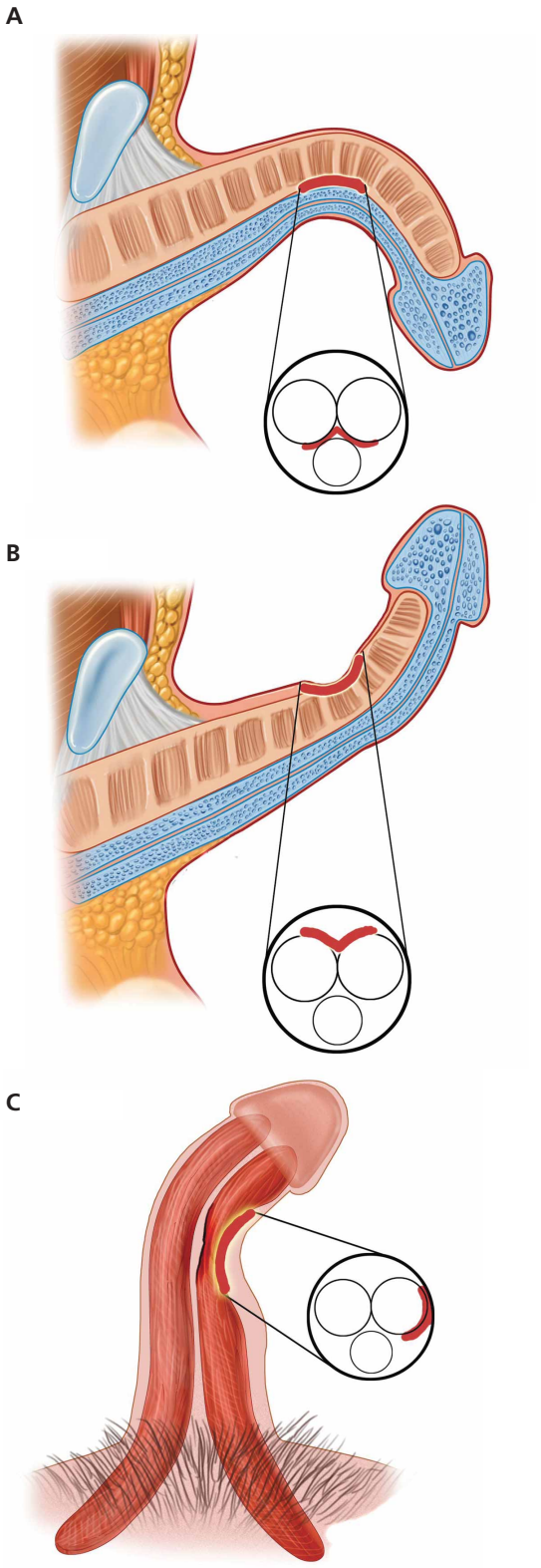
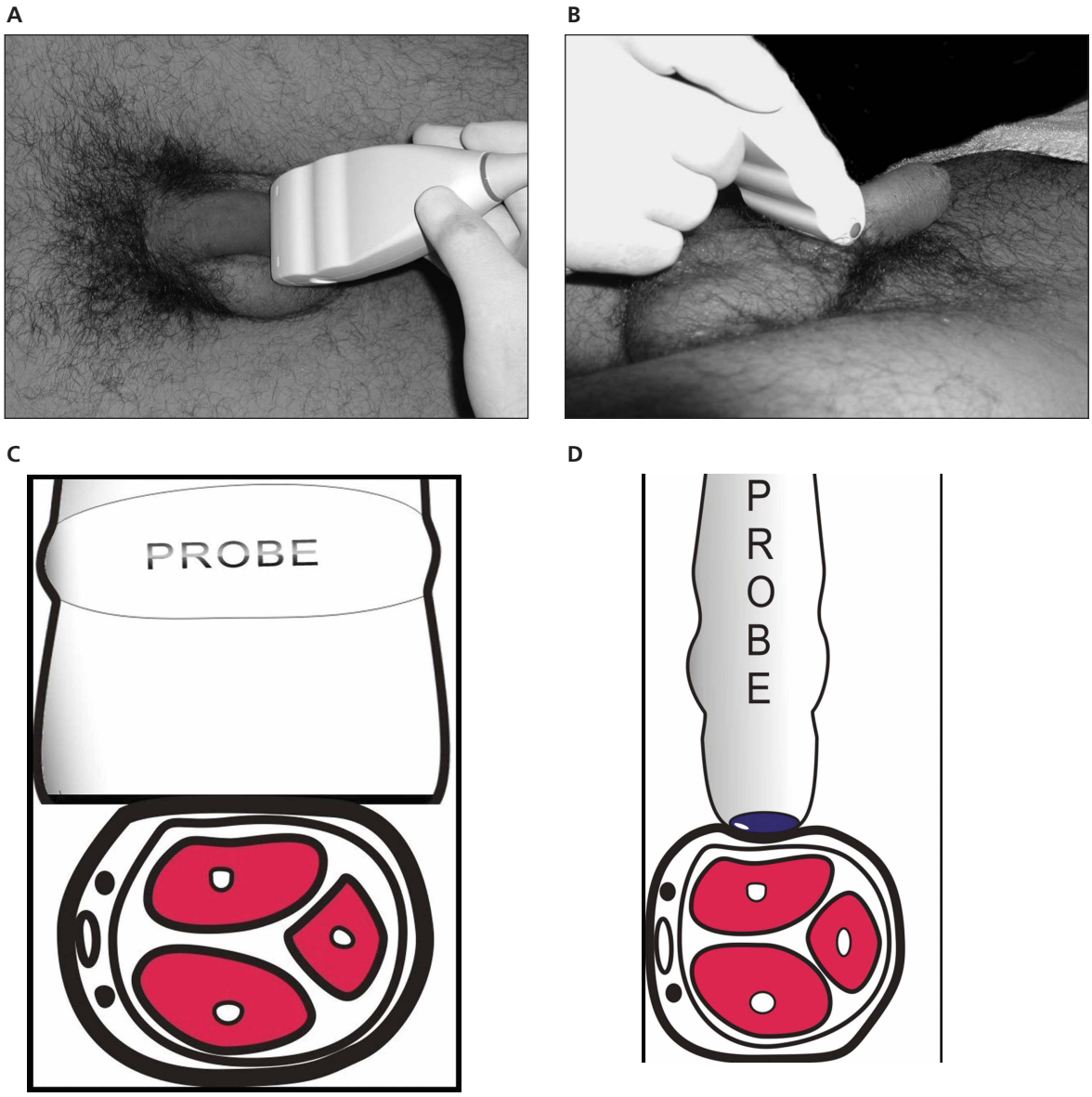


Table 1. Ages and Numbers of Patients Studied (N = 78)

Age, y	Patients, n
20–29	6
30–39	13
40–49	16
50–59	27
60–69	15
70–79	1

the penis toward the glans. The study included a complementary evaluation in the longitudinal plane so that the 3 dimensions of the lesion and its precise location inside the penis could be determined. A sonographic evaluation in the coronal plane (lateral access) was regularly performed. Its importance and value, although not referred to in the medical literature, are discussed. The ultrasound equipment always included a high-

Figure 3. Penile sonographic technique. **A**, The penis is in the natural position, lying over the scrotum. The probe is placed transversely on the dorsal surface of the penis (dorsal access). **B**, The penis is in the anatomic position, lying on the anterior abdominal wall. The probe is placed transversely on the ventral surface of the penis (ventral access). **C** and **D**, Schematic representing lateral access to the penile shaft transversely (**C**) and longitudinally (**D**) both from the left side of the penis.



frequency linear array transducer of 7.5 MHz or higher. The use of a correctly focused high-frequency transducer is essential in penile studies.

When the physician did not specify the use of intracavernous vasoactive drugs, sonography was performed only with the penis in a flaccid state. When erectile induction was ordered without specifying the need for a Doppler spectral waveform study of the cavernous arteries (3 cases), sonography was performed before and after injection of 0.5 mL of prostaglandin E_1 (PGE_1; 10 µg/mL) plus phentolamine (200 µg/mL) into each corpus cavernosum. When a Doppler complementary study of the cavernous arteries was ordered, both examinations were performed, ie, conventional sonography of the flaccid penis and a flow velocity study of the cavernous arteries, before and after erectile induction. In this case, a combination of 1 mL of PGE_1 (10 µg/mL) plus phentolamine (200 µg/mL) was injected into each corpus cavernosum.

The goal of the sonographic evaluation was to quantify the fibrotic involvement caused by the disease while determining the precise location of the lesions in the penis, as well as the length, width, and thickness of the plaques.[7,8] The latter parameter could only be measured in fibrotic plaques, which did not show acoustic shadowing.

Results

Clinical Aspects

The 78 patients examined had some palpable abnormality in the penis (nodule, focal hardening, or bending of the axis of the penis during erection). With the penis in the flaccid state, the lesions were painless in all patients, although in 9 (11.5%), there were reports of vague pain on palpation of a nodule or fibrotic focus. The lesions caused discomfort, pain, or hyperesthesia during sexual intercourse in 45 of 78 patients (57%). Bending of the penis was reported in 23 of 78. This condition could not be confirmed clinically in most patients (66 of 78). However, the curvature could be confirmed by the radiologist in 11 of 12 patients who agreed to undergo pharmacologic induction of erection. In 9 of these 11 patients, the curvature did not exceed 45°, and in 2, the penile curvature was substantial, measuring between 45° and 90°.

Number of Lesions

The number of lesions in each patient was carefully studied. We detected a single lesion in 42 of 78 patients (53.8%), 2 lesions in 20 (25.6%), 3 lesions in 6 (7.6%), and 4 or more in 10 (12.8%).

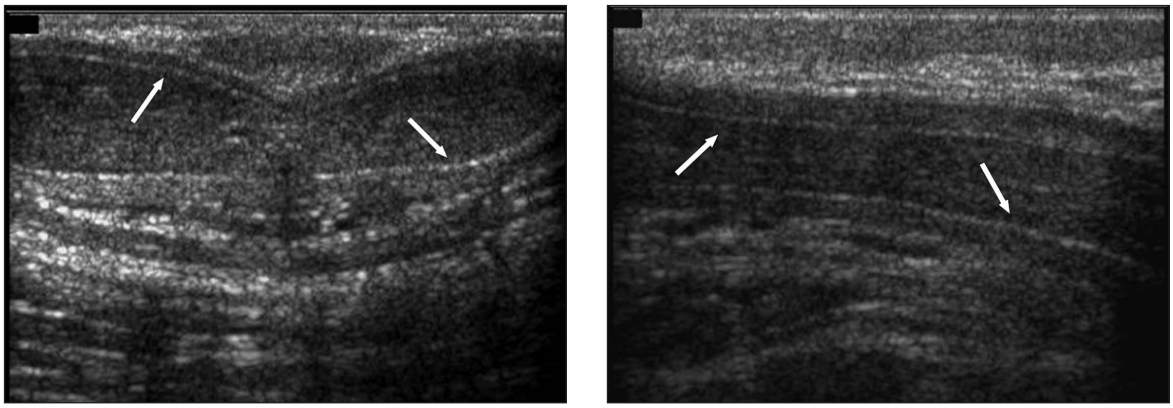
Location of Lesions

Although there are some reports of plaques found in the tunica albuginea of the penile root, none of our patients had lesions in this segment of the penis. All lesions detected during this study were restricted to the free portion of the penis.

A total of 137 lesions were detected in the 78 patients. Of this total, 75 (54.7%) occurred on the dorsal surface of the penis, 42 (30.6%) on the ventral surface, 18 (13.1%) in the center of the septum (middle portion, not dorsal and not ventral), and 2 (1.4%) on the lateral surface. Fifty-five of the lesions (40%) were located on the midline of the penis, either within or near the septum.

Sonographic Aspect of the Lesions: The Classic Echogenic Plaque

The normal tunica albuginea appears as a thin hyperechoic line covering the corpora cavernosa (Figure 4). Penile plaques are usually seen as focal hyperechoic thickening of the tunica albuginea.[21,22] A total of 47 of 78 patients (60.2%) had the classic presentation of 1 or more plaques situated in the thickened albuginea and exhibiting strong echogenicity with substantial attenuation of the acoustic beam (Figures 5 and 6). The attenuation of the beam is due to calcification in the plaque.[21] In 12 of 78 patients (15.3%), the echogenic plaque with acoustic shadowing was associated with a less common type of sonographic lesion, which will be discussed below. Thus, an echogenic plaque on the tunica albuginea, isolated or not, was present in 59 of the 78 patients (75%). In these 59 patients, we found a total of 112 plaques, which varied in length from 2 to 35 mm (Table 2). A radiographic study of the penile shaft was performed in only 8 patients who had echogenic plaques with strong acoustic shadowing (probably calcified). The lesions were in fact calcified in these 8 patients (Figure 7).



A **B**

Figure 4. Normal aspect of the tunica albuginea. An axial scan (**A**) and an longitudinal scan (**B**) of the penis are obtained with the probe on the ventral aspect. The tunica albuginea (arrows) corresponds to a regular and thin hyperechoic line surrounding each corpus cavernosum.

Less Common Lesion Variants: Nodular Echogenic Thickening

In 6 patients, we found focal nodular echogenic thickening of the septum (Figure 8). In 3, we found focal echogenic thickening of the tunica without posterior acoustic enhancement or attenuation of the acoustic beam (Figure 9). In 1, an echogenic lesion was identified in the septum surrounding a central small hypoechoic area (Figure 10). Diffuse hyperechogenicity of the tunica albuginea (Figure 11) with little or no tunical thickening was observed in 3 patients, all with echogenic plaques in adjacent areas where the disease was likely advanced.

Less Common Lesion Variants: Isoechoic Lesions

Isoechoic lesions in PD have not yet been described. Three patients had a retractile isoechoic lesion with posterior attenuation. Two had isoechoic lesions with "curtain" attenuation (Figure 12). In 2, we did not identify a tunical lesion using sonography but only a focal area of hypodistension and thickening of the tunica with consequential focal narrowing of the corpora cavernosa.

Figure 5. Large echogenic plaques. **A**, Longitudinal sonogram, ventral access. Large calcified plaques (arrows) in the dorsal face cause dorsal curvature of the pendulous shaft. **B**, Axial sonogram, dorsal access. The plaque is in the dorsal midline (arrow) with bilateral paramedian extensions. There is an acoustic shadow in either the sagittal or transverse plane.

A **B**

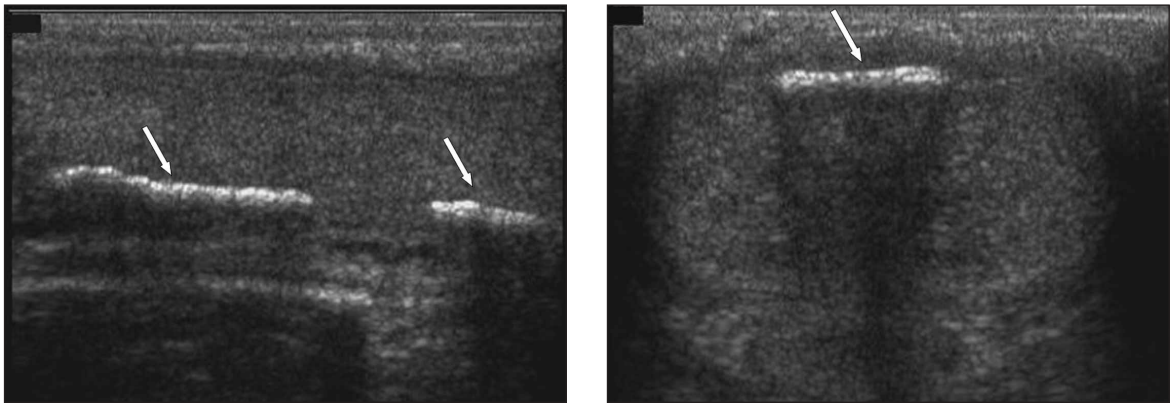
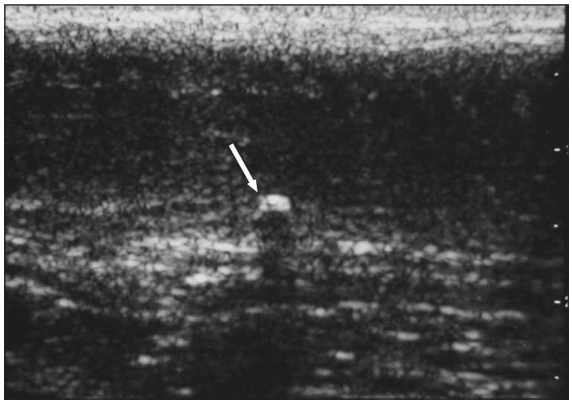


Figure 6. Small echogenic plaque causing lateral curvature. **A**, Longitudinal sonogram, oblique dorsal access (from the midline to the left lateral face of the penis). The lesion (arrow) produces a small acoustic shadow. **B**, Axial sonogram, oblique access. The plaque is lateral and a bit larger in the transverse plane (arrow). **C**, Axial sonogram, right lateral access with mild compression. The lesion can be totally examined. There is a lack of acoustic attenuation due to the compression.

A



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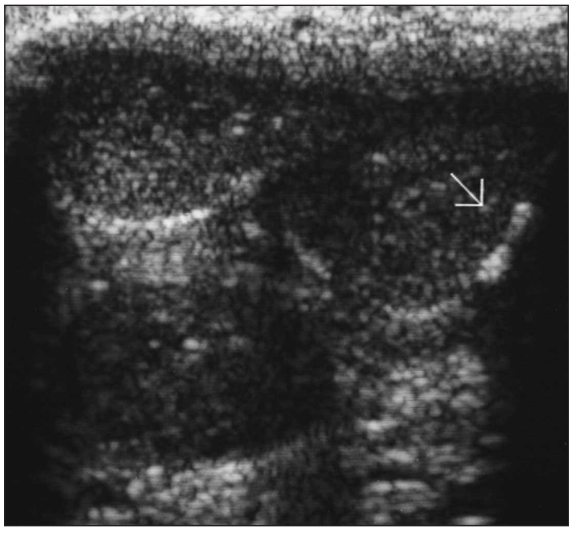

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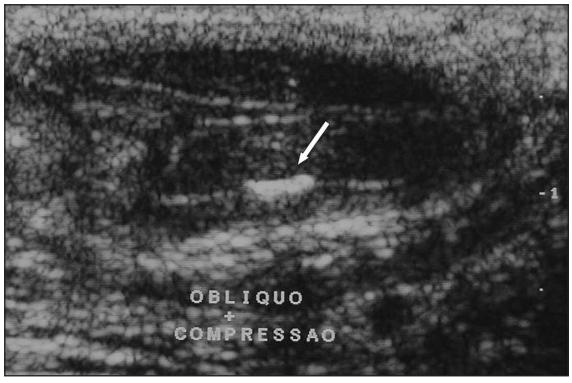


Less Common Lesion Variants: Hypoechoic Lesions

On rare occasions, penile plaques in PD present as hypoechoic lesions characterized by focal thickening of the pericavernous tissue.[16] This form of presentation is found in the initial stages of the disease when the fibrosis is still small and interstitial edema predominates.[16]

Hypoechoic lesions in the tunica albuginea were identified in 6 patients. In 3, the lesions were seen without either acoustic enhancement or attenuation (Figures 13 and 14). In 1, the hypoechoic lesion showed posterior acoustic enhancement (Figure 15). In 1, when pharmacologic induction of erection was performed, the hypoechoic lesion became focally retractile; ie, it did not allow local distension of the corpora cavernosa, which caused a slight bending of the penis toward the affected area (Figure 16). In 2 of the 6 patients in this group, the hypoechoic lesion affected not only the tunica but also the adjacent subcutaneous tissue (Figure 17).

Less Common Lesion Variants: Focal Lack of the Tunica Albuginea

The focal lack of the tunica albuginea is quite rare and was not referenced in the literature. It was found in only 2 of our patients. In 1, it was observed without any other concomitant findings and was coincident with the area of focal pain on examination (Figure 18). In the second patient, a focal disappearance of the echogenic line representing the tunica albuginea was identified in an area adjacent to a small echogenic plaque (Figure 19).

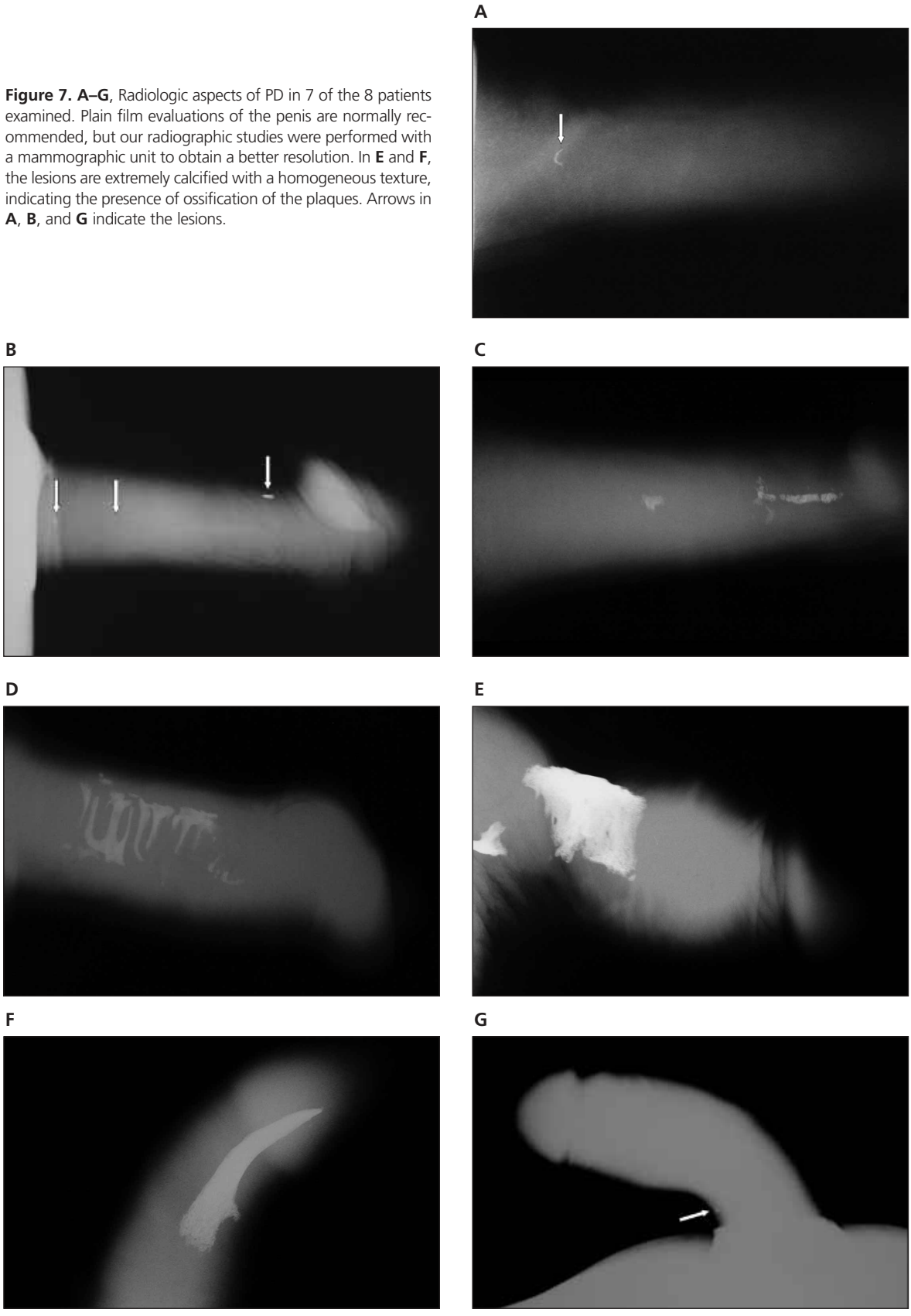
Negative Sonographic Findings

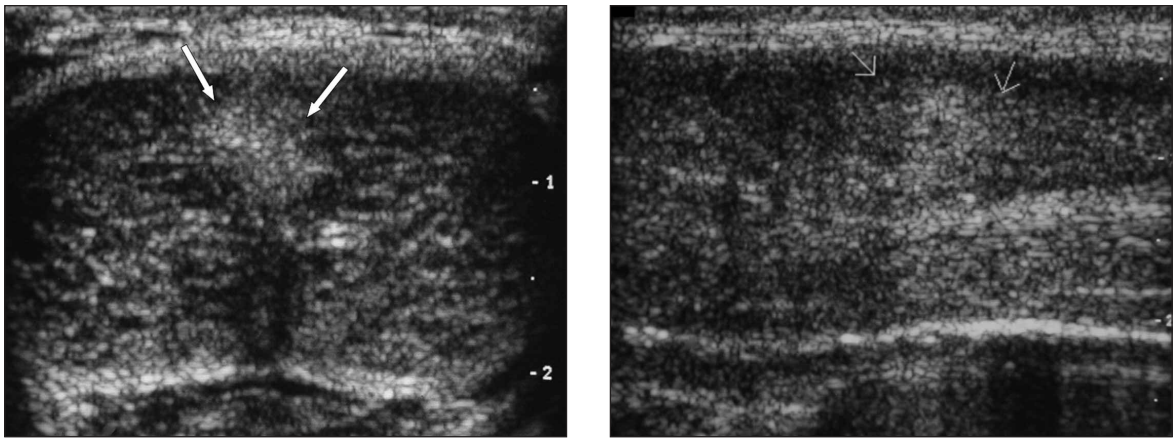
The sonographic studies did not reveal any type of focal or diffuse alteration of the penile tissue in 2 of the 76 patients examined (2.5%). These 2

Table 2. Frequency of Echogenic Plaques in Relation to Their Maximum Diameter

Diameter, mm	Plaques, n	%
Up to 2	32	28.5
Up to 5	50	44.6
Up to 10	15	13.4
Up to 15	7	6.2
Up to 20	4	3.5
Up to 25	3	2.6
Up to 35	1	.8

Figure 7. A–G, Radiologic aspects of PD in 7 of the 8 patients examined. Plain film evaluations of the penis are normally recommended, but our radiographic studies were performed with a mammographic unit to obtain a better resolution. In **E** and **F**, the lesions are extremely calcified with a homogeneous texture, indicating the presence of ossification of the plaques. Arrows in **A**, **B**, and **G** indicate the lesions.





A B

Figure 8. Less common variant of PD showing a palpable echogenic nodule on the dorsal aspect of the septum (arrows). **A**, Axial sonogram, dorsal access. B, Longitudinal sonogram, dorsal access.

patients had a small dorsal nodule and no curvature of the penile shaft. Both lesions were palpable by both the urologist and the sonographer. In 1, a spectral Doppler study of the cavernous arteries was also performed but did not show any alteration in the normal diameter of the artery or flow within the vessel.

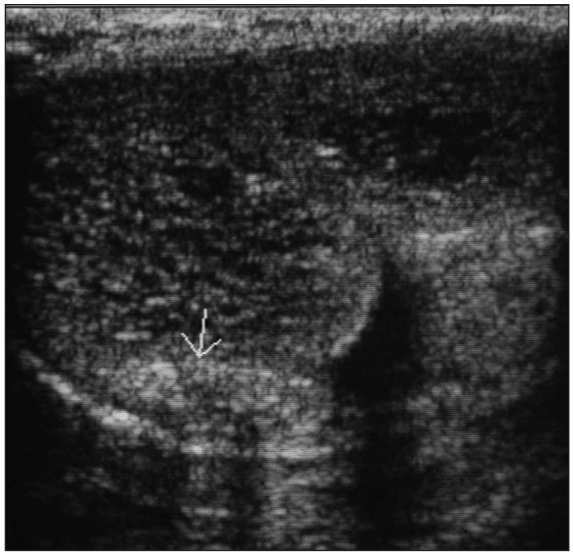
Pharmacologic Induction of the Erection

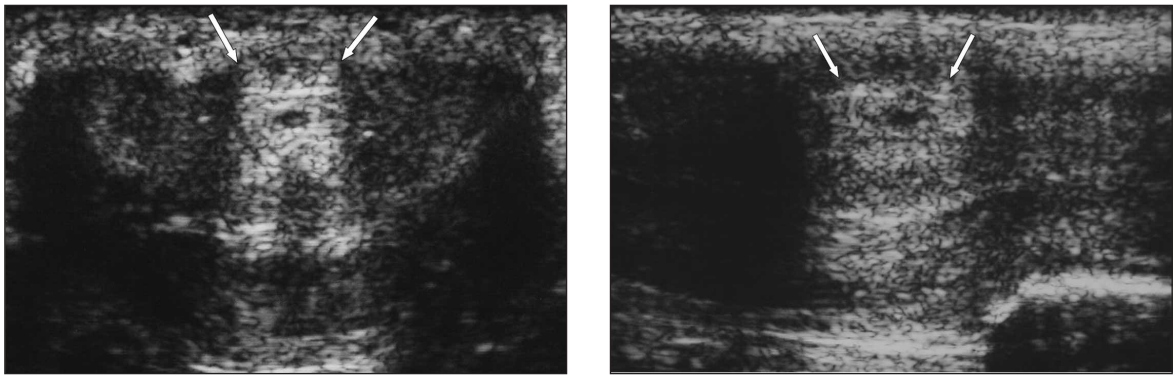
Twelve patients underwent penile color Doppler sonographic after intracavernous injection of vasoactive drugs, as ordered by the urologist. Results were normal in 10. In 1, we found bilateral arterial insufficiency and in the other, we found insufficiency in the right cavernous artery only, on the contralateral side of the albuginea lesion. In these 2 patients, the caliber of the cavernous arteries was found to be normal, and there was no alteration in the texture of the corpora cavernosa, only focal albugineal involvement due to PD. In 3 other patients, the pharmacologic induction was ordered only to complement the sonographic study.

Discussion

According to the literature, penile lesions in PD occur on the dorsal aspect of the penis in 70% of the patients.[3] Less frequently, they can occur on the lateral aspect (15%) or ventral aspect (10%).[3] In this study, the number of lesions found exclusively on the dorsal aspect (54.7%) was quite inferior to the literature findings because of the fact that the septal involvement was considered in a separate group (13.1%). We also found a smaller number of lateral lesions (1.4%). A total of 42 of 78 patients (53.8%) had a solitary lesion. In previous studies, single plaques were found in the range of 24% to 95% of cases.[15,21]

Figure 9. Less common variant of PD showing focal echogenic and heterogeneous thickening of the tunica albuginea (arrow) without posterior acoustic enhancement or acoustic attenuation. Axial oblique sonogram, mixed dorsal and left lateral access.





A B

Figure 10. Less common variant of PD showing an echogenic lesion with minimal posterior acoustic enhancement, suggesting the acute phase of the disease. **A**, Dorsal longitudinal scan. **B**, Dorsal axial scan. The echogenic lesion (arrows) has a central hypoechoic area.

In only 8 of the 59 patients (13.5%) with probably calcified echogenic plaques did we perform penile radiography using mammographic equipment. In each of these 8 patients, at least 1 calcified lesion was found. Plaques considered probably calcified but not confirmed by radiography were present in 51 of 59 patients (86.4%). In previous studies, the incidence of "calcified plaques" ranged between 33% and 48%.[3,12,16,21,23] Calcification of plaques is an important finding in the treatment of patients with PD because it suggests that the lesion has stabilized.[23]

Not only can sonography show lesions within the tunica albuginea, but it also can show perilesional changes, which help estimate the age of a lesion. For example, in only 1 patient was the lesion surrounded by a hypoechoic halo. This finding, although not fully corroborated by histopathologic analysis, appears to be an indication of active disease.[23] This is an important distinguishing feature when evaluating a patient for potential surgery because surgery should not be attempted until the disease is stable.[23]

Sonography is also a very sensitive method to detect lesions that are nonpalpable. In 28 of 78 patients (35.8%), we found a large number of lesions by sonography that had not been suspected by either physical examination or by the patient. This suggests that, in almost 36% of the patients, the disease was more extensive than Helweg et al[24] initially determined by physical examination alone. This information has clinical relevance because sonography can show lesions that precede the appearance of classic plaques. Similar findings were described by Helweg et al,[24] using contrast-enhanced magnetic resonance imaging, in patients with PD. The lesions, which were clinically palpable, showed focal enhancement around or within the lesion on magnetic resonance imaging when a contrast agent was administered, indicating active disease.[24]

On the other hand, such findings conflict with those of Lopez and Jarow,[25] who reported in 1991 that sonography revealed only 39% of the plaques, whereas 94% of the lesions were identi-

Figure 11. Less common variant of PD showing diffuse hyperechogenicity and a marked loss of elasticity due to fibrosis of the tunica albuginea of the corpus cavernosum. Longitudinal scan, dorsal access, after PGE_1 induction of an erection.

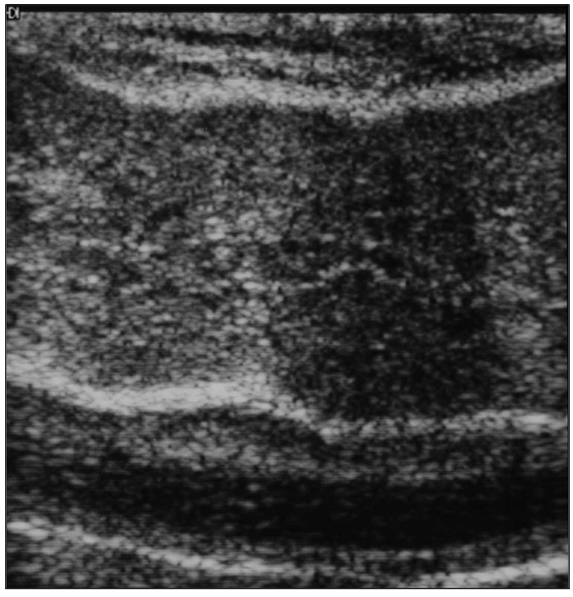


Figure 12. Less common variant of PD showing an isoechoic lesion with curtain attenuation. This aspect has not previously been described in the literature. **A**, Longitudinal scan, dorsal access. The fibrotic lesion is isoechoic and consequently can not be identified on sonography; only its strong acoustic attenuation can be identified easily (arrows). Good correlation with the symptoms and simultaneous palpation are recommended to find this type of lesion, avoiding false-negative sonographic findings. **B**, Axial scan, dorsal access. The probe is located over normal penile tissue (no signs or symptoms in this area). The corpora cavernosa and corpus spongiosum can be identified easily because the normal tunica albuginea has good transmission of the acoustic beam. **C**, Axial scan, dorsal access, exactly over the palpable area of hardening reported by the patient. There is strong bilateral and symmetric attenuation of the sound due to dorsal isoechoic fibrotic bilateral involvement of the tunica albuginea. **D**, Characteristic attenuation. When the fibrosis affects the dorsal aspect of the penis, including the septum and both dorsal tunica albuginea, symmetrically it causes poor identification of the "posterior" distensible penile tissue (curtain appearance).

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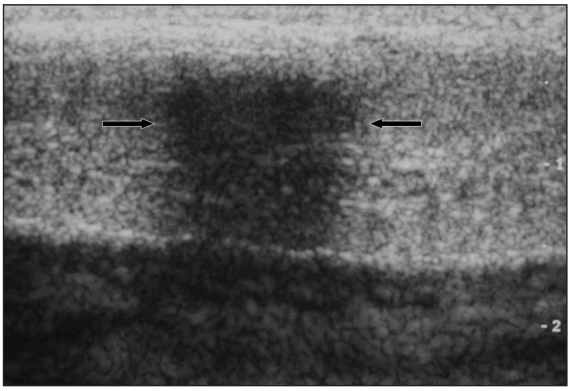

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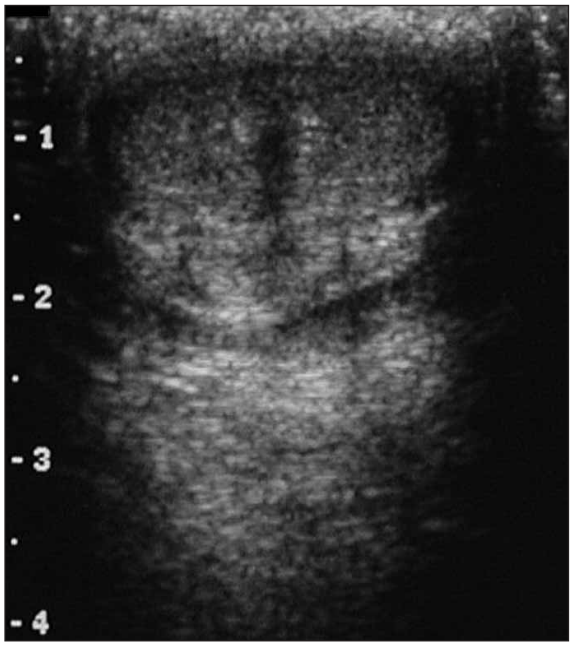

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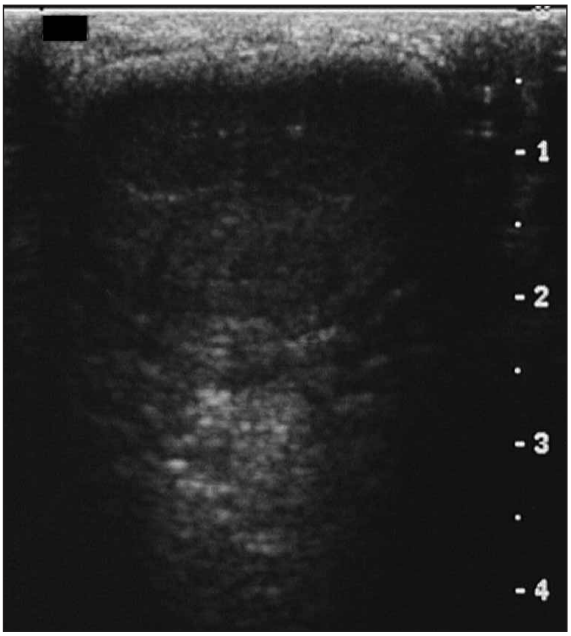

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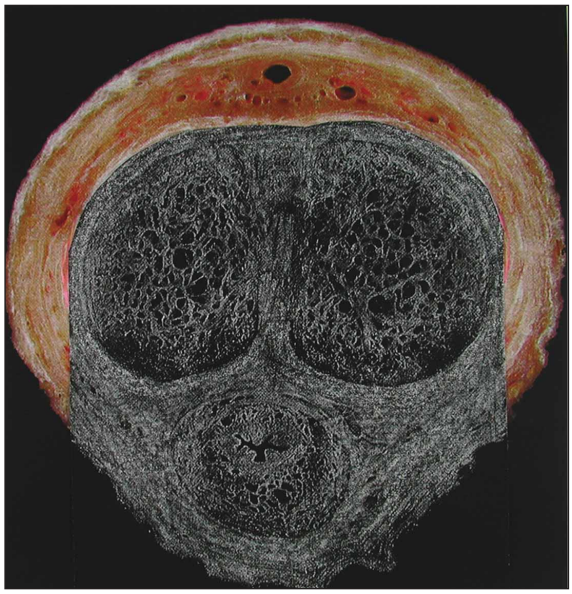


fied by palpation. This discrepancy in findings, however, is likely due to the more sensitive and technologically advanced sonographic equipment currently available.

Although most of the patients in our series (64 of 78 [82%]) had 1 or more of the "classic lesions" of PD (echogenic plaques with strong acoustic attenuation), we found that 14 of the 78 patients (18%) had the less common lesions related to the initial or milder stages of the dis-

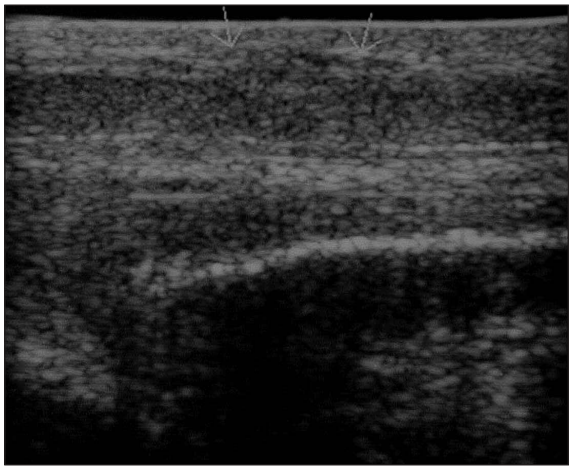


Figure 13. Less common variant of PD showing a hypoechoic lesion of the dorsal tunica albuginea without acoustic attenuation or acoustic enhancement (arrows). Longitudinal sonogram of the left corpus spongiosum.

ease. This finding has clinical relevance because it stresses the need for careful sonographic evaluation so that the more subtle forms of the condition are not overlooked. Whenever possible, the sonographer should correlate the findings with the physical examination. When confronted with a clinically palpable lesion but negative sonographic findings, a new examination with pharmacologic induction of an erection should be performed. This is necessary because hypoechoic and isoechoic lesions will only be detectable with distensibility or retraction of the corpora cavernosa.

The circumferential narrowing of the corpora cavernosa results in an "hourglass appearance" in the erect penis (Figure 20). This alteration is not necessarily associated with the calcified plaque but with a circular albuginea lesion, which appears retractile, is slightly echogenic or even hypoechoic, and is better identified after pharmacologic induction of an erection. Lateral penile deviations indicate that the thickening should be sonographically interrogated on the lateral aspect of the corpora cavernosa, where the cicatricial retraction is located, or even on the contralateral side, opposite from the site of the penile lesion, as shown in Figure 20.

The isolated thickening and fibrosis of the septum represent the most challenging aspect of the disease, from a technical point of view, because they are more difficult to show sonographically.[22] This is due to the orthogonal orientation of the septum, which naturally produces acoustic attenuation in the axial and sagittal planes. When the fibrous tissue is very circumscribed, an echogenic nodule can be observed in the septal region. When it is more diffuse, however, the examination of the penis should be performed in the longitudinal plane with the surface of the transducer parallel to the septum, as shown in

A

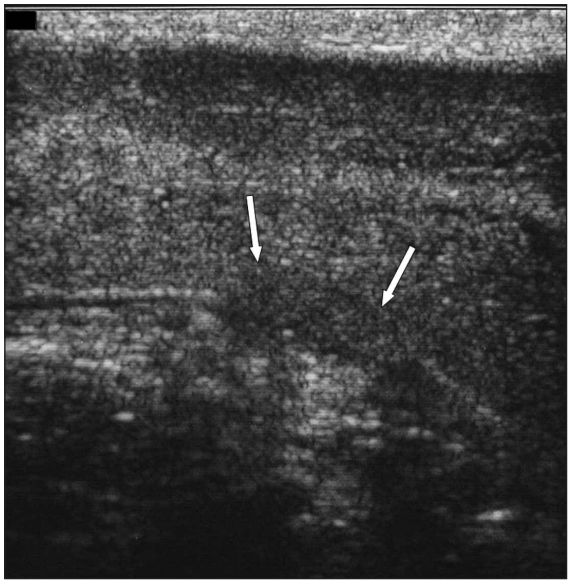
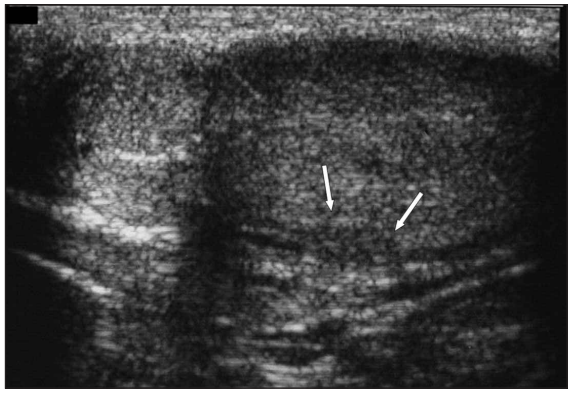
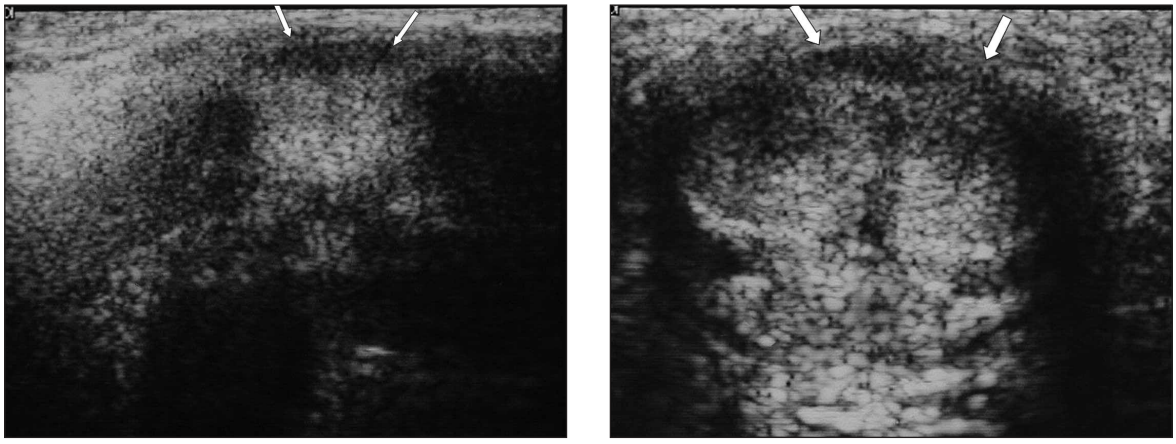


Figure 14. Less common variant of PD showing a hypoechoic well-defined nodular lesion of the tunica albuginea without acoustic attenuation or acoustic enhancement (arrows). The plaque is in the left lateral aspect of the penis. Right lateral access to the penile shaft is recommended. **A**, Longitudinal sonogram. **B**, Axial sonogram.

B



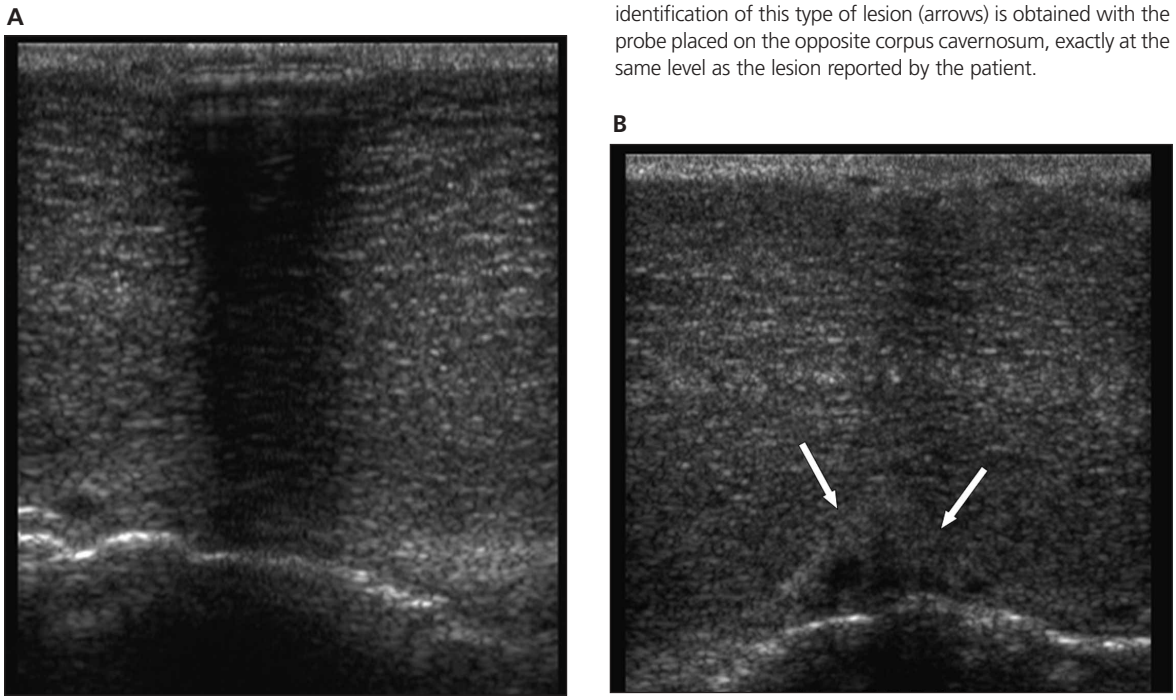


A B

Figure 15. Less common variant of PD showing a hypoechoic lesion with acoustic enhancement. **A**, Longitudinal scan, dorsal access. There is focal hypoechoic thickening of the tunica (arrows) with easy identification of the corresponding posterior acoustic enhancement. **B**, Axial scan, dorsal access. There is median and paramedian dorsal thickening of the tunica (arrows) and very good symmetric through-transmission of the ultrasound.

Figure 4B. In this case, the fibrosis may have a "veil-like" appearance, as described by Broderick and Arger.[22] This veil-like acoustic attenuation produced by dense septal fibrosis can also be found in isoechoic tunica albuginea lesions, as shown in Figure 15 (for unilateral involvement), and Figure 17 (for bilateral and symmetrical lesions). Slight septal fibrosis can be imaged more easily with the transverse or lateral approach so that the incidence of the acoustic beam is perpendicular to the septal fibers.

Figure 16. Less common variant of PD showing a markedly inelastic hypoechoic lesion with lateral retraction of the left corpus cavernosum, clearly shown after induction of an erection. **A**, Longitudinal sonogram with the probe placed on the side of the curvature (left side). There is no good contact with the skin because of the bending of the penis to the left. **B**, The best identification of this type of lesion (arrows) is obtained with the probe placed on the opposite corpus cavernosum, exactly at the same level as the lesion reported by the patient.



A B

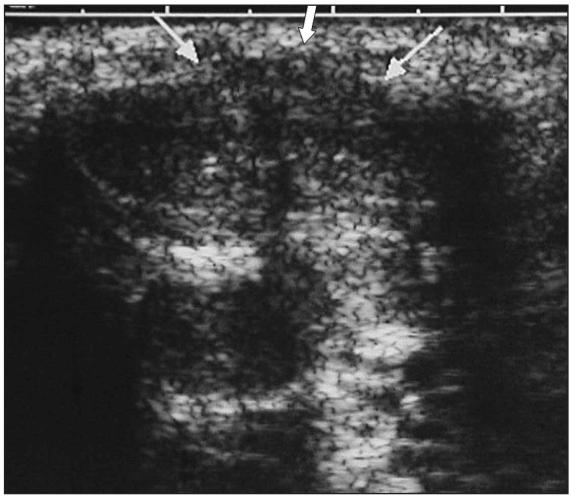


Figure 17. Less common variant of PD. The hypoechoic thickening is not limited to the tunica albuginea but also includes the surrounding peripheral tissues (arrows). According to the literature, this variant is found in the earliest stages of the disease, when fibrosis is not well developed and interstitial edema is the main finding.

Figure 18. Less common variant of PD with a focal lack of identification of the tunica albuginea (arrows). Longitudinal scan.

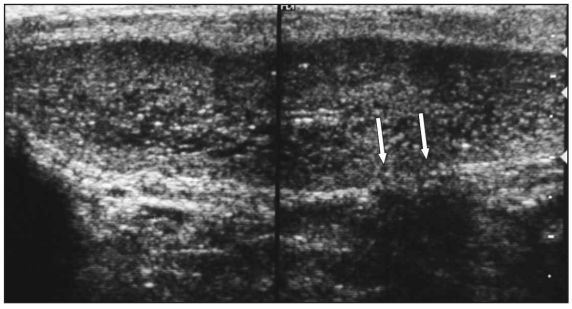
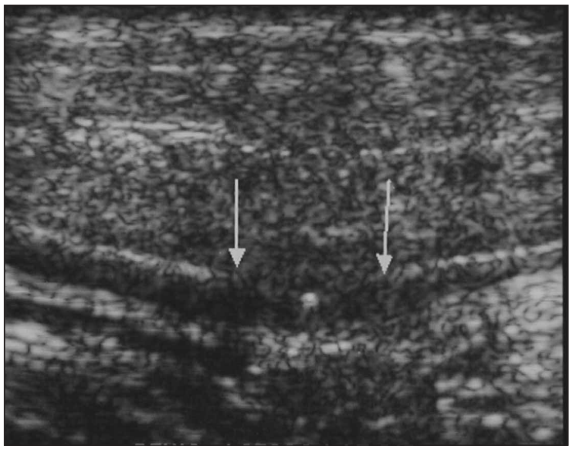


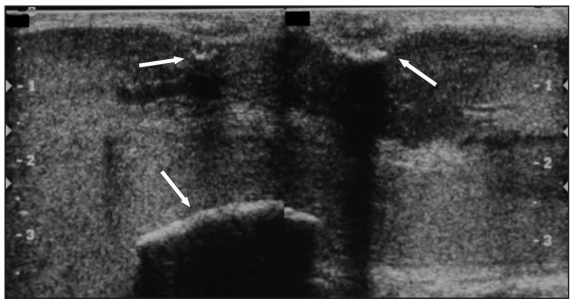
Figure 19. Peyronie disease with a focal lack of identification of the tunica albuginea (arrows) and a central small echogenic plaque. Axial scan, ventral access.



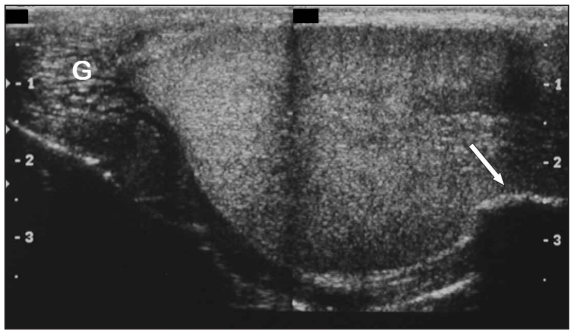
A precise description of the findings obtained with sonography is essential. Measurement of the plaque in 3 dimensions, the presence or absence of calcification, and the precise topography of the plaque or albuginea thickening are necessary. Plaques that show only slight acoustic

Figure 20. Marked involvement by PD showing circumferential focal narrowing of the penile shaft. **A**, Longitudinal scan of the penis, lateral access, after induction of an erection. The probe is placed on the opposite (less involved) corpus cavernosum. There are echogenic plaques (arrows) on both lateral surfaces of the corpora cavernosa. **B**, Longitudinal scan of the distal shaft. There is minimal distention of the glans (G) due to the narrowing. **C**, Digital plain radiograph of the penis in a wide-open window showing the penile silhouette (contours). There is substantial circumferential ringlike narrowing of the middle penile shaft (arrows) due to the inelastic and retractile plaques shown in **A** and **B**.

A



B



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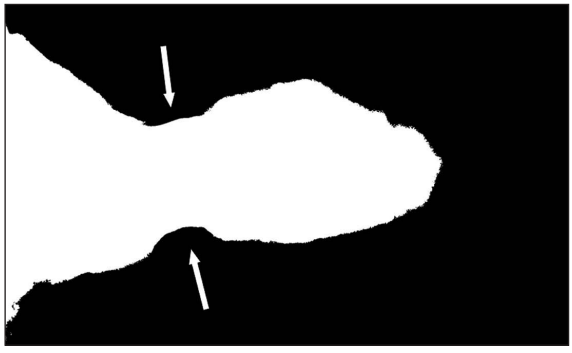


shadowing may not be calcified. In addition, sonography is sensitive enough to identify subtle lesions that are not calcified.[14]

Because PD can present with lesions that stabilize quickly or even regress (either partially or completely),[9] sonography appears to represent an ideal method for follow-up of these patients.[14] In addition, sonography can also distinguish lesions that lie outside the echogenic tunica albuginea (Figure 21), which appears to be a new use of this technology in evaluation of the disease.

To enhance the communication of data found with sonography in PD, we introduce the use of a map (Figure 22) where the topography and dimensions of the lesions are outlined. The anatomic marks used to determine the site of the penile lesion are the external urethral ostium, corona glans, and pubic symphysis.

In conclusion, sonography provides useful diagnostic information in the detection, characterization, and treatment of penile lesions caused by PD. Sonography can precisely locate the lesion and determine its activity, which constitutes a spectrum of disease ranging from an initial inflammatory active lesion to a lesion already heavily calcified and stable. This is an important factor in determining the type of treatment, the extent of the disease, and the timing of surgery. Sonography is also a valuable method for following the evolution and treatment of PD because it is painless, noninvasive, and easily repeatable.

Figure 21. Peyronie disease showing an echogenic plaque (arrow) with an "extra-albuginea" appearance. The tunica is almost normal if the presence of the lesion is not considered. Longitudinal sonogram, ventral access.

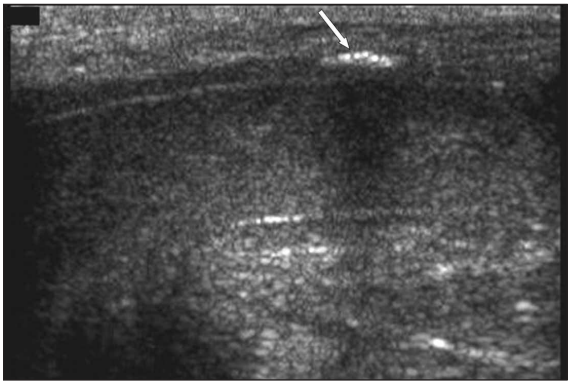
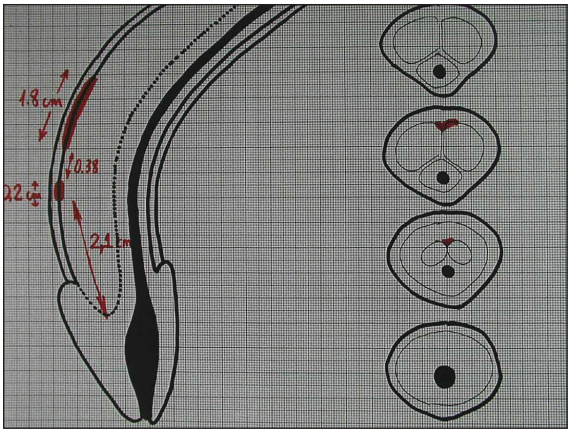


Figure 22. Schematic drawing used to enhance communication of the sonographic findings. The size, position, and sonographic type of the lesion are outlined according to the main landmarks on both longitudinal and axial view drawings.



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