

## ORIGINAL ARTICLE

# Early echographical assessment of minimal lesions of cavernosum corpora and tunica albuginea in subjects with erectile dysfunction, suggestive of La Peyronie's disease

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The aim of the study is to evaluate the incidence and the echographic characteristics of minimal lesions of cavernosum corpora and tunica albuginea (TA) in subjects reporting erectile dysfunction (ED), which could suggest the suspicious of La Peyronie's disease (LPD). In total, 185 patients (pts) underwent dynamic penile Ultrasound Color Doppler (USCD) for ED. None of the pts presented any clinical symptoms or any clinical findings for LPD. In this study we evaluated, using USCD, thickness, echogenicity, regularity of the surface profile of the dorsal TA, the intercavernous and the intercaverno-spongy septa, and the extension of the eventual pathologic lesions. In all, 16 pts (8.7%) presented minimal lesions at the ultrasound examinations. In nine of these pts (56%) the lesion was localized at the dorsal position, in six (38%) on the intercavernous septum and in one patient (6%) in both positions. The dorsal lesions were represented in nodular form in four pts (4%), and in diffuse form in five pts (55%). The nodular form was present in all the intercavernous septal lesions observed. As reported in the literature, USCD represents the investigative technique of choice in the study of LPD and in ED. Furthermore, the results of this study suggest that this technique could allow the localization of minimal lesions attributable to LPD during a preclinical phase of this disease. The localization of these lesions could permit to start a therapeutic approach during an early phase of the disease.

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## Introduction

Early clinical manifestations in patients (pts) suffering from La Peyronie's disease (LPD) are pain, penile curvature and clinical observation of fibrotic lesions prevalently localized at the dorsal part of penis.<sup>1,2</sup>

Clinical evolution is almost always towards an increase in penile curvature, which causes difficulty during sexual intercourse. Moreover, pts suffering from LPD have a high incidence of erectile dysfunction (ED) of organic origin.<sup>3,4</sup> Conventional therapies, whether pharmacological or not, do not offer satisfying results probably due to delayed diagnosis and the presence of lesions already in a fibrotic and/or calcific phase.<sup>5,6</sup>

In this study, the authors evaluated the incidence and the ultrasound characteristics of early lesions in pts who had been referred to a physician for ED without any typical symptoms of LPD and/or negative clinical assessment for fibrotic lesion of the penis. These findings were compared with the typical echographic results of advanced and clinically evident lesions in order to obtain an echographic description of the natural history of the disease.

The understanding of ultrasound characteristics of early lesions of LPD may enable a diagnosis in the early asymptomatic phase of the disease and eventual therapy carried out during such a phase may have greater success than those undertaken in more advanced phases.

## Materials and methods

Of the 463 pts, 185 submitted to dynamic penile Ultrasound Color-Doppler (USCD) for ED between January and September 2004 are included in this

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study, taking into consideration only those pts without pain, curvature, indurative and/or fibrotic lesions and negative clinical assessment for thrombosis of cavernous bodies or other benign or malignant penile diseases. The mean age of the pts was 58 years (range 18–72 years).

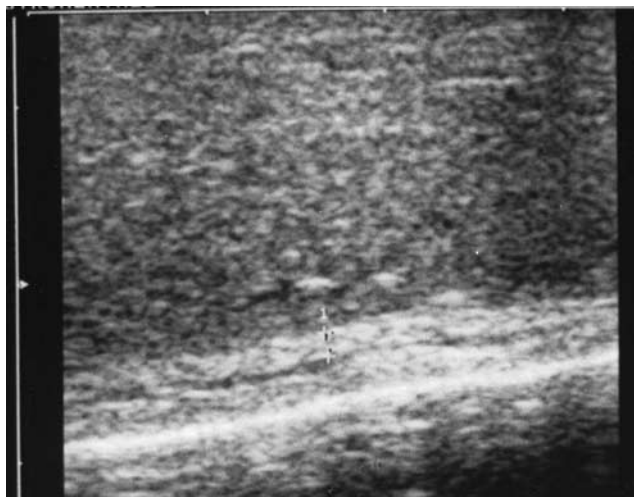
Using a linear probe of 7.5 MHz, transverse and longitudinal scanings of the penis from the base to the apex were performed in basal conditions and after injection of 10 mcg of PGE1.

The ultrasound scanning in basal condition was carried out only to exclude fibrotic and/or calcified areas due to the limited anatomic definition of the penile structures that did not allow optimal measurements of the lesions size and of the hemodynamic parameters.

After the PGE1 injection the velocity parameters of systolic and diastolic peaks at second, fifth, tenth and fifteenth min were recorded in order to evaluate the hemodynamic aspect according to accepted parameters worldwide.<sup>7</sup>

Thickness, echogenicity, regularity of the surface of dorsal tunica albuginea (TA), intercavernous and intercaverno-spongy septa and the extension of the identified lesions were evaluated and measured in the phase of maximum clinical response, namely in erection, which is particularly important because in the flaccid state superimposition and retraction phenomena may determine overestimation of the lesion.

Normal echographic findings were considered an albuginea with a regular surface, thinner than 2 mm and a dense and homogenous echostructural pattern (Figure 1). As normal values of thickness of the albuginea revealed through echography have not been documented, we considered a minimal value of 2 mm based on our observations of healthy pts.



**Figure 1** Tunica albuginea (TA) in normal subjects: the thickness is less than 2 mm, with a regular surface and a dense homogenous echostructural pattern.

Although an albuginea thicker than 2 mm or the alteration of its echostructural and surface patterns were considered pathological lesions. Pathological echostructural patterns have been considered as follows:

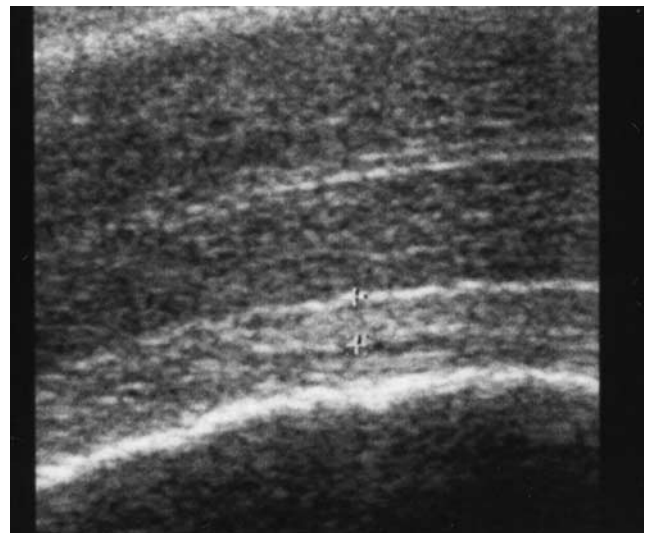
- (1) indentation of the internal albuginea surface with small and irregular ramifications extended towards the underneath cavernous tissue;
- (2) homogenous hyperechogenicity, characteristic of a dense fibrotic tissue;
- (3) echographic nonhomogeneous feature of the lesions characterized by the presence of circumscribed small hypoechoic areas likely to be interpreted as small areas of hemorrhage which are present at initial phases of this disease.

The lesions were classified as nodular or diffuse according to the extent of the lesion.

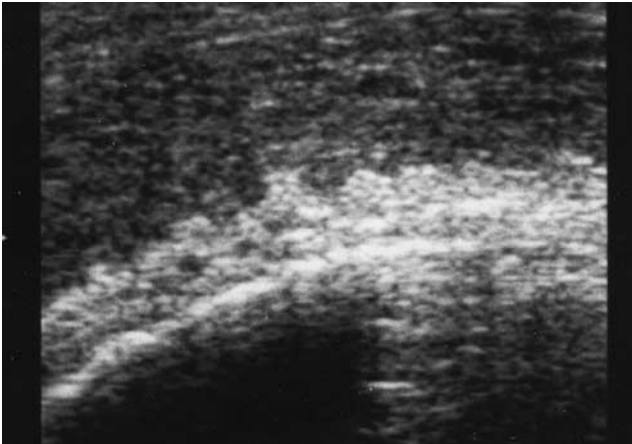
## Results

Echographic examinations revealed the presence of minimal, pathological lesions, in 16/185 (8.7%) pts. In 9/16 of these pts (56%), lesions were localized at dorsal position, in 6/16 pts (38%) lesions were on the intercavernous septum and in one patient (6%) both the dorsal albuginea and the intercavernous septum were involved. Among the nine pts having a dorsal lesion, five pts showed a diffuse form (55%), which extended from the base to the apex of the penis and in four pts the nodular form (45%).

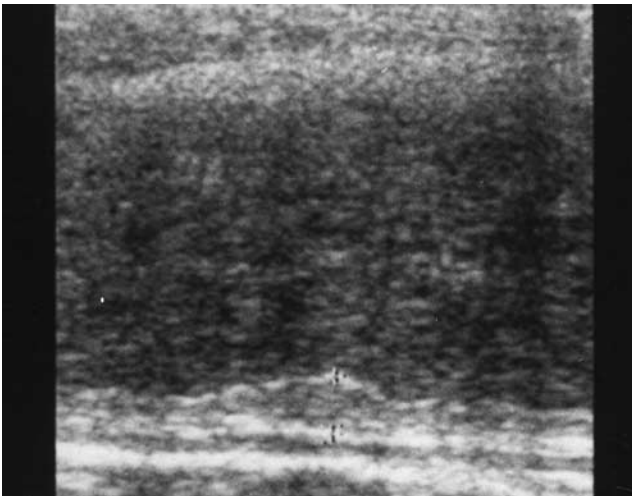
In the diffuse forms, the mean thickness of lesion was 2.8 mm (min 2.2 mm, max 3.5 mm) with an echographic pattern always characterized by a homogenous echogenicity (Figure 2). In three pts



**Figure 2** Echographic aspects of diffuse forms characterized by a homogenous echogenicity.



**Figure 3** Alteration of the profile of tunica albuginea (TA) on the cavernous side characterized by the presence of irregular fibrous indentations.

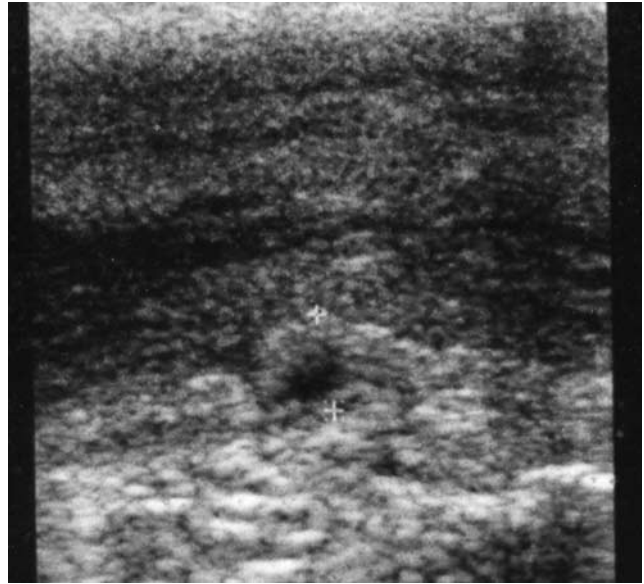


**Figure 4** Nodular and circumscribed lesions characterized by their hyperechogenicity.

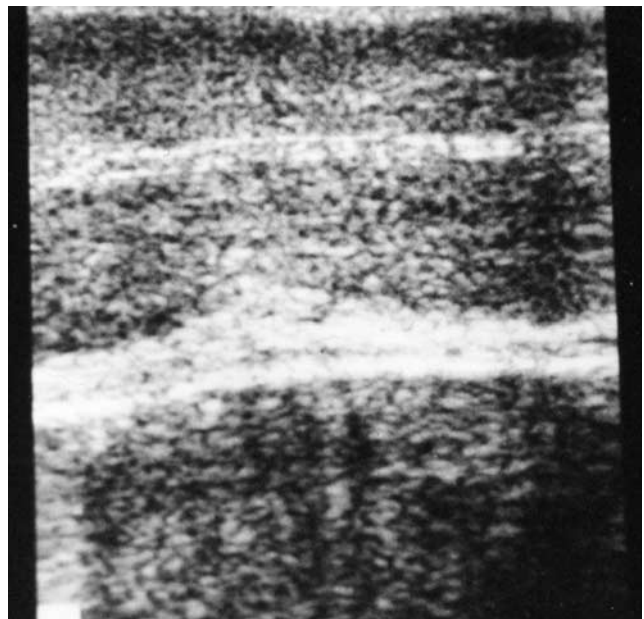
(60%) it was possible to identify an alteration of the surface of TA for the presence of irregular fibrotic indentations (Figure 3).

Nodular lesions showed an hyperechoic pattern (Figure 4) with a mean thickness of 2.5 mm (min 2 mm, max 3.5 mm). In contrast to the diffuse forms, in which the echogenicity was always homogenous, 3/4 pts (75%) did not show homogenous nodular lesions characterized by the presence of small hypoechoic areas (Figure 5). The surface of the lesion was regular in all but one patient, in whom the internal surface of the plaque presented an initial detachment and then continued more or less regularly with the TA (Figure 6).

In the six pts with intercavernous septal localization, the lesion had a nodular type pattern with an average thickness of 2.5 mm (min 2.2 mm, max 2.8 mm). The echographic aspect was characterized by a homogenous echogenicity. The medio-penile portion of the intercavernous septum was present in



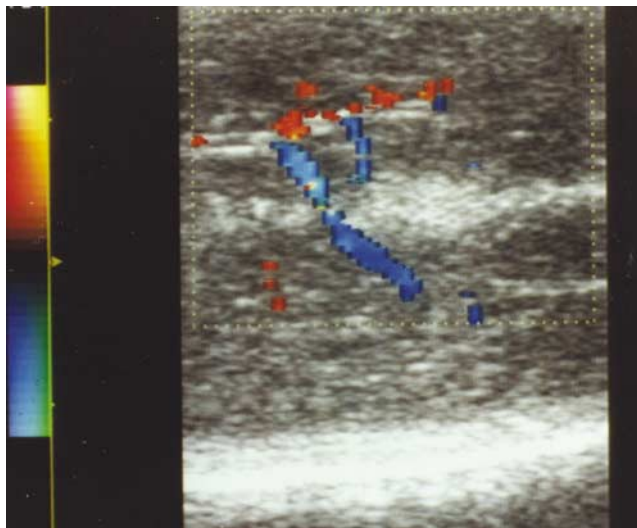
**Figure 5** In three patients (pts) with nodular lesions, we have observed the presence of small hypoechoic areas.



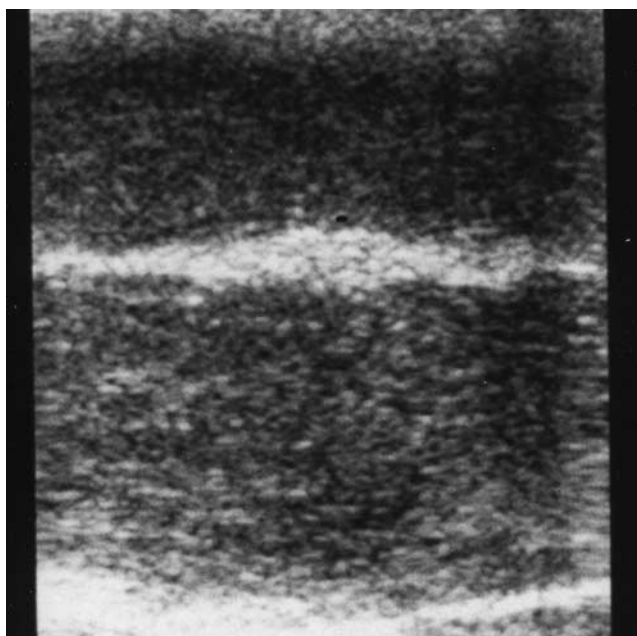
**Figure 6** Initial detachment of the internal surface of the plaque.

all pts and in two pts the cavernous arteries were present in the fibrotic lesion. In these pts, the arteries were dislocated from their normal position and vascular caliber was shrunk (Figure 7). Down to the lesion on the cavernous artery, a reduction of the velocity curves was observed. In the other two pts the lesion was localized in the proximity of a perforant arterious branch.

In the pts with the lesion localized either dorsally or on the intercavernous septum, the lesion was nodular, homogenous with a regular surface and with a thickness of 2.8 mm for the dorsal localization and 2.3 mm for the intercavernous (Figure 8).



**Figure 7** Nodular lesion of intercavernous septum proximal to perforant vessels of the septum.



**Figure 8** Nodular lesion of the intercavernous septum.

## Discussion

The typical lesions of LPD were described centuries ago.<sup>2,8</sup> Until recently, the diagnosis was exclusively based on the symptoms referred by the patient and on clinical evidence. Pathognomonic clinical findings are considered to be pain and curvature in erection and the presence of fibrotic areas in the flaccid state at the clinical assessment, prevalently localized in the dorsal part of cavernous corpora. The diagnosis often occurs in a delayed phase of the disease and this may explain the poor success

obtained with conventional therapies. Furthermore, if the condition is diagnosed when the lesions present sclerotic or calcific features, the therapeutic approach may be ineffective.<sup>5</sup>

The availability of ultrasound evaluation renders easier the assessment of various aspects of this pathology as to ensure an extremely accurate evaluation of size, anatomical characteristics and ultrasonographic features of the disease.<sup>7,9-11</sup>

Some authors' opinion that ultrasonography is less sensitive than manual palpation is debatable for two reasons: first, palpable lesions are already in an advanced clinical phase; second, clinical and USCD should be considered as synergic diagnostic tools because a well executed ultrasonographic assessment must be guided by the palpation and vice versa, echographic images guide the clinical assessment overall when minimal lesions are present, so increasing the sensitiveness of diagnosis.

Dynamic penile USCD probably represents the best diagnostic tool in the evaluation of these pts being sensitivity and specificity of high-resolution ultrasound higher than Resonance Magnetic Imaging performed with paramagnetic contrast medium.<sup>12,13</sup> Ultrasound investigation, carried out in experienced hands, allows routine evaluation of the echographic features of palpable lesions, for clinical purpose and follow-up; but the present study highlights the possible USCD usage in the early detection of nonpalpable LPD lesions.

The presence of minimal lesions in our patient series was 8.7%. These subjects were asymptomatic for LPD and came to our observation exclusively due to ED.

The albuginea thickness cutoff value of 2 mm is extrapolated from a series of measurements in 346 men submitted to USCD for ED.

Moreover, the analysis of the echographic feature of the lesion seems to be of utmost importance. In normal subjects, the TA appears as a thin, homogenous, hyperechoic band with a regular surface (Figure 1), infrequently with some fine irregularities determined by ramifications directed toward the cavernous corpora; the latter are more evident at the flexion point of fibers on the intercavernous septum. TA lesions are simply characterized by its thickening. This finding could well correlate with the theory that the initial LPD process starts from TA and that the lesions directly continue with the normal contiguous tissue. Furthermore this aspect should confirm the results of studies carried out on bioptic samples and also confirms the primitive involvement of TA meaning the theoretical primitive early involvement of subalbugineal areolar tissue appears disputable.

Lesions localized at the dorsal part may be characterized by two different possible features: diffuse and nodular. In our experience, the incidence of the diffuse form was higher while the

lesions on intercavernous septum always showed a nodular feature.

Different localizations and features might be expression of diverse evolutive phases of the disease or alternatively expression of dissimilar clinical forms.

In advanced and clinically manifest phases, important penile curvature with scarce palpatory findings, or on the contrary, slight or absent curvature with huge fibrotic lesion may be present.

These advanced clinical findings suggest that the diffuse form may evolve towards curvature, while the nodular form towards a large single lesion. Such a precise distinction may not always be possible in the advanced stages of the pathology clinically and echographically well-localized lesion may be associated with a diffuse involvement of TA, easily recognizable by ultrasound but clinically undetectable.

In 60% of cases with a diffuse lesion localized on the dorsal TA, the internal surface may be altered by an indentation due to the presence of small and irregular ramifications extended towards the underneath cavernous tissue. The interpretation of this aspect is difficult but may represent a more advanced phase of the diffuse form with regular surface.

The study of the echographic pattern of lesion, which provides information about anatomo-pathologic aspects of the disease, is important.

In diffuse forms, the echostructure is always characterized by a homogenous hyperechogenicity, which is the characteristic of a dense fibrotic tissue. In 75% of cases, on the contrary, we found an echographic dishomogeneity of the lesion characterized by the presence of small circumscribed hypoechoic areas. This finding may be interpreted as the presence of small areas of hemorrhage, which are present at initial phases of the disease as suggested by Montorsi *et al*.<sup>14</sup>

The nodular forms may be interpreted as initial lesions of the indurative process. Repeated microtraumas may induce delaminating phenomena of TA, microhaematomas and the presence of fibrin deposits;<sup>8</sup> all these aspects concord with our echographic findings in nodular forms. Extension of inflammatory infiltrates to subalbugineal areolar tissue may be confirmed by the indented aspect of diffuse forms.

A characteristic finding is observed in some pts with a nodular form localized on intercavernous septum: in these cases there was an involvement of arteries perforating the septum, which are normally present and anastomize the cavernous arteries of both sides. In 33% of cases, the lesion was near to perforant vessels; in 33% of cases it involved cavernous arteries of both sides inducing dislocation and compression of the vascular lumen. We do not know if the relationship between the lesion and

the vessels has any pathogenetical correlation or if it is just casual.

Thus, it seems that in LPD, even minimal lesions localized on intercavernous septum may have significant haemodynamic repercussions on intracavernous arterial circulation. Nevertheless, thanks to large anastomoses existing at this level, an isolated alteration of this type may rarely have significant effects on erection if other more proximal arterious lesions or a venoocclusive dysfunction are absent.

## Conclusions

USCD evaluation carried out after intracavernous injection of PGE1 is the method of choice in the study of pts suffering from ED and LPD, as reported by the literature. This method, in experienced hands, can also allow to early individuate minimal lesions which could be suggestive of LPD in asymptomatic subjects, thus to permit to start a therapeutic approach during a early phase of the disease. The results of this study confirm the need of an ultrasound investigation of all pts who have been referred for ED.

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