

ORIGINAL RESEARCH—PEYRONIE'S DISEASE**Use of Penile Extender Device in the Treatment of Penile Curvature as a Result of Peyronie's Disease. Results of a Phase II Prospective Study**

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ABSTRACT

Introduction. Pilot experiences have suggested that tension forces exerted by a penile extender may reduce penile curvature as a result of Peyronie's disease.

Aim. To test this hypothesis in a Phase II study using a commonly marketed brand of penile extender.

Methods. Peyronie's disease patients with a curvature not exceeding 50° with mild or no erectile dysfunction (ED) were eligible. Fifteen patients were required to test the efficacy of the device assuming an effect size of >0.8, consistent with an "important" reduction in penile curvature. Changes in penile length over baseline and erectile function (EF) domain scores of the International Index of Erectile Function (IIEF) constituted secondary end points.

Main Outcome Measures. Patients were counselled on the use of the penile extender for at least 5 hours per day for 6 months. Photographic pictures of the erect penis and measurements were carried out at baseline, at 1, 3, 6, and 12 months (end of study). The IIEF-EF domain scores were administered at baseline and at the end of study. Treatment satisfaction was assessed at end of study using a nonvalidated institutional 5-item questionnaire.

Results. Penile curvature decreased from an average of 31° to 27° at 6 months without reaching the effect size ($P = 0.056$). Mean stretched and flaccid penile length increased by 1.3 and 0.83 cm, respectively at 6 months. Results were maintained at 12 months. Overall treatment results were subjectively scored as acceptable in spite of curvature improvements, which varied from "no change" to "mild improvement."

Conclusions. In our study, the use of a penile extender device provided only minimal improvements in penile curvature but a reasonable level of patient satisfaction, probably attributable to increased penile length. The selection of patients with a stabilized disease, a penile curvature not exceeding 50°, and no severe ED may have led to outcomes underestimating the potential efficacy of the treatment. **Gontero P, Di Marco M, Giubilei G, Bartoletti R, Pappagallo G, Tizzani A, and Mondaini N. Use of penile extender device in the treatment of penile curvature as a result of Peyronie's disease. Results of a phase II prospective study. J Sex Med 2009;6:558–566.**

Key Words. Peyronie's Disease; Nonsurgical Treatment; Penile Extender

Introduction

Peyronie's disease can be defined as an acquired penile deformity of the erect penis, which is caused by a fibrous plaque. Men with Peyronie's disease may present with a combination of com-

plaints, including penile curvature, painful erections, erectile dysfunction (ED), and penile shortening leading to significant detrimental psychological effects [1–4]. A conservative medical treatment is usually advocated as the first-line therapy, particularly in the early inflammatory

phase, although there is little evidence that this is effective [5]. If such management proves unsuccessful, a more invasive surgical approach may be contemplated once the disease has been stabilized, usually after 1 year from onset [1]. The long-term results of surgery are not devoid of complications, particularly following graft procedures, with ED and penile shortening being not unusual complaints [6,7]. It has been claimed that the penile extender, a nonsurgical device that employs progressive mechanical traction to the penis, produces a significant improvement in penile length [8,9].

Two preliminary pilot experiences have suggested that the tension forces exerted by a penile extender could also reduce penile curvature as a result of Peyronie's disease [10,11]. The combination of these effects may provide an intriguing treatment option in selected Peyronie's disease patients. We tested this hypothesis in a Phase II study designed to assess whether a penile extender produces significant improvement in penile curvature as a result of Peyronie's disease.

Materials and Methods

Patient Eligibility

Patients with a penile curvature as a result of Peyronie's disease were considered eligible for the study if they met the following inclusion criteria: (i) a penile curvature not exceeding 50°, sustained by fibrous plaques detectable through genital palpation or ultrasound (US); (ii) a history of the disease lasting at least 12 months; and (iii) no penile pain in the flaccid state. Previous medical treatment did not contraindicate study participation. The exclusion criteria were a history of major psychiatric disorder, reduced manual dexterity that might prevent the correct use of the device, previous penile surgery, or severe ED based on the erectile function (EF) domain scores of the International Index of Erectile Function (IIEF).

End Points and Sample Size Statistics

Changes in penile curvature during erection compared with the baseline after 6 months of treatment and durability of the response 6 months after treatment discontinuation were considered the primary study end points. Given the objective difficulty of estimating the standard deviation of baseline penile curvature, calculation of the sample size was based on the "effect size" [12].

Effect-size is a standardized, scale-free measure of the relative size of the effect of an intervention.

It is particularly useful for quantifying effects measured on unfamiliar or arbitrary scales and for comparing the relative sizes of effects from different studies. Cohen [12] defined the effect size " d " as the difference between the means, $M1-M2$, divided by standard deviation, σ , of either group. By convention, the subtraction, $M1-M2$, is performed so that the difference is positive if it is in the direction of improvement or in the predicted direction, and negative if in the direction of deterioration or opposite to the predicted direction. Thus, effect size quantifies the size of the difference between groups, and may therefore be said to be a true measure of the significance of the difference. Effect sizes were defined as "small, $d = 0.2$," "medium, $d = 0.5$," and "large, $d = 0.8$ ". Effect sizes can also be interpreted in terms of the percent of non-overlap of the experimental group's values with those of the control group: a d of 0.8 indicates a non-overlap of 47.4% in the two distributions; a d of 0.5 indicates a 33% non-overlap; and a d of 0.2 a 14.7% non-overlap.

It was assumed that with 15 evaluable patients, the finding of a "relevant" reduction in penile curvature, defined by an effect size ≥ 0.8 , would have a statistical power of 80% and a probability of a false negative result of less than 5% (2-sided). Changes in flaccid and stretched penile length, plaque size, treatment tolerability, patient compliance and satisfaction, as well as changes in the IIEF-EF domain scores at last follow-up compared with the baseline measurements constituted secondary end points.

Baseline Investigations

Baseline patients' assessment included full medical and sexual history, and physical examination. The EF domain scores of the IIEF were administered at baseline and at the end of the study (6 months after treatment discontinuation). Patients scoring severe abnormal values (IIEF-EF ≤ 10) were excluded [13]. A penile US was required for study entry in order to record the size of plaques (determined as the product of length and width in mm²) and the location and sonographic appearance (calcified, hypoechoic, hyperechoic) of the plaques. Fibrous nodules undetectable sonographically were measured manually using a caliper. The same measurement method was used in each patient for the posttreatment determination of the plaque size.

The degree of curvature was documented using photographic pictures taken by the clinician from three angles (frontal, lateral, and dorsal) during an

in-office intracavernous injection test with 20 mcg alprostadil or, for patients refusing the injection, by self-photographs during an at-home full erection. The former was strictly required for patients scoring abnormal IIEF-EF domain scores.

The magnitude of curvature on photographs was determined by placing a goniometer in the angle formed by the intersection of two drawn segments running parallel to each of the two bended portions of the shafts. Following pharmacological erection, the center of the goniometer was placed over the point of maximum curvature and the limbs were positioned along the shaft, proximal to and distal to this point. Posttreatment curvature was determined in each patient using the same method they had chosen at baseline. Penile measurements (t_0) were obtained employing the standard technique validated by Wessells et al. [14]. Using a taper ruler to the nearest 0.5 cm, the penis was initially measured in the flaccid state and then while applying tension to maximally stretch it, from the pubopenile skin junction to the meatus. The circumference was measured at midshaft. Inter-operator agreement was assessed by performing a set of measurements on a small sample of young volunteers ($N = 8$) with individual variability always falling below 0.5 cm.

Device Description and Treatment Schedule

After signing the informed consent form, patients were taught how to use a common brand of penile extender, the Andropenis® (Andromedical, Madrid, Spain), a device designed to exert a continuous and gradually increasing traction force on the penis. The device consists of a plastic ring, where the penis is introduced, and from where two dynamic metallic rods originate the traction.

In the upper part there is a plastic support where a silicone band holds the glans in place. Detailed instructions on how to increase the traction force from 600 g during the first month, 900 g during the second month, up to 1200 g during the fifth and sixth months were provided following the manufacturer's leaflet. Briefly, the traction is rendered a dynamic process by means of the rigid rods combined with the action of "compression springs" (springs that react by exerting a traction when compressed). As the tissues are stretching throughout months of treatment, more and more elongations of the two metal rods of Andropenis® combined with the action of the "compression springs" are needed to achieve the needed traction forces [15].

In cases of concomitant untreated ED, patients were advised to postpone the use of erectile aids until the end of study. Sexual activity was not interdicted at any time during the study. It was suggested that patients wear the device for up to 9 hours/day and it was explained that, based on the available evidence [10,16,17], the magnitude of both the straightening and the elongating effect would be proportional to the traction time. The minimum daily use for testing treatment efficacy was assumed to be 5 hours and this was the minimum requirement for entry into the study.

Follow-Up Visits

Follow-up visits were scheduled at 1 (t_1), 3 (t_3), 6 (t_6), and 12 months (t_{12}) (end of study, after a wash-out period of 6 months) to record side effects, treatment compliance, calculations of curvature using fresh photographs, and to carry out genital examinations and take penile measurements. At the end of the study, the EF domain scores of the IIEF and a satisfaction questionnaire were administered. The latter consists of a set of five questions designed by the investigators that ask patients to assess subjective improvements in penile curvature (Q1) on a 0–4 scale (0 = worsening, 1 = unchanged, 2 = mild improvement, 3 = significant improvement, 4 = complete resolution), as well as to assess flaccid penile length (Q2), erect penile length (Q3), and overall results (Q4) on a 0–3 scale (0 = no change/worsening, 3 = optimal result). Lastly, Q5 addresses overall results on a 0–4 scale (0 = no result, 1 = very mild, 2 = acceptable, 3 = good, 4 = optimal results). Plaque size was also calculated at the end of study using a caliper or a penile US. The study protocol was granted Ethical Committee approval in February 2005.

Results

Out of a set of 40 patients referring with a complaint of penile curvature between February 2005 and May 2006, 19 met the inclusion criteria and entered the study. Reasons for exclusion were congenital curvature ($N = 2$), concomitant penile pain ($N = 6$), disease history lasting less than 12 months ($N = 6$), a curvature exceeding 50° ($N = 4$), and refusal to undergo the proposed treatment ($N = 3$). Baseline characteristics of the sample for age, disease features, EF domain scores of the IIEF, and penile measurements are listed in Table 1. None of the eligible patients was taking ED therapy at study entry.

Table 1 Baseline patient characteristics (N = 19)

Variable	Categorization	Value
Mean age (SD)	—	53.33 (7.45)
Mean disease duration in months (SD)	—	16 (3.5)
Previous medical treatment N (%)	None	5 (26)
	Oral agents	7 (37)
	Intralesional therapy	4 (21)
	Topical therapy	3 (16)
Mean plaque size in cm (SD) (method of determination: US N = 13 or calliper N = 6)		1.4 (0.5)
Plaque pattern at US N (%)	Calcified	7 (37)
	Hypoechoic	2 (10)
	Hyperechoic	4 (21)
	Not detectable	6 (32)
Plaque location N (%)	Proximal	3 (16)
	Midshaft	10 (53)
	Distal	6 (31)
Mean curvature degrees (SD) (method of determination: intracavernous injection N = 12; at-home photographs N = 7)		31 (1.55)
Curvature location N (%)	Dorsal	8 (42)
	Ventral	3 (16)
	Lateral (left or right)	8 (42)
Mean values (in cm) of penile measurements (SD)	Flaccid	7.9 (0.35)
	Stretched	10.66 (0.6)
	Circumference	9.86 (0.47)
IIEF-EF domain score N (%)	Normal (26–30)	8 (42)
	Mild ED (17–25)	9 (48)
	Moderate ED (11–16)	2 (10)
	Severe ED (1–10)	0

US = ultrasound; IIEF-EF domain = erectile function domain of the International Index of Erectile Function; ED = erectile dysfunction.

One patient discontinued treatment with the penile stretcher after a few days because of discomfort caused by the device and three patients did not attend the scheduled follow-up visits and were lost to follow-up. Data on the 6-month treatment period and follow-up were available for all 15 remaining patients. Median time of daily use of the device was 5.5 hours (minimum–maximum: 3–6 hours) at 1 month, 5 hours (minimum–maximum: 3–6 hours) at 3 months, and 5 hours (minimum–maximum: 2–8 hours) at 6 months, respectively ($P = 0.191$; Greenhouse–Gasser corrected, repeated measure analysis of variance).

Penile curvature decreased from a mean baseline value of 31° (SD 1.55) to 27° (SD 2.79) after 6 months of treatment ($P = 0.059$) (Figure 1). The degree of curvature worsened ($+10^\circ$) in one patient, remained unchanged in eight, and decreased in six (-20° in 2/6, -10° in 2/6, and -5° in 2/6). Curvature values remained unchanged in each patient after the 6 months wash-out period. Figures 2 and 3 report the box plots related to the changes in the flaccid and stretched penile length, respectively at 6 months. After 6 months of treatment with the penile extender, a significant (Wilcoxon $Z = -2.852$, $P = 0.004$ and Wilcoxon $Z = -3.068$, $P = 0.002$) and overall mean gain of 1.3 and of 0.83 cm for the flaccid and stretched penile length, respectively was observed. Table 2 reports the changes which occurred across all time intervals in penile curvature and length. The gain in length was maximal in the t_0 – t_1 time interval

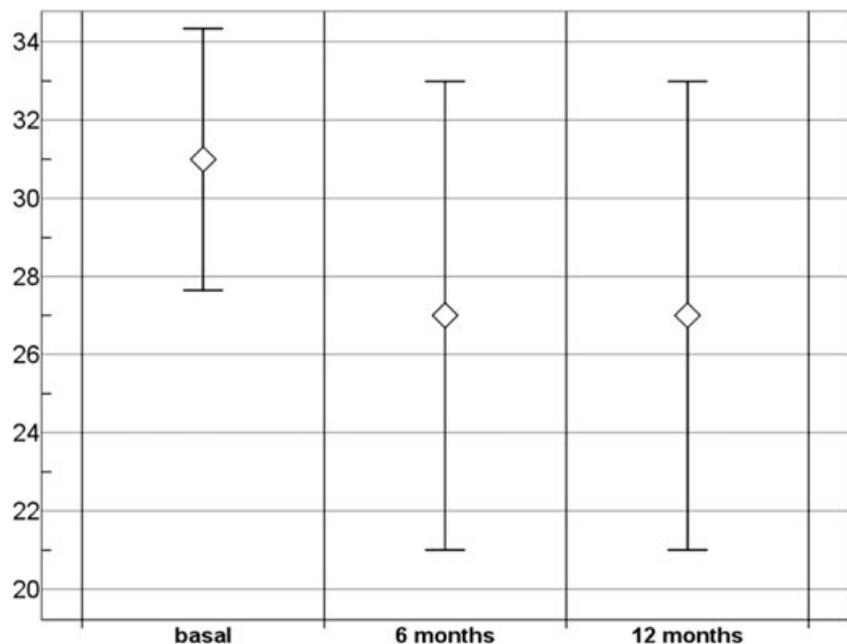


Figure 1 Plots showing mean changes over baseline in the penile curvature after 6-month treatment with the penile extender and at 12 months (after 6 months of treatment discontinuation).

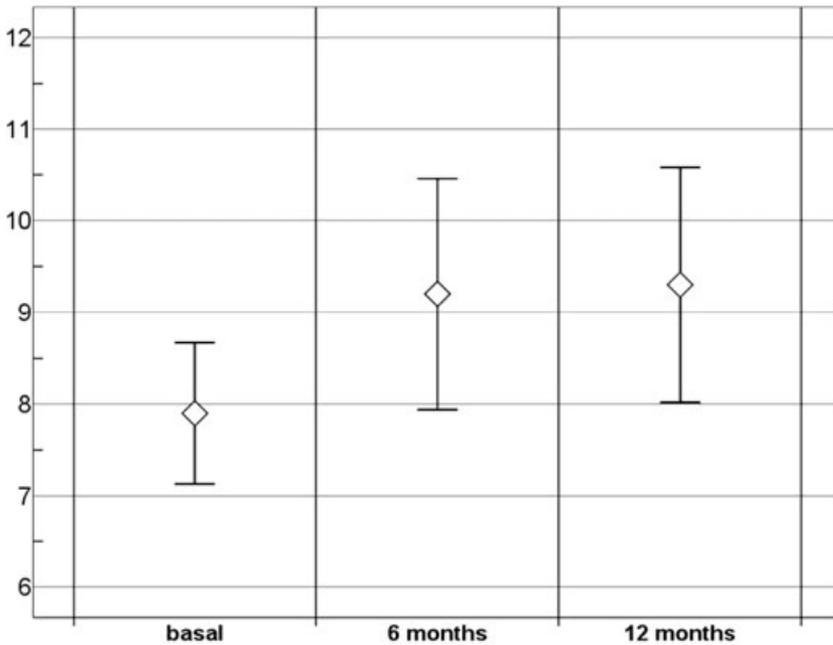


Figure 2 Box plot showing changes over baseline in the flaccid penile length after 6-month treatment with the penile extender and at 12 months (after 6 months of treatment discontinuation).

and showed progressive declines in t_1-t_3 and t_3-t_6 intervals. Curvature degrees and penile length remained stable at 12 months (t_6-t_{12}). Changes in penile girth were negligible and not significant (mean value of 9.86 cm at baseline and of 9.96 cm at 6 months).

Plaque size did not show significant changes during the study period (1.35 cm vs. 1.30 cm, $P=0.4$). No patient requested treatment for ED during the study period. IIEF-EF domain scores

showed only marginal improvements, from a mean baseline value of 23.8 (SD 4.07) to 24.7 (SD 4.11) at 12 months ($P=0.23$). Specifically, 6 months after treatment, the IIEF-EF domain score normalized in three out of six patients with mild ED at baseline, while two patients with normal pretreatment EF scored IIEF-EF values consistent with mild ED.

Mean patient satisfaction scores for the 5-item questionnaire are reported in Table 3. The treat-

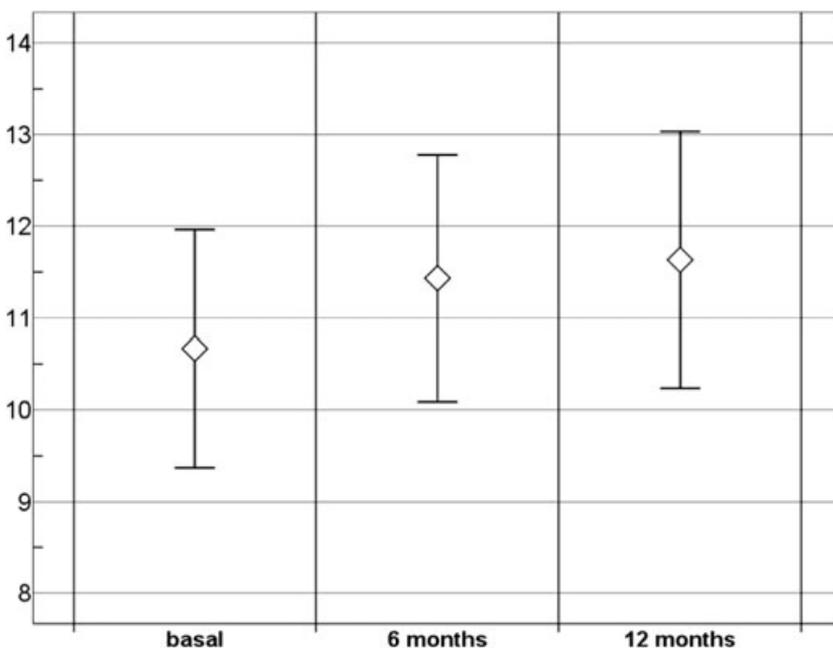


Figure 3 Box plot showing changes over baseline in the stretched penile length after 6-month treatment with the penile extender and at 12 months (after 6 months of treatment discontinuation).

Table 2 Mean changes in penile curvature and in stretched and flaccid penile length at different time intervals and corresponding 95% confidence intervals (95% CI)

Time interval	N	Mean change	95% CI	
Penile curvature				
t ₀ -t ₆	15	-4.00°	-8.08	0.08
t ₀ -t ₁	15	-1.00°	-2.55	0.55
t ₁ -t ₃	15	-0.33°	-3.78	1.11
t ₃ -t ₆	15	-1.67°	-3.93	0.59
t ₆ -t ₁₂	15	0.00°	NA	NA
Stretched penis				
t ₀ -t ₆	15	+0.83 cm	0.42	1.11
t ₀ -t ₁	15	+0.40 cm	0.14	0.59
t ₁ -t ₃	15	+0.20 cm	-0.06	0.39
t ₃ -t ₆	15	+0.23 cm	0.27	0.44
t ₆ -t ₁₂	15	+0.20 cm	-0.14	0.54
Flaccid penis				
t ₀ -t ₆	15	+1.30 cm	0.46	2.13
t ₀ -t ₁	15	+0.80 cm	0.25	1.35
t ₁ -t ₃	15	+0.30 cm	0.10	0.63
t ₃ -t ₆	15	+0.20 cm	-0.06	0.33
t ₆ -t ₁₂	15	+0.10 cm	-0.09	0.29

t₀ = baseline; t₁ = 1 month of treatment; t₃ = 3 months of treatment; t₆ = 6 months of treatment; t₁₂ = 12 months from treatment onset corresponding to 6 months of follow-up after stopping the treatment; NA = not applicable.

ment was generally well tolerated, with only three patients reporting bruising (N = 2) or itching (N = 1).

Discussion

Several treatment options, including oral compounds, intralesional and topical agents, have been proposed for the treatment of Peyronie's disease but the evidence that any of these may be effective remains weak, such that observation alone is considered a viable option [7,18,19]. The lack of precise data on the pathogenesis of Peyronie's disease is probably one key element that prevents the development of appropriate treatment strategies for this disease. Some data suggest that the currently available nonsurgical options may have a window of opportunity in the acute phase of the disease. Once the disease has stabilized, typically after 12–18 months, it is unlikely that any medical

treatment will produce a beneficial effect [20]. At this stage, surgery may be contemplated as the last remaining option to restore successful sexual intercourse [7]. All the currently available surgical techniques are essentially unable to provide a curative effect of the disease; rather, they aim to palliate its side effects by restoring a straight shape to the curved penis. Strict selection criteria (i.e., highly motivated patients with severe curvature impairing sexual intercourse) are mandatory as tunical lengthening surgical procedures carry a significant risk of complications leading to a high patient dissatisfaction rate. On the other side, tunical shortening procedures such as the Nesbit corporoplasty, in spite of the low morbidity, may result in a significant loss of penile length [21]. We selected a study population of patients with clinically stable Peyronie's disease and a mild to moderate degree of curvature (not exceeding 50°) and no severe ED as defined by the EF domain scores of the IIEF [11]. No specific treatment is currently available for this disease subgroup as surgery may probably turn out to be an overtreatment while nonsurgical options are unlikely to be effective once the disease is stabilized [22]. Notably, the majority of our patients had previously failed medical treatment.

Based on the preliminary evidence reported by Scropo et al. [10] of a 50% reduction in the curvature of the shaft after the application of progressive mechanical traction forces on the penis over a 6-month period, these patients may be ideal candidates for a trial with a penile extender device. In our series, the mean curvature of the shaft decreased by 4° (13% of the baseline value) following a 6-month treatment period using the same brand of penile extender. Albeit of borderline significance, the magnitude of improvement did not meet the expected "effect size" necessary to state that the treatment was effective. Interestingly enough, these results were comparable with the average absolute improvement in penile curvature (13.5%) reported in a recent meta-analysis on

Table 3 Mean scores of the 12-month satisfaction questionnaire (N = 15)

Question: After treatment . . .	Mean score	Minimum score	Maximum score	SD
Q1: How would you rate your penile curvature?*	1.6	0	4	0.23
Q2: How would you rate your flaccid penile length?†	1.96	0	3	0.34
Q3: How would you rate your erect penile length?†	1.96	0	3	0.33
Q4: How would you rate your sexual life?†	1.6	0	3	0.32
Q5: How would you rate the overall result achieved?‡	2.0	0	4	0.30

*Q1 scores: 0 = worsening; 1 = unchanged; 2 = acceptable improvement; 3 = significant improvement; 4 = complete resolution.

†Q2, Q3, Q4 scores: 0 = reduced; 1 = unchanged; 2 = acceptable improvement; 3 = significant improvement.

‡Q5 scores: 0 = no result; 1 = very mild; 2 = acceptable; 3 = good; 4 = optimal.

intralesional injection therapy, one of the most popular treatment modalities for Peyronie's disease [5]. Measurable reductions in curvature ranging from 5° up to 20° were recorded in 6 out of 15 (40%) evaluable patients, the remaining patients having stable (8/15) or progressive (1/15) disease. Although spontaneous improvement in the degree of bending has been reported [2,23], this is less likely to occur when the disease is stabilized, as in our series. Of note, no changes in penile curvature were detected after 6 months of treatment wash out. If it seems reasonable to state that the treatment proved effective in some patients, the small sample size did not allow us to identify predictors of response. In a subgroup of our patients refusing an in-office intracavernous injection, the curvature was calculated based on at-home photographs, a methodology that has been recently found to underestimate the degree of penile bending as compared with trimix intracavernous injection [24]. This may have led to inaccurate measurements, given the inability of the investigator to assess the rigidity of the erection. It may be speculated that the shorter daily use of the device in our study in comparison with the study of Scropo et al. [10] might account for the lower degree of curvature reduction.

The mean time of daily use of the device in our study tended to be close to the minimum required for study entry. It is likely that a more strict protocol requiring a minimum of 8 or 9 hours of daily use would greatly reduce patients' compliance [10,17]. Our results were overall lower than that reported in a recent pilot study where an average 33% curvature reduction was recorded [11].

Differences in selection criteria, device properties, and treatment schedule may account for these discrepancies in outcomes and represent limitations of the current study. For instance, the requirement of a "clinically" stable disease for study entry may have led to select a subgroup of patients with a disease less amenable to plastic changes following the application of traction forces as opposed to a Peyronie's plaque in the acute phase. The reason for these strict inclusion criteria was to minimize the possibility of self-improvement of the curvature that could more likely occur during the acute disease phase. Also, by restricting the limit of penile bending to 50°, we may have reduced the chances to obtain an effect of significant magnitude. Baseline mean curvature in our study was 31° as compared with 51° in the study by Levine et al. [11]. With these inclusion criteria, we aimed to minimize the

risk of study dropout from patients with a severe curvature that could have been less compliant to a 1 year duration trial.

Variations in plaque size constituted a secondary study end point. The lack of significant post-treatment changes in the current study is likely to be clinically irrelevant and it does not affect the potential efficacy of the device as no correlation between the extent of the plaque and the severity of curvature has been demonstrated so far. Besides, it is possible that the two different methods employed in the current study to obtain plaque size (US or caliper) may not be equally accurate.

Whether the application of the device in the acute disease phase may reduce the plaque size remains to be proven. The application of a penile extender in the current study caused only minimal and self-resolving side effects, leading to discontinuation of treatment in only one case. Mean baseline IIEF-EF domain scores were consistent with mild ED as we deliberately excluded patients with severe ED that may be less amenable for conservative treatment of Peyronie's disease. Sexual dysfunction is a common complication in the presence of fibrous penile plaques with both psychological and organic factors contributing to its pathogenesis [22]. Currently, there is no evidence that any medical treatment may have beneficial effects on the sexual function of Peyronie's disease patients [5]. An average 5-point improvement of the IIEF-EF domain scores has been recently reported in a pilot experience on a penile traction device [11]. Posttreatment IIEF-EF domain scores in our study showed marginal, nonsignificant changes compared with baseline scores. It is possible that the lower degree of baseline sexual dysfunction in our series as opposed to the one of the Levine et al. study [11] (mean IIEF-EF domain score of 23.8 vs. 18.3) may account for the lower degree of improvement.

Notably, our finding corroborates the safety profile of the penile traction device as opposed to the detrimental effect on sexual function sometimes reported following graft surgery [6].

The Andropenis® produced an effective and durable (over the 6-month off treatment period) lengthening of the penis both in the flaccid and the stretched state. The elongating effect was of a lower magnitude than that observed in our previous study where dysmorphophobic and postsurgery short penises underwent the same treatment protocol [9]. A reduction in penile elasticity as a consequence of the reduced content in elastin within the fibrous plaques could explain why

Peyronie's disease patients are less susceptible to the elongating effects of the penile extender [25].

Even though baseline penile size in our patients falls within the normal range based on the criteria outlined by Wessells et al. [14], penile lengthening was probably the most notable clinical finding of the current study. Penile shortening, a bothersome symptom of Peyronie's disease, cannot be addressed as an end point by any medical treatment. Restoration of penile lengthening would involve a complete reversal of the fibrotic process, a finding that has never been proved to occur with any specific treatment modality in Peyronie's disease. Besides, it is usually significantly worsened by surgery, no matter which procedure is employed, leading to a high dissatisfaction rate [7]. From this perspective, the penile extender could play an essential role as part of a multimodal treatment strategy. In the absence of validated instruments to assess the patients' perception of the efficacy of the device, we designed a specific posttreatment 5-item questionnaire. Average scores for the two questions about the flaccid and stretched penile length were consistent with "acceptable results," meaning that patient self-judgment of the gain in both the flaccid and the erect penile length somehow substantiated the objective changes we recorded through measurements. While improvement in sexual function and penile curvature were rated as intermediate between "no changes" and "acceptable," the overall results were surprisingly assessed by the patients as "acceptable." Our satisfaction assessment is limited by the absence of a comparative pre- and posttreatment analysis, and lack of validation. Notwithstanding these limitations, it hints at favorable acceptance of the device that warrants further study to explore the clinical utility of this noninvasive treatment modality in Peyronie's disease.

Conclusions

In our study population, the penile extender produced an improvement in penile curvature of clinical interest when compared with that achieved with other commonly used treatment modalities such as intralesional injections. Overall, the reduction of curvature was not of great clinical relevancy. However, results were achieved in a selected population with stable disease, a condition where the existing treatment options are less likely to be effective. Significant lengthening of the penis both in the flaccid and in the stretched state was also recorded, albeit of lower magnitude than that obtained in studies on short penis. The device

caused negligible side effects. Overall results were self-reported as "acceptable," making this minimally invasive treatment modality a potential new treatment option in selected Peyronie's disease patients.

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Statement of Authorship

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References

- Hellstrom WJ, Bivalacqua TJ. Peyronie's disease: Etiology, medical, and surgical therapy. *J Androl* 2000;21:347-54.
- Gelbard MK, Dorey F, James K. The natural history of Peyronie's disease. *J Urol* 1990;144:1376-9.
- Rosen R, Catania J, Lue T, Althof S, Henne J, Hellstrom W, Levine L. Impact of Peyronie's disease on sexual and psychosocial functioning: Qualitative findings in patients and controls. *J Sex Med* 2008;5:1977-84.
- Smith JF, Walsh TJ, Conti SL, Turek P, Lue T. Risk factors for emotional and relationship problems in Peyronie's disease. *J Sex Med* 2008;5:2179-84.
- Russell S, Steers W, McVary KT. Systematic evidence-based analysis of plaque injection therapy for Peyronie's disease. *Eur Urol* 2007;51:640-7.

- 6 Montorsi F, Salonia A, Briganti A. Five year follow-up of plaque incision and vein grafting for Peyronie's disease. *J Urol* 2004;171:331.
- 7 Kendirci M, Hellstrom WJ. Critical analysis of surgery for Peyronie's disease. *Curr Opin Urol* 2004;14:381-8.
- 8 Moncada I, Jara J, Martinez-Salamanca JI, Cabello R, Herenandez C. Management of penile shortening after Peyronie's disease surgery. *J Sex Med* 2005;2(suppl 1):MP2-5.
- 9 Gontero P, Di Marco M, Giubilei G, Tizzani A, Bartoletti R, Mondaini N. Phase II prospective study to test the efficacy and tolerability of a penile extender device in the treatment of short penis. *J Sex Med* 2008;5(Suppl 2):10, 291.
- 10 Scropo FI, Mancini M, Maggi M, Colpi GM. Can an external penis stretcher reduce Peyronie's penile curvature? *Int J Impot Res* 2001;13(Suppl 4).
- 11 Levine LA, Newell M, Taylor FL. Penile traction therapy for treatment of Peyronie's disease: A single-center pilot study. *J Sex Med* 2008;5:1468-73.
- 12 Cohen J. *Statistical power analysis for the behavioural sciences*. 2nd edition. Hillsdale, NT: Lawrence Earlbaum Associates; 1988.
- 13 Cappellieri JC. Diagnostic evaluation of the erectile function domain of the International Index of Erectile Function. *Urology* 1999;54:346-9.
- 14 Wessells H, Lue TF, McAnich JW. Penile length in the flaccid and erect states: Guidelines for penile augmentation. *J Urol* 1996;156:995-9.
- 15 Gometz E. Penile enlargement without surgery with the Andropenis. Available at: <http://www.andromedical.com/studies.htm> (accessed May 17, 2008).
- 16 Colpi GM, Martini P, Scropo FI, Mancini M, Castiglioni F. Efficacy of the daily penis-stretching technique to elongate the "small penis". *Int J Impot Res* 2001;13(suppl 4):Abstract 42.
- 17 Gomez EA. Penile enlargement without surgery with the Andro-Penis®. Hispanoamerican Sexual Education Congress; 2001.
- 18 Briganti A, Salonia A, Deho F, Zani G, Rokkas K, Rigatti P, Montorsi F. Peyronie's disease: A review. *Curr Opin Urol* 2003;13:417-22.
- 19 Bella AJ, Perelman MA, Brant WO, Lue TF. Peyronie's disease (CME). *J Sex Med* 2007;4:1527-38.
- 20 Riedel CR, Plas E, Engelhardt P, Daha K, Pfluger H. Iontophoresis for treatment of Peyronie's disease. *J Urol* 2000;163:95-9.
- 21 Pryor J, Akkus E, Alter G, Jordan G, Leuret T, Levine L, Mulhall J, Perovic S, Ralph D, Stackl W. Chapter 14. Priapism, Peyronie's disease, penile reconstructive surgery. In: Lue TF, Basson R, Rosen R, Giuliano F, Khouri S, Montorsi F, eds. *Sexual medicine. Sexual dysfunction in men and women*. 2nd International Consultation on Sexual Dysfunctions. Paris: Health Publications; 2004:383-409.
- 22 Gholami SS, Gonzalez-Cadavid NF, Lin CS, Rajfer J, Lue TF. Peyronie's disease: A review. *J Urol* 2003;169:1234-41.
- 23 Teloken C, Rhoden EL, Grazziotin TM, Da Ros CT, Sogari PR, Vargas Souto CA. Tamoxifen versus placebo in the treatment of Peyronie's disease. *J Urol* 1999;162:2003-5.
- 24 Ohebshalom M, Mulhall J, Guhring P, Parker M. Measurement of penile curvature in Peyronie's disease patients: Comparison of three methods. *J Sex Med* 2007;4:199-203.
- 25 Pryor JP, Ralph DJ. Clinical presentations of Peyronie's disease. *Int J Impot Res* 2002;14:414-7.