

Epidemiology of Peyronie's disease

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Francois Gigot de la Peyronie, surgeon to Louis XV of France, has become synonymous with the rather enigmatic though not uncommon condition of Peyronie's disease (PD), a localized connective tissue disorder of the penile tunica albuginea. The true prevalence of Peyronie's disease is unknown. Therefore, we decided to perform an evaluation of existing epidemiological data. A prevalence rate of 3.2% was determined in male inhabitants of the greater Cologne area. This is much higher than revealed by the data reported up to now, thus rendering the accepted prevalence rates of 0.3% to 1% untenable. The actual prevalence of Peyronie's disease may be even higher, considering many patients' reluctance to report this embarrassing condition to their physicians. Along these lines, most clinicians note that the number of Peyronie's patients has increased since the advent of oral sildenafil. Comparably high prevalences are known for diabetes and urolithiasis, suggesting a greater frequency of this rare disease than formerly believed.

International Journal of Impotence Research (2002) 14, 379–383. doi:10.1038/sj.ijir.3900863

Keywords: epidemiology; Peyronie's disease; penile induration; Cologne questionnaire

Introduction

Even though he was not the first to describe it, the name of Francois Gigot de la Peyronie, surgeon to Louis XV of France, has become synonymous with the rather enigmatic though not uncommon condition of Peyronie's disease. De la Peyronie considered chronic irritation through sexual abuse as well as sexually transmitted disease to be causative factors. Since the initial description of this disease, however, little progress has been made in discovering its cause, consistently successful treatment options, or the actual incidence of the disease with time.

Peyronie's disease is a disorder characterized by fibrotic plaques of the tunica albuginea penis.^{1–3} Over 250 y after the first description, the etiology of the disorder still remains obscure. The most widely accepted hypothesis is the initiation of Peyronie's disease by trauma to the erect penis with subsequent aberrant wound healing and scar formation.^{4–6} Some authors have suggested an infectious aetiology, autoimmune disease or local manifestation of a general fibromatosis.^{7–10}

Because of the still unresolved debate over the causation of abnormal production of fibrous tissue and the optimal therapy for Peyronie's disease, as well as its unclear natural history, new epidemiological studies represent an important approach to a better understanding of this penile fibromatosis. There is great demand for evaluation of prevalence data.

The epidemiological data on Peyronie's disease is quite inconsistent. Polkey¹¹ reported on 550 case reports worldwide up to 1928, and an Italian publication, published in 1966, described 3600 affected patients.¹² In 1968, Ludvik¹³ established a rate of 0.3–0.7% in all male patients seen in one private urological practice.

Lindsey *et al*¹⁴ in their 1991 study, postulated a prevalence of 388.6 cases of Peyronie's disease per 100 000 male patients in Rochester, Minnesota. At Devine's institution, about 1% of the male physician population between 30 and 65 y of age had Peyronie's disease.¹⁵ On the other hand, the disorder has been established much more frequently in autopsies, such as by Smith, who observed a mild form in 23 of 100 male post mortem examinations.¹⁶ Thus the estimated number of unknown cases in men over the age of 45 seems to be much greater than the most advanced or fully manifested stages diagnosed in the consulting room may suggest.

Therefore our Department decided to perform an evaluation of the prevalence of this not uncommon disease.

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Received 1 June 2001; accepted 12 February 2002

Patients and methods

A total of 8000 men living in the greater Cologne area (≈ 1.5 million inhabitants) received via the mail a validated questionnaire. The questionnaire consisted of four parts: first, a cover sheet requesting demographic and socio-economic data, as well as information on disease-related factors such as smoking and alcohol habits, diabetes, cardiovascular diseases including high blood pressure, heart insufficiency and arteriosclerosis, hernia, history of drug therapy/medication and any operations; second, a set of questions on sexuality; third, data on micturition or 'lower urinary tract symptoms' (LUTS); and fourth, questions concerning Peyronie's disease.

Validation

Prior to the mailing, the questions referring to Peyronie's disease were validated based on 182 patients treated in our outpatient department, including 158 men without Peyronie's disease and 24 patients with this penile fibromatosis. A physical examination was performed on these patients and, if evidence of PD was found, an additional intracavernous injection of prostaglandin E1, resulting in artificial erection, proved deviation. In this way subjective information could be objectified by clinical examination to establish descriptive diagnostic quality terms such as sensitivity or specificity. The mean age of the 182 men was 50.9 ± 9.7 y, with an age range from 24 to 70. The mean age of the 24 patients with evidence of PD was 54.5 ± 7.9 y, with an age range from 26 to 69.

Sensitivity of the question on penile plaque was 100%, while specificity was 99.4%. Of the 24 men with palpable induration, 23 (96%) reported a bent erection, although curvature could be confirmed in all 24 patients by intracavernous injection. Fourteen of the 24 men (58.3%) suffered from painful erection, as did 14 of the 158 men (8.9%) without Peyronie's disease. Twelve of the 24 PD patients (50%) reported erectile dysfunction.

Survey

After validation of the survey questions, questionnaires were mailed to 8000 men aged 30–80 y living in Cologne, whose addresses were provided by the Cologne public registration office. Selection of the participating men followed age stratification (30–80 y) and comprised all social classes. This selection is therefore equivalent to a representative cross-section of the general population of a European city.

To achieve a high response rate, the mailing was repeated three times over a period of 6 months.

Statistics

Data were evaluated using standard SPSS software. Crude prevalences were calculated for each age group separately. Exact Clopper-Pearson confidence intervals were calculated for taking into account low prevalence rates.

Results

Response rate after the third mailing was 55.4% (4432 out of 8000 men). The mean age was 51.7 ± 13.1 y, with an age range from 30 to 80 y.

Of the 4432 responses, 142 men reported a palpable penile plaque. The prevalence of Peyronie's disease was therefore 3.2%, with a steep age-related increase (1.5–6.5%). The increase was linear in the age groups from 30 to 49 y, while the age groups from 50 upwards showed an exponential increase in prevalence. The mean age of these men was 57.4 ± 13.4 y, with an age range from 31 to 78 y. Age stratification showed that only 1.5% of the group between 30 and 39 y noticed an induration, in contrast to 3% of the 40–49 and 50–59 y age groups, 4% of the men aged between 60 and 69 y and 6.5% of the men over the age of 70 (Figure 1).

Three men experienced induration alone (0.07% of 4432). A combination of penile induration and deviation without pain was reported by 73 men (1.65% of 4432), and of induration and pain but without deviation by 20 men (0.45% of 4432). The triad of plaque, angulation and painful erection occurred in 46 men (1.04% of 4432), as shown in Figure 2.

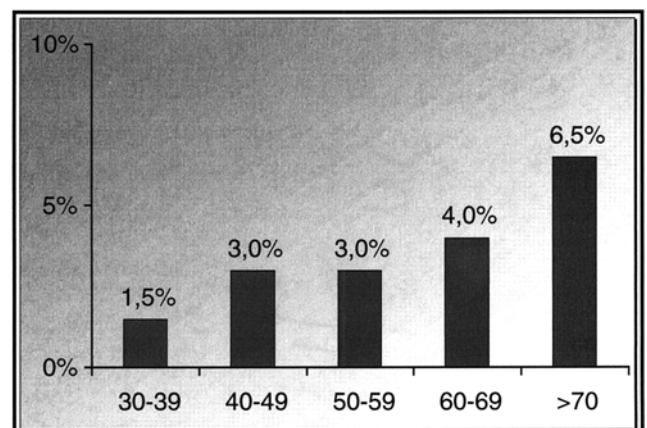


Figure 1 Age distribution of Peyronie's disease in 4432 men.

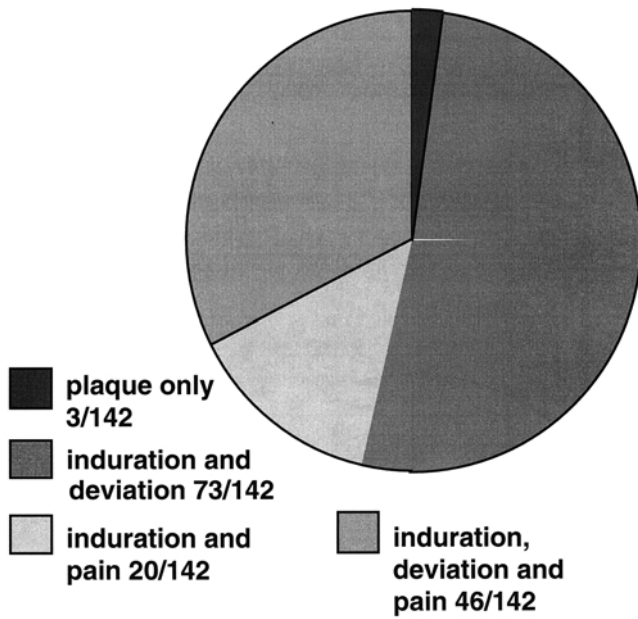


Figure 2 Symptoms of Peyronie's disease and their combination in 142 affected men.

Table 1 Penile induration and combined symptoms in 4432 men

| Symptom | Total | Prevalence rate |
|---------------------------------|-------|-----------------|
| Induration | 142 | 3.2% |
| Induration and angulation | 119 | 2.7% |
| Induration and pain | 66 | 1.5% |
| Induration, angulation and pain | 46 | 1% |

Table 2 Prevalence of diabetes, β -blocker-therapy and sexual dysfunction

| | Induration (142/4432) | No induration (4290/4432) |
|---------------------|--------------------------|------------------------------|
| Diabetes* | 18.3% \gg | 6.0% |
| β -blocker* | 22.5% $>$ | 14.2% |
| Sexual* dysfunction | 57.7% \gg | 19.2% |

*Significant difference (two-sided $P < 0.01$).

Consequently, 119 of the 142 affected men (83.8%) suffered from penile curvature during erection (2.69% of 4432) and 66 men (46.5%) from pain (1.49% of 4432) (Table 1).

Of the 142 men with palpable plaque, 58 (40.8%) reported erectile dysfunction. Evaluation of questions on internal diseases showed a higher rate of diabetes (18.3% vs 6.0%) and therapy with β -blockers (22.5% – 14.2%) in men with PD compared to those not affected (Table 2). There was no association of Peyronie's disease with other diseases (heart insufficiency and arteriosclerosis, hernia, history of other drug therapy/medication such as β -blockers and any other operations), 'lower urinary

tract symptoms' (LUTS), pelvic surgery, drinking alcohol and smoking.

Discussion

To our knowledge, this study provides the first prevalence rates for Peyronie's disease in a defined community in Europe. Demonstrated epidemiological data obtained by means of a mailed questionnaire survey support the thesis of a higher prevalence rate than formerly accepted. All questions were checked beforehand as to their validity. Participants in the study were chosen randomly and represent a valid, age-stratified cross-section of all male inhabitants of a German city, selected from all population classes. Considering the very private nature of the questions, a response rate of 55.4% is a good result.¹⁷ On the other hand, it must be pointed out that no data are available for the non-responders. Such information is critical for an understanding of the possible bias of the study.

The currently most quoted publication on Peyronie's disease is that of Lindsay and co-workers from 1991, who determined a prevalence of 0.39% in a large patient population.¹⁴ An average annual crude incidence rate of 22.4 per male population of 100 000 was found. Mean patient age at diagnosis was 53 y (range 19–83 y). The highest incidence is reported for the 50 to 59-year age group.¹⁴ Devine reported on two separate populations, with 1% prevalence of a symptomatic penile induration.¹⁵ In contrast, we were able to confirm the suspicion that the prevalence of plastic penile induration is much higher than 1%. Of the five objective criteria of Peyronie's disease (induration, number, size and localization of plaque and bending), the validated question addressing palpable plaque, which can be answered by self-examination, was considered the most sensitive question for determining manifestation of this localized connective tissue disease. Byström and Rubio² likewise identified a palpable penile induration as the main symptom of PD in 103 of 106 men with Peyronie's disease.

In our survey a prevalence of 3.2% was found. This surpasses the formerly assumed maximum rate by more than a factor of three. Therefore, the prevalence of Peyronie's disease seems to be equivalent to that of important public diseases like diabetes and urolithiasis, both established in 3% – 4% of the general population.

Shaw *et al* retrospectively reviewed data from three hospitals in New Orleans from 1994 to 2000.¹⁸ The racial distribution for PD was the following: 77.6% were Caucasian (Northern Europe descent), 19.4% were African-American, and 2.9% were of Hispanic origin: There were no Asian males with PD in the reviewed cohort.

The age of our outpatients (mean 50.9 ± 9.7 y) involved in validating the questions is comparable to the age of the survey respondents (mean 51.7 ± 13.1 y), but the mean age of the affected men was higher (54.5 ± 7.9 y in validation, 57.4 ± 13.4 y in survey). The risk of acquiring Peyronie's disease increases with advancing age. This may result from the inevitable accumulation of sexual activities, which over the years augments the risk of repetitive penile trauma, or from the increased vulnerability of the tunica albuginea.^{13,14,16} The prevalence rates in the older age groups reflect this hypothesis.

Additionally, we can confirm that diabetes seems to be a potential risk factor^{8,10,19} as the share of diabetics with Peyronie's disease was three times greater (18.3 vs 6.0%).

Penile induration plus newly occurring deviation during erection were reported by 84% of those affected, induration and painful erection by 46%. Thus the resulting prevalence rates of these combined symptoms are higher than has been published previously: coincidence of induration and curvature was found in 119/4432 men (2.69%), of induration and pain in 66/4432 men (1.49%). Furthermore, a combination of all three symptoms (induration, curvature and pain) was observed by 1.04% of all respondents (46/4432 men)—a count so far accepted as the maximum prevalence rate for Peyronie's disease. This is indeed a high rate, since pain is usually reported only in the acute inflammation stage by 10%–50% of men with PD.^{3,15}

Localized penile induration is equivalent to scar formation and leads in the majority of cases to penile curvature during erection. At least 30%,²⁰ and in our series 40.8% of those with Peyronie's disease suffer from erectile dysfunction because of pain or inability to achieve vaginal penetration.

The etiology of Peyronie's disease still remains unclear. It has been associated with a generalized fibrotic tendency,^{21,22} and patients with this disorder have been reported to have an increased incidence of Dupuytren's contracture (up to 48% reported in non-population-based studies)²³ In the Rochester study, only four patients (4%) had a diagnosis of Dupuytren's contracture.¹⁴ Although Dupuytren's contracture is considered uncommon, in the absence of incidence rates for comparison, no conclusions can be drawn from these data.

Several investigators have linked Peyronie's disease to the use of β -blockers, particularly propranolol hydrochloride.²¹ Among our patients with Peyronie's disease, β -blocker use was uncommon before 1975. Based upon the comparison between β -blocker use in the male population of Rochester and in patients with Peyronie's disease, the data suggest no association.¹⁴ On the other hand, if one compares the prevalence of a diagnosis of hypertension among the patients with Peyronie's disease and the Rochester male population, the data suggest that hypertension is, indeed, more common among the patients.¹⁴

Conclusions

This is, to our knowledge, the first large European study to evaluate the prevalence of Peyronie's disease. By means of a mailed questionnaire survey using previously validated questions, a prevalence rate of 3.2% was determined in the 4432 male inhabitants of the greater Cologne area who responded. This is much higher than revealed by the data reported up to now, thus rendering the accepted prevalence rates of 0.3–1% untenable. The actual prevalence of Peyronie's disease may be higher, since many patients are reluctant to report this embarrassing disorder to their physicians. Along these lines, most clinicians note that the number of Peyronie's patients has increased since the advent of oral sildenafil. With more men being successfully treated for erectile dysfunction (ED), an increasing number of Peyronie's cases are becoming manifest and being presented for evaluation. Men with Peyronie's disease may complain of penile pain, penile angulation, palpable plaque, and decreased erectile function. Comparably high prevalences are known for diabetes and urolithiasis, suggesting a greater frequency of this 'rare' disease than formerly believed.

Because of the current fundamental change in the population structure, with the consequent growing importance of age-correlated diseases and focus on successful treatment of erectile dysfunction, such sexual function disorders will continue to attract increasing attention on the part of the general public in the future.

References

- Dunsmuir WD, Kirby RS. Francois de La Peyronie (1678–1747): the man and the disease he described. *Br J Urol* 1996; **78**: 613–622.
- Byström J, Rubio C. Induratio penis plastica (Peyronie's disease). Clinical features and etiology. *Scand J Urol Nephrol* 1976; **10**: 12–20.
- Gelbard MK, Dorey F, James J. The natural history of Peyronie's disease. *J Urol* 1990; **144**: 1376–1379.
- Devine CJ, Somers KD, Jordan GH, Schlossberg SM. Proposal: trauma as the cause of the Peyronie's lesion. *J Urol* 1997; **157**: 285–290.
- Jarow JP, Lowe FC. Penile trauma: an etiologic factor in Peyronie's disease and erectile dysfunction. *J Urol* 1997; **158**: 1388–1390.
- Wahl SM. Inflammation and growth factors. *J Urol* 1997; **157**: 303–305.
- Ralph DJ et al. The genetic and bacteriological aspects of Peyronie's disease. *J Urol* 1997; **157**: 291–294.
- Chilton CP, Westwood WM, Pryor JP. Factors associated in the aetiology of Peyronie's disease. *Br J Urol* 1982; **54**: 748–750.
- Carrieri MP et al. A case-control study on risk factors for Peyronie's disease. *J Clin Epidemiol* 1998; **51**: 511–515.
- Schneider HJ, Rugendorff EW, Röhrborn C. Pathogenesis, diagnosis and therapy of Induratio penis plastica (IPP). *Int Urol Nephrol* 1985; **17**: 235–244.

- 11 Polkey HJ. Induratio penis plastica. *Urol Cut Rev* 1928; **32**: 287–308.
- 12 Urologia. International inquiry on the therapy of Induratio penis plastica. *Treviso* 1966; **33**: Fasc.II.
- 13 Ludvik W, Wasserburger K. Die Radiumbehandlung der Induratio penis plastica. *Z Urol Nephrol* 1968; **61**: 319–325.
- 14 Lindsay MB et al. The incidence of Peyronie's disease in Rochester, Minnesota, 1950 through 1984. *J Urol* 1991; **146**: 1007–1009.
- 15 Devine Jr, CJ. Editorial International conference on Peyronie's disease. *J Urol* 1997; **157**: 272–275.
- 16 Darling CA, Davidson JK Sr, Conway-Welch C. Female ejaculation: perceived origins, the Grafenberg spot area, and sexual responsiveness. *Arch Sex Behav* 1990; **19**: 29–47.
- 17 Smith BH. Subclinical Peyronie's disease. *Am J Clin Path* 1969; **52**: 385–390.
- 18 Shaw K, Puri K, Ruiz-Deya G, Hellstrom WJG. Racial considerations in the evaluation of Peyronie's disease. *J Urol* 2001; **165**: 170: 687A.
- 19 Hauck EW, Heitz M, Schreiter F, Weidner W. Induratio penis plastica. Peyronie's disease. *Akt Urol* 1999; **30**: 386–404.
- 20 Weidner W, Schroeder-Printzen I, Weiske WH, Vosschenrich P. Sexual dysfunction in Peyronie's disease: an analysis of 222 patients without previous local plaque therapy. *J Urol* 1997; **157**: 325–328.
- 21 Chilton CP, Castle WM, Westwood CA, Pryor JP. Factors associated in the aetiology of Peyronie's disease. *Br J Urol* 1982; **54**: 748.
- 22 Hinman F Jr. Etiologic factors in Peyronie's disease. *Urol Int* 1980; **35**: 407.
- 23 Williams JL, Thomas GG: The natural history of Peyronie's disease. *Proc Roy Soc Med* 1968; **61**: 876.