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VACUUM ERECTION ASSOCIATED IMPOTENCE AND PEYRONIE'S DISEASE

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ABSTRACT

Purpose: Use of a nonmedical, catalogue type vacuum erection device resulted in a case of vacuum induced vasculogenic impotence and Peyronie's disease.

Materials and Methods: A 66-year-old potent man used a nonmedical vacuum erection device (cylinder plus a hand pump without a pressure-release valve and a doughnut-shaped ring at the base without tension bands) after having achieved a spontaneous rigid erection. The resultant excessive overinflation of the penis was followed by dorsal curvature, diminished rigidity and decreased erectile maintenance.

Results: Physical examination revealed a dorsal mid shaft Peyronie's plaque. Nocturnal penile tumescence testing and office injection testing were abnormal and demonstrated partial, short-lived, dorsally curved erections. Dynamic pharmaco-cavernosometry and pharmaco-cavernosography established vasculogenic impotence with site-specific crural (unrelated to the Peyronie's plaque) veno-occlusive dysfunction and dorsal penile curvature.

Conclusions: Vacuum erection devices create pulling forces on the penis. We estimate that the pulling forces in this case were prohibitively high (approximately 29 pounds) due to absence of a pressure-release valve and to the preexistent erection at vacuum application. These intense pulling forces are hypothesized to have damaged the tunica in the mid shaft (Peyronie's disease) and the crus (veno-occlusive dysfunction), the latter being the site of attachment of the corpora to the ischiopubic ramus and a most likely location for high magnitude pulling forces to exert an abnormal injury effect. The patient underwent a Nesbit plication procedure and presently performs self-injection for satisfactory sexual activity.

KEY WORDS: penile erection, penile induration, impotence, vacuum

We report on a potent man with normal erectile function who, during use of a nonmedical, catalogue type vacuum erection device, suffered Peyronie's disease and vasculogenic impotence.

CASE HISTORY

H. O., a 66-year-old potent, sexually active white man experienced full rigid and sustained spontaneous erections. In addition to regular sexual relations, he used a nonmedical vacuum erection device consisting of a cylinder, hand pump (without a pressure-release valve) and doughnut shaped ring at the base (without tension bands) as an outlet for self-stimulation before masturbation approximately once per month. The device was advertised as "providing extra strong suction" and it created extremely rigid erections. In January 1992 the patient used the vacuum device after already having achieved a spontaneous full and rigid erection. He continued to create additional vacuum, which further stretched the penis, and magnified the erectile rigidity and size. He claimed that the vacuum device created "the most unbelievably hard and largest erection he ever had in his life" and maintained the erection for approximately 15 minutes. While he denied immediate pain, swelling or ecchymosis, the intense overinflation of the penis was associated with unusual pressure and discomfort.

During the next few weeks the patient noticed a change in quality of the stimulated erections. He gradually experienced difficulty with vaginal penetration due to increased dorsal curvature, diminished rigidity and decreased erectile maintenance. After 2 years of progressive dysfunction he presented for assessment.

Physical examination revealed a dorsal plaque on the mid shaft of the penis consistent with Peyronie's disease. Nocturnal penile tumescence testing revealed diminished rigidity and duration of erections. Office intracavernous injection testing with vasoactive agents induced a partial short-lived erection. Dynamic infusion pharmaco-cavernosometry with repeat dosing (times 3) revealed veno-occlusive and arterial erectile dysfunction with abnormal flows-to-maintain (5 to 9 ml. per minute, normal less than 3), venous outflow resistance (11 to 16 mm. Hg per minute per ml., normal 30 to 50), pressure decay (78 mm. Hg for 30 seconds, normal less than 45) values and abnormal cavernous artery gradients on the left and right sides (35 and 58 mm. Hg, respectively, normal less than 30). Pharmaco-cavernosography demonstrated bilateral proximal site specific leak and Peyronie's disease (see figure).

DISCUSSION

Medical vacuum erection devices provide a safe, effective, inexpensive and noninvasive therapeutic option for impotent patients.[1] Associated complications include difficulty with ejaculation, penile pain, ecchymosis, hematomas, petechiae and skin necrosis.[2] Vacuum erection devices create negative intracavernous pressure and, thus, high stretching forces on the penis, causing blood to enter the lacunar spaces independent of smooth muscle relaxation.[3] Nonmedical vacuum erection devices have been advertised primarily for the purposes of improving erection, penile lengthening and auto-stimula-

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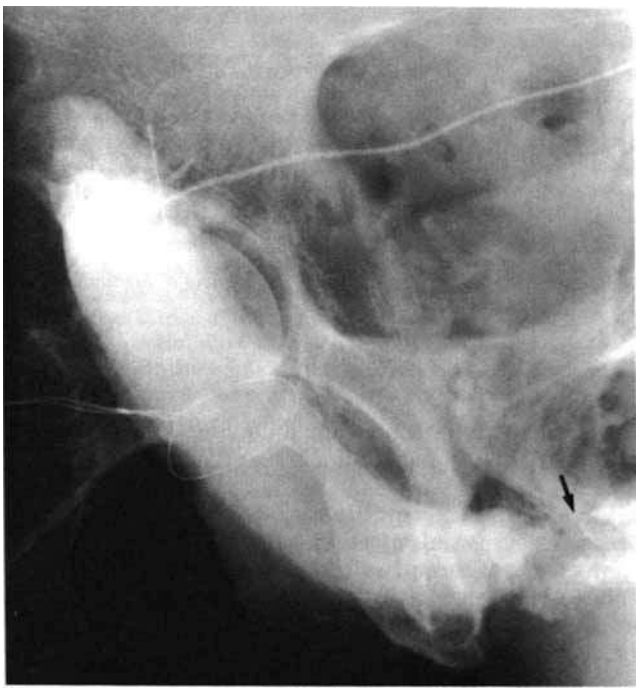

Pharmaco-cavernosography shows bilateral proximal site specific leakage (arrow) and abnormal curvature (Peyronie's disease) caused by excessive pressure forces from catalogue-type, nonmedical vacuum erection device.

tion. Medical vacuum devices differ from the nonmedical apparatuses in that the former use pressure-release valves to restrict the negative subatmospheric pressures to 300 to 500 mm. Hg (14 to 21.5 inches mercury, normal use range 100 to 200 mm. Hg or 4 to 7 inches mercury). Continued unabated stretching during vacuum erection may result in large magnitude pulling forces up to 10 times those of physiological erections (see Appendix), which may result in focal injury to the tunica albuginea. Such vacuum induced tunical injury has been reported previously.[4] In addition, our patient demonstrated new onset vasculogenic impotence and a site specific crural leakage pattern on pharmaco-cavernosography.

While veno-occlusive dysfunction is frequently associated with Peyronie's disease, the reported site of Peyronie's disease related abnormal venous drainage on pharmaco-cavernosography has been localized to the plaque, that is the so-called pitchfork sign.[5] Since pharmaco-cavernosography in our patient revealed the leakage to be crural and unrelated to the dorsal mid shaft plaque, we hypothesized that the hemodynamic abnormality was secondary to the intense pulling forces on the crura, the site of attachment of the corpora to the ischiopubic ramus and the most likely location for high magnitude forces to exert an abnormal injury effect. Thus, we believe there were 2 complications, Peyronie's disease and vasculogenic impotence, induced by the pulling forces, which were analyzed to be approximately 29 pounds (the weight of a 19-inch color television set attached to the erect shaft). To our knowledge we report the second case of vacuum induced Peyronie's disease and the first case of vacuum induced vasculogenic impotence. The patient underwent a Nesbit plication procedure and presently uses self-injection therapy for satisfactory sexual activity. While to our knowledge there have been no previously recognized contraindications to the use of a vacuum erection device during full erection, it is possible that a pressure-release valve would have decreased the risk of penile injury.

APPENDIX: ENGINEERING PRINCIPLES TO DETERMINE PULLING FORCES ON THE ERECT PENIS ASSOCIATED WITH SEXUAL AND VACUUM INDUCED ERECTIONS

The pulling force ($F_{pulling}$) on the erect penis is considered the force exerted on the corporeal bodies during erection that induces penile stretch. The pulling force during erection may be calculated using the expression:

$$F_{pulling} = (P_{internal} - P_{external}) \times A$$

where A is the circular cross-sectional area of the erect penis, $P_{internal}$ is the intracavernous pressure during erection and $P_{external}$ is the atmospheric pressure.

Sexual erection. The pulling force during sexual erections may be calculated assuming that an erect penile diameter (D) is 1.5 inches (then $A = \pi D^2 / 4$, approximately equal to 1.77 inches^2), the intracavernous pressure during erection is 90 mm. Hg (1.74 pounds per square inch) and the atmospheric pressure is 0. Therefore, the calculated pulling force during sexual erections is approximately 3 pounds.

Vacuum induced erection. The pulling force during vacuum induced erections may be calculated assuming that an erect penile diameter is 1.5 inches, the intracavernous pressure during sexual erection is 1.74 pounds per square inch and, assuming there is near total vacuum, the external pressure is (−) 14.7 pounds per square inch. Thus, ($P_{internal} - P_{external}$) = (+) 16.4 pounds per square inch or 29 pounds.

The pulling force during vacuum induced erection is increased almost 10-fold compared to the sexual erection. The magnitude of the pulling force in the aforementioned example is equivalent to that of a 19-inch television being suspended from the penis. (This calculation assumes no change in penile diameter and internal pressure during vacuum erection. However, the effect of the vacuum device may be expected to produce even larger pressures and larger penile diameters, thereby creating even greater pulling forces on the vacuum induced erection.)

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