PRIAPISM

REPORT OF CASES AND A CLINICAL STUDY OF THE LITERATURE WITH REFERENCE TO ITS PATHOGENESIS AND SURGICAL TREATMENT

By Frank Hinman, M.D.

of Baltimore, Md.

ASSISTANT RESIDENT SURGEON, JOHNS HOPKINS HOSPITAL

True priapism is a remarkable pathologic condition of prolonged and persistent erection unaccompanied with sexual desire, and usually painful. It is to be distinguished from the transitory nocturnal forms of recurrent erection, which are not uncommon in inflammatory conditions of the genito-urinary tract, and which are usually of slight significance and amenable to local treatment. True priapism, as a rule, responds to no form of medication, and subsides spontaneously, sometimes quickly, but usually very gradually. Its pathogenicity is varied and obscure. The condition is rare, there being only about 170 cases reported in the whole medical literature. The object of this paper is to report two new cases and to indicate, through an analysis of cases in the literature, a simple classification and a rational course of treatment.

Case I.—W. L., a colored man of forty-five, stevedore by occupation, came to the Johns Hopkins Dispensary, Friday morning, April 14, 1913, complaining of having had an erection since 5 o'clock that morning.

At the age of 30 he had a chancre for which he took treatment for six months. He gives no history of secondaries. Married 22 years and has two healthy children. Family and personal histories are otherwise negative. Patient says that he and his wife had intercourse this morning at about 4 o'clock. After the act, which was normal, he did not feel satisfied and desired a second which his wife refused, and on this refusal he lays the blame of his present condition. He soon ceased to have sexual desire but the penis remained erect and began to ache. On physical examination there is found a pronounced arcus senilis in both eyes, enlargement of the axillary inguinal and epitrochlear glands, tortuous and thickened radials. The deep and superficial reflexes are all normal and a careful neurological examination by Dr. Taneyhill was negative. Neither the spleen nor liver are palpable. Blood-pressure is 165 mm. (Tycos). Blood ex-

amination showed 7000 white blood-cells and 80 per cent. hæmoglobin (Sahli). The urine in three glasses is clear in all. It has a specific gravity of 1006, shows a small cloud of albumen but nothing microscopically. Guaiac and acetone tests are both negative. The phenosulphonephthalein test gives an output of 48 per cent. after one hour and ten minutes by intramuscular injection. Blood taken for Wassermann.

Special Note.—The penis is in a condition of extreme erection, slightly bowed down and to the right. Movement in any direction causes considerable pain. There is no urethral discharge. The corpora cavernosa are tensely distended and hard, while in marked contrast the corpus spongiosum is flaccid and soft and the glans penis is small and compressible. At the root of the penis the two ischiocavernosus muscles are felt to be rigidly contracted in a rope-like cramp, and are tender. On the dorsum of the penis can be seen the scar of an old chancre. The scrotum and its contents are negative. The prostate is normal in size, shows no tenderness or nodules, and its secretion is negative. Both seminal vesicles are palpable, but normal.

The patient was admitted to the colored ward. The galvanic electric current was applied to the contracted ischiocavernosus muscles with no effect. Patient put to bed. Ice caps applied to the penis and perineum. Morphine gr. ¼ (h.) given every three hours.

April 15: No improvement.

April 16: No improvement. Patient drowsy and asleep most of the time, but there is no change in the local condition even during deep sleep.

Report of Wasserman reaction, positive.

April 17: Morphine discontinued; 0.9 mg. neosalvarsan given intravenously, and the patient put on a mixture of potassium iodide and bichloride of mercury (grs. 5 and 1/17 respectively) and hydrargyri cum cretæ (gr. 1) q. 4. h.

April 18: During the night while the patient was asleep the penis became flaccid enough to fall over on the thigh, but so soon as he awoke it become erect and tense.

April 19: There is a noticeable change in the distention of the corpora and of the rigidity of the ischiocavernosus muscles. The penis hangs at an oblique angle to the abdomen and the patient now has no pain or discomfort.

April 21: Salvarsan 0.4 given intravenously. There is a marked change in the condition. The penis is no longer erect, but hangs loosely against the body. The corpora are, however, still somewhat distended.

April 23: Patient discharged. Penis is now permanently flaccid, but somewhat elongated and firm. He has had no return of erection.

August 29: Patient seen. Has had no return of erection but has had sexual desire, though much weaker than before the onset of the priapism, and ejaculation is only occasionally present after prolonged though infrequent attempts at intercourse. He has had no nocturnal pollutions.

NOTE.—This case was admitted to a ward of the Johns Hopkins Hospital in the service of Dr. Hugh H. Young to whom I am indebted for the privilege of reporting it.

CASE II.—W. D., negro fisherman, aged fifty-two, was admitted to Mercy Hospital, May 12, 1911, complaining of a painful erection which he had had for over 24 hours.

Patient has had pneumonia and typhoid fever, the last attack of gonorrhœa two years ago. Denies lues, although he says that he had a sore on penis at time of last gonorrhœa.

The onset of the present prolonged erection occurred suddenly in the night and was not preceeded by sexual or alcoholic excess or by any apparent cause. The patient, however, had been troubled for several months previously with frequent and painful nocturnal erections accompanied with frequency of urination and nocturnal incontinence. Eighteen years ago the patient had an erection unaccompanied with sexual desire which lasted for several hours and then subsided spontaneously and quickly. Since then he has had other attacks of short duration at infrequent intervals and for which he knows no cause. Aside from some burning there has been no trouble in urination. On examination the penis is seen to be in complete erection and is very painful, particularly on movement. There is a slight glairy mucous discharge from the meatus. First urine glass is clear, second one cloudy. Back of the corona is seen the scar of an old sore. Inguinal glands are slightly enlarged. Testicles, epididymis and prostate, normal. Atrophic scars on anterior surfaces of the tibia. Pupils are irregular but react to light and accommodation. Patellar reflexes are active on both sides.

May 15: Condition about the same. Given potassium iodide and lepullin.

May 16: Condition the same. Ice locally and to spine. Blood examination for leukæmia is negative.

May 17: Condition unchanged.

May 18: Wassermann reaction is negative.

June 16: Condition has remained unchanged. Patient is dis-

charged from the hospital 35 days after admission unimproved and with erection still present.

January, 1913: Patient lost, not to be found at address given.

NOTE.—This case occurred in the practice of Dr. A. G. Rytini, Baltimore, to whom I am indebted for the history.

Discussion.—The first case, in view of the immediate response to antisyphilitic treatment, is most likely the result of some luetic lesion of the nervous system. The striking feature in the case is the remarkable and prolonged spasm of the ischiocavernosi and the resultant partial character of the erection, the corpora cavernosa alone being involved. This muscle spasm might result from continuous irritation or inhibition either in the brain or in the cord. There was no evidence of any local genito-urinary infection which might cause spasm of these muscles through reflex stimulation. Furthermore, priapism due to such reflex causes is usually recurrent and transitory, as in the early history of the second case. Thrombosis, traumatic or infective, of the corpora is excluded by the early and relatively rapid subsidence, as well as by the observation that on the third night, during sleep, the condition was partially relieved, which would not have occurred if the cause had been local and mechanical.

In the second case there had been many previous urethral infections and, as is common with such infections, many recurrent and transitory erections. The prolonged attack was most likely the result of a secondary thrombosis of the corpora cavernosa, occurring in or following upon one of these reflex erections. Conditions would be ideal for the formation of a thrombus: infection, congestion and slowing of the blood stream and mechanical tension or injury. The persistent prolonged character of the priapism coincides with this assumption.

The Physiology of Erection.—An understanding of the physiology necessarily precedes a logical consideration of the pathology of erection. Normal erection is a reflex act, the immediate centre for which is assumed to lie in the lumbar cord. This centre may be acted upon by descending or by ascending impulses. The descending impulses come from a cortical centre in the cerebrum which receives its stimulation through the special senses (eyes, ears, nose) giving rise to erotic sensations and thoughts. The ascending impulses arise in some part of the genital tract. The glans penis is supposed to harbor the most sensitive of these afferent fibres, but the urethra, the spongy tissues of the penis, the prostate, the seminal vesicles, and even the bladder are all

assumed to have nerve fibres which may carry impulses to the erectile centre in the lumbar cord.

An erection represents a remarkable circulatory phenomenon of increased venous pressure. This increase in pressure is effected in two ways, by an augmented inflow and by a diminished outflow. The erectile tissues contain large venous spaces, freely anastomosing and in communication with their arterial supply without the intervention of any definite capillary system, and it is the marked overdistension of these spaces that produces the rigidity of the organ. The arterioles to these areas have both vasoconstrictor and vasodilator nerve fibres. The vasoconstrictors have been shown to arise (dog) from the second to the fifth lumbar nerves, to pass over to the sympathetic chain and thence to reach the penis either by way of the sacral sympathetic ganglia and their branches to the pudic nerves, or by way of the hypogastric nerve and pelvic plexus. The vasodilator fibres arise from the sacral cord (first to third, dog), pass by way of the nervi erigens to the pelvic plexus, and thence to the penis. Stimulation of the nervi erigens has been shown (dog) to produce a large dilatation of the arterioles in the erectile tissues, and augments the flow of blood to the part eight to fifteen times.

To this increased inflow in an erection is opposed a partial occlusion of the venous outflow. The efferent veins of the corpora cavernosa pass by way of each crus through the ischiocavernosus muscle, and that of the corpus spongiosum by way of the bulb through the bulbocavernosus muscle. The dorsal vein of the penis is the efferent outlet for the glans and has no constricting muscle other than intrinsic ones. These muscles are supplied by the pudic nerves and their contraction completes the act of erection by compression of these efferent veins which they surround, the occlusion not being complete, but enough to greatly increase the venous pressure in the erectile tissues. In addition to these special muscles there are smooth muscle fibres freely distributed throughout the spongy tissues of the penis, action of which, no doubt, has an intrinsic value in increasing venous pressure. It is seen, therefore, that erection is a complex nervous and circulatory phenomenon.

Classification of Priapism.—There have been several attempts to subdivide cases of priapism. The most complete and recent analysis was presented by Sheuer in 1911, who grouped his cases into those due to local causes and those to general diseases. The local causes he subdivided into:

I. Peripheral.
   (*A*) Produced through nervous influences (reflex).
      1. Through inflamed irritating conditions of the urethra and its glands.
      2. Through new growths or tumors of the anterior or posterior urethra.
   (*B*) Produced through mechanical causes in the spongy tissues.
      1. Through the spread of a disease process in the urethra into the spongiosum.
      2. Through the independent occurrence of local disease of the penis: (*a*) inflammatory in nature; (*b*) neoplastic in nature; (*c*) traumatic in nature.

II. Central.
   (*A*) Through anatomical disease of the brain or cord.
      1. Traumatic in nature.
      2. Neoplastic in nature.
      3. Inflammatory in nature
   (*B*) From functional disturbance of the brain or spinal cord.

The general diseases producing priapism he subdivided into:

I. Peripheral.
   (*A*) Infectious diseases (tabes, lues, etc.).
   (*B*) Intoxications.
   (*C*) Constitutional and blood disease (leukæmia).

II. Central.
   Intoxications.

The above classification, as well as those of Taylor, 1899; Pryce, 1903; Lohnstein, 1906; Blum, 1906; Terrier and Dujarier, 1907; and Laurent and Nové-Josserand, 1908, all of which are similar, though not nearly so complete, are too general for diagnostic purposes in the application of treatment, inasmuch as they are based upon etiologic rather than pathogenic considerations.

The distinct nervous and circulatory mechanisms of normal erections, although complex, indicate a dual pathogenicity for the pathologic manifestation, and every case in the final analysis may be grouped as due either to a nervous or a mechanical factor, or, as in Case II, to a definite combination of these.

A simple and practical classification of the cases of priapism, therefore, would be into:

1. Cases due to nervous causes.
2. Cases due to local mechanical causes.

The nervous causes may be simply subdivided into these:

(*a*) From ascending peripheral stimuli (reflex).

(*b*) From direct stimuli: (1) to the spinal cord centre; (2) to the nervi erigens or pudens.

(*c*) From descending cerebral stimuli: (1) direct; (2) indirect.

The mechanical causes may be subdivided into:

(*a*) Thrombosis, or pseudothrombosis.

(*b*) Hemorrhage and hæmatoma.

(*c*) New growths of the penis.

(*d*) Inflammatory swellings and œdema of the penis.

Analysis of Cases.—The meagre and poor histories in many of the reports render an attempt to arrange the cases according to the above classification additionally difficult. Nevertheless, the result, although inaccurate in part, is instructive and interesting.

Transitory Erections.—Erections of short duration are relatively common with all inflammatory conditions of the lower genito-urinary tract, and sometimes accompany certain diseased conditions of the nervous system. They are pathologic in the sense that they are painful and without sexual desire; but their frequent occurrence, short duration and tendency to recur, strongly distinguishes them from the uncommon, remarkable condition of prolonged and persistent erection. For this reason, the cases of recurrent or nocturnal erections of transitory reflex nature, about 43 cases reported in the literature as priapism, are not included as cases of true priapism. Many cases of priapism, however, are preceded by these transitory erections and, therefore, such cases are of importance as a factor of predisposition to the rarer and more serious condition. They may be of two kinds:

I. Local reflex forms of erections (acute transitory erections) which occur commonly with any abnormal condition of the lower genito-urinary tract, and which clear up permanently with relief of this local trouble. These forms are of small significance.

II. Painful erections, usually nocturnal and of short duration (chronic transitory erections), but of such frequent recurrence and over such a long period as to greatly interfere with sleep and with the pursuit of the patient's occupation. These transitory erections are mostly nervous in origin, as in tabes, sexual neurasthenia, etc. They may be so frequent and troublesome as to seriously impair the health of the individual. There are cases on record of recurring attacks of erection, of a few minutes' or hours' duration, lasting for 10 to 12 years, during which time every method resorted to failed to give relief. Curiously enough, these cases usually occur in men past middle age.

Fifty per cent. of the transitory erections reported in the literature were due to an ascending peripheral stimulation as the result of irritation from some disease or abnormality of the external genitals (urethritis, 12 cases; 100 cases reported by Hill not included; stricture, 1 case; chancroid, 1 case; herpes genitalis, 1 case; venereal warts, 1 case; polypi in posterior urethra, 3 cases; varicocele, 1 case).

Nine cases occurred in the early stages of tabes dorsalis. Six had some psychic cause. Three were the result of irritation of the brain or cord centre from infectious toxins, the erection recurring and subsiding with the rise and fall of the temperature. One case was the result of cantharides.

Priapism Due to Nervous Causes.—There were 35 cases that may be attributed to nervous causes.[1] Only three of these cases were the result of ascending peripheral stimulation, and these were all of only a few days' duration (venereal warts and phimosis, 1; anal fissure and phimosis, 1; polyp in fossa navicularis, 1). The remaining 32 cases were the result of descending impulses, 17 from the brain and 15 from the spinal cord. The 17 cerebral cases were both direct and indirect. Priapism resulted in one case from a tumor in the cerebellum. Another followed a rifle ball injury of the cerebrum, while a third was reported in an infant as a result of forceps injury to the head at the time of delivery. One case was indefinitely associated with epilepsy. Four cases were due to intoxications, three following cantharides and one accompanying diabetes. One case only was definitely associated with cerebrospinal syphilis. Five cases were associated with nasal polypi, the removal of the polypi being followed by an immediate cure except in one case in which thrombosis had evidently occurred to prolong the condition. These nasal cases have a peculiar interest in view of the observations of Mackenzie [2] and Fliess [3] on the

[1] Since writing this paper Shropshire and Watterston have reported (*Southern Med. J.*, 1914, vii, 320) a case of priapism treated by salvarsan, intravenously, 4 weeks after onset, with gradual subsidence within the next few days. Wassermann test was negative, but leutin test was positive. It is possible, in view of the long duration, that this case was mechanical in origin and the subsidence a coincidence and not the result of antisyphilitic treatment.

[2] Mackenzie, J. N.: "Irritation of the Sexual Apparatus as an Etiological Factor in the Production of Nasal Disease." *A. G. Med. Sc.*, April, 1884. "The Physiological and Pathological Relations between the Nose and the Sexual Apparatus of Man." *J. Hopk. H. Bull.*, 1898, ix, 10.

[3] Fliess, W.: "Die Beziehungen zwischen Nasr und Weiblichen Geschlechtsorganen in ihrer biologishen Bedentung Iargestellt." *Leipz. u. Wien.*, 1897, F. Denticke, 245 j., 8°.

interrelationship of the nose and the internal organs in women, and the external genitals in man. Fliess designates certain points in the nasal mucosa as "genital spots," which swell, bleed easily and are sensitive to the touch at the time of menstruation. These spots are located on the tuberculum septi and the anterior part of the inferior turbinate in either side of the nose. Mager [4] found he could permanently cure 50 to 75 per cent. of his cases (93) of dysmenorrhœa by a few applications of trichloracetic acid to these genital spots. Fliess and Mackenzie describe for the male analogous spots, pathogenic disturbance of which may set up a nasal reflex sexual neurosis, or *vice versa,* as considered by Mackenzie (being a laryngologist), the influence of pathology of the sexual apparatus is of importance in the production of nasal disease. The nerve path of this reflex is not known, but its existence would explain the pathogenesis of these five cases of priapism associated with nasal polypi, and suggests as well a therapeutic measure in certain cases of psychic priapism.

Fifteen cases of priapism were associated with injury or disease of the spinal cord. In one case in which the priapism had persisted for over a year, there was found at autopsy a general myelitis of the cord. In another case a new growth (sarcoma) was found pressing upon the cervical cord. The other 13 cases were the result of fracture, 11 being in the cervical region, 1 at the level of the third lumbar and another at the level of the second thoracic. In the fracture cases the priapism occurred at the time of the injury, and in most of the cases did not persist up to the time of death, but subsided spontaneously after a few days. It is of interest also that in several cases the erections were not complete. In five of the cases it is stated that complete erection would reflexly occur upon stimulating the glans. The ischiocavernosi were noted to be contracted and board-like in most of the cases. These cases are probably examples of loss of cerebral inhibition rather than due to cerebral stimulation.

In the discussion by Goetz, "Uber Erektion und Ejakulation bei Erhaengten" (About Erection and Ejaculation in the Hanged), no explanation is offered for the condition which is analogous to cases of priapism following injury of the cervical cord. In one case reported by Goetz, the man lived twenty-four hours after his neck was broken, and recovered consciousness. Ejaculation had occurred and erection persisted up to his death, although there was no sexual desire. Beck

[4] Mager: The Internal Treatment of Dysmenorrhœa. *J. Am. Med. Ass.,* 1914, lxii, 6.

makes an interesting observation in reporting a case of priapism accompanying a complete motor and sensory paralysis up to the level of the third intercostal space, in which it was found that the erection could be made to disappear by pressing the penis down, but that as soon as left in this relaxed position it could be seen to distend with each pulsation. Beck attributed the condition to paralysis of the vasomotor nerve fibres supplying the vessels of the penis. Loss of cerebral control may also result in the escape of impulses from the erectile centre to the muscles, which by their contraction would produce a circulatory obstruction and a partial erection. Howell states that no report has been made of erection occurring experimentally as a result of section of the vasoconstrictor fibres to the penis, as would be expected if the above observation and conclusion of Beck were correct. It is more likely that the cerebral inhibition produces both vaso-dilatation and muscle spasm in somewhat the same way as occurs normally in the case of nocturnal erections in sleep.

Priapism Due to Mechanical Causes.—There were 135 cases which had a mechanical or a combined nervous and mechanical element as a cause for the priapism. Thrombosis of the veins of the corpora was by far the most common factor, and can be assumed to have occurred in 125 of the cases. Sixty-four of the cases, in 55 of which there was thrombosis, followed sexual excess. In three of these there was a nervous factor, in that they had frequent short intermittent erections preceding the onset of the thrombosis and the priapism. In six cases the thrombosis accompanied a general infection (appendicitis, yellow fever, malaria, tuberculosis), and occurred as the result of a local cavernitis in ten and a local abscess formation in one case. Two cases were due to local luetic angioneurosis. In two other cases the obstruction was due to local new growths of the penis (sarcoma and carcinoma). Local injury produced hæmatoma or thrombosis of the venous spaces of the corpora with subsequent priapism in seven cases. There were 28 cases in which the priapism had been preceded by recurrent transient attacks of erection. The priapism, however, is really due to the mechanical factor, although it doubtless would not have occurred if the nervous element had not been present. Of these 28 cases, there were 2 tabetics, 5 neurotics, 3 with intoxication from cantharides, 3 with intoxication from some general infection and 15 with some local disease (urethritis, etc.), in all of which transitory recurrent erections preceded the final continuous and prolonged attack evidently due to a thrombosis.

Priapism occurred in association with leukæmia and gout in about

27 per cent. of the cases. This proportion is unexpected in view of the rarity of the condition in leukæmia. Cabot did not find a single case of priapism in his series of 89 cases of leukæmia and it has not occurred as a complication in any of the cases at the Johns Hopkins Hospital. Nevertheless, there are 45 cases that show a definite relationship to leukæmia. The pathogenesis is probably both nervous and mechanical in character. There is no evidence to indicate disease or direct irritation of the brain or spinal cord in these cases. However, it is possible that the condition of the blood tends to set up a reflex erection, which is then prolonged by a subsequent thrombosis. The evidence for thrombosis is convincing. Twenty-nine, about 70 per cent., had a duration of from twenty to sixty days. The corpora cavernosa were stated to be alone involved in 18 of the cases. Five cases were operated upon and thrombus found. The subsidence in the non-operated cases was slow, spontaneous and gradual. That the thrombosis is not the only factor is evidenced by the statement, in over 50 per cent. of the cases, of previous attacks of short duration, usually of the nature of nocturnal erections. The cases associated with tabes and those the result of an ascending peripheral reflex are similar to those with leukæmia in respect to a history of short previous attacks, or of bothersome nocturnal erections preceding the priapism. It is possible that the marked increase in white blood corpuscles brings about a distention or congestion in the vessels of the penis, which reflexly produces stimulation of the erectile centre and so causes these short, frequent, nocturnal erections. Many of the cases (stated in 14) had a sudden onset in the night, and thrombosis would be more apt to occur with the penis distended than when flaccid.

The four cases associated with gout are similar to the leukæmia cases and may be attributed to a thrombosis supervening upon a nervous reflex. They lasted from three to six weeks and all subsided slowly and spontaneously.

Nine cases in the literature are so incompletely reported as to be doubtful and are not classified.

SUMMARY OF ANALYSIS OF CASES

The above analysis of cases of true priapism shows that only about 20 per cent. are purely nervous in origin, and it is questionable whether a thrombosis had not occurred as the prolonging factor in some of these. Eighty cases (50 per cent.) were the result of both nervous and mechanical causes, the nervous factor being in most instances the

primary inciting cause and the mechanical factor the fundamental prolonging cause. The 45 cases occurring in the course of leukæmia are included here, although in most instances the condition may be well considered as purely mechanical in origin. Forty-five cases (30 per cent.) were of primary mechanical origin, although no doubt transitory nervous reflexes complicated the condition in some of these cases. It will be seen that mechanical factors are not uncommon. One hundred and thirty-five, or 80 per cent., have a local mechanical cause, either alone or in combination with a nervous element as the important factor.

Symptomatology.—There is no marked difference in the symptoms of the nervous and mechanical group of cases, except that over 80 per cent. of the nervous cases, as compared with less than 10 per cent. of the others, had a duration of less than 10 days.

Age.—Priapism may occur at any time of life, but is most frequent between the twentieth and fiftieth years (97 cases). There were 18 cases under twenty and 14 cases in men over fifty. The youngest case was in congenital syphilis and occurred shortly after birth. The oldest case was of nervous origin in a man of seventy-five (the age was not given in 40 cases).

Duration.—Excluding cases of transitory erection of only a few hours' duration, priapism is seen to persist from two days to over two years. Over 65 per cent. of the cases attributed to mechanical cause (thrombosis, etc.) lasted between 20 and 60 days. Eighty per cent. of the leukæmia cases had a duration of this character. On the other hand 85 per cent. of the nervous cases lasted less than 10 days (there was early death in 50 per cent. of these cases). There was slow and gradual subsidence of the condition in only one case of the nervous group, while a rapid subsidence was stated as occurring in about 50 per cent of these cases. Of the mechanical group 70 per cent. of the non-operated cases were said to have a slow and gradual recovery and in not one case was a speedy cure observed (the duration was not definitely given in 47 cases and the character of the subsidence was not stated in 65 cases).

Previous Attacks and Onset.—Previous attacks of a few hours' duration were stated to have occurred in 34 cases, 27 of which are in the mechanical group. This emphasizes the significance of intermittent or short attacks as an etiologic factor in the prolonged condition, and the importance of careful treatment of persistent painful nocturnal erections which so commonly accompany disease of the genitals.

The condition is not stated to have had a gradual onset in a single case. Sudden onset in the night is mentioned in 23 cases, 11 of which were in leukæmia. It followed coitus in 22 cases, of which 50 per cent. were after coitus interruptus, followed defecation in two leukæmia cases, and came on after an enema in one case. The onset was sudden in all of the cases (not stated in 56).

Character of the Erection.—This was stated in 63 of the histories and in 43 of these, 70 per cent., the corpora cavernosa alone were involved, the glans and spongiosum not taking part in the erection. Thirty-eight of these are in the mechanical group (18 in leukæmia). In the 5 other cases the priapism was the result of a fracture at the level of the cervical cord and it was noted in all these 5 cases that a complete erection would follow stimulation of the glans which would soon subside, leaving the corpora alone erect. In these 5 cases there was spasm of the ischiocavernosi. In 10 other nervous cases the whole penis is stated to be involved, while in only 10 of the mechanical cases was a complete erection observed to be present.

Pain.—The condition was not uniformly painful. In some cases there was little if any discomfort. In the great majority of the cases, however, there was pain present, particularly on handling. In a few cases this was extreme, particularly in those cases due to a nervous reflex.

Urination.—Urinary symptoms were mentioned in 73 of the cases. In 60 there was frequency, difficulty or retention. Several cases had to be catheterized. In only 13 is it stated that urination was undisturbed. These disturbances are associated in the great majority of the cases with a complete erection, *i.e.*, erection of the corpus spongiosum.

Sexual Desire.—There was loss of all sexual desire in 107 of the cases (not mentioned in 60 cases). In three cases in the nervous group there was at first an increase in sexual desire which was only temporary, as subsequently, except in the case of Donne in which death occurred early, there was loss of all desire.

Ejaculation.—This was not observed to have occurred at the onset of the priapism in any case except in those cases in which the condition followed coitus. Attempts were made in several cases to relieve the condition by coitus and in most cases a normal ejaculation occurred, but with an aggravation rather than a relief of the priapism. After the priapism had subsided and before a return of the power of erection attempts at coitus were followed in 11 cases by normal ejaculation.

This supports the fact that the centres for erection and ejaculation are at a different level and are separate.

Subsequent Power of Erections.—Inability to have an erection after the subsidence of the priapism was observed in only 17 of the cases and, inasmuch as the time of observation in most of these had been for a few months at the longest, presumably all of them may have eventually recovered this function. A recovery of the ability to have an erection was mentioned in 36 of the histories. In several cases a slow or partial recovery was noted, it being a frequent observation that the early erections following priapism, and particularly when due to thrombosis with cavernitis, were crooked or that the distention was greater in one corpus than in the other. A recovery of the power to have normal erections was noted relatively much more frequently in the nervous group of cases than in the mechanical. The loss of the power of erection was not mentioned in a single nervous case but there were 17 deaths in this group.

Mortality.—In not a single case was death attributable to the priapism. There were 33 deaths, 11 from leukæmia, 18 following cerebral or spinal cord injury, 2 from pyæmia, and 2 of doubtful cause. The erection persisted after death in 3 cases.

PATHOGENESIS

Priapism may follow or accompany a great variety of conditions. This protean character of its etiology has led to considerable confusion in establishing its pathogenesis. A normal erection is a complexity of nervous and circulatory factors. The circulatory factor is effective through a special anatomical arrangement of blood-vessels, whereby obstruction to circulation results in congestion of the venous spaces under arterial tension. In this sense a normal erection is mechanical. The pathologic condition is also always mechanical, but may be due to obstruction from nervous reflex spasm of the muscles partially occluding the efferent vessels as in a normal erection; or to obstruction to venous outflows from intrinsic cause, such as thrombosis or hæmatoma of the vessels.

There have been various theories advanced to explain priapism. Thrombosis has been considered as a factor in some cases, the remaining cases being attributed to complex nervous elements. Recently Worms and Hamont [5] advance the idea of a diagonal passage of the

[5] Worms, G., and Hamont, A.: Sur le priapisme prolongé et son traitement. *Chirurgicale Gazette des Hôpitaux,* 1913, xliv, 709.

efferent vessels through the sheath of the corpora cavernosa, which in congestion binds these vesesls at this point so as to produce priapism. They consider all cases as due to this factor. However, if this were the explanation of the condition, one would expect priapism to occur much more frequently than it does, as this factor is present in all men. It is true that the anatomical structure and arrangement are at the bottom of priapism, but only in connection with other factors, which occur only occasionally. Our analysis shows that nervous causes for the condition are exceptional, and that most cases are apparently due to some form of obstruction, of which thrombosis is the most common. This is possibly not a true thrombosis in many cases, but the evidence in favor of the existence of at least pseudothrombosis is most convincing. In all the operative cases a definite thrombus, or thick, grumous or coagulated blood was evacuated. In the non-operative cases the condition subsided spontaneously and gradually, and in three cases the erection persisted after death. The frequent observation of erection of the corpora cavernosi alone also favors the theory of obstruction.

As is well known, there are a number of variable conditions closely related to the occurrence of thrombosis. There is no single cause. Its chief factors are generally held to be (1) slowing in the blood stream and the formation of eddies; (2) changes in the vessel wall itself, such as endothelial injury; (3) increased coagulability of the blood plasma; and (4) increased agglutinability of the blood elements. Aschoff[6] believes that neither endothelial damage nor increased coagulability play any rôle in static and toxic capillary thrombosis, but that a slowing of the blood stream and an increased agglutinability of the blood platelets are the important factors, and that thrombus formation cannot occur without their coexistence, but that in static and similar types of thrombi, the slowing of the blood stream is of prime importance; whereas in the toxic varieties, changes in the blood elements play the greater rôle. Infection, according to Aschoff, plays a secondary part in the formation of thrombi, and when present usually supervenes upon an already existing simple thrombus. In the case of local infection (such as cavernitis of the penis) it might progress along the vessel wall and produce first a phlebitis, to be followed by a secondary thrombosis by deposition (phlebitis thrombosis—Aschoff).

[6] Aschoff, L.: *Deutsche Naturforsches und Aertzte*, 1911; *Arch. Int. Med.*, 1913, xii, 503.

The first stage in thrombus formation is the erection in a slowed blood stream of a morphological structure of blood platelets or leucocytes by a process of deposition and agglutination. In the second stage, coagulation occurs by the formation of fibrin ferment. These principles may be applied to the causation of priapism. There is a slowing of the blood stream with a widening and stretching of the vessels and formation of eddies. Blood platelets or leucocytes are deposited, and in case the factor of agglutinability is present, are cemented together, so as to plug the vessels. Later there may or may not be the liberation of fibrin and coagulation.

According to these ideas, transitory erections, probably, are all nervous in origin, but cases of true priapism may be either nervous or mechanical. The nervous cases are relatively few and are apparently due to a prolonged spasm of the ischiocavernosi muscles, or to a complex of nerve stimuli as in normal erection. The mechanical cases comprise the majority. They are almost invariably preceded by nervous causes. These incite an erection, which is prolonged by local obstruction by the formation in the stagnant, congested blood stream of either pseudothrombi or true thrombi. In a few cases mechanical obstruction is effected by the presence of a tumor, of a hæmatoma or a hæmatocele. No doubt even in these cases, however, there is also additional mechanical obstruction from pseudothrombosis, as is evidenced by the absence of unilateral or localized erections.

DIAGNOSIS

It is important for purposes of treatment that the four groups of pathologic erections be differentiated. The acute transitory reflex erections differ from chronic recurrent erections only in degree. Both are of short duration, are painful and are unaccompanied with sexual desire. The former are mostly associated with disease of the genito-urinary tract and disappear with improvement of the local condition. The latter are more often associated with some marked nervous disturbance, such as tabes or a marked psychosis, and are often extremely resistant to all medication and may persist for years. This chronic character renders the condition serious. Each group may occur during either the night or day, although the chronic group have erections more frequently during the waking hours. The transitory erections are complete in character, no case being on record of erection of the corpora cavernosa alone. They usually subside quickly if the patient awakes (when nocturnal) or after urination, or sometimes only after he gets up and walks about or does something to distract his mind.

They last from a few minutes to a few hours. The transitory reflex erections are significant only as a predisposing factor to priapism, but the chronic recurrent erections are, in addition, frequently of so serious a nature as to demand radical measures for their relief.

In true priapism it will be difficult to differentiate between a nervous and a mechanical cause. A blood examination should always be made, and if leukæmia exists, the case is most likely mechanical. If the patient has a brain or spinal cord injury, the priapism is as definitely nervous. The previous history is of importance with respect to attacks of transitory erections, which frequently precede a mechanical priapism. The nature of the onset, whether following sexual excess, coitus interruptus, or sudden onset in the night, is significant of a mechanical cause. If the case has persisted for more than six or seven days, it is more likely mechanical. In case the corpora cavernosa are alone involved and the ischiocavernosi are not chronically contracted, the case is almost sure to be mechanical. The genito-urinary tract should be carefully examined. Priapism following local disease or injury is almost always mechanical. The cases cited by Hobbes suggest elimination of the possibility of some nasal disease which might incite a nervous priapism. The possibility of a cerebral or spinal cord lues should be eliminated. In the case of tabes there will have been previous nocturnal erections and the condition will be mechanical. The probabilities in the absence of a brain and spinal cord lesion are greatly in favor of a mechanical cause for the condition.

The condition of satyriasis should offer few difficulties. It may, however, be accompanied with a persistent erection, as in the case of Donne, and the condition may lead to thrombus formation and mechanical priapism.

TREATMENT

There has been no definite method of procedure in the treatment of priapism. Internal medication has no apparent effect. In many cases leeches were applied to the penis and perineum, with no result. Almost all the sedatives and hypnotics known to medicine have been tried and found futile, and even deep narcosis gives no relief. The condition has been treated by operation in 34 cases. In one case the dorsal arteries of the penis were ligated with a cure. In the other cases, incision of one or both corpora cavernosa was practised and with immediate benefit in all but two cases. In one (Dawson) the incision was apparently too superficial to relieve the obstruction, and the case gradually and spontaneously subsided after 11 days. The other case (Sothron) was of

nervous origin and persisted in spite of all medication, and even after incision of the corpora.

The subdivision of the cases into four groups suggests the need of a different procedure in the treatment of each group.

Treatment of Transient Erections.—This will depend largely upon the etiological factor. In case the recurrent nocturnal erections are the result of an ascending peripheral stimulation from a urethritis, stricture, herpes genitalis, etc., satisfactory treatment of the local disease gives permanent relief. In case tabes is present, recurrent erections may not respond to any form of internal treatment, even antisyphilitic, and certain psychic forms of the condition are equally stubborn. Lewis cured one case of over two years' duration by ligation of both dorsal arteries of the penis. In case of repeated recurrences, in spite of sedatives and thorough local and general treatment, some operative measure along the same lines as for nervous priapism should be undertaken.

Treatment of Priapism of Nervous Pathogenesis.—These cases should have thorough general treatment before subjecting them to operation. Eighty per cent. have a duration of less than ten days, and furthermore the general condition of these cases, particularly those of brain or spinal cord injury, is so serious that the priapism is of minor and secondary importance. Those few cases, however, in which the priapism is the serious feature, and which persist for more than a week, should be relieved by operative means.

Several operations suggest themselves:

1. It would be possible to expose the pudic nerves in the perineum and inject their sheaths with some drug, or to divide them with a knife. The superior terminal division of the pudic nerve with the dorsal arteries penetrates the ischiocavernosus muscle on each side, and supplies this muscle as well as the vessels and intrinsic muscles of the corpora cavernosa and glans. Blocking of impulses carried by it would relieve the spasm of the erector muscles and the erection of the corpora.

2. The two dorsal arteries of the penis can be exposed close to the pubes and ligated, as was done by Lewis. This would prevent an increased blood flow to the corpora and relieve their erection.

3. The ischiocavernosi muscles themselves may be divided in the perineum, and the nerve and artery with them. To what extent the power to have future erections would be destroyed by any of these three procedures is problematical. Lewis does not mention this point in his case.

Treatment of Priapism of Mechanical Pathogenesis.—There seems to be one simple and effective form of operation for this form of priapism, no matter what its particular etiology may be. This is by incision and drainage of either one or both corpora cavernosa. A single incision, inasmuch as the blood-vessels of the corpora anastomose freely, is about as effective as double incision. In the 33 cases in which this operation has been done, there was immediate cure in all but two cases (in one the incision was apparently not thorough enough, and the other in which the operation failed was one of nervous pathogenesis). Worms and Hamont have advised this operation for all forms of priapism, but it would seem to be applicable to the mechanical form only. The operation does not destroy the power of future erections. Priapism even may follow, as occurred in one case several months after the operation. These very favorable results recommend an early and thorough incision of one or both corpora cavernosa in all cases of mechanical priapism.

Technic of the Operation.—Unfortunately few of the operators have indicated (no one clearly) the procedure followed by them in opening the corpora. The incision in a majority of the cases has been made a little back of the midpart of the corpus on the dorsolateral surface. The mid-dorsum and ventrum are to be avoided because of the dorsal vessels and nerves above and the urethra below. It seems important that this incision should extend well into the spongy tissue of the body and be of sufficient length to allow of the contents to be thoroughly evacuated. In many of the cases both corpora were opened; in some others only one incision was made on one side and the opposite corpus emptied through this (the vessels of the two anastomose). The fibrous sheath of the corpus should be completely slit and the incision extend deeply into the spongy tissue or the veins and spaces will be with difficulty and only partially emptied.

The contents are described as consisting of "black grumous blood," "thick clot," "thick coagulum," "coagulated blood," etc. No definite thrombus is mentioned nor described for any of the operative cases. Kast found at autopsy, in his case, "large leukæmic thrombi" in the corpora cavernosa. The corpora are only emptied after considerable squeezing and manipulation, and it has been necessary in some cases to make secondary incisions into the spongy tissue through the primary skin opening in order to completely empty the organ of its contents. In all cases the entire corpus seemed involved in the process. In no case was there excessive bleeding afterward. Usually a small wick or

rubber drain was inserted and the skin and fascial sheath closed with interrupted or continuous suture.

Perfect asepsis during and after the operation would seem to be of considerable importance, inasmuch as several of the cases subsequently became infected and suppurated for some time and a number of urinary fistulæ are reported with these cases. A number of the cases (following cavernitis) were already infected at the time of the operation. The ultimate results as to the character of subsequent erections, the formation of scar tissue at the site of the incision and as to whether this scar was tender and painful on erection or not, etc., is stated in none of the accounts.

The following few cases will serve as example of the different forms of priapism:

Cases of Nervous Origin.—DUKEMAN: Has had persistent priapism for five months, and previously, at intervals, for months at a time. Father was an officer in the English army stationed in the South Sea Islands. Son was stolen by natives at the age of seven and not recovered for four years. Used during this time as idol by the natives who practised with him the habit of satisfying their sexual desires by the act of suction. Habit acquired by boy and would often have violent spasms of the penis lasting several days and only relieved by practising the above act himself. Married at sixteen. Three healthy children. Free of trouble till after death of wife nine years ago when old trouble returned. Intercourse aggravates the condition. No medication gives relief.

HOBBS: Patient came to office with frontal headache and nasal stenosis. Strabismus operation. Awoke next morning with a painful priapism, came to office several days later and adnephrin and cocaine applied to nasal mucous membrane with, inside of 30 minutes, a decided change in the priapism.

KOCHER: Patient fell out of a tree on back. Had severe priapism, bladder filled but no difficulty in urination. Corpora cavernosa were alone involved but glans and spongiosum could distend on stimulation of glans. Thirty-three years old. Priapism persisted to death several days later. Autopsy: Total dislocation between the sixth and seventh cervical vertebra with destruction of the seventh cervical spinal segment and of the lower part of the sixth.

Cases of Mechanical Origin.—DAWSON and GOEBEL: Age thirty-eight. Has had intermittent attacks of transitory erections for the last eight years. No gonorrhœa. Present attack came on suddenly after sexual excess. Urination painful. Responded to no therapeutic measure, not even deep anæsthesia. Corpora cavernosa alone involved. On the twenty-third day an incision made in the corpora from which thick coagulated blood was evacuated without effect. A second incision three days later followed by immediate cure. Duration of priapism 26 days.

TRIPE: Twenty-six-year-old patient had priapism following coitus with no apparent cause. Lasted three months and not affected by the most varied

treatment. The erection in the corpora cavernosa persisted for some time after that in the spongiosum had subsided, and then disappeared very gradually after several days.

VORSTER: Onset of priapism following a kick in the scrotum with bleeding from the meatus and retention of urine. Catheterization even under ether, which had no effect on the priapism, impossible so that an external urethrotomy was necessary. Tumor could be seen projecting into the urethra which on opening proved to be a hæmatoma of the right cavernosum and was filled with partly coagulated blood, emptying of which immediately relieved the priapism.

SCHEUER: Area of induration on the right side of the body of the corpus cavernosum, which for some time has been sharply curved to that side when in erection, rendering coitus difficult. During the night after an unsuccessful attempt at coitus patient suddenly seized with an intense priapism, very painful, involving mainly the corpora cavernosa. After persisting two days the right corpus cavernosum was incised and a great deal of partly coagulated black blood was evacuated, giving immediate relief.

DUJON: Convalescent from a severe diphtheria. Seized suddenly in the night with a painful erection which persisted. On examination presented a large spleen. Blood count showed 132,000 leucocytes of which only 25 were polymorphonuclears. The corpora cavernosa were alone involved in the erection. After several days the root of the left corpus cavernosa was incised at the point where it passes through the ischiocavernosus. Immediate relief, but no return of erections on last observation several months later.

HAILLOT ET VIARDIN: Age thirty-four, for the past year patient has been having erections almost every morning which last from two to three hours. No sexual excess. No genito-urinary disease. Spleen much enlarged and blood picture typical of leukæmia. Corpora cavernosa swollen and tense while the glans and spongiosum were not involved. All medication without effect. After 25 days the corpora were opened by two deep incisions and thick coagulated blood emptied out with relief of the priapism.

Cases of Transitory Erections (Chronic and Acute).—PITRES: Age sixty, lues 25 years ago. Lancinating pains and hypersensitive areas in the thighs 11 years ago. Soon after began to have erections of variable length without sexual desire which were so intense as to keep him awake. These lasted intermittently for over a year. Then became ataxic and nightly erections persisted. No medication helped.

FRANK: Age thirty-one, gonorrhœa 12 years ago. Complains of nocturnal erections which are very painful and cause much loss of sleep. No sexual desire. Several small polyps found between the verumontanum and the mouth of the bladder, removal of which cured the condition.

LITERATURE

Abramow: Ein Fall von Priapismus. Russ. Zeitschr. f. Haut und vener-Krankh., May, 1910, xix; Abstr. Arch. f. Derm. und Syph., 1911, 109, 473.

Adams, F.: Ein Fall von Leukemie mit Priapismus. Inaug- Diss. Bonn, 1891.

Ambrosali, Carlo: Dell uso del cloralio nel priapismo doloroso che accompagna alcune malattie veneree. Gios. ital. d. mal. ven. Milano, 1910, ii, 80.

Ayers, P. S.: A case of priapism. Med. Brief, St. Louis, xxxii, 1005.

Bays, A. H.: On a Case of Persistent Priapism. Bristol Med.-Chir. Jour., 1883, i, 224.

Beck, B.: Ueber Verletzungen der Wirbelsaule und des Reuckenmarks. Virchows Arch., 1879, lxxv, 226.

Bernstein: Ein Fall von Priapismus. Monatsberichte f. Urol., 1905, x, 12.

Betz, F.: Zerreisung des Reuckenmarks und der Reuckennerven durch Hyperflexion des Koepers. Memorabilien, 1873, xviii, 167; Abstr. Arch. f. Derm. und Syph., 1911, 109, 474.

Birkett: A Case in which Persistent Priapism Was Caused by Extravasation of Blood into the Corpora Cavernosa of the Penis. Lancet, February, 1867, 207.

Blanc, R.: Sur un Cas de Priapisme prolongé. Revue pratique des mal des organ. gen.-urin., xxvii, V. année.

Blanchard, R. G.: A Case of Priapism. Atlan. Med. Weekly, 1897, vii.

Blum, V.: A Case of Leukemic Priapism. Lancet, London, 1906, i, 1573.

Booth, M.: On a Case of Persistent Priapism. Lancet, 1887, 978.

Bouveyron: Priapisme chronique de sommeil. Lyon Med., 1909, xxxiv, 313.

Brooks and Boswell: A Case of Priapism. Steth. and Virg. Med. Gaz Richmond, 1851, i, 558.

v. Broich: Ueber Priapismus. Arch. f. Derm. und Syph., 1904, lxx, 2.

Bruce: Report of a Case of Priapism. Lancet, 1873, i, 90.

Bryant: International Encyclopedia of Surg., vi, 660.

Burchard, F. H.: A Case of Priapism of Three Years' Duration with Recovery. New York Med. Jour., 1887, xlv, 66.

C.H.: Idiopathic Priapism. Scots Mag., 1755; Abstr. N. Y. Med. Jour., 1904, lxxx, 188.

Billaud: A propos d'un cas de priapisme prolongé. La Gazette medicale du Centre., December, 1911, 274.

Calloway: London Medical Repository, 1824, 286.

Carpenter: The Treatment of Leucocythemia. Lancet, London, 1880, 172.

Cabellero, F.: Un cas notable du Priapisme. Bol. de Med. Cirug. y. farm., Madrid., 1851, 2, ep. i, 83.

Carroll, T.: Persistent Priapism with Report of a Case. Cincin. Lancet-Clinic. n. s., xxxv, 697.

Clark, F. L. G.: Recurring Attacks of Priapism. St. Thomas's Hospital Reports, Lond., 1887, n. s., xvi, 19.

Clary: Abstr. Arch. f. Derm. und Syph., 1911, 109, 476.

Chinnock: London Med. and Surg. Jour., 1836, i-, 575.

Coskery, A. J.: A Short Note on Priapism. Mary. Med. Jour., Baltimore, 1881, 2, viii, 555.

Crago, W. H.: A Case of Persistent Priapism. Auster. Med. Gaz., Sidney, 1888, viii, 61.

Crancour, I. L.: Persistent Priapism. New Orleans Med. and Surg. Jour., 1880–1881, n. s., vii, 330.

Dawson, J. L.: Priapism, Its Causes and Treatment, Including the History of a Remarkable Case. Med. News., Phila., 1887, i, 63.

Debrou, E.: Exam. Physiologique du mecanisme de l'erection a propos d'une varieté de priapisme qui ne se produit gue pendant le sommeil. Gaz. Med.

de Paris, 1850, 3, s., v, 698, 729 and 826. Ann. de Med., Belge., Brux., 1850, iii, 297.

D'Haemens: Observations d'un cas de Priapisme. Progres Med. Belge., Brux., 1899, i, 3.

Delbet, P.: Gazette des hopitaux., 1908, 1203.

Deguise and Brasdoe: Observation d'un Priapisme. Rec. Period Soc. d. Med. de Paris, 1800, vii, 112.

Demeaux: Priapisme spontane, persistence de l'erection pendant 30 heures, retention d'urine, traitement energique, guerison. Ann. de la Chir. franc. et étrang., Paris, 1841, iii, 403.

Demarquay: Maladies Chir. du Penis. Deutsche Chir., l, 242.

Donne, W. H. D.: Case of Injury of the Head with Rifle Ball with Priapism and Salacious Appetite. West. Med. Gaz., Cincin., 1835, ii, 295.

Dietz, P.: Un cas de priapisme aigu. Gaz. Med. de Liege, 1896, 7, ix, 198.

Dukeman, W. H.: A Case of Priapism of Several Years Duration. Pacific Med. Jour. of San Fran., 1889, vol. xxxii, 480.

Dujon: Deux Observations de priapisme prolongé. Congres franc de Chirurg., 1910, 1189; Le priapisme prolongé, en dehors des lésions nerveuses, procédé opératoire par incision de l'une des racines des corps caverneux. Assoc. franc. de chir. proc. verb., Paris, 1910, xxiii, 590; J. Med. de Brux., 1911, vol. xvi, 181; Arch. prov. de Chir., Paris, 1910, xix, 638.

Dunn: Lancet, August, 1863, 162.

Dalle-Favera, G. B.: Ueber einen Fall von Priapismus bei Leukaemie. Monatsch. f. prakt. Derm., xlvii, 1.

Dyce Dukeworth: Edinb. Med. J., 1898.

Edes: Cases of Leukemia. Bost. Med. J., 1871, lxxxv.

Eisenstaedter, M.: Ein Fall von Priapismus bei linealer Leukaemie. Wiener Med. Woch., 1907, 15.

Emödi: Funktionelle Stoerungen der Genitalien nach chronischer Bleivergiftung. Urologia, 1906, 55.

Eschenbach, J.: Dissertationis de Satyriasi et Priapismo., 4 Jenae, 1670.

Fére, C. P.: Priapisme epileptique. Med. Mod., Paris, 1898, ix, 73.

Fischer: Ein Fall von 16 tage dauernden priapismus. Zeitsch. f. Wundaertze u. Geburtsh. Winnenden, 1880, xxxi, 19.

Fournier: "Lecons sur la periode preataxique du Tabes," p. 53.

Frank, E. R. W.: Ueber die Beziehungen der papillomatoesen Wunderungen des Blasenhalses und der hinteren Harnroehre. Zeitsch. f. Urol., ii, 1908, 922.

Friedmann: Verh. der Syph. Gesellsch., Peters. b., September 30, 1895.

Feurbringer: "Die Stoerungen der Geschlechtsfunktionen des Mannes. Nothnagel, Spec. Path. und Therap., xix, 118.

Goebel: Ueber idiopathischen protrahierten Priapismus. Mitt. aus den Granzgeb. d. Med. und Chir., 1904, xvii.

Goebel, C.: Un cas de Priapisme idiopathique. Egypte Med., Alexandria, 1902–1903, ii, 200.

Gore, A. C.: Persistent Priapism even after Death. Med. Council, Phila., 1902, vii, 406.

Goetz: Ueber Erektion und Ejakulation bei Erhaengten. Inaug. Diss., Berlin, 1898.

Gohl, J. D.: De foedo priapismo in agonigante, colica spasmodica laborante, a me observato. Selecta Med. Francof. Francof ad Viado, 1737–1739, i, 116.

Gundegger, R. I.: Sluchae Priapizma. Bolnitsch. Gaz., St. Petersb., 1, 1901, xii, 954.

Gross: Western Med. Gaz., Cincin., 1835, ii, 14.

Gunckel, P. L.: Priapism a Symptom of Leukemia, Report of a Case. Amer. Med., Phila., 1906, xi, 27.

Guttman: Ueber einen Fall von Leucaemia acutissima. Berl. Klin. Wochenschr., 1891, 48.

Gyabrenths: Jour. d. Med. Chir. et Pharm., Brux., 1848, vii, 223.

Haillot and Viardin: Priapisme et grosse rate; 25 jours d'erection continue, sans remission n'ayant cede qu'apress un debridement des corps caverneux. Bull. Med., 1904, 72.

Hargis: Observations on Persistent Priapism with a Case Treated Successfully by Bromide of Potassium. New Orls. Jour. of Med., 1869.

Harwood, E. C.: Prolonged Priapism in Connection with a Localized Myelitis (1 year and 16 days). Inter. Jour. Surg., New York, 1889, i, 7.

Hill, E.: A Case of Priapism Cured with Large Doses of Salophen. Denver Med. Times, 1899.

Hird: Case of Priapism Lasting Six Weeks; Recovery. Lancet, January, 1873, 90.

Hobbs, A. G.: Priapism from Nasal Reflex; Something for the Rhinologists. Indiana Med. Jour., Indianop., 1906–1907, xxv, 142; Another Case of Priapism from Nasal Reflex. Atlanta Jour.-Record Med., 1906–1907, viii, 217.

Homberg, A.: De Lentigine, 8 Jenae, 1671.

Hughes, C. H.: A Case of Persistent Eccentric Priapism. Kansas Med. Index, Fort Scott, 1880, i, 198.

Heustis, J. F.: Idiopathic Priapism. New Orls. Med. and Surg. Jour., 1858–1859, xv, 641.

Hulke: A Case of Long Continued Priapism after Coitus; Remarks. Lancet, December 8, 1888, 321.

Hunt, W.: On Priapism Accompanying Injuries of the Spine. Phila. Med. News, February 8, 1882, xl, 281.

Jadioux: Hypertrophie ancienne du foie et rate: priapisme probablement du a l'adminstration des cantharides et suivi de mort. Gaz. des hopitaux, Paris, 1845, 626.

Janzion: Observation sur une fievre remittante maligne ou ataxique, ayant le priapisme pour principal symptome pendant le duree du redoublement. Ann. Soc. de Med. Prat. de Montpel., 1804, iv, 146.

Jewsejenko: Priapismus durch eine Operation zur Heilung gebracht. Wratsch., 1881, 11; Ref. Petersb. Med. Wochenschr, 1881, 39, 337.

Jones, Handfield: Lancet, 1873.

Kast: Ueber den Leukaemischen Priapismus. Zeitschr. f. Klin. Med., 1895, xxvii, 79.

Kauders: Ueber Priapismus und Cavernitis. Wiener Med. Jaehrbuecher, 1882.

Kaufmann: Verletzungen und Krankheiten des Penis. Deutche Chir., 1, 243.

Ketli: Ein Fall von Priapismus bei Leukaemischen. Orvosi Hetilap., 1883, No. 9.

Klehmet: Berliner Klin. Woch., 1908, No. 18, 896.
Klemme: Schmidt's Jahrbeucher, 1886, cxxxi, 173.
Kocher, Th.: Die Laesionen des Reuckenmarks bei Verletzungen der Wirbelsaeule. Mitt. aus den Grenz. der Med. und Chir., 1896, i.
Koschel: Ein Fall von Priapismus bei Leukaemie. Berl. Militaeraertzliche Ges., April 22, 1908; Abstr. Berl. Klin. Woch., 1908, 18, 896.
Kunst, W.: Leukaemisches Priapismus mit nervoesen Pathogenese. Med. Klin., 1907, iii, 45.
Lang, E.: Fall von Priapismus. Verhandl. der k.k. Gesell. Aertze in Wien., Wiener Klin. Woch., 1896, No. 45.
Laurent and Nove-Josserand: Le Priapisme. Gaz. des hopitaux, 1908, 1203.
Leao, E.: Priapismo Chronico Nocturno. Jour. Soc. d. Sc. Med. de Lisb., 1901, lxv, 266.
Lewis, Bransford: Case of Semi-priapism; Ligation of the Dorsal Penile Arteries; Recovery. Med. Fortnightly, St. Louis, 1897, xii, 332.
Lloyd: Med. Times and Gaz., 1852, ii, 185.
Loewenfeld, L.: Sexualleben u. Nervenleiden, Wiesbaden, 1906, 274; *ibid.*, 1911, 14.
Lohnstein, I.: Vorstellung eines Falles von Priapismus. Berl. Klin. Woch., 1906, xliii, 410; Ueber Priapismus. Verhandl. d. Berl. Med. Gess., 1907, xxxviii, 76.
Longuet, M.: Priapisme chez un malade atteint de Leucaemie splenique Progres Med., 1875, 447.
Luke: Lancet, 1867, July 5.
de Lonjon: Priapisme, Castration pratiques par le malade lui-meme Hemorrhagie de l'artere spermatique. emploi du perchloride de fer. guerison. Rec. de trav. Soc. Med. d'Indre et Loire, Tours, 1854, 21.
Louyer-Villermay: Priapisme. Dict. d. Sc. Med., Paris, 1820, xlv, 114.
Mackie: Edinbor. Med. Jour., 1872, 418.
Mainzer: Idiopathischer Priapismus, 9 tage persistierend. Deutsch. Med. Woch., 1903, No. 44.
Manasseine: Lecons de Therapeutique generale. Abstr. Arch. f. Derm. u. Syph., 1911, No. 109, 464.
Margulies, M.: Beitraege zur Frage des Priapismus. Russki J. Koschn in Ven. Bolesney., January, 1904; Agstr. Monat. f. Harnkrank. u. Sex. Hyg., 1904, 491.
Markow: Persistent Priapism. N. Y. Med. Jour., 1885.
Mathias: Noch ein Fall von Priapismus bei Leukaemie linealis Allg. Med. Zentralzeitg., 1876, No. 97–8.
Mathieu: Neurasthenie et Hysterie combinees. Progres Med., 1888, ii, 58.
Maurel: Sur un priapisme suivi de retention d'urine. Jour. de Med. Chir. Pharm., 1772, 150.
Maurer: Inaug. Diss., Halle, 1883.
Mori: Un cas de priapisme permanent. Gaz. degli ospedali el delle clin., 1905, xxvi, 952.
Morris, H.: Cases of Induration of the Erectile Tissues of the Penis. Lancet, 1895, September 14.
Moore, J.: A Singular Case of Priapism. Amer. Med. Recorder, Phila., 1823, vi, 94.

Klemme, A. C. J.: Ueber einen Fall von Leukaemie linealis. Marburg., Cassel, 1863.

Neidhart: Ueber Priapismus bei Leukaemie. Allgem. Med. Zeitung., 1876, 682.

Neumann, J.: Ueber Priapismus und Kavernitis. Med. Jahresb., Wien., 1882, ii, 143.

Niemann, A.: Ein Beitrag zur Behandlung der Erektionen beim Kinde Therap. Monatsh., Ber., 1910, xxiv, 423.

Nickerson, L. H. A.: Case of Priapism Cured by Dilatation of the Urethra. Virg. Med. Weekly, Richmond, 1878, v. 29.

Noth: Priapism Accompanied by Deafness Ending in Death. Indian Lancet, Calcutta, 1899, xiii, 437.

Nole, Leon: Priapisme inflam. constate chez un infant de douze et treize ans; inutilite des premiers moyens employes pour le combattre, et bons effets decivifs de la soignee generale. Jour. de Med. Chir. et Pharm. de Toulouse, 1855, n. s., vii, 267.

Nuckols, C. H.: Congenital Syphilitic Priapism. Louisville News, Cincin. Clinic, 1876.

Ohmann-Dumesnil: Case of Persistent Chordee. Jour. of Cut. and Ven. Dis., N. Y., 1885, iii, 177.

Oliver. J. H.: An Obstinate Case of Priapism. South. Med. and Surg. Jour., August, 1848, n. s., iv, 592.

Peabody: On Persistent Priapism not Connected With a Lesion of the Central Nervous System. N. Y. Med. Jour., 1888, xxxi, 463.

Petraens, H. De: Gonorrhœa, Satyriasi et Priapisme. Ref. Becker, Nosol. harmonica dogmat. et Hermat., 4 Morparigi Cattorum, 1616, ii, 361.

Payne: Priapism and Impotence. Virg. Med. Monthly, 1876, iii, 615.

Peyer: Die Nervoesen Erkrankungen der Uro-Genital Organe. Handb. d. Harn-u. Sexualorgane von Zuelzer und Oeberlaender, iv, 226.

Pitres: Ann. d. Mal. des Org. Gen. Urin., 1901, 3.

Prasada, M.: Persistent Priapism for 47 days, probably due to Urethritis. Indian Med. Record, Calcutta, 1897, xiii, 283.

Pryce, H. V.: Painful Persistent Priapism apart from any gross lesion of the Central Nervous System. St. Barth. Hosp. Reports, 1902; London, 1903, xxxviii, 99.

Prallini, C. F.: De priapismo ab extracto panchymagago Collii. Misc. Acad. Nat. Curios. Lips. et Francof., 1694, i, decuria, 3, 240.

Raikline: Le Priapisme chronique nocturne. Annal. des mal. d. org. gen.-urin., 1901, No. 3, xix, 294; Kronicheskiy nochoi priapizm. Klin. Jour. Mosk., 1901.

Rathelot, A.: Une forme exceptionelle de priapisme. Farseille Med., 1894, xxxi, 177.

Richet: Fall von spontanem Brande der kavernoesen Koerper des Penis. Arch. d. mal. de Paris, July, 1841.

Robert and Vidal: Bons effets de l'emploi de lepulin contre les erections gui surviennent a la suite de l'operation du phimosis. Bull. gen. de Therap., Paris, 1855, xlviii, 128.

Rokitansky: Lehrb. d. Path. Anat., 1885, iii, 407.

Rosenthal: Anzeiger d. K. K. Ges. d. Aertze in Wien., 1882.

Rosenthal, F.: Ueber postappendizitischen priapismus. Berlin. Klin. Wochenschr., 1910, No. 4, xlvii, 147–149.
Salzer: Ein Fall von langdaurendem Priapismus nebst Bemerkungen ueber die Beziehungen desselben zur Leukaemie. Berl. Klin. Woch., 1879, ii, 152.
Scholz: Ueber Infiltration der Schwellkoerper des maennlichen Glieder. Wiener Klin. Woch., 1858, viii, No. 48.
Schulze: Ueber Leukaemie. Deutsches Arch. f. Klin. Med., vol. lii.
Scheuer, Oscar: Ueber Priapismus. Arch. f. Derm. u. Syph., 1911, 109, 449.
Sick, C.: Ueber einen fall von sogenanntem idiopathischen Priapismus, geheilt durch inzision d. Corp. Carv. Vereinsblatt, der Pfaelzischen Aertze., November, 1905, xxi.
Smith, Johnson: A Case of Priapism Lasting More Than Four Weeks; Recovery. Lancet, 1873, 804.
Smith, J. R.: Idiopathic Priapism with a Case. New Orls. Jour. of Med., January, 1869.
Scott, W. J.: Report of a Case of Persistent Priapism. Bull. Cleveland Gen. Hosp., 1899, i, No. 4, 23.
Sotheran: A Unique Case of Priapism. Virg. Med. Semi-monthly, Richmond, 1902–1903, vii, 437.
Soresina: Zwei Faelle von akuter Blen. mit Priapismus. Gior. ital. d. mal. ven. e. d. pelle., 1869, 3; ref., Arch. f. Derm. u. Syph., 1869, i, 603.
Stichter, H. D.: A Case of Priapism of Spinal Origin. Therap. Gaz., Detroit, 1903, 3-s, xix, 532.
Stanjeck: Ueber priapismus bei Leukæmie. Inaug. Diss., Leipzig, 1909.
Steele, B.: Gunshot Wound of the Second Cervical Vertebra. Phila. Med. and Surg. Reports, xl, 11, March 15, 1879.
Steuber: Ein klin. Beitrage zur Lehre von der Leukæmie. Inaug. Diss., Berlin, 1889.
Stevens: A Case of Acute Lymphatic Leukæmia. Lancet, 1905, p. 153.
Sticker: Beitrage zur Pathologie und Therapie der Leukaemie. Zeitsch. f. Klin. Med. 8, 188, xiv, 80.
Stimson: Persistent Priapism. N. Y. Med. Jour., 1885, xli, 676.
Tarnoksky: Die krankhaften Erschienungen des Geschlechtssinnes.. Berlin, 1886..
Tauszky, R.: Ein Fall von Priapismus; 36 stunden nach dem tode beobachtet im Path. Inst. In. Wien. Wiener Klin. Pr., 1874, 713.
Taylor: A Case of Prolonged Priapism. Maryl. Med. Jour., Baltimore, 1883, 4, x, 854. Causes of Priapism. Med. Record, 1899.
Terrier, T., and Dujarier, C.: Du priapisme prolonge. Revue de Chir., 1907, 35.
Thaut: Eulensburg's Realenzyklop.
Thornburn: A Case of Priapism. Lond. Med. Gaz., April 17, 1830.
Torday: Ein Flai von Priapismus. Orvosi Hetilap., 1906, 540; ref. Kollmann-Jacoby Jahresb., 1906, 308.
Tripe, J. W.: Lancet, 1845, 8; Bull. of Med. Sc., 1845, iii, 032.
Van Meter, S. D.: Priapism, Incision into Corpora Cavernosa. Tr. Colorado Med. Soc., Denver, 1902, 372; Intern. Jour. of Surg., N. Y., 1903, xvi, 147.
Velpeau: Priapisme traite avec succes par la ponction du corps caverneux. Bull. gen. de Therap., 1852, xliii, 324.

Vorster: Zur operative Behandlung des Priapismus. Deutsche Zeitschr. f. Chir., 1888, 173.
Walker: Amer. Med. Jour., N. Y., 1877, No. 146, 565, April.
Ward: A Case of Persistent Priapism. Lancet, April 24, 1897, 1143.
Weber: Persistent Priapism from Thrombosis of the Corpora Cavernosa. Edinb. Med. Jour., September, 1898.
Weinerek, J.: Ein Fall von Priapismus durch Myelog. Leukaemie. Beh. Roentgenstrahlen: Casopis lekaru ceskych. v. praze, 1907, xlvi, 571; Abstr., Scheuer, Arch. f. Derm. u. Syph., 1911, 109.
Weise: Priapismus e causa arthritica. Med. Zeitschr. v. V. f. H. in Pr., 1837, No. 36.
Wetherell: Persistent Priapism. Med. Record, N. Y., 1880, xviii, 192.
v. Windisch: Priapismus, Schmidt's Jahrbucher, 1836, ix, 214.
Volkovich, M.: Sluchai Priapizma. Trudo Kiyeo, Khirurg. Obsh. (1908-9), 1910, 241-243.