his corps. Each year a board of senior officers of the Medical Corps considers those who have become eligible and selects the ones who are to be promoted. This plan was started, for the higher grades, in 1926, and has worked so well there that it has recently been extended to include all grades. It makes our job a highly competitive one and keeps every man on his toes in the effort to excel and to win promotion.

IN CONCLUSION

There are many other aspects of our life and our work that I would like to tell you about, but I have already taken too much of your time. Perhaps I have helped you to understand why we who are in the Navy love it, or perhaps you may have found it, like the sailor's parrot, far-fetched and full of nonsense. In any case, it has been a delightful experience for me to spend this evening with you.

U. S. S. *Relief*, San Pedro, California.

URINARY EXTRAVASATION FOLLOWING URETHRAL STRICTURE*

By Carl F. Rusche, M.D.
and
Samuel K. Bacon, M.D.
Hollywood

Discussion *by Nathan G. Hale, M.D., Sacramento; Henry A. R. Kreutzmann, M.D., San Francisco; Louis Clive Jacobs, M.D., San Francisco.*

A GENERAL survey of medical literature shows a relative infrequency of any comprehensive treatise on the subject of urinary extravasation. This paucity of material may be due to the assumed fact that the present records are sufficiently broad of view to cover the subject and remain as a criterion of excellence; to the fact that the comparative magnitude of this disease has not been fully and vividly appreciated; or, finally, to the fact that only a limited number of urologists have been privileged to attend large clinics, and observe and estimate the frequency and importance of the condition.

PURPOSE OF THE AUTHORS' PAPER

Feeling this gap in medical writings, we are taking the opportunity of offering a personal contribution, having for its object the successful conduct of an extravasation of urine occurring external to, and limited by the urogenital diaphragm. This is not because we differ with other writers in the main, but rather because we absolutely agree with them in general and only wish to indicate our variations in the detailed management of this urgent condition.

Several of the old textbooks are entertaining, although not particularly enlightening in regard to urinary extravasation. The descriptions of this disease include such symptoms as violent straining, sudden sensation of giving way, followed by urine gushing into the surrounding connective tissue. These dramatic accounts had never particularly formed a part of our impression of the observed sequence of events; however, very recently we have been fortunate to see a young adult with the urinary bladder distended to the umbilicus, unable to void, yet after straining most violently, empty the bladder and immediately distend the scrotum, as one would inflate a football.

Before citing in detail the case history we wish to report, we would like to make some general observations on the subject of urinary extravasation.

SYNONYMS OF THE TERM "EXTRAVASATION OF URINE"

In the study of this subject there seems to be a great confusion of terms. We do not question the correctness of the definitions accepted by others, but, since a generally accepted definition is the first requisite for proper scientific comprehension, we believe it best to name the terms associated with this disease so that there will be a denominator of common definition. The term "extravasation of urine," as used in this paper, shall be essentially synonymous with such expressions as:

1. "Urethral or periurethral gangrene, with or without infiltration";
2. "Diffuse gangrenous cellulitis of urethral origin";
3. "Periurethral cellulitis";
4. "Diffuse phlegmonous inflammation";
5. "Periurethral phlegmon";
6. "Periurethral abscess, with urinary infiltration."

As our title discloses, we do not intend to deal with every aspect of urinary infiltration; we specifically limit ourselves to emphasizing that, in the majority of cases, urethral *stricture* is the significant causative factor of this disease; and we, therefore, exclude a group of important entities due to the escape of urine into tissues above the triangular ligament. We realize the unusual fact that an extravasation of urine may be present even though the urethral caliber be within normal limits, and we accept the theory of urethral infection.

The facial planes of the perineum and genitals control the advancement of urine escaping from the normal channel. The relationship between a urethral perforation and these barriers determines the course of extravasation.

The diagnosis of urinary extravasation can be made by the urologist as rapidly as that of any other entity in this specialty. The symptoms and findings require no great process of elimination.

The clinical history and management of an average patient with this condition can be described most concisely by following the methods of Martin and Soloway, and we deviate only where our personal experience has shown some variation.

A TYPICAL STRICTURE CASE

In the typical stricture case, a patient possibly had a previous gonorrheal infection treated with a strong solution or remained untreated, or neg-

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lected to subject himself to urethral dilatation for stricture. Symptoms of frequency, dysuria, loss of force, and narrowing of the urinary stream, have been present for several years. Finally, exposure to cold, alcohol, sexual excess, or unusual emotional excitement precipitates acute urinary retention. After a characteristic delay for the relief of this situation, a physician, usually without adequate urologic equipment, is consulted. Attempts to catheterize the patient with rubber or metal catheters, and with perhaps a metal sound thrown in for good measure, may complicate the stricture by adding hemorrhage, false passage, and infection. Occasionally the urine is withdrawn by suprapubic aspiration through a needle or trocar, and the patient is instructed to go to a urologist, to a hospital, or to his home and take hot sitz baths.

THE PICTURE WHEN COMPLICATIONS ARISE

Remembering the painful ordeal of previous urethral instrumentation, and temporarily benefited by the emptying of his bladder, the patient disregards the instructions to go to a urologist and have his stricture properly treated. A period passes and a repetition of urinary retention occurs. Now it presents a different picture. The scrotum is enlarging; the skin of the penis is swelling; for hours, or for a day or two, the patient has withheld fluids; he can no longer procrastinate. At this time an ambulance usually must call at his residence and deliver him to a hospital for immediate urologic care.

The resident physician and interne have to deal with a serious emergency. The patient is dehydrated and emaciated. Fetid breath, dry red tongue, fever, tachycardia, rapid respiration, possibly pulmonary râles, usually distended bladder, swollen, painful perineum, distended, glistening reddish-brown scrotum, perhaps with the epithelium separating like a broken blister, foul odor about the genitals, penile edema causing the meatus to be hidden, and bilateral subcutaneous infiltration suprapubically, illustrate the clinical aspect of an advanced urinary extravasation.

There is only one way of dealing with a patient like this, and that is to resort to immediate radical surgery. Unfortunately, not all physicians and urologists adopt this heroic treatment. Only a few months ago, one of our professional acquaintances stated, in a telephone conversation, that he had just completed the procedure of attempting to aspirate an extravasated patient. He admitted that, although he had been very thorough in trying the needle in many areas, fluid did not return, the scrotum remained distended, and the sufferer was not relieved.

To temporize, to delay, or to falter upon an occasion characterized by urinary infiltration is almost a display of unjustifiable ignorance. Prompt and wide use of the knife is the only procedure that will deal adequately with the exigencies of the case.

Some three years ago we were privileged to be with Dr. Robert V. Day when he was observing an extravasated patient the morning following surgery. He turned to the resident urologist, and asked: "Doctor, do you think you cut enough?"—although this doctor had already incised through a great area of tissue. The surgeon glanced once more at the bare testicles and gaping wounds; then with apologies, replied that he thought he "had made a sufficient number of incisions." Doctor Day waited courteously but impatiently through the answer; then retorted with the statement, which we consider axiomatic, "When you arrive at that conclusion, you had better close your eyes and slice some more."

TREATMENT OF URINARY EXTRAVASATION

The treatment of urinary extravasation calls for three courses of action:

1. Diversion of the urinary stream;
2. Multiple incisions of all infiltrated areas;
3. Urethral dilatation.

To those surgeons who have already incorporated these courses in their management of such cases, we extend our compliments. Those who remove the prostate suprapubically in some cases and through the perineum in others, will understand our personal variations, but will to a greater or lesser degree endorse the following type of surgery. Our routine must not be considered the only correct procedure, and we desire to appreciate the records of those surgeons who advocate perineal cystostomy. In fact, we ourselves occasionally have recourse to this operation.

AUTHORS' CHOICE IN PROCEDURES

The following order of procedure (arranged in sequence) essentially summarizes our own choice in the management of urinary extravasation cases:

1. Intravenous saline;
2. Urethral calibration;
3. Spinal anesthesia;
4. Suprapubic cystostomy.
5. Multiple incisions of extravasated areas;
6. Postoperative potassium permanganate continuously;
7. Hot sitz baths early;
8. Urethral dilatations;
9. Indwelling urethral catheter;
10. Removal of suprapubic catheter;
11. Periodic urethral dilatation.

IMPORTANCE OF IMMEDIATE SURGICAL INTERVENTION

To reëmphasize the necessity of immediate surgery is more important than to stress any particular item peculiar to any one urologic surgeon, provided that the patient receives free and adequate incisions for drainage.

While the local areas are being examined and shaved, an intravenous solution of normal saline will assist in the relief of dehydration. Ample evidence concerning the urethral caliber can be obtained with a soft rubber catheter, but even this examination is not essential at this time, as the urethra should not be traumatized. It is a fact that upon occasions when perineal diversion of

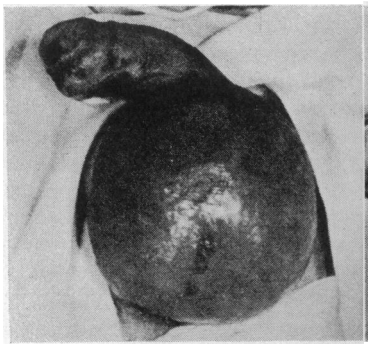

Fig. 1.—Extravasated scrotum and penis.

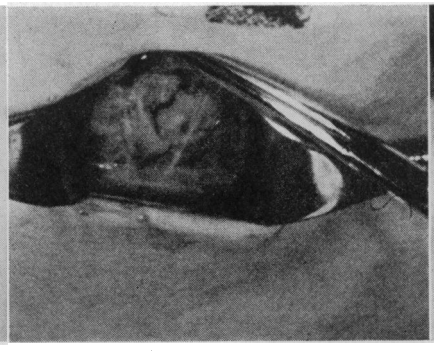

Fig. 2.—Bladder exposed through transverse suprapubic incision.

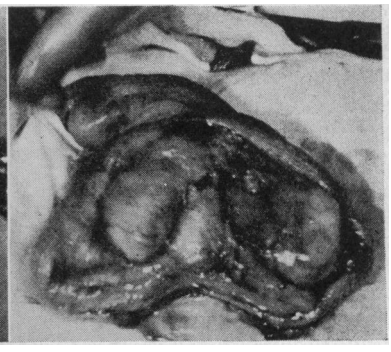

Fig. 3.—Bisected scrotum and dissection throughout scrotal tissue.

the urinary stream is contemplated, even the passing of a guide such as a small filiform will frequently cause the urethra to bleed.

SUPRAPUBIC CYSTOSTOMY

In the majority of instances we resort to suprapubic cystostomy, because we think it is sound therapy and it is not a dangerous operation. In this disease there is not, in our opinion, a single advantage in the transverse over the longitudinal incision. This operation can be a fifteen- or twenty-minute procedure, and in an occasional case we have divided either one of those figures in half. The operating time certainly should be minimized. Through a two-inch incision with a distended bladder, which is the usual finding, only a small area of the bladder at the topmost portion need be exposed. Open, aspirate, and examine the bladder, and allow a Pezzer catheter to remain in place. For exponents of vesical decompression, the technique of inserting a trocar after the bladder is exposed, removing the obturator, and passing a No. 22 Pezzer through the sheath, removing the sheath and attaching this drainage tube to a decompression apparatus, should not be considered a novelty.

Following suprapubic drainage, the patient is placed in the lithotomy position. Completely bisect the scrotum, dissect throughout each half and resort to additional incisions elsewhere in the scrotum, penis, and suprapubic areas, if there is the remotest question of their necessity. Necrotic, or gangrenous tissue may be excised. Nature, however, is a good judge of how much tissue to cast away.

POSTOPERATIVE PROCEDURES

From what we can ascertain from the literature or in direct communication with urologists, there are minor variations in the postoperative methods of treatment in individual clinics. A continuous drip of potassium permanganate through tubes placed into the wounds, in a similar fashion as advocated in the Carrel-Dakin program, is advisable. It should be borne in mind that hemorrhage may be associated with sloughing tissue.

When the patient can be placed in a hot sitz bath two to three times a day, convalescence will be particularly shortened. The benefit of hot water has been strikingly impressed upon us very recently. One extravasated patient, considered to be fairly rapidly approaching death, was for days at a time allowed to remain in a specially constructed bathtub containing a hammock. That patient recovered.

Nature is kind to these unfortunate individuals. Scrotal symmetry is frequently the rule. Skin grafting is rarely required. To assist and perhaps hasten the union of the skin edges, one may keep the skin somewhat separated from the underlying parts by daily application of gauze strips.

When the urethral and periurethral infection and edema of the penis have subsided—which requires approximately ten days—then urethral dilatation is started. From our experience, we personally emphasize the importance of interval dilatation, gradually and slowly increasing the urethral caliber. Upon arriving to approximately a No. 16 Fr., a soft-rubber catheter should be used as an indwelling tube, and the suprapubic cystostomy wound is allowed to close.

In the above description we have not mentioned the technique of dealing with the urethral stricture at the time of the extravasation operation. It is our opinion that cutting the stricture, internal urethrotomy, or even passing the various guides before perineal operation, all add trauma. These strictures soften, and the inflammation and infection recede when one employs this conservative method. Certainly, without a cutting operation into the urethra no more scar can be produced. The necessity to resort to a retrograde method borders upon the unusual in our experience.

To demonstrate many of the above ideas, which are in no way original with us, a case of urinary extravasation due to urethral stricture will be summarized briefly and the preoperative appearance, the surgical technique, and the postoperative management will be shown in motion pictures.

REPORT OF CASE

History.—A male, age sixty-nine years, was admitted to the hospital March 4, 1934. He complained of scrotal swelling for ten days, a mass in the lower abdomen for ten days, and a slow, dribbling, burning urinary stream for fifteen years. Some thirty years ago he had gonorrhea, which had been treated by a druggist.

Physical Examination.—Revealed an elderly white male, acutely ill and in severe pain. A cystic mass (Fig. 1), extending to the umbilicus, was believed to be the urinary bladder. The skin of the penis appeared edematous and the glans penis was scarred. A soft-rubber catheter met an obstruction in the bulbous portion of the urethra. The

scrotum (Fig. 2) was reddish brown in color and was distended to approximately the size of an indoor baseball.

Diagnosis.—Urethral stricture with retention and extravasation of urine.

Operation.—March 4, 1934, the afternoon of day of admission, under spinal anesthesia, a transverse suprapubic cystostomy was executed (Fig. 3), with an adequate drainage of all extravasated areas (Fig. 4), by multiple incisions.

Postoperative Management.—This consisted of continuous hot potassium permanganate dressings; ambulation on the fifth day, with hot sitz baths; introduction of a filiform bougie to the bladder and strapped in the urethra on the seventh day; urethral dilatation carried out up to a No. 6 Fr. silk catheter on the thirteenth day (Fig. 5). Interval gradual dilatation followed, until a No. 16 Fr. soft-rubber catheter could be admitted as an indwelling tube. Then the suprapubic Pezzer was removed. At the end of approximately two months (Figs. 6, 7, and 8) the urethra had been dilated to a No. 26 Fr. and the wounds were essentially healed; the patient was discharged with instructions to return for periodic soundings.

CONCLUSIONS

1. This paper is a further contribution for the express purpose of emphasizing the gravity of urinary extravasation.

2. In the majority of cases, neglected urethral stricture is the significant causative factor of extravasation.

3. Urinary extravasation demands immediate radical surgery. No palliative measures are justifiable.

4. There are three paramount courses of action, namely: (1) divert the urinary stream; (2) multiple incisions of all infiltrated areas; and (3) interval gradual urethral dilatation.

5. Dealing with the stricture should be referred to a later time when a process of slow dilatation will produce a more satisfactory result.

6. Suprapubic cystostomy is a highly satisfactory procedure to divert the urinary stream; perineal cystostomy is not to be condemned, but any operation directed toward cutting the stricture at the time of the extravasation, in our opinion, is unwarranted.

1680 North Vine Street.

DISCUSSION

NATHAN G. HALE (1127 Eleventh Street, Sacramento). Relating to "the complete confusion of terms," "extravasation" is commendable; the others superfluous, since most of the terms mentioned define degree of extravasation and end-results. Except the lethal usually resulting from the untreated case and the prolonged morbidity of the imperfectly treated case.

The authors deviate from concise management as outlined by the textbooks, and so they should. Each case presents different problems, but all cases demand the immediate drainage best suited to the needs of the patient's immediate emergency, plus adaptability of the physician in charge to carry out that procedure. Stricture, the causative factor, is of minor importance after the extravasation. There is no undilatable stricture—some are more resistant than others. Let us remember, and at this point pay due homage to Keyes, who, in his textbook, said, "Cleanliness is godliness, but gentleness is better." Gentlemen, fewer papers on this subject would have to be written if Keyes' rule or axiom were more closely followed. Immediate radical surgery, after the extravasation has occurred, is really conservative surgery, no matter how radical.

The three principles approved by the writers, (1) divert the stream, (2) multiple incisions, (3) do a urethral dilation, could be changed to: (1) drain the extravasation; (2) reëstablish the urinary course to the exterior; and (3) prevent secondary infection.

To the urologist the evidence of extravasation is apparent. The method: Proceed without delay. Let us disseminate this information to our brethren, and congratulate the authors on their paper.

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HENRY A. R. KREUTZMANN, M. D. (2000 Van Ness Avenue, San Francisco).—The authors correctly reiterate the advice to cut and keep on cutting wherever the urine has escaped into the surrounding tissue from a ruptured urethra. The urine itself is toxic, and the fact that it is always infected results in tremendous absorption of poisonous products into the system. The only possible method of removal is, as the Doctors have so emphatically stated, by free drainage with multiple incisions.

The treatment for extravasation of the urine has been very concisely outlined and presented. In this paper no mention is made as to the duration of time the suprapubic drainage should be continued. We have found it advantageous to continue the diversion of the urinary stream until the urethra has been dilated to such a size that filiforms are no longer necessary. This has a twofold purpose. It prevents edema of the strictured area, with its resultant acute retention. In the second place, it prevents absorption of the infected urine, thereby lessening the danger of chills and fever.

Immersing the patient in hot baths is an excellent aid in treatment. Still better, is to put a mild solution of potassium permanganate in the tub. This gives alleviation of pain and at the same time cleans the multiple wounds.

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LOUIS CLIVE JACOBS, M. D. (450 Sutter Street, San Francisco).—Doctors Rusche and Bacon emphasize the importance of stricture of the urethra as a contributing factor in rupture with extravasation of urine. It has been my experience that extravasation of urine, as a result of the neglected urethral stricture, is not uncommon. Patients with stricture of the urethra should receive adequate treatment, and be impressed with the importance of reporting to their physician for the introduction of sounds at stated intervals. I usually keep my patients under observation for a period of years, dilating their canals to F. 28. The frequency of treatment depends upon the individual's reaction thereto.

In reviewing case histories, I find many similar to those reported above. Three to ten days have already elapsed before hospital relief is sought, and the record sheet shows urethral instrumentation associated with traumatism. One patient was hospitalized for over three months. His recorded findings were similar to the case history that Doctors Rusche and Bacon report; but his extravasation and infiltration were so extensive that gangrene was present. The perineum, scrotum, testes, and abdomen were involved, with redness and edema of the skin extending to both axilla and along the thighs. He later required plastic surgery.

It is not infrequent to have patients with a brawny swelling located in the perineum, associated with abscess formation, as a result of even a slight abrasion of the urethral walls. In degree, the rupture, which is usually located upon the floor of the urethra, varies from the smallest laceration to a complete tear with solution of the continuity of the urethra, and subsequent disintegration of adjoining tissues. Ultimately urine extravasates into the perineal space and along the planes of fascia to the adjacent structures. Whenever a rupture of the urethra is neglected, some infiltration of urine will occur; which is always followed by sepsis. Even in the presence of sterile urine, the infiltrated area becomes septic; the character of the urine alone influencing the length of time before the patient becomes comatose. Thus, it is evident that an early diagnosis is necessary, so that proper surgical procedures may be instigated.

Such procedures have been thoroughly enumerated by Doctors Rusche and Bacon, whose technique in the treatment of such patients is sound.