CHAPTER 9

WOUNDS OF THE SCROTUM, TESTIS, EPIDIDYMIS, AND SPERMATIC CORD STRUCTURES

GU Tract Structure	Ch 2 Kidney	Ch 3 Ureter	Ch 4,5 Bladder	Ch 6,7,8,11 Urethra	Ch 8,9 Scrotum Testis	Ch 8,9 Spermatic Cord	Ch 8,10 Penis
No. Patients With Injury to Structure	132	36	72	83	199	14	128
% of Total GU Injuries	19.1	5.2	10.4	12.0	32.8	2.0	18.5

GU: genitourinary

INTRODUCTION

In the limited data published to date on genitourinary injuries from the Vietnam War, the incidence of scrotal–testicular injuries has varied from 25.4% of all urological injuries reported by Salvatierra et al[1] to as high as 35.4% by Busch et al.[2] In all the series to date, scrotal–testicular injuries constituted the major proportion of wounds of the external genitalia.[1–5] These wounds were most often secondary to penetrating or perforating agents. In both Salvatierra et al's[1] and Selikowitz's[4,5] series, wounds of the kidney were more common than wounds of the scrotum and testis. Likewise, in his World War II analyses, Culp[6] reported kidney wounds to be more common than the next-most common, which was to the scrotum and testis; Kimbrough,[7] however, reported a much higher percentage of scrotal–testicular than renal wounds.

WOUND ANALYSIS

In our experience in Japan, which was primarily at the US Army Hospital, Camp Zama, we authors (JNW and JWW) found that scrotal–testicular wounds were almost twice as common as those to the kidney, the next-most-common organ wounded; they comprised 32.8% of our total injuries (see Table 2-1). Of the 452 injuries of the external genitalia outlined in Table 9-1,

TABLE 9-1
INJURIES OF THE EXTERNAL GENITALIA

Organ Injured	No. Patients*	Injuries No.	Injuries %
Scrotum and Testis	199	227	50.2
Penis	128	128	28.3
Urethra			
Anterior	48	48	10.6
Posterior	35	35	7.8
Spermatic Cord	14	14	3.1
Totals:		**452**	**100.0**

*303 patients total; some had injuries to more than 1 organ

we see that the injuries of the scrotum, testis, and spermatic cord comprised slightly more than 50% of the entire group of wounds of the external genitalia. All but 7 of the scrotal, testicular, and spermatic cord injuries were caused by penetrating agents; many of these were from high-velocity missiles (bullets and primary fragments). There were 4 blunt injuries, 1 circular saw injury, and 1 secondary to burns. Table 9-2 details the distribution of 227 scrotum and scrotal–testicular wounds in 199 patients. Only 75 (37.7%) of the 199 patients had scrotal-only wounds, whereas 124 (62.3%) patients had 152 scrotal–testicular wounds, reflecting both the anatomical proximity of the scrotum and testes and the fact that many patients had more than 1 injury. In more detail, the breakdown of the 152 testicular wounds in 124 patients is presented in Table 9-3. Ninety-six patients had a unilateral injury only, whereas 28 patients experienced bilateral testicular injuries.

TABLE 9-2
SCROTAL–TESTICULAR WOUNDS

	Number	
Organ Wounded	**Wounds**	**Patients***
Scrotum	75	75
Scrotum and Testis	152	124
Totals:	**227**	**199**

*Some patients had more than 1 wound

TABLE 9-3
TESTICULAR WOUNDS

Type of Wound	No. Patients
Unilateral	96
Bilateral	28
Total:	**124**

Included in this group of patients with scrotal–testicular injuries are 8 patients with 9 epididymal injuries: 1 injury was bilateral, 7 were lacerations, and 2 were contusions. Five of the patients had associated testis injuries, and 4 had intrascrotal injuries that involved only the epididymis. The most common source of injury to the epididymis was metallic fragments.

Another interesting group of 14 patients, who had injury of the spermatic cord outside of the scrotal contents in the inguinal region, is discussed in greater detail later in this chapter. The 14 patients in this group had 9 wounds from fragments and 5 from bullets. Their wounds varied from complete transection of the entire cord to isolated vascular—either arterial or venous—or vas transection only, to contusions.

In general, the reports of the initial treatment of this type of wounds from Vietnam stressed the need for extreme conservatism when the testis is injured. The policy for treating wounds of the scrotum was that these were explored with hemostasis being a prime concern. Debridement, generally conservative, was done of obviously devitalized tissue. Treatment included thorough inspection of the testis with attention to its blood supply. The testicular wounds, unless massive, were generally handled by debridement of the obviously destroyed intratesticular substance and then loose closure of the debrided tunica albuginea with chromic catgut sutures.

Orchiectomy appeared to be considered only in instances of total testicular destruction except in instances of massive injury to the rest of the body. Generally, the scrotum was primarily closed with absorbable sutures, usually chromic catgut,

and drains were used liberally. Most of these patients had other injuries and accordingly were treated with an antibiotic umbrella. In some instances because of more-severe extragenital injuries, wounds to the testes were not adequately debrided and often were treated with dressings only.

Not uncommonly, more-extensive injuries with tissue loss of the scrotum were treated by what at times appeared to be heroic attempts at sliding scrotal skin from one side to the other. With this general conservative approach to testicular wounds and with the philosophy of "if there is a doubt as to viability, salvage the testis," the orchiectomy rate was not exceedingly high. Salvatierra and colleagues[1] reported 18 patients with unilateral orchiectomies and 2 with bilateral orchiectomies in their 64 patients with scrotal injuries. This same group reported primary repair in 22 and noted that 2 badly damaged testes were replaced in the scrotum on 2 occasions, reflecting their concern for maximum conservation of testicular tissue. In Busch's series,[2] 5 unilateral orchiectomies were performed in the 10 patients with testicular injury, and there were no castrations in this group. Selikowitz[5] does not give the incidence of orchiectomy in his testicular injuries; however, he states, "high-velocity testicular injury invariably led to orchiectomy if the wound tract was followed and debrided."[5(p493)] In these reports from Vietnam, the follow-up is inadequate to assess the efficacy of the general or specific treatment modalities in these injuries. The authors state that they had no significant complications in their patients.[1,2,5]

The initial treatment (in the Republic of Vietnam, RVN) of the 96 patients with unilateral testicular wounds is outlined in Table 9-4. About 50% of the patients with unilateral testicular injury underwent orchiectomy and another significant percentage underwent partial orchiectomy. All but 14 of these 96 patients with unilateral testicular injuries had either orchiectomy or partial orchiectomy; of the remainder, 7 patients with epididymal wounds were treated with either partial or complete epididymectomy; 4, testicular contusions that were treated with drainage; 2 patients had no treatment; and treatment was unknown in 1. Of the 28 patients with bilateral testis injury (Table 9-5), castration was performed in 5 patients for

TABLE 9-4
INITIAL TREATMENT IN VIETNAM OF PATIENTS WITH UNILATERAL TESTICULAR WOUNDS

Initial Treatment	No. Patients*
Orchiectomy	50
Partial Orchiectomy	32
Partial or Complete Epididymectomy	7
Drainage of Contusion	4
No Treatment	2
Treatment Unknown	1
Total Patients:	**96**

*96 patients; all had unilateral injuries

TABLE 9-5
INITIAL TREATMENT IN VIETNAM OF PATIENTS WITH BILATERAL TESTICULAR WOUNDS

Initial Treatment	No. Patients*
Unilateral Orchiectomy	17
Partial Orchiectomy	27
Bilateral Orchiectomy	5

*28 patients total; some had more than 1 procedure

either totally destroyed or avulsed testes. Bilateral partial orchiectomy was performed in 6 patients and unilateral orchiectomy and contralateral partial orchiectomy in 17. These figures reflect the attempts at maximum conservation of testicular tissue in the primary treatment.

The complications of the scrotal–testicular injuries in the reports from Vietnam reflect no significant problems in their management. Because of the limited short-term follow-up in this group, it is apparent that significant early complications were not seen or recorded. However, the complications of the scrotal–testicular spermatic cord wounds that we saw in Japan were relatively significant.Table 9-6 details the complications secondary to injuries of this area that were managed in Japan and required a surgical operation. There were 42 surgical procedures required in the management of the complications listed in this table. There were obviously many more, relatively minor complications that did not require surgical treatment; these were managed by the primary physicians in Vietnam and Japan and were unknown to the urologists. Of the 14 documented cases of epididymitis seen in consultation in Japan associated with scrotal, testicular, and spermatic cord injuries, 3 required epididymectomy.

Many of the cases of epididymitis may have been unrelated to these wounds per se and possibly relate to other etiologic factors. There were innumerable cases of separation of the scrotal wound, many of which were unrelated to infection and were seemingly secondary to the environment. Of these, 12 required resuture in Japan. We (JNW and JWW) utilized monofilament, nonabsorbable suture materials, such as 00 or 000 nylon, to repair these separated scrotal defects. Based on this high incidence of scrotal wound separations, we subsequently recommended the use of monofilament, nonabsorbable suture in the primary treatment of these wounds in Vietnam and then saw a significant reduction in the incidence of this complication. The actual incidence of scrotal hematoma with or without sepsis was un-

TABLE 9-6
COMPLICATIONS* OF SCROTAL–TESTICULAR WOUNDS TO THE SPERMATIC CORD

Complication	Treatment	No. Complications Treated With Surgery
Separation of Wound	Resuture (nonabsorbable)	12
Scrotal Hematoma Infection	I&D, debridement	10
Intrascrotal Abscess	I&D, debridement	9
Epididymitis	Epididymectomy	3/14
Testis Atrophy, Infarction, Necrosis	Orchiectomy	5
Segmental Necrosis	Partial orchiectomy	3
Total:		**42**

*Managed in Japan
I&D: incision and drainage

known and was obviously higher than those 10 patients who required definitive incision and drainage and debridement. Likewise, the incidence of intrascrotal abscess alone was higher than the 9 patients who required definitive surgical drainage and further debridement in Japan.

Significant orchalgia, sepsis, ischemia, swelling, atrophy, and necrosis in various combinations that necessitated orchiectomy were seen in 5 patients. Likewise, significant segmental testicular necrosis was identified in 3 patients, who required delayed partial orchiectomy. All of the injuries to the scrotal, testicular, and spermatic cord areas that required orchiectomy in Japan were wounds.

The complications of the initial treatment in Vietnam were similar, in that these testes manifested various combinations of pain, ischemia, swelling, sepsis, atrophy, and necrosis. Histologically, testicles that were removed secondarily all showed various degrees of necrosis, ischemia, and atrophy, and often were described as "dead" testes. Two of the patients in this group had spermatic cord injuries, which were primarily treated with ligation and control of bleeding only. It is not surprising that this treatment ended in an ischemic dead testis.

In the 3 patients in Japan who underwent delayed partial orchiectomy, again, the initial wounds were caused by penetrating missiles. Two of the patients' wounds were known to have been caused by high-velocity missiles, and all 3 patients had initially been treated with partial orchiectomy in Vietnam. All 3 were symptomatic in Japan, and on reexploration, the tissue showed dissolution and separation of the suture line with partial extrusion of dead testicular substance. After redebridement and a secondary partial orchiectomy, these patients manifested no further symptoms and healed completely. Readers might conclude that these complications were related to inadequate initial debridement; however, the delayed effects of high-velocity trauma may well have contributed. As previously noted, the incidence of nonsurgical complications in this group is unknown; however, there were innumerable instances of funiculitis, scrotal swellings that were deemed nonsurgical or were in patients who had more serious wounds and in whom the stay in Japan was limited, many minor hematomas, and innumerable instances of orchitis and orchalgia.

Of the 14 spermatic cord wounds, complications were appreciated in Japan in 8 patients. Interestingly, only 2 surgical complications arose from this group, both of whom had secondary orchiectomy in Japan. These complications occurred in patients who had had debridement and ligation of the spermatic cord at the site of injury in Vietnam, without removal of the testis. Four such injuries were treated in this manner; 2 needed secondary orchiectomy. Readers might conclude that in a patient with severe injuries of other organ systems, ligation of the spermatic cord may well, as an expedient, be indicated in the primary care. Two patients in this group of 8 underwent primary vasovasotomy in Vietnam. Likewise, readers might consider such a procedure prudent when the contralateral testis and spermatic cord are injured, or in instances of such damage to a solitary testis and the spermatic cord. Patients with spermatic cord injuries most often had lingering swelling, induration, and pain of a somewhat indolent nature. The number of patients in this group who subsequently required orchiectomy at a later date is unknown.

CASE REPORTS

Selected cases from our experience in Japan are presented to amplify and illustrate pertinent aspects of the diagnosis and treatment of patients with wounds to the scrotum and testis. Certain aspects of these cases also will illustrate the complications and their management in the intermediate and delayed stages of their wounds.

Case 9-1

F. S., a 25-year-old soldier, was a helicopter pilot whose injuries were received in hostile action (IRHA) on 12 August 1969 in RVN. The airborne helicopter was hit from below by a .50-caliber missile; multiple fragments from its metal seat (secondary missiles) lacerated the perineum, bladder, left scrotum, and testis. The bladder laceration was debrided and closed; suprapubic and Foley catheter drainage were established. The retropubic space was debrided and drained. Proctoscopy revealed no rectal injury. The left scrotum was explored with a partial orchiectomy for the testis laceration. The soft-tissue perineal wounds were debrided and dressed open. Antibiotic coverage was with penicillin and chloramphenicol (Chloromycetin). He was evacuated to Japan on 17 August 1969; after secondary closure of his perineal wounds, his recovery was uncomplicated (Figure 9-1).

Comment on Case 9-1

This case illustrates a common injury with multiple fragments (these were often secondary missiles, which have lower velocities than primary) involving the perineal–genital area—not an uncommon injury in helicopter pilots; it is easy

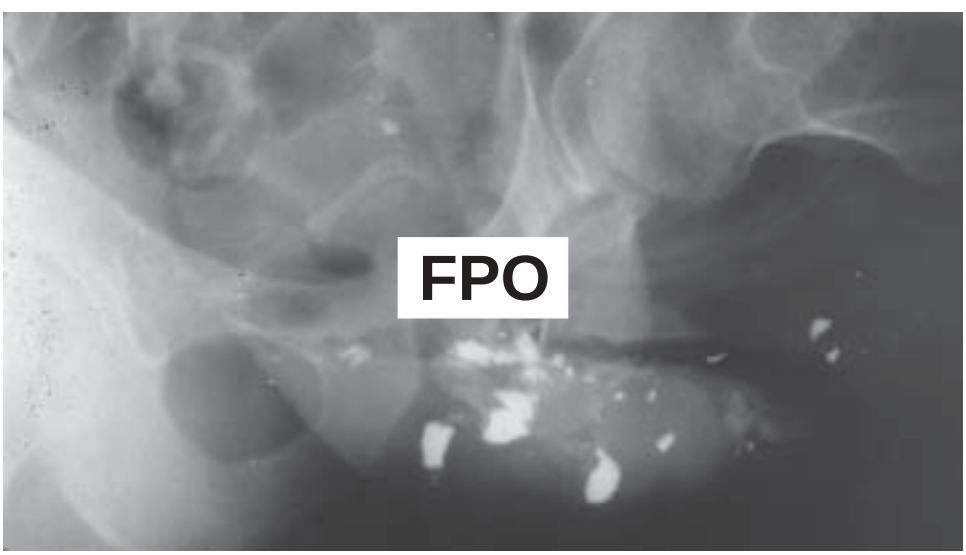

Fig. 9-1. Case 9-1. The patient was a helicopter pilot during the Vietnam War. The roentgenogram shows multiple missile fragments from the metal seat of the helicopter, involving the soft tissues of the genitoperineal region.

to understand why multiple wounds to other organ systems, as well as multiple genital wounds, can occur. The patient's soft-tissue wounds were well handled by initial debridement and delayed primary closure. The scrotal–testicular wound was ideally managed by primary debridement and a conservative approach with partial orchiectomy and primary closure. Because of the limited tissue damage caused by the low-velocity missile, the bladder laceration was appropriately handled by debridement and suprapubic drainage. Without evidence of urethral injury there is, however, no need for a Foley catheter in addition to the suprapubic tube.

Case 9-2

S. T., a 23-year-old soldier, received extensive, multiple, high-velocity missile wounds to both thighs, groin, perineum, scrotum, testes, bladder, posterior urethra, and pelvis from an M-16 rifle on 29 July 1969. The massive soft-tissue wounds were debrided, the fractured right tibia was pinned, the shattered testis removed, and the partially destroyed anterior bladder reconstructed over a suprapubic catheter, with a colostomy for rectal wounds. He required 20 units of blood during initial therapy in RVN. After he arrived in Japan on 3 August 1969, his subsequent course was incredibly complicated by sepsis, malaria, the need for massive periodic redebridement, a right above-the-knee amputation, transfusion of 23 units of blood, and finally a permanent supravesical urinary diversion. He was evacuated to the continental United States on 20 November 1969 after 110 days of hospitalization in Japan (Figure 9-2).

Fig. 9-2. The patient in Case 9-2 after he arrived in Japan just before his injuries were redebrided. He had massive wounds of the thighs, groin, perineum, scrotum, testes, and bladder.

Comment on Case 9-2

This case illustrates the devastation caused by high-velocity missiles. Their explosive effects in wounds of the testis frequently resulted in total disruption and destruction. Multiple, contiguous organ injuries are not uncommon with the wounds of the genitalia, especially when associated with high-velocity wounds of this area. The most-common accompanying wounds of the external genitalia are soft-tissue and bony wounds of the lower extremity and pelvis. Colostomy is mandatory for large-bowel wounds, and surgeons must be highly suspicious of rectal perforation.

The management of this patient's bladder and posterior urethral wounds is discussed in Chapter 4, Wounds of the Bladder, and Chapter 7, Wounds of the Posterior Urethra and Prostate.

Case 9-3

R. D. was a 39-year-old soldier, IRHA in RVN, and who received fragment wounds of the buttocks and scrotum on 3 June 1969; they were debrided and primarily closed that day. He developed an abscess with cellulitis and an acute suppurative inflammation of the subcutaneous connective tissue of the scrotum and perineum, which, 10 days later in Japan, cultured *E coli* and *Pseudomonas.* On 4 occasions over the next 6 weeks, he underwent surgical redebridement of the scrotum and perineum under anesthesia and was treated with local antibiotics and multiple dressing changes preceding delayed primary closure (Figure 9-3. a,b).

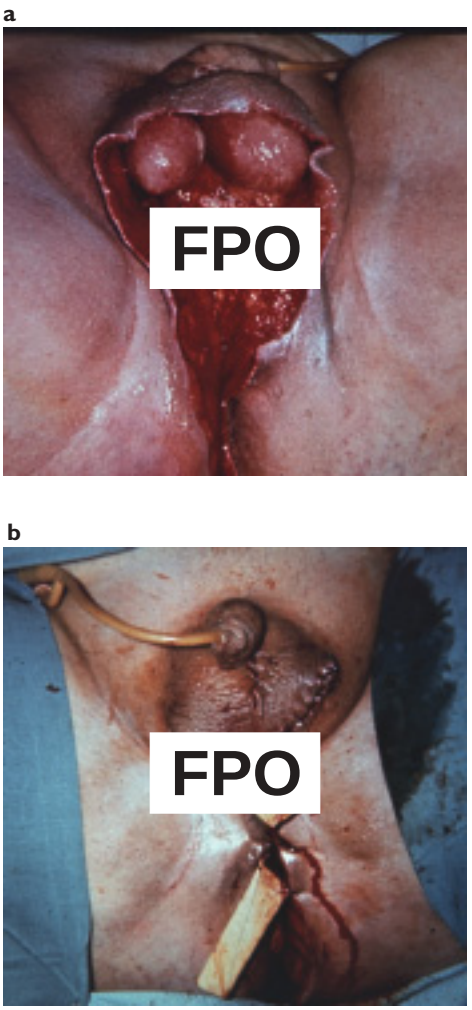

Fig. 9-3. Case 9-3. The condition of the patient's scrotal perineal wounds is seen after multiple redebridements and (**a**) before and (**b**) after delayed primary closure.

Comment on Case 9-3

This case demonstrates several significant points:

- Adequate initial debridement and drainage of contaminated wounds of the perineal-scrotal area are necessary. All of these wounds should be drained—whether caused by high- or low-velocity missiles.
- If debridement has been inadequate or incomplete, these injuries can be dressed open and redebridement and primary closure delayed until the patient is in the next treatment echelon of the evacuation system.
- The "apparent" need to immediately cover large skin defects of the scrotum initially by the mobilization of adjacent scrotal skin, or by burying the testicles within the medial thighs, has been overemphasized, in our opinion.
- This is especially true when we consider that contaminated high-velocity injuries of this area do not lend themselves well to immediate skin coverage.
- We (JNW and JWW) have found that these large defects can be managed rather well by frequent dressing changes, antibacterial coverage, local antibiotic dressings, and redebridement without the necessity of quick or immediate skin coverage. This patient had such management for 6 weeks in Japan without skin coverage of the testicles with no significant complications.

Case 9-4

R. W. was a 23-year-old soldier, IRHA in RVN. He incurred through-and-through, high-velocity missile wounds of both thighs and both scrotal compartments with destruction of 50% of the left testis and 80% of the right. Both scrotal compartments were debrided and drained, and the testes were debrided and primarily repaired. Several days later, in Japan, purulent fluid and testicular tissue began to drain from the left hemiscrotum. At surgical reexploration, the necrotic, infected scrotal tunicae were excised, and it was apparent that the previous repair of the testis had completely disrupted. A large segment of the remaining testicular tissue—dead and necrotic—was debrided until active bleeding and residual normal testis were encountered. The debrided fresh edges of tunica albuginea were closed with 00 chromic catgut sutures, and the scrotum was drained. The scrotal skin was closed with nylon sutures. Microscopic analysis of the excised testicular tissue revealed hemorrhagic infarction. Healing was uncomplicated.

Comment on Case 9-4

This case reemphasizes the importance of conservative initial approach to bilateral testicular injury and demonstrates the need for redebridement. The fact that a conservative operation was performed originally does not necessarily mandate a more radical procedure if a reoperation is indicated. Possible reasons for dehiscence of the original surgical repair in the testis include traumatic infarction, sepsis, incomplete initial debridement, and dissolution of suture material.

Case 9-5

This case, unlike the others above, is not included in the wound statistics. A Vietnamese man was injured by a high-velocity penetrating missile. The wound of entry is in the left buttocks and the exit wound is in the suprapubic area with creation of significant soft-tissue defect. The large hematoma suggests scrotal–testicular and possible penile–urethral damage (Figure 9-4. a,b).

Comment on Case 9-5

Such indirect evidence of nonspecific injury into this area was not uncommon and illustrates 1 of the reasons why all of these penetrating wounds had to be explored. This pa-

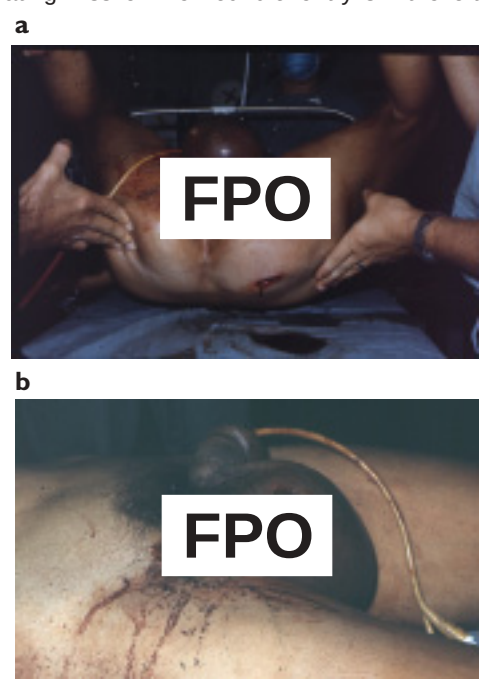

Fig. 9-4. Case 9-4. The patient's injuries included (**a**) the wound of entry, left buttock; a massive scrotal hematoma; a classic "butterfly" hematoma of the perineum from bleeding into the deep and superficial tissue spaces bounded by Colles fascia; (**b**) the massive scrotal hematoma; and suprapubic soft-tissue defect from the exit wound.

tient was found on exploration to have a shattered left testicle as well as a wound to the bulbus urethra and bony defect of the symphysis pubis.

DISCUSSION

This is the largest reported series of wounds from the Vietnam War that gives intermediate and, at times, delayed follow-up of initial management of wounds of the scrotum, testis, epididymis, and spermatic cord structures. Our experience reflects the facts that (1) the initial management of these wounds was relatively sound and (2) testicular wounds should be approached conservatively, the goal being maximal conservation of testicular tissues. The general philosophy of exploring all penetrating scrotal wounds was fruitful, and we found no evidence of missed injuries to the scrotal–testicular region. The major complications we encountered were associated with sepsis. This reflects the high degree of contamination in the wounds themselves and is exacerbated by incomplete debridement. This latter was often directed toward maximum conservation of residual tissue, especially in testicular wounds. Interestingly, we managed no cases of gas gangrene involving soft tissues of the external genitalia.

Not surprisingly, approximately one third of the patients with unilateral testicular injuries had conservative treatment with partial orchiectomy. The incidence of bilateral orchiectomy was relatively low, and on review of the records, every instance appeared to be clearly indicated and dictated by the extent of the initial injury. It appeared that the criteria for orchiectomy were (1) absence of vascular supply as evidenced by the lack of bleeding of the testis, (2) complete transection of the spermatic cord proximal to the testis, or (3) complete explosion and dissolution of the testis.

When primarily repaired, scrotal wounds were sutured routinely with absorbable chromic catgut. Because of the high incidence of delayed separation of scrotal wounds so treated in Japan, often without infection, we believed and recommended that these wounds should be closed primarily with nonabsorbable monofilament nylon or proline suture. The recommendation was subsequently instituted by many of the urologists in Vietnam, and thereafter we saw a significant decrease in the incidence of this complication.

We also saw in Japan several patients with extensive loss of scrotal skin and whose contaminated wounds were closed primarily by rather heroic attempts at sliding adjacent residual scrotal skin. This skin was often sutured under tension in traumatized, incompletely debrided tissue. The subsequent wound separations were redebrided, which necessitated several dressing changes, and we were able to protect the testes with antibacterial dressings for several weeks without problems. It became obvious from this experience that in the initial management phase of these extensive injuries, there is no need to obtain coverage with either a skin graft or by placing the testes in an abnormal position. These patients can be treated with initial debridement and dressings with multiple redebridements if necessary, and then delayed primary closure either with adjacent scrotal skin or with split-thickness grafts. The testes can also be placed

in the thighs, if skin is available in this area, at a later date. However, such wounds are often accompanied by extensive destruction of the immediately adjacent thigh tissues, which makes this impractical.

Based on the experience of military surgeons in RVN and those who managed the intermediate and late aspects of scrotal–testicular wounds, we recommend that *all* penetrating scrotal wounds be explored and debrided. Orchiectomy should be considered only when the wound indicates either complete devascularization or total destruction of the testis. If in doubt as to the viability of residual testicular tissue, the surgeon should err on the conservative side. The tunica albuginea should be debrided and the testis debrided to the point of viability as evidenced by fresh bleeding. The tunica albuginea should then be approximated without tension with moderate-sized chromic catgut sutures. All such wounds should be drained dependently. Unless they are grossly contaminated, scrotal wounds that are caused by small, low-velocity missiles can be debrided and closed primarily. Contaminated scrotal wounds should be debrided and adequately drained, and closure should be delayed; the wounds can be periodically redebrided in the evacuation chain. Testes exposed because of large scrotal tissue loss may be adequately covered with medicated dressings and under an antibiotic umbrella. Plastic reconstruction of the scrotal area, if needed, should be reserved for the intermediate stages of management. Redebridement and reexploration may be necessary in the evacuation chain, and many testicular injuries are amenable to a second conservative operation such as redebridement and partial orchiectomy. Surgeons must consider the remarkable regenerative power of the scrotal skin before resorting to major plastic reconstructive procedures.

Of the infections that we saw in Japan involving scrotal–testicular wounds, the most common culture results included a mixture of Gram-negative organisms, mainly *E coli, Klebsiella aerobacter, Proteus,* and *Pseudomonas*. Staphylococcal infections were uncommon.

Readers should keep in mind that once patients were evacuated from Japan to CONUS, follow-up was virtually nonexistent; many patients may have required further surgical procedures, but such details are not available. The incidence of delayed orchiectomy in CONUS is not known but may be significant. The incidence of functional hypogonadism in patients with bilateral testicular injuries and in patients with missed testicular injuries is also unknown, as well as the incidence of infertility in this group. Considering the nature of the injuries that occurred in Vietnam, the incidence of castration was extremely low. We know of no incidence in which patients received testicular prostheses either in RVN or Japan.

REFERENCES

1. Salvatierra O Jr, Rigdon WO, Norris DM, Brady TW. Vietnam experience with 252 urological war injuries. *J Urol*. 1969;101:615–620.
2. Busch FM, Chenault OW Jr, Zinner NR, Clarke BG. Urological aspects of Vietnam War injuries. *J Urol.* 1967;97:763–765.
3. Ochsner TG, Busch FM, Clarke BG. Urogenital wounds in Vietnam. *J Urol*. 1969;101:224–225.

4. Selikowitz SM. Penetrating high velocity genito-urinary injuries, I: Statistics, mechanisms, and renal wounds. *Urology*. 1977;9(4):371–376.
5. Selikowitz SM. Penetrating high velocity genito-urinary injuries, II: Ureteral, lower tract, and genital wounds. *Urology*. 1977;9(5):493–499.
6. Culp OS. War wounds of the genito-urinary tract: Early results observed in 160 patients treated in the European theater of operations. *J Urol*. 1947;57:1117–1128.
7. Kimbrough JC. War wounds of the urogenital tract. *J Urol*. 1946;55:179–189.