Chapter 14

DISABLING AND DISFIGURING INJURIES

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Barse Miller *Requiem Mass* 1944

Barse Miller was an artist for Life Magazine before he enlisted in the U.S. Army in 1943. He served with the Corps of Engineers before becoming the War Art Leader of the Combat Art Section. In this watercolor, Miller portrays the interior of a church in World War II that has been converted to a makeshift hospital to care for combat-injured soldiers. The man in the foreground has sustained wounds to his hands and face, the two areas most associated with visible expression of emotions. These are among the injuries that soldiers fear the most—those that leave them permanently disfigured or disabled or both.

Art: Courtesy of US Center of Military History, Washington, DC.

INTRODUCTION

This chapter takes up the neurological and physiological disturbances and the behavioral changes that follow major amputations, spinal cord injury with paralysis, facial disfigurement from missile wounds and burns, blindness, and mutilating and castrating wounds of the external male genitalia. Changing conditions of warfare and the greater explosive power of weapons have raised the proportion of some types of wounds, and increased the incidence of multiple injuries. Improved methods of evacuation and the development of new surgical techniques have resulted in the survival of many men who previously would have died. Whereas the combat zone hospital mortality rate in World War II was 3.3%, the rate in Korea was 2.4%, and that in Vietnam 1.8%.[1] The changing nature of future combat actions, to include nation assistance, foreign internal defense, and operations other than war (OOTW), broadens the range of patients that may be seen.

Survivors of disabling and disfiguring injuries share a number of problems. Along with their physical limitations, they experience an altered body image, lowered self-esteem, and changes in their personal relationships. Some bear the social stigma associated with crippling and deformity. It is only since World War II that these features have been recognized and specialized programs set up for amputees, paraplegics, and the burned and the blind. Sustaining a combat wound does not preclude the development of post-traumatic stress disorder (PTSD), and depression, denial, and drug abuse pose major problems in therapy. While the management of each type of disability will be considered separately, overall principles of management are presented.

AMPUTATION

Amputation of a limb as a result of an injury in combat has profound and special behavioral consequences. These are the emotional reactions to the initial trauma, the problems of coping with the motor disability, the alterations of body image caused by the loss of a previously healthy arm or leg, and the neurophysiological and psychological aspects of phantom limb phenomena.

Lower-limb amputations are much more common than amputations of the upper extremity; in Vietnam these wounds were caused predominantly by antipersonnel land mines and booby traps, and might extend to involve the scrotum, buttocks, and abdomen. The limbs might be severed by the injury, or a surgical amputation was carried out, usually within hours of the initial trauma. In cases in which attempts were made to preserve a shredded limb the amputation might not be performed until days or weeks later.

Behavioral Effects

Behavioral disturbances are not usually a problem in the early postoperative period over which the combating of infection, the maintenance of metabolic balance, and the management of other injuries are the paramount considerations. Also, newly wounded soldiers are apt to be euphoric, glad to be alive, and thankful that their injuries were not more severe. Even at this early stage, however, what the emergency room, surgical, and ward staff say to the patient (or to each other within hearing distance) is important even if they think the patient is unconscious. Depression may follow elation, but it is mainly when the patient encounters the stresses of further treatment and recovery, and begins to realize the extent of his physical and social limitations, that emotional problems arise. The physical stresses include surgical revisions of an infected, often painful, stump, learning to use a temporary prosthesis, and experiencing the fatigue caused by alterations in posture, balance, and locomotion. Patients worry how they will be accepted by their family and community, and whether they will be able to make a living and lead a normal life. They are concerned with physical attractiveness and sexual ability.

Anxiety and Depression

Anxiety and depression are the most common forms of emotional distress. These states are experienced as feelings of tension, sleep disturbances, somatic complaints, phobias such as fears of falling or otherwise injuring the amputation stump, irritability, outbursts of anger, and feelings of worthless-

ness and social withdrawal. The circumstances of the initial injury are a factor in that soldiers who have undergone a particularly traumatic experience involving the death or mutilation of others are more severely stressed.

Case Study 1: Lord Nelson at Tenerife

Admiral Lord Nelson, England's greatest naval hero, had his right arm amputated above the elbow following a wound sustained in an attack on the Spanish fortress of Tenerife in 1797. The assault failed with heavy British casualties, largely because of Nelson's overconfidence induced by his contempt for the Spaniards, his faith in Providence, and his belief in his own magical qualities of leadership. He was initially elated but several days later he wrote in left-handed script to his superior, Lord St. Vincent, "I am become a burden to my friends and useless to my country. When I leave your command I become dead to the world; I go hence and am no more seen. I hope you will give me a frigate to convey the remains of my carcass to England."[2(p145)] The wound healed but Nelson continued to experience phantom pain for the rest of his life.[3]

Comment: Lord Nelson believed that the phantom fingers of his amputated arm provided a direct proof of the existence of the soul.

In World War II it was observed that amputees who had been injured through their own negligence, or while they were absent without leave (AWOL), were more apt to be depressed and have disciplinary problems.[4] Some patients deal with the stresses and boredom of hospitalization by resort to alcohol or other drugs.

Denial

Denial is the most prominent defense mechanism. Patients do not deny the actual loss of a limb unless there is brain dysfunction such as might result from an associated head injury, or a toxic or metabolic encephalopathy. Amputees may deny phantom sensations for fear of being thought mentally abnormal. Denial may be expressed in dreams in which the patient sees himself with his limbs intact or as having sustained some lesser damage such as a fracture. An occasional patient expresses the idea that his limb will grow back or that he can get a transplant. Some have the unrealistic expectation that an artificial limb will allow them to function as well as they did before they were injured. Most commonly, patients deny concern, depression, and other negative feelings. Some have a paranoid reaction and blame the staff and hospital equipment for their less than satisfactory progress. Amputees may manifest denial by not recognizing the need for rehabilitative procedures. Others offer a show of bravado, and boast of their physical and sexual prowess. They may engage in reckless behavior such as racing wheelchairs down hospital corridors.[5] Preoccupation with religion may become a form of denial as patients avoid discussion of their problems by engaging in theological speculations.[4,6]

Denial appears on both conscious and unconscious levels. It may function temporarily as an adaptive mechanism but, if continued over time, poses barriers to treatment. It keeps the soldier from coming to terms with his loss and prevents the development of close personal relationships with other patients and staff; it is often followed by depression.

Phantom Limb

Phenomenology

The phantom limb, the experience of sensation in the severed extremity, is virtually universal. The phantom may be so mild that the amputee is aware of it only when his attention is directed toward it; in other cases it is more vivid. The phantom may originally duplicate the normal limb, but over time differs in size, sensation, shape, position, and completeness—in the case of an amputation at the shoulder, there may be a gap between the shoulder stump and the phantom elbow. The foot and hand are felt most prominently. Sensations range from a not unpleasant tingling and feelings of warmth, cold, and heaviness, to cramping, twisting, burning, or lancinating pain. The phantom usually appears immediately after amputation, so that patients on awakening from anesthesia do not believe that the limb has been removed, but it occasionally comes on later. Most phantoms begin to fade within weeks, with sporadic later occurrences over a period of years.[7,8] Fading of the phantom, which is felt more vividly in the upper extremity, may be associated with telescoping, the sensation that the fingers or toes, or hand or foot are attached directly to the stump. Chronically painful phantoms, however, do not telescope.

Pain occurs in both the stump and the phantom. Stump pain is almost always present. It is usually severe immediately after the operation and subsides in a few days. If it persists, then there is likely a problem with the stump, such as infection or poor blood supply. Recurrence may often be traced to local abnormalities such as bone spurs, deficient soft tissue padding, difficulties with the

prosthesis, and alterations in gait and posture.[9] Phantom pain is much more variable. Whereas the phantom itself appears immediately, the pain may not come on for months or years after the amputation, with disagreeable feelings replacing the original benign sensations.[8] Phantom pain is more likely to be present in persons who have had pain prior to operation.[10] The pain may be described as similar in type and location to that previously experienced, with even the limb in the same distorted position.[11,12]

Somatosensory memories, most of which are painful, may be multimodal involving not only pain, but tactile, visual, motor, and even olfactory components. Riddoch[7] described the case of a soldier whose arm was blown off by the premature explosion of a bomb that he was holding. In the painful phantom, his hand was still grasping the bomb. A phantom reported by Henderson and Smythe[8] included the sensation of blood trickling down the limb. A soldier whose leg was amputated in the Italian campaign of World War II could still feel and visualize the fragments of his shattered bones. Some somatosensory memories are benign as in the instance of the man who reexperienced the sensation of a bandage being applied to his wounds, but most are associated with high levels of anxiety and emotion.[12]

Phantoms, painful and nonpainful, may appear without apparent cause, or they may be brought on by a wide variety of perceptual, cognitive, or affective experiences. Sensory stimulation of the stump and elsewhere on the body or face can produce or accentuate a phantom, as may pain from an arthritic shoulder or an anginal attack. Visual experiences can elicit a phantom, as in a case described by Varna, Lai, and Mukherjee,[13] in which a man, after an upper-limb amputation, would feel his ring on an absent finger when he saw someone wearing a ring on the corresponding digit. Micturition, defecation, yawning, and sexual activity may occasionally elicit phantom sensations and images. A phantom may be evoked by thinking of it, and a sense of movement created by willing it. Bailey and Moersch[14] reported a patient who related that while his amputated arm was being burned at his request, he had felt the ashes gradually dropping from the phantom. Riddoch[7] described an amputee in whom pleasant excitement caused his phantom to tingle along with the rest of his body. When, however, his mind was fully occupied, he was as unaware of the phantom as he was of the rest of the body. Episodes of phantom pain can be precipitated or intensified by emotional stress.

Neurophysiological Aspects

Observations that could not be explained by current neurophysiological concepts, and the failure of surgery to help phantom pain more than temporarily, led to the belief that phantom limb phenomena were of psychological origin, and various theories were advanced. One view was that the symptoms were caused by the amputee's narcissistic reluctance to accept the reality of his physical mutilation—in essence a denial. Another was that the phantom represented mourning for the lost limb.[15] A number of the patients studied by Kolb[16] had had a close emotional attachment to another amputee, and pain was thought to express the patient's feelings of hostility and guilt toward persons with whom he identified as mutilated or mutilating, and on whom he was dependent. It was also believed that amputees who developed phantom pain had a high incidence of premorbid psychopathology.[16–18]

Psychological, cultural, and emotional factors enter into the perception of pain, but recent psychological and neurophysiological investigations have not yielded evidence that phantom phenomena are psychogenic. Pain is often precipitated by stress and associated with anxiety and depression; and, patients with adjustment problems are apt to focus on pain as the source of their discontents. In World War II, amputees referred to a psychiatrist for disturbances in behavior or disciplinary infractions were more likely to complain of pain than those who sought help voluntarily.[19] Such observations, however, do not mean that pain, per se, is necessarily of psychogenic origin. Patients with chronic pain, however, whether of organic or functional origin, have high scores for "neuroticism" on the Eysenck Personality Inventory, and are notoriously difficult to treat.[20]

Older neurophysiological theories of phantom limb involved the action of afferent fibers from the stump on spinal and supraspinal cells and the sending of abnormal impulses to cortical sensory areas. Most hypotheses focused on pain rather than other sensory disturbances and, in particular, did not offer an explanation of telescoping. More recent formulations have utilized the evidence of brain plasticity, that is, the manner in which the brain can modify its connections in response to experience, and the way in which it can reorganize function after damage.

In World War II, a study of amputees showed that the thresholds for two-point discrimination on the skin of a stump were consistently lower than

those in the homologous area of the sound limb. This suggested that there had been a central cortical reorganization of function, in which the stump had taken on features of the amputated hand or foot.[21] Subsequent studies also showed lower thresholds (ie, finer discrimination for light, touch, and point localization). Furthermore, accuracy in point localization was significantly influenced by telescoping, in that it was most efficient in above elbow amputees who perceived their phantom to be within the stump.[22]

The work of Merzenich and his associates[23–25] has established a basis for the understanding of the mechanism of cortical reorganization after peripheral trauma. It was found that after amputation of a finger in the adult monkey, the cortical area that had been deprived of its original input could be activated by touching the adjacent fingers, and even by stimulation of other points on the body and face, in the way a phantom in man can be elicited by a stimulus on the stump and elsewhere. The perceived length, size, and shape of the phantom may thus be a peripheral marker of the extent to which input from the stump and other regions has taken over cortical areas originally driven by input from the amputated limb. Plasticity of cortical reorganization is also determined by the use of the digit, paralleling the observation in man that the length and shape of the phantom changes after extensive use of the stump. If a stump is surgically cleft and the two parts used as a forceps, patients may report a cleft phantom hand.[26] Severe pain prevents the use of a prosthesis, and may contribute to the failure of telescoping to develop in such patients.

Phantom-limb phenomena also have a temporal dimension in that preamputation sensations, particularly painful ones, may be reproduced in vivid detail. Katz and Melzack[12] emphasize that the patient not only remembers that he had pain but has the direct experience of pain. Pain, or stress, or both appear to be crucial for the development of somatosensory memories because most of them are painful. The authors suggest that sensitized cells in the spinal cord activate the structures in the brain which subserve sensory memories, a process resembling the flashbacks of PTSD. The highly emotionally laden features of multimodal phantom representations may relate to the fact that multimodal association areas, rather than the primary unimodal cortical sensory areas, are interconnected with the paralimbic regions concerned with the affective coloring of experience.

Treatment

There has been an apparent decline in the incidence of severe and enduring phantom pain since World War II. Prior literature and reports of observations early in the war described suffering so intense as to lead to serious depression, morphine addiction, and suicide. A noted neurosurgeon, James C. White, recommended surgical intervention in amputees with severe phantom pain of more than 6 months duration before psychic changes became irreversible.[27] Unfortunately, procedures such as sympathetic block, chordotomy, tractotomy at medullary and midbrain levels, and cortical parietal ablation failed to provide lasting relief. Revisions of the stump for ulceration, necrosis, and neuromas might relieve local stump pain but did not, as a rule, help phantom pain.

More recent studies present a more favorable picture. A 1955 review of 400 amputees treated at the U.S. Navy Amputee Rehabilitation Center in Oakland, California, the majority of whom were battle casualties, found that 94% were employed and wearing their prostheses.[28] Painful phantoms were rare among British amputee prisoners of war (POWs) in Germany in World War II.[8] A long-term follow-up of Finnish amputee veterans of the wars with the Soviet Union (1939–1946) showed persisting debilitating pain in only 2% of subjects.[29] No painful phantoms were encountered among Vietnam amputees treated at Valley Forge General Hospital in Pennsylvania.[6] Two thirds of Israeli amputees of the Yom Kippur War of 1973 had phantom pain, but in the great majority of cases it decreased in intensity and disappeared after a few weeks or months.[30]

The method of study influences the evaluation of phantom pain. A 1979 poll of U.S. medical schools, Veterans Administration (VA) hospitals, pain clinics, and pain specialists found that 58% of respondents who had treated amputees reported no experience with phantom pain.[31] A mailed questionnaire, however, sent by the same investigators to 5,000 U.S. veteran amputees yielded an incidence of pain in 78%, and 85% of subjects who reported pain experienced it for 6 or more hours a day. However, 90% of the respondents were able to use their prostheses more than 8 hours a day.[32,33]

The decline in the frequency of severe chronic pain may be attributed to a number of advances in medicine stemming from World War II. These include the shortening of the period between wounding and hospitalization, better surgical techniques,

a broader spectrum of antibiotics and analgesics, recognition of the special behavioral problems of amputees with the setting up of amputee centers, and changes in the attitudes of society toward the handicapped.

The treatment of an amputee begins prior to surgery. It is important to control pain and avoid unnatural positions of the injured limb, and to operate as soon as feasible to diminish the likelihood of painful somatosensory memories. The patient should be told what to expect in the way of phantom phenomena. If there is pain after surgery, its relationship to tension and stress should be discussed with the patient. Maximum use of his prothesis should be encouraged. He should be urged to keep a log, so that any correlation with weather, diet, alcohol, smoking, or a particular type of stress can be noted. Sources of referred pain into the phantom—from pathology in the stump, a faulty prosthesis, an arthritic joint or an intervertebral disc abnormality—should be identified.

In the absence of specific precipitating factors, treatment of phantom pain can be very difficult, and none of the numerous methods that have been employed have been consistently efficacious. In World War II, Russell[34] reported that percussion or vibration of the stump alleviated pain. Measures that reduce tension and interrupt the pain-anxiety cycle, such as biofeedback and relaxation training, have been suggested.[35] An occasional patient benefits from self-hypnosis. Transcutaneous electrical nerve stimulation (TENS), a procedure based on a reported concordance between points of tenderness and skin conductance on the outer ear and pain in an extremity, is said to have resulted in a moderate reduction of phantom pain.[36]

Many medications have been used, and relief has been reported with the anticonvulsant, carbamazepine,[37] antidepressants used alone or in combination with other drugs,[38,39] phenothiazines,[40] and propranolol, a beta-blocker.[41,42] Such studies, however, have been poorly controlled with insufficient data for critical evaluation. Narcotic analgesics usually result in increasing dosage and drug dependence with poorer and poorer pain control and depression. Sedatives and hypnotics are not only ineffective in relieving phantom pain, but tend to be habit-forming and increase depression.[39]

The treatment of the amputee goes beyond the control of pain and extends into the broader behavioral area. In former years the emphasis was on the promotion of denial as amputees were encouraged to be optimistic and not give into their fears and doubts in the interest of maintaining good ward morale. Frank[6] noted that the objective of the hospital staff was to keep the patient so busy with activities that he did not have time to dwell on his problems. Staff also tended to give an overly rosy picture of what the prosthesis could accomplish. Interest by psychiatrists was discouraged on the grounds that it would stir up new problems or reactivate old ones.

Currently, there is more cooperation among surgeons, psychiatrists, nurses, and rehabilitation personnel. The amputee is given a realistic account of the difficulties he will encounter and asked to participate in his own treatment, as in the care of his stump. He is allowed to speak openly of his feelings, whether of powerlessness, shame, anger, or self-blame, and pass through the period of mourning for the dismembered part of his body, which is essential for the eventual acceptance of loss. Efforts are made to help the soldier incorporate the prosthesis into his body image, for example, by doing his exercises in front of a mirror rather than regarding it as a foreign object.

The amputee must acquire a new identity. This involves not only in some cases training for a new occupation, but new ways of thinking, feeling, acting, and relating to others. Actions that were once carried out automatically now require focused attention. The amputee must reevaluate himself and, if necessary, change old attitudes, notably those concerning physical attractiveness, masculinity or femininity, and self-sufficiency. If he persists in the belief that a physically handicapped person is also psychologically and socially inferior he is likely to perceive these attitudes in others.[43] The successful amputee must have qualities of concentration, flexibility, and sensitivity.

SPINAL CORD INJURIES

The systematic study of the behavioral aspects of spinal cord injuries (SCI) did not begin until World War II, as in World War I 80% of men with SCI died within a few weeks of injury.[44] Even with the advances in surgery, antibiotics, and methods of evacuation in World War II, the majority of patients arrived at hospitals in the United States suffering from decubitus ulcers, urinary tract infections, and

malnutrition. It was largely through the work of Donald Munro and Ernest Bors in America and Sir Ludwig Guttmann in Great Britain that the humanitarian needs of paraplegics and quadriplegics were recognized and comprehensive spinal cord injury centers were established.

Neurological Aspects

Spinal cord transections vary in completeness and are classified according to the level of the lesion into cervical, thoracolumbar, and cauda equina types. The wounds are most often caused by shell fragments or bullets with the foreign bodies piercing the cord directly, or driving bone into the spinal canal. Blast injuries may produce intramedullary hemorrhages. Falls and vehicle accidents are other sources of injury. Alcohol exacerbates the neurochemical and behavioral effects of spinal cord trauma.[45] SCIs are commonly associated with abdominal and chest injuries, and with brain damage, especially with high cervical cord lesions. Shock, loss of blood, sepsis, stress hormonal responses, anoxia from respiratory embarrassment, and the administration of morphine for pain also contribute to impairment of brain function. Opioids apparently decrease spinal cord perfusion, and opioid receptor antagonists can reduce tissue damage following central nervous system trauma.[46]

There is no immediate intrinsic phenomenological awareness of disability and many patients sustaining acute SCIs initially deny or are unaware of their paralyses and sensory loss. Such anosognosia may persist for days or weeks. Heilporn and Noel[47] found that only 4 of 40 paraplegics were immediately and spontaneously aware of their deficits. Others realized that their legs were paralyzed and had lost feeling when they tried to move them, and some recognized their disabilities after they were demonstrated on a neurological examination. Anosognosia is more marked and more enduring in patients who have been unconscious and who have gone through a period of amnesia and disorientation. Quadriplegics show more denial/unawareness because of the more frequent association with brain damage. Another factor in early unawareness of paralysis is that patients may be confused by phantom sensations. Paraplegics who have had an initial loss of consciousness may have the illusion that the lower part of their bodies have been amputated.[48]

As in the experience of amputees, phantom phenomena are common. Bors[49] found them in all of the 50 paraplegic veterans of World War II whom he studied. The most frequent abnormal sensations were paresthesias in the anesthetic limbs, and feelings that the legs were floating upward from the bed or frame, extended at the knees or ankles, and slightly flexed at the hips.[50] Other phantoms are more bizarre. Patients may feel that their legs have been cut off, and one described the feeling that blood was oozing from the stumps.[51] Another paraplegic felt as if he had an extra pair of legs that, at times, were tied up in knots.[52] If there is associated brain damage, the patient may have the persistent delusion that he has another pair of arms or legs.[53,54] In the absence of significant brain injury, phantoms usually disappear in a few weeks, except those resulting from cauda equina lesions. Unlike amputees, however, SCI patients do not experience telescoping, possibly because of inability to move their legs.

Toxic psychosis caused by sepsis from urinary tract infections and deep decubitus ulcers are rare when adequate treatment facilities are available.[55] However, brief episodes of delirium and agitated behavior may be associated with fever or occur after general anesthesia for operative procedures in the first few months after injury. Hypoxic episodes occurring during sleep in patients with high cervical cord lesions may contribute to cognitive impairment.[56]

Patients with high cervical cord lesions necessitating traction with tongs and neck and head immobilization may show manifestations of sensory deprivation.[57] They are lethargic, with little interest in food or surroundings, and in interviews they keep their eyes closed. They comprehend and retain orientation, but respond slowly. Alertness and eye contact can be restored by a tactile stimulus to the neck, but they may revert to the previous state until stimulated again. Hallucinations may occur. This condition usually disappears when the restraint is removed and the patient is helped to sit upright. Loss of spinal cord function produces many physical problems in addition to the paralysis. Laminectomy and surgical stabilization of the spine may be necessary followed by immobilization in a prone position on a Stryker frame for several weeks to avoid pressure sores. A study by Jacobson and Bors[58] found decubiti in almost half of men sustaining SCI in combat in Vietnam. There is impairment of bowel and bladder function, pain, leg spasms that may be very painful, and defective autonomic reflexes with reduced capacity for blood pressure regulation. Genitourinary complications include irritation from catheters, infection, calculosis, hydronephrosis, and epididymitis. Complete spinal cord transection may require an orchiectomy adding to the sense of emasculation. Insomnia may

be a problem because of frequent turning on a frame and the diminished amount of REM (rapid eye movement) and deep sleep associated with cervical cord lesions.[56]

Behavioral Effects

Patients respond to the loss of control over their bodies and the overwhelming sense of helplessness and dependence in a number of ways. Some become childish and demanding while others withdraw and show little emotion. Some are hostile, others are anxious or depressed. Many express denial. Several models of the behavioral course of SCI patients have been offered. Guttmann[55] described a first stage of anxiety and regression, sometimes associated with negativistic behavior and provocative attitudes, followed by denial, and then by adjustment. Another proposed sequence is one of initial denial, succeeded by depression with grief and mourning, with eventual acceptance of disability.[59,60] However, not all patients get depressed. Others become depressed in response to some disappointment such as the failure of a laminectomy to clear up the paralysis. Patients may or may not express hostility or denial. Behavioral manifestations such as withdrawal and indifference can be interpreted as either depression or denial.

Depression

Estimates of the incidence and significance of depression vary. Some authors believe that it is normal for a severely disabled person to become depressed.[61] It has been stated that when a newly paralyzed person does not appear to be depressed he is denying his loss of function and its social implications.[60] Other observers have not found depression to be inevitable, and believe that the incidence has been exaggerated through the expectations of the hospital staff.[62] A prospective study[63] of 71 civilian patients followed through the acute and rehabilitative stages found that 14 fulfilled the criteria of the Diagnostic and Statistical Manual, 3rd edition, of the American Psychiatric Association (DSM-III)[64] for major depressive disorder, and that another 13 had transient periods of depressive mood. The time of onset of depression was from 3 to 40 weeks after injury. Remarkably, depressive disorders appeared with comparable frequency in paraplegics (17%) and quadriplegics (23%). Similarly, Lawson[65] showed that the level of cervical cord injury was not a factor in the incidence or severity of depression. These observations were made in civilian hospitals but there is no reason to believe that there would be different findings in military personnel. Thom and Von Salzen[66] noted no difference in the incidence or severity of depression in World War II veterans who sustained SCIs in combat and in those hurt in accidents.

While a period of grief and mourning is helpful in allowing the patient to work through his feelings of loss on the way to acceptance, prolonged depression has disastrous effects. Self-neglect is a frequent feature of depression. Such patients present with either angry, rebellious attitudes, or are withdrawn, indifferent, and overtly self-destructive.[67] They do not cooperate with the hospital staff, may refuse medication or other treatment, refuse to eat or maintain fluid intake or breathe deeply, and fail to attend to skin care or manage their catheters. They may demand unnecessary surgery and have alcohol or other drug problems.

Suicidal ideation is very common in the first days after injury but it rarely materializes.[55] Suicide, however, may be a problem later on and Hohmann[60] warns that it is a great mistake to assume that because a patient is disabled his incapacity will physically preclude his trying to kill himself. Suicidal intent should be suspected in patients with self-neglect who deny having ever having harbored thoughts of ending their lives.[56] A 20-year follow-up of veterans of World War II with traumatic myelopathies revealed suicide to be the third most common cause of death, ranking behind only renal failure and secondary amyloidosis.[68] The figure does not include other deaths involving self-destructive behavior such as alcoholism, smoking, and motor vehicle accidents.

Denial

Unless there is associated brain dysfunction, SCI does not result in classical anosognosia in the sense that the patient explicitly denies or is unaware of his paralysis, forgets that he cannot walk, or represents the disability in delusional fashion. Brain damage is produced by the injury, or by a toxic or metabolic encephalopathy. An investigation of fatal craniocerebral injuries, principally from motor vehicle crashes, noted that 46% of victims with spinal cord damage also had brain pathology.[69] Wilmot, Cope, Hall and Acker[70] identified four risk factors for brain dysfunction: (1) quadriplegia following a high deceleration accident, (2) loss of consciousness, (3) cortical or brain stem neurological signs, and (4) required respiratory support at the time of injury. Of patients with one or more risk factors, 64%

showed impairment on neuropsychological testing a median 48 days after injury.

Apart from classical anosognosia, denial is expressed in a number of ways. Unlike the amputee whose loss is visible, the SCI patient may cling to the hope that he will regain the function of his limbs through some new medicine or operation. A form of denial encountered by Guttmann[55] in young soldiers wounded in World War II was a defiant "we can take it" mentality, with rejection of advice and instruction by the hospital staff. Some patients are highly euphoric and joke about their problems. As amputees do, some engage in reckless behavior such as the wheelchair racing portrayed in the Marlon Brando movie, *The Men*. Others are indifferent and are not motivated to participate in self-care or rehabilitation. Denial of loss of sexual function may be shown in inappropriate boasting of sexual prowess and excessive interest in pornography.[71] Paranoid forms of denial are shown by patients who charge that newly discovered treatments are not being made available to them, or who blame paralysis on being kept on a Stryker frame.

It may be difficult to separate denial from hope and faith, and in the earliest stages it can be a help in survival. Denial, while it may make a patient more comfortable and provide a temporary solution to his problems, is ultimately maladaptive. It deprives him of the opportunity to grieve, prevents the formation of intimate relationships, and blocks rehabilitative efforts. Moreover, the collapse of a denial system is apt to be followed by depression.

Personality Factors

While no type of premorbid personality has been found to be predictive of adaptation to SCI, previous experience is significant. Social background, academic and vocational achievement, quality of interpersonal relationships, habitual modes of coping with stress, and the values that determine the meaning of the incapacity are all relevant.

Civilian patients with histories of sociopathic behavior, poor school and job records, drug abuse, and painful punishment in childhood were found to adjust poorly after SCI, with more depression and disruptive behavior.[59,72] Similarly, soldiers who have had problems with authority may find it difficult to establish a trusting relationship with the professional staff. Patients who have been well educated and have developed skills are better able to occupy themselves productively and plan for the future than those whose vocational abilities are limited and involve physical work. A study of the individual beliefs of SCI patients showed that those who believe that they exercised control over their lives and health were less depressed than those who thought that rewards and punishments resulted from chance, luck, fate, or the actions of powerful others.[73]

The meaning of the disability in terms of the person's value systems is highly significant. Some patients with pain are mainly concerned with what the pain means in regard to their health and prognosis, and are apt to refuse medication unless it serves some therapeutic purpose. Others react in terms of their current suffering and want relief. Patients who have needed physical activity, such as jogging, to ease tension, are apt to find the limitation of mobility particularly difficult to accept. Some feel that the disability means loss of manhood, and a loss of sexual attractiveness. Or, they may equate the incapacity with inferior status as a person, and a loss of love and respect. A soldier who has had an authoritarian religious upbringing may perceive in this injury a manifestation of God's will, and a punishment for sin.

Roberts,[74] from his experience in a rehabilitative facility, regards spontaneity, ability to show emotional experience, the holding of conventional but not fundamentalist or dogmatic religious beliefs, good contact with reality, and feelings of personal adequacy as predictive of good adjustment.

Treatment

The aims of treatment are: (*a*) managing of the initial state of impaired awareness, (*b*) motivating the patient to participate in self-care and rehabilitation, (*c*) addressing denial, and (*d*) dealing with the problems of pain, depression, and sexual dysfunction.

It is useful to point out to the patient that phantom sensations are normal and do not mean that he is losing his mind. The staff should avoid fostering denial unwittingly. A corpsman who might feel sorry for a soldier should not try to cheer him up by telling him that he will recover the use of his limbs. Similarly, a physician may believe that if the patient is given the facts of his situation, hope will be destroyed and that he will have no motive to work in therapy. Roberts[74] is of the opinion that loss of motivation, over time, is more often due to the patient's failure to achieve unrealistic goals based on misleading information. When should a patient be told of his prognosis? It should not be in the acute stage when he may have impaired brain function, or when he is too sick or uncomfortable for the

information to matter. He should be told at the point at which he is able to retain information and participate in treatment. He should receive an explanation of SCI, and be told the reasons why procedures are being carried out and why it is important for him to attend to skin care, breathe deeply, and maintain fluid intake and nutrition.

Pain following SCI is of different types and degrees of severity. Pain in the area of the wound usually clears in a few weeks. Pain in the shoulders, elbows, and fingers of paraplegics may be due to tendinous and articular contracture, often caused by faulty positioning of the upper limbs following injury.[55] Radicular pain, along with hyperesthesia, results when damaged nerve roots are encased in an adhesive arachnoiditis, and is particularly severe, with a causalgic quality, in cauda equina lesions. Flexor leg spasms can be painful. Visceral pain that may be referred to anesthetic areas can occur because of distension or reflex activity of the bladder, colon, uterus, or ureter. Syringomyelic pain may develop in chronic cases as a consequence of cavitation in the spinal cord above the level of the lesion.[75]

Phantom sensations are not usually painful, but tingling, pressure, and burning sensations in areas below the level of the lesion are common and may be perceived as painful. The dysesthesias recede in most cases, but they can be long-lasting. While such central pain is not psychogenic, it is affected by emotional and attentional factors. It is also influenced by fatigue, weather, alcohol excess and other drug abuse, smoking, and pressure sores.[52,76] It is unlikely that a pressure sore causes pain by direct neural transmission, but the need to lie in a bed or on a frame for long periods contributes to depression. Moreover, depression may have led to self-neglect and the development of a bed sore.

Drugs can create problems in a number of ways. Patients may resort to marihuana and alcohol to relieve pain and boredom. The cord injury may exacerbate preexisting drug dependency. Insomnia may lead to excessive use of hypnotics, especially benzodiazepines.

Local pain responds to nonnarcotic analgesics, but radicular pain and central pain are much more difficult to treat. Some patients with radicular pain are helped by carbamazepine (Tegretol) or phenytoin (Dilantin) but in most chronic cases not even chordotomy gives permanent relief.[52] One must rely on directing the patient's attention away from his symptoms into other activities such as prevocational training and sports. If possible, the patient should be taught relaxation techniques and self-hypnosis. Anxiolytic or antidepressant drugs may be given if there is evidence that anxiety or depression is present.

Antidepressant drugs should be used when appropriate with great caution. Depression should be distinguished from sorrow, despair, and grief. It should also be differentiated from states of conservation-withdrawal in which patients weakened by long bed rest, intercurrent infections, and nutritional depletion are apathetic.[77] Drugs with anticholinergic effects can compromise the function of a neurogenic bladder, and those with alpha-adrenergic properties can induce dangerous hypotension. Tricyclic antidepressants, and especially the nontricyclic, bupropion, can lower seizure threshold, a significant factor for patients with brain damage. Levin, Burtt, Levin, and Ginsberg[78] reported ventricular fibrillation in quadriplegic patients on therapeutic levels of imipramine. Of tricyclic antidepressants, desipramine and nortriptyline have the least alpha-blocking actions and relatively few anticholinergic effects. However, newer generations of antidepressants (fluoxetine, paroxetine, sertraline, bupropion) are virtually free of alpha-blocking, anticholinergic, and antihistamine effects. In treating psychotic states, haloperidol and piperazine have the fewest anticholinergic effects. They may, however, require the addition of anticholinergic agents (preferably amantadine) to prevent extrapyramidal syndromes, such as dystonia, pseudoparkinsonism, and akathisia. Stewart[57] notes that it is important to avoid drugs such as trazodone (Desyrel) which have soporific side effects, as vigilance is necessary for self-care. Electroconvulsive therapy should be considered in severe depression when rapid action is required. With anesthesia, muscle relaxants, and oxygenation, the risk of fracture or further cord damage is low.

The effects of spinal cord damage on sexual functions is a serious concern of the recovering patient. While sexual competence is impaired in ways that depend on the completeness and level of the lesion, patients have normal desires, fantasies, and erotic dreams. The issue should be addressed, and a physician should overcome whatever inhibitions he or she may have in the matter. It can be pointed out that marriage is feasible, that a majority of males have erections, and that some can consummate intercourse. The therapist can indicate that other methods of gaining sexual satisfaction are not necessarily perversions, and that stimulation of erotic areas other than the anesthetic parts of the body can be enjoyable. Above all, the need of a loving relationship to accommodate mechanical handicaps should be emphasized.

DISFIGUREMENT

Major disfigurement, involving the face and hands, occurs mainly as the result of burns, and of blast and missile wounds. Thermal injuries include exposure to flames, flash burns from gas explosions, the effects of chemical and high-voltage electrical agents, and smoke and carbon monoxide inhalation. Burns occur principally in tank warfare, and after vehicle explosions including airplane crashes and ship sinkings. Burns accounted for 4.6% of all casualties in Vietnam, for 12.5% in the 1973 Yom Kippur War, and for 18% of British casualties in the 1982 Falkland Islands War. It is estimated that 9% of the casualties in the 1991 Persian Gulf War had burn injuries.[79] Facial injuries are produced by bullet wounds, and by blast from mortars, mines, and other explosive devices, which commonly cause other disabilities such as blindness. Survivors of high-velocity missile wounds are more apt to have had maxillofacial and mandibular fractures than penetrating orbital injuries, which are often fatal.

This section focuses on burns because they are more likely to involve other organs including the brain, pose the most difficult problems in cosmetic surgery, and have the most severe and lasting behavioral consequences. The survival rate following even severe burns is high: more than 50% of patients 15- to 40-years-old with burns covering 75% of total body surface (TBS) live.[79] Life-threatening complications, however, are frequent with burns involving more than 30% of TBS. These involve the hormonal and cell immune systems, heart, lungs, liver, adrenals, kidneys, gastrointestinal tract, hematopoietic and blood clotting systems, and central nervous system and peripheral nerves.

Brain Syndromes

Delirium

Burn encephalopathies, which develop in the majority of patients with burns involving 30% or more TBS, have a number of etiologies. These include hypoxia, hypovolemia, electrolyte imbalance, notably hyponatremia resulting in seizures, acidosis, and sepsis. Patients may be awake, alert, and well-oriented on admission to the hospital, but within hours or days may become restless, agitated, disoriented, with fluctuating levels of consciousness, memory lapses, hallucinations, and paranoid ideation. Fear, pain, terror, and immobilization contribute, but the more massive the burn, the more likely the patient is to develop delirium, which is almost always associated with an abnormal electroencephalogram (EEG).[80] Some patients are only mildly disoriented, a condition that may be overlooked. Delirium usually clears in a few weeks but abnormal behavior may persist for weeks or months.[81]

Delayed Manifestations

There are also delayed complications, appearing weeks or months after the burn and usually associated with sepsis or fluid or electrolyte imbalance. These include focal neurological manifestations such as seizures, cranial motor nerve palsies, hemipareses,[82] spinal cord and peripheral nerve disabilities,[83] behavioral disorders including paranoid disorders, hallucinations,[84] psychoses,[82,85] and somatic delusional states, notably anosognosia and reduplicative misidentification syndromes.

Anosognosia and Reduplication

Patients deny or appear unaware of the somatic manifestations and obvious consequences of their injuries. If a burned limb has been amputated, its loss may be denied or represented in delusional fashion. Thus a patient in danger of losing a severely burned hand developed the idea that the doctors had removed the hand and was angry at their delay in putting it back.[81] Damage to the body can be selectively ignored, as in the case of a man who failed to notice the silver-nitrate–blackened skin of fellow patients in the burn unit.[81] Reduplication of the self was noted in a case described by Steiner and Clark.[86] In an apparently lucid period in which the patient expressed concern for her status, she told the staff to débride the sick woman in bed with her while she and her husband went to have a cup of coffee in the cafeteria.

Some anosognosic patients are bland and unconcerned, others paranoid or euphoric. A paranoid form of implicit denial was noted in a man with burns over 60% of his body. Despite being so weak that he was unable to raise his head from the pillow, he threatened to punch his physician in the nose.[87] A state of blissful euphoria associated with anosognosia was described by Hamburg, Hamburg, and de Goza.[88] The patient was a woman with extremely severe burns necessitating maintenance

on a Stryker frame. She had initially thought that she would die, following which she claimed that she had recovered and would be able to go home in a few days and care for herself and her children. She died 2 weeks later. The experience at the A.V. Vishnevskii Institute of Surgery in Moscow is that euphoria succeeding depression is a grave prognostic sign.[82]

Neuropathology

Examination of the brains of persons who have died of burns and their complications has shown very little. In the great majority of instances no pathology has been found, although in a few cases cerebral edema, small infarcts and hemorrhages, and neuronal degeneration have been noted.[89,90] The cause of the delayed onset of symptoms referable to the central nervous system is unclear beyond that which can be attributed to sepsis or fluid or electrolyte imbalance, or a vascular complication. It is likely that burn encephalopathy is relatively common with many manifestations and few deaths.[90]

Stresses of Recovery

The surviving patient is subject to a broad range of stresses throughout the process of recovery. Pain is exacerbated by debridement, dressing changes, skin grafts and other plastic surgery, and the need to exercise burned limbs to avoid contractures. Gastric stress ulcers are another source of pain. The patient may have to be isolated until the danger of infection has passed, and extensive bandaging further reduces environmental contact. A tracheostomy may interfere with communication. In the patient's state of relative sensory isolation all fears are magnified. If he has facial burns and edema of the eyelids he worries that he will be blind, and burns in the genital area cause concern about sexual function. Insomnia can be a problem. When he is with other patients, the sight of charred bodies and the odor of wounds and dressings are distressing. The patient's first look at himself in the mirror can be a shocking experience and should be managed sensitively.

After survival is assured and the patient is no longer preoccupied with the issue of life and death new problems arise. As he is now able to participate in his own care, he needs less attention from nurses and other staff members to whom he may have become attached, and may thus feel betrayed and abandoned. Although his wounds have healed or been covered by grafts, he must face the fact of disfigurement and wonder if he will be socially rejected or unable to work. Burns of the exposed parts of the body, the face and the hands, have the most serious social consequences. The burned soldier must anticipate the reactions of people who may be horrified, curious, hostile, or pitying. Eventually he must come to recognize that burned faces may all look much the same, without individuality, and that his capacity to smile or use other muscles of expression to convey emotion may be reduced. If his hands have been severely burned, he is handicapped in using them in gesture. Moreover, posture, which reflects so much of personality and attitudes, may become rigid and distorted by contractures about joints.[91]

Coping Mechanisms

Patients react to disfigurement in various ways. Some accept their misfortune and cooperate in treatment. Most are depressed and anxious in some degree. There may be post-traumatic stress disorder with agitation, tremulousness and startle responses, nightmares or flashbacks concerning the circumstances of the injury, and difficulty in concentrating. Depression is usually self-limiting. It may come on at any time—on emergence from delirium, or weeks or even months later. It may be precipitated by the discovery that grafted skin does not look quite normal. Serious depression is manifested in feelings of hopelessness and thoughts of suicide, insomnia, lethargy, and poor cooperation as in refusal to eat. Suicidal ideation and gestures are rare during initial hospitalization, but they may occur following discharge. Some patients react with anger and bitterness, directing their resentment against the hospital staff. Others show what has been called regressive behavior, because it suggests a return to childhood attitudes. Such patients are excessively dependent, demanding, and demonstrative. They are apt to complain a great deal, and feel neglected or mistreated.

Denial in patients without impaired brain function usually does not involve somatic delusions, but takes other forms that may be adaptive or maladaptive. It helps the person combat anxiety and depression and may give him hope for the future. On the other hand, it leads to lack of concern about problems, unrealistic expectations of the future, and, at best, passive participation in therapy. Many patients seek religious meaning as they struggle to come to terms with their suffering.[92] These have positive and negative aspects. A person may feel sustained by God's presence or by the idea that he

has been purified by fire. Others may see the injury as a punishment for sin or misconduct, or as some other manifestation of divine will.

Adaptive—and maladaptive—mechanisms have been usually formulated in psychodynamic terms, but organic neurological features must be considered in patients who have severe burns. One of the effects of such brain damage is a lowered threshold for the effects of acute environmental stress and the action of drugs. One of the survivors of the Coconut Grove fire disaster in Boston of November 1942 was a woman who showed no evidence of impairment of brain function until she received the news that her husband and son had died. She responded to the news with a state of excitement and paranoid suspicions that the doctors and nurses considered her to be a sinful, immoral person.[93] A U.S. Army sergeant, burned in a fire in his apartment, was ordinarily quiet and cooperative. He would, however, become extremely demanding, critical, and combative following the recovery of consciousness after the administering of a general anesthetic for dressing changes and skin grafting.[88] Similarly, burn patients may be sensitive to drugs used to control pain, anxiety, and depression.

Treatment

The aims of therapy are the management of delirium, the control of pain, anxiety, and depression, and the establishing of a social milieu in which the patient can come to terms with his disability and participate in his care.

Pharmacotherapy

Treatment of delirium involves the correction of disturbances of fluid and electrolyte balance, providing orientation cues such as keeping lights on at night, and protection of patients from self-injury. Neuroleptics are the drugs of choice, given orally if possible, with checking for hypotension. High-potency neuroleptics with minimal anticholinergic effects and alpha-adrenergic blocking are preferred.

Pain is especially severe in the first few weeks. If necessary, morphine or meperidine is indicated as the danger of addiction is slight. Respiratory depression may be more of a problem. For the control of acute anxiety provoked by the anticipation of pain, oral diazepam given one hour prior to the treatment has been effective, with intravenous (IV) administration of diazepam or chlordiazepoxide in more severe cases.[94] These drugs can impair cognition and are long-acting. Chronic use can cause depression. Intramuscular use is contraindicated because of poor absorption by that route. If major depression or chronic anxiety states supervene, antidepressants should be used, as they are effective for both the depression and the anxiety. Doxepin may be particularly useful for depressed or anxious patients who also have peptic (stress) ulcers because it is one of the most potent histamine-2 receptor blocking agents, more potent than cimetidine (Tagamet) in reducing gastric acid secretion. It is primarily a noradrenergic modifying antidepressant, hence useful in chronic pain disorders as well. Its anticholinergic and antihistamine effects can, of course, be detrimental for alertness, bladder function, and vascular reflexes.

Behavioral Management

As soon as the patient's medical condition permits and he is able to retain information, he should be given a statement of the extent of his injuries, the type of and rationales for the treatment that will be required, and the anticipated length of his hospital stay. As noted by Kjaer,[95] the often heard phrase, "You're lucky to be alive," is rarely helpful. In the absence of information, rumors and irrational fears flourish, and it is important for physicians and nurses to maintain communication with patients other than that which involves a dressing change or some other painful procedure.

The belief that the soldier has some control over his destiny should be fostered. The first self-feeding or unassisted bath should be met with expressions of approval. If possible patients should be taught self-hypnosis or other relaxation techniques. These are not only helpful in the relief of pain, nausea, anorexia, and tension, but provide a sense of mastery and raise self-esteem. Group therapy allows for the ventilation of feelings, mutual support, and the building of a common identity. If there are multiple survivors of the same event, critical event debriefing may be helpful. Chapter 11, Debriefing Following Combat, discusses several methods available.

The management of demanding and dependent patients is difficult, in part because such behavior brings out resentment in the staff. It is important to keep in mind that the behavior has an adaptive function in that many of these patients are dramatizing their problems by taking the role of a child. Limits should be set, with some choices left to the patient to enable him to keep some sense of autonomy.

Physical and adjustment problems may persist after the soldier has left the hospital. He may need further surgery to correct scars and contractures. While such reconstruction is helpful, the patient should be cautioned that scarring may never be entirely eradicated, or a burned face restored completely. Patients who have been disappointed with the results of surgery may demand further operations that are not medically indicated. Some may use relatively minor disfigurement as a focus for their discontents, and blame job failures, inability to make friends, or domestic difficulties on others' reaction to their appearance.

Case Study 2: Fall of a Hero

A 24-year-old decorated combat infantry officer sustained fractures of the left zygoma and mandible, multiple facial lacerations, injury to the left ear canal, and a left facial nerve palsy in an airplane crash. He was comatose on admission to the hospital and over the next 2 to 3 weeks he was restless, combative, and feared that he would be killed. In this state, he reenacted scenes of battle in Korea. After recovering orientation he complained a great deal of pain in his jaw. Following each of two corrective surgical procedures he became confused and hostile. Routine mental status, however, was normal and he returned to duty 5 months after his injury.

In Korea, he experienced dizziness, diplopia and unsteadiness of gait, was depressed, had nightmares and flashbacks, and found that he was intolerant of the noise of grenade and rifle fire. He did not seek medical aid for these complaints, but rather focused on his disfigurement. He had several scar revisions and was noted as being unusually sensitive about his appearance. Following a complaint of pain and photophobia in his left eye, a blepharoplasty was performed. A small foreign body was found and it was suspected that he had inserted it himself.

Four years after his initial injury he was referred by his commanding officer for psychiatric observation because of disrespectful behavior and for having made allegations, out of channels, of inefficiency and security violations. This conduct contrasted with his previously excellent efficiency reports and his reputation for bravery in combat. Examination showed no evidence of organic brain damage, neurosis, or psychosis and he was discharged to duty. His full scale intelligence quotient (IQ) of 115, however, was considered to represent a fall from his premorbid level.

Following his resignation from the service, the patient continued to have difficulties. He attributed his employment and marital problems to his facial disfigurement and was preoccupied with violence. He carried pictures of his men who had been killed in combat and made several suicidal gestures. Following the assassination of President Kennedy, he claimed that he had known Lee Harvey Oswald, that he had had foreknowledge of the assassination, and feared that he would be set up by the same conspirators who had murdered Oswald.

Comment: This case illustrates the association of traumatic facial disfigurement with a brain injury (the severity of which was not recognized), PTSD, and a paranoid delusional state.

BLINDNESS

Loss of vision is a catastrophic event that thrusts a soldier into an unfamiliar world, profoundly alters his perception of reality, robs him of mobility, and ends a way of life. Changing conditions of warfare have markedly increased the incidence of eye injuries. In the Civil War ocular wounds made up 0.5% of surviving casualties. The figure rose to 2.14 % in World War I.[96] In Korea the rate was 8.1%,[97] and in Vietnam 9% of surviving combat casualties had ocular injuries.[98,99] In Vietnam the great majority of wounds were generated by fragments from explosive projectile shells, rockets and bombs, grenades, booby traps, and land mines. Tank warfare, which requires commanders to expose their upper bodies for better vision, produces many eye injuries, totalling 25% of all Israeli casualties in the 1967 Arab-Israeli War.[100] Most casualties sustain other wounds as well. In Vietnam, it was not uncommon for a man to be blinded by the same explosion that caused multiple facial fractures, and blew off a leg. Chemical agents may result in blindness as occurred with mustard gas in World War I. Ocular trauma from high-velocity fragments is frequently accompanied by brain injury, and blindness of central origin results from intracranial wounds involving the visual pathways.

The current battlefield laser rangefinders and designators produce multiple pinpoint burns on the retina, where the beam has been focused by the lens of the eye. This can occur at distances of several kilometers if the source of the laser is viewed with the naked eye, and out to many kilometers if viewed through binoculars, gunsights, or other optics. The tiny burns are quickly surrounded by edema. While loss of peripheral vision may go unnoticed, burns in the fovea produce sudden impairment of vision. Depending on size and location of the retinal burns, recovery of vision may take days, and can leave visual field defects.

Cerebral Blindness

Cerebral or cortical blindness is usually the result of bilateral occipital lobe lesions involving the striate cortex. It is characterized by failure to see light or movement, even though the pupils are dilated and react to light, and in attempted convergence. Blindness may not be total, but as most patients have mental changes it is sometimes difficult to be certain of the degree of visual loss. Binocular blindness may also be caused by lesions of the optic chiasm, and by anoxia, such as that resulting from carbon monoxide poisoning. Anoxia may also result in selective visual impairments such as achromatopsia, and loss of perception of form and motion in which the patient tries to identify an object by color alone.[101] Lesions of the visual pathways cause hemianopias in both the vertical and horizontal planes.

Anosognosia for Blindness

The most striking behavioral abnormality associated with cerebral blindness is anosognosia for visual loss, known as Anton's syndrome, in which patients deny or appear unaware of their blindness. Even though they appear to be totally blind, they confabulate descriptions of the examiner and their surroundings. Denial may be incomplete in that a patient may complain of dim vision, but attribute it to the darkness of the room, or being kept in a dungeon. Some patients are cheerful and unconcerned about their deficits; others become angry and hostile when their claims to vision are challenged.[102] Patients may behave in ludic fashion, joking and clowning. Such apparent emotional indifference or inappropriateness could contribute to a mistaken diagnosis of conversion disorder. Patients are usually disoriented for place and time, and may have visual hallucinations. They are amnesic, particularly when the injury has resulted in loss of consciousness, and they confabulate about their activities and reason for coming to the hospital.

The pathology is bilateral and extensive. When the occipital lobes are involved, the lesions usually extend from the ventromedial portions into the temporal lobes. When blindness is caused by damage to the optic chiasm at the base of the brain there are commonly lesions of the frontal lobe. Anton's syndrome also appears with blindness of peripheral origin provided there is additional cerebral damage. Recovery from cortical blindness caused by occipito-temporal lesions may go through various stages of visual agnosias and homonymous scotomata.[103]

Case Study 3: Denial of Blindness

A 21-year-old paratrooper, while on maneuvers in Germany, was thrown from a moving vehicle sustaining a basilar skull fracture and bleeding from his right ear canal. He lapsed into unconsciousness, and a subdural hematoma and necrotic brain tissue was removed from the right parietal-temporal region. Papilledema developed, followed by optic atrophy and bilateral loss of vision.

On arrival at Walter Reed Army Medical Center in Washington, D.C. 6 weeks after his injury, the right pupil was fixed to light and the left reacted sluggishly. Visual acuity in the better eye was 20/200. The patient was disoriented for place and date, was amnestic for his injury, and did not remember that he was married. He denied anything was wrong with his vision, even though he identified objects mainly by feeling them. He was cheerful and uncomplaining; at times he stated that his vision was dim because the ward was so dark, and that maybe he should get goggles. There were many references to vision in colloquial speech, as in reporting on his first leave. "Well, I got home and *seen* my uncle, and *seen* nearly everybody. I went and got baptized. I went to *see* everybody. I *seen* my aunt and grandmother and everyone else. *Seen* people I hadn't *seen* for a long time." Denial of blindness lasted for 3 to 4 weeks by the end of which period he was completely oriented. He then developed a hysterical tremor of his head.

Comment: The case is of particular interest because it demonstrates that patients with anosognosia can have unconscious awareness of their deficits, and that a conversion reaction can be a late consequence of brain injury.

Anosognosia for Hemianopia

Whereas patients with Anton's syndrome have other disorders of consciousness, patients with a homonymous hemianopia from a head injury may be unaware of their visual loss even though their mental faculties are intact. Such patients do not see only one half of space. Because of the phenomenon of completion, they "fill in" the part of the image falling in the hemianoptic field, and report a complete circle when a semicircle is presented. Such patients may not complain of visual loss or they may have noticed only a slight difficulty in picking up a line in reading. Although such soldiers might function well in ordinary surroundings, they are at serious risk if exposed in a combat situation.

Visual Phenomenology

Visual hallucinations, as distinguished from mental imagery, may occur during a period of de-

lirium, but are rare in traumatic blindness of peripheral origin unless it is associated with brain damage, drug effects, or extended sleep deprivation. Transient episodes of phantom vision comparable to phantom limb sensations have been described in Vietnam combat veterans following enucleation of one or both eyes.[102] Some had had brain injuries but all were aware of their blindness. As in cases of extremity phantoms, the men were reluctant to report their experiences of seeing out of an empty socket out of fear of being thought mentally unbalanced. Patients stated that they had seen clouds, flashing lights, and movement—in one case the man's mother—even though they knew that there was nothing there. The visions appeared under a variety of circumstances, often while the patient was relaxed. Phantom vision should be differentiated from the pseudo-hallucinations of the Charles Bonnet syndrome. These are well-formed, often of marching soldiers, and are common after cataract extraction in the aged, but rare after trauma in the young.[104] Visual phantoms should be discussed with patients, not only to allay fears of being mentally disturbed, but to remove false hopes that they are a sign of recovery of vision.

There may be a cessation of dreaming for a period after brain injury, but most recently blinded persons have an active dream life. Many report that their dreams are more vivid and the colors more intense since the loss of sight.[105] Soldiers in the early stages are apt to reenact battle experiences or other trauma, but as nightmares recede, dreams become more varied. Men may dream that they can see, while knowing that they are blind. One man would dream that he could see but not reach the object. Wittkower and Davenport[106] described the case of a soldier at St. Dunstan's who dreamed that he could see his empty sockets in a mirror. When disturbing dreams do occur, the dreamer, rather than being a victim, may be a detached spectator of some trauma.

Early Reactions

Soldiers who have been blinded in combat are not usually unconscious unless they have sustained a brain injury but, as in paraplegia, they may not be immediately aware of their visual loss. When they find they cannot see they react in various ways. In some cases, they go into in a state of emotional and cognitive withdrawal. They may believe that the visual loss is only temporary, and that they will see when the swelling subsides or the bandages are removed. Some are in a state of despair, talk of suicide, and express regret that they were not killed outright. Some do commit suicide "accidentally" in such mishaps as falling out of a window.[107] Others are relieved and thankful that they were not injured more seriously.

Stresses and Coping Mechanisms

As a patient's condition stabilizes he encounters the consequences of his blindness—the sensory isolation, the loss of autonomy, and the impairment of communication. He must attend to countless actions that formerly were carried out unconsciously. He must learn how to walk again, to wash, bathe, dress, and feed himself. He must rely to a much greater degree on the senses of hearing, touch, proprioception, and smell and be able to visualize the information. He must depend more on his memory. He must acquire the ability to form visual and affective images of people he knows only by their voices, and overcome the handicap of not being able to see their facial expressions and gestures. If there is the additional loss of hearing, this interferes with his ability to judge depth and distance of objects. If he is also disfigured, the inability to observe the reactions of people whom he meets may be especially troubling. He must learn to use the aids that will enable him to be literate again, and acquire new work skills and modes of recreation. If he has lost a limb or sustained hearing loss or brain damage these tasks are more difficult. He must accustom himself to the fact that he will never drive a car again, play or watch a baseball game, or see the faces of his children.

Blindness imposes a loss of status and self-esteem. Many soldiers feel deprived of their manhood and dignity. In the hospital some are too ashamed or embarrassed to tell people at home what has happened to them. They are concerned with whether they can function as a husband or father and associate with people. As one man noted, "It's hard to make friends with people you can't see." They worry about making a living, and being dependent on the charity or pity of others. Many feel inferior to and are resentful of the sighted. Patients respond to these stresses with varying degrees of denial and depression, frustration, anger, and anxiety and resort to alcohol or other drugs. Moreover, blindness exacerbates previous emotional and social problems.

Denial and Nonacceptance

Patients do not continue to deny or appear unaware of their blindness unless they have severe

brain damage, as in Anton's syndrome, but manifest denial in other ways. They may cling to the hope that sight will be restored by a transplant or some miracle. Denial may be expressed by inappropriate cheerfulness and unrealistic plans for the future. Nonacceptance is indicated by such statements that if the surgeons had performed the right operation the patient would be able to see. Denial is also shown in patients' refusal to use the Hoover light cane as an aid to spatial orientation and mobility and participate in other training exercises.

Patients who have light perception and some useful vision within the definition of blindness as central visual acuity of 20/200 or less in the better eye, or central visual acuity of more than 20/200 if there is a peripheral visual field subtending an angular distance no greater than 20 degrees in the better eye, have some advantage over the completely blind. They, however, on the whole are less accepting of their disability and make a poorer adjustment.[106,108,109] The minimally sighted are more reluctant to enter into rehabilitation training, and continue to rely on their residual sight which may provide erroneous information. Whereas the completely blinded have come to terms, once and for all, with the fact that they will never see, the partially blinded often retain false hopes and are beset by fears that they will lose their remaining vision. The earlier the person accepts his blindness, the more favorable the behavioral outcome.[110] Some patients show "blindisms," (ie, vacant stare, grimacing, overloud voice and failure to look at the person with whom they are conversing). It has been noted that men with the grossest "blindisms" are particularly apt to resist training.[111]

Denial may be unwittingly reinforced by the attitudes of caretakers. A staff member may give a patient an assurance that his sight will return in a well-meant effort to keep up his morale. Physicians may contribute to denial by their reluctance or inability to give the patient a definitive evaluation. Statements such as "one chance in a million" and "perhaps a miracle will happen" should be avoided.[108] Soldiers are apt to remember such phrases to the exclusion of everything else they have been told and become bitter over what they consider to have been a deception.

Depression

The majority of men blinded in combat are depressed to some degree and feelings of hopelessness and suicidal ideation are common during hospitalization. The experience at St. Dunstan's, the training center for British soldiers blinded in World War II, was that 29% of patients were depressed, although very few were "grossly and patently" so.[106] Mainly, they were withdrawn and moody and dwelled on the past. Feelings of guilt and self-blame are more likely to be expressed by soldiers blinded by disease or in accidents than those wounded in combat.[108] Depressed patients regard training as another stress to be avoided rather than an opportunity to overcome some of their handicaps.

An initial period of depression has been considered to be a mourning process through which the person grieves for the death of the sighted self in order to be reborn as a blind man. Cholden[112] believed that such depression was necessary before the patient could accept his loss and that it diminished with time. A blinded veteran recalled:

> I think it must have been or was a lot like dying. Anyway I know I went through all the stages of "dying" that some one who is terminally ill goes through when he's told he's dying. I remember how strenuously I demanded that the doctors do everything to restore my vision, even though it was hopeless. I called them "idiots" and "fools" for not knowing what to do to help me. I prayed and made promises to God. But I was blind and no amount of denial of the fact could change it. I was angry and resentful for a long time, and I remember how often I asked, "Why me?" I went through a stage where I cried a lot and was really depressed. I still feel that way sometimes but I've learned to accept my blindness the best I can. I came to a point where I started having some good days. Now most of them are okay.[113(p35)]

Other observers, however, have not found this sequence to be necessary or inevitable.[114] Some men are briefly devastated by the news that they will not see again, but then work vigorously on a rehabilitation program.[109,115] Depression may not come on until after the patient has left the hospital, and some men are chronically depressed. In the St. Dunstan's study, 50% of the patients followed for periods of from 1 to 4 years were depressed, resentful, or showed other psychiatric abnormalities.[106] If depression is severe or enduring, it should be actively treated. Along with denial, prolonged depression poses the greatest barrier to successful adaptation.

Anxiety is manifested in fears of falling, and in suspicions of being watched by sighted people. Insomnia may occur, due in part to the absence of the light-dark cycle, and some patients develop a fear of the dark. There may be accompanying PTSD and psychosomatic complaints include headache, dizziness, gastrointestinal discomfort, and eye

strain. Blind men may complain of eye strain after Braille reading even after both eyes have been enucleated.[106]

Adaptation to blindness is determined by the extent of other injuries, personality and social factors, and the quality of the training program. Patients with concomitant brain damage and deficits in memory and attention, and those with amputations, marked facial scarring, and hearing loss are at a disadvantage. Certain premorbid personality features favor the development of denial. Such patients are described as having been compulsive and perfectionistic, as reluctant to share their feelings, and as priding themselves on their self-sufficiency. They had regarded disability as a personal failure or disgrace.[116,117] Patients with a history of dependency, on the other hand, may find it all too easy to accept any assistance that is offered and be reluctant to work on their own.[109] Levels of education and degree of family support correlate positively with successful adjustment.[118] According to one combat-blinded veteran (known to the author), who was active in rehabilitation, macho types see in blindness a loss of masculinity and have particular difficulty in enduring the limitations of physical activity.

Treatment

Modern treatment of blindness resulting from combat began during World War II and is based on the principles of orientation and mobilization (O & M), acceptance of blindness, and the forming of a group esprit. Despite the experience of World War I, the U.S. armed services were not fully prepared for the care of the 1,400 men blinded in World War II. Soldiers were evacuated to Dibble General Hospital in Menlo Park, California or Valley Forge General Hospital in Phoenixville, Pennsylvania. U.S. Navy and Marine Corps personnel were sent to the Philadelphia Naval Hospital in Pennsylvania, but the first center devoted exclusively to the rehabilitation of the blind was not set up until June 1944 at Avon Old Farms, Connecticut. Treatment had consisted of instruction in self-care, posture, and facial expression; physical exercise and sports activities; social recreation; and industrial, vocational, and academic classes. Morale was not good, and over 40% of the men at Dibble General Hospital were considered by a psychiatrist to be maladjusted.[108]

The prevailing philosophy at Avon Old Farms was that the blind could be taught to "see" through "facial vision." This was the idea that the person could perceive obstacles in front of him by changes in the sensations of touch, pressure, and temperature emanating from the object. The method had had rare success with the congenitally blind but was ineffective for the war-wounded. Locomotion was aided by an ordinary wooden walking cane.

What came to be known as the Hoover light cane was introduced at Valley Forge by Sergeant Richard E. "Dick" Hoover[119] (who completed medical school after World War II), and the O & M technique was to be developed with the collaboration of Russell C. Williams who had been blinded in the Normandy campaign, and C. Warren Bledsoe, who had been a teacher of the blind. Hoover found the conventional cane to be too cumbersome, and devised a lightweight longer one made of steel—subsequently aluminum or fiberglass—that the patient swung in an arc in front of his trailing foot. This extension of the patient's arm enabled him to "feel" objects and gain an appreciation of their qualities through the transmitted vibrations. The metallic body was a good sound conductor that gave information about the presence of walls, open spaces, or changes in terrain. The cane tip also gave auditory information. Even some bilateral upper limb amputees could use the cane which was more of a wand and light enough to be attached to a stump. Hoover and his associates trained many instructors, and the technique has spread around the world. The shift to O & M occurred in the context of a change in social attitudes toward the blind. An original objection to O & M was that the Hoover cane made the user conspicuous while "facial vision" disguised the blind so that they would not upset or offend the sighted.

A follow-up study (1952–1953) of 1,949 veterans blinded in World War II and the Korean conflict[118] showed a high level of adjustment, considering that so many men had other disabilities. Of these blinded veterans, 50% were employed and 82% of these expressed satisfaction with their jobs. A much higher employment rate was found in men who had completed rehabilitation training. Nine of 10 were reported as coping well with community attitudes and relating well in their families. The same number expressed themselves fluently, and appeared orderly in their thinking processes. Eight of 10 did not appear nervous or depressed during interviews, and 8 of 10 did not show "blindisms." As for manifestations of denial, 30% had unrealistic plans for the future, 15% were reported as using cheerfulness to mask other feelings, and 32% had retained hopes of seeing for 10 or more months after their injuries.[118] No comparable study of Vietnam veterans has been published.

The following do's and don'ts in dealing with a blind patient have been suggested:

1. Address him directly rather than his escort.
2. Do not shout unless the patient has a hearing loss.
3. Do not avoid the words "look" and "see" for fear of embarrassing the blind person.
4. Do not hesitate to ask the person how much sight he has.
5. Announce when you are entering or leaving his room.
6. Give specific directions on location of objects rather than using the vaguer term, "over there."
7. Ask the patient to take your arm rather than taking his and propelling him.
8. Tell a patient you have not guided before when coming to steps.
9. Walk in line with the patient but in going up and down stairs keep one step in front of him.
10. Do not feel offended if the blind person refuses help.

CASTRATION AND GENITAL MUTILATION

Wounds of the external genitalia are the most feared combat injuries. Soldiers in foxholes have been observed to place their helmets over their genitalia, and airmen noted to reinforce their seats with life jackets. While the incidence is low as compared to other wounds, it has risen over the years with the change from the static trench warfare of World War I to more mobile modern tactics. Wounds of the penis, scrotum, and testicles made up 2% to 3% of American casualties in Vietnam,[120] and comprised from 40% to 67% of all genitourinary injuries.[121–124] The rate was higher before the 1968 Tet offensive because there were more below-the-waist explosions from mines and booby traps than after Tet when there was a higher proportion of shell-fragment wounds.[122,123] Burns are another source of genital injuries.

The great majority of genital wounds are associated with other organ damage—to the extremities, other parts of the genitourinary tract, the abdomen, and chest—and the greater explosive power of weapons over the years has increased the incidence of such injuries. Spinal cord damage, amputations, and even blindness may result. Such extensive injuries differ strikingly from the castrating and mutilating genital wounds of civilian life. The latter are caused mainly by low-velocity bullets, now commonly used in drug wars, and by knives, razors, and scissors wielded by vengeful lovers or rivals. Self-castrations are performed by mentally disturbed persons. Such wounds do not produce the massive tissue destruction and the extensive contamination that result from the impact of the high-velocity particles of combat.

Patients are usually admitted to the hospital in shock and early attention is directed to life-threatening problems, so that definitive treatment is delayed until their condition has stabilized. Complete loss of external genitalia was reported as a common occurrence in the Soviet Army in World War II[125] but penile amputation has been encountered much less frequently by American surgeons.[124,126–128] Superficial penile injuries involving the skin and glans or subcutaneous tissues or both, are much less likely to be accompanied by other genital wounds and generally heal without major complications.[122] Severe penile wounds with injury to the corpora cavernosa are apt to be associated with urethral and testicular damage but partly severed penises can be reconstituted provided sufficient corpus cavernosum is retained. Later complications include penile pain and fibrosis, and chordee interfering with erection.

Scrotal-testicular wounds are the most common external genital injuries. They made up 32.8% of all genitourinary wounds in a series of 124 patients evacuated from Vietnam to Japan. It was usually possible to preserve at least part of a testicle. Orchiectomy or partial orchiectomy was performed in 77 of 98 men with unilateral testis injury, and total bilateral orchiectomy was done in only 5 of 28 patients with damage to both testicles.[124] Loss of one testicle does not interfere with potency or cause sterility, and does not contraindicate return to duty. After bilateral orchiectomy, hormone replacement with depo-testosterone maintains potency and bone density. The course and disposition depends not only on the severity of the genital wounds but on the extent of other injuries.

Behavior

There are no published studies of the behavioral sequelae of combat-incurred genital mutilations. One reason is that such wounds are relatively uncommon. Another is that because of the frequently

associated injuries, patients with genital wounds, unlike amputees and those with spinal cord damage or blindness, do not form a distinct group with a training program from which data can be derived.

As noted, it may be some time before the wounded soldier becomes aware of the extent of his injuries. The first sight of a mutilating genital wound may be so distressing that some surgeons perform the first procedures with the patient under anesthesia.[124] While some men react with equanimity, depression ensues in the great majority of cases. It usually improves over time but may persist, especially if the patient is septic or in pain. Patients experience the emotional problems of the disabled and disfigured, along with those specifically related to sexual functions. The incidence of impotence associated with persisting penile deformity is not known, but the sensitivity to the cosmetic aspects is an important psychological factor. For some, disfigurement of sexual organs is equivalent to the loss of all manly qualities. Adding to the sense of alienation in some cases is the lack of a reference group such as those with which the amputee, the paraplegic, and the blind can identify and gain support.

The major behavioral disorders in the chronic stages are depression, social withdrawal, and substance abuse. Statistical data are lacking so it is not known if the association of genital wounds with amputations, spinal cord injuries, and blindness or facial disfigurement or both adds to the suicide rate or increases the incidence of behavioral disturbances. Phantoms of the genitals may occur but have not been reported in the literature of recent wars. Patients with relatively minor genital injuries may also have psychiatric problems. A man with a slight penile deformity may believe he is physically repulsive and make it the focus of all his personal problems. A patient with loss of one testicle may be beset by fears that the other will be damaged or he may engage in compulsive sexual activity to prove his potency.

Treatment

Treatment depends on the extent of genital loss and the nature and severity of other injuries that determine the patient's ability to participate in a rehabilitation program. Unfortunately a man with a genital injury cannot improve his performance the way a blind man can become proficient in orientation and mobilization techniques. There should, in any case, be a doctor-patient relationship in which feelings of despair, loneliness, anger, and shame can be expressed. The patient must be assured that loss of physical capacity does not mean loss of personal integrity and that all that can be done for him is being done. Some of the more successful outcomes have been associated with the initiative and resourcefulness of surgeons who have followed their patients over the years and the personal qualities of the patients themselves.

The following cases are illustrative of some of the features that have been presented.

Case Study 4: Of Arms and the Man

On Friday, 13 October 1967, a 17-year-old machinegunner in Vietnam was struck by a high-velocity missile that pierced his left flank and exited from the right, destroyed his left kidney and one half of his right one, damaged extensive areas of bowel and penetrated the cauda equina. At an evacuation hospital where he arrived within 15 minutes of his injury, a surgical team performed a left nephrectomy, a right heminephrectomy, multiple bowel anastomoses and a colostomy, and inserted drains in the pelvic area. In Japan, the patient was noted to be paraplegic and underwent a lumbar laminectomy after which he developed a bloody pleural effusion and contracted a severe urinary tract infection. At a hospital in the United States to which he was admitted 1 month after his injury he was still paraplegic, had large decubiti over the sacrum and other pressure points, and had osteomyelitis of the lumbar vertebrae and pelvic bones. To protect what was left of his remaining kidney from infection, an ileal conduit was constructed. The patient was confused and lethargic as a result of his sepsis, was in constant pain, became addicted to several drugs, and was deeply depressed. He tolerated food poorly and his weight had dropped to 57 pounds.

At this point his physician, recognizing the noxious effects of his pain-racked, functionless, septic lower body, conceived of a translumbar hemicorporectomy, an operation that had been performed on patients with advanced cancer of the bladder and pelvis. Following the procedure, the patient's condition improved remarkably. He was free of pain, came off drugs, and was no longer depressed. He entered a rehabilitation program, developed great arm strength, and was able to use and transfer himself from a wheelchair. One year after his injury he was discharged to his home and, with the support of his family and the community, has led an active life. He operates a small-engine repair shop, drives a number of vehicles, and serves as a member of a radio emergency-action communication team. He collects guns, target shoots, hunts with a rifle and crossbow, and fishes. He was fitted with a prosthetic trunk and legs but has discarded these, as he finds it easier to ambulate on his hands which he does without embarrassment. He cares for his personal hygiene and handles his colostomy and ileal bags successfully.[129]

In a 1993 interview, the veteran reported that he had had no emotional problems. For several years after his return home from the hospital he drank heavily but stopped

after he put on a great deal of weight. He has not been depressed and never thought of suicide. He recalled that he had been immediately aware of his paralysis after being wounded in Vietnam, and that in the hospital there he had been terrified during shelling because of his immobility. He since has had no symptoms of PTSD. He has experienced a phantom of his right lower extremity with a sensation of dull pain from his knee upward, but no genital phantoms. He has had no sexual sensations, desires or imagery, and no erotic dreams. When asked how he sees himself in dreams, he replied that he does not visualize himself, only others. He states that he does not regret not having gotten married and having children, and that he regards his nephews as his sons. He is not bitter over his war experience, but rather, he is proud of having served his country as his father and brother have, and is grateful to the doctors for saving his life.

Comment: One can only marvel at the superb medical care he received and the patient's survival skills.

Case Study 5: Against All Odds

An 18-year-old combat engineer was injured in Vietnam in 1968 when his helicopter was struck by rocket fire and crashed into a mountain. Both legs were sheared off above the knees on impact, his right little finger was amputated, there were fractures of both arms, and he had facial and genital wounds. There was penetration of the left orbit into the frontal lobe necessitating enucleation of the left eye and injury to the right eye left only light perception. The right eye was subsequently enucleated. The genital wounds consisted of penile lacerations closed by primary repair, and a damaged right testicle requiring orchiectomy. He later had a craniotomy for an infected frontal sinus, reparative upper-limb procedures, a number of revisions of his amputation stumps, and in 1972 exenteration of his right hip joint for osteomyelitis.

The veteran was interviewed 20 years after his injury when he was located by his surgeon, Dr. Kenneth Swan. He recalled that he had been unconscious only briefly, but that it was not until several days later, and then only after he had been told by a fellow soldier, that he discovered he could not see, and that he had lost his legs. He stated that he was not depressed or concerned over his condition while in Vietnam. He thought that he would be able to get along fine with wooden legs, and that his remaining vision would suffice. Following a craniotomy in Japan, he had an episode of delirium lasting 4 months, over which time he was agitated and hallucinatory, reexperiencing combat. This was followed by long periods of lethargy and depression that improved after the removal of his infected hip joint. Subsequent depressive episodes associated with aggressive behavior have appeared mainly in response to frustration. He recalled that the first time he struck his wife was when he was having difficulties with college courses. He also has had problems of drug abuse, but gave up drinking after a grand mal seizure. Symptoms of PTSD appeared in 1972, 4 years after his injury, and anniversaries of traumatic experiences such as the 1968 Tet offensive have been associated with emotional distress.

He had been told during his last military hospitalization that he would be sterile; subsequently he engaged in excessive sexual activity after discharge. He later married and fathered two children. He is potent except for brief periods when he is under stress. He remains totally blind and navigates from a wheelchair with the aid of a sonar path sounder. He has experienced phantoms of both lower extremities with sharp pains that may last up to 24 hours. He has not had phantoms of the missing testicle or little finger. Since enucleation of the right eye, there has been phantom vision in which he "sees" bright lights.

In the late 1980s, the veteran's wife suffered a nervous breakdown, an episode of depression brought on by his social withdrawal, his abusive behavior, and her inability to cope with the management of the household. The couple went into counseling and the veteran feels he has been able to resolve his feelings about the war and his own experiences as an abused child. Although he states that he is making a better adjustment at home, he still finds it difficult to be comfortable with people in public.

Comment: One factor contributing to the worse adaptation of the this second patient is the brain injury that he suffered.

SUMMARY

Amputation, spinal cord injury, facial disfigurement from wounds and burns, blindness, and mutilating and castrating genital injuries have a number of features in common. Each involves the loss of a major function of the body that is largely irreparable. The injuries are frequently associated in that a mine explosion may blow off one or more limbs, damage a testicle, and blind a soldier. Following the initial shock and the undertaking of life-saving measures, most patients must endure a long hospitalization, often with complications necessitating arduous and painful surgical procedures. Psychologically, there is a profound alteration of body image, a loss of self-esteem and, for many, the end of a way of life. Injuries may be associated with PTSD, depression, and denial as prominent behavioral features, and brain dysfunction is common.

Brain dysfunction occurs in a number of ways. It may result from direct impact as in spinal cord injuries, notably cervical cord lesions, and from penetrating head wounds in blinded patients. Brain abnormalities can also be caused by anoxia, sepsis,

and metabolic abnormalities. Sensory isolation consequent to head immobilization for cervical cord injuries may bring on behavioral disturbances. Phantom-limb manifestations were once regarded as psychogenic, but current findings suggest that the phenomena are the result of reorganization of denervated cortical sensory areas. Burn encephalopathies are manifested in initial delirium and occasionally in delayed focal neurological signs and psychotic reactions. Among the organic mental syndromes subsequent to severe burns that have been reported are depressive-withdrawn and paranoid-aggressive states, anosognosia in which the patient denies or appears unaware of his bodily deformities, and delusional misidentifications. In patients without overt behavioral disorders, brain damage lowers thresholds for stress and increases the complications of drug therapy. Psychoses in the absence of evidence of brain dysfunction are rare.

A wounded soldier may not be spontaneously and immediately aware of the loss of a limb or of paralysis, blindness, or disfigurement. The duration of such anosognosia depends on the state of brain function and the degree of interaction in the environment. Later manifestations of denial include unrealistic expectations of the future, faith in a miracle cure, and a defiant "we can take it" attitude. Blind patients may persist on relying on an inadequate fragment of remaining vision and refuse training to help them compensate for the loss of sight. Denial may take a paranoid form in which a patient may angrily blame his incapacity on improper treatment. In the early stages denial may detach a patient from the catastrophic reality and help him preserve a sense of identity, but it is ultimately maladaptive. It deprives the patient of the opportunity to grieve, hinders the development of group relationships, and blocks rehabilitative efforts.

Depression at some stage is almost universal. While a period of grief and mourning is helpful in allowing a patient to come to terms with his loss, prolonged depression with dwelling on the past has disastrous effects. It leads to noncooperation in treatment and to self-neglect. Suicide is a danger even in severely incapacitated patients, especially those with self-neglect who deny ever having harbored thoughts of ending their lives.

Although disabling and disfiguring injuries present a variety of problems, there are some common principles of treatment. The staff should avoid statements and attitudes that reinforce denial. Patients should be told of their prognoses and given the rationale for their treatment as early as they can retain and evaluate information and cooperate in self-care. The development of a new identity should be facilitated by acceptance of a handicapped status and by participation in a rehabilitative training program. Feelings about disability should be shared in group sessions and the patient should be helped to understand how his feelings about himself affect his perceptions of the attitudes of others. Depression, aggression, and pain should be managed with both behavioral and pharmacological measures.

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