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CARE OF PATIENTS WITH INJURIES OF THE SPINAL CORD

This publication is intended to acquaint Air Force and Army medical officers with professional methods and military policies in the total care of patients with injuries of the spinal cord.

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SECTION A-GENERAL INSTRUCTIONS

1. Goal of Patient's Care. From the outset, the goal of those caring for the patient must be to restore him to his physical self and to his economic and social status. This is true whether he makes a partial, or no recovery from his original neurologic loss.

2. Relation of Attitude to Recovery. Medical officers should emphasize the importance of early, intelligent surgical and nursing care, and later rehabilitative care, to the patient's physical, mental, and social well-being. It is especially important that the patient's early care at no time be vitiated by a defeatist attitude on the part of those responsible for any part of that care. Even those patients with extreme degrees of paralysis must be considered socially and economically salvageable.

3. Bibliography. Other publications on this subject are :

a. Bowers, Warner F.: *Surgery of Trauma*, Philadelphia, 1953. J. B. Lippincott Co., page 121.

b. Carney, John F.; Lindsey, Quinton; McCrea, Lowrain E.: *Demountable Tidal Drainage Apparatus*, U.S. Armed Forces Med. J. 2:1575-1577, 1951.

SECTION B-EARLY SURGICAL CARE

4. Transporting the Patient. Since most injuries of the spinal cord are associated with injury to the vertebral column, it is of paramount importance to remove the patient from the accident scene in such a way that the cord is not further injured by improper posture or undue mobility of the vertebrae at the injury level. Handlers should also bear in mind that the patient may have suffered other bodily injuries and should take appropriate precautions, in keeping with the demands of the spinal cord injury.

a. **Placing Patient on Litter.** At least three persons are needed to place the injured patient upon a litter. In the case of cervical injury, one of the assistants should hold the head rigid, keeping it in a neutral position, without extension, flexion, or lateral rotation. The litter should be firm and flat, with the patient in the full length, supine position. Padded bricks, sandbags, or additional folded towels or clothing should be placed at the sides of the head so that it will not roll from side to side. Never place a pad or pillow under the head. If the lower thoracic and/or lumbar spine is injured, hyperextension must be avoided. Placing rolls under the cervical and lumbar spine adds to the comfort of the patient with an

injury to the thoracic region, which requires no special positioning.

b. **Treatment Enroute to Surgery:**

(1) For surgery to accomplish maximum benefits, the patient must be taken to the place where he will receive definitive surgical care. During early evacuation he should not be given strong sedatives or other drugs which would mask neurologic changes. As soon as possible after the diagnosis of cord injury is confirmed, a urethral catheter should be inserted and allowed to drain freely. Provisions for intravenous fluids and intranasal oxygen are desirable, if available; the latter is particularly important if the cervical cord is injured.

(2) Because of the potential vertebral instability, it is of great advantage to transport all patients on a fixed reversible litter, such as a Stryker or Foster frame. However, when such apparatus are not available-e.g., in a combat area specially fitted and padded standard canvas litters serve as efficient substitutes. With such frames or specially prepared litters, the routine of turning the patient every 2 hours should be instituted immediately. Bivalved plaster body casts should not be used to transport the cord injured patient, because of the hazard of producing decubitus ulcers.

5. **Surgical Care of Open Injury.** An emergency exists when a bullet, shell fragment, knife, or other foreign body has entered the vertebral canal, causing a neurologic deficit. Surgical exploration must be performed at the earliest possible hour, consistent with the patient's general condition and associated injuries. This is true regardless of the level of the injury. Lateral and anteroposterior X-rays of the injured level are necessary, and compatible blood should be available. The urethral catheter should be open and draining. The patient must be examined for concomitant injuries that may be clinically inconspicuous, especially if they occur below the level of cord injury, and particu-

larly if they are within the chest or abdomen. **The mode of anesthesia should be at the discretion of the surgeon and anesthesiologist.**

a. **Making the Incision:**

(1) Regardless of the missile's point of entry, the incision for inspection and repair of the spinal cord should be the classical dorsal midline approach. Dissection, with removal of all foreign bodies and tissue debris, and very gentle handling of bone fragments, is continued down to the dural level. (The dissection should be performed with the knife and not with the periosteotome, because the latter is most dangerous and prone to drive loose bone fragments into nerve or cord.)

(2) **Inspecting the missile tract.** Without opening the dura mater, the tract of the missile should then be inspected, with special attention to the removal of any indriven shreds of clothing or other foreign material. If the dura is lacerated, the opening should be closed with fine black silk. If the wound is old and frankly contaminated, do not incise an intact dura. The condition of the cord should be estimated as thoroughly as possible and the wound closed in anatomical layers, without drainage. Place a small drain in the depths of the missile tract.

b. **Completing Surgical Exploration.** If the wound is estimated to be surgically clean, the exposed dura should be opened in the usual manner and the cord inspected. Clots, bone fragments, or other debris should be removed. Use saline irrigation sparingly. If the cord is not greatly swollen or contused, close the dura mater with interrupted fine silk sutures. If the cord is greatly swollen, the laminectomy and dural incision should be carried far enough superiorly and inferiorly to demonstrate normal pulsations of the cord or cauda equina. Before wound closure, care must be exercised that all bleeding is controlled and there are no retained clots.

6. Surgical Care of Closed Injury. Set rules cannot be laid down as to whether the definitive treatment of closed cord injuries is to be surgical or non-surgical. That decision must rest on the total clinical picture, which will vary in its important aspects from patient to patient. Certain general rules, however, always apply. **Special** consideration must be given to a *cervical* injury, since unwise surgery may be fatal. In general, for closed injury in the thoracic and lumbar levels, with gentle handling of the tissues the patient has everything to gain and nothing to lose by surgical exploration. Avoid local anesthesia. Preceding all surgery for the closed injury, a urethral catheter must be draining; intravenous fluids running; blood on hand for a possible transfusion; and oxygen available. Have good lateral and anteroposterior roentgenograms at hand.

7. Injuries to the Cervical Cord:

a. **Characteristics of Injury.** The typical cervical spinal cord injury is the result of a fracture, a dislocation, or a fracture-dislocation of one or more vertebrae. Severe injury above the level of the fifth cervical cord segment is rarely compatible with life, because the phrenic nerves have their origin at segments C₃₋₅. The intercostal nerves are not functioning, and the patient's respiration is dependent solely on the integrity of the phrenic nerves. Roentgenograms may show marked crushing of the bodies and fragmentation of the pedicles, laminae, and spines, with or without the facets being locked entirely out of position. Under no *circumstances must the grave error be made of trying to reduce a cervical dislocation by closed manipulation.* Most severe injuries of the cervical vertebrae are accompanied by complete transverse physiological loss of cord function, often extending one or more segments above the site of vertebral injury. In other instances the vertebral injury demonstrated roentgenologically will be minimal in comparison with the marked neurologic loss. There is no known method of deter-

mining whether an early spinal cord injury is due to contusion, with physiologic interruption and anatomic preservation, or to frank anatomical discontinuity.

b. **Procedure Required in All Cases.** In every instance of closed injury to the cervical cord, with evidence of vertebral damage, the head should be completely shaved, the crown area surgically prepared, Crutchfield tongs inserted, and sufficient traction applied at the earliest possible hour after injury to effect vertebral realignment. Twenty-five or 30 pounds of traction may be necessary. Apply tongs through stab incisions made in the scalp, using local anesthesia. Place small drill holes symmetrically in the parietal bones approximately 2½ inches to either side of the midline and in a line upward from the mastoid tip. The incisions are so small that no sutures are needed, and dressings are rarely necessary. It is well to shave the hair from around these areas regularly.

c. **Time Needed for Alinement of Vertebrae.** With the patient on a firm mattress, or better still, a Foster or Stryker frame, and with sufficient traction continuously applied to the slightly extended head, the vertebrae will in most instances relocate in almost normal alinement within 24 to 36 hours. Serial lateral bedside X-ray pictures should follow the progress of the restitution. Reduce traction gradually to 6 or 8 pounds, which must be maintained for at least 6 weeks.

d. **When Immediate Surgery Is Proper.** Immediate decompressive Laminectomy for the injured cervical cord is attended by severe morbidity and mortality. However, there are two instances when it is proper to operate early :

(1) If the original state of the patient was one of incomplete loss of cord function, with the appearance, hours or days later, of increasing loss of function, decompressive laminectomy should be performed, **with the patient still on his frame and traction maintained;**

(2) If at any time after injury roentgenograms show clearly that a bone fragment rests upon the cord in such position that traction could not, or after 36 hours has not relieved its pressure, immediate decompressive laminectomy is in order. The possibility of a mass of centrally extruded intervertebral disc substance must not be overlooked.

e. Verifying Anatomical State of Cord. Whenever the injured cord, at any level, is treated by decompressive laminectomy, whether the injury is recent or remote, it is well to open the dura mater and verify the anatomical state of the cord. This may be done through a small midline dural incision that is closed after inspection. If complete decompression of the cord is indicated, open the dura wide throughout the length of the laminectomy and leave it open. On the other hand, a nearly normal looking cord may not reveal its functional state.

f. Delay Fusion of Vertebrae. Do not attempt to fuse the vertebrae at the operation of laminectomy for an acute injury of the spinal cord. These procedures should be delayed until the necessity for spinal stabilization is demonstrated during rehabilitation.

8. Injuries to the **Thoracic** Cord:

a. Factors Affecting Treatment. The thoracic segments of the vertebral column form a relatively rigid mass; the thoracic vertebral canal is the narrowest of all parts of the canal; and the spinal cord throughout its thoracic extent has a less rich blood supply than at either the cervical or lumbar levels. These three factors affect the early surgical care of closed injuries to the thoracic cord. A crushed anteriorly wedged vertebral body causes a sharp kyphos, thrusting the overstretched cord dorsalward against the lamina arch. Even without inward displacement of the laminae, pedicles, and spines, the cord may thus be impinged between bone. If these dorsal elements are also frac-

tured and depressed toward the canal, the cord damage will be irreparable. Dislodged muscle and clot add to the compression.

b. Early Surgery Imperative. Such an injury must be treated by wide decompressive laminectomy, at the earliest possible moment after injury. The treatment of certain associated injuries, e.g., ruptured viscus, will have primacy. Never attempt to correct the vertebral body deformity by hyperextension until bone fragments, clot, and impacted muscle have been removed, for this maneuver might cause a forward compression upon the cord by the damaged posterior elements. Remove the tips of the spines of the adjacent superior and inferior vertebrae in order to prevent pressure areas from developing at such "high" points at the ends of the incision. Following laminectomy it is perfectly safe to place the patient in a supine position with a firm, thin dressing in place. Do not apply body casts after such injury. The Stryker or Foster Frame provides adequate immobilization to insure bony healing.

9. Injury at the Lumbar Level:

a. Early Surgery Imperative. As with injury at the thoracic level, dislocation of one lumbar vertebral body upon another, wedging of a body with kyphos formation, or fracture of the posterior arches, calls for immediate decompressive laminectomy. Operative handling of the cauda equina may produce so much pain as to require general anesthesia. Injury of the conus medullaris (T_{12}, L_1 vertebral levels) is of grave significance. Below that level the delicate filaments of the cauda equina may be badly torn and -attenuated, the injury being attended by considerable subarachnoid hemorrhage. Extensive bone damage may exist with an incomplete lesion on physiologic testing. Conversely, complete transverse neurologic deficit may be found with slight degree of bone injury. The opened dura mater may reveal roots of the cauda which

are completely severed. The edema, hemorrhage, and entangled condition of the roots usually make the task of apposing the related segments impossible. The motor roots are true peripheral nerves, and theoretically could be sutured with some expectation of regeneration; practically, however, this is rarely a possibility.

b. **Post-Surgery Procedure.** After laminectomy, the patient should be placed on a Stryker or Foster frame, or a specially padded canvas stretcher, or in a supine position on a firm, smooth bed, with adequate support under the lumbar spine. Again, do not treat such injury by hyperextension, and at no time apply a body cast. Patients with cauda equina lesions must be turned at frequent intervals, with continuous attention to the care of the skin.

SECTION C-LATE SURGICAL CARE

10. Reasons for Operating. Regardless of the level of injury, there is little hope of restoring cord function by laminectomy after the lapse of days, weeks, or months. However, if there is reason to believe that the patient might benefit by surgery, surgery must not be denied him. Operation is often an important factor in bolstering the patient's morale for his adjustment to a new way of life. Furthermore, it frequently confirms a diagnosis and accurate prognosis.

11. Controlling Root Pains. Root pains at the level of injury may develop weeks or months after injury. This may be due to the presence of remaining bone fragments pressing upon the roots, or to overgrowth of callus at the site of injury or at the adjacent foramina. Malunion of the vertebral column with abnormal mobility, especially in the thoracic levels, may be a cause. Controlling the pain may require surgical decompression of the affected foramina, removal of the callus, or special measures to assure good union of the vertebrae; such

measures are usually quite effective. Occasionally it is necessary to perform posterior root section (rhizotomy) of the affected roots, if the pain is clearly and segmentally outlined and other measures to control the pain have failed.

12. Controlling Prolonged Pain in the Lower Extremities. There are certain patients who, with injury at any level, complain of burning, nonsegmental, poorly localized pain in the lower extremities, days to months after injury. Such pain may be transmitted through the extra-medullary autonomic pathways, or it may be due to scarring at the level of the lesion; however, the true nature of the distress has not been discovered. It is most likely to occur in the thin, tense, worrisome patient, who eats and sleeps poorly, smokes excessively, suffers considerable emotional stress, and adjusts slowly to his misfortune. The pain is invariably worse if the patient is malnourished, has a source of sepsis such as decubitus ulcers and infected urinary tract, or a poorly functioning bowel. Various procedures to relieve this pain have been employed, such as wide rhizotomy, sympathectomy, anterolateral tract cordotomy, resection of the scarred ends of the severed cord, and subarachnoid alcohol injection. The fact remains that these measures are usually of little or no help, and relief usually comes with the passage of time and a general improvement in the patient's state of nutrition and rehabilitation. Great care must be taken that such patients do not become drug addicts. They may be allowed moderate doses of mild sedatives, **but should never be given opiates or other strong anodynes.** Subarachnoid injection of alcohol or phenol in the cord-injured patient at any time for any purpose has been abandoned, more controllable surgical methods being available.

13. Other Helpful Surgical Methods. Various adjunct surgical procedures may be helpful to the patient. Transurethral resection of

the hypertrophied neck of the bladder may aid the patient to develop automatic reflex micturition. Or, pudendal nerve block or resection can be used toward the same end. If strong adductor muscle spasms prevent positioning in a wheel chair or in bed (where they are productive or decubiti), resection of the obturator nerves gives welcome relief and is of help in rehabilitating the patient. If it appears certain there will be no further neurologic return, and the patient is handicapped by severe flexor spasms of the lower extremities, extensive caudal anterior rhizotomy will relieve the condition. It will allow the patient to sit in a chair comfortably, lie in bed properly, and be spared the distressing jerking of the whole body that accompanies such spasm.

14. Avoiding Decubiti. It is axiomatic that decubiti are a penalty, the result of poor skin care and failure to turn the patient. Decubitus ulcers (see paragraph 22) usually respond well to conservative measures if the patient consistently receives good nursing care and is well nourished. Once clean and granulating, even large defects can be successfully closed by simple excision and suture, rotation flaps, or other properly selected plastic procedures.

SECTION D-NURSING CARE AND REHABILITATION

15. Good Nursing Care Vital. Rehabilitation begins with proper nursing care at the time of injury. Good surgical care fails if it is not accompanied by good patient care. Optimistic, persistent, intelligent, detailed nursing care is synonymous with rehabilitative care. Many patients with cervical cord injury require tracheotomy immediately. But a tracheotomy alone will not assure a good airway unless it is properly placed and kept meticulously clean.

16 Use of Catheter. If the patient is unable

to void, insert a #16 gage Foley type catheter changing it with aseptic technique every 5 to 7 days. Bacitracin ointment is an excellent lubricant for an indwelling catheter. During the first few days the catheter should be allowed to drain freely and the bladder irrigated with normal saline solution every 6 hours. When the open drainage method is used, the catheter is kept clamped, reopened with complete bladder drainage every 2 hours, and irrigated by gravity every 6 hours. If possible do not leave a catheter on constant open drainage. This results in a contracted bladder of small capacity, which can never be expected to develop any reflex, automatic function. Open and constant drainage is absolutely necessary when urinary tract infection exists. The penis should always be positioned upward on the pubis to prevent edema and angulation of the urethra over the catheter at the penoscrotal junction. Periodic cystometrograms are an aid in following the return of either reflex or voluntary bladder control.

17. Replacing Catheter With Suprapubic Tube. If the patient develops a frank cystitis, bladder calculi, severe urethritis, or perineal abscess, remove the urethral catheter and place a suprapubic tube in the bladder with constant open drainage. From the standpoint of eventual bladder capacity and automatic micturition, suprapubic catheters are entirely nonphysiologic devices. Sudden, severe headache, transient hypertension, and elevation of body temperature are pathognomic signs of urinary tract obstruction, infection, or both.

18. Need for an Enema Program. Early following cord injury, the patient may have one to several involuntary bowel movements daily; later he will become habitually constipated, and an enema regime is needed for regular evacuation. Enema bowel training should follow a very rigid time schedule, the enema being given every second or even third day ;

this procedure, with a well-regulated diet, should develop a satisfactory reflex defecation. The importance of attention to bladder care and the use of an enema program in bowel training cannot be overstated.

19. Use of Foster and Stryker Frames Desirable. The type of bed used is the first importance, and fortunately the Foster and Stryker frames are available in most military installations. At the earliest possible time after injury, place the patient on the frame (or on the litter substitute), turn him every 2 hours, and position him carefully on the cushions, with the feet supported in a neutral dorsiflexed position and with slight flexion of the knees and hips. If the injury is one of the cervical spine and tongs are in place, the tongs must be tested daily for security, and the attached weights must hang free at all times. All frames should be inspected for mechanical defects before being returned to storage. Parts do wear out, and it is a trying experience for a paralyzed patient to be on a frame when one of the supporting head pins breaks or wears through during turning.

20. Use of Beds When Frames Not Available. If a frame is not available, the patient should be placed on a sufficiently long bed, with a firm, smooth mattress. The sheets under the patient must be dry, clean, and unwrinkled at all times. A thin foam rubber mattress is comfortable and helps to distribute the patient's weight, but it is difficult to keep the sheet on this type of mattress. If the patient is on a regular bed, he must be turned to a new weight bearing skin surface at least every 2 hours.

21. Skin Care Required. The attention to the skin may spell success or failure in the total care of the patient, and this should begin *immediately* after injury. Remove urine, feces, and other soilage promptly. When an indwelling urethral catheter is used or the patient has frequent loose stools, it will

facilitate his nursing care to have the lower abdomen, pubes, perineum, and buttocks shaved from time to time. Since perspiration quickly macerates the skin of a weight-bearing surface, bathe the patient as necessary; also, rub his skin with alcohol, and powder it at intervals. *Reddened skin over pressure points must never* again bear pressure until the redness subsides*; this is the first warning signal of an impending decubitus ulcer. Sheet burns, superficial skin necrosis due to pressure, or blisters should be left undressed, exposed to the air, coated with compound tincture of benzoin, and treated twice daily with several minutes of mild dry heat by lamp.

22. Treating Decubitus Ulcers. If actual decubitus ulcers have developed, they may be covered with dry, leathery, blackened, necrotic skin that has not yet separated, or they may be open, sloughing, odorous ulcers. If the necrotic skin has not yet separated, it should be encouraged to do so with sterile, warm moist dressings, with surgical debridement as necessary from day to day. Once the ulcers are open, treat the lesions with moist, sterile saline dressings, changed every two or three hours; provide mild, dry heat for several minutes twice a day with a heat lamp. *All attendants must realize the ease with which the surrounding skin is burned.* Ultra-violet light applied directly to the lesion is also beneficial. When the gangrenous material has sloughed, the ulcers quickly fill with healthy granulations and may be allowed either to heal spontaneously or be closed by some proper surgical procedure. The detailed, time-consuming care that such lesions require, once they are established, is a graphic illustration that "an ounce of prevention is worth a pound of cure,"

23. Hot Weather Care. During hot weather many cord injured patients may suffer actual heat stroke lying in their bed. Because they do not perspire below the autonomic level of their cord injury, the higher the lesion the

greater the amount of body surface that is denied the natural cooling device of body perspiration. For this reason, air conditioning is desirable on a ward filled with such patients. It eliminates the need for such nursing attentions as alcohol sponge baths, ice packs, and other measures to reduce temperatures,

24. Dietary Requirements. Because patients with cord injuries almost always have poor appetites much ingenuity is sometimes required to get them to take sufficient food. The food served should always be attractive and varied, and the attendant must be patient, and unhurried, if a patient cannot feed himself. Total fluid intake should be at least 3,000 cc. daily, while protein intake should be at least 125 to 150 grams daily. Protein supplement in the form of various protein hydrolysates, added to milk, ice cream, custards, or juices is a useful dietary aid. Between-meal feedings may be necessary to maintain the intake at the necessary minimum of 3,000 calories per day. Although all cord injured patients tend to develop anemia and hypoproteinemia, with a good food intake and regular daily vitamin supplement the blood picture should remain fairly normal. Use of an "acidash" diet at any time in the care of the cord injured patient is not indicated. The careful administration of anabolic agents may aid the patient to maintain his muscle bulk and tone; it may also produce a mild euphoria when he might otherwise be emotionally depressed.

25. Periodic Urine and Blood Studies Required. Once a week a complete urinalysis, including microscopic examination, should be performed. Twice a month the patient's blood must be studied for total protein content, urea nitrogen, and complete red and white cell counts. If the patient is ill or his condition is in any way unstable, make such studies more often.

26. Little Medication Needed. A non-irritating urinary antiseptic should be employed while a urethral or suprapubic catheter is in place and while there is residual urine during the period of reflex automaticity. Rotating these agents weekly will extend their usefulness. Little other medication is necessary or even advisable. The patient must not be habituated to the use of sedatives for sleep or for various discomforts.

27. Activating the Patient. As soon as it is consistent with wound healing and good bone union, the patient should be activated, both mentally and physically, to forestall the early development of a difficult emotional situation. This is a considerable problem with the tetraplegic patient; but if he can use his hands and arms, he can perform many duties for himself, such as his toilet, recording his fluid intake and output, and other personal duties. Bedside occupation & therapy, however simple, should be started immediately after injury. As soon as he becomes a wheelchair patient, the scope of occupational therapy should be broadened and directed toward such handicrafts as might eventually lead to a new trade or profession.

28. Helping the Patient Adjust to His Condition. The attitude of all those attending the patient should be one of optimism and friendliness, **but not of pity!**, with an indication that those about him understand his plight and realize his helplessness and needs. Eventually, however, many cord injured patients do become problems in personal management. They tend to become particularly demanding and truculent about cooperating in their own care. Those difficulties are usually overcome when the patient accepts his situation, makes an attempt to meet it through learning a new method of daily living, and busies himself at efforts to learn new methods for gainful work. The patient's problem should be discussed with him at an early stage, to point out his own role in his -rehabilitation and spell out his objectives.

29. Role of Physical Therapy:

a. **Importance of Starting Early.** A long, unceasing program of rehabilitation by physical therapy and the use of mechanical aids begins very early, at the bedside. Massage, active and passive exercise, and the use of resistance exercises with dumbbells and other portable apparatus, not only improve the patient's strength and general physical well-being, but give him an immediate new interest on his own behalf. Light weight, removable cervical braces may be put on the patient with a cervical cord injury shortly after the skull tongs have been removed. Then, wearing a snug abdominal binder he may be put in a wheelchair, transported to new surroundings, and sent to the physical therapy department for his treatment, thus enlarging his horizons. Wheelchair ambulation is even easier, and usually earlier, for patients with thoracic or lumbar injuries. Plaster collars and plaster body jackets are unnecessary, and serve only to encumber the patient further.

b. **Transfer to VA Facility.** An extensive variety of training apparatus is available for cord injured patients in the military and VA hospitals in the United States. Since long term vocational and psychotherapeutic re-

habilitation is properly the function of the Veterans Administration, the patient should be transferred to a VA facility as soon as his physical condition has become stable and transportation is feasible.

SECTION E-DISPOSING OF PATIENT

30. Releasing Patient for Continuing VA Treatment. The long, integrated program of rehabilitation for the cord injured patient is directed entirely to restoring him, as far as possible, to normal function; to insuring that the neurologic defects remaining will be compensated for, so far as possible, by what additional function can be taken over by the intact parts of his body; to stabilizing him safely in his new program of altered body function ; and to preparing him once more to enter into normal social contacts so far as his powers of ambulation will allow. He will be processed for disability separation under current regulations at the earliest practicable date, and transferred directly from the military hospital to the VA facility nearest his home having an established service for the care of such patients. The great majority of patients will require months, even years, of further hospitalization and re-education in such facilities.

BY ORDER OF THE SECRETARIES OF THE AIR FORCE AND OF THE ARMY

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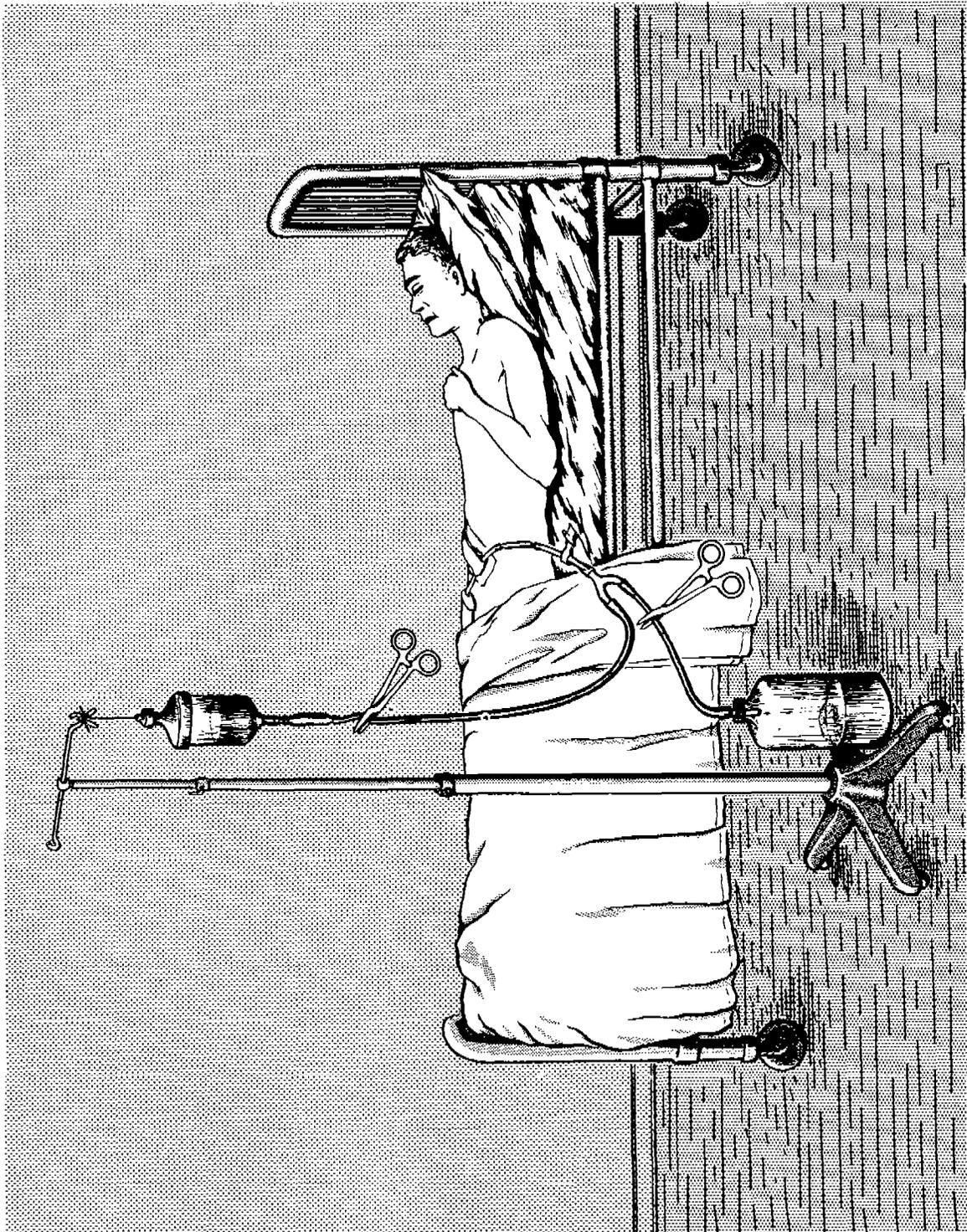
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1 Atch
1. Bladder Drainage and Irrigation
Arrangement



Bladder Drainage and Irrigation Arrangement

Attachment 1

