

WOUNDS AND THEIR COMPLICATIONS

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THE very common subject of wounds looms larger and larger these later days as swiftly moving vehicles create havoc upon our highways. Incised wounds are commonly due to windshield glass that breaks and divides tissue, often of the face. If the larger vessels of the neck, arm, groin or thighs are opened, a percentage of the victims die of uncontrolled hemorrhage, usually because bystanders do not understand the application of an improvised tourniquet or do not realize that hemorrhage even from a large vessel may be arrested by pressure or by pinching the artery between the thumb and finger until expert assistance arrives. When the injury involves the very vascular tissues of the head, satisfactory healing should occur after thorough mechanical cleansing despite the free use of antiseptics and even some degree of tension. The wound may be flooded with one-half strength tincture of iodine, grease removed with turpentine or ether, dirt-begrimed tissue trimmed away and after adequate hemostasis, bleeding vessels controlled with very fine (000 to 0) plain catgut or wire, then united very accurately with 35 gauge rustless steel wire or horsehair, without drainage, and healing free from reaction may be expected.

Apart from a permissible compression bandage to limit oozing during the first twenty-four hours, no dressing for wounds of the face is necessary. Dressings about the openings of the mouth, eyes and nose are particularly objectionable as they retain decomposing secretions in contact with the wound. Infection or a poor cosmetic result from an incised or even the average lacerated wound of the face or scalp, as a rule, indicates a slipshod operation or lack of surgical skill.

When a part of less vascularity, as the hand, or particularly the foot, is involved, much greater care is necessary in order that the vitality of the tissues be not destroyed by manipulation, strong antiseptics, the tension from tight sutures or lack of rest. Here the part should be given absolute rest, at least until primary union has occurred, and should the injury be at all extensive, general rest by keeping the patient in bed. Rest favors minimal exudate, primary healing and early recovery, and insures against the spreading, destructive infection so often seen when partly devitalized and contaminated tissue is subjected to early movement. Drains are not to be used unless the patient falls into such shock that the operation cannot safely be prolonged. They provide a path for the entrance of surface bacteria to the depths of the wound. At times, they are used to salve the conscience of the operator who knows he has been inexcusedly careless in his wound sterilization or hemostasis. A drain is justified in a clean wound only for uncontrollable oozing. Even in the most radical amputations of the breast, we do not use one. As a rule it is better to occasionally evacuate a sterile hematoma between stitches at the second or third dressing than to risk having the wound contaminated through a drain.

To reduce scarring, alternate sutures may be removed from the face or scalp, provided there is no tension, on the second or third day and the remaining sutures on the fourth or fifth day. With wounds of the limbs or trunk supporting sutures should be left in for a week, with the foot for eight days, or if the wound is under tension or there is a strain upon divided skin, fascial or aponeurotic planes, an adequate

number of supporting sutures to prevent separation should remain in place for from ten to fifteen days. Should infection develop, stitches are to be removed and wet, warm, non-irritating dressings used. A deforming or unsightly scar may be excised three or more months after complete healing and the edges of the wound then coapted with meticulous care.

Contused closed wounds with or without fracture are characterized by tissues so bruised and devitalized as especially to be subject to necrosis and infection. Of particular danger in extinguishing the limited residual life of the part is the tension resulting from hemorrhage and edema. If tension is prevented, tissues that seem to be hopelessly damaged and are therefore thought to require amputation, frequently recover in a surprising way with little evidence of infection or necrosis. Tension results chiefly from the restraining skin and fascia which in a severe crush or contusion should be divided freely in the axis of the limb, if necessary on two sides. The divided skin and fascia will then separate widely. If the sheaths of muscles are also tense, these should be freely opened. The skin should, of course, first be carefully cleansed with ether or turpentine followed by tincture of iodine of 3½ per cent strength. Bleeding vessels should be ligated with fine (No. 35 B. and S. gauge) soft alloy steel wire, and fractures should be reduced without internal fixation or undue manipulation. If there is a marked tendency to displacement, continued extension by Kirschner wire or Steinman pins may be used. A very copious wet dressing of warm 1-4000 bichloride of mercury on fluffed gauze surrounded by cellophane or similar impermeable layer and finally a heavy encasement in sterile cotton, held by a lightly applied supporting bandage, is used. Unless complication develops, the dressing should not be removed for three or four days. This is the treatment to be used for crushing wounds of the extremities during the early period while there is any question as to the viability of the tissues. In many severe cases it enables

one to best determine the necessity for amputation.

CASE I. A brakeman was admitted with his forearm crushed nearly flat between the bumpers of an old-fashioned freight train; the skin was tense, no pulse was detected at the wrist, and there were multiple fractures of the radius and ulna. Immediate amputation through or above the elbow was considered essential by consultants.

Treatment. Following sterilization of skin, one volar and one dorsal incision was made through the skin and fascia from the elbow into the hand. The muscular sheaths were found to have been crushed apart. The multiple fragments of the radius and the ulna where displaced, were gently pushed back into position and overlaid by muscle. Warm, wet antiseptic dressings were applied as described above.

Result. Granulation and healing of the widely open wounds occurred without necrosis or loss of tissue and there was bony union with a strong somewhat flattened forearm of excellent function.

Many surgeons have hesitated to incise badly contused parts or at the most have attempted to relieve tension by inadequate multiple punctures. Where the vitality of a limb is in jeopardy from a crush, all tension should be released aseptically by one or more long incisions reaching from uninjured tissue above to uninjured tissue below.

On the head, neck and trunk, the vitality of the tissues is so great that the long relaxing incisions mentioned are rarely necessary. However, large hematomas may produce serious pressure symptoms so that aseptic evacuation through a large aspirating needle or by incision may be indicated, preferably some days after the primary hemorrhage has ceased. If a large artery such as the iliac, femoral or axillary has been ruptured, the state of shock, the vitality of the limb, the local damage to the tissues, the ability to temporarily control the flow of blood from the artery and the skill of the surgeon should all be evaluated. An emergency operation upon a badly shocked patient with a ruptured main artery has a high mortality and is indicated

only when it is evident that the hemorrhage or oncoming gangrene will cost the life of the patient in which case there should be no delay. If the patient is in fair condition and the bleeding can be controlled above the field of injury by tourniquet, direct compression, or temporary ligation of the artery, it may be possible to evacuate about the artery and do an arterial suture, or at least determine the necessity for an amputation. In the average case a pressure pad, and a bandage evenly applied from the phalanges to a point above the injury will limit the size of the hematoma, and the operation for the false traumatic aneurysm may be delayed until conditions are more propitious.

In all cases the toes or fingers should be exposed so that interference with the circulation may promptly be detected. If pain continues, the surgeon should search for the cause without delay. An overlooked dislocation, an unreduced fracture, a tight bandage or cast, a beginning pressure sore, or an iodine or hot water burn are common causes of distress that should not be neglected. In one little girl the physician made traction for a broken leg through a shoe despite the child's suffering. After two weeks the removal of the shoe revealed great sloughs, exposed tendons and a permanently crippled foot, all due to the pressure of the shoe. An uncomplicated wound should not cause intense pain.

Contused and lacerated wounds including open crushing injuries have the element of potential infection, the avoidance of which depends largely upon the first treatment. The surrounding skin should be aseptized, the wound flooded with 3½ per cent tincture of iodine and mechanical sterilization of the wound carried out by excising with a very sharp scalpel all tissue that is devitalized or impregnated with dirt. Bone containing dirt should be removed with a sharp chisel, not by scraping. Vessels should be ligated with fine alloy steel wire as most other materials form a nidus for infection. Such wounds of the head and face, and most wounds of the neck and trunk may then be immediately and very

accurately closed without drainage with the fine (No. 35 or 36 gauge) annealed rustless steel wire. With a meticulous technique primary union with slight scarring is to be expected. There is little excuse for the suppuration of any wound of the scalp or face. In children under ten years of age, with wounds of the neck, in Negroes and others with a constitutional tendency a keloid thickening of the scar may develop.

With a lacerated wound of an extremity, tension and lack of blood supply may cause the loss of the patient's limb or his life. The treatment of crushing and lacerated wounds of the extremities consists therefore in careful debridement with the least possible traumatism to living tissues and the prevention of tension, if necessary by very long incisions in the axis of the limb carried freely through constricting skin, fascia and muscle sheath as previously described. Skin sutures are only permissible where and when they produce no tension. Copious warm, wet antiseptic dressings are valuable. Distal portions of the arm or leg that hang from what seems like only a small pedicle of soft tissues may not infrequently be saved.

CASE II. One hand of a man was lacerated and contused by the explosion of a bomb he was holding. The thumb and metacarpal bone were dangling from a ribbon of soft tissue 2 cm. wide containing a small branch of the radial artery. The head of the first metacarpal was fragmented and many phalanges were fractured, and two fingers were lacerated, pale and bloodless. Amputation of thumb was urged by several consultants. The thumb and bony fragment in the joint were replaced and held in position by a few fine sutures in the muscle, the skin and fascia not being sutured but copious, warm, wet, antiseptic dressings were applied.

Result. Healing was without suppuration or necrosis with restoration of one-third of the normal movement of thumb.

Böhler leaves the wound entirely open and exposed to the air, protected from dust only by a single layer of muslin and obtains excellent results. He obtains reduction and retention of compound fractures by the Steinmann pin or Kirschner wire passed

through the bones at a distance from the injury and held in a supporting frame.

With severely contused and lacerated wounds of an extremity after sterilizing and debriding the wound, divided parts may be gently apposed, but not to the extent of adding to the tension or traumatism. The prevention of secondary tension or retention of secretions is the first consideration; formal anatomical restoration often is best delayed until the vitality of the tissues has been regained. A common mistake with lacerated wounds is meticulously to suture divided muscles, tendons, nerves and skin with resulting tension, necrosis and spreading infection.

CASE III. A lacerated wound of the hand with division of the tendons and a fracture of the metacarpals resulted from the fall of a large wheel. Two hours were devoted to the immediate careful suture of divided tendons, alinement of bones and closure of the skin.

Result. A widespread infection involved the forearm and the hand, lasted for months and resulted in a disorganized and nearly useless member.

Thorough debridement is especially important if there is the likelihood of bacterial contamination as in wounds from gunshot or the fang or claw of lower animals.

CASE IV. Lacerated wounds of the hand with fractured metacarpals resulted from bite of a large monkey. All the wounds were sutured and covered with gauze dressing.

Result. A prolonged, agonizing infection, swollen, very painful, crippled hand with septic osteitis and purulent sinuses one year later.

CASE V. Dog bites of both hands and wrists were treated by antiseptic cleansing and gauze dressing without debridement, relaxing incisions, warm, wet, antiseptic poultices, or immobilization.

Result. Infection with final loss of one hand and crippling deformity of the other.

Infection by the Bacillus Welchii. The spores of the gas bacillus carried into the wound with minute particles of woolen clothing, intestinal discharges or street dirt are not destroyed by permissible antiseptics, and cannot certainly be removed by debridement. The gas bacillus and re-

lated organisms however seem unable to start infection in a well vascularized living tissue. It is in devitalized muscle, or in muscles the blood supply to which has been arrested by the injury or by the secondary tension within the sheath that this organism colonizes, causing a putrid form of gangrene that with much gas and liquid exudate spreads from muscle to muscle. A wound may contain many spores of the Welch bacillus and yet heal without reaction. Other pathogenic bacteria may likewise remain in a wound without harm, provided no semidevitalized, dead tissue or blood clot is present.

One should think of gas bacillus infection after any crushing or gunshot injury, especially of the extremities, when there is delayed or increasing shock without loss of blood sufficient to cause the symptoms. Prostration and a rapidly rising pulse rate with cold skin and high rectal temperature are common findings. The crackling of the tissues on palpation, the gas in and between the muscles shown by roentgenogram, the later foul, brownish, gas-filled wound secretion are pathogenomic. Dependence should be placed early upon the wide opening of the limb and the removal of all devitalized soft tissue. Often this necessitates the excision of entire muscles which may be pale and firm as if cooked. For the advanced case with the patient delirious, nearly pulseless and apparently moribund, a high guillotine amputation is at times life-saving.

The Welch organism may remain in the tissues for months and produce gangrene only when the muscle is damaged or becomes avascular.

CASE VI. An aneurysmal dilatation of the anterior tibial artery in a young man was caused by the entrance of fine bird shot about fifteen months previously. There was no inflammatory reaction in the leg. The angiomatic mass was resected, and one or two bird shot was removed from apparently healthy muscle. The open muscular sheath was sutured under marked tension and without drainage. Rapid development of gas gangrene in the leg followed with death within seventy-two hours

despite the injection of two hundred dollars worth of combined Welch antitoxin. In this case the Welch bacilli or spores carried into the tissues with the bird shot had remained dormant until tension interfered with the blood and lymph circulation in the muscle, when they rapidly developed to then swarm out and overwhelm the body.

Thyroid crisis may be precipitated by injury, a relatively slight operation or even a mental shock, with increasing tachycardia, tremor, restlessness, progressive hyperpyrexia (by rectum) and at times death in twenty-four or thirty-six hours. The crisis is to be suspected if there is a visible or a palpable goitre or thyroid nodule, but it should be remembered that the goitre may be entirely intrathoracic and only visible on the roentgen film. In such a case the high internal temperature is especially dangerous for the central nervous system. Adequate refrigeration, the free use of iodine and glucose solutions by vein and iodine by mouth and rectum are the best known methods of treatment.

ANTISEPTICS

Progressive repair, reduced toxemia and rapid elimination of necrotic tissue are very much more important than high bactericidal action of the antiseptic applied to the wound. A healing contaminated wound is preferable to a sterile dormant wound. Many of the newer antiseptics, while they may have high bactericidal power, when they are applied to the wound produce a sluggish condition with delay in healing. A similar retardation of healing occurs when the dressing is impregnated with certain of the older germicides, such as solutions of formalin, carbolic acid, lysol or other cresol. None of these substances should be used as a wound dressing. As is well known, a wet dressing of even a weak solution of carbolic acid has produced gangrene of fingers and toes. On the other hand, granulations grow rapidly under a weak wet dressing of bichloride of mercury, iodine or even bromine. Bromine in 1:3000 to 1:5000 strength has a special value for very fetid wounds.

Dakin's solution is not applicable in ordinary practice and should only be used when the wound is wide open. Injected into the fresh wound under tension it produces necrosis. In the abdomen it dissolves the mesentery down to the blood vessels. It is essential that it be applied copiously every two hours following the very precise technique elaborated by Carrel.

For irritated wounds or where the skin is excoriated, liquor aluminii acetatis of the National Formulary, diluted 1 to 4, is of value. For tissues of low vitality as in a diabetic or arterosclerotic the mildest and least irritating antiseptics only should be used.

SUTURES

Sutures have attracted more and more attention during recent years. We must remember that, while absorbability is very desirable, all sutures derived from lower animals are objectionable. Catgut produces reactions which retard healing and favor infection. It is especially harmful in infected wounds and on mucous surfaces. After thyroidectomy, surgeons have long wondered why it was that the wound became edematous, required drainage and did not heal as well as other wounds of the neck. It was thought that the secretion from the thyroid or the exposure of the trachea was responsible. We were impressed likewise until after we studied the undesirable reactions of the tissues to catgut in about 130 patients. Implanted in the skin catgut causes a red flare and a wheal in twenty-four hours which so progresses that at the end of a week there is a zone of reaction and necrosis about each strand. Thus firm healing is delayed until the catgut has been absorbed and the local damage to the tissues from the catgut repaired. From silk there is only a slight redness at the end of a week; from rustless or alloy steel wire no flare or wheal even at the end of four months. With the substitution of silk or wire for catgut in thyroidectomy the wound heals like other wounds of the neck without reaction or drainage. The wire tied in a small knot and placed in a septic

wound, becomes buried without producing local irritation or a sinus. Therefore, we have used it increasingly for several years past, burying it in abdominal wounds and in hernioplasties, and using it as the sole material for suture and ligature in infected or contaminated wounds. We believe it solves much of the difficulty in closing cleft palates, duodenal and vesicovaginal fistulas, the suture of the ureter and bladder. Size 35 and 36 (B. & S. gauge) is hair-like and is used for fine plastic work and fine ligatures; No. 32 and No. 30, about the size of 000 or 0000 catgut, but much stronger, are used to unite strong fascias or as a through and through suture; size 18 to 22 is very strong and is used to wire bone.

Suturing with living fascia to me recalls the barbaric surgery of savage tribes. Heavy coarse needles open great holes in delicate aponeuroses and crudely weave bands of fibrous tissues into the depths of the wound. I am informed that the younger Coley is soon to publish the end results from the method in treating hernia with a report of about 17 per cent of recurrences.

Residual infection should be considered with a wound that has been seriously infected but has healed. Therefore, how long a delay should be practiced in such a case before re-operation is done for an ununited fracture, divided tendons or nerves? Usually at least three months, but it is best to first test the part by free manipulation under gas anesthesia. If this is not followed by serious local reaction, the operation may be done. If it is followed by a marked local reaction or what occasionally occurs, the development of an abscess, of course, a much longer delay should be practiced. With infected fractures during the inflammatory period before free suppuration has been established, operative manipulation may produce a fatal septicemia.

THE APPLICATION OF COLD OR HEAT

Cold retards healing and the resistance of the body to infection. It has little germicidal value, although it may reduce the activity of bacteria. Warmth favors wound healing and high temperatures that are

tolerated by peripheral tissues markedly impair the pathogenicity of a number of bacteria. Fever, kept within such limits that the central nervous system is not injured, is a valuable therapeutic agent in infection. Therefore, an injured part should be kept warm. Refrigeration is only to be considered in the early hours of a rapidly destructive local infection to hamper bacterial activity until there is time for protective bacteriolytic and antitoxic substances to be formed. Even in this early stage heat may serve a better purpose. Ice bags or cold solutions should not be used upon tissue of low vitality.

INFECTED WOUNDS

Infected wounds may be divided clinically into two great classes. In the first class we operate; in the second we wait. *In the first early operation cures; in the second it kills.* This applies not only to wounds, but also to peritonitis and other forms of infection. The first class is typified by the staphylococcus which forms an endotoxin and an exotoxin which act upon endothelium with the production of thrombi in blood and lymphatic vessels and plastic exudate on serous surfaces. The thrombi and plastic exudate block off the infected area from the rest of the body, limiting the general reaction, but causing a local ischemia and necrosis. Thus the center of a boil or carbuncle dies and may later be expelled as the "core." In the skin the localized thrombosis may lead to limited areas of gangrene. The local tension from the inflammatory exudate increases the damage. Thus the process may be arrested or limited by early incisions or, as with a carbuncle, by excision of the thrombosed area. In osteomyelitis the destructive inflammation may be at once arrested by the early drilling of the bone with a gimlet to relieve tension. With a beginning furuncle we may arrest the process by destroying the microorganisms before the thrombotic process has fully developed. To this end 0.5 to 2 minims of liquified phenol is injected through a very fine needle into the center of the boil, a procedure not to be used on

the fingers or toes. For the more superficial pustulations on hairy surfaces as the scalp or axilla, the frequent application of undiluted tincture of green soap with exposure to the air is particularly beneficial. For an extensive staphylococcic cellulitis free incisions and warm, wet dressings of 1:5000 bromine solution are valuable. In peritonitis the exudate is protective and is not to be removed. Years ago Dudgeon and Ross showed that a mixed colon bacillus and staphylococcic peritonitis was less dangerous than a pure colon bacillus peritonitis. Infections by the staphylococcus, the pneumococcus, the bacillus pyocyaneus, the gas bacillus we treat by sterilizing, incising or debriding early. Free drainage, no sutures, wire instead of catgut ligatures, warm, wet antiseptic dressings and rest are important. Against a few of these infections there is an antitoxin of some value.

Class II is represented by a group of pathogenic microorganisms of which the streptococcus is a striking example, that do not as a rule produce thrombic and plastic exudative reactions and, therefore, tend to any early and wide diffusion through the blood and lymphatic channels. The exudate, as a rule, remains liquid, but often causes a marked edema with redness, swelling and pseudo-fluctuation suggesting an abscess. Usually this exudate is finally spontaneously absorbed. The general reaction may be early and marked and a bacteremia established in a few hours. For example, a surgeon pricks himself while operating for a streptococcic infection. In two to four hours there is a chill and fever and red tender streaks mark the spread of the coccus through the lymphatic vessels radiating from the wound. If the puncture is incised or excised, additional lymphatic spaces are opened, a more severe chill, higher temperature and death from blood stream infection commonly follow. The proper treatment is immediate absolute rest in bed. The lymphatic circulation should be reduced by keeping the extremity splinted, but not constricted. The wound should be covered with an antiseptic ointment, as unguentum oxidum

flavum or a wet dressing, and not handled, squeezed, incised or disturbed. To supply complement, a transfusion of 150 c.c. to 200 c.c. of typed blood should be given every third day until the temperature remains normal.

If the donor will permit, the richly leucocytic blood of an immuno transfusion may be used. Fifty million killed typhoid bacilli are injected into the donor's blood stream with resulting chill, sweat and fever. Six or eight hours later, or at the height of the resulting leucocytosis the transfusion is made. Transfusion has a high mortality in infancy, and many more babies have been killed than saved by the injection of blood.

In acute osteomyelitis we have examples of the two classes of infection. The common form occurs in childhood or youth, is due to the staphylococcus, and may be aborted as previously mentioned by venting the bone. The second type, due to the streptococcus develops in infants, and the mortality is markedly increased by early operation.

Anthrax also belongs in Class II. The pustule which closely resembles that of vaccinia is usually seen in those who work with imported hair or hides. Formerly the lesion was excised, cauterized, injected with carbolic acid, or other antiseptic solution, and this militant treatment resulted in a fatal anthrax septicemia in 30 to 50 per cent of the patients. Now we keep the patient in bed, protect the pustule from movement, scratching and meddling consultants, with a layer of yellow precipitate ointment, thick soft dressings and a splint, and about 95 per cent of the patients recover within two weeks.

DRAINS

While the mortality may be greatly reduced by delay in draining a mixed streptococcic appendiceal abscess, if the pus is then drained through the free peritoneal cavity, 6 per cent or more of the patients will die of peritonitis. We, therefore, prefer to make a muscle splitting incision close to the right anterior iliac spine, strip the unopened peritoneum from the hollow

of the ileum, and locate the abscess from behind the peritoneum by the finger, which also guides a closed curved Mayo scissors into the abscess cavity. The scissors is then opened and withdrawn and a drain introduced. This method, if it can be carried out, largely eliminates the late mortality.

Deaths from the Early Removal of Drains. With a virulent, and especially a Class II infection, gauze drains should not be removed before the ninth day or before they have loosened spontaneously. After draining for septic appendicitis, or any streptococcic infection, do not let an interne or anyone else pull out the drain on the second or third day. The lymphatic spaces are thus torn open, a chill and rising temperature frequently follow, with death from a blood stream infection. In one year in one hospital in Philadelphia 6 deaths were attributed to this cause. Remember also that drains often fix the infection. Those who in peritonitis drain to the bottom of the pelvis have the greatest percentage of secondary pelvic abscesses. Again, a gauze drain should rarely be renewed. When impregnated with wound secretions it becomes more of a cork than a drain. If continued drainage is necessary, fill a glass syringe with a modified Beck's plumb, 25 to 50 per cent of bismuth subiodide in white petrolatum. Squeezed into the wound without tension, this causes no pain and facilitates drainage and early closure. It may be renewed without undue pressure only every four to eight days.

SKIN GRAFTING

Granulating wounds if large may epithelialize so slowly as to greatly retard convalescence. Skin grafts are often applied when a quicker and much better result could be obtained by sterilizing the granulatory surface with a 10 per cent solution of chloride of zinc, blotting and excising the granulation tissue with a sharp knife and then liberating the adjacent skin, which is slid over the defect and sutured. The area may be so large however that skin grafting is desirable.

It is to be remembered that only autogenous grafts live. Not many years ago attempts were made to graft frog skin, the lining of an egg, and the bones of dogs into humans. None of these tissues endure. We cannot even graft skin from a mother to a child, or from one member of the same family to another, unless they are homologous twins.

Only autogenous grafts, grafts made from the same person, will survive. It is true that a graft from perhaps a related person may appear to "take" for one or two weeks, but then it melts down and finally disappears, although one may be misled by the fact that some living sebaceous or sweat glands remaining in the grafted area have in the meantime started to form new islands of skin. The cosmetic result from small Thiersch or pinch grafts is very poor. Large Thiersch grafts, split skin grafts or fitted and sutured full thickness grafts should be used, especially on exposed portions of the body. To ensure a successful "take" the even compressure from rubber sponges incorporated in the dressings is important.

SUMMARY

The treatment of the various types of incised, contused and infected wounds is notoriously poor in a large percentage of our hospitals as well as in private practice.

Disfigurement, mutilation and even death daily express the widespread failure to appreciate and apply the simple principles underlying the surgery of traumatism and infection. Methods of treatment for incised, contused and infected wounds are described and errors illustrated by concrete examples. The selection and application of sutures, ligatures, antiseptics and dressings are indicated and the great danger from transfusing babies mentioned. Methods of preventing or aborting infectious processes are given.

Common tragedies from intervention in Class II infections and from the mishandling of drains are emphasized and attention is directed to the faulty use of skin grafts.