

the lung, the enclosed air may be extracted by suction, through the external wound, or by making a new puncture in the chest-walls.

The subsequent inflammation of the lung-tissue is treated by counter-irritation over the chest, diaphoretics, anodynes, etc.

WOUNDS OF THE PERICARDIUM.—A punctured wound in the præcordial region, which does not implicate the heart or great vessels, is of rare occurrence. Such a wound may prove fatal from the entrance of blood or air into the pericardial sac, pressing upon the heart so as to paralyze its movements. The inflammation of the pericardium which follows a wound of this kind may also destroy life.

This wound is recognized by the ordinary signs of pericarditis. Upon auscultation there is heard a dry, rubbing friction-sound accompanying the cardiac impulses. This is succeeded by an augmentation of the area of præcordial dulness from effusion, and by diminished intensity of the heart-sounds, and feeble pulsations. The constitutional effects are shown by a rapid, irritable pulse, hot skin, and anxious face.

When the hæmorrhage has been controlled, the wound is closed in the ordinary way, and opium is administered in full doses. Blisters, dry or wet cups over the præcordia, are effective agents in subduing the inflammation.

WOUNDS OF THE HEART may be instantaneously fatal, or life may be prolonged for several days. The case of a noted pugilist of this city, named Poole, will be remembered. He received a bullet-wound in the heart, and walked home afterward. Death did not occur for hours after the injury was inflicted.

Small punctured wounds of the heart have been known to terminate in recovery.

A wound of the auricles is more rapidly fatal than a wound of the ventricles. The walls of the former are thinner, and the fibres more uniformly arranged, and their contractions less likely to prevent hæmorrhage. The muscular walls of the ventricles are thick, and the fibres interlaced, and, if the wound be small, profuse bleeding cannot occur.

The signs of wounds of the heart are those of shock and loss of blood. The patient becomes rapidly insensible, and the pulse ceases. There is extreme pallor. The extremities are cold and sometimes clammy. When the immediate danger has passed, signs of pericarditis appear. If life be prolonged sufficiently to give chance for treatment, the patient is to be kept perfectly quiet, the wound closed, and covered with cold-water dressings. Opium is given internally, and, when inflammation appears, remedies are employed as in the preceding case.

WOUNDS OF THE ABDOMEN OR ITS CONTENTS.—Penetrating wounds of the abdomen are generally either punctured or incised. Lacerated wounds are not frequent. If the bleeding is in any way profuse, the vessels should be tied. If the wound is small, so as to make it impossible to reach the vessel, the opening must be enlarged to make it accessible. When there is simply an oozing from the wound, interference is not necessary. It is better for the blood to escape outside than into the peritoneal cavity. The great danger in these cases, as in all wounds of the abdomen or its contents, is peritonitis. This dreaded complication is made known by the occurrence of a sharp pain near the wound, which soon extends over the whole abdomen. There

are also tympanitis, constipation, and vomiting. The pulse is hard, tense, and wiry. The skin is dry and the temperature increased. When the intestines are wounded, there is still greater liability to peritonitis. If the opening is large, there is always an escape of fecal matter into the peritoneal cavity. This irritating material is certain to excite peritonitis, even when in minute quantities. A small wound of the intestines may be closed by eversion of the mucous membrane.

*Treatment.*—If the intestines protrude externally, and cannot easily be returned through the wound, the opening should be enlarged. The intestine should be cleansed thoroughly in tepid water before it is returned. If the intestinal wound is more than three or four lines in length, its edges should be drawn together by means of sutures. An opening, of such a size as to be completely closed by the everted lining membrane, may be let alone. Ericceon recommends passing a ligature around this variety, in order to make the escape of fecal matter an impossibility.

In dealing with wounds of the abdominal wall, there is some discrepancy of opinion. Some believe that the sutures should merely include the skin, and not the deeper structure below. It is reasonable to suppose that, in closing the wound in this way, a separation to a greater or less extent would take place in that portion below the integument. Inflammatory products must fill up the gap, and there is nothing to prevent their getting into the peritoneal cavity and giving rise to peritonitis. Unless there are special indications to prevent it, it is better to pass the needle down to the peritonæum, and bring all parts of the wound in complete apposition. If there is much suppuration following the wound,

it should be opened, kept clean with carbolic-acid wash, and free escape of pus allowed.

Opium is given internally to control the inflammation and allay pain. The patient should be brought under its influence until his respirations are down to 14, and his skin perspiring. Light poppy fomentations are also of much benefit.

Contusion of the abdominal walls may lacerate the integument or muscles, and the viscera within. The internal organs alone may be injured, without any perceptible lesion of the walls. Severe contusions are scarcely ever recovered from. As a good example of the manner in which these wounds are received, and their mode of termination, the following case may be of interest:

James D., aged twenty-seven; occupation, laborer; was admitted to Ward 11, Bellevue Hospital, suffering from a severe contusion of the abdomen. He had been riding on the rear platform of a Third-Avenue car, which was driven at considerable speed. The car suddenly came to a halt at the corner of a street. A hack running behind, on the track, failed to stop at the same time, and, its impulse being continued, the pole of the vehicle struck D. in the abdomen, near the umbilicus, pressing him with great violence against the back of the car. On admission, the patient was suffering somewhat from shock, and the abdomen was exceedingly tender at the point of injury.

The day following, inflammation set in. The abdomen enlarged, and was so tender that the weight of the bed-clothes could scarcely be borne. Peritonitis, in all its phases, was well marked. Death took place on the fourth day. A *post-mortem* examination showed that a portion of

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the small intestine was much bruised, but its walls had not been torn through. Pus and lymph in considerable quantities covered the intestines, gluing them together in several places.

When the liver and kidneys are ruptured, there is usually more collapse than in injury of the intestines. The patient rarely lives long enough to develop peritonitis.

A puncture or rupture of the bladder is succeeded by peritoneal inflammation. The urine may pass into the abdominal cavity or into the abdominal walls. In the latter case, the wound is below the part where the peritonæum is reflected over the organ. If the laceration is at the base, the point of a catheter may pass through and be felt in the rectum. The escape of urine into the peritoneal cavity is attended with a sharp pain, which rapidly increases till the peritonæum, through its extent, is involved in inflammation. In the cellular tissue of the pelvis or groin, it excites diffuse suppurative inflammation.

*Treatment.*—When the urine accumulates in the cellular tissue, free incisions are made to give it exit. It is prevented from accumulating in the bladder by allowing it to run out through a catheter introduced for that purpose. Opium, in full doses, is beneficial.

**WOUNDS OF THE PERINÆUM.**—Lacerated wounds of this part occur frequently in women during labor. The child's head, as it is forced down by the uterine contractions, is pressed against the distended perinæum, and, if it is at all resistant, rupture takes place. As soon as labor has terminated, the edges of the wound should be brought together by sutures.

In the male, these wounds are liable to injure the urethral canal, and operative measures are necessary to relieve the resulting retention of urine and effect a cure. Perineal section is usually performed.

When the patient has been fully anaesthetized, a staff or steel sound is passed down to the laceration and through it, if possible, and the tissue of the perinæum divided in the median line down to that point. The external incision extends from the termination of the scrotum to within half an inch of the anus. The knife is then carried on in the direction of the urethra until the injured portion has been passed. A catheter is then introduced into the bladder and retained for forty-eight hours, to keep the canal open and allow free passage of the urine. A steel sound is afterward occasionally introduced to prevent narrowing of the urethra. As this operation is performed in its most difficult point without a guide, the anatomical relations must be borne in mind. The urethra passes through the triangular ligament from three-quarters to an inch below the pelvis. The opening in this ligament, when appreciated by the touch, will be sufficient to keep the operator from cutting in wrong directions. When a deep, perineal wound bleeds profusely, and the vessels cannot be tied, a small Barnes dilator may be pushed into the opening and filled with ice-water. Dr. Synott, one of the Bellevue house-surgeons, first employed this method. It has proved successful. Another plan is to place a piece of oil-silk, or other suitable material, around a lead-pencil, pass it into the wound, and pack tightly between the oil-silk and pencil a quantity of lint. Ice-bags may afterward be applied to the wound to prevent inflammation. If the blood from the urethra flows out at the meatus uri-

narius, a sound is passed down the canal and the penis compressed against it with a bandage.

Fractures of the pelvis are sometimes associated with lacerated wounds of the perinæum. The following case is a good illustration.

Patrick C., aged forty; occupation, laborer; was injured while exposing himself in an unnecessary manner over the end of a dock. A ferry-boat, coming into the slip at the time, crushed him against the timbers of the wharf. He was brought to Ward 16, Bellevue Hospital, a few hours afterward. An external examination failed to detect a fracture. A catheter was introduced, but met with an obstruction about the termination of the membranous portion of the urethra. As there was considerable urine in the bladder, it was decided to perform perineal section without delay. Ether was administered to the patient. An incision was then made through the tissues in the median line, commencing near the base of the scrotum and carried within half an inch of the anus. When I reached the membranous portion of the urethra, I found fragments of bone pressing upon, and completely obliterating, the canal. The ramus of the pelvis, and a portion of the body of that bone, were broken in several fragments. The *débris* of soft tissue and bone blocked up the rest of the urethra to the bladder. An opening was, however, made into the organ, and the obstruction removed. The amount of fracture and destruction of tissue rendered his case hopeless. Inflammation set in afterward, and the patient died on the third day.

PENETRATING WOUNDS OF JOINTS, and non-penetrating contused wounds, are always serious. They may result in synovitis, complete or partial ankylosis, or loss of the whole

limb. The joint is known to be perforated by the appearance of a thick, transparent fluid (*synovia*) from the joint. This may be absent when the wound passes into the part from above downward.

*Treatment.*—If the wound is small, the edges should be drawn together as closely as possible and held in close apposition by adhesive plaster. Ice-bags, applied afterward, may prevent, or at all events modify, the amount of inflammation. Large wounds should not be entirely closed. Inflammation of the joint is an invariable accompaniment, and a space must be left through which the discharges may pass.

GUNSHOT-WOUNDS.—Under this head are included all wounds which result from the explosion of gunpowder. They may be made with bullets, cannon-balls, or splinters of wood and stone. The worst wounds are those inflicted by cannon-projectiles and splinters.

All gunshot-wounds, whether external or internal, are attended with danger. A greater amount of shock, contusion, and laceration, accompanies gunshot-wounds than is found in other varieties. Inflammation and suppuration follow in the track of the bullet. Pus is liable to be retained and burrow in the neighboring tissues. Deep suppuration is one of the principal dangers. The wound made by the bullet is smaller where it enters than where it leaves the body, and its edges are inverted, while at the point of exit the edges of the wound are everted. A bullet is easily driven out of its course by bony projections. The missile may strike a rib on the left side, and, passing under the tissues, emerge on the right side of the body. Henner relates a case where the bullet entered the upper portion

of the arm and passed down to the thigh on the opposite side.

*Treatment.*—The first efforts of the surgeon are directed to control the hæmorrhage, and to arouse the patient from the state of collapse by stimulants. When this is done, foreign bodies, such as pieces of clothing, bullets, splinters of wood or bone, are to be extracted. The presence of a bullet may be made out in deep wounds by the use of Nélaton's probe. This instrument consists of a silver shaft and a bulbous extremity formed of porcelain. When the bullet is touched a leaden-colored mark is produced on the porcelain. The wound is afterward syringed with a weak solution of carbolic acid, and covered with cloths dipped in an ice-water solution of the acid. Ice-bags are then found serviceable in limiting the amount of inflammation. When suppuration commences, warm fomentations may be used to hasten its progress, and the *débris* prevented from remaining by frequent syringing. In the suppurative stage, there is great danger from secondary hæmorrhage. Therefore, when the wound is in the vicinity of large vessels, it should be carefully watched, and a compress or tourniquet should be placed loosely around the limb, ready to be used at a moment's warning.

Gunshot-wounds of viscera are treated in the same manner that ordinary wounds are after extraction of foreign bodies.

## CHAPTER V.

### WOUNDS OF ARTERIES AND VEINS.

Ligation of large Arteries.—Air in Veins, etc.—Causes of Sudden Death.—Treatment.

WHEN large vessels are wounded, there is a great and immediate danger to life. The blood may be poured out externally, or become diffused in the tissues near the artery, or dissect up the sheath of the vessel. Efforts should in every case be made to tie both ends of the bleeding artery in the wound. (*See* article on Hæmorrhage.) If this cannot be done, the artery is then tied between the wound and the heart. Ligation of large vessels is generally followed by complete obliteration of their canals. The ligature divides the middle and internal coats, and brings the external walls together. The blood coagulates at each end of the ligature. The coloring matter of the clot is absorbed. Lymph is poured out between each coat of the artery, between the clot and the lining membrane, and external to the vessels, blending all these parts together, and becoming ultimately a fibrous cord. The ligature, meanwhile, makes its way out by a process of ulceration, and the space formerly occupied by it is filled up by granulation. From ten to fourteen days after the operation the ligature comes away, and then there is the greatest danger of secondary hæmorrhage.