medium is consolidated. This is effected by the formation of fibrous tissue in the deeper parts of the uniting medium and by the forma­tion of epithelial tissue in the more superficial parts where the skin is divided. Along with these changes the uniting medium becomes less vascular, and a linear scar is the result.

This is the case of an incised wound in which the surfaces are not brought at once into contact. If, however, this is done, the same changes take place, and in a small wound no untoward results need follow. But in a wound of some size there is danger in bring­ing the edges of the wound into contact. In consequence of the difference in the retractile power of the different tissues that are divided, it may be impossible to bring the deeper parts into accurate contact. The patient will complain of local pain, accompanied by a throbbing sensation, showing that an accumulation of serum has taken place. If a stitch is removed, the serum will escape and the local uneasiness disappear. If, however, no relief is given, the re­tained serum, pressing upon the surrounding tissues and acting as a foreign body, will cause effusion of more serum. The white blood corpuscles will pass from the vessels in large numbers, will die, and practically a cemetery of white blood corpuscles will be formed ; if a stitch is then removed a creamy fluid escapes. This fluid is termed “pus.” Once the tension is relieved, the local uneasiness disappears ; but the wound cannot then heal by primary union. The walls of the cavity must again become glazed ; vascularization must take place ; and, as the walls of the cavity gradually come together by contraction, fibrous tissue is formed. This is *union by second intention.*

The collection of white blood corpuscles floating in the effusion and eventually forming pus is termed an *abscess.* Pus may also form amongst the tissues after a blow or other injury. As the result of a blow a certain area of tissue becomes congested, and effusion takes place into the tissues outside the vessels ; the effusion coagulates and a hard brawny mass is formed. This mass softens towards the centre ; and if nothing is done the softened area gradually increases in size, the skin becomes thinned over it, the thinned skin loses its vitality, and a small slough is formed. When the slough gives way, the pus escapes. Such shortly is the history of an acute abscess under the skin, and the explanation generally given is that a local necrosis or death of tissue takes place at that part of the inflammatory swelling farthest from the normal circu­lation. When the dying process is very acute death of the tissue occurs *en masse,* as in the core of a boil or in the slough in a carbuncle. Sometimes, however, no such evident mass of dead tissue is to be observed, and all that escapes when the skin gives way is the creamy pus. In the latter case the tissue has broken down in a molecular form ; in the former case it has broken down *en masse.* After the escape of the core or slough along with a certain amount of pus, a cavity is left, the walls of which become lined with lymph. The lymph becomes vascular, and receives the name of granulation tissue. The cavity heals by second intention. Pus may accumulate in a normal cavity, such as a joint or bursa. It may also be met with in the cranial, thoracic, and abdominal cavities. In all these situations, if the diagnosis is clear, the principle of treatment is free evacuation of the pus, and in joints and in the peritoneal and pleural sacs washing out the cavity at the time of opening, free drainage, and careful antiseptic treatment during the subsidence of the inflammatory process. The tension is relieved by letting out the pus. If the after-drainage of the cavity is thorough the formation of pus ceases, and the serous discharge from the inner side of the abscess wall gradually subsides ; and as the cavity contracts the discharge becomes less and less, until at last the drainage-tube can be removed and the external wound allowed to heal. The large collections of pus which form in connexion with disease of the vertebræ in the cervical, dorsal, and lumbar regions are also now treated by free evacuation of the pus, with careful antiseptic measures. In all cases care should be taken to make the opening as dependent as possible in order that the drain­age may be thoroughly efficient. If tension occurs after opening by the blocking of the tube, or by its imperfect position, or by its being too short, there will be a renewed formation of pus.

When a considerable portion of tissue dies in consequence of an injury, the death taking place by gradual breaking down or dis­integration, the process is termed *ulceration,* and the result is an ulcer. As long as the original cause which formed the ulcer is at work, the gap in the tissues becomes larger and larger. Suppose that the ulcerative process is going on and the ulcer is spreading. The ulcer is then painful and the parts around are inflamed. Remove the cause by appropriate treatment and the necrotic process ceases, the shreds of tissue are cast off, the ulcer gradually cleans, the inflammation subsides, the pain disappears : the ulcer becomes a healing ulcer. The surface of the gap becomes glazed, and those changes take place in it which have already been described as occurring in an open wound. The gap gradually contracts in size. Round the edges cicatrization occurs, leaving a scar or cicatrix. Within the last few years the process of cicatrization has been hastened by planting on the granulation tissue small grafts of epidermic tissue in the manner already described (p. 681). There

can be little doubt that the growth of an ulcer, as well as the disintegrating process which precedes its formation, is closely associated with the multiplication of low forms of plant life in the decaying tissue. By destroying these organisms with some powerful antiseptic the destructive process may be checked. Since these organisms live on decaying matter, they are termed “sapro­phytic. The healthy tissues are antagonistic to their growth, and any treatment which renders the tissues around the gap healthy will interfere with their further development. The entrance of those organisms into a wound made by the surgeon, if they find in it a suitable soil for their development, is undoubtedly also a fertile cause of suppuration in wounds. But it must be distinctly remem­bered that any means which are adopted to keep the injured tissues in a healthy condition interferes with the growth of these sapro­phytes as directly as if the surgeon used some antiseptic substance which destroyed them. What relation obtains between a local necrotic process, such as the formation of a boil with its central slough, situated necessarily in the first instance under the skin, or the equally necrotic process, the formation of pus in a subcutaneous abscess, and these low forms of plant life ? There can be no doubt that by the injection into the tissues of a powerful irritant these necrotic changes can be induced without the intervention of organisms. Professor Ogston and Mr Watson Cheyne have also shown that micrococci are present in the great majority of acute subcutaneous necrotic inflammations, as they are commonly met with in the human body. Here the question at present rests. The opinion of the present writer is that in all probability they are the cause of the necrotic process. It is not asserted that they are the cause of the primary inflammation, w’hich need not go on to necrosis ; but the probability is that they find in the inflamed area a nidus for their growth and development. It is not known how they cause it, whether by direct action upon the tissues or by irritating products formed during their growth. The organisms described by Ogston and Cheyne have a life history and require conditions for their existence and development different from those demanded by the saprophytic organisms already described. To reach the subcutaneous area of inflammation they must pass by the blood-stream, and must be able to exist in the living blood. They are probably associated w’ith the infective class of organisms. In some suppurations at the present moment, such as acute suppurative periostitis, the formation of pus under the periosteum connected w’ith bone, a suppuration within the medullary cavity of a bone called osteomyelitis, and in acute ulcerative endocarditis, the organ­isms met with are undoubtedly infective. We do not know exactly how they enter the blood-stream, but we know that they can live in it, and that the occurrence of these diseased conditions is un­doubtedly’ a local effect closely connected with blood-poisoning.

A portion of the body may die in consequence either of an intense inflammation or of a cutting off of the blood-supply. Besides these two distinct varieties there is a great intermediate group of cases in w’hich both causes may be at work. A comparatively slight injury affecting a portion of the body imperfectly supplied with blood may give rise to an inflammatory condition which in a healthy part would be easily checked, but which in consequence of imperfect nutrition may end in mortification. Whilst the pressure of a tight boot in an old person with atheromatous vessels can give rise to mortification, the same pressure in a healthy person would give rise only to an evanescent redness. Frost-bite is a localized death of a portion of the body Which has been exposed to prolonged cold. It may attack the fingers or toes. The death may occur directly without any intermediate reactionary inflammation, or it may follow an excessive reaction. The rule of treatment in all cases of gangrene in which there is a tendency to death is to keep the part warm by layers of wadding, but to avoid all methods which hurry the returning circulation ; because any such increase would be followed by excessive reaction, which in its turn in a part already weakened would be followed by secondary death. When the part is dead, envelop it in antiseptic wadding to prevent putrefaction ; wait until the line of demarcation between the living tissues and the dead part is evident, and then, if the case permits, amputate at a higher level. In spreading gangrene in W’hich sepsis is present, and in w’hich no line of demarcation forms, the best chance for the patient—at best a poor one—is to amputate high up in sound tissues. In these cases the blood is generally poisoned, and if the patient recovers from the primary shock of the operation a return of the decaying process may attack the stump, aud carry him off.

III. Diseases.

1. *Diseases of Blood-vessels.*

An aneurism, in so far as we have to deal with it at present, may be defined as a sac communicating with the lumen of an artery. The sac-wall may be formed of one or more of the arterial coats which have become dilated. The tissues around, being condensed and being more or less adherent to the sac-wall, strengthen and sup­port it. The dilatation of the arterial coats is generally due to a local weakness, the result of disease. The diseased condition is almost always a chronic form of inflammation, to which the name *atheroma*