

ure. If this be true, in the former condition the pain would probably be circumscribed, while in the latter we would expect it to be diffused. Clinical facts, however, cannot always be reconciled with this view.

2. **CEREBRAL ABSCESS.**—In cerebral abscess headache is the earliest and most constant general symptom, just as it is in brain tumor. It is generally of great severity, but often manifests itself as a persistent dull ache, deeply situated, and referred mainly to the seat of the abscess. The development and growth of the abscess are likely to produce paroxysms of headache of the severest type. During the latent stage the pain may be slight and occur only periodically. The attacks may last for from several hours to several days. As in brain tumor, the pain is aggravated by everything that causes mechanical congestion or increases the intracranial circulation. The headache may be general, but is more frequently confined to the same side as the abscess. In otitic abscess it may be strictly circumscribed to the temporal region, the pain being first experienced in the ear, and later radiating over the entire head. Abscess in the cerebellum may begin with frontal headache, but is usually accompanied by pain in the occipital region and neck. In cerebral abscess the headache is generally associated with other symptoms of intracranial pressure, as optic neuritis, vomiting, and slowness of the pulse. As the disease advances, there may be general or localized convulsions, weakness of memory, restlessness, irritability, or mental confusion. Fever is generally present, but often disappears for varying periods, only to return higher than before. Frequently the temperature is normal or subnormal. The commonest cause of abscess in the brain is middle-ear disease. In such cases the temporal lobe or cerebellum is most frequently involved.

3. **INFLAMMATION OF THE PIA OR LEPTOMENINGITIS.**—This is always due to an infective process. The acute form is often purulent, and of the cerebrospinal type. Extremely severe general headache is a persistent, prominent, and obtrusive symptom. It may precede or follow a chill and rise of temperature. There may be vertigo, vomiting, general hyperesthesia, rigidity of the neck muscles, inequality of the pupils, and, later, mental confusion and coma. In *chronic leptomeningitis* persistent headache is a frequent symptom, but it is not present in every case. Its severity is probably dependent on the extent of the process. It is usually accompanied by signs of intracranial pressure, such as vomiting and optic neuritis. The disease may attack either the convexity or the base of the brain. In the former, the cranial nerves escape, there is more delirium, and there may be unilateral or general convulsions and hemiparesis. In the latter, several or many of the cranial nerves may be involved, and there is more marked rigidity of the post-cervical muscles.

4. **INFLAMMATION OF THE DURA OR PACHYMEINGITIS EXTERNA.**—The headache is usually circumscribed, and is often accompanied by nausea or vomiting and slight fever. When only one side of the convexity of the brain is involved the pain is confined to the same side. In severe cases the disease may extend to the pia, and it is then often accompanied by typical Jacksonian epileptic attacks and hemiparesis on the opposite side of the body. It is usually the result of traumatism to the skull, of caries of the petrous portion of the temporal bone, as in mastoid disease, of syphilis, and of ethmoidal caries. *Pachymeningitis interna or hematoma of the dura* is also accompanied by headache and somewhat similar symptoms. This disease occurs most frequently in old people with chronic alcoholism, syphilis, or dementia.

5. **INTRACRANIAL SYPHILIS.**—Headache may antedate all other symptoms of intracranial syphilis, especially syphilitic meningitis, for several months or years. As a rule, it is the earliest and most constant symptom, and often occurs in paroxysms, or there are periodical exacerbations in which it becomes intolerable. Very frequently such exacerbations occur toward evening or at night, and thus prevent sleep. At times the attacks are periodical. At the height of the paroxysm the pain often becomes

excruciating, while during the intervals it may diminish to a dull aching sensation or entirely disappear. The headache is rarely circumscribed (unless there is disease of the cranial bones), but is usually distributed over the frontal, temporal, or parietal regions, and eventually over the occiput and neck. Extreme tenderness on pressure upon the skull occurs only when the periosteum or bones are involved at the same time. The pathological process affecting the intracranial structures is that of arteritis, gumma, or gummatous meningitis. It is uncommon for all three conditions to exist at the same time. The meningitis is frequently of the type of a meningo-encephalitis, and may be confined either to the convexity or to the base of the brain. In the former, there are more delirium, and disturbance of consciousness, and localized or general epileptic seizures, sometimes followed by hemiparesis or hemiplegia. In the latter, the cranial nerves at the base often become involved, thus producing facial or ocular paralysis, etc. Chronic syphilitic meningitis is generally local, and occurs chiefly in the neighborhood of a gummatous growth. The main features or general symptoms of cerebral syphilis are similar to those of tumor. Thus, in addition to headache, there are vomiting, double optic neuritis, and various paralyses. Mental hebetude, somnolence, or periods of unconsciousness are often characteristic and almost pathognomonic symptoms that occur in association with the persistent headache of intracranial syphilis. In addition, there often are alterations in character, loss of memory, mental dullness, and absence of the pupillary light reflex.

6. **VASCULAR DISEASE.**—Headache due to arterio-sclerosis is essentially the result of circulatory disturbances in the brain and interference with nutrition. (See Cerebral hyperemia and anemia.) In syphilitic endarteritis, however, the headache is not due to the arterial changes alone, but to the associated meningitis or gumma. Vascular disease, such as arteritis and sclerotic degeneration, frequently arises in conjunction with chronic renal disease, chronic gout and rheumatism, and old age.

7. **ENCEPHALITIS.**—This is an acute inflammatory affection of the brain. It has recently been well-described by Oppenheim as "acute primary hemorrhagic encephalitis." The headache is very severe, and generally affects the entire head, or the pain may be greater in the occipital region and neck. It is accompanied by vertigo, nausea and vomiting, apathy and general depression. These symptoms are soon followed by somnolence, which rapidly develops into unconsciousness. Later, there may be monoplegia, hemiplegia, and various other signs indicating involvement of special cerebral centres. Recovery is not infrequent. The disease is rare, and generally affects young people between fifteen and thirty years of age. As it most frequently complicates or follows acute influenza, it has also been termed "influenza encephalitis." It is acute in its onset, beginning like many of the acute infectious fevers.

There is another form of encephalitis known as "acute polio-encephalitis superior." After several days of headache, vertigo, and vomiting, mental confusion and delirium take place. At about the same time the eyes become involved in paralysis of ocular muscles, which at times develops into complete ophthalmoplegia. It usually terminates in death in about two weeks. Recovery is rare. This disease was originally described by Wernicke. It is an acute hemorrhagic encephalitis confined mainly to the gray matter in the floor of the third ventricle and that of the aqueduct of Sylvius. Chronic alcoholism and infection are the usual causes.

8. **MASTOID DISEASE AND SINUS THROMBOSIS.**—Headache occurring in these conditions is usually on the same side as the lesion. Beginning in the ear the pain radiates over the entire side of the head. When severe, it generally arises in consequence of the extension of the infective process to the dura. As the local and general pyæmic infection advances, the headache often diminishes *pari passu* with the obtunding of the sensorium. Furthermore it may be complicated by the presence of a subdural, temporal, or cerebellar abscess, and leptomen-

ingitis may ultimately develop with its usual train of symptoms. Mastoid disease and sinus thrombosis are in nearly all cases due to middle-ear disease and caries of the petrous portion of the temporal bone. Sinus thrombosis is also a complication of facial carbuncle and erysipelas of the head.

9. **DISEASE OF THE CRANIAL BONES. PERIOSTITIS.**—Bone disease affecting the exterior of the skull is the result of traumatism in the majority of instances. In a large proportion of cases, however, there may be periostitis due to syphilis, *i. e.*, periosteal nodes over the cranium. Circumscribed gummata of the skull arise in the most part in the epicranial periosteum. In such cases headache is often constant and, as in all forms of intracranial syphilis, is liable to exacerbations during the night. The bone affected is usually tender and painful to the touch. The headache accompanying cranial periostitis may be mistaken for the form of headache due to muscular rheumatism, or vice versa.

10. **DISEASE OF THE FRONTAL SINUS.**—In catarrh or suppuration in the frontal sinus, the headache is confined to the frontal region as a rule, but may become general, with the greatest intensity over the affected sinus. At first the pain is dull and intermittent in character. It may gradually or suddenly become persistent and severe and prevent sleep. Percussion over the sinus usually increases the pain. Swelling and tenderness of the tissues over the region of the affected sinus are commonly present, and ultimately all of the symptoms of local and general infection may develop.

11. **CARIES OF THE CERVICAL VERTEBRÆ.**—Occipital headache is commonly present in caries of the upper cervical vertebrae. The pain may extend to the parietal and temporal regions, and is increased by movement and deep pressure over the vertebrae. It is usually accompanied by rigidity of the neck muscles, or the head may be partially fixed in the median line.

12. **ACROMEGALY.**—The headache may be localized in the occiput or the frontal region, or be confined to one side of the head. It may be continuous or intermittent, and is often persistent and severe, usually being worse in the morning. It is almost always accompanied by ocular symptoms, such as impairment of central vision or bitemporal hemianopsia, which often terminates in optic atrophy and complete blindness. Acromegaly is a rare disease, and was first described by Pierre Marie of Paris, in 1886. Since that time many cases have been observed in this country and elsewhere. The diagnosis of the cause of the headache can be made only by a recognition of the associated pathognomonic physical signs of the disease, *i. e.*, enlargement of the hands and feet, enlargement of the cranial and facial bones, hypertrophy of the tongue, and of the muscular and connective tissues of the extremities, slow but progressive weakness, and the visual defects as above described.

The headache may continue for years or persist during the progress of the affection, and is supposed to be due to the enlargement of the hypophysis (pituitary body).

13. **SPINAL-CORD DISEASE.**—Headache cannot be considered a symptom of spinal-cord disease. When it is present, it is merely a coincidental element in the general constitutional disturbance, or due to some complication. The characteristic tabetic neuralgic pains occasionally attack the scalp, and are due either to involvement of the spinal or cerebral sensory root of the trigeminus, or to irritation in its peripheral distribution.

GENERAL DIAGNOSIS.—The diagnosis of the cause of headache depends entirely upon the patient's history and the presence or absence of certain associated symptoms. This will be readily appreciated after a review of the conditions in which headache occurs, either as a concomitant or as a pathognomonic symptom. The general health of the patient must always be carefully investigated, particularly with regard to the function of the digestive tract and the action of the kidneys. While the seat of the pain is often suggestive, too much stress must not be placed on this indication, for in all forms of headache the

pain may vary in its location from time to time. In supraorbital and occipital neuralgia, the pain is more or less paroxysmal and superficial in character, being usually confined to the anatomical distribution of the nerve, and is therefore not a true cephalalgia. Continuous headache lasting many days, with nocturnal exacerbations, should always lead to the suspicion of cerebral syphilis. It is always necessary to decide whether the headache is due to a functional disturbance, or is the result of organic intracranial disease. A safe rule to follow in all cases of persistent headache is to ascertain if any signs of cerebral disease are present, such as muscular spasm; paresis or paralysis affecting the face, extremities, or cranial nerves. A constant general headache which is accompanied by optic neuritis and frequent attacks of vomiting invariably points to intracranial disease. The examination of the pupils should never be omitted. In hyperæmic forms of headache the pupils are usually contracted, while in anemia they are found dilated. When the pupils fail to react to light, or are absolutely rigid, the vision being unaffected, it is highly suggestive of cerebral syphilis or some other form of cerebral degeneration. The ophthalmoscope often proves extremely valuable in diagnosis. Although abnormalities of the cerebral circulation may exist without evidence of such disturbance in the retina, the discovery of "choked disc" or optic neuritis, or a high degree of hypermetropia or myopia, will often be the means of determining the cause of the headache. The most important use of the ophthalmoscope in cases of headache is to determine the presence or absence of optic neuritis. White its absence does not exclude organic disease, its presence is presumptive evidence of some form of intracranial disease (basal meningitis, increased brain pressure from cerebral tumor, or the vascular degeneration associated with renal disease).

TREATMENT.—A careful investigation of the entire organism is essential in every case, the most important element in the treatment of patients with headache being the recognition of the cause, as the pain is oftener dependent upon some underlying constitutional condition than upon organic intracranial disease. The discovery and correct interpretation of such facts should be the principal guide in the adoption of therapeutic measures. In the toxæmic form of headache, as well as in all other forms, it is absolutely necessary that the intestine be kept free from fecal accumulation, and that the action of the digestive organs be regulated by suitable diet. Headache from constipation is rapidly relieved by a brisk cathartic. All supposedly reflex causes should be rectified, but too much stress must not be laid upon the paramount importance of such disorders, for many patients seem to possess an inherited or inherent predisposition to develop headache upon the slightest provocation. It is generally desirable and universally advocated that any existing error of refraction or eye-muscle defect be corrected. Even when such conditions are discovered and remedied, relief from the headache does not always follow, for several causes may be operative in the same individual. Therefore, before saddling a patient with spectacles for slight refractive errors, or cutting the eye muscles, or operating upon the nose for deviated septum, or replacing a slightly displaced uterus, or suturing a trifling laceration of the cervix, etc., all other probable causes of the headache should be systematically eliminated. Headache due to cerebral congestion may be relieved by the avoidance of all forms of cerebral stimulants and psychical excitement, regulation of the diet, free purgation by calomel and salines, and the administration of bromide of potassium gr. xv., and fluid extract of ergot ℥ xv., every three or four hours. Severe cases require cupping or blistering over the nucha, and local blood-letting or venesection. It would appear from the experiments of Leonard Hill and others upon dogs that the application of ice-bags to the head as a form of treatment has practically no effect upon the cerebral circulation. Hence the time-honored custom of using the ice-coil and ice-bag in cases of meningitis or cerebral

congestion is without any scientific evidence as to its action. Its clinical value, however, is still an open question. When the ice-cap is used, it should always be applied to the shaven scalp. In headache from cerebral anemia, rest in bed with the head low, and special attention to the cause (which is usually general anemia) are of prime importance. The administration of cardiac tonics, and the use of iron and easily assimilated food, generally prove successful when organic visceral disease is absent. In every form of headache we are often forced to resort to the temporary use of local applications of dry or moist cold or heat, or some form of anodyne or counter-irritant. Antipyrin, acetanilid, phenacetin, caffeine with bromide of potassium, etc., or diffusible stimulants such as aromatic spirits of ammonia, tincture of valerianate of ammonia, etc., often prove serviceable as symptomatic remedies, but their selection must be left to the judgment of the physician. When headache accompanies the infectious or malarial fevers, the reduction of the temperature by hygienic or other appropriate measures, or the use of quinine, usually proves efficacious. In headache due to cerebral tumor, free catharsis from time to time, the avoidance of cerebral stimulation or of causes known to produce interference with the intracranial circulation, the administration of the drugs above mentioned, or morphine if necessary, constitute the essential features in the medical treatment. The operation of trephining the skull should be resorted to if other methods fail to relieve the pain. This is often followed by decrease in the intracranial pressure and cessation of the headache. When the tumor is accessible to surgical measures, it should be removed as soon as its location is established. It is customary, before operating, to institute a thorough course of antisyphilitic treatment in order to give the patient the benefit of any doubt as to the possible gummatous character of the growth. The subsidence of headache and other general symptoms of cerebral tumor during the administration of mercury and iodide of potassium does not necessarily imply that the neoplasm is syphilitic, for the irritative symptoms of sarcomatous and other processes have been known to undergo retrogression under this plan of treatment. Headache due to syphilis (gumma, meningitis, periostitis) is rapidly relieved by mercury and iodide of potassium. In cerebral abscess, correct localization and immediate surgical operation constitute our only hope.

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HEAD, WOUNDS OF.*—Certain features in the anatomy of the skull are of great surgical importance when considering the nature and occurrence of wounds of its component bony parts and of injury to the brain. The periosteum of the cranium—called usually the pericranium—is not thick, but is strong and resistant. Except over the sutures and the great foramina, it can be easily stripped off, or even made to glide over the bone; though in the aged its connection with the underlying bone is more firm. It is nourished principally by vessels from the bone. The internal periosteum of the cavity of the cranium is the dura mater, which is thicker and tougher than the pericranium. Concerning the cranial bones themselves, it should be remembered that the diploë exists only during middle life, and is not to be found in the very young or very old. The amount of space which the frontal sinus may occupy should always be borne in mind.

Of great importance are the connections which the veins of the superficial soft parts enjoy with the deep sinuses and the veins of the diploë through the emissoria Santorini. The most important of these anastomoses are: (1) Among the occipital veins, which connect with the lateral sinus through the mastoid foramen; (2) along and around the interparietal suture, especially its posterior extremity, where numerous openings connect with the

* Use has been made in this article of a portion of that which appeared in the first edition of this work on "Skull, Fractures of the Base of," by Dr. Thomas H. Russell, of New Haven, Conn. The part thus used is enclosed in quotation marks.

superior longitudinal sinus; (3) the ophthalmic veins, according to Sesemann's investigations, empty into the cavernous sinus as well as into the facial veins. It will thus be seen that the sinuses of the brain have their overflow outlets, or "waste weirs," in abundance. Nevertheless, this freedom of venous connection enhances materially the danger from pyæmic or thrombotic trouble in case of erysipelas or phlegmon of the external soft parts.

It will be well, at the very outset, to give here the greatest possible prominence to the classical dictum (so often ascribed to Sir Astley Cooper, but really clearly enunciated by Hippocrates): "No injury to the head is too slight to be despised, nor too severe to be despaired of." There is a great temptation to ignore trivial scalp-wounds, to cleanse them insufficiently, or to dress them carelessly. If nothing else teaches the danger of carelessness in these cases, the experience gathered from the sword-duels of German students should be convincing, since each year several deaths are caused by comparatively trivial scalp- or face-wounds.

SUPERFICIAL WOUNDS.—Bruises and contusions need only slight attention besides rest: evaporating lotions, cold applications, or, if the patient is not seen till after swelling and ecchymosis have taken place, then hot applications constitute all that is required. Upon a superficial abrasion some antiseptic should be used. Any ordinary effusion of blood between scalp and bone will be checked, and then reabsorbed, under this treatment. The hair may be cut short or shaved if required; this should be done if the wound has been in any sense severe. If effusion be very great, and apparently unchecked after prolonged trial with simpler measures, then it would be right to make a free incision, turn out the fluid or solid blood, search for bleeding vessels, twist them or tie them with catgut, cleanse thoroughly, wait till all bleeding has stopped, and then neatly approximate the edges of the incision with fine silk or catgut, with the insertion of a few threads of horse-hair or catgut for drainage, and with a firm compress over all. Of course all this should be done under antiseptic precautions, with clean hands and instruments, etc.

Small punctured wounds need only antiseptic occlusion after their freedom from foreign matter has been secured. Small instruments and weapons sometimes make small punctures, yet wound a vessel of some size. Numerous cases of aneurism of terminal vessels have been reported from such causes. From such a wound hemorrhage would be free, while it would be easy to recognize whether an artery or a vein, or both, had been injured. If a vein, pressure would in most cases suffice; this should be made a part of the antiseptic occlusion, being maintained by an elastic bandage or by some mechanical device.

But if an artery be wounded and such pressure be insufficient, it should be included in a deep suture or occluded by acupressure. This might need to be done on either side of the cut, which should then be cleaned and occluded as before. In other cases it might be well to clip off the hair, shave the part, and enlarge the opening so that the bleeding vessel may be caught and secured.

Extensive lacerations or complicated incised wounds are often received, by which large skin flaps are torn up and the periosteum is stripped rudely off, and yet with only temporary concussion or "stunning."

In such cases the attendant should satisfy himself that the bone has received no such injury as may call for operative interference. He should first check hemorrhage, next shave the parts, and then, with sponge and forceps, address himself to removing every particle of dirt and every loose hair. Shreds of tissue whose vitality is doubtful had best be removed. It then remains only to close the wound. If periosteum have been torn and raised, it is best to readapt the torn edges with fine catgut sutures. Then the superficial wound edges are carefully approximated by silk or catgut sutures, continuous or interrupted. At each angle a stitch may be

omitted for the escape of serum, or a few catgut threads may be inserted for capillary drainage.

In the dressing of such wounds, gentle compression should be so exerted as to compel approximation of raw surfaces. For small wounds collodion makes a very serviceable application, the parts being first thoroughly dried and dusted with an antiseptic powder. When a moist dressing is used about the scalp or hairy face, the writer usually prefers a glycerin dressing; *i. e.*, some antiseptic in glycerin solution or emulsion, since whatever serum exudes from the wound will be readily taken up, and the dressing cannot dry and so stick to the parts that its removal will be very unpleasant to the patient.

For all dressings about the head, the writer esteems naphthalin very highly, since it seems to be particularly prophylactic against erysipelas; the latter being more common after head injuries than after those of any other part of the body. Should there be any special reason to fear inflammation, as meningitis, an ice-bag may be applied outside the dressing.

Cases occasionally occur in which some part, or nearly the whole, of the scalp has been torn off or torn loose, as by machinery or "scalping." If the patient be seen in time an effort should be made to replace the loose portion. Astonishing successes have been reported in injuries of this nature, and the case must indeed be very severe which does not justify a trial. The general rules given above are sufficient to guide the reparative effort; perfect cleansing, proper antiseptic, accurate approximation, and judicious pressure constituting the important canons of treatment. Should the effort partially succeed or fail, if the loss of substance be not too great, a plastic operation may be attempted: otherwise the bare or raw surface must be kept clean, and healthy granulations stimulated by such dry applications as zinc oxide or boric acid, or compresses soaked in a saturated solution of potassium chlorate. The healing process may be further hastened by Thiersch skin-grafting. No case of this kind, which is not speedily and primarily fatal, need be despaired of.

The soft spots about the head and face possess great reparative and recuperative power, and pieces which have been severed may yet unite by adhesion if properly and quickly reapplied. Thus, by bites and by various accidents, portions of the nose and ears may be nearly or quite detached. Unless the circumstances be very unpropitious the attempt should be made to restore them. Careful cleansing and perfect approximation are here, as elsewhere, essential to success.

Ragged lacerations of the lips and cheeks may sometimes be cleaned and sewed up; at other times it will be best to trim or pare their edges, and then neatly close the wound, this procedure causing less scar or disfigurement.

It may happen that we are called upon to deal with parts which have already become inflamed, or, perhaps, erysipelatous. In such case we should proceed as follows: The hair or beard should be closely removed. If the appearance of the part or the general condition of the patient indicates any septic process, the wound should be opened, its interior freely exposed to examination, and a most painstaking disinfection of its entire surface made. Foul spots or suppurating surfaces should be treated with an eight-per-cent. solution of zinc chloride, new openings made for drainage at the most dependent parts, and, according to circumstances, the edges reunited or the whole left open to close by second intention, putrefying and necrotic tissue being removed with knife, scissors, or curette. Abscesses should be laid freely open and their cavities disinfected. If erysipelas have supervened, the whole scalp may be covered with antiseptic poultices, of which the best is made of common brewers' yeast, to be soon followed by the Crèdè silver ointment, or one containing two per cent. of guaiacol and ten per cent. of ichthyol. Few surgeons would feel justified in making ice applications in such a case unless cerebral complications were extremely severe. It will of course be remembered, in the light of the vascular connection between the scalp and deeper parts (*vide* above),

that all cases of erysipelas of the head are at least serious.

With reference to later results of former injuries in the way of granulating or indolent ulcers, caries, necrosis, etc., there are no indications calling for treatment different from that generally resorted to for similar conditions elsewhere about the body. A healthy ulcer may be covered by skin grafts, or by a plastic operation; an unhealthy one should first be made healthy. All dead or dying bone should be removed with curette or chisel, and its surface allowed either to heal by granulation or to be covered by a plastic operation.

The soft parts about the head and face are, if possible, more vascular than in other parts of the body. This means, on the one hand, that life may be lost by neglect or from ignorance. Thus, within a short time, the writer has seen a drunken man so completely exsanguinated by hemorrhage from a superficial scalp wound only 2 cm. long, that it was with the greatest difficulty and care that he was recalled to life. On the other hand, by virtue of this excessive vascularity, reparative processes go on more rapidly; and, provided that proper precautions have been taken, it is the rule for most extensive solutions of continuity to heal *per primam*.

Superficial gunshot wounds should be treated on general principles. It must be remembered that a bullet may not only pursue a most tortuous track, but may carry in foreign matter. Such a wound should either receive primary antiseptic occlusion, without the slightest exploration or disturbance, or its track must be carefully cleansed and drained, being laid open for this purpose if necessary. After it has been interfered with or explored it differs in no wise from other wounds, so far as indications for treatment are concerned. There is seldom any positive indication for removal of a deeply buried bullet, save the anxiety of the patient, and this of course is a minor consideration.

DEEP WOUNDS WITH INJURIES TO THE BONES.—Like all other wounds, these call at first for hæmorrhage, then for perfect cleanliness, with removal of the hair in the neighborhood. This completed, exact exploration should be made. Should it appear that underneath a small external lesion extensive damage is concealed, then by free incision the whole must be exposed to touch, if not to sight. According to the extent of these deeper lesions the superficial wound, as thus extended, should or should not be reunited.

It may happen that one or more pieces of the external table, or of the malar or other bones, may be chipped off or entirely separated from their bony basis, and held only by their connections with the periosteum and soft parts. Not forgetting that they may still be nourished by these connections, it is, on the whole, the safest plan to remove them, leaving if possible the periosteum. But should a prominent process of bone be thus detached from its seat, *e. g.*, a part of the supra-orbital ridge or margin of the orbit, or even the mastoid process (and such cases have been reported), it would only be proper to make every effort to save it. Such a fragment is to be held in place by pressure, by stitches in the periosteum, or by drilling and suturing with catgut or silver wire. Pieces of bone that lie quite loose must unhesitatingly be removed, even if dura mater or brain be thereby exposed.

Hemorrhage from a denuded bone surface, and oozing from a deep wound, may commonly be checked by ice-water or hot water and pressure. A solution of antipyrin (five per cent.) makes a most excellent styptic, while suprarenal extract or "adrenalin" furnishes almost an ideal remedy in this regard. Once checked, the bleeding is not likely to recur after the wound is protected from the air and dressed with suitable compression.

Aside from leaden projectiles, a great variety of foreign bodies may not only injure the cranial bones and those of the face, but parts of them may even become embedded or disappear from sight—as, for example, workmen's pointed tools, knife-blades, bayonet, sword or foil points, arrow-heads, hatchet or tomahawk points,