

rare instances it remains permanently, is usually of short duration. The paralysis of the muscles of the trunk and of the tongue, and the indistinctness of articulation usually disappear at an early period. The facial paralysis also diminishes, sometimes disappears altogether. The paralysis of the arm is usually most profound, and slowest to improve.

The hemiplegia of a later period is, as a rule, to be found only in the face and extremities, though sometimes the tongue continues, when protruded, to deflect toward the paralyzed side. If the facial paralysis be slight, it will be observed that the nasolabial fold is less marked than on the sound side, that the upper lip is less arched, and the angle of the mouth droops somewhat on the affected side. A slight paralysis becomes more marked when the muscles are actively exercised, as in smiling, exposing the teeth, etc. Not rarely the effort to expose the teeth will reveal a decided facial paralysis, while laughing will show none whatsoever—probably a psychic reflex act on the part of the thalamus. The opposite, the appearance of a more decided paralysis with laughter than with voluntary movements of the face, is observed in rare instances, probably indicating lesion of the thalamus. In the extremities usually certain groups of muscles are most likely to be paralyzed, or most deeply affected, e.g., extensors of the fingers, supinators, trapezius muscles, anterior tibial, and peroneal group of muscles, and flexors of the knees. As a rule the hands and feet are more affected than the higher parts of the extremities. The skilled movements of the fingers are most affected. In walking a dragging of the toes on the paralyzed side is often observed.

In cases of permanent hemiplegia, especially if the paralysis be considerable, after a few weeks contracture of the paralyzed muscles usually occurs, a condition termed late rigidity. In a well-marked case we shall find the arm drawn toward the chest, the forearm flexed on the arm and pronated, and the fingers flexed; in the inferior extremity all the joints extended, and the foot in the position of talipes equino-varus. The rigidity is usually greater in the upper than in the lower extremity. In rare instances we find extension of the joints of the arm instead of flexion, or flexion in the lower extremity instead of extension. Sometimes the muscles of the face are also affected; then the naso-labial fold becomes deeper, and the angle of the mouth elevated on the affected side. In extreme cases the rigidity is more or less constant; but usually it is much less than in the instance above described, and it is then increased by voluntary efforts to move the parts, or by emotional excitement, while it is diminished or absent during sleep. In some cases the rigidity improves very much with time, so that it is only observable during acts requiring special skill.

Hemiplegics often succeed in walking with the aid of a cane, even though the leg be completely paralyzed, especially if the limb be at the same time rigidly extended. In this case the pelvis and hip of the paralyzed side are elevated by the contraction of the abductor muscles of the thigh on the sound side, and the foot is then propelled forward by the action of the inward rotators of the healthy limb, the toes usually scraping the floor during the forward movement. The body now rests partly upon the foot of the paralyzed limb, partly on the cane, held in the hand of the sound side, the centre of gravity being between them while the healthy limb is being brought forward.

In permanent hemiplegia the deep reflexes are usually very much increased. The knee jerk, elbow jerk, wrist jerk, etc., are exaggerated and the ankle clonus can be elicited, which is almost never found in healthy individuals. The deep reflexes may even be exaggerated, though to a less degree, on the non-paralyzed side. But it is also true that the latter side may be weaker than before the paralysis set in. There is often some alteration in the condition of the superficial reflexes. Only one of the latter has much diagnostic import, the toe phenomenon, recently described by Babinsky. The usual plantar reflex is flexion of the toes. Babinsky observed that

when there is disease of the pyramidal tracts stroking the sole of the foot produces extension of the big toe. Care is usually necessary to get the proper response. The patient's mind should be distracted if possible, and then a stroke slowly made from the heel toward the toes. A not pointed pencil answers very well for making the stroke. This sign has not the full significance of the ankle clonus, because not so commonly found, yet it may have a greater diagnostic value, because it may be found very soon after the paralysis sets in, while one or several weeks elapse before the ankle clonus can be elicited. In several instances the writer has found the toe phenomenon within one, or at least a few, hours after the onset of an apoplectic stroke.

Other motor phenomena are observed more or less frequently, the probable results of irritation of, or lessened inhibition in, the motor areas. Often there is a movement of the paralyzed arm—hand lifted to the head or the like—in yawning, etc. A slighter movement in the paralyzed extremity is frequently observed at the same time with corresponding movements of the sound limb. The opposite is also observed, viz., contractions of corresponding muscles on the sound side with attempted movements of the paralyzed side. The kind of motor phenomena just described are usually spoken of as accessory movements. More rarely tremor, or choreic movements, or athetoid movements (slow continuous movements of fingers and toes) are found in the paralyzed extremities. The choreic and athetoid movements have been supposed to occur especially with lesion of the thalamus. If that be true, it is probable that it is rather because the posterior part of the internal capsule is affected than because of injury to the thalamus itself.

SEAT OF LESION.—Hemiplegia is most frequently caused by a lesion of the corpus striatum, or in its neighborhood, the paralysis being on the opposite side of the body. If the paralysis be permanent, it is because the internal capsule has been damaged, while the late rigidity is attendant on degeneration of the pyramidal tracts.

Hemiplegia, produced by lesions in other parts of the motor tracts, has in some instances special manifestations.

Cortex.—Lesions in the motor area of the cortex, the anterior and posterior central convolutions, more frequently produce monoplegia—paralysis of one limb, or of the face—than hemiplegia, but the latter may occur if the lesion be sufficiently extensive. Such lesions are often attended by convulsive movements, especially in case of a neoplasm. In such instances there occur usually periodic attacks of clonic spasms in one extremity or one side of the face; in the hand if the lesion chiefly affect its centre, etc. These spasms are likely to be at first quite limited and not accompanied by loss of consciousness. But in succeeding attacks the convulsions may extend to other parts of the body. They first travel over one side of the body. If the convulsion also seizes the other side, loss of consciousness is likely to supervene. There is often some blunting of the sensibility corresponding to the amount of paralysis, indicating that the cortical centres for motion have also direct relationship with the sensory functions. But such cases do not always give a like clinical picture. In a case of the writer's, in which there was a large tumor on the convexity, implicating chiefly the leg centre, there was paresis of the opposite arm and leg, but no appreciable impairment of sensation, and there had never been any convulsive movement.

Crus Cerebri.—Hemiplegia from lesion of the crus cerebri is often attended by paralysis of the third nerve on the side of the lesion. There is paralysis of the face and extremities on one side, and of the muscles of the eye on the other side.

Pons Varolii.—Lesions of the pons Varolii cause what has been termed alternate hemiplegia, that is, paralysis of the arm and leg on one side, and of the face on the other, the extremities being affected on the side opposite to, the face on the same side as, the lesion. The reason for this is the following: The central prolongation of the

seventh nerve, like that of all other motor nerves, passes from one side of the brain to the other, the site of crossing being, in case of the seventh, in the pons. Lesions, then, in the latter locality may affect only the peripheral parts of the nerve—the nerve trunk itself, or its nucleus—and the facial paralysis be on the side of the lesion. The facial paralysis in such cases differs from that with ordinary hemiplegia, in that it has the stamp of peripheral paralysis. The paralysis is likely to be complete, all parts supplied by the nerve being equally affected, the eyelids and forehead as much as the lips and cheek. There will also be found changes in the electrical reactions, the so-called reaction of degeneration. The electrical reactions of the nerve and faradic contractility of the muscles are lost, while the galvanic contractility of the muscles may be heightened, but with a change in the normal formula of the reactions. Such changes in the electrical reaction are never found in central paralysis, only in paralysis of a peripheral type. If the degree of paralysis be great, some atrophy of the facial muscles may also take place.

Medulla Oblongata.—Hemiplegia from lesions of the medulla is likely to be attended by paralysis of other cranial nerves, while the seventh nerve escapes. There are likely to be a considerable paralysis of the tongue, indistinctness of articulation, and paralysis of the vocal cords from the involvement of the hypoglossal and pneumogastric nerves. The writer had under his observation a case of unusual interest, in which there was probably a lesion of the medulla and pons of traumatic origin. The injury was caused by an iron rod penetrating the right submaxillary space, and passing upward four inches in the direction of the foramen magnum. Immediately after the injury there was complete paralysis of the right arm and leg, of the cheeks, lips, tongue, and vocal cords. The patient was unable to swallow or to make any vocal sound. The upper part of the face was unaffected. He could move the eyes freely, open and close the lids, and was entirely conscious. There was also loss of sensation on the left side of the face. The condition of the patient rapidly improved, but there remained permanently a right-sided paralysis, considerable difficulty in articulation, and anaesthesia of the left side of the face.

Spinal Cord.—Hemiplegia from unilateral lesion of the cord is not attended by paralysis of any cranial nerve, but the arm and leg of the same side are paralyzed if the lesion be in the cervical region, and the leg only, if the lesion be at a lower level. Such a unilateral lesion produces a peculiar array of symptoms, spoken of as Brown-Séquard paralysis, because produced experimentally and first described by that distinguished physician. The symptoms are motor paralysis and loss of muscular sense, on the side of the lesion, in every part below it, and impaired or lost tactile, pain, and temperature sense on the opposite side. There is likely to be a narrow area, encircling the body, at the level of the lesion, in which there is hyperaesthesia. The explanation of the symptoms appears to be that the tracts for the motor fibres and muscular sense run up in the cord on the same side as are the corresponding nerve roots, and only cross to the other side in the medulla, while the tracts for tactile, pain, and temperature sense cross to the other side of the cord immediately after leaving the nerve roots.

Infantile Paralysis.—Some cases of hemiplegia of infancy, which are either congenital or acquired early in life, deserve special mention. The lesion is a varied one, from hemorrhage, inflammation, arrested development, etc., and is often of traumatic origin. The hemiplegia is usually attended by contractures of the paralyzed muscles, and by a considerable arrest of development. The leg and arm are smaller in circumference and shorter than those on the sound side, and the face is also frequently smaller than on the paralyzed side. The choreic, athetoid, and accessory movements already spoken of occur very frequently in these cases. Great impairment of intellect, even complete idiocy, is frequently found, and epileptic convulsions become established in many cases.

Hysterical Hemiplegia.—In hysterical hemiplegia the paralysis is mostly confined to the extremities, the face escaping. When there is an appearance of facial paralysis it is usually found that there is really spasm, not paralysis of the facial muscles. It is not so commonly true of hysterical as of organic paralysis that the arm is more profoundly paralyzed than the leg. Mostly the paralysis is not complete. There is paresis, rather than paralysis. In that case one frequently observes that the resistance of the patient to the efforts of the examiner to move the limb is done in a jerky manner. There is resistance for a moment, then none whatever, as though there were no effort on the part of the patient. More power may be manifested in emotional conditions, in gesticulation, etc. A degree of power may be revealed in an apparently paralyzed limb, by a sense of resistance on passively moving the limb, or by the limb remaining momentarily in the position in which it has been placed, a position requiring some muscular effort. The gait is ordinarily different from that of organic hemiplegia, the paralyzed foot rather dragging behind, than swinging forward in a circle.

The reflexes are commonly not affected, neither the superficial nor deep being altered in the way already described as occurring in organic hemiplegia. Not rarely contractures occur in the paralyzed limbs. As a rule they make the prognosis less favorable, at least in so far as the duration of the symptoms is likely to be much greater. Anaesthesia is commonly found with hysterical hemiplegia. The sensory symptoms are usually more extensive than is the paralysis, the face being affected as well as the extremities. There may be both superficial and deep anaesthesia and also of the special senses on the affected side. Not rarely there is partial anaesthesia, loss only of tactile, or only of pain sensation, or impairment of one more than of the other. The patient may be altogether unaware of the impaired sensation.

Hysterical hemiplegia affects mostly the left side. It has been said to occur three times as often on the left as on the right side. It may come on abruptly or gradually. Not rarely it follows a convulsive seizure. It may be caused by an injury, or any physical or mental shock. Very likely an emotional condition, or, at least, some mental impression underlies the hemiplegia in most instances, though it need not immediately follow upon the exciting cause.

The patient usually recovers from the paralysis, but it may take days or years. During this time the paralysis may remain unchanged, or it may vary greatly in its intensity. The disappearance of the paralysis, just as its inception, may be due to mental causes, shock, suggestion, or the like.

The characteristics of the paralysis just given may suggest or establish the diagnosis of hysteria. But it is well to remember the ofttime difficulties of diagnosis, not the less so that not rarely there is association of hysteria and organic disease. Where the question of hysteria has arisen mistakes have been made not infrequently even by the best men. Not only the peculiarities of the supposed hysterical symptoms should be considered, but also the personality of the patient, the apparent cause of the manifestations, as well as the history and the whole clinical picture. Philip Zenner.

HEMORRHAGE.—From *αιμα*, blood, and *ρηγνυμι*, to break through. The blood may escape from the arteries, veins, or capillaries, and from its origin the hemorrhage is designated arterial, venous, or capillary.

In arterial hemorrhage the blood escapes from the arteries in jets synchronously with the contraction of the left ventricle, and flows continuously during diastole. The blood is then of a bright or pale red according to the quality.

In venous hemorrhage the blood escapes from the veins in a continuous stream, and is dark in color. Blood has been seen to escape from a hemorrhoidal vein in jets, but synchronously with the contraction of the abdominal muscles. In capillary hemorrhage the blood oozes from

the capillaries over a smaller or larger surface, and is reddish in color.

Secondary hemorrhage is bleeding that arises from failure in repair of an injured or ligated vessel or from ulceration into a vessel (Gould). The cause may be in the altered composition of the blood itself or in a rupture of the vessels, or both conditions may obtain at one and the same time. Sometimes abnormal pressure may cause the rupture of thin-walled veins, as happens, for example, in rupture of the thin-walled veins of the lower end of the œsophagus in hepatic cirrhosis.

Just what are the alterations in the blood which favor hemorrhage are not definitely determined, but the white corpuscles are greatly increased in numbers and the time required for coagulation is increased. The coagulation time may be determined by the coagulometer; normal blood clots in the tubes in from three to five minutes. In some forms of purpura the coagulation time is retarded to ten or fifteen minutes, and in hæmophilia it has been delayed for as long a time as fifty minutes (Osler).

These changes in the constitution of the blood, which lessen its coagulability and thus favor hemorrhages, obtain particularly in leukæmia, purpura, and prolonged icterus, especially if associated with malignant disease.

Of recent years there has been an increasing tendency to regard the spontaneous hemorrhages occurring in newborn children as a manifestation of micro-organismal disease; and, although this view can scarcely as yet be said to be thoroughly established, there are a great many facts in favor of it (Thompson in "Allbutt's System").

CONSEQUENCES.—Repeated small hemorrhages may gradually bring about a profound degree of anæmia. Large hemorrhages result in anæmia, but they are also followed by a condition of shock. It has been shown conclusively that death from hemorrhage takes place in consequence of a lowering of intracardiac and intravascular pressure, incompatible with the continuance of the function of the circulatory organs.

Hemorrhage may result disastrously, not only from the loss to the individual of a large quantity of blood, but also from the pressure of the escaped blood on adjacent structures. This is notably the case in intracranial and pericardial hemorrhages.

SYMPTOMS.—The symptoms vary with the rate and quantity of blood lost. In repeated small hemorrhages anæmia is the obvious result. The objective signs are pallor of the skin and mucous membranes, coldness of the surface, the degree of anæmia present being most accurately determined by a blood count. It is of course evident that a much greater quantity of blood may be lost in small quantities and at intervals without a fatal result than in one or two large hemorrhages. In the former instance repair is constantly going on and the system acquires toleration.

The shock resulting from the rapid loss of a large quantity of blood is most alarming to all concerned. The patient becomes rapidly pale, cold, and restless. The dilated pupils, blurred vision, weak voice, small or imperceptible pulse, yawning, and the appeal for more air are evidences of the resulting acute anæmia. The patient may complain of roaring noises in the ears, a cold, clammy perspiration may cover the body, and the thermometer may not register at all in the axilla, and give a very low temperature per rectum.

At other times the evidences of hemorrhage are to be sought for in focal lesions of the brain or in the presence of physical signs of fluid in the pericardium, in the pleura, or in the abdomen.

It is not always easy to differentiate the symptoms of acute anæmia the result of a large concealed hemorrhage, from shock due to other causes. Reliance must be placed upon the history of the onset, and the exclusion of other causes of shock, such as fright, local injuries to important organs, extensive superficial burns, severe pain, and the presence of the physical signs of fluid in the great cavities of the body.

TREATMENT may be prophylactic, constitutional, and local.

Prophylaxis.—The researches of Dr. A. E. Wright have shown that the coagulability of the blood may be increased by the administration of salts of lime. Mayo Robson has made practical application of this discovery, and has found that the administration of thirty-grain doses of calcium chloride every four hours for a few days before operation has rendered the blood more plastic and has lessened the tendency to bleeding, both at the time of operation and subsequently. After the operation the drug may be continued by the mouth or by nutrient enema.

Before beginning an operation usually attended by considerable hemorrhage, some surgeons have made it a practice to introduce into the circulation through a vein or subcutaneously a litre of normal saline solution.

In operations upon an extremity much blood can be saved by previously placing around the limb an Esmarch elastic band. The constricting band should be two inches or more in width and so placed that important nerves shall not be unduly pressed upon. Negligence of this precaution has occasionally resulted in a more or less persistent paralysis of the parts below the elastic ligature. There is no object in applying this bandage too tightly. Sufficient pressure to arrest the circulation in the arteries is better than more. Before applying the Esmarch band the limb may be elevated for a few minutes. Force of gravity will materially lessen the quantity of blood in the vessels. It is not usually wise to bandage the limb before applying the constrictor; by so doing septic matter might be forced along the vessels into the circulation. Troublesome oozing is apt to follow the prolonged application of Esmarch's elastic band. It is due to a degree of vaso-motor paralysis.

Temporary ligation of vessels may be practised with safety. Senn states that a temporary ligature may be left on a vessel for twenty-four hours without permanent injury, provided the ligature is not drawn tight enough to injure the intima. He has frequently placed temporary ligatures on the carotid at the level of the lower border of the thyroid cartilage, before operating on the parts above. He refers especially to operations performed on the pharynx, parotid, and submaxillary regions. He places a double ligature, which if need be can be made permanent. Temporary may well replace preliminary ligation of large arteries in suitable cases.

Compression of the abdominal aorta as practised by Macewen is a valuable prophylactic measure when indicated.

Constitutional Measures.—Many drugs are held in high repute as hæmostatics. Mention may be made of aromatic sulphuric, tannic, and gallic acids, spirits of turpentine, ergot, acetate of lead, and opium. Some act by producing clotting, some by stimulating the vessels to contract, and opium by equalizing the circulation and thus lessening intravascular pressure at the bleeding point. Turpentine has many advocates. It may be given three or four times daily in doses of ten to fifteen minims. In hemorrhage from the intestinal mucous membrane opium has been found very useful.

Stypticin, hydrochloride of cotamin, is the base of the opium alkaloid narcotine. It is a yellow, inodorous, bitter powder. It is usually given in doses of three-fourths of a grain from five to eight times daily. In some cases three grains or even more may be safely given. A ten-per-cent. solution may be introduced in the form of deep intermuscular injections. It is said to have yielded good results (Senn).

Suprarenal capsule is now being used largely as a styptic. Its active principle is called adrenalin. Powdered suprarenal capsule may be used locally or may be given internally in doses of two or five grains. Adrenalin is very readily oxidized, and is on the market in solution. That prepared by Parke, Davis & Co., is adrenalin chloride 1 to 1,000 of normal saline solution. Its permanence is maintained by the addition of 0.5 per cent. of chlorotone. It may be used locally or internally in doses of from five to thirty minims. Locally it acts in very weak solution. A solution made by adding one part of the 1 to

1,000 solution to one thousand parts of sterilized normal salt solution is an effective local astringent. Powdered suprarenal body and its active principle adrenalin act by causing the contraction of the walls of the vessel. Evidence of its effectiveness is accumulating daily. The writer has found it most satisfactory in arresting hemorrhage in epistaxis and in bleeding piles. As it acts by stimulating the contraction and closure of the gaping vessel, it might be expected to fail when applied to vessels whose surroundings prevented contraction, as, for instance, in the indurated base of a gastric ulcer or perhaps in hemorrhage from bone.

Local Treatment.—Arterial hemorrhage may be arrested spontaneously by the contraction of the vessel wall and the clotting of the blood. "If a small artery is completely divided the circular fibres of the muscular coat contract and narrow the orifice; at the same time the internal and middle coats curl up in the interior of the vessel, and the longitudinal fibres contract and shorten it, so that it retracts within its sheath. As a result, there is clotting of blood; as soon as the blood comes in contact with the tissues which are injured, or which are not similar to the lining membrane of the vessels, it undergoes coagulation. Consequently, as soon as the blood escapes from the vessel, clotting tends to take place, unless the escape of blood be so free that the clot is swept away by it. The clotting within the vessel extends up to the nearest collateral branch." Later on, the clot becomes organized into fibrous tissue. If the vessel is only partially divided it cannot contract within its sheath and the hemorrhage is more apt to continue. The spontaneous arrest of hemorrhage from veins and capillaries is due chiefly to clotting and sealing by lymph (Cheyne and Burghard).

Of all the artificial methods of arresting hemorrhage that by *ligature* is far and away the most important. The aseptic ligature is one of the great results of Lister's work. Of the absorbable ligatures catgut is the chief, and silk is the ideal non-absorbable ligature. Catgut may now be prepared in a manner that renders it aseptic and not too readily absorbed. It is certainly the best ligature to use in a field that is, or is likely to become, infected. Silk has the great advantage of being easily prepared and may be used in aseptic tissues. It is better to use the smallest sizes of both catgut and silk that can be used with safety. It is no longer thought necessary to tie a ligature tightly enough to rupture the intima. If the walls of the vessel are brought firmly in contact adhesions between them will take place and the vessel be quite safely occluded.

Suture of wounds in large arteries and veins may be successfully accomplished. Although Lambert, of Newcastle, successfully sutured a wound of the carotid artery in 1762, but little attention has been given to this method of closing wounds of blood-vessels until recent years. This method of closure should be adopted in wounds of important vessels, such as the aorta, carotid, axillary, or femoral arteries, when not more than half the circumference of the vessel is divided and when the wound is aseptic. Experiments seem to show that if end-to-end anastomosis is performed, after complete division of the artery, complete occlusion will occur in a few weeks, but not until sufficient time has elapsed for the collateral circulation to become established. The endothelial and connective-tissue proliferation which closes the wound in a part of the vessel wall goes on to complete occlusion when the whole circumference has been divided and afterward stimulated by many needle punctures and by the presence of the suture material. Closure of wounds of veins by means of sutures has also been practised successfully. In the suturing only the outer coats should be included, the intima being avoided. The sheath of the artery should also be sutured.

Pressure is a valuable means of controlling hemorrhage from small wounds and from veins. The hemorrhage from a ruptured varicose vein is thus readily stopped. Even bleeding from the sinuses of the brain may often be effectually arrested by pressure. In applying pres-

sure it is important to get the pad directly on to the bleeding vessel. If this is at the bottom of a deep wound and it is not desirable to enlarge it, a graduated compress may be applied. Place first simply a small pad

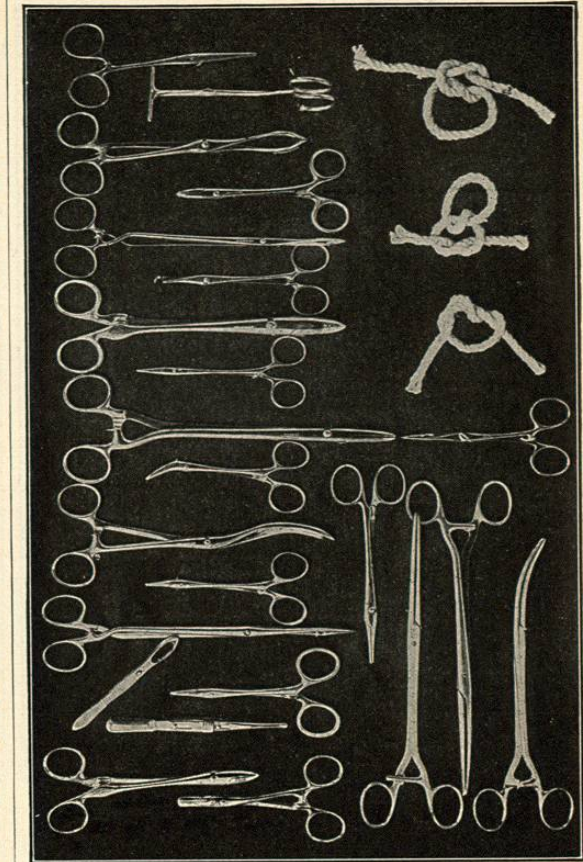


FIG. 2600.—Various Contrivances in Common Use for Arresting Hemorrhage. The three knots shown in the right-hand upper corner of the picture represent respectively (from above downward) the *surgeon's knot*, the *granny knot*, and the *reefers knot*. Immediately below the last knot, placed transversely, is *Pean's artery forceps*; and below this are four different types of forceps known respectively (from left to right) as *Armstrong's forceps*, *Doyen's clamp forceps* (straight), *Terrier's clamp forceps* (curved), and *Richelot's clamp forceps* (lateral-curved). The left half of the picture is occupied by a series of eighteen different patterns of forceps known respectively (from above downward) as (1) *Kocher's forceps*, (2) *Pozzi's T-forceps*, (3) *Bottini's forceps*, (4) *Tait's forceps*, (5) *Pean's long-point bleeding-point forceps*, (6) unnamed pattern of forceps, (7) *Greig Smith's heavy forceps*, (8) *Halsted's mosquito-point forceps*, (9) *Segond's bleeding-point forceps* (heavy), (10) *Horsley's lateral angular forceps*, (11) *angioclasp*, (12) *Horsley's artery forceps* (curved on the flat), (13) *Pean's long bleeding-point forceps*, (14) *Hamilton's artery forceps*, (15) *Horsley's artery forceps*, (16) *Esmarch's torsion forceps*, (17) *Greig Smith's small forceps*, (18) *Ferguson's artery forceps*.

deep down on the bleeding point, then another against the first, and so on until sufficient pressure is obtained. In emergency cases, when bleeding is taking place from an extremity, a bandage or handkerchief or a pair of suspenders may be placed around the limb above the bleeding point. This may be tightened by twisting as in the Spanish windlass.

Elevation of the limb is of material assistance. The pressure of the hæmostatic forceps permanently stops the bleeding in many small cutaneous vessels. Doyen extended the application of this principle in his angiotribe.

Torsion has not been very extensively used. By torsion the intima and media are ruptured. They curl up, plug the lumen of the vessel, and are held by the twisted

adventitia. If applied to large arteries the vessel should be caught, freed from its sheath and surrounding tissues, and held by one pair of forceps at a point above where it is desired to rupture the inner coats. The cut end of

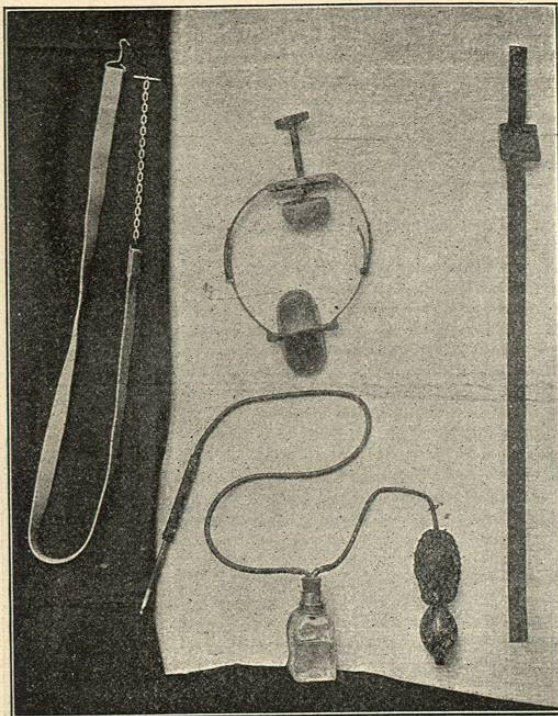


FIG. 2601.—Other Apparatus used in Arresting Hemorrhage. On the left-hand side, Esmarch's flat tourniquet; on the right, emergency tourniquet; in the centre, above, Skey's arterial compressor; in the centre, below, thermo-cautery apparatus.

the vessel is then caught by another forceps and twisted until the rupture is felt to occur. It can scarcely be called a safe method and should be confined to small and cutaneous vessels. In such cases it is unnecessary to apply more than the one forceps and that to the cut end.

The cautery is still sometimes found useful as a hæmostatic, particularly to arrest oozing from surfaces that are deep and inaccessible or where, because of the thinness of the tissue or its extreme friability, a ligature is contraindicated. The Paquelin thermocautery is now generally used, and for hæmostatic purposes the point should be only of a dull red heat, just turning black. If too hot it does not arrest the bleeding, and if too cold it sticks to the tissue. It is said to be less effective as a hæmostatic than the old cautery irons, but is much more convenient.

Hemorrhage from bone is sometimes troublesome. The bleeding vessel may have retracted into a bony canal, as happens, for example, in the case of the middle meningeal in the Hartley-Krause operation for removal of the Gasserian ganglion. If the vessel cannot be caught the bony canal may be plugged with gauze, an ivory peg or a bit of sterilized wood. For the oozing from the edges of divided bone Victor Horsley has prepared an antiseptic wax. It is composed of beeswax 7 parts, almond oil 1 part, and salicylic acid 1 part. It is often very helpful. Suprarenal extract or adrenalin may be found the most satisfactory of all. The writer used it successfully in a case of secondary hemorrhage in acute osteomyelitis.

Cold, locally applied, in the form of Leiter's tubes, or cracked ice, may be used in robust patients, for the arrest of oozing. It acts by stimulating the muscular coats to

contract and reflexly may stimulate vessels situated beneath the surface. Cold should generally be avoided in the weak and in acute anæmia.

Heat, preferably in the form of hot saline solution, has a decidedly styptic action on tissues. The temperature may be 110° to 115° F., or as hot as the hand can bear.

Hot steam has been applied to bleeding surfaces as a styptic by Snegirew, with satisfactory results. He used it at a temperature of 212° F. in the cavity of the uterus (Senn).

Treatment of the Acute Anæmia resulting from hæmorrhage is only second in importance to the arrest of the bleeding which caused it. Stimulants must be exhibited with caution until the bleeding is stopped, as their effect is often to increase intravascular pressure. They have an important place in the treatment when used with discretion and good judgment. Opium is also valuable as an equalizer of the circulation and a determinant of blood to the cerebral centres.

Transfusion.—At the head of the list, however, stands normal saline solution, six-tenths of one-per-cent. solution. It may quickly be prepared by adding a drachm of salt to the pint of boiled water, cooled to a temperature of 100° F. A pint thrown into the rectum is useful. Much better and quicker results are obtained by injecting it beneath the skin in the infraclavicular and submammary regions. A double-branched tube with a hollow needle attached to each branch affords the most expedi-

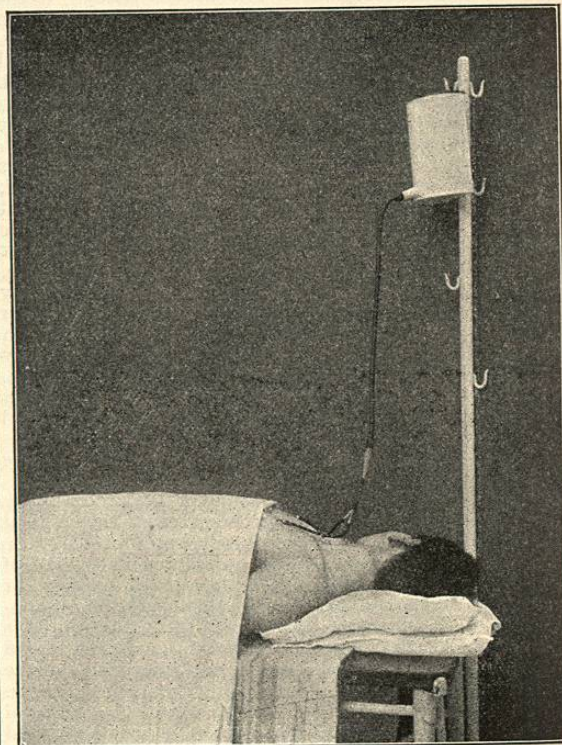


FIG. 2602.—Apparatus for Subcutaneous and Intravenous Injection of Saline Solution.

tious means of accomplishing this. Two pints can thus be introduced in from ten to twenty minutes. While it is being injected gentle massage should be continuously practised.

Many prefer in extreme cases to introduce the saline solution directly into the circulation through one of the superficial veins. A vein of the arm just above the elbow is usually selected. This little operation will be most readily accomplished by carefully laying bare the vein selected for a distance of an inch and then carefully pass-

ing beneath it a double ligature; tie the distal ligature; with a sharp knife make an incision in the wall of the vein just large enough to admit the end of the needle or nozzle; then tie the proximal ligature around the vein and the included needle or nozzle. As much as two or three pints of solution may be introduced. Then withdraw the nozzle and tie the proximal ligature, or pass a fresh ligature around the vein at that point. Precautions must be taken not to permit any air to enter.

In extreme cases until the bleeding is stopped elastic bands may be applied to the extremities close up to the body, thus saving the patient's blood. The foot of the bed should be raised eight or ten inches, thus sending the major part of the blood toward the great centres of the nervous and circulatory systems. This is a most effective method of auto-transfusion.

George E. Armstrong.

HEMORRHOIDS. See *Anus*, etc.

HEMP. See *Cannabis Sativa*.

HEMP, INDIAN. See *Cannabis Indica*.

HENBANE.—HYOSCYAMUS. "The dried leaves and flowering tops of *Hyoscyamus niger* L. (fam. *Solanaceæ*) collected from biennial plants" (U. S. P.). Of the three forms in which this plant presents itself, the most efficient one is insured by the language of this definition and of the accompanying description. The plant grows both as an annual and as a biennial. The former, and the latter during the first year of its growth, are to be rejected. The last-mentioned bears no flowers and is excluded by the words "flowering tops." Flowers are supplied by the annual form, but they lack, to a great extent, the "purple veins" called for by the description. Thus the highly active second year's growth of the biennial plant is the only form which affords a drug markedly characterized by yellow flowers with purple veins.

Henbane is a native of Europe and Western Asia, where it is a very common and abundant weed. It is also cultivated for medicinal purposes. Rarely, it occurs as a weed in the United States. It looks somewhat like the stramonium, but is not so large and is even more coarse-looking and more strongly viscid-hairy. The habit of the inflorescence is shown in the accompanying cut.

The following is the description of the drug:

Coarsely, roughly, and glandularly hairy throughout, except the corollas; larger leaves shortly and broadly petioled, 15 to 25 cm. (6 to 10 in.) long, and two thirds as broad, the upper becoming smaller and sessile; blades angularly ovate, acute, coarsely and angularly toothed or lobed, grayish-green or slightly yellowish-green; flowers in pseudo-racemes, short-pedicelled, the calyx cylindrical, somewhat contracted above the ovary, unequally five-toothed, the teeth triangular, acute, the corolla campanulate, five-lobed, sulphur yellow, with deep purple veins; capsule a two-celled pyxis; odor heavy, narcotic; taste bitter, somewhat acrid. From tobacco, henbane is distinguished by its incised leaves, from stramonium by its hairiness, and from belladonna by both these characters.

A full account of the composition and properties of henbane would constitute, to a great extent, a duplication of our account of belladonna. It may therefore be most profitably considered by comparing it with that drug.

The alkaloidal percentage of henbane is very much lower than that of belladonna. Some authorities place it below one-tenth of one per cent., while others state it as high as three-tenths. The best authorities agree upon 0.2 to 0.25 per cent. as the standard. The most of this alkaloid is *hyoscyamine*, separately treated. Whether any atropine is present, is disputed, but if so, the amount is unimportant. Atropine may readily form during manufacturing operations, by conversion of the hyoscyamine. The most important variation from belladonna is in the presence of a small amount of hyoscine

or scopolamine, also separately considered, in its alphabetical order.

The general similarity of henbane to belladonna in properties and uses will readily be inferred from its composition; yet the slight characteristic differences stated are sufficient to establish noticeable differences in these

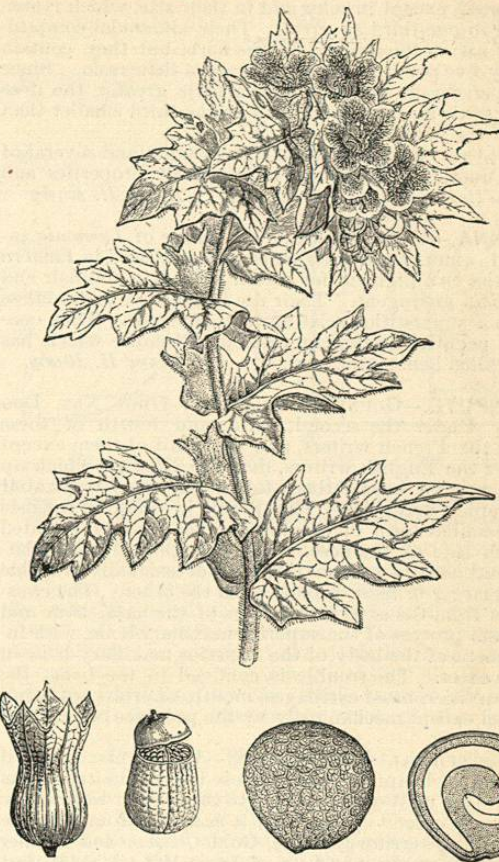


FIG. 2603.—Henbane, Plant and Fruit (about one-half natural size) — Seed Enlarged. (Baillon.)

directions. These differences may be stated generally by saying that henbane is more distinctly sedative than belladonna, and that this sedative action extends to the cerebral, motor, and sensory functions, though less so to the latter. The marked tendency to delirium resulting from the use of belladonna may be quite absent in that of henbane, or even the opposite effect can be induced.

Hence the distinct uses of henbane. It is scarcely employed in eye practice, though it produces very similar effects to those of atropine. If distinct cerebral-depressant effects are desired, it is better to give hyoscine itself, but when we wish the effects of belladonna, but desire to avoid its mental disturbances, henbane is chosen. Its commonest uses are intestinal and cystic, or renal. The former use is mostly in combination with purgatives which would otherwise be griping. At the same time that this unpleasant effect is averted, the henbane itself powerfully promotes peristalsis, and is therefore laxative, even excelling belladonna in this respect. The second-named use is as a sedative diuretic, relieving both painful and spasmodic conditions of the genito-urinary tract. Here again it is usually combined with other drugs, such local diuretics as buchu, kava, or oil of juniper. It is, however, often given alone in colic, cystitis, calculus, etc. It is commonly given in larger doses than belladonna. There are official an extract, the dose of which is 0.3 to 1 gm. (gr. ss.-i.); a fluid extract, dose