of gauze of sufficient thickness are arranged transversely and superficial to the macintosh. These pieces are three or four or more in number, and they act as padding for the splint, and at the same time as an antiseptic dressing (Fig. 54). When the dressing is changed, a piece of gauze is pinned to each

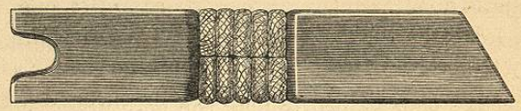

FIG. 54.—SPLINT FOR EXCISION OF KNEE, READY FOR APPLICATION.

The splint is padded at the upper and lower parts, and the splint and padding are covered with a piece of macintosh cloth. The space opposite the knee is filled with masses of gauze arranged transversely and superficial to the macintosh.

of the old pieces, and then the old piece being pulled out the new is pulled in, and thus the limb is never left without support (Fig. 55). Over the front of the limb an ordinary gauze dressing of suitable size is applied.

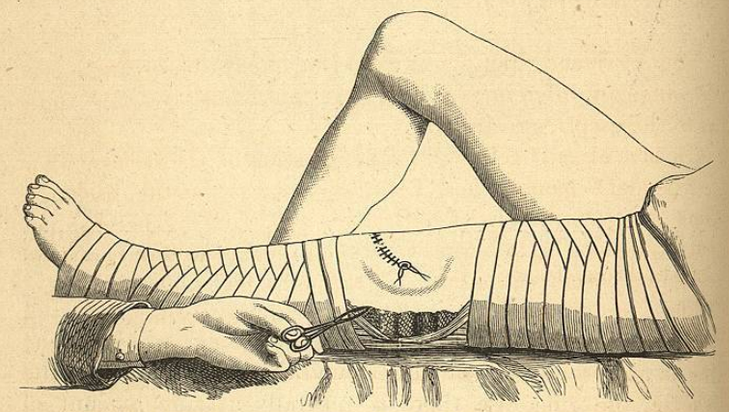

FIG. 55.—SPLINT APPLIED IN A CASE OF EXCISION OF THE KNEE.

This shows the method of changing the dressing. In the first way described a mass of gauze would be pinned on to the end of the old piece on the other side of the limb, so that as the old piece is pulled out the new is pulled in, or it may be arranged in the second manner described, and shown in Fig. 54—viz., a piece only extends to the middle line behind, and as soon as each is pulled out a fresh piece is pushed in.

Another more convenient way in which this may be managed with even less movement is to have each of the masses of gauze mentioned in the former paragraph divided in the middle line, and thus the half of each mass is pulled out at a time and a new piece substituted (Fig. 54).

Another way is to apply a wire splint next the skin, fix it there, and then apply the dressings outside.

When the discharge becomes still less the limb may be put up in plaster of Paris, a window being left for dressing.

Excision of joints is now, however, rarely performed, for with aseptic treatment an incision into a joint and the insertion of a drainage tube is generally sufficient in cases where formerly excision or even amputation would have been required. Several advantages are thus gained, among the most prominent of these being absence of shortening of the limb (and this is most important in children), and often a certain and even a considerable amount of motion in the joint afterwards.

It may be mentioned here that Mr. Knowsley Thornton in *ovariotomy* cases does not apply a bandage round the abdomen. He fastens the dressing with adhesive plaster, and does not change it for a week, by which time healing is generally complete, except where the stitches are.

Such are the chief points as to the application of antiseptic dressings in different situations. I must now say a few words as to the aseptic treatment of abscesses.

I have already referred to the question of the necessity for a dependent opening, and I pointed out that, as the discharge from an abscess treated aseptically is not irritating, because not putrid, it does little harm even though left to well out, instead of being permitted to flow out through a dependent opening. In fact, aseptic surgery has altered the relative importance of the questions to be considered in selecting a situation for opening an abscess; and now the chief point to be looked at is not whether the orifice of the tube is in the most dependent position possible, but whether it is at the point furthest removed from sources of putrefaction—*i.e.* whether there is the greatest possible space for the overlapping of the antiseptic dressings.

Indeed, in some abscesses pointing near such canals as the pharynx, anus, &c., it is better to make an opening in healthy structures at some distance from the abscess, and burrow a channel into it, than to make an incision directly into the abscess cavity.

I saw a striking example of this in Edinburgh several years

ago. A boy was admitted into the infirmary with retropharyngeal abscess connected with occipito-atloidean disease. The abscess was on the point of bursting into the pharynx. Mr. John Chiene, who had charge of the case, instead of opening the abscess at the only place where it was pointing, viz., in the pharynx, cut down behind the sterno-mastoid, and burrowed into the abscess cavity from behind. The abscess followed a typical aseptic course, and the patient recovered completely. Thus then the great rule in selecting a situation for opening abscesses is to make the incision as far as possible from sources of putrefaction.

When opened, instead of dealing tenderly with the pyogenic membrane as was formerly done under the impression that it was a hurtful thing to injure it, we now empty the cavity thoroughly, especially in the case of chronic abscesses, in order to get out all curdy masses of pus, &c., which may have gravitated to the bottom of the abscess. When this is done opportunity is given for the rapid adhesion of the greater part of the wall of the abscess cavity, and thus in a very short time there is merely a sinus left leading down to the seat of disease.

There is no necessity for washing out the cavity of an abscess, as is done in so many quarters. To do so is simply to irritate the pyogenic membrane unnecessarily without securing any corresponding benefit. Indeed, it might give rise to such an amount of oozing from the wall of the abscess as would wash out all the carbolic acid from the dressings in a very short time, and thus lead to the putrefaction of the discharge. The treatment by hyperdistension, while erroneous in theory, is very dangerous in practice, as the fluid may be forced into the cellular tissue, and lead to diffuse inflammation and even gangrene, or to carbolic acid poisoning and death.

The greatest care must be taken in the drainage of abscesses. In the case of a large psoas abscess the surgeon should introduce the largest sized drainage tube in the first instance. This tube may be changed for a smaller in a few days. It ought not to be removed for the first time till at least three days have elapsed since the abscess was opened, otherwise there may be great difficulty in replacing it. It should not be shortened till it is found to be absolutely impossible to get it in fully. Whenever this is the case a piece must be cut off from the end. (Here I speak of chronic abscesses, an acute abscess heals in a week or ten days.) In some cases, where the same tube is left in for a week (where the case is only dressed once a week), some difficulty will be found in withdrawing it, owing to the granulations having grown in at the holes and holding it in position. In this instance the guide as to shortening is lost, because the tube cannot be pushed out; and therefore it will be found best in old cases to use a tube having holes only close to its inner end. This cannot be held, and is gradually pushed out as the sinus heals from the bottom. If on removal of a tube the discharge is found to increase in quantity, the tube must be reintroduced.

As the incision into the abscess is merely large enough to admit the tube, there would be no reason for using protective; and therefore the wet gauze is applied directly over the orifice of the tube. A tube is the only form of drain suitable in these cases.

The precautions required in order to ensure an aseptic result are precisely the same as in the case of wounds.

In changing the dressings the same rules are followed as were formerly described with regard to incised wounds. Chronic abscesses, more especially abscesses connected with diseased bones, are extremely tedious; but nevertheless, as a rule they ultimately recover. The same care must, however, be taken from first to last. It is never safe to change the carbolic dressing for a boracic one, however superficial the wound appears to be. In the case of spinal abscesses absolute rest in the recumbent posture must be maintained till healing is complete; and as the cases generally extend over many months it is well to warn patient and friends before commencing to treat the case. Whether the rule as to the maintenance of the recumbent posture may not be modified by the use of Sayre's jacket, or even without it, is now a question. Lately in two cases which had been under treatment for a long time, and in which all uneasiness in the spine had passed off, Mr. Lister allowed the patients to get up before healing was complete, and without any bad results.

Empyema does particularly well under this dressing. I

mention it, in order to state that a metallic drainage tube with a shield like a tracheotomy tube, and with lateral holes, is the best because the india-rubber tube may get compressed between the ribs or be too abruptly bent where it passes into the interior of the pleural cavity.

There are some cases in which neither the gauze dressing nor the boracic can be employed, but which may nevertheless be treated aseptically. I refer especially to abscess in the perineum or by the side of the anus.

Abscess in the perineum may be treated aseptically with very satisfactory results. The abscess is opened under the spray, and a piece of lint dipped in 1–5 carbolic oil or 1-10 carbolic glycerine is introduced into the cavity to act as a drain. Outside this two or three layers of lint soaked in 1–5 carbolic oil or 1–10 carbolic glycerine are applied, and fixed with a T bandage. Should this become displaced or wet with urine, &c., the patient pours a little carbolic oil or glycerine over the wound and over the lint, and replaces the dressing. No spray is required in changing the dressings. On the third day a piece of lint dipped in carbolic oil is laid over the wound, and a pair of oiled forceps is slipped under the lint to seize and withdraw the plug; or the plug may simply be pulled out under the spray. Carbolic oil or glycerine 1–10 is then used for dressing, and when the wound has become superficial boracic or salicylic ointment is employed.

The same method of dressing is employed in abscesses beside the anus. In this case, when the patient defæcates, he holds aside the dressing, defæcates past it, wipes the parts with 1–20 carbolic lotion and then with 1–10 carbolic oil. He then soaks the dressing with the oil, or applies a new dressing. (The glycerine and carbolic acid may also be used.) The result of this method of treating these abscesses is often excellent, fistula in ano being apparently often avoided when the abscess is taken in time.

So much for wounds made by the surgeon and their treatment. I now come to the consideration of *wounds produced accidentally*. Here the problem is different from and much more difficult than the former. In the cases we have just

been considering we had merely to keep out the septic particles; in the present instance these particles have already gained admission, and therefore we have not only to prevent the entrance of more but also to destroy those already present.

This is done by washing out the wound with 1–20 carbolic lotion, provided it be recent, *i.e.*, made within twenty-four hours, and then treating it like a wound made by a surgeon.

This washing out of the wound must be done very thoroughly. It is best carried out by using a syringe with a catheter attached to it. The point of the catheter is introduced into all the recesses of the wound and the 1–20 lotion is injected through it, and thus comes thoroughly in contact with all parts. There must be no attempt to distend the cavity, as, for instance, by shutting the orifice of the wound around the syringe, for the fluid might be forced into the cellular tissue and lead to inflammation or even sloughing. The opening must be left perfectly free and enlarged if necessary. Should there be any shreds of tissue, they had better be cut off, and if there be much dirt ground into the tissue, it must be got rid of by means of a nail brush. The injection and the subsequent procedures are carried out under the spray.

If the wound was made twenty-four to forty-eight hours before being seen, a stronger solution is employed, viz., the 1–5 spirituous solution. This is used in the same way as the other.

Having thus got the wound pure the question of stitching it up arises. The answer to this question varies according to the parts injured. As a rule, in injury of the soft parts, a drain is introduced, and the same accurate stitching employed under the spray as was described on a former page. More especially is this the rule in scalp wounds, where most brilliant results may be obtained by the use of catgut drains and accurate stitching. The rest of the treatment is the same as in operation wounds.

Where the wound is much contused, the same rules apply as to purification, but it must not be stitched up. After purification a drainage tube is inserted if necessary, the wound is left open, a piece of protective is placed over it, and the dressing applied in the usual manner.

I have mentioned the methods to be employed when the wound is seen within the first forty-eight hours. It may be, however, that it does not come under notice till putrefaction already exists. In this case it may be purified by the introduction of iodoform suspended in water by the aid of alcohol, or if superficial, by stuffing it thoroughly with lint dipped in 1–5 carbolic oil. This dressing repeated for several days generally converts it into an aseptic wound. In most cases it is best to apply iodoform or the chloride of zinc solution.

Certain special wounds call for attention.

Compound fractures are the wounds in which this treatment was first applied, and in which excellent results can be obtained. There are a few special points to be noted. In purifying the wounds great pains must be taken. Any dirt must be carefully scraped or scrubbed out. All blood clots ought to be turned out as completely as possible. The ends of the bones are cleaned, and if they cannot be returned or got to fit, portions should be sawn off. The ends may be tied together with silver wire. The parts ought to be well kneaded as the carbolic lotion is injected through the catheter, in order to diffuse the lotion as much as possible into all the recesses of the wound. No stitches are inserted, but on the contrary, free drainage by tubes is used. The same sort of dressings and apparatus are employed as in excisions.

Wounds involving tendons, nerves, or muscles, are treated in the same manner as others, and the ends of the divided muscles, tendons, or nerves, ought to be stitched together with catgut, and the position of the part so arranged as to avoid dragging on these stitches.

Wounds of joints are very important. When recent no operation (excision or amputation) is required in the first instance. As a rule the joint may be saved, and perfect movement obtained by washing it out very thoroughly with carbolic lotion 1–20. The wound in the joint is enlarged if necessary. Where several hours have elapsed since the accident (more than eight or ten hours), it is well to employ the spirituous solution. A drainage tube is introduced into the joint, but no stitches are used. After a few days, when the discharge has diminished,

the drain is removed. In about three weeks, or earlier, passive motion ought to be begun, otherwise the adhesions outside the joint may become so strong as to require to be broken down under chloroform.

Compound fractures of the skull are treated in the same manner as compound fractures elsewhere, purification being attempted with 1–20 carbolic lotion. The dura mater may be freely dealt with without fear of inflammation, for the irritation of carbolic acid is only very transient. Bleeding vessels are secured by catgut. Should one of the great sinuses be wounded, a graduated compress of catgut arrests the hæmorrhage satisfactorily. This I have known to act very well in a case of wound of the longitudinal sinus, occurring during the operation of trephining over the seat of an old injury.

Wounds penetrating the thoracic cavity are much more difficult to treat. Should the wound penetrate the lung, and should the lung protrude, the exposed parts and those around are purified with carbolic lotion 1–20. In deciding as to the returning of the injured lung and the stitching up of the wound, the surgeon must be guided by the circumstances of the particular injury. In some cases, if the wound in the lung were superficial, the edges of the divided visceral pleura might be stitched together with fine catgut, the lung returned, and the external wound closed. Where a large bronchus is injured it might be better practice to leave the lung in the wound, and leave the wound open.

Where there is merely a wound of the parietal pleura, and where the lung is not wounded, the external wound only is purified and is closely stitched, in the hope that union by first intention may occur, that the air may be absorbed, and that any septic dust present in the pleural cavity may be unable to cause mischief.

Wounds of the abdomen are variously treated, according as there is or is not protrusion of the contents. Where there is no protrusion, and where there is no reason to suspect injury of the viscera, the external wound ought to be purified and closely stitched, so as to get primary union throughout, no drain being used.

Where the intestines protrude, they ought to be carefully

bathed in warm carbolic lotion 1–30 or even 1–20, and if there be no injury of them in any part they may be returned. If they are cut, the gut may be stitched with catgut by the glover's suture.

If the omentum protrudes, opinions vary as to the treatment. When it can be returned do so after thorough purification, and then stitch the abdominal walls, including the peritoneum, close together. Where, from adhesion or other sufficient cause, this cannot be done, or where the omentum is very dirty, I should, from a research into the consequences of unreturned omentum by Dr. Kenneth McLeod, of Calcutta, consider it the safest practice, especially in the case of a person with strong muscular parietes, to stitch the deepest parts of the omentum to the deep part of the wound, cut off the remainder and close the skin over all.

If internal hæmorrhage is going on, apparently from the mesenteric vessels, the wound may be enlarged and the bleeding point sought for. Simon advised that in bleeding from the kidney, the injured organ should be excised; this suggestion was never put into practice, but nevertheless it is one well worth bearing in mind.

Such are the chief points to be attended to in recent wounds; there remains for consideration the class of cases in which putrefaction has been present for a long time. I refer to cases of putrid sinuses, generally connected with diseased bones or joints. An attempt may be made to purify these during the course of an operation, and sometimes when the sinuses are few and uncomplicated, and where all the dead bone is removed, this attempt may be successful. The sinus is scraped out with one of Volkmann's sharp spoons (Fig. 56), and all the granulation tissue, as far as possible, removed. The raw surface of the sinus, &c., is then washed out with the chloride of zinc solution, which is applied thoroughly to all parts, and a gauze dressing is used, in the hope that putrefaction has been thus eradicated. The spray should be employed during the whole procedure.

If this is successful, well and good. If not, boracic ointment (at first full strength, afterwards half) or salicylic ointment, covered with boracic lint, is the best dressing, indeed, it is the best dressing in all cases where strict aseptic measures are inapplicable.

The aseptic treatment of burns varies according to the degree and extent of the injury. In any case, unless where the burn is very extensive and where the parts are extremely dirty (necessitating scrubbing of the surface and consequent shock, and also risk of carbolic poisoning), an attempt should be made to purify the surface with 1–20 carbolic lotion. This having been done, if the surface is small, boracic ointment (full strength) and boracic lint form a convenient dressing. When the extent of the burn is greater, wet boracic dressing (wet boracic lint used as water dressing—covered by gutta-percha

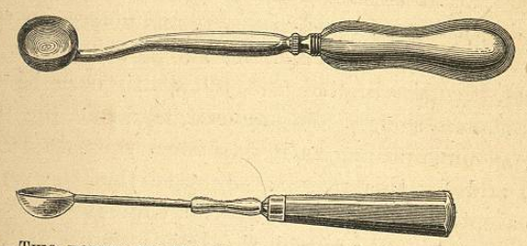

FIG. 56.—TWO FORMS OF SHARP SPOONS, A LARGE ROUND ONE AND A SMALL OVAL ONE.

tissue or macintosh) is the most suitable. The wet boracic dressing is also applied in those cases where, on account of the extent of the burnt surface and the amount of dirt, purification with carbolic acid is not advisable. Where the surface is thoroughly charred and where the wound is not very extensive, boracic ointment or carbolic oil 1–10 are the best dressings. The objection to carbolic oil, which was formerly used in all cases, is that, when the surface is large, there may be a fatal absorption of carbolic acid.

In the after-treatment the sores are dressed with boracic dressings (protective and boracic lint, or better, in the first instance, boracic ointment) just as in the case of ulcers.

The rules as to the treatment of gangrene are altered in

aseptic surgery, and this is more especially the case with senile gangrene. Should symptoms of senile gangrene set in, say in the lower extremity, the skin of the foot, toes and leg, are thoroughly cleansed with 1–20 carbolic lotion. This must be done very efficiently. All the folds about the nails, &c., must be carefully cleansed and washed. This having been done, the whole limb and foot are enveloped in a large mass of carbolised cotton wool (carbolised in a 1 per cent. ethereal solution of carbolic acid). This being pure in its substance, and being applied over a pure surface, completely shuts out causes of putrefaction. The carbolic acid soon flies off, and then the cotton wool acts simply as a filter, while it protects the part from unequal pressure and retains the heat. This may be kept on for any length of time, and so long as discharge does not extend to the surface or the gangrene above the limits of the dressing, the part remains sweet, and very often the gangrene, which in the first instance threatened to involve the whole leg, becomes limited, and there may even be merely a small cutaneous slough. In any case, as a rule, the gangrene does not go on spreading as it does when treated in the usual manner, and for this reason:—Suppose that the part is not treated aseptically, the tissue at the edge of the dried gangrenous mass becomes putrid, the living tissue in the neighbourhood is very weak, the putrid material acts on it like a caustic, destroys its vitality or excites an inflammation which kills it, and so the gangrene goes on spreading, till at length parts are met with of sufficient vitality to resist this action of the putrid materials. Then a line of demarcation is formed. On the other hand, when the gangrenous parts are not putrid, the weak parts in the vicinity, which would to a certainty have died in the former case, retain their vitality and gain strength. Thus also the rule of never amputating in senile gangrene, except to trim a stump formed naturally, is done away with, and it is generally better to amputate as soon as it is clear to what extent the tissue is dead, rather than to subject the patient to the continual pain and irritation arising from the presence of the dead piece. The same reasoning applies to cases of traumatic spreading gangrene. This is only one instance of how completely many current ideas as

to surgical pathology and treatment are reversed, when means are taken to render the dust of the atmosphere inert before it reaches a wound.

In treating nævi great benefit is obtained from the injection of pure carbolic acid. The nævus is first thoroughly cut off from the circulation by ligatures tightly applied around its base, and then half minims of pure carbolic acid are injected into various parts of the tumour. Ten minutes or so having been allowed to pass, in order to ensure complete and firm coagulation, the ligatures are divided and removed, and the punctures are touched with collodion. The surface being left completely dry, any slough which forms becomes absorbed or separates as a crust after some time, the part beneath being found to be a scar.

The same method answers excellently in the treatment of varicose veins. A tourniquet having been firmly applied around the upper part of the limb in order to arrest the circulation, the vein is punctured at various parts, and half minims of carbolic acid are introduced into it. The tourniquet is kept on for ten minutes after the injection is completed. Coagulation and a slight degree of inflammation are thus induced, but this, so far as I have seen, never goes to any dangerous extent, and is followed by at least temporary cure. I have not known any case return with reformation of varicose veins.

A dissection or post-mortem wound does not give rise to bad results if the wound be instantly purified with 1–20 carbolic lotion.