

LORD LISTER AND THE EVOLUTION OF MODERN SURGERY.

GLASGOW, 1861-1869.

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It is almost impossible for the young surgeon of the present day vividly to realize what the state of surgery was thirty-five or forty years ago.

Surgery before Antiseptics.

The introduction of ether and chloroform some time previously had initiated great changes. Pain being abolished surgery was robbed of no small part of its terror, and patients, in their anxiety to be restored to health, submitted more willingly to such operations as were recommended for their cure. In this way no doubt a great impetus was given to the surgical art. New operations were devised and employed, while those which were old and well established were resorted to in a larger number of cases. And so, uncertain as the healing of wounds had always been, the uncertainty and disappointment which dogged the footsteps of the surgeon became increasingly greater as the scope of surgery was extended. In almost all wounds, whether inflicted by the surgeon or by accident, inflammation and suppuration were expected as a matter of course. And these things were only the beginning of evil. No matter what skill and care had been expended on the making and dressing of the wound, the issue was necessarily looked forward to with doubt and anxiety. Few of those who did recover did so without serious episodes and complications of some sort. All suffered from pain and fever more or less pronounced, and very many only reached the *terra firma* of restored health by swimming through weeks or months of severe and painful illness.

Secondary hæmorrhage, tetanus, erysipelas, septicaemia, pyaemia, and hospital gangrene were never all absent from the hospital wards, and at times pyaemia and hospital gangrene became alarmingly epidemic. In the absence of any certain knowledge of the real mode of causation of these wound-begotten diseases, and, therefore, of any sure means of avoiding their occurrence, the surgeon felt no real personal responsibility regarding them, whatever grief and disappointment he might experience when his best efforts repeatedly ended in disaster and failure. When his patients were decimated and his heart was well-nigh broken by these terrible visitants, he received the sympathy of his friends and pupils. He had done his work well, and a hail in harvest had come to destroy it. He was in no way to blame. He was a man beset by misfortune.

This was very much the state of matters in the Glasgow Royal Infirmary, at that time the only General Hospital in the city, when in 1861 Lord Lister (then Mr. Lister, a young man of 34) was elected one of its surgeons. He had been made Professor of Surgery in the University of Glasgow a year before, and began the duties of his chair in the summer session of 1860. In those days, however, the professor had no official connexion with the infirmary, and a year passed before he succeeded in obtaining an appointment in that institution. From that time, until he was transferred to the Chair of Clinical Surgery in Edinburgh in the autumn of 1869, he continued to practise and to teach clinical surgery in the same set of wards. Two of them were situated in a building then always spoken of as the "New Surgical Hospital," erected and opened only about a year previously. The one contained the principal cases of operation and all those of injury in males, while the other accommodated the whole of the female patients. A third large male ward contained, for the most part, patients who suffered from chronic forms of disease, and was situated in the old infirmary buildings.

Although his principal wards were thus parts of a new building, he soon found that hospital diseases were always distressingly prevalent, and that the fate of every patient who suffered from a wound must be regarded with some degree of anxiety. I myself, when acting as dresser, have seen no fewer than five cases of pyaemia following amputation for injury die in the male accident ward in one week, while other instances of the same disease and of hospital gangrene lay ill in the same ward. The grief and mental worry arising

from such experiences, often repeated, produced in Lister's mind a sense of discontent with things as they were, and this seemed to many of us who were his pupils in strange contrast to the resignation with which some of his colleagues viewed similar experiences. They appeared to regard them as inevitable and quite unpreventable so long as the human body was what it was.

Before coming to Glasgow he had already commenced a valuable investigation into the essential nature and determining causes of inflammation and suppuration in wounds, and those of us who remember his lectures after he came here can recall very vividly the enthusiasm with which he pursued this line of study. He taught from the first that the prime cause of suppuration in wounds was the decomposition of blood and serum retained within them, brought about in some way through the influence of the atmosphere. In the wards he insisted on scrupulous cleanliness; on the frequent washing of the hands of all those assisting at operations or engaged in dressing wounds; while he used constantly various deodorant lotions, and recommended the frequent changing of dressings in all suppurating wounds. By way of prophylactic treatment, sodium or potassium sulphite in solution, in accordance with the then recently published views of Polli, of Milan, was administered in frequent doses each day to every patient admitted with a compound fracture, or other lacerated wound. But all was really to no purpose.

The Germ Theory of Putrefaction.

While engaged in these observations, and in such strenuous and constant endeavours as I have indicated to improve the existing state of matters, the newly published researches of the French chemist Pasteur on Fermentation and Putrefaction came under Lister's notice. Possessed strongly as he was of the scientific imagination, he seems to have recognized at once the all-important bearing which the result of those researches, if true, must have on the questions which had been occupying his own attention so long. In one of the earliest communications made by him on the subject—an address given at the Dublin meeting of the British Medical Association in August, 1867, these were his opening words:

"In the course of an extended investigation into the nature of inflammation, and the healthy and morbid conditions of the blood in relation to it, I arrived several years ago at the conclusion that the essential cause of suppuration in wounds is decomposition brought about by the atmosphere upon blood or serum retained within them; and, in the case of contused wounds, upon portions of tissue destroyed by the violence of the injury. To prevent the occurrence of suppuration, with all its attendant risks, was an object manifestly desirable, but, till lately, apparently unattainable, since it seemed hopeless to exclude the oxygen which was universally regarded at the agent by which putrefaction was effected. But when it had been shown by the researches of Pasteur that the septic properties of the atmosphere depended not on oxygen or any gaseous constituent, but on minute organisms suspended in it, which owed their energy to their vitality, it occurred to me that decomposition in the injured part might be avoided without excluding the air by applying as a dressing some material capable of destroying the life of the floating particles."

Compound Fractures.

The material he was led to try was carbolic acid, a substance little known in this country at that time. He had been much struck by an account given of the effect of the admixture of a small amount of it with the sewage of the town of Carlisle, with which certain lands were irrigated. It not only prevented odour from the pastures so irrigated, but destroyed the entozoa which were said always to infest the cattle which grazed upon them. Having obtained from his colleague, the late Dr. Thomas Anderson, Professor of Chemistry in the University of Glasgow, a sample of this acid which he chanced to have, Lister determined to try what power it might possess of preventing putrefactive changes in compound fracture. How very dangerous that particular form of injury was in those days may be better understood from a circumstance recently related publicly by Lord Lister—that Mr. Syme, the safest surgeon of his time, once told him that he was inclined to think that it would be,

on the whole, better if all compound fractures of the leg were subjected to amputation without any attempt to save the limb.

A method of using the antiseptic was soon adopted and carried out in a series of cases with most astonishing results, the injuries following the same quiet course as if the skin had remained unbroken. A small piece of calico or lint saturated with the undiluted liquid acid, and held in a pair of dressing forceps, was introduced into the interior of the wound, and all its interstices as far as they could be reached without undue force, were thoroughly stirred up with it. After this was done, two layers of lint, also saturated with the undiluted acid, were laid over the wound. They were made large enough to overlap it for about $\frac{1}{2}$ in. in all directions. Over these was placed a piece of thin block tin moulded to a shape like a small model of a youth's straw hat, the hollow portion or crown fitting over the pieces of lint, while the flattened edge or brim lay close to the skin, and could be fixed to it by strips of plaster. The carbolic acid made a thick paste with the blood, both in the wound and in the substance of the little mass of lint which adhered to its surface, and so a sort of antiseptic crust or scab was formed. Lastly the fractured limb was fixed in a suitable apparatus, well padded with some soft and absorbent material to receive the serum that oozed from under the crust.

Once a day or so the tin cap was removed, and the crust of lint and blood was lightly painted over with carbolic acid on its external surface. The object aimed at was to keep this crust from becoming septic, while its surface next the wound gradually lost the carbolic acid it originally contained, and so became quite unirritating to the wound. The procedure was, in fact, an imitation of those fortunate cases of compound fracture in which a small wound became at once covered over and sealed by a clot of blood, which dried into a sort of scab. The communication with the outside having been cut off, and luckily no irreparable mischief having been introduced, healing and cicatrization might take place without inflammation or suppuration, exactly as in a simple fracture.

The vapour of the pure carbolic acid which was daily applied to the surface of the antiseptic crust interfered with the cicatrization of the wound and so it had to be torn off from the wound, to which it often adhered very firmly, as soon as it was thought that the communication with the interior was well shut off. Some simple form of dressing was then applied which admitted of cicatrization proceeding undisturbed to a conclusion.

Large Abscesses.

The class of cases to which Lister next turned his attention was that of abscesses. These when connected with vertebral caries were followed by a mortality which, if not so striking and speedy as that of compound fractures, could hardly have been in reality much less. A case of abscess on the point of bursting in one loin having presented itself, he asked himself whether some treatment similar to that which had yielded such astonishing results in compound fracture might not be adopted here also. Accordingly he opened the abscess and mixed some of the thick pus which escaped with undiluted liquid carbolic acid. This furnished a paste, not so consistent, indeed, as the grumous mass which blood and carbolic acid together form, but sufficiently so to be laid over the wound in two pieces of lint, and covered with a cap of block tin as before. When this dressing was changed he found that instead of thick pus escaping as would have been the case had it been poulticed as usual, there escaped only a few drops of clear serum. He was naturally delighted, but of course had no material with which

to make a second dressing of the same sort. He therefore used a dressing made of a solution of carbolic acid in boiled linseed oil (1 to 4) mixed up with whiting (carbonate of lime), to the consistency of dough, so as to form an antiseptic putty. It was spread upon a piece of block tin and fixed over the incision by means of adhesive plaster and bandages. This particular case of abscess healed up ultimately, having furnished nothing but a thin serous discharge,

constantly and steadily diminishing. The demonstration was here made for the first time of a fact which he shortly afterwards, when the method of treatment was further systematized, referred to in these terms:

"Abscesses of large size have, after the original contents have been evacuated, furnished no further pus whatever, the discharge being merely serous, which in a few days has amounted only to a few drops in the twenty-four hours. Whether the opening be dependent or not is a matter of perfect indifference, the small amount of unirritating fluid being all evacuated spontaneously by the rapidly-contracting pyogenic membrane. At the same time, we reckon with perfect certainty on the absence of all constitutional disturbance."

This case was the first of many which proved that abscess connected with caries of bone, ultimately, if kept free from sepsis and at rest, recovered and healed securely, a fact which it seems to me is nowadays too much forgotten. I know, by abundant experience, that a psoas or lumbar abscess connected with tuberculosis of



Glasgow Royal Infirmary; front house; built 1798. From a photograph by Stuart, Glasgow.

the lumbar or dorsal vertebrae has only to be evacuated and dressed in such a way as to ensure asepsis of its interior, while the patient is kept constantly in the horizontal posture, and it will be found that sooner or later—perhaps not for a year or more—permanent healing will occur. To obtain such a result, as much care must be exercised in the dressing of the sinus to the very end as was taken in the original opening of the abscess. Operations undertaken for the removal of the abscess wall and of the bone, which is the starting-point of the abscess, are both unnecessary and disappointing. The avoidance of sepsis in the abscess cavity and in the resulting sinus until firm and complete healing has occurred, together with the removal of all weight from the diseased part of the spine by means of the constantly-maintained recumbent posture, are very certain means of effecting the recovery of such patients. This was the lesson regarding large collections of pus which Lister's practice taught at quite an early period—a lesson which I cannot help thinking is, as I have said, too little regarded at the present time.

The "antiseptic putty" now became the regular dressing in all cases of compound fracture and of abscess. In the former, after the interior of the wound had been treated with carbolic acid, or, as was found later on to be quite sufficient, with a five per cent. solution of the acid in water syringed into it, a piece of lint steeped in a solution of carbolic acid and oil (1 to 4) was placed immediately over the wound, overlapping it for a little distance in all directions, and over this a large dressing of the putty spread on calico, in a continuous sheet about a quarter of an inch thick, and covered by block tin. The dressing of putty was changed daily, but the oiled piece of lint, now more or less saturated with blood, was left always next to the wound, to which it adhered by means of a crust of inspissated blood collected beneath it. It continued quite dry and was commonly left untouched till the usual period for removing the splints in a simple fracture, when it was found that either a sound cicatrix existed beneath it, or, as was the case in larger injuries of the soft parts, that the wound was, to all intents and purposes, a superficial one.

The method of treating abscess of all kinds was as follows:—A square piece of lint dipped in a solution of carbolic acid in oil (1 to 4) was laid over the skin and allowed to remain in contact with it for a little. The lower edge of it having been raised, an incision was made with a knife which had been steeped in the antiseptic oil. The curtain of oiled lint was then let fall over the part, and the abscess evacuated under its protection by firm pressure on the cavity. A strip of lint dipped in the same antiseptic oil, especially if there was any considerable thickness of tissue divided by the knife, was introduced into the abscess cavity. It served the purpose alike of stopping oozing of blood, of preventing primary union, and of serving as a drain for the great serous oozing which follows immediately upon the evacuation of every large abscess. To prevent this from undergoing septic changes was the next problem, assuming that the abscess had been evacuated without introducing into it any living germs. This was done by means of the putty spread upon block tin or common tinfoil about 6 in. square. Fixed on by means of adhesive plaster, it was covered by a folded towel and secured in position by bandages. The serous discharge oozed out beneath its edges into the towel, and the dressing was, as a rule, renewed at least once in twenty-four hours.

These early methods of antiseptic treatment gave really excellent results, and the putty was found not unreliable in the treatment too of operation wounds. Although these methods have since been spoken of by Lord Lister himself as "both rude and needlessly complicated," they gave him the opportunity of making some new and very valuable pathological observations on the repair of wounds. Speaking of this period of his work before the British Association for the Advancement of Science at Liverpool in 1896, he said:

"We had the intense interest of observing in open wounds, what had previously been hidden from human view, the manner in which subcutaneous injuries are repaired. Of special interest was the process by which portions of tissue killed by the violence of the accident were disposed of, as contrasted with what had till then been invariably witnessed. Dead parts had been always seen to be gradually separated from the living by an inflammatory process and

"thrown off as sloughs. But when protected by the antiseptic dressing from becoming putrid, and therefore irritating, a structure deprived of its life caused no disturbance in its vicinity; and, on the contrary, being of a nutritious nature, it served as pabulum for the growing elements of the neighbouring living structures, and these became in due time entirely substituted for it. Even dead bone was seen to be thus replaced by living osseous tissue."

Ligature of Arteries.

These observations seem to have at once, or very soon, suggested a possible solution of a serious difficulty which presented itself, from the point of view of antiseptic treatment, in regard to the method of tying arteries, whether in their continuity or after their division in a wound. Hitherto the substance used for the purpose had been a thread of waxed silk, one or both ends of which were left hanging out of the wound until the dead and septic piece of artery embraced in the knot separated by the familiar inflammatory and suppurative processes, and so freed the ligature. Such a means of staunching bleeding or of ligaturing an arterial trunk in its continuity was clearly incompatible with the ideal aimed at by Lister in wound treatment. His first attempts at burying ligatures were made upon arteries in their continuity.

"One point," he wrote in 1869,¹ "which the antiseptic system has brought out in striking relief is that a portion of dead tissue is not necessarily thrown off by suppuration; but unless altered by putrefaction or artificially imbued with stimulating salts, serves as pabulum for the surrounding living parts which remove it by a sure process of absorption. Hence the death of a portion of the external coat included in the ligature does not of itself render it a cause of suppuration. And I conceived that if a silk thread, steeped in some liquid capable of destroying the septic organisms in its interstices, were tied round an artery, and left with short ends in a wound dressed antiseptically, the foreign body soon losing, by diffusion in the circulation, the stimulating salt by which it was saturated at the outset, and being in its own substance as unstimulating chemically as a pellet of lead from a fowling-piece, would either remain, like the latter, permanently encapsuled, or itself experience absorption together with the dead tissue in its grasp."

Before carrying out this idea in actual practice, he tied one of the carotid arteries of a horse with a silk ligature steeped in a strong watery solution of carbolic acid, cutting the ends off close to the knot and dressing the wound antiseptically (December 12th, 1867). Rapid healing took place without inflammation or suppuration. Six weeks afterwards, the part was examined, and so satisfied was he with what he found that he carried out essentially the same procedure a few weeks afterwards (January 29th, 1868) when called upon to tie the external iliac artery in the case of an elderly lady for an aneurysm of the upper part of the femoral artery. This time, to make assurance doubly sure, he steeped the silk in undiluted liquid carbolic acid. In other respects the operation was on the same lines as that on the horse's carotid artery, the ligature being tied, in both instances, with sufficient tightness to cut through the internal and middle coats of the vessel. The wound healed without suppuration and the aneurysm became completely consolidated. In a fortnight the patient sat bolt upright in bed: in another fortnight she was allowed to walk about her room, and, just six weeks after operation, went down three flights of stairs and walked for some time in the street, returning without undue fatigue to her room. She continued in good health for about ten months, when, having suffered from occasional attacks of dyspnoea, she died suddenly from the rupture of an aortic aneurysm. Careful examination after death of the part of the artery operated on shook Lister's confidence in this particular form of ligature and made him believe that it might not always prove even so satisfactory as it had done in this case. For he found what he could not but regard as evidence of a commencing suppuration. The knot of silk, although eroded and altered by the absorbing action of the surrounding parts, was still to a great extent present, and, enclosed with it in a little thin-walled capsule was a minute quantity of yellowish semifluid material, composed, as the microscope showed, in part of pus cells,

¹ Observations on Ligature of Arteries on the Antiseptic System. *Lancet*, 1869.

mixed with other cellular constituents and with fragments of silk fibre of various lengths and sizes.

These appearances made him feel that if there was any chance, even in exceptional cases, of a silk ligature applied antiseptically, giving rise to abscess by the persistent presence of sharp and jagged fragments of the fibres of the thread, he had better try to find some substitute for the silk, more likely to be readily and safely disposed of by the tissues. The use of "animal ligatures" was therefore next resorted to. They had been—long before—tried and abandoned, but his hope was that the avoidance of sepsis, alike in the ligature and in the wound, would lead to a different result from that obtained by other experimenters. On December 31st, 1868, he tied the carotid artery of a calf with ligatures of two different kinds, separated from each other by an interval of about $1\frac{1}{2}$ in. One was composed of three strips of peritoneum from the small intestine of an ox twisted into a cord, the other of fine catgut. Both had been soaked for four hours in a saturated watery solution of carbolic acid. The wound healed as the others had done, and the artery was examined a month afterwards. He found—to state the matter as nearly as possible in his own words—that the ligatures of peritoneum and catgut had been absorbed and replaced by living bands of tissue. The dead but nutritious mass had served as a mould for the formation of new tissue, the growing elements of which had replaced the materials absorbed, so as to constitute a living solid of the same form. He had previously observed the same sort of apparent transformation of dead into living material in the case of both blood clot and bone in compound fractures. Instead of the vessel being weakened at the spot, the encircling ring of new tissue incorporated with the arterial wall had given it additional strength. By the early healing of the wound, moreover, an immediate reconsolidation of the tissues which had been detached from the vessel at the point of ligature, had no doubt taken place. These considerations seemed to point to the great security against secondary hæmorrhage or other mishap furnished by such a plan, and from that day forward the catgut ligature was used, although prepared by somewhat different methods from time to time. During the rest of his practice in Glasgow it was for the most part prepared by suspending it in five parts of oil with one part of carbolic acid, liquefied by adding 5 per cent. of water to the crystals.

The Avoidance of Local Irritation.

I have already mentioned that the antiseptic putty spread on cloth was used in the dressing of incised wounds as well as in cases of compound fracture and of abscess; the wounds being washed with a solution of carbolic acid before being stitched, with the view of destroying any germs which might have fallen on them from the atmosphere during the operation. It will be observed, from the short account which I have given of the origin and development of the antiseptic system of treatment during the Glasgow period, that its author was always greatly impressed with the danger of contamination of the wound by the floating particles of the air. For this reason he washed an operation wound before finally stitching it, opened and evacuated abscess under a curtain of lint saturated with carbolic oil, and covered wounds with an antiseptic "guard" during the changing of dressings, substituting the one for the other as quickly as possible. Lastly, after he had gone to Edinburgh, he began the use of a carbolic acid spray during operation, and the subsequent dressings of the wound, with the object of displacing the surrounding atmosphere and substituting for it one charged with a finely divided germicidal solution. Later experience, and the growth of bacteriological knowledge convinced him, in after-years, that such precautions were not really necessary; and he was led to conclude that it was the grosser forms of septic mischief, rather than microbes in the attenuated form in which they existed in the atmosphere, that we had to dread "in surgical practice." He had hinted at the London Medical Congress in 1881, when describing some bacteriological experiments which he had carried out, that it might yet be possible to disregard the atmosphere. It was not, however, until the Berlin Congress in 1890 that he was able to bring forward what he considered absolute demonstration of the harmlessness of this supposed source of infection, and to announce that he felt himself justified in abandoning the

use of the spray. Latterly he neither used the spray nor washed the wound. I refer to this matter in some detail because I often hear people speak as if, at this early period of his work, infection of the wound by the atmosphere was the only source of defilement against which he took precautions. Nothing could be further from the truth. If he did guard against that supposed source of danger with an unnecessarily constant and watchful rigour, he was equally insistent, from the first, upon the careful sterilizing, by means of carbolic acid solution, of all hands coming directly or indirectly into contact with the wound, as well as the skin of the patient widely around the situation of the intended operation, and all sponges, sutures, ligatures, and instruments about to be used.

Experience went to show after a time that the putty, although it had yielded excellent results, presented some serious disadvantages. It was heavy and bulky, and apt to slip and change position, especially when applied on the posterior aspect of the body. He therefore, about this time, made many experiments with a view to devising something more suitable. This was ultimately secured in the "antiseptic lac plaster." He found that shellac, if melted and mixed with some carbolic acid, retained the acid with very great tenacity, and thus served as a reliable reservoir of the antiseptic, from which it was not too quickly given off and was not liable to be washed away. Spread as a plaster and applied to the skin, it unfortunately proved very adhesive, sticking in a most undesirable manner. This difficulty was, however, overcome. He had previously observed that carbolic acid passes quite readily through india-rubber or guttapercha tissue. A mixture of one part of carbolic acid in four parts of shellac spread upon calico was, therefore, painted over with a solution of indiarubber in benzine. When the benzine had evaporated, the thin layer of indiarubber left effectually prevented all adhesion of the plaster to the wound or skin while it offered no interference with the action of the antiseptic. This plaster was a trustworthy reservoir of the carbolic acid, and much longer intervals were soon allowed between the times of changing the dressings than had formerly been ventured upon. It was also light and pliable, easily accommodating itself to the shape of any part of the body.

It was always a point aimed at that wounds should be placed, as much as possible, in conditions resembling subcutaneous injuries; free alike from septic changes and from any undue stimulation.

"Of all those," Lister wrote very shortly after the time of which I am writing, "who use antiseptics in surgery, I suspect that I apply them least to the surface of the wound. "After the first dressing, the object which I always aim at is "to have the material in contact with the exposed tissues "approximate as closely as possible to the perfectly bland "and neutral characters of the healthy living textures. If "you consider the circumstances of a simple fracture, which "you cannot too often call to mind if you wish to keep "your ideas clear and right upon this subject, if you remember how the severe contused internal wound, "with the interstices of the mangled tissues loaded "with extravasated blood, recovers quickly and surely "under the protection of the unbroken integument, it is "plain that all that is required in an external wound is to "guard it against the disturbing influence of external agency. "The injured tissues do not need to be 'stimulated' or "treated with any mysterious 'specific'; all that they need "is to be let alone. Nature will then take care of them; "those which are weakened will recover, and those which "have been deprived of vitality by the injury will serve as "pabulum for their living neighbours. Now, of all external "agencies the most injurious by far is putrefaction, and this, "above all, we endeavour to exclude. But a substance "employed with this object, if sufficiently potent to destroy "the life of the putrefactive organisms, cannot fail to be "abnormally stimulating to the exposed tissues; and these "must be protected from its action if the wound is to progress "exactly like a subcutaneous one."

To protect the wound, therefore, against the stimulating and irritating effect of the carbolic acid in the dressing, he now aimed at covering the surface of the wound itself on the line of incision (according as it was open or closed by stitches)

with something which would prevent all harm to it from the acid in the lac plaster, which in its turn would widely overlap it in all directions, and prevent by its antiseptic influence the advent of mischief from without.

At first he tried covering the wound with thin black tin, afterwards with tinfoil, but the former was too rigid, while the latter wore quickly into holes. Afterwards he devised "a protective plaster," the basis of which was the common oiled silk. The oiled silk was covered with gum copal and brushed over with a solution of dextrin.² Before being applied it was dipped in a solution of carbolic acid, which uniformly moistened and wetted its dextrin-coated surface, and ensured that it was actively antiseptic at the moment of application. This small amount of the acid soon became dissipated, and left "the protective plaster," an aseptic and unstimulating covering of the wound or line of incision, as the case might be. The lac plaster was so placed upon it as to overlap it widely in all directions.

This was the antiseptic dressing in use when Lister left Glasgow in the autumn of 1869.

The Results on the Practice of Surgery.

Although the period when Lister was thus developing his antiseptic system of treatment in Glasgow, extending as it did from March, 1865, until the autumn of 1869, was a very short one, it is hardly possible to exaggerate the changes which he accomplished in every department of surgical practice. To describe these in detail is impossible within the limits of this paper. Wounds were found to heal without inflammation, suppuration, or constitutional disturbance; compound fractures and dislocations were robbed of the former dangers which surrounded them; large chronic abscesses connected with bone disease were proved to be no longer incurable, even when occurring in the adult; arterial trunks were ligatured in their continuity without fear of secondary hæmorrhage or other mishap; joints opened, whether by accident or by the surgeon's knife, healed without a disquieting symptom; ununited fractures were treated boldly by removing the ends of the fragments in open wounds; and incisions were made with success into departments of practice which up to that date were looked upon as forbidden ground.

Two such operations I must mention, since they may be regarded as the first examples of what have now become common and established surgical procedures.

One was an osteotomy for the correction of deformity. A patient had had his foot driven outwards and backwards by the violence which occasioned a simple fracture of the fibula and internal malleolus four months before, and union had occurred with the foot in this faulty position. Relying on his recently-devised means of wound treatment, Lister divided the callus of both tibia and fibula, although knowing that in so doing he was opening the ankle-joint. The foot having been drawn forcibly into proper position and the wounds treated antiseptically, the patient recovered with a sound and useful foot.

The other case was one of carcinoma of the mamma with glandular disease high in the axilla, which occurred much about the same time (1867). Mr. Paget and Mr. Syme had both been consulted, and, in accordance with the practice of the day, had advised against any surgical interference. Having satisfied himself, by rehearsing the operation on the cadaver, that there was no insuperable anatomical difficulty in the way, Lister removed not merely the mamma, but also, I believe for the first time in the history of surgery, the whole of the axillary glands, dividing the pectoralis major muscle up to the clavicle, and cutting the minor entirely across. This great wound was conducted to a successful issue, and the lady lived for three years without any recurrence of disease in the part. She died of a metastatic tumour of the liver.

It only remains to be added that the effects of the new treatment upon the wards "were in the highest degree beneficial, converting them from some of the most unhealthy in the kingdom into models of healthiness."³

² Gum copal offers even stronger opposition to the passage of carbolic acid than does the oiled silk.

³ *The Effects of the Antiseptic System of Treatment upon the Salubrity of a Surgical Hospital.* Edinburgh: Edmonston and Douglas, 1870.

EDINBURGH ROYAL INFIRMARY, 1869-1877.

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The Chair of Clinical Surgery in Edinburgh and its Occupants.
In 1903 the chair of Clinical Surgery in the University of Edinburgh will have been established for one hundred years. Its first occupant, James Russell, held the position for thirty years. In 1833 he was succeeded by James Syme. In 1829, Mr. Syme, unable to get wards in the Royal Infirmary, had instituted a surgical hospital in Minto House. Dr. John Brown, Dr. Alex. Peddie, and Dr. Cornwall were his principal assistants. Dr. Peddie is now the Nestor of the profession in Edinburgh.

Mr. Syme held the chair of Clinical Surgery for thirty-six years, and retired in 1869. Joseph Lister, Syme's house-surgeon in 1855, and afterwards Assistant Surgeon and Lecturer on Surgery in the Extra-mural School, came from the Systematic Chair of Surgery in Glasgow University, and spent eight years in Edinburgh as Professor of Clinical Surgery, to be succeeded by Thomas Annandale in 1877.

In one hundred years four surgeons have held this important position, and it is my privilege to speak of the time from 1869-1877.

The Surgical Hospital in Edinburgh was built in 1777, and used as the Edinburgh High School for fifty-two years; it then became the Surgical Hospital, and was only vacated in 1880, when the new Edinburgh Royal Infirmary—a building with the beginnings of which Syme had much to do—was opened. The old hospital building is now the Edinburgh Fever Hospital, and is much altered internally. The old wards are still there, the little room where Mr. Syme used to meet his dressers, and the residents' room are now small wards. The theatre is now divided into wards. Externally the building is unaltered.

"The Germ Theory of Putrefaction: The Basis of a New Method of Treatment."

Joseph Lister was appointed in August, 1869. He began his official life as Professor of Clinical Surgery on November 8th by delivering his introductory lecture in the old chemistry class room. I was then Demonstrator of Anatomy with Professor Turner, who had succeeded Professor Goodsir in 1867, and I well remember that lecture. The large room was crowded, and the late Principal, Sir Alex. Grant, was in the chair. Mr. Syme was present, and received a great ovation from his old pupils. Mr. Lister said: "We may all rejoice that our old master is still among us to cheer us by his presence and aid us by his counsel." In 1896 Lister, when President of the British Association at the Liverpool meeting, spoke of Syme as the "safest surgeon of his time." Mr. Syme was not long spared, and some who read this will recall a sad day in June, 1870, when "our old master" was laid at rest in the burial ground to the east of St. John's Episcopal Chapel at the west end of Princes Street.

Lister devoted his introductory lecture to "an endeavour to convince" his hearers of "the truth of the germ theory of putrefaction," "the basis of a new method of treatment," "the antiseptic system." He told his students of Pasteur and his work, and during the years spent in Edinburgh he always spoke of Pasteur as his master, and when he represented Great Britain at the Pasteur Jubilee in 1892 he addressed Pasteur, and said: "Truly, in the whole world there does not exist any one to whom medical science owes more than to you." "Owing to you surgery has undergone a complete revolution."

Lister's Influence on Students.

At this time (1869) Mr. Lister had published five papers on Antiseptic Surgery, the outcome of his early investigations in Glasgow. His disciples then were few; the method he adopted was called by many the "carbolic acid system." In 1871, when he delivered the address on Surgery at the Plymouth meeting of the British Medical Association, it was said that "Professor Lister's solutions became weaker and weaker, while his faith appears to grow more and more." At that time the new doctrines were not in general favour.