A Paper

ON

THE PREVENTION OF ACCIDENTS AND COMPLICATIONS IN THE COURSE OF TREATMENT IN CHRONIC OSTEOMYELITIS *

BY

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Almost exactly sixty-six years ago—on August 9th, 1867—Joseph Lister, then professor of surgery in the University of Glasgow, spoke before the British Medical Association at a meeting in Dublin "On the Antiseptic Principle in the Practice of Surgery." No one needs to be reminded of the epoch-making character of that address. It began a revolution in the practice of surgery; lives and limbs have been saved and suffering has been alleviated beyond any possibility of computation. It is instructive to recall, however, that this revolution was a gradual one. It was not until eight years later—in 1875, at Edinburgh—that Lister, again before this Association, gave his address "On the Effect of the Antiseptic Method upon the General Salubrity of Surgical Hospitals." It was in this address that he brought together his own observations and clinical experiences, and those of a number of other distinguished teachers of surgery, as to the clinical value of asepsis and antiseptics. With your kind permission I shall endeavour, somewhat in the manner of Lister's Edinburgh address, to bring to your attention at this time a slightly different method for the employment of the "antiseptic principle" in dealing with osteomyelitis and some of the accidents and complications that have commonly attended and followed this disease.

When Lister became professor of surgery at King's College, London, in 1877, not more than three or four surgeons in London had accepted, or were employing, the antiseptic method. Not only so, but in the odd sixty years since that time the antiseptic method as designed by Lister has been so altered that most cases of osteomyelitis, compound fracture, and other infected wounds are treated with less regard for the original antiseptic or aseptic principle than they would have been in 1870 by Lister himself. In surgical practice before the time of Lister acute infections of all kinds were the rule after injuries and surgical operations. Erysipelas, gangrene, septicaemia, and other septic complications, as well as amputations after compound fractures, were looked upon as unavoidable accidents—that is to say, as customary complications and sequelae for which there was neither prevention nor satisfactory treatment. Even now we have a set of similar, though less severe, complications of wounds and compound injuries that are looked upon as at least excusable, if not unavoidable. A large amount of the terrible wound sepsis of the great war was blamed upon the character of the soil with which wounds were contaminated in Flanders. Secondary sepsis and septicaemia, shortening after compound fractures, delay in healing, deformity, and disability, were accounted for and excused by the difficulty of treating these severe wound infections.

It is to this phase of the subject that I particularly desire to direct your attention. I am strongly of the opinion that these septic complications and their after-effects in osteomyelitic and compound injuries may, and should be, prevented by proper operative precautions,

management of the patient, and after-care, and it is of a method designed to prevent and to correct acute operative and post-operative infections, septicaemia, contracture deformity, and disability that I wish to speak.

EVOLUTION OF THE METHOD

It seems inevitable that one who interests himself in the prevention or treatment of sepsis should become a disciple of Lister. So in the search for a method of treatment I turned first of all to his earlier teachings with regard to the fundamentals of the prevention of inflammation and infection. The method of treatment which I have worked out consists in a combination of the antiseptic method and of certain other technical methods which have been shown by illustrious British surgeons to be of fundamental importance in surgical practice. I refer especially to the employment in surgical practice of the natural forces of repair, as enunciated by John Hunter; the protection of the patient against irritative motion and muscle spasm, as set forth by John Hilton; the protection of the wound against chemical irritation and infection, as originally taught by Lord Lister; and the use of mechanical apparatus to secure immobilization and rest in correct position, as was advocated so long and so successfully by Hugh Owen Thomas of Liverpool and Sir Robert Jones.

It must be said that my own convictions as to the importance of combining these various factors into a plan of treatment did not crystallize until we were faced with the apparent failure of the antiseptic system during the great war. The antiseptic method had been so carefully worked out by Lister, and had been so universally and so successfully employed, that it seemed incomprehensible that it could be at fault. That we had so many bad results in infections and in compound fractures must, it appeared, have been due rather to difficulties of some other kind. During my military experience in one of the hospitals in France we suggested that bad results after compound infected fractures and in other infected wounds must result from the neglect of factors other than the antiseptic method.*

In making a study at that time to determine the reasons for our poor results in war wounds and compound fractures, I first re-read all of Lister's contributions upon this subject. Naturally I turned first of all to the Dublin address. I was struck at once with the fact that our so-called modern antiseptic practice did not conform at all to the exact rules originally proposed by Lister himself. One of the fundamentals of Lister's teaching was that we must protect and defend the wound surface not only against infection, but against injury by trauma or chemical irritation as well. Consider for a moment what we were doing during the years of 1917, 1918, and 1919 in our military hospitals. There was constant use of chemicals of all kinds in compresses, fomentations, drainage tubes, irrigations, and frequent dressings. Neither the wound nor the patient had protection or rest. Not

* *The Treatment of Orthopaedic Patients in Base Hospitals.*—

The considerations involved in the treatment of war wounds in base hospitals must be made to include not only existing and imminent surgical pathology, but ultimate position and function of injured parts as well. It is these latter points which, in both civil and military surgery, operators have been prone to overlook. A bleeding or an infected wound, especially if of considerable size, makes an immediate and urgent demand upon the surgeon's attention. There has been a tremendous accumulation of evidence in this war to prove, however, that wounds of whatever size and character heal better if all the parts involved are restored immediately to and adequately maintained in as nearly as possible normal anatomical relations. The different effect of such treatment upon the patient's ultimate career should be almost too obvious to require comment. It is a fact, however, that not only because of the stress of war conditions, but because of the failure of surgeons to interest themselves in what, for convenience, must be called the orthopaedic viewpoint, many of these patients in base hospitals for treatment or in preparation for conveyance to the United States have not been dealt with adequately in this regard. (From Memo. No. 178, Hq. Hospital Centre, Savenay, November 28th, 1918.)

* Read in opening a discussion in the Section of Orthopaedics at the Annual Meeting of the British Medical Association, Dublin, 1933.

only so, but organisms of all kinds were permitted to drift into the wound or were actually carried by the surgeon, his assistants, or nurses into dressing fields that should never have been disturbed at all. In addition, the splints employed in fractures and similar injuries were loosely applied, disturbed, or even removed so that wet dressings might be applied and frequently changed. Plaster-of-Paris casts, the most efficient form of immobilization dressing that we know, were fenestrated, split, bivalved, or otherwise bedevilled, so that they never were, or soon ceased to be, efficient for the purposes for which they were designed.

Altogether our methods for post-operative care were such that Lister, Hunter, Hilton, and Thomas, and their teachings, were forgotten or ignored on behalf of an operative and post-operative programme in which the patient and his wounds were not permitted suitable continuity, or asepsis, antisepsis, protection against secondary infection, or immobilization and rest in correct position. Many poor results in fractures and chronic infections were the inevitable consequence.

ITS APPLICATION

In my first attempts to revise the clinical methods which appeared to be at fault, and which seemed to be responsible for many poor results, I was influenced by two principal considerations: first, that both local and general (and acute and chronic) septic complications should be provided against; and secondly, that well-understood and established measures of immobilization in correct position should be employed from the orthopaedic viewpoint. I felt that adequate fixation in casts or splints would contribute not only to the patient's general comfort, but would prevent spasmodic contracture of muscles, pain, deformity, and ultimate impaired function and disability. Happily it was soon found that the first of these demands for a different surgical therapeutic method were met to a large extent by correct and constant application of the considerations involved in the second.

After this period of study and reflection I undertook to determine the effect upon patients with acute and chronic infections of the changes in treatment that I considered would conform to this altered viewpoint. It appeared that patients with chronic osteomyelitis, having survived the acute infectious period, and having become somewhat accustomed to the organisms which they were carrying, might be safely tested first by immobilization in plaster-of-Paris casts and by having their wounds infrequently dressed. I felt that such patients, having already demonstrated a degree of acquired immunity, could protect themselves against any ordinary amount of infection that might accumulate in the wound. My application, soon after, of the same method to compound fracture, acute osteomyelitis, and other patients in whom no such built-up immunity might be assumed, was based upon a slightly different theory. This was that in such cases we should, by early drainage, débridement, and by avoiding exposure of the wounds for dressings, keep the degree of infection down to an amount that the patient could "absorb" (in the sense that one "absorbs" punishment of other kinds), and this has proved to be correct.

During 1920 and 1921, therefore, a few such patients were treated by immobilization in plaster, with long intervals between dressings. It was soon found that not only did the patients do well, but that they ceased to have complications in the way of local and general sepsis, that pain was diminished, and that a few of them actually healed in the first cast. This soon led to bolder methods. Some of the more actively infected wounds were drained, some with deformity were corrected even in the presence of active suppuration, and the same

immobilization and dressing methods were employed. An improvement in results followed at once, so that as time went on compound fractures, acute osteomyelitis, soft part infections, and many other conditions were treated in this way. This method has now come to be called the "method of immobilization and rest." A high percentage of healing without complications, with prevention of deformity, and with many other advantages has thus been developed. Patients who had been dressed daily for years were found to go on to complete healing in the course of a few weeks or months with only one or two dressings, and with a minimum of pain, inconvenience, expense, and with much less than the usual incidence of acute complications, infectious sequelae, and ultimate deformity and disability.

The exact programme which was worked out for these cases now more than ten years ago is given below.

THE "ORR" METHOD IN OSTEOMYELITIS, COMPOUND FRACTURES, AND OTHER INFECTIONS

OUTLINE

1. Immobilize patient at once in best position possible on operating table.
2. Do a thorough débridement or drainage operation if necessary.
3. Pack entire wound open with sterile vaseline gauze, using no sutures or drainage tubes.
4. Apply an extensive well-fitting plaster-of-Paris cast.
5. Do not disturb the cast, the wound, the dressings, or the injured part, except for definite complications.

THE METHOD IN DETAIL

1. Preliminary

- (a) Secure best position of the injured limb possible by traction, manipulation, etc.
- (b) Use the simplest and least possible number of movements in reducing fractures or in correcting deformities.
- (c) Employ moleskin traction, pins, or ice-tongs if found to be necessary, included in the cast to maintain length and correct position.
- (d) Do not move or manipulate inflamed or injured parts during or following the operation.

2. The Operation

- (a) Make an incision or opening that will thoroughly uncover (saucerize) the infected area.
- (b) Remove foreign material and dead or dying tissue as much as possible.
- (c) Do not curette or damage healing and protective portions of the wound cavity. No attempt is to be made to remove all diseased or infected tissue.
- (d) Do not remove bony or soft parts that may contribute to repair.
- (e) Wipe out with iodine and alcohol, just as the skin was prepared, in order to give a clean field for the dressing.

3. The Closure

- (a) Fill cavity with a vaseline gauze pack from the depths to the surface of the wound. Pack gently but firmly.
- (b) Use no drainage tubes or other mechanical irritants in the wound.
- (c) Use no chemical as a dressing at any time.
- (d) Do not suture or cover any infected area with flaps of muscle, fascia, or skin.
- (e) Cover with a dry, sterile, absorbent pad to take up drainage at the edges of the vaseline pad.

4. The Splint

- (a) Maintain the length and position already obtained, and immobilize the affected part in such a manner that no muscle spasm or contracture can occur.
- (b) Plaster-of-Paris, well-fitting and extensive, has been found to be most satisfactory as an immobilizing device. Its efficiency has been greatly improved by the plan following.
- (c) Moleskin adhesive straps or skeletal fixation devices to be included in the cast will ensure fixed traction, control of fracture fragments, and comfort for the patient.

5. The Dressing

- (a) Plaster-of-Paris casts are applied so as not to be fenestrated or split. In this way the temptation to inspect or dress the wound is prevented.

(b) Secondary dressings, when done, should be done in the operating room and aseptically.

(c) The injured part is not to be moved nor the wound surface to be damaged.

(d) Do not hesitate to employ anaesthetics for secondary dressings.

(e) Make late dressings as infrequent as early ones.

IMPORTANCE OF ROUTINE

In the further consideration of chronic osteomyelitis at this time it should be borne in mind that all forms of bone infection (in whatever manner they may have arisen) are under discussion. One of the too common teachings about chronic osteomyelitis, compound fractures, and, indeed, many other injuries and diseases, is that the surgeon and the method of treatment must adapt themselves to the individual patient, to the particular type of injury or disease, and to the circumstances surrounding the particular case. It is my definite opinion that such considerations interfere with proper treatment. In undertaking to develop a new method of therapy for these patients it was hoped that a plan might be found and systematized which would have a general application. It is my belief that such a plan has been found, and that the more nearly we can approximate a standard routine in dealing with these patients the better our results will be. We have learned that even bone and joint tuberculous patients with mixed infections will respond promptly to this plan of treatment, and in most cases go on in casts with infrequent dressings to as good a recovery as those who have been aspirated or drained aseptically. It is, of course, occasionally necessary to make departures for extraordinary conditions or circumstances. Speaking generally, however, it has been found possible to apply the plan of treatment described above almost without exception in dealing with all of these conditions. The prevalent notion that the individual patient and the individual surgeon must always have particular and different consideration for every case has been one of the commonest reasons for departure from established principles of treatment, and is responsible for many poor results.

With regard to the details of treatment in my method I have had hundreds of letters suggesting that this or that phase of the treatment might be modified or omitted. To all of these I have made the same reply—that the more closely we adhere to all the details the better our results will be. During the early years of my work for osteomyelitis patients I was often persuaded to leave off casts or splints, to do more frequent dressings, or in other ways to vary from my usual programme. In such cases I found that I encountered exactly those difficulties that we were so anxious to avoid. Those who do vary from this programme are quite certain to find that their patients will have pain, swelling, local or general inflammatory complications, or delayed recovery in one way or another.

CONCLUSION

I submit this discussion for your consideration in the hope that we shall be able to add something to the wonderful progress in surgery already made by many distinguished members of this Association. To review briefly what I have endeavoured to bring to your attention: adequate surgical drainage of infected areas; the maintenance of such drainage without exposing the wound to further trauma and infection; and prolonged protection of the wound, the injured or inflamed part, as well as the patient, against the evil effects of irritative motion, contracture deformity, and ultimate disability. These are all important functions of the attending surgeon. By such a programme the vital resources of the patient may not only be conserved but employed toward his recovery, limbs and lives may be saved, and the patients made more comfort-

able. They can also be taken care of at less trouble and expense than usual. If we have made progress in these directions we have made a definite contribution to this department of surgery. These features of surgical treatment and clinical results are difficult to study or to demonstrate in figures and statistical tables. We have had very few satisfactory reports of clinical results in osteomyelitis and compound fractures from our civilian clinics and hospitals. A study of the results obtained in wound infections and compound fractures from our military experience of fifteen years ago revealed many unhealed wounds, ununited fractures, and chronic infections years after the war was over. Similar figures from our civilian hospitals would show similar results. Suffering, meta-static infections, contracture deformities, incapacity for former occupations, and disability because of persistent pain do not appear in the statistical tables. I believe that we have been able to show, however, that with the simpler surgical therapeutic method I have described we have made definite improvement in these respects. Such clinical results can only be observed and recorded in general terms by surgeons and their associates on the basis of contact with patients and clinical experience. It is hoped that the plan which I have proposed will be given a trial. It is only upon the basis of such a special test that conclusions which are fair and which are scientific in the best sense may be reached.

[Lack of space makes it impossible to print here Dr. Winnett Orr's case records and statistical tables. For the same reason the author's account of correspondence and discussions, relating to the method of treatment, and giving the experience of other surgeons, has been omitted. This additional material will be found in a reprint to be published separately.]

THE SIGNIFICANCE OF VITAMINS IN PRACTICAL EXPERIENCE *

BY

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The task I have set myself to-day is to summarize certain evidence as to the real practical importance of vitamins in day-to-day clinical experience. First, however, I want to say how fully I appreciate the great honour which your president has paid me in asking one whose work has lain principally in the laboratory and not in the clinic to open this discussion. But let me add this, that it would be a mistake to suppose that the research worker is not interested in the immediate practical problems of the clinician. At the same time, I am only too well aware that many practitioners still regard vitamins as largely of academic interest, and suppose that correct feeding is a matter that can be left to "Nature," or "instinct," or "common sense."

If one is asked, How did our ancestors manage to get on so well before the era of vitamins, I think one can only reply that they did not. In 1730 out of all babies born in London 74 per cent. died before they were 5 years old; in 1770 the figure had been reduced to 50 per cent.; and by 1833 to 30 per cent. During the first quarter of the present century the death rate of infants under 1 year fell continually and steadily, from 150 per 1,000 to 70 per 1,000. It would of course be unfair to minimize the important part played by other

* Read in opening a discussion in the Section of Diseases of Children at the Annual Meeting of the British Medical Association, Dublin, 1933.