ASEPTIC TREATMENT OF WOUNDS

THE ASEPTIC TREATMENT OF WOUNDS

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NEW YORK THE MACMILLAN COMPANY 1948

Printed in the United States of America.

Set up and electrotyped. Published, February, 1948

Gratefully dedicated to
the Peter Bent Brigham Hospital,
an environment in which the opportunity
and responsibility essential for early
professional maturity abound.

PREFACE

The prompt, kindly healing of wounds, long a rarely attained goal of the most adept surgeon, has become so routine that modern surgeons habitually assume the miracle of the 1870's to be an attribute of their own skill rather than a specific system of treatment as effective and spectacular as that of chemotherapy. Indeed, a wave of chemotherapeutic hysteria has engulfed many surgeons, whose aseptic treatment is unknowingly so sketchy that wound complications plague their work.

The aseptic treatment of the wound in the operating room is the culmination of so much daily thought and effort on the part of those to whom the responsibility for its details has been relegated that most surgeons think of asepsis only as the use of rubber gloves and a few sterile drapes. Oddly enough, the host of laymen who contribute to asepsis influence the sterility of the operative field more often than does the surgeon.

This monograph is an attempt to correlate the knowledge and effort of all who contribute toward the aseptic treatment of wounds, much as did Curt Schimmelbusch's monograph of similar title fifty years ago. While it was written primarily to serve as a text for medical school courses in surgical technic, it is hoped that it will enable manufacturers, salesmen, architects, trustees, administrators, contractors, and craftsmen, such as plumbers, steamfitters, or electricians, to orient their contribution to the care of the patient and make them realize their grave responsibility for his safety.

The scientific data presented may prompt nurses and surgeons to question the wisdom of pride in a traditional technic and continued subservience to expediency. Failure to standardize aseptic technic on a scientific basis is in itself an outstanding fault, because the successful performance of any technic depends upon the respect and cooperation it commands from all concerned with its proper function. Every change in personnel, whether among surgeons, nurses, medical students or lesser subordinates, introduces uncertainty in the chain of safety until the newcomer forgets previous training, which may well have been superior, and learns a new brand of "asepsis." Carelessness, tradition, expediency, and habit dictate many technics, whereas safety for the individual patient demands a basis of fact and a standardized technic.

The technic described, one of several acceptable technics, is that elaborated at the Peter Bent Brigham Hospital and expresses the surgical philosophy of Harvey Cushing and Elliott C. Cutler. Many surgeons and nurses have contributed ideas and constructive criticism and, above all, were tolerant and understanding when it seemed easier to do things "the old way." The author was fortunate in working with Catherine Richards, Esther Kinney, Bridget

Egan, and Elizabeth Comisky, successive operating room supervisors, each of whom aided in improvement of technic during the past twelve years.

The myriads of questions prompted in the minds of medical students, internes, and nurses by the inconsistencies and discrepancies in aseptic technic established the need for this book. Numerous adventures in hospitals where postoperative infection and sepsis presented problems broadened its scope. Even within one hundred miles of Boston, hospitals were visited where instruments were not sterilized routinely between cases; where the chamber of a steam sterilizer had never been connected to the steam supply; where waterproof duck was used as sterilizing wrappers; where the dry goods frequently burst into flame as they were withdrawn from the sterilizer; where the superintendent's hero was an orderly who "sterilized" twice as much dry goods in half the time usually needed by the nurses by simply pushing the packages through a double ended autoclave into the "sterile" supply room. In each instance, surgeons requested help to solve problems that basic knowledge would have avoided.

Authorities in the surgical trade often proved to be the ultimate source of knowledge and the principal sterilizer manufacturers have put their facilities at the author's disposal.

Special mention must be made of the assistance of Adolph Watzka who has made a noteworthy career of enforcing aseptic technic, as can be attested by the thousands of patients he has lifted to the operating table and the hundreds of students and young surgeons whose technic bears the imprint of his corrections.

The bibliography is not exhaustive. Of thousands of references, only those of significance for the student interested in more detailed knowledge are listed.

The illustrations, particularly the graphs and diagrams, are shown with sufficient poetic license to emphasize the basic principles involved rather than to represent the actual data. The latter can readily be obtained by referring to the original works for which references are given.

The diagrams which clarify technical points were produced in collaboration with draftsmen of the Wilmot Castle Company, Rochester, New York.

So much of the book is carried by the illustrations that Miss Mildred Codding has played the rôle of co-author rather than artist. The author is grateful not only for her skill but also for the loyalty and persistence with which she carried on for six months while he was convalescent.

The industry and devotion of Miss Dorothy Wysocki are responsible for the preparation of the manuscript, lettering of the graphs and diagrams, and building of the index.

The manuscript was reviewed by Dr. S. Burt Wolbach. His suggestions and criticisms were appreciated greatly.

Finally, the author acknowledges the stimulus and inspiration of Dr. Elliott C. Cutler whose zeal bridged the North Atlantic to goad publication.

FOREWORD

This volume contains within its pages information of the utmost value to everyone who is concerned with the surgical care of patients, whether it be the surgeon, the nurse, the medical student, or the hospital superintendent.

The aseptic technic had its beginning in simple cleanliness, a principle magnified beyond its true and safe values by Lawson Tait, but it had to be established through the experience of antisepsis and its emergence was beclouded by that struggle. Thus, the notable book by Schimmelbusch, published in 1893 and entitled *The Aseptic Treatment of Wounds*, fell in part on deaf ears though it compressed within its small bulk all the principles of asepsis as then understood. In the intervening half century there has been little attempt to put into a single volume our present knowledge of the methods by which we render aseptic the surgeon, his assistants, and all the materials that enter into a surgical procedure. The methods used to prepare materials for dressing the wounds in the wards have often been considered apart from those methods which we use in our operating rooms. The preparation of fluids for subcutaneous or intravenous administration sometimes has been relegated to the pharmacist as of lesser importance, yet underlying everything the surgeon does are the technics by which we fight off sepsis. The principles are fixed and immortal. The procedures are now adequate and have been carefully studied. It has been my feeling for years that in the mass of technical methods the principles have sometimes been lost sight of. Surgeons, hospital administrators and hospital architects have often paid more attention to outward appearance and superficial cleanliness than to the machines upon which we must rely for sterilization. And the surgeon has become so busy that he has relegated to the nurse and the hospital engineer, the proper running of his autoclave. Moreover, the bacteriologist has not been given his fair share in hospital responsibility. Every surgeon should know at least the principles which underly the working of an autoclave, for he cannot escape full responsibility if the material supposedly sterile be not sterile.

This is but a small volume and its contents should be known to everyone who takes upon his shoulders the responsibility of opening the human body. There can be little excuse now for sepsis following an operation of election, since the methods of avoiding it are presented here in simple words and with complete explanation. All surgeons will be grateful to Dr. Walter for this splendid contribution.

ELLIOTT C. CUTLER

Brigadier General, AUS (Retired) and Chief Consultant in Surgery, European Theater, U. S. Army; Late, Moseley Professor of Surgery, Harvard Medical School and Surgeon-in-Chief, Peter Bent Brigham Hospital.

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CHAPTER I

THE IMPORTANCE OF THE ASEPTIC TREATMENT OF WOUNDS

— CURT SCHIMMELBUSCH, 1893 *

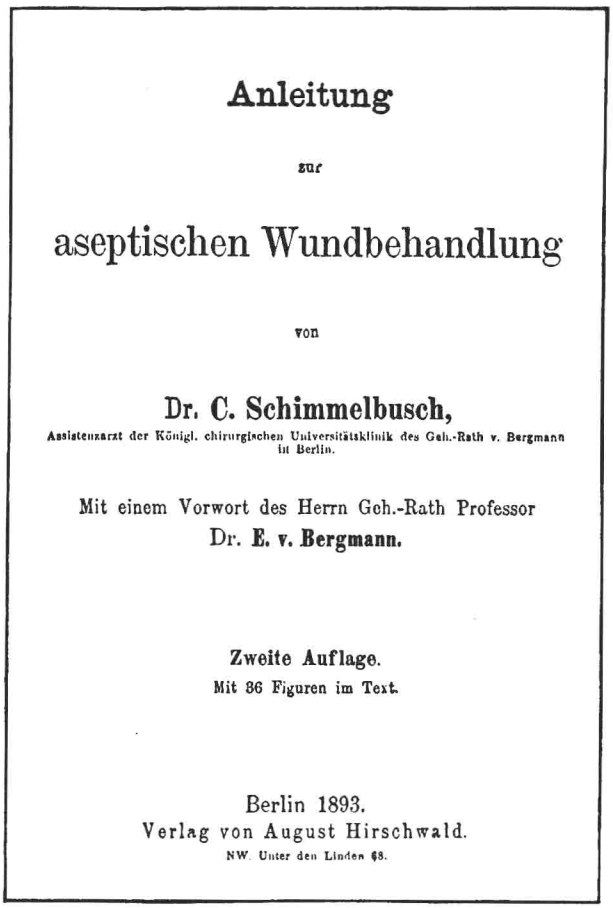
"It is well for us, who have profited by the achievements of our predecessors, and who watch the progress of science perhaps not without occasional misgivings, to look back upon the past and gauge the value of what we have inherited. We need not go back to ancient times, in which the performances of surgery were cramped by want of anatomical and physiological knowledge, no less than by imperfect technique; we need go no further back than thirty or forty years. Let us compare the modern epoch of our science with that period, in which the highest abilities and a degree of operative skill, that we cannot hope to surpass, were powerless to control the dark issues of the fate that hovered over the wounded, making all calculations of the results of operations futile. At that time, the idea of a wound was inseparable from that of fever; the healing of a wound without inflammation was not known, and wound fever and wound inflammation appeared to be the normal reaction of the injured organism. It was then that Pirogoff wrote his treatise on luck in surgery, in which, after long years of surgical practice, he so resignedly gave expression to the feeling of the futility of his own skill, and estimated the influence of the surgeon, of the method of treatment, and of mechanical dexterity, at nothing compared with that of chance in determining the success of an operation. Suppuration, purulent edema, hospital gangrene, erysipelas, and traumatic tetanus, the scourges of surgery, as Pirogoff [1] aptly terms them, dogged the steps of the surgeon and frustrated his success.

"Lindpaintner [2] writes of Nussbaum's Clinic in Munich as follows: 'Eighty per cent of all wounds were attacked by hospital gangrene. Erysipelas was so much in the order of events, that its occurrence could almost be regarded as normal; it was a standing axiom to sew up no scalp wound; healing by primary intention was practically unknown, and suturing had at most the result of favouring by retention of secretion, the occurrence of erysipelas. In one year 11 out of 17 amputations died of pyaemia alone; in our department a compound fracture was very rarely to be seen, for either the limb was amputated at once, or the occurrence, in a few days' time, of purulent infection, hospital gangrene, and septicaemia rapidly led to a fatal result.' The mortality after compound fracture, in Volkmann's Clinic at Halle, had been 40

* SCHIMMELBUSCH, CURT: *The Aseptic Treatment of Wounds*, Berlin, 1893, Chapter I, translated by Alfred T. Rake, 1894, H. K. Lewis and Company, Ltd.

[1] PIROGOFF, N.: *Klin. Chir.*, Leipzig, 1854.

[2] LINDPAINTNER, J.: Ergebnisse der Lister'schen Wundbehandlung, *Deutsche Ztschr. f. Chir.*, 7:187, 1877.



Anleitung

zur

aseptischen Wundbehandlung

von

Dr. C. Schimmelbusch,

Assistenzarzt der Königl. chirurgischen Universitätsklinik des Geh.-Rath v. Bergmann in Berlin.

Mit einem Vorwort des Herrn Geh.-Rath Professor Dr. E. v. Bergmann.

Zweite Auflage.

Mit 86 Figuren im Text.

Berlin 1893.
Verlag von August Hirschwald.
NW. Unter den Linden 68.

FIGURE 1

Facsimile of the title page of *The Aseptic Treatment of Wounds* by Curt Schimmelbusch, Berlin, 1893.

per cent during the long period of his predecessor's rule as well as during his own, and in the years 1871 and 1872 the number of the victims claimed by pyaemia and erysipelas was so large, that Volkmann entertained the idea of closing his Clinic for a time.

"How different is all this at the present time! The Clinics, in which twenty years ago hospital gangrene was reckoned the most frequent disease of wounds, are now-a-days in such a condition, that the medical student no longer has the opportunity of seeing hospital gangrene, and most young surgeons no longer recognise the disease. The most serious operations under modern surgeons run a favourable course with such a certainty, that the chance of a failure in the healing hardly enters into their calculations. Fatal inflammation after amputation should, as a rule, no longer occur.

"There is now no such thing as good and bad luck in the treatment of a wound; the fate of the patient lies in the hands of the surgeon who performs the operation and dresses the wound. The old saying of Ambroise Paré, '*Je le pansays, Dieu le guarit*,' has ceased to be the involuntary motto on the shield of the operating surgeon, and in putting on the dressing, the surgeon undertakes the entire responsibility for complete and certain healing. 'A short time ago,' says Volkmann [3] in his excellent way of expressing it, 'the surgeon when he had completed a bloody operation, according to rule, was like a husbandman, who having sown his field, waits with resignation for what the harvest may bring, and reaps it, fully conscious of his own impotence against the elemental powers, which may pour down on him rain, hurricane, and hail-storm. Now he is a craftsman from whom one expects good workmanship.'

"In the duration of the processes of healing, modern surgery has been revolutionized. In 1875 Nussbaum [4] complains that accident cases from the working classes were only provided, according to contract, for nine weeks in hospital, and adds that for many this limit was not sufficient, that even in the case of quite insignificant wounds, healing was not complete till much later, owing to inflammation. The healing of an amputation of the breast usually took from three to six months, the healing of the major amputations often several months.

[3] VON VOLKMANN, R.: Ueber den antiseptischen Occlusivverband, &c.; die Behandlung der complicierten Fracturen; die moderne Chirurgie, *Samml. Klin. Vorträge — Chirurgie*, 30.

[4] NUSSBAUM, J. N.: *Lister's grosse Erfindung*, ein klinischer Vortrag, München, 1875.

Now we see amputations of the breast, with clearing out of the axilla, get well in a fortnight, and complain, if in a case of amputation of the thigh we have to keep the patient in the hospital over the third week, in order to have the artificial limb adapted. Our ideas are entirely changed. We no longer believe that the healing of a fresh wound must be different in the case of a cancerous or tuberculous patient from what it is in a sound one. The spectre of diathesis to wound inflammation has disappeared. We operate, with the assurance of uninterrupted healing, on the youngest and oldest no less than on the fully developed adult. The modern surgeon no longer anxiously avoids injury to the joints and body cavities, but without hesitation opens the abdomen or the skull, and touches organs which to the ancients were a *noli me tangere*.

"For this entire transformation in our art of healing, we have to thank the great discoveries, which at one stroke have dispersed the darkness which has hung for thousands of years over the infection of wounds. These discoveries have shown us that, like putrefaction and fermentation, wound infection depends upon minute organisms, and that it is only necessary to prevent their access in order to do away with the infection of a wound.

"And although the weapons, which we to-day use against the now recognised foe, are no longer those which were first chosen, and although yet better be discovered in the future, our gratitude will always remain the same to him who first showed us the path along which we progress, and the name of Lister will always be illuminated with the brightest light."

CHAPTER II

THE DEVELOPMENT OF THE CONCEPT OF ASEPSIS

For this disease seized such women only, as were visited, or delivered by a practitioner, or taken care of by a nurse, who had previously attended patients affected with the disease.

In short, I had evident proofs of its infectious nature and that the infection was as readily communicated as that of the small pox, or measles, and operated more speedily than any other infection with which I am acquainted.

— ALEXANDER GORDON, 1795 [1]

Many of the daily problems in aseptic technic, particularly those raised by inconsistencies and discrepancies in methods advocated by various surgeons, are easily understood and evaluated when analyzed from the perspective that the history of asepsis affords, figure 2. Many records give the retrospective impression that the author recognized that communicable disease can be controlled or that postoperative suppuration can be prevented. At best, they were but sporadic expressions of empiric thought and did not exert lasting influence. William Henry,[2] for example, described the hot air sterilizer in 1832, figure 3, as a means of destroying the contagious matter of scarlatina. Dry heat (stoving), however, was used only sporadically until bacteriologic study established its worth in 1881. During the period when the concept of controlling communicable disease was elaborated and aseptic technic was evolved, a thousand odd contributions to the literature built the tradition upon which modern technic stands. Half of these concerned aseptic technic. The various brands of asepsis practiced today represent branches of the main stem which has outstripped them. Forty-two references of those listed in the bibliography represent only the technical headliners in a movement which covered roughly the nineteenth century.

The evolution of operative obstetrics was responsible for a chain of contributions on the etiology of puerperal fever which led to the establishment of the idea that communicable disease can be checked by rigid control of the channels which are responsible for its spread. Puerperal fever was a rarity until obstetrical operations fanned it to epidemic proportions and presented the profession with the grave problem of controlling a "professional pestilence." [3]

Charles White of Manchester, England, the "Man Mid-wife Extraordinary to the Manchester Lying-in Hospital and Charity for Delivering Poor Married Women at Their Own Habitations," also a great surgeon and the principal founder of the Royal Infirmary of Manchester, spearheaded re-

[1] GORDON, ALEXANDER: *A Treatise on the Epidemic Puerperal Fever of Aberdeen.* London, 1795.

[2] HENRY, W.: Further Experiments on the Disinfecting Powers of Increased Temperatures. *Philosoph. Mag.*, **11**:22, 1832.

[3] CUTTER, I. S.: History of Puerperal Fever, *Obstetrics and Gynecology.* Philadelphia: W. B. Saunders Co., 1933, Vol. I, Chapter 2.

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EVOLUTION OF ASEPSIS

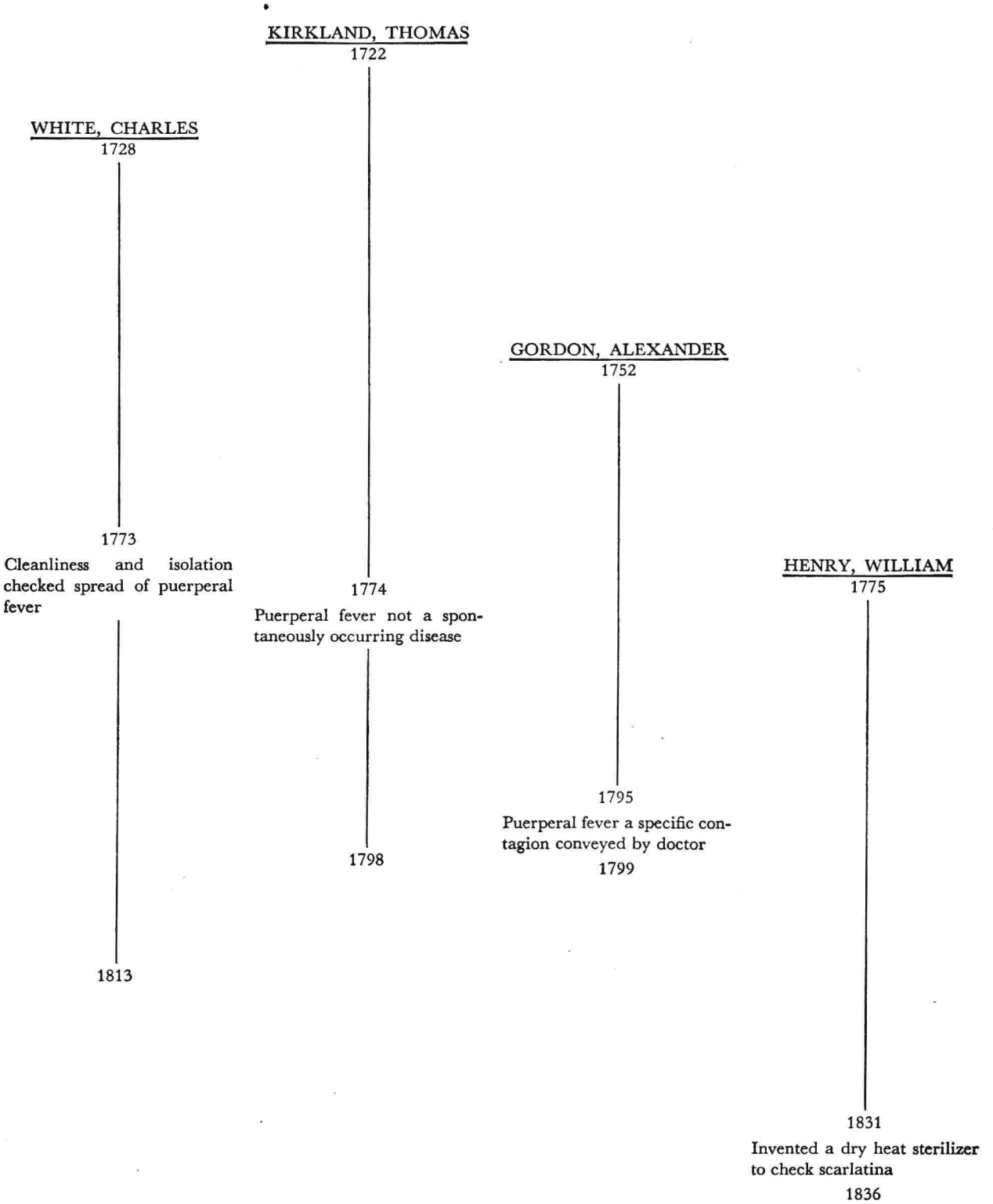
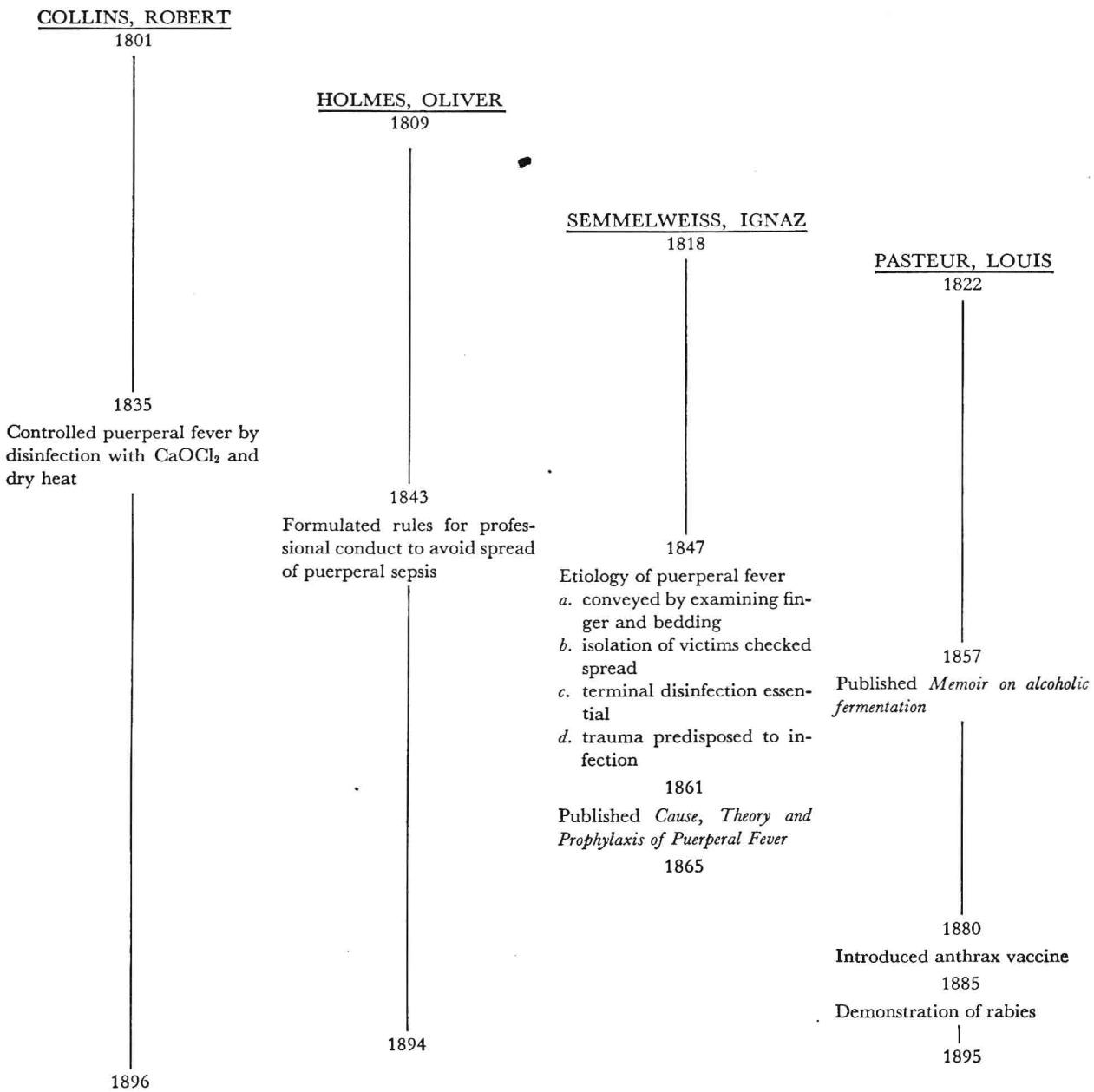


FIGURE 2

EVOLUTION OF ASEPSIS (*Continued*)



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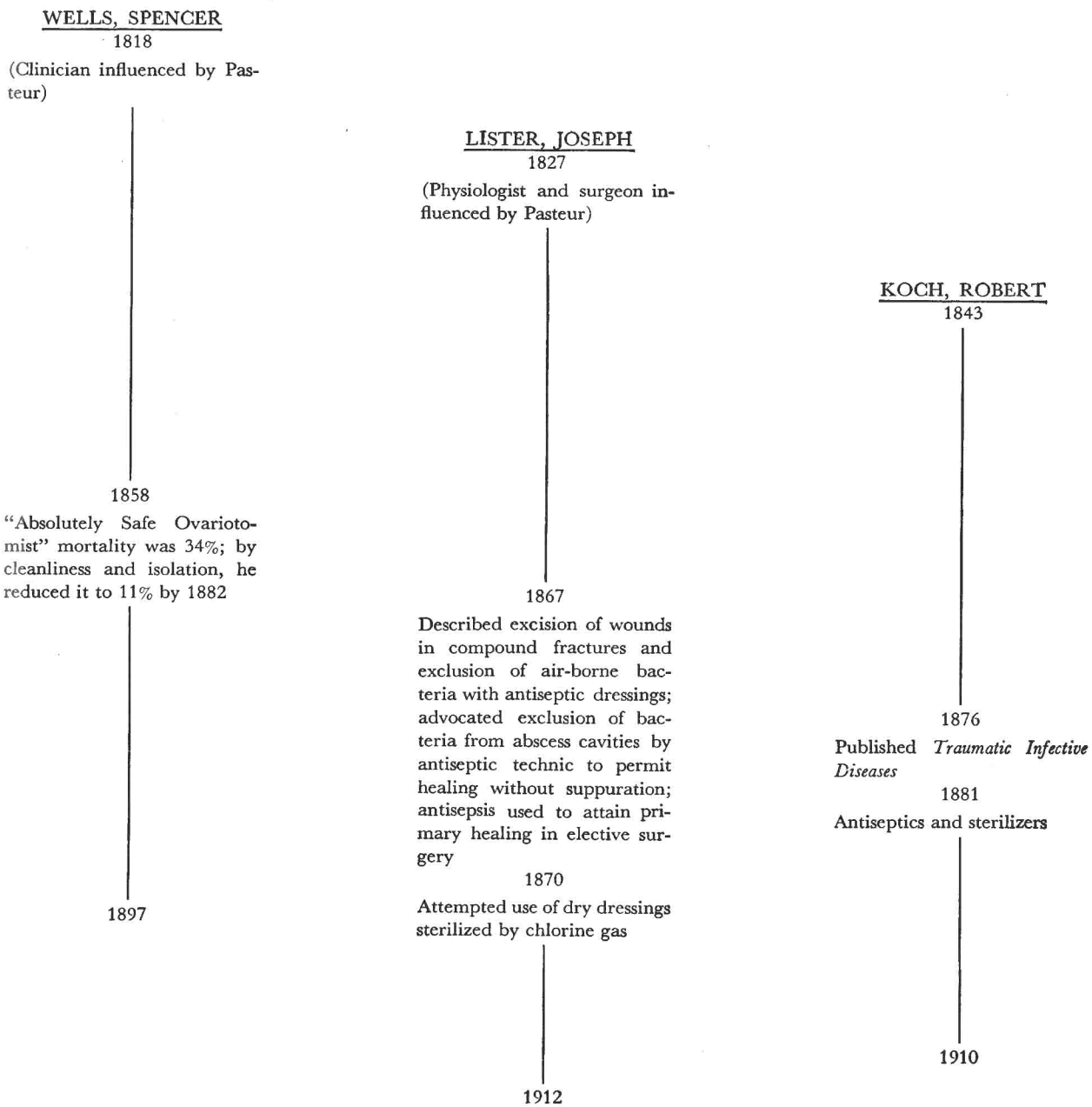

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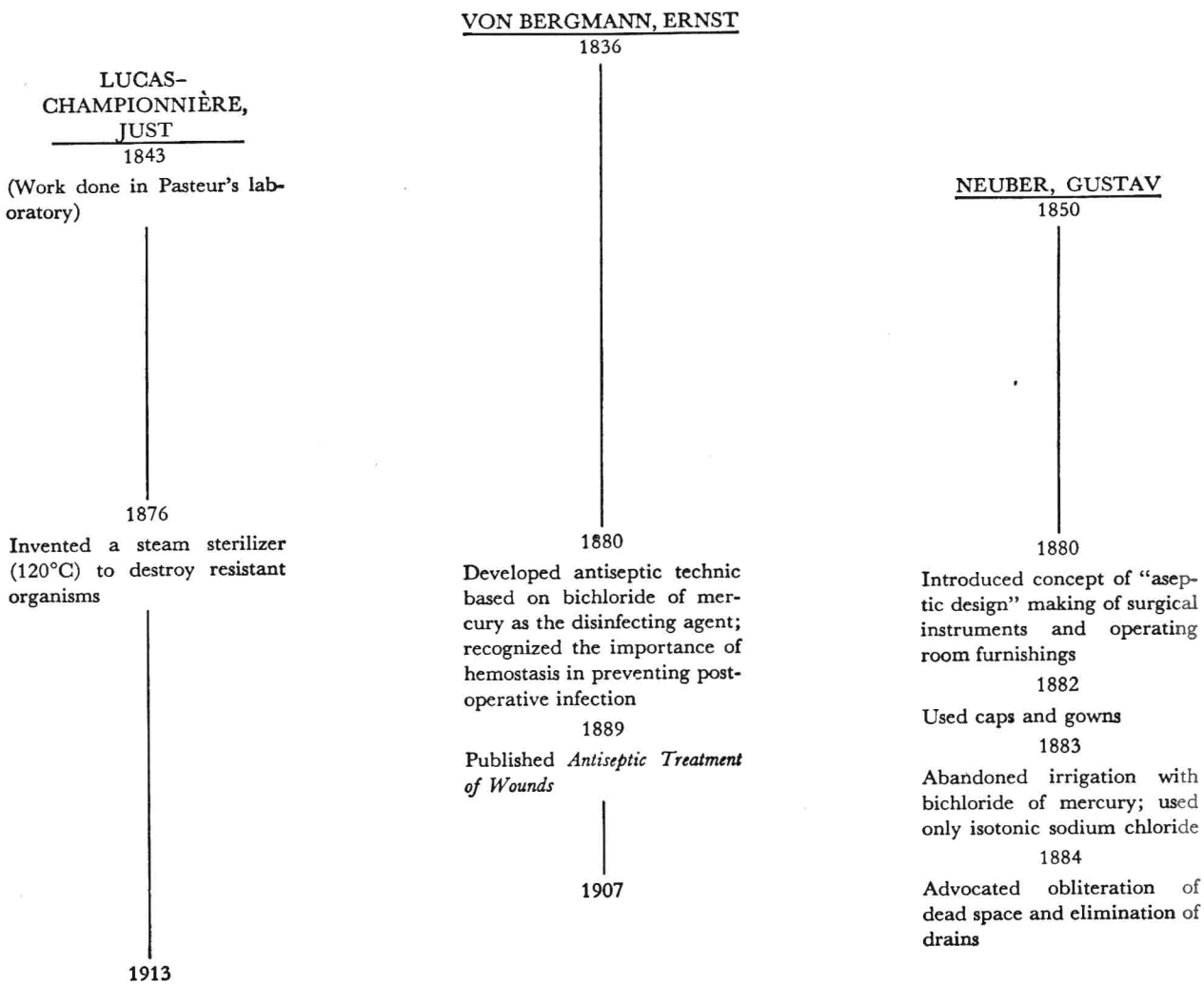

FIGURE 2

WOLFFHUGEL, GUSTAV
1845
(Work done in Koch's laboratory)

1881
Studied bacteriology of hot air sterilizer

1899

GAFFKY, GEORG
1850
(Work done in Koch's laboratory)

1881
Invented a steam sterilizer and studied its bacteriology

1918

LOEFFLER, FRIEDRICH
1852
(Work done in Koch's laboratory)

1881
Invented a steam sterilizer and studied its bacteriology

1915

VON ESMARCH, ERVIN
1855

1884
Used dry sterile dressings for small wounds

1888
Studied effect of superheated steam in sterilizer; advocated routine bacteriologic proof of sterilization

1915

FIGURE 2