Clinical Orthopaedics

NUMBER 10

Clinical Orthopaedics

ANTHONY F. DePALMA
Editor-in-Chief

With the Assistance of the
ASSOCIATE EDITORS
THE BOARD OF ADVISORY EDITORS
THE BOARD OF CORRESPONDING EDITORS

Number Ten

Fall, 1957

J. B. LIPPINCOTT COMPANY
Philadelphia and Montreal

Distributed in Great Britain by Pitman Medical Publishing Co., Limited, London

Library of Congress Catalog Card Number 53-7647

Clinical Orthopaedics is designed for the publication of original articles offering significant contributions to the advancement of surgical knowledge.

Original, typed manuscripts, not carbon copies, and illustrations should be forwarded prepaid to Dr. Anthony F. DePalma, 1025 Walnut Street, Philadelphia 7, Pa.

Manuscripts should be typed double spaced on one side of standard typewriter paper, leaving wide margins. While every effort will be made to guard against loss, it is advised that authors retain copies of manuscripts submitted. All pages should be numbered. Dorland's *American Illustrated Medical Dictionary* (edition 22) and Webster's *New International Dictionary* (edition 2) should be used as standard references. Scientific names for drugs should be used when possible. Copyright or trade names of drugs should be capitalized. Units of measurement, e.g., dosage, should be expressed in the metric system. Temperature should be expressed in degrees centigrade. A contribution in a foreign language, when accepted, will be translated and published in English.

Black-and-white illustrations will be reproduced free of charge, but the publisher reserves the right to establish a reasonable limit upon the number. Ordinarily, colored illustrations cannot be published except at the author's expense. Black-and-white photographs should be in the form of glossy prints. **These should not be defaced in any way.** Any changes desired in them should be marked on a tissue overlay. This should be done before it is pasted to the print, since it is important not to mar the print in any way. Or any changes may be indicated on a separate sheet of paper. Line and wash drawings should be on white art board, with lettering in black India ink large enough to be readable after necessary reduction. Large or bulky illustrations should be accompanied by smaller glossy reproductions of the same to facilitate their circulation among the members of the editorial board. Illustrations should be numbered, the tops indicated, and the author's name and the title of the article in brief should appear on the back. **However, this should be done lightly, so as to leave no imprint on the face of the illustration.** A separate typewritten sheet of legends for the illustrations should be supplied.

A bibliography of numbered references *in alphabetic order* should appear at the end of the manuscript with corresponding numbering in the text. Bibliographies should conform to the style of the *Quarterly Cumulative Index Medicus:*

If a book:

Author's name, title of book, edition if there is more than one, page numbers if it is wished to direct the reader to a specific section of the book, city in which publisher is located, publisher's name, year of publication of book, *in the order named.*

If an article in a journal:

Author's name, title of article, volume number, inclusive page numbers, year of publication, *in the order named.*

Manuscript may be submitted to us in the original language of the author. Now it is our policy to handle the translation of these articles by our office without cost to the contributor if the article is found to be acceptable for publication.

All manuscripts should be submitted with an extra carbon copy, including a short synopsis of approximately 200 to 250 words for translation into Interlingua.

Following are the general subjects of forthcoming issues of *Clinical Orthopaedics:*

***Orthopaedic Surgery in the Geriatric Patient**, Spring, 1958*
***Rehabilitation**, Fall, 1958*
***The Hand, Part I**, Spring, 1959*
***The Hand, Part II**, Fall, 1959*
***The Foot**, Spring, 1960*

All contributors desiring to submit articles for consideration for publication on the topics listed above or in the general sections of this publication should submit them to the editor some months in advance of the date of the issue for which they are intended.

PRINTED IN THE UNITED STATES OF AMERICA

CLINICAL
ORTHOPAEDICS
Number Ten
Fall, 1957

Contents

Section II

THE PATHOLOGIC PHYSIOLOGY OF METABOLIC BONE DISORDERS

A Symposium
(Conclusion of Section I, Clinical Orthopaedics No. 9)

Edward C. Reifenstein, Jr., M.D.
Guest Editor

Section III

GENERAL ORTHOPAEDICS

1

Phemister, of Chicago (1882-1951)

EDGAR M. BICK, M.D.*

Dallas Burton Phemister was born on a farm in Carbondale, a rural town in southern Illinois, on July 15, 1882. After a normal boyhood, he went off to college at Valparaiso at the age of 16. He remained there two years, when he moved on to finish his undergraduate work at the University of Chicago, receiving his degree in 1900. Next came Rush Medical College for an M.D. in 1904, followed by an internship at the Cook County Hospital. So ended his schooling. Dr. Phemister then started out quite on his own; immediately he entered the private practice of medicine in LaGrange, near Chicago, and here all resemblance to most young practitioners of his age ends, and the Phemister known to medical literature begins.

Early in his practice he felt drawn to teaching and went to his alma mater as an instructor. In 1908 he became Assistant Clinical Professor of Surgery at Rush Medical College. His ambition led him to the study of pathology, the science then considered to be basic to the practice of surgery. Since it was all but impossible for a serious student to obtain proper instruction in that discipline in the United States, Phemister followed other Americans of his day and in 1909 went off for a two-year period of study abroad. He worked and observed in the hospitals and the laboratories of Paris, Vienna and Berlin.

Upon his return to Chicago he continued his teaching at Rush and entered the surgical service of the Presbyterian Hospital. From 1917 to 1919 he served overseas with his hospital unit as a major in the American Expeditionary Forces of World War I. Returning to Chicago he continued, as before, his practice, investigations and teaching. In 1926 came his first mark of academic distinction. The newly organized Medical School of the University of Chicago was to be opened, and, following the trend of the progressive institutions of the time, a faculty was gathered whose senior officers were to be full-time educators. Phemister, now recognized as one of Chicago's outstanding teachers and surgeons, was offered the Chair of Surgery in 1926. Since the physical facilities of the school would not be ready for students until the following year, Phemister went back to the University College of London for further work.

He remained Professor and Chairman of the Department of Surgery at the University of Chicago for 22 years, and in 1948 became Professor Emeritus. During those years he received many of the academic and surgical honors of American and European societies. Among them were the Presidencies of the American College of Surgeons and of the American Surgical Association. He was elected Honorary Fellow of England's Royal College of Surgeons and member of the Académie de Chirurgie of France. Although in practice he remained a general surgeon, the importance of his work in skeletal surgery and the surgical pathology of bone merited his election as Fellow of the American Academy of Orthopaedic Surgeons.

* New York, N. Y.

Dallas Burton Phemister

Phemister applied himself to studies in several surgical fields, especially during his earlier years. While working at University College in London (1926-1927) he concerned himself with the problems of vascular physiology, especially those aspects related to shock. Somewhat later he became interested, for a while at least, in the pathologic physiology of the gallbladder and the gastro-intestinal tract. Some papers of his earlier period reported passing interest in the surgery of cancer. However, his real contribution by far lay in the surgical pathology of bones. In this field he earned a permanent niche in the annals of American orthopaedic surgery. It is proper that a critique of that work should be published before its references become too deeply embedded in the prodigious skeletal literature of the mid-century.

During Phemister's early years, the century-and-a-half-old problem of bone transplantation or bone grafting was being reexamined actively by Axhausen and Lexer, in Germany, and by MacEwen, in Scotland. Ollier had just completed his extensive studies in France. In 1914 Phemister launched into the subject with his publication on *The Fate of Transplanted Bone.*[1] He was among the first of the American osteologists to do so. Throughout his career he retained an interest in bone grafts, which became the subject of a number of successive reports[13,25] both in the laboratory and operating. Subsequently he combined this interest with his studies in the treatment of bone tumors and described cases of bone resections repaired by grafts.[21,22,24] Of these papers, his early ones were of chief importance, since they served to stimulate interest in the problems of bone transplantation in the United States and acquainted his readers with the advanced work of the time of the men whom he had visited abroad.

Another subject which from the beginning engaged his interest constantly was that of the pathology of bone tumors. Here, however, he followed the lead of Bloodgood, who at the time was inspiring a very active and wide study of these neoplasms. Although Phemister wrote of solitary bone cysts,[7] chondrosarcoma,[11] round cell sarcoma,[12] fibrous osteoma of the jaws[18] and, in general, the treatment of bone tumors,[26] his influence, other than educational, cannot be said to have been seriously contributory, excepting possibly his work on chondrosarcoma. However, in 1920 there appeared the first of a lifelong series of papers on the subject with which his name is inextricably associated—that of avascular necrosis. Axhausen's studies in this field were well known to investigators. The necrosis of bone following infection was a common experience. Axhausen described quiet necrosis in the absence of necrotizing pus and referred to the process as aseptic necrosis, due, as he believed, to the lodgment of miscroscopic emboli, bacterial or other, in the blood channels. These emboli were said to have produced intra-osseous infarcts in the localized

areas served by the affected blood channels and, when in sufficient numbers, caused the effect of general area necrosis. In later years, because of the accepted microvascular nature of the process, the term *avascular* necrosis came to supersede *aseptic* necrosis.

Axhausen further described the potential process of healing by peripheral ingrowth of new vascular channels and new trabeculae, using the term *schleichender Ersatz*. In Phemister's writings this term became the *creeping substitution* of common English parlance. His paper on the comparative studies of dead bone as seen in pathologic specimens and on roentgenograms, published in the *Annals of Surgery* in 1920, was his first important contribution to the subject.[2] It caused considerable comment and review and led to further publications in both the surgical and the roentgenologic literature.[3,9,16,20,27,28] Subsequent recognition of roentgenographic appearances of avascular necrosis in its many phases was due in great measure directly and indirectly to this work.

Phemister retained his interest in this problem throughout his life. In his hands the subject was expanded greatly and was applied to the interpretation of lesions hitherto inexplicable or otherwise misunderstood. During the 1920's and the early 30's the group of diseases variously termed Legg-Perthes', Kienböck's, Köhler's, Osgood-Schlatter's and similar lesions were classified as osteochondritis. They were believed to be manifestations of an inflammatory reaction in bone. To Phemister they came to represent localized areas of avascular necrosis. Although this process explained their pathology, it did not explain the etiology. At one point Phemister followed Legg in a belief that streptococci formed the emboli causing the bone changes of Legg-Perthes' disease and in related lesions elsewhere in the skeletons.[10] However, in later reports, the avascular necrosis remained, and the streptococci were lost.[27]

An early and a very important paper was his discussion of radium necrosis in bone published in 1926.[6] In this he suggested the mechanism of radium destruction on a vascular basis. In another paper he noted that avascular changes in articular surfaces could explain the pathogenesis of lesions such as osteochondritis-dissecans.[4] He saw the process as the common denominator of the changes in the head of the femur following fractures of the neck, dislocation of the hip and morbus coxae senilis.[9]

Of particular interest was his report with Kahlstrom and Burton on the bone lesions of caisson disease.[19] A serious explosion near Chicago in 1938 presented an opportunity to study the disease, and Phemister, concentrating on its bone lesions, offered the pathogenic explanation of avascular necrosis caused by emboli of concentrated nitrogen bubbles in the blood stream. Although he and his associates published only one report on the subject, his view has remained fixed in its literature.

It is greatly due to Phemister's recognition of the broad application of the concept of avascular necrosis in bone that in the decades which followed the 1930's this process took its place with the traditional school-taught processes of inflammation, and neoplasia, as a basic phenomenon in bone pathology. It is not enough to say that he derived from Axhausen and Lexer. As far as they wrote, aseptic necrosis was a specific reaction in bone which served to explain certain sharply demarcated lesions. Phemister broadened the applicability of the concept to include a large variety of still-unrecognized affections of bone. His contributions to the literature of roentgenology in this field went far in establishing roentgenographic criteria for its several phases. This led to his becoming co-author of a textbook on diagnostic radiology published in 1941.[23]

In 1933 Phemister published his classic paper, *Operative Arrestment of Longitudinal Growth of Bones in the Treatment of Deformities*.[14] This was the introduction to the now commonly accepted surgical procedure of epiphysiodesis and its derivatives. There was no technical background to this

highly original surgical invention. In his paper he discussed the several attempts which had been made to equalize inequality of length of the lower extremities in deformed children and adults. Following the resections of Rizzoli in 1847, in which equalization was attained by shortening the sound side, Codivilla in 1905 suggested lengthening the shortened limb by traction after osteotomy. During the 1920's several attempts at improving the mechanics of this procedure by Abbott and others increased its fashion. However, neither of these operative technics presented sufficient success to make them acceptable to the standard armamentarium of the orthopaedic surgery of their day. When successful the result was gratifying; too often the risk outweighed the anticipation.

To Phemister, who had spent years studying the nature of growth of long bones[17] and was acquainted with experimental work in epiphyseal growth, it occurred that control of this growth plate might retard the development of the normal limb sufficiently to equalize length without the undue risk of the more daring operations. Furthermore, he had available and quoted recent studies on the rate of longitudinal growth in children. He therefore operated to destroy the epiphyseal growth plate at an age calculated to result in equality of length at the time of skeletal maturity. The concept took root in the orthopaedic literature. Eventually modifications by Blount and others permitted greater leeway in the matter of growth calculations. Stapling superseded complete destruction of the plate and allowed for correction of judgment in the time factor. Whatever the future of these procedures, and later experiments in stimulating activity of the plate on the shorter side may invalidate the older technic, to Phemister is due the concept of equalizing limb length by attacking the physiologic mechanism of epiphyseal growth.

Spaced among the papers of his more constant interests were a number of apparently isolated studies of tangential problems in bone pathology. Bone and joint tuberculosis,[15] epiphyseal and articular pressures,[5] and fibrous osteomyelitis (a nonsuppurative form)[8] were among these studies. Several of his papers on tumors, and especially their treatment by resection and bone transplant, had some temporary influence, but his work in the field of bone neoplasms was overshadowed by Bloodgood, Coley, Jaffe and others, to whom bone tumors were a major interest.

Phemister accumulated a bibliography of some 150 papers. Many of these were timely and spanned a rather wide range of subjects. He worked constantly. As in all creative and scientific efforts, from this large schedule certain works have become well ensconced in the literature. Others of perhaps temporary interest in their day have enjoyed less recognition. The following twenty-eight publications are a selective listing of Phemister's papers on skeletal pathology and surgery. In the literature of orthopaedic surgery they merit recollection.

REFERENCES

1. The fate of transplanted bone and regenerative power of its various constituents, Surg., Gynec. & Obst. **19**:303, 1914.
2. The recognition of dead bone based on pathological and x-ray studies, Ann. Surg. **72**:466, 1920.
3. Studies in reduction of bone density, Am. J. Roentgenol. **8**:355, 1921.
4. Causes and changes of loose bodies arising from the articular surface of the joint, J. Bone & Joint Surg. **6**:278, 1928.
5. The effect of pressure on articular surfaces, Ann. Surg. **80**:481, 1924.
6. Radium necrosis of bone, Am. J. Roentgenol. **16**:340, 1926.
7. (With J. E. Gordon) The etiology of solitary bone cyst, J.A.M.A. **87**:1429, 1926.
8. Chronic fibrous osteomyelitis, Ann. Surg. **90**:756, 1929.
9. Repair of bone in presence of aseptic necrosis resulting from fracture, transplantation and vascular obstruction, J. Bone & Joint Surg. **12**:769, 1930.
10. (With A. Brunschweig and L. Day) Streptococcal infections of the epiphyses and

short bones and their relation to Legg-Perthes' disease, Kienböck's disease, and Köhler's disease of the tarsal navicular, J.A.M.A. **95**:995, 1930.
11. Chondrosarcoma of bone, Surg., Gynec. & Obst. **50**:216, 1930.
12. Undifferentiated round cell sarcoma, Ann. Surg. **93**:125, 1931.
13. Splint grafts in the treatment of delayed non-union of fractures, Surg., Gynec. & Obst. **52**:376, 1931.
14. Operative arrestment of longitudinal growth of bones in the treatment of deformities, J. Bone & Joint Surg. **15**:1, 1933.
15. (With C. H. Hatcher) Correlation of pathological and roentgenological findings in the diagnosis of tuberculous arthritis, Am. J. Roentgenol. **29**:736, 1933.
16. Fractures of the neck of the femur, dislocation of the hip and obscure vascular disturbances producing aseptic necrosis of the head of the femur, Surg., Gynec. & Obst. **59**:415, 1934.
17. Bone growth and repair, Ann. Surg. **102**: 261, 1935.
18. Fibrous osteoma of the jaws, Ann. Surg. **105**:564, 1937.
19. (With S. C. Kahlstrom and C. C. Burton) Bone and joint changes in caisson disease including impaction and deforming arthritis, Surg., Gynec. & Obst. **68**:129, 1939.
20. The pathology of ununited fractures of the neck of the femur with special reference to the head, J. Bone & Joint Surg. **21**:681, 1939.
21. Bone transplantation in the treatment of tumors and dystrophies of bone, Soc. internat. de chir. XI cong. (1938), Brussels, 1939.
22. Conservative surgery in the treatment of bone tumors, Surg., Gynec. & Obst. **70**: 355, 1940.
23. (With P. C. Hodges and A. Brunschweig) Diagnostic Radiology, New York, Nelson, 1941.
24. Rapid repair of defect of femur by massive bone grafts after resection for tumors, Surg., Gynec. & Obst. **80**:120, 1945.
25. Treatment of ununited fractures by onlay bone grafts without screw, or tie fixation and without breaking down of the fibrous union, J. Bone & Joint Surg. **28**:946, 1947.
26. Cancer of bone and joint, J.A.M.A. **136**: 545, 1948.
27. Cystlike lesion of carpal bones, associated with ununited fractures, aseptic necrosis and traumatic arthritis, J. Bone & Joint Surg. **30A**:151, 1948.
28. Treatment of the necrotic head of the femur in adults, J. Bone & Joint Surg. **31A**:55, 1949.