Cytology of the Central Nervous System

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Cytology of the Central Nervous System

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Dedication

This work is affectionately dedicated to: my daughter, Ann, who enthusiastically
supported and helped me; my husband, Sheldon, and sons, James and Larry, who survived without me; and to George L. Wied, MD, who challenged me.

Acknowledgements

My second day on the job at UCLA, Claire McLatchie entered my office with a slide in hand, and made the inquiring declaration, `You do spinal fluids, don't you!!?' A portion of the succeeding 10 years has been spent learning and teaching the cytology of the central nervous system. The result of that effort is reflected in this book, and presumptively answers Claire's question.

This has not been a singular effort. The growth of the Cytology Service at UCLA has been in large measure due to the constant support of my chief, Walter F. Coulson, MD. Claire McLatchie, CT (ASCP), CFIAC, diligently supervised the processing, screening, and selection of teaching materials in the early years, and is now devoted to resident and postgraduate education.

The UCLA cytotechnology staff, especially Diane Mandell, CT (ASCP), CMIAC, have provided active input into the focus of this monograph. The close collaboration with the Hematology staff, and my education regarding the treatment of the leukemias by Stephen A. Feig, MD, are hopefully accurately reflected in these pages. To the many clinicians who have relied on cytologic diagnoses in the management of their patients, and who have often sent us specimens simply for their teaching value, my sincere thanks.

The secretarial efforts of Giok Brandt, Pamela Helfert, Nancy Lines, and Lucia Wisdom, and the bibliographic proofing of Thais Aubrey, Jil Leibel and Jeannine Loncar, I am sure, are appreciated by the publishers. Dr. Charles F. Visokay and Monika Brendel of Karger patiently awaited the rough manuscript, and Denise Greder meticulously supervised the transformation into the finished product.

In my opinion, the major worth of a cytology text lies in the quality of its photographs. Stephen C. Suffin, MD, provided the superior photographic equipment, and encouraging critique, for which I am most grateful. Carol Appleton patiently and expertly developed and printed the endless photographs, the best of which are reproduced here. The anatomic drawings (except for fig. 53 and 54) were carefully executed by Gwynne Gloege of the UCLA Medical Illustration Department.

Final thanks are due to the UCLA resident physicians, and the registrants of the Tutonals of Cytology. Every teacher knows that `by your students will you be taught'. If readers of this text benefit, then my `teachers' will have done their jobs well. My special thanks to them. They have truly been my inspiration.

Introduction

The microscopic examination of spinal fluid to diagnose inflammatory and neoplastic conditions has been performed for over 100 years [72]. However,
not until recently has the cytologic evaluation of cerebrospinal fluid (CSF) achieved a meaningful place in the diagnostic workup of both symptomatic and asymptomatic patients who might develop central nervous system (CNS) disease secondary to a malignancy or other serious illness. Multiple reasons account for the increasing popularity of this procedure. With the extended longevity of cancer patients, not only are they candidates for intracranial metastases [201] but, due to their often immunosuppressed status, are also at risk for previously uncommon infectious diseases, especially viral and fungal. Cancer patients with CNS involvement diagnosed by CSF cytology require further CSF monitoring to optimally adjust their therapy. Clinicians who have thus gained confidence in the reliability of CSF cytology have also come to rely on it for the preliminary or final diagnosis of the primary brain tumors, and may thereby avoid unnecessary surgery for their patients. Certain deeply seated lesions are surgically inaccessible for tissue diagnosis or will not readily shed cells into the CSF. These can now be reached by thin needle aspiration guided by stereotactic methods. Treatment will be more specifically directed than if only indirect evidence of tumor is obtained by radiographic techniques. Most pathologists and cytotechnologists have superficial training in neuropathology and a dim recollection of neuroanatomy. Consequently, CNS cytologic diagnosis presents a foreboding challenge. This text attempts to bridge the gap produced by this unfamiliarity. From the experience of self-teaching and resident training came the realization that, as in all disease processes, patterns evolve, and these patterns form the basis for each differential diagnosis [234]. The chapters on CNS cytology in the texts of Koss [148] and Hajdu and Hajdu [108] and the atlases of Den Hartog Jager [63], Kölmel [144] and Oehmichen [204] provided this writer with the solid foundation from which the observations and conclusions in this text are derived.

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In addition to the appearance of the cells, the clinical history and location of any lesion must be considered in order to narrow the diagnostic choices to a logical few. Thus, cytologic material from the CNS can be conclusive and not provide simply a positive or negative diagnosis. A most important prerequisite to the diagnosis is excellent specimen handling and preparation. Several techniques are well suited for processing the usually hypocellular specimens of fluids from the CNS, and their recent development has no doubt been responsible for the greater reliability and acceptance of cytologic diagnosis [103]. These various methods will be described and evaluated in the chapter on preparatory techniques.
Finally, although this is a book about cytology, the tissue whence these cells come must always be considered and, thus, many histologic sections have been included for comparison with cells obtained from the same patient. A solid understanding of tumors and reactive processes in the C’S is essential for the correct interpretation of cells derived from these conditions [42, 46]. Collaboration with a neurosurgeon is most helpful in obtaining specimens at the time of surgery that can be made into cytologic preparations ideal for reference material. This kind of self-teaching will always supersede the printed page.

As in any other skill, practice is necessary in order to achieve fluency and confidence. This is best accomplished by reviewing previous cases, comparing knowns with similar unknowns and obtaining follow-up on puzzling cases. The challenge is great but so are the rewards, and to that end this book is written: