CLINICAL ANATOMY

A REVISION AND APPLIED ANATOMY FOR CLINICAL STUDENTS

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SIXTH EDITION
SECOND PRINTING

BLACKWELL SCIENTIFIC PUBLICATIONS
OXFORD LONDON EDINBURGH MELBOURNE

To my wife and parents

Blackwell Scientific Publications
Osney Mead, Oxford
8 John Street, London, WC1
9 Forrest Road, Edinburgh
P.O. Box 9, North Balwyn, Victoria, Australia

First published 1960
Second edition 1962, reprinted 1963
Third edition 1966
Fourth edition 1969
Fifth edition 1971, reprinted 1972 1973 1974
Sixth edition 1977, reprinted 1978

Distributed in the United States of America by
J. B. Lippincott Company, Philadelphia
and in Canada by
J. B. Lippincott Company of
Canada Ltd, Toronto

British Library Cataloguing in Publication Data

Ellis, Harold, b. 1926
Clinical anatomy.—6th ed.
1. Anatomy, Pathological
I. Title
616.07 RB25

ISBN 0-632-00446-0

Filmset in Ireland by Doyle Photosetting Ltd., Tullamore
and printed and bound in Great Britain by
Billing & Sons Ltd., Guilford and Worcester

Preface to the sixth edition

Experience of teaching clinical students at three medical schools and of examining them in ten cities and in seven countries has convinced me that there is still an unfortunate hiatus between the anatomy which the student learns in his pre-clinical years and that which he later encounters in the wards and operating theatres.

This book attempts to counter this situation. It does so by highlighting those features of anatomy which are of clinical importance, in medicine and midwifery as well as in surgery. It presents the facts which a student might reasonably be expected to carry with him during his years on the wards, through his final examinations and into his post-graduate years; it is designed for the clinical student.

Anatomy is a vast subject and therefore, in order to achieve this goal, I have deliberately carried out a rigorous selection of material so as to cover only those of its thousands of facts which I consider form the necessary anatomical scaffolding for the clinician. Wherever possible practical applications are indicated throughout the text—they cannot, within the limitations of a book of this size, be exhaustive, but I hope that they will act as signposts to the student and indicate how many clinical phenomena can be understood and remembered on simple anatomical grounds.

In this sixth edition a complete revision of the text has been carried out. Many pages have been redrafted and entirely new sections have been added on the segmental anatomy of the liver and on the autonomic nervous system. Twenty-six new figures have been added and many older illustrations replaced or enlarged.

The continued success of this volume owes much to the helpful comments which the author has received from readers all over the world. Every suggestion is given the most careful consideration in an attempt to keep the material abreast of the needs of today's medical students.

Westminster Medical School, 1976 HAROLD ELLIS

Acknowledgments

I wish to thank my colleagues—the registrars, house surgeons and dressers at Westminster Hospital—who have kindly perused and commented on the text and have given valuable help in proof-reading.

The majority of the illustrations are by Miss Margaret McLarty and Miss Audrey Arnott; I must thank them sincerely for all their care.

I am grateful to the following authors for permission to reproduce illustrations:

Lord Brock for Figs. 20 and 21 (from *Lung Abscess*);

Professor R. G. Harrison for Figs. 12, 32 and 67 (from *A Textbook of Human Embryology*);

and Professor Sheila Sherlock for Fig. 69 (from *Diseases of the Liver and Biliary System*).

To my sister, Mrs L. Witte, go my grateful thanks for invaluable secretarial assistance. Finally, I wish to express my debt to Mr Per Saugman and the staff of Blackwell Scientific Publications for their continued and unfailing help.

H. E.

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THE THORAX

Surface anatomy and surface markings
Figs. 1, 2 and 3

The experienced clinician spends much of his working life relating the surface anatomy of his patients to their deep structures.

The following bony prominences can usually be palpated in the living subject (corresponding vertebral levels are given in brackets):

- superior angle of the scapula (T2);
- upper border of the manubrium sterni, the suprasternal notch (T2/3);
- spine of the scapula (T3).
- sternal angle (of Louis)—the transverse ridge at the manubrio-sternal junction (T4/5);
- inferior angle of scapula (T8);
- xiphisternal joint (T9);
- lowest part of costal margin—10th rib (L3);

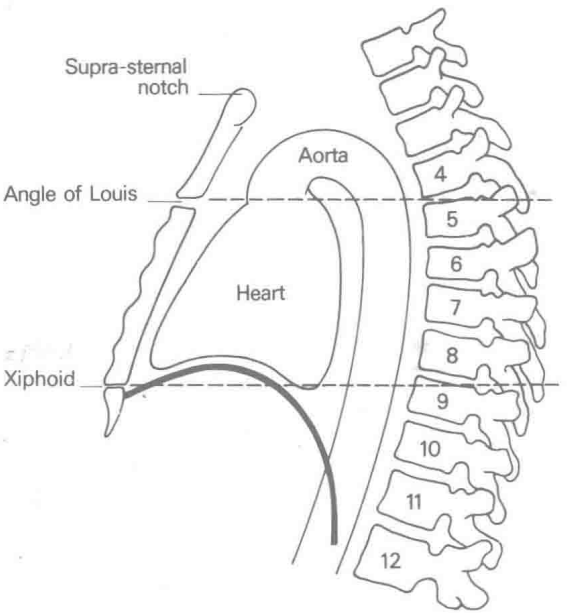

Fig. 1. Lateral view of the thorax—its surface markings and vertebral levels. (Note that the angle of Louis (T4/5) demarcates the superior mediastinum, the upper margin of the heart and the beginning and end of the aortic arch.)

Note from Fig. 1 that the manubrium corresponds to the 3rd and 4th thoracic vertebrae and overlies the aortic arch, and that the sternum corresponds to the 5th to 8th vertebrae and neatly overlies the heart.

Since the 1st and 12th ribs are difficult to feel, the ribs should be enumerated from the 2nd costal cartilage, which articulates with the sternum at the angle of Louis.

The spinous processes of all the thoracic vertebrae can be palpated in the mid-line posteriorly, but it should be remembered that the first spinous process which can be felt is that of C7 (the vertebra prominens).

The position of the *nipple* varies considerably in the female, but in the male it usually lies in the 4th intercostal space about 4 in (10 cm) from the mid-line. The *apex beat*, which marks the lowest and outermost point at which the cardiac impulse can be palpated, is normally in the 5th intercostal space $3\frac{1}{2}$ in from the mid-line. (Just below and medial to the nipple.)

The *trachea* is palpable in the suprasternal notch midway between the heads of the two clavicles.

Surface markings of the more important thoracic contents (Figs. 2–4)

The trachea

The trachea commences in the neck at the level of the lower border of the cricoid cartilage (C6) and runs vertically downwards to end at the level of the sternal angle of Louis (T4/5), just to the right of the mid-line, by dividing to form the right and left main bronchi. In the erect position and in full inspiration the level of bifurcation is at T6.

The pleura

The *cervical pleura* can be marked out on the surface by a curved line drawn from the sterno-clavicular joint to the junction of the medial and middle thirds of the clavicle; the apex of the pleura is about 1 in (2.5 cm) above the clavicle. This fact is easily explained by the oblique slope of the first rib. It is important because the pleura can be wounded (with consequent pneumothorax) by a stab wound—and this includes the surgeon's knife and the anaesthetist's needle—above the clavicle.

The lines of pleural reflexion pass from behind the sterno-clavicular joint on each side to meet in the mid-line at the 2nd costal cartilage (the

angle of Louis). The pleural edge then passes vertically downwards to the 6th costal cartilage and then crosses:

- the 8th rib in the mid-clavicular line;
- the 10th rib in the mid-axillary line; and
- the 12th rib at the lateral border of the erector spinae.

The pleura actually descends just below the 12th rib margin at its medial extremity—or even below the edge of the 11th rib if the 12th is unusually short; obviously in this situation the pleura may be opened accidentally in making a loin incision to expose the kidney, perform an adrenalectomy or to drain a subphrenic abscess.

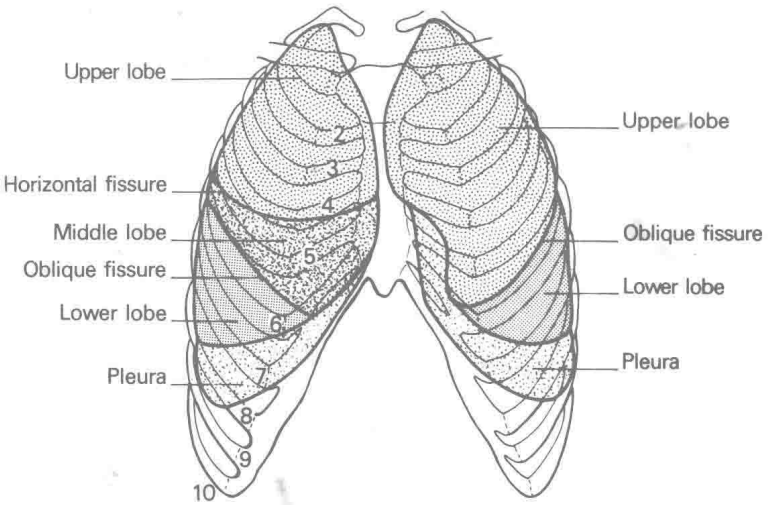

Fig. 2. The surface markings of the lungs and pleura—anterior view.

The lungs

The surface projection of the lung is somewhat less extensive than that of the parietal pleura as outlined above, and in addition it varies quite considerably with the phase of respiration. The *apex* of the lung closely follows the line of the cervical pleura and the surface marking of the *anterior border of the right lung* corresponds to that of the right mediastinal pleura. On the left side, however, the *anterior border* has a distinct notch (the *cardiac notch*) which passes behind the 5th and 6th costal cartilages. The *lower border* of the lung has an excursion of as much as 2–3 in (5–8 cm) in the extremes of respiration, but in the neutral position (midway between inspiration and expiration) it lies along a line

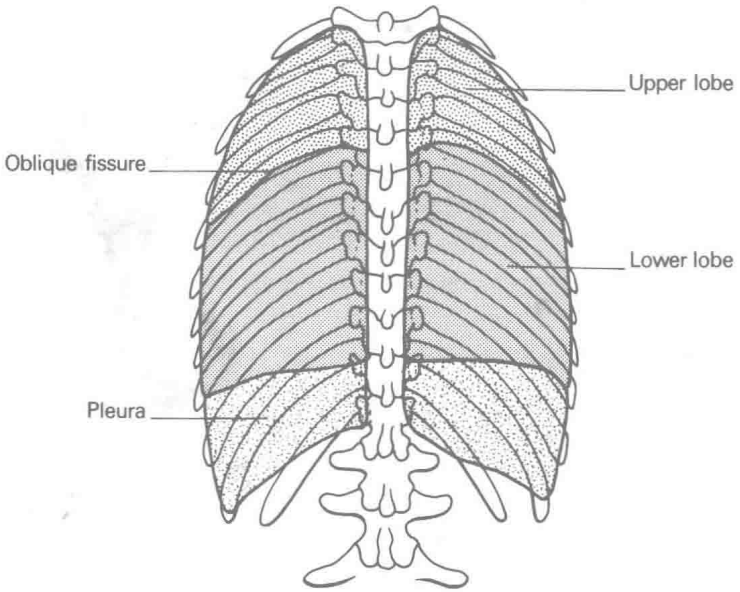

Fig. 3. The surface markings of the lungs and pleura—posterior view.

which crosses the 6th rib in the mid-clavicular line, the 8th rib in the mid-axillary line, and reaches the 10th rib adjacent to the vertebral column posteriorly.

The *oblique fissure*, which divides the lung into upper and lower lobes, is indicated on the surface by a line drawn obliquely downwards and outwards from 1 in (2.5 cm) lateral to the spine of the 5th thoracic vertebra to the 6th costal cartilage about $1\frac{1}{2}$ in (4 cm) from the mid-line. This can be represented approximately by abducting the shoulder to its full extent; the line of the oblique fissure then corresponds to the position of the medial border of the scapula.

The surface marking of the *transverse fissure* (separating the middle and upper lobes of the right lung) is a line drawn horizontally along the 4th costal cartilage and meeting the oblique fissure where the latter crosses the 5th rib.

The heart

The outline of the heart can be represented on the surface by the irregular quadrangle bounded by the following four points (Fig. 4):

1. the 2nd *left* costal cartilage $\frac{1}{2}$ in (12 mm) from the edge of the sternum;