

Competency-Based
BD Chaurasia's
Human Anatomy

Regional and Applied | Dissection and Clinical

Ninth
 Edition

Volume
2

- Volume 1 UPPER LIMB and THORAX
- Volume 2 LOWER LIMB, ABDOMEN and PELVIS
- Volume 3 HEAD and NECK
- Volume 4 BRAIN-NEUROANATOMY

Widely acclaimed as a standard textbook in view of its simple language, comprehensive coverage, lucid presentation and neatly-drawn line diagrams, **BD Chaurasia's Human Anatomy** remains the most preferred textbook in India and abroad. This edition has been thoroughly revised and updated to make it extremely informative and much more student-friendly.

The ninth edition now features diagrams adapted from the first edition, originally prepared by Dr BD Chaurasia, which have been suitably redrawn, modified and colored appropriately. Many text chapters have citations to videos of osteology and soft parts which are accessible through CBSiCentral App. Clinically oriented FAQs and MCQs, and ECE cases have been included to make the volumes absolutely clinical in nature.

Salient features of the four volumes

- Text follows the **CBME Guidelines** and all topics are described as per the **Competency Based Undergraduate Curriculum for the Indian Medical Graduate** prescribed by the National Medical Commission.
- **Colour codes** used consistently in the drawings of various cells, tissues and organs are given at the beginning of each section.
- Impressive **line diagrams**, originally hand-drawn by Dr BD Chaurasia, adapted from the first edition of *BDC Human Anatomy*, have been incorporated in this edition to make drawing of illustrations easier for the students.
- **Videos of osteology and soft parts**, accessible from CBSiCentral App through scratch code, have been numbered and cited in the respective chapters in all the four volumes. The App also includes answers to FAQs.
- **Latest updates** on various topics have been provided from standard international publications.
- **Clinical orientation** has been enthused by structuring many FAQs and MCQs in 'clinical mode'. **Early Clinical Exposure (ECE)** has been provided in the form of signs, symptoms, investigations and treatment of a particular case.
- Important features like **viva voce questions**, **molecular regulation**, **clinicoanatomical problems**, **ossification**, **dissection (steps)** are continued from the previous editions.
- **This volume features**
 Tables 52, Flowcharts 4, Illustrations 653, Ossification boxes 12, Dissection boxes 36, X-rays 5, Clinical Anatomy boxes 101, Facts to Remember 229, FAQs 132, MCQs 232, Viva Voce questions 508, Videos 50, Clinicoanatomical Problems 35.

Chief Editor

Krishna Garg MBBS, MS, PhD, FIMSA, FIAMS, FAMS, FASI is ex-Professor and Head, Department of Anatomy, Lady Hardinge Medical College (LHMC), New Delhi. She joined LHMC where she completed her MS and PhD and taught anatomy till her retirement. She has received fellowships of the Indian Medical Association, Academy of Medical Specialists, and the International Medical Science Academy. She was elected fellow of the Academy of Medical Sciences (FAMS) in 2005. She was honoured with Excellence Award in Anatomy in 2004 by Delhi Medical Association. She has received Life Time Achievement Award, Fellowship of Anatomical Society of India, and DMA Distinguished Services Award, in 2015. She is visiting faculty of DNB, MDS and a PhD examiner.

She is author of *Manual of Human Anatomy Dissection*, *Companion Pocketbook—BDC Human Anatomy (Vols 1–3)* and *BDC Human Anatomy for Dental Students 3/e*; coauthor of *Textbook of Histology 5/e*, *Textbook of Neuroanatomy 6/e*, *Anatomy and Physiology for Nurses, Anatomy and Physiology for Allied Health Sciences*, *Practical Anatomy Workbook*, *Practical Histology Workbook* and *Practical Anatomy Workbook for Dental Students*; and editor of *Human Embryology 2/e*, *Handbook of General Anatomy 6/e* and *BD Chaurasia's Applied Anatomy and Physiology for BSc Nursing Students*.

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 Edition



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 Chaurasia's
Human Anatomy

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2

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BD Chaurasia's
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Regional and Applied | Dissection and Clinical

Ninth
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As per the CBME Guidelines | Competency Based Undergraduate Curriculum for the Indian Medical Graduate

Lower Limb
Abdomen and Pelvis

Scratch Code on Inside Front Cover for Accessing CBSiCentral App

Available Free on CBSiCentral App

- Original Images from First Edition of BDC Human Anatomy (Vols 1–3) hand-drawn by Dr BD Chaurasia
- Videos on Osteology and Soft Parts
- Frequently Asked Questions & Answers

Wall Chart on Veins of Human Body

Many easily reproducible diagrams, originally hand-drawn by Dr BD Chaurasia, now modified and coloured suitably, are given at the relevant locations in the text



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Ninth Edition

Volume



2

Competency-Based

BD Chaurasia's

Human Anatomy

Regional and Applied Dissection and Clinical

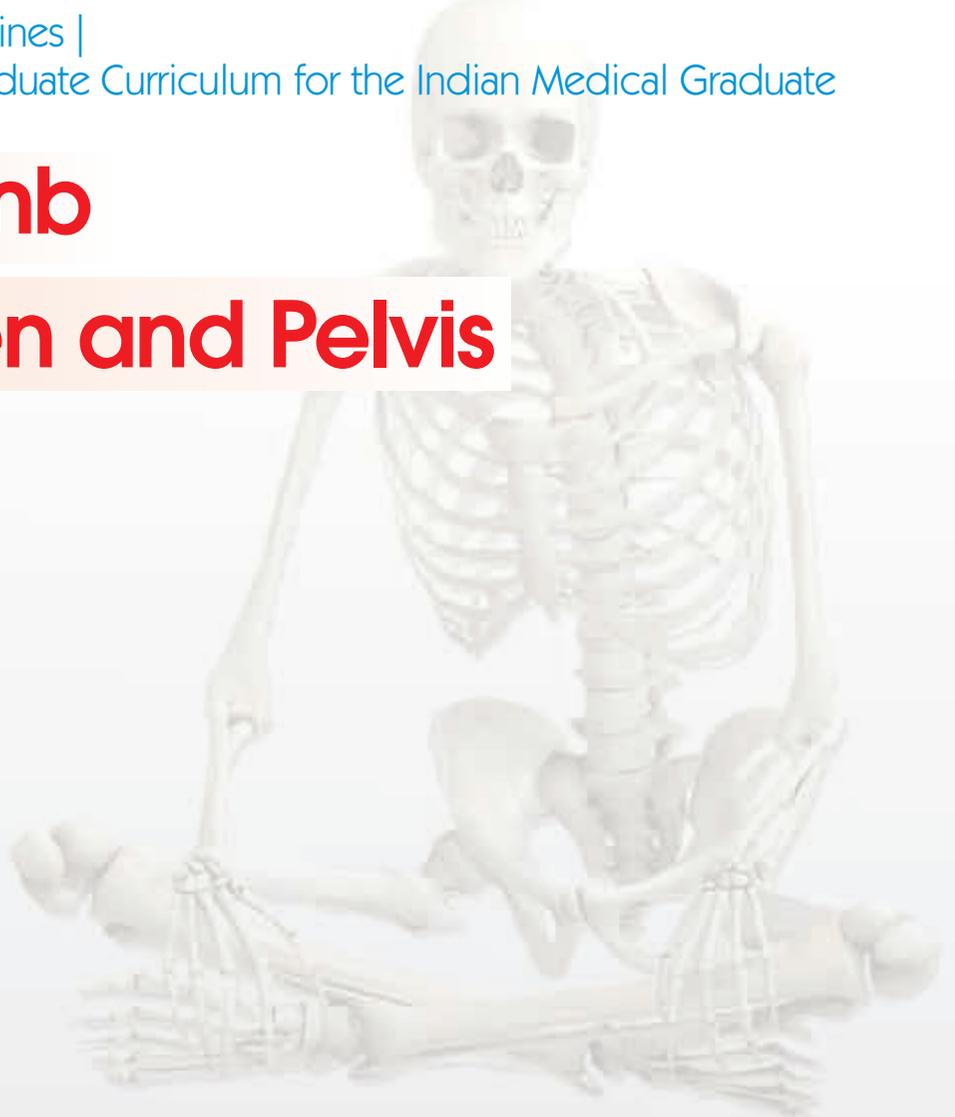
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Lower Limb



Abdomen and Pelvis





Dr BD Chaurasia (1937–1985)

was Reader in Anatomy at GR Medical College, Gwalior.

He received his MBBS in 1960, MS in 1965 and PhD in 1975.

He was elected fellow of National Academy of Medical Sciences (India) in 1982.

He was a member of the Advisory Board of the *Acta Anatomica* since 1981, member of the editorial board of *Bionature*, and in addition member of a number of scientific societies.

He had a large number of research papers to his credit.

Ninth Edition

Volume

2

Competency-Based

BD Chaurasia's

Human Anatomy

Regional and Applied **Dissection and Clinical**

As per the latest CBME Guidelines |
Competency based Undergraduate Curriculum for the Indian Medical Graduate



Lower Limb



Abdomen and Pelvis

Chief Editor

Krishna Garg

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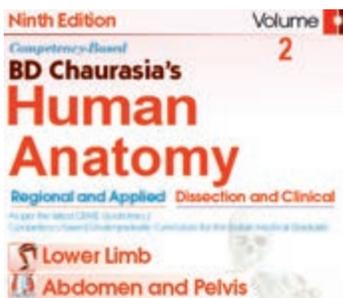
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to

my teacher

Shri Uma Shankar Nagayach

— BD Chaurasia



Volume

1

UPPER LIMB and THORAX

Volume

2

LOWER LIMB, ABDOMEN and PELVIS

Volume

3

HEAD and NECK

Volume

4

BRAIN-NEUROANATOMY



*This human anatomy is not systemic but regional
Oh yes, it is theoretical as well as practical
Besides the gross features, it is chiefly clinical
Clinical too is very much diagrammatical.*

*Lots of tables for the muscles are provided
Even methods for testing are incorporated
Improved colour illustrations are added
So that right half of brain gets stimulated*

*Tables for muscles acting on joints are given
Tables for branches of nerves and arteries are given
Hope these volumes turn highly useful
Editors' hardwork under Almighty's guidance prove fruitful*

Preface to the Ninth Edition

This edition features a number of significant modifications which we have made in the light of the wide-ranging suggestions that we received in the recent months from students, teachers and also the well-wishers of this epic textbook. As the information explodes and knowledge multiplies, appropriate improvements, additions and changes are also required to be made in the contemporary literature. Latest research information sourced from the standard international publications has been selectively incorporated in these volumes.

Numerous unique line diagrams, originally hand-drawn by late Dr BD Chaurasia and used in the first edition of the book, after thoughtful moderation, have now been incorporated in the ninth edition. Our criteria for the selection and manipulation of these drawings were clearly based on the simplicity and lucidity of the anatomic description. These simply structured illustrations can be easily reproduced by the students in multitudes of tests and examinations, including university examinations.

Diagrams form the foundation of anatomy: The drawings create imprints on the brain. Figures, artwork and the dissection are recorded in the right half of the cerebrum while the text is learnt by using left half of cerebrum. Thus, learning by drawing diagrams and steps of dissection help in using both the halves of cerebrum, which is an ideal condition. This textbook lays stress on understanding anatomic structures and details through clear, neat and crisp diagrams.

Earlier, videos of the dissection of all regions had been given free access to the readers on [CBSiCentral App](#). These videos are now uploaded on the App after reorganization of the sequences, numeration and providing appropriate citations in the text. Readers can register on the App and access the enumerated videos through the scratch code given on the inside front cover of each volume. These videos adequately compensate the scarcity of the cadavers in medical institutions for conducting dissection.

The videos of the dissection give three-dimensional image descriptions of tissues and organs which get effectively registered in brain for a longer time.

Processes and steps of dissection given in blue boxes with dissection photographs have been retained as many students and teachers appreciate the same. However, no addition in dissection photographs has been made as a separate CBSPD publication *Manual of Human Anatomy Dissection* (ISBN: 978-93-89688-00-9) with numerous dissection photographs is available to the readers who aspire to learn and enjoy the dissection in a meticulous manner.

We have incorporated all the competencies prescribed by National Medical Commission under the [Competency Based Curriculum for the Indian Medical Graduate](#) for spirited implementation of [Competency Based Medical Education Guidelines](#).

Since National Medical Commission has laid stress on teaching and learning clinical aspects from the very beginning of the MBBS study period, the questions asked are mostly clinical. [Clinical aspects](#) have been explicitly given in the text such that the students are able to learn, recapitulate and answer the clinically-oriented questions in their examinations.

As NMC curriculum also lays emphasis on [Early Clinical Exposure](#), crisply written and well-presented [ECE Cases](#) have been given at the end of every section, which make the book clinical-savvy. These case studies will help the budding doctors in imbibing the salient clinical features, getting appropriate investigations done, and treating the patients satisfactorily once they are in clinical practice.

All the illustrations in the four volumes of this book have been prepared on a common colour scheme applicable to cells, tissues and organs. Colour codes employed in the preparation of the human anatomy illustrations are given in the beginning of each section. This characteristic feature will help the students in identifying the anatomic components clearly and draw appropriately coloured diagram in a schematic manner.

Extensive research by numerous scientists has decoded the molecular control of development of organ tissues of the body. Basics of this molecular control are given briefly in these volumes.

We have continued with the practice of giving one separate **wall chart** in each volume for easy comprehension of the topics.

Sincere attempt has been made to present all facets of theory and practical anatomy to make these volumes truly holistic. In addition to the descriptive text, the following rich features lend a high pedestal to the book in the context of the international literature.

	<i>Volume 1</i>	<i>Volume 2</i>	<i>Volume 3</i>	<i>Volume 4</i>	<i>Total</i>
Figures	414	653	462	210	1739
Flowcharts	7	4	12	9	32
Dissection Boxes	37	36	12	5	90
X-rays/MRI and CT Scans	5	5	4	16	30
Ossification Boxes	13	12	14	–	39
Tables	43	52	33	23	151
Clinical Anatomy Boxes	52	101	77	41	271
Mnemonics Boxes	22	15	8	4	49
Facts to Remember	93	229	114	67	503
FAQs	99	132	104	52	387
MCQs	149	232	135	72	588
Viva Voce Questions	259	508	227	125	1119
Clinicoanatomical Problems	19	35	20	14	88
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Chief Editor

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Mrudula Chandrupatla

Preface to the First Edition (excerpts)

The necessity of having a simple, systematized and complete book on anatomy has long been felt. The urgency for such a book has become all the more acute due to the shorter time now available for teaching anatomy, and also to the falling standards of English language in the majority of our students in India. The national symposium on 'Anatomy in Medical Education' held at Delhi in 1978 was a call to change the existing system of teaching the unnecessary minute details to the undergraduate students.

This attempt has been made with an object to meet the requirements of a common medical student. The text has been arranged in small classified parts to make it easier for the students to remember and recall it at will. It is adequately illustrated with simple line diagrams which can be reproduced without any difficulty, and which also help in understanding and memorizing the anatomical facts that appear to defy memory of a common student. The monotony of describing the individual muscles separately, one after the other, has been minimised by writing them out in tabular form, which makes the subject interesting for a lasting memory. The relevant radiological and surface anatomy have been treated in separate chapters. A sincere attempt has been made to deal, wherever required, the clinical applications of the subject. The entire approach is such as to attract and inspire the students for a deeper dive in the subject of anatomy.

The book has been intentionally split in three parts for convenience of handling. This also makes a provision for those who cannot afford to have the whole book at a time.

It is quite possible that there are errors of omission and commission in this mostly single-handed attempt. I would be grateful to the readers for their suggestions to improve the book from all angles.

I am very grateful to my teachers and the authors of numerous publications, whose knowledge has been freely utilised in the preparation of this book. I am equally grateful to my professor and colleagues for their encouragement and valuable help. My special thanks are due to my students who made me feel their difficulties, which was a great incentive for writing this book. I have derived maximum inspiration from Prof. Inderbir Singh (Rohtak), and learned the decency of work from Shri SC Gupta (Jiwaji University, Gwalior).

I am deeply indebted to Shri KM Singhal (National Book House, Gwalior) and Mr SK Jain (CBS Publishers & Distributors, Delhi), who have taken unusual pains to get the book printed in its present form. For giving it the desired get-up, Mr VK Jain and Raj Kamal Electric Press are gratefully acknowledged. The cover page was designed by Mr Vasant Paranjpe, the artist and photographer of our college; my sincere thanks are due to him. I acknowledge with affection the domestic assistance of Munne Miyan and the untiring company of my Rani, particularly during the odd hours of this work.

BD Chaurasia

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We have the blessings and good wishes of Prof NA Faruqi (Aligarh); Dr DC Naik (Rewa); Dr SD Joshi and Dr SS Joshi (Indore); Dr (Brig) Rakesh Gupta (Greater Noida); Dr DR Singh (Lucknow); Dr M Kaul; Dr C Anand and Dr I Bahl (Delhi); Dr Mohsin Azmi (Kanpur); Dr Medha Joshi (Ghaziabad); Dr Surbhi Gupta (Delhi); and Dr Nitin Nagarkar (Raipur).

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Videos of bones and soft parts of human body, prepared at Kathmandu University School of Medical Sciences, have now been added with the respective chapters and are available at our mobile App [CBSiCentral](#). I (chief editor) am grateful to Dr R Koju, CEO of KUSMS and Dhulikhel Hospital, for his generosity.

The moral support of my (chief editor) family members, Late Dr DP Garg, Dr Suvira Gupta, Dr JP Gupta, Mr Manoj, Ms Rekha, Mr Sanjay, Ms Meenakshi, Dr Manish, Dr Shilpa Garg, Dr Naveen Garg, Dr Manoj, Dr Nalini Shukla, Dr Vikas Verma and Dr Swati Gupta, is appreciated.

The magnanimity shown by Mr SK Jain (Chairman) and Mr Varun Jain (Director), CBS Publishers & Distributors, has been always forthcoming. The unquestionable support of Mr YN Arjuna (Senior Vice President—Publishing, Editorial and Publicity) and his entire team comprising Ms Ritu Chawla (GM—Production), Mr Sanjay Chauhan, Mr Neeraj Prasad and Mr Rohan Prasad (Graphic Artists); Mr Surendra Jha and Mr Prasenjit Paul (Copy Editors); Ms Jyoti Kaur and Mr Tarun Rajput (DTP Operators) has made an excellent contribution to bring out this edition. We are really obliged to them and pray for their prosperity.

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**Pragati Sheel Mittal
Mrudula Chandrupatla**

Thus spoke the cadaver

*Handle me with little love and care
As I had missed it in my life affair
Was too poor for cremation or burial
That is why am lying in dissection hall*

*You dissect me, cut me, section me
But your learning anatomy should be precise
Worry not, you would not be taken to court
As I am happy to be with the bright lot*

*Couldn't dream of a fridge for cold water
Now my body parts are kept in refrigerator
Young students sit around me with friends
A few dissect, rest talk, about food, family and movies
How I enjoy the dissection periods
Don't you? Unless you are interrogated by a teacher*

*When my parts are buried post-dissection
Bones are taken out for the skeleton
Skeleton is the crown glory of the museum
Now I am being looked up by great enthusiasm*

*If not as skeletons as loose bones
I am in their bags and in their hostel rooms
At times, I am on their beds as well
Oh, what a promotion to heaven from hell*

*I won't leave you, even if you pass anatomy
Would follow you in forensic medicine and pathology
Would be with you even in clinical teaching
Medicine line is one where dead teach the living*

*One humble request I'd make
Be sympathetic to persons with disease
Don't panic, you'll have enough money
And I bet, you'd be singularly happy*

—Krishna Garg





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Ethical Aspects of Cadaveric Dissection

The cadaver, the dead body, that we dissect, plays an important role in the teaching of anatomy to medical students. The cadaver and the bones become an important part of our life as medical students as some academics have even referred to the cadaver as the 'first teacher' in the medical school.

We must pay due respect to the cadavers and bones kept in the dissection hall or museum. In some medical schools, it is mandatory to take an 'oath' before beginning the cadaveric dissection which aims to uphold the dignity of the mortal remains of the departed soul while other medical schools help the student to undertake dissection in a proper manner and empathise with the families of the donor. During the course of dissection, the student is constantly reminded of the sanctity of the body he/she is studying so that the noble donation of someone's body is used only as a means of gaining scientific knowledge/progress. Each and every dissected part afterwards is disposed or cremated with full dignity.

Honour of the donor and his/her family is the prime responsibility of the health professional. 'The dead teach the living', and the living pledge to use this knowledge for the upliftment of humankind.

Three-dimensional models and computer simulations cannot replace the tactile appreciation achieved by cadaveric dissection and we should always be grateful to those who have donated their bodies and strive to respect them. We have the privilege to study the human being through a body of a fellow human and have to be humble and carry forward the legacy of nobility and selflessness in our careers.

(Contributed by Dr Puneet Kaur)

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Competency based Undergraduate Curriculum for the Indian Medical Graduate

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