book reviews

Chromosome Abnormalities and Genetic Counseling: Fourth Edition

By RJ McKinlay Gardner, Grant R Sutherland and Lisa G Shaffer. New York: OUP USA, 2011. 624 pp.

This book first appeared in 1989 and rapidly became an indispensible resource for genetic counselling students, medical geneticists and cytogeneticists alike. The original authors, RJ Mckinlay Gardner (a medical geneticist of some 40 years experience) and GR Sutherland (a cytogeneticist and molecular geneticist) have been joined by LG Shaffer (a micro-array specialist) to cover the additional molecular techniques in use in the modern cytogenetics laboratory.

In the preface to the fourth edition, the authors write, *'Classicists see the chromosome as a vertical structure; to the molecular scientist, DNA may lie horizontally: but they are looking at the same thing. The move away from classical microscopy into molecular methodologies, predicted for some time, is now actually happening. Smaller and subtler abnormalities can be detected. We know a lot more (but much yet to know) about normal genomic variation. Chromosomal testing of embryos before implantation, while not commonplace, is no longer regarded as extraordinary … Meiosis is as vulnerable as it has always been. Chromosomes continue to undergo rearrangement. Conceptions still happen, and children continue to be born, with an incorrect chromosomal complement. And people still want to know why, and what they can do about it.'*

Keeping up-to-date in this rapidly developing field is a challenge to any clinician involved in the process of genetic counselling, which spans prenatal, paediatric and adult disciplines. As the authors state, 'Overall, around 1/135 live-born babies have a chromosomal abnormality, and about 40% of these are phenotypically abnormal due to the chromosomal defect.' However, this number is likely to be an underestimate, as cytogenetic testing is moving to a finer focus, with application of higher resolution banding and employment of molecular methodologies. Thus, genetic counselling will be in higher demand. Cytogenetic reports are also becoming increasingly sophisticated, as more information is derived from analysis. This book aims to educate the counsellor to be able to explain and interpret the chromosomal problem identified.

The initial chapters on basic concepts provide a concise and thorough review of chromosome pathology with careful cross referencing to later chapters. The text has been updated meticulously, providing evidence for each concept being introduced. Judicious use of pie charts, tables, schematic diagrams and karyotypes help to illustrate and summarise the information. The newer molecular techniques of array comparative genomic hybridisation (aCGH), single nuclear polymorphism arrays, polymerase-chain based applications including multiplex ligation-dependent probe amplification (MLPA) and quantitative fluorescent polymerase chain reaction (QF-PCR) and next generation sequencing are explained. Importantly, the science is balanced by addressing the ethical and counselling issues encountered in clinical practice, when abnormal chromosomal results are obtained. In particular, when interrogating the entire genome using microarray based technology, incidental abnormalities or findings of unclear significance may be discovered. For example, testing a child with developmental delay may identify a 'de novo' deletion that explains their phenotype, but the deletion may incidentally include an adult onset cancer predisposition gene. Addressing these possibilities in pre-test counselling is now considered best practice and an understanding of these issues is integral for any counsellor.

Ensuing chapters cover parents with a chromosomal abnormality, variants, normal parents with a chromosomally abnormal child, including disorders of sex development and chromosome instability syndromes, disorders associated with aberrant genomic imprinting, reproductive failure, prenatal diagnosis, including pre-implantation genetic diagnosis and noxious agents. The reader is helped to understand chromosomal abnormalities, as each chapter is divided into a 'Biology' section, which provides the basis to answer the question, 'How and why did it happen?', followed by a 'Genetic Counseling' section that addresses the questions 'Could it happen again?' and 'If so, how likely would it be to happen again?'. Helpful internet resources or databases are listed after some sections, to direct the counsellor to other valuable resources.

I enjoyed reading this book and found it was a treasure trove of information, providing a practical approach to managing an individual or family with a chromosomal abnormality. Cytogenetic scientists may require other texts covering human cytogenetics in more depth, such as *The Principles of Human Cytogenetics* by Keagle and Gersen (Humana Press). Similarly, a complementary text for genetic counsellors might include, for example, *Practical Genetic Counselling* by Harper (Hodder Arnold).

The book aims 'to provide in convenient form accurate information concerning chromosomal conditions'; overall it rose to this challenge admirably. However, it is not a small pocket handbook but a hardback book made to last and to be consulted regularly. I wholeheartedly recommend clinical geneticists, cytogeneticists, genetic counsellors, paediatricians, obstetricians and fertility specialists own a copy. It should help them counsel families with cytogenetic abnormalities more effectively.

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