

Cambridge University Press

978-1-107-62551-8 - Hydrophthalmia or Congenital Glaucoma: Its Causes, Treatment, and Outlook

J. Ringland Anderson

Frontmatter

[More information](#)

HYDROPTHALMIA

Cambridge University Press

978-1-107-62551-8 - Hydrophthalmia or Congenital Glaucoma: Its Causes, Treatment, and Outlook

J. Ringland Anderson

Frontmatter

[More information](#)

Cambridge University Press

978-1-107-62551-8 - Hydrophthalmia or Congenital Glaucoma: Its Causes, Treatment, and Outlook

J. Ringland Anderson

Frontmatter

[More information](#)

HYDROPTHALMIA
OR
CONGENITAL GLAUCOMA
Its Causes, Treatment, and Outlook

by

J. RINGLAND ANDERSON

M.C., M.D., B.S. (Melb.), F.R.C.S. (Edin.), F.R.A.C.S.,
D.O.M.S. (Lond.)

Ophthalmic Surgeon to the Alfred Hospital, Melbourne

WITH A FOREWORD BY

SIR JOHN HERBERT PARSONS

C.B.E., D.Sc., F.R.C.S., F.R.S.

CAMBRIDGE

Published for the

British Journal of Ophthalmology

AT THE UNIVERSITY PRESS

1939

Cambridge University Press

978-1-107-62551-8 - Hydrophthalmia or Congenital Glaucoma: Its Causes, Treatment, and Outlook

J. Ringland Anderson

Frontmatter

[More information](#)

CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town,
Singapore, São Paulo, Delhi, Mexico City

Cambridge University Press
The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org
Information on this title: www.cambridge.org/9781107625518

© Cambridge University Press 1939

This publication is in copyright. Subject to statutory exception
and to the provisions of relevant collective licensing agreements,
no reproduction of any part may take place without the written
permission of Cambridge University Press.

First published 1939
First paperback edition 2013

A catalogue record for this publication is available from the British Library

ISBN 978-1-107-62551-8 Paperback

Cambridge University Press has no responsibility for the persistence or
accuracy of URLs for external or third-party internet websites referred to in
this publication, and does not guarantee that any content on such websites is,
or will remain, accurate or appropriate.

Cambridge University Press

978-1-107-62551-8 - Hydrophthalmia or Congenital Glaucoma: Its Causes, Treatment, and Outlook

J. Ringland Anderson

Frontmatter

[More information](#)

To
MY WIFE

Cambridge University Press

978-1-107-62551-8 - Hydrophthalmia or Congenital Glaucoma: Its Causes, Treatment, and Outlook

J. Ringland Anderson

Frontmatter

[More information](#)

CONTENTS

<i>Illustrations</i>	<i>page</i> xiii
<i>Foreword</i>	xvii
<i>Introduction</i>	xix
<i>Chapter I. GENERAL: AETIOLOGY</i>	1
Definition	1
Title	1
Retrospect	2
Summary of Questionnaire	3
AETIOLOGY	4
Incidence	4
Bilateral incidence	5
Influence of sex	6
Time of origin	7
Age of onset	7
Relationship to juvenile glaucoma	8
Influence of heredity	11
Heredity in congenital glaucoma	12
Influence of consanguinity	14
Anticipation	15
Summary	16
References	17
<i>Chapter II. DIFFERENTIAL DIAGNOSIS</i>	19
Myopia	19
Tears in Descemet's membrane in myopia	22
Anterior staphyloma	26
Keratectasia	27
Keratoconus	27
Megalocornea	28
Incidence	37
Inheritance	38
Theories of origin	39
Megalophthalmia	45
Summary	46
References	47

<i>Chapter III. THE STRUCTURE AND DEVELOPMENT OF THE INVOLVED TISSUES: THEIR EMBRYOLOGY AND THEIR COMPARATIVE ANATOMY</i>	<i>page</i> 50
The development of these tissues	50
The sclera	50
The cornea, its size, its curvature	51
The deepening of the angle of the anterior chamber	53
The development and the retrogression of the associated mesoderm	53
The structure of these tissues	62
The angle of the anterior chamber	62
The scleral furrow and the scleral roll or spur	63
The canal of Schlemm: the afferent arteriolar supply to Schlemm's canal	69
The meshwork of the angle: termination of Descemet's membrane	72
Iris processes: the anterior attachment of the ciliary muscle	75
The comparative anatomy of involved tissues	77
Conclusions	96
References	97
 <i>Chapter IV. THE PATHOLOGY OF CONGENITAL GLAUCOMA</i>	 99
A. Interference with function	99
Refraction	99
Vision	104
Intra-ocular pressure	105
B. Alterations in structure	106
The orbit and the globe: size of angle and degree of distension	106, 110
The sclera	111
The cornea: increase in size, thinning of cornea, changes of curvature, opacities of the cornea, age of onset of the tears, congenital pupillary synechiae and corneal defects	119
The uveal tract: the iris, aniridia, the ciliary body, the ciliary and vorticosae veins, the choroid	127

CONTENTS

ix

The lens: alteration in shape and position, aplasia	<i>page</i> 136
The retina and the optic nerve	139
The anterior chamber	141
The angle of the anterior chamber: the angle in chronic glaucoma, the angle and Schlemm's canal, persistent or aberrant meshwork in the angle, defects of Schlemm's canal, posteriorly placed Schlemm's canal, rudimentary development of scleral spur, peripheral anterior synechiae	142–152
Summary	153
C. Association of hydrophthalmia with other anomalies	153
Ocular defects: non-ocular anomalies	153
Associated hydrophthalmia	156
1. Generalised neurofibromatosis or von Recklinghausen's disease: clinical manifestations, onset and distribution of ocular lesions, summary of reported cases, ciliary neurofibromata, summary of examined specimens, cranial and intra-cranial lesions, signs of intra-cranial disease, association with hemihypertrophy, the escape of the eye in hemihypertrophy and atrophy, other ocular changes in neurofibromatosis	158–179
2. Hydrophthalmia and facial naevi: summary of cases, angle of filtration, vascular changes in the uvea, other ocular changes, summary of examined specimens, cranial and intra-cranial lesions, disorders of growth, hemihypertrophy, meningo-cutaneous angiomatosis, intra-cranial angiomatous malformations that may be associated with facial naevi and glaucoma, contrast with neuro-retinal angiomatosis	180–206
3. Causes of hydrophthalmia in association with facial naevi and neurofibromatosis: mechanical theories, neuro-vascular theories, a nervous origin, other theories	211–218
Summary	221
References	222

<i>Chapter V. PATHOGENESIS</i>	<i>page</i> 230
The theories of origin of hydrophthalmia	230
1. The developmental theory	231
The significance of ocular anomalies	232
The significance of the association with non-ocular anomalies	233
The significance of persistent and aberrant mesoblastic tissue in and round the anterior chamber	234
The significance of the meshwork in the angle	236
Hydrophthalmia and neurofibromatosis	239
Hydrophthalmia and facial naevi	240
Aniridia	240
Microphthalmia	241
The significance of an “absent” canal of Schlemm	242
The significance of iris processes	244
The significance of peripheral anterior synechiae	245
The significance of congenital pupillary synechiae and congenital corneal defects	248
Congenital glaucoma in the lower mammals	259
Experimental evidence of interference with filtration	260
2. Inflammation as a cause	260
Introduction	260
The significance of the signs of ocular inflammation	261
The significance of the state of the choroid	266
The significance of lowered resistance of the scleral coat	267
The significance of endophlebitis	268
The significance of the state of the vitreous	270
The significance of the association with general disorders: syphilis, early incidence of interstitial keratitis	272–3
3. Other theories of origin	279
The association with nervous and endocrine disorders: hypersecretion, Angelucci’s theory	279
Two main types of hydrophthalmia	280
Summary	285
References	289

CONTENTS

xi

<i>Chapter VI. TREATMENT</i>	<i>page</i> 292
History of treatment	292
Medical treatment: miotics	294
Operative treatment	299
Iridectomy	299
Paracentesis of the cornea	305
Posterior sclerotomy	306
Anterior sclerotomy	308
Incision of the angle: the operation of de Vincentiis (1893–5)	312
The theory of fistulisation	314
Lagrange's sclerecto-iridectomy	318
Holth's sclerectomy	322
Corneo-scleral trephining	323
Holth's iridencleisis	330
Iridotaxis	332
Heine's cyclodialysis	332
Other operations: extraction of the lens	334
The relative merits of various operations	335
Multiple operations	337
The question of operation	338
The time for operation	338
Tension after operation	340
Treatment of complications: cataract, detachment of the retina	341–2
Summary	342
References	343
<i>Chapter VII. PROGNOSIS</i>	347
The final picture. A permanent cure	347
I. The spontaneous arrest of congenital glaucoma: mild cases	348
II. Results of operative treatment in different series	354
III and IV. Vision of unoperated and operated patients in later life	354
V. Influence of age at operation on vision and tension	355

xii	CONTENTS	
	<i>Chapter VII. PROGNOSIS (contd.)</i>	
	VI. Influence of size of cornea on visual prognosis	page 356
	Optic disc	
	VII. Analysis of cases with final vision of at least 6/12	358
	VIII. The prognosis of hydrophthalmia when associated with neurofibromatosis and facial naevi	359
	IX. Juvenile mortality	361
	Information obtained from Questionnaire	361
	Summary	362
	References	363
	<i>Chapter VIII. GENERAL REFLECTIONS</i>	365
	<i>Index</i>	371
	<i>Tables at back</i>	
	Analysis of Early Specimens	
	Analysis of Specimens over 2½ years and under eleven	
	Analysis of Specimens over eleven years	
	available for download from www.cambridge.org/9781107625518	

ILLUSTRATIONS

FIGURE	PAGE
1. Normal eye	20
2. Myopic eye	21
3. Myopic eye, with staphylomatous condition	21
4. Myopic eye, youngest recorded specimen with neurofibromatosis	22
5. Myopic eye, typical peripheral synechia	22
6. Hydrophthalmic eye, with wide open angle	23
7. Hydrophthalmic eye, with extensive sub-choroidal haemorrhage	24
8. Very distended eyeball removed at age of ten years	26
9. Megalocornea, showing typical lustrous appearance	30
10. Angle and anterior half of eye with megalocornea	31
11. Gonioscopic view of angle in megalocornea	36
12. Gonioscopic view of angle in normal eye	36
13. Schematic section of the angle in megalocornea	37
14. Eyes of adult and young <i>Tarsius</i>	45
15. Eyes of adult and young <i>Tarsius</i>	45
16. Foetal eye at end of the fifth month	54
17. Foetal eye at beginning of sixth month	55
18. Foetal eye at beginning of sixth month	56
19. Anterior chamber in middle of sixth month	57
20. Angle and ciliary region at six months	57
21. Angle at beginning of seventh month	58
22. Angle at end of seventh month	58
23. Angle of seven months' foetus filled with haemorrhage	59
24. Angle at eighth month	60
25. Angle at ninth month	60
26. Angle at birth	60
27. Angle of a four-months-old child	61
28. Angle of a normal adult	61
29. Monkey, showing unusual appearance of Schlemm's canal	62
30. Eye of aged Orang-Outang	63
31. Scleral furrow with its environment	64
32. Peripheral section through filtration angle of human eye	65
33. Angle of 32·0 cm. foetus	66
34. Diagrammatic representation of four types of scleral spur	68
35. The involved tissue in <i>Ornithorhynchus</i>	78
36. Echidna	79
37. Pseudochirus	80
38. <i>Dasyurus</i>	81
39. <i>Dasyurus</i>	82
40. Rabbit	83
41. Rabbit	84
42. Sheep	85

FIGURE	PAGE
43. The involved tissue in Cow	86
44. Pig	87
45. Hippopotamus	87
46. Dog	88
47. Tarsius	89
48. Man	90
49. Aniridia, showing mesodermal tissue	100
50. Aniridia, partial, showing persistent uveal meshwork	101
51. Newly-formed hyaline material covered by endothelial cells	102
52. Filtration angle in hydrophthalmia	103
53. Hydrophthalmic eye at ten months	104
54. Eye, showing signs of inflammation (Reis, Specimen I)	105
55. Seefelder, Specimen I	106
56. Reis, Specimen II	106
57, 58. Persistent uveal meshwork with torn trabeculae	107
59, 60. Angle of eye, showing various changes	108
61, 62. Showing angle torn open	110
63. Showing angle open, with Schlemm's canal and spur almost absent	111
64, 65. Showing angle open	112
66. Angle torn open so that it extends into the ciliary muscle	113
67, 68. The connection of the iris to the cornea is indirect, by means of fibrous tissue containing very few nuclei	113
69. Neurofibroma of choroid	114
70. Congenital glaucoma showing incomplete separation of iris from cornea	116
71. Direct union of the iris and cornea	145
72. Congenital glaucoma	146
73. Congenital glaucoma with staphyloma due to corneal perforation	147
74. Section showing anterior synechia	148
75. Section showing central anterior synechia and very thin cornea	149
76. Section showing extensive peripheral synechia with atrophy of ciliary body	152
77. Narrow rupture with gap covered by new hyaline tissue	155
78. Typical curled pigmented line at one edge of wide rupture	156
79. Showing advanced folding of the hyaline tissue	157
80. Hydrophthalmia associated with neurofibromatosis	159
81. Showing angle closed	160
82. Angle at opposite side of eye	163
83. Thickened posterior choroid	165
84. Normal choroid	167
85. Posterior choroid, showing whorl formation	168
86. Showing failure of iris to differentiate	169
87. Choroid replaced by avascular neurofibromatous tissue	170
88. Extensive neurofibromatosis throughout cornea near limbus	171
89. Showing dense structure of extra-ocular extension	173
90. Showing whorls in fibroid choroid	174

ILLUSTRATIONS

xv

FIGURE	PAGE
91. High power view of whorls in choroid	175
92. Section of ciliary body	177
93. Section showing wide open angle filled with a pigmented strand and proliferated hyaline material	178
94. Section showing extension round the angle of pigmented tissue from the iris	179
95. Section showing peripheral synechia and atrophic ciliary region	193
96. Peripheral synechia and atrophy of ciliary region	195
97. Showing new vessels in tissue uniting cornea and sclera	197
98. Showing marked peripheral thinning of cornea	199
99. Showing angle wide open with indistinct traces of Schlemm's canal	201
100. Periphery of the cornea	202
101. Centre of the cornea	203
102. Large sub-choroidal haemorrhage dividing the ciliary body from the sclera	204
103. Sclerosis of the tissues near the iris base	205
104. Showing angle wide open, but no canal of Schlemm	206
105. Showing peripheral thinning of cornea, with angle wide open	207
106. Showing marked cupping and atrophy of optic disc	208
107. Showing angle torn open, with Schlemm's canal closed	209
108. Cysts and oedema of iris	210
109, 110. Dr Glen Campbell's patient with hydrophthalmia, facial naevi and neurofibromatosis at the ages of six months and fifteen years	211
111. Generalised naevi, epilepsy and hydrophthalmia	212
112. Generalised naevi, epilepsy and hydrophthalmia	213
113. Hydrophthalmic eye at ten months	215
114. Showing enlarged cornea and bluish sclera in patient with arrested hydrophthalmia	216
115. Stereoscopic views of optic disc in arrested hydrophthalmia	217
116. Photograph showing glaucoma cup	219

Cambridge University Press

978-1-107-62551-8 - Hydrophthalmia or Congenital Glaucoma: Its Causes, Treatment, and Outlook

J. Ringland Anderson

Frontmatter

[More information](#)

Cambridge University Press

978-1-107-62551-8 - Hydrophthalmia or Congenital Glaucoma: Its Causes, Treatment, and Outlook

J. Ringland Anderson

Frontmatter

[More information](#)

FOREWORD

In a foreword to Dr Ringland Anderson's book on *Detachment of the Retina*, I expressed the hope that others would follow his good example and provide other such monographs. It is a matter for congratulation that he himself has now written one on *Hydrophthalmia*, a disease better known under the picturesque but otherwise unsatisfactory name Buphthalmia. The last monograph on this subject was published in 1897 by Dr Edmund L. Gros, under the title *Étude sur l'Hydrophthalmie ou Glaucome infantile*, and was an excellent résumé of our knowledge up to that date. The present is a much more extensive treatise and will long remain authoritative. In dealing with a disease of such obscure aetiology, in which, however, congenital malformations are a prominent factor, the scientific approach must be by way of pathology and comparative anatomy. In both of these respects the treatment here is exhaustive, and beautifully illustrated. Dr Anderson has taken advantage of his special opportunities to obtain specimens from Australian fauna—ornithorhyncus, echidna, pseudochirus, dasyurus—and to describe the condition of the angle of the anterior chamber in them and in tarsius. This is in itself a valuable contribution to comparative anatomy. The remarkable association of hydrophthalmia with neurofibromatosis, facial naevi and other angiomatic conditions is fully discussed.

To the practising ophthalmic surgeon the most important part of the book is the description of all the different methods of operative treatment which have been tried, with a thorough analysis of the results obtained by various surgeons. One cannot help regretting that the survey shows no signs of indicating in the treatment of hydrophthalmia any such hopeful improvements in operative technique as were beginning to bear fruit when Dr Anderson's book on *Detachment of the Retina* was published, and which have proved so successful.

J. HERBERT PARSONS

Cambridge University Press

978-1-107-62551-8 - Hydrophthalmia or Congenital Glaucoma: Its Causes, Treatment, and Outlook

J. Ringland Anderson

Frontmatter

[More information](#)

Cambridge University Press

978-1-107-62551-8 - Hydrophthalmia or Congenital Glaucoma: Its Causes, Treatment, and Outlook

J. Ringland Anderson

Frontmatter

[More information](#)

INTRODUCTION

CONSULTING ROOM, MELBOURNE, 1933.

Father of a 9-year-old boy blind from congenital glaucoma. Grahame had a trephine operation on each eye when he was a year old.

Would he have had a better chance without such treatment?

Surgeon. I do not know.

Father. Do any untreated patients with this disease retain sufficient vision to enable them to earn their living for a few years?

Surgeon. I do not know.

Father. If he marries will his children be affected?

Surgeon. I do not know.

The following pages are the result of an attempt to answer these questions: Through the generosity of Messrs G. J. and E. B. Coles, it was possible to send out 874 Questionnaire forms to 346 oculists throughout the world. A summary of the data obtained will be found later in this book.

The author is grateful to the following surgeons for supplying valuable material: Humphrey Neame, London; E. O. Marks, Brisbane; W. R. Fairclough, Auckland, and J. M. Wheeler, New York. The author is indebted to Professor A. W. Mulock Houwer and Captain v. Blaauboer for the specimens from Tarsius. The following pathologists have most willingly aided in its investigation: Drs Rupert Willis, R. B. Maynard and Adelaide Gault. Dr Kevin O'Day kindly allowed the author to examine his sections of *Dasyurus* and *Pseudochirus*. The microphotographs are by Mr Lewis Booth of the Alfred Hospital and Mr H. Marriott of the Department of Anatomy, Melbourne University. The author would express his appreciation of the generosity of those who permitted the use of plates from older works. To Miss Jean McNab and Miss Elizabeth Agar the author would offer his warmest thanks for hours spent in typing and translation.

If it had not been for the enthusiasm and the outstanding ability of Miss Diana Mann, B.Sc., this book would not have been written. For three years her eagerness to understand some of the mysteries

Cambridge University Press

978-1-107-62551-8 - Hydrophthalmia or Congenital Glaucoma: Its Causes, Treatment, and Outlook

J. Ringland Anderson

Frontmatter

[More information](#)

xx

INTRODUCTION

of congenital glaucoma has led her through many hundred pages of foreign works, through the examination of several hundred slides and through the almost endless arduous tasks that are known only by those who carry out a work of this kind. For these labours the author is deeply grateful.

Sir John Parsons, Mr R. R. James and Mr H. B. Stallard have helped in the production of this work and to them and to the Directors of the *British Journal of Ophthalmology* the author would acknowledge his indebtedness.