

SECOND EDITION

DERMATOSCOPY AND SKIN CANCER

A HANDBOOK FOR HUNTERS
OF SKIN CANCER AND MELANOMA



CLIFF ROSENDAHL, AKSANA MAROZAVA,
MOHAMMADREZA HASSANI & SIMON CLARK

DERMATOSCOPY AND SKIN CANCER

SECOND EDITION

DERMATOSCOPY AND SKIN CANCER

**A HANDBOOK FOR HUNTERS
OF SKIN CANCER AND MELANOMA**

CLIFF ROSENDAHL

Professor, Faculty of Medicine, The University of Queensland, Australia

AKSANA MAROZAVA

*Dermatovenereologist, Assistant Lecturer, Department of Dermatovenereology
and Cosmetology, Belarusian State Medical University, Belarus*

MOHAMMADREZA HASSANI

Omega Health Medical Centre, Australia

SIMON CLARK

Senior Lecturer, Faculty of Medicine, The University of Queensland, Australia



Scion

© Scion Publishing Ltd, 2025

ISBN 9781914961670

Second edition published 2025

Updated edition published 2023

First edition published 2019

All rights, including for text and data mining (TDM), artificial intelligence (AI) training, and similar technologies, are reserved. No part of this book may be reproduced or transmitted, in any form or by any means, without permission.

A CIP catalogue record for this book is available from the British Library.

Scion Publishing Limited

The Old Hayloft, Vantage Business Park, Bloxham Road, Banbury OX16 9UX, UK

www.scionpublishing.com

Important Note from the Publisher

The information contained within this book was obtained by Scion Publishing Ltd from sources believed by us to be reliable. However, while every effort has been made to ensure its accuracy, no responsibility for loss or injury whatsoever occasioned to any person acting or refraining from action as a result of information contained herein can be accepted by the authors or publishers.

Readers are reminded that medicine is a constantly evolving science and while the authors and publishers have ensured that all dosages, applications and practices are based on current indications, there may be specific practices which differ between communities. You should always follow the guidelines laid down by the manufacturers of specific products and the relevant authorities in the country in which you are practising.

Although every effort has been made to ensure that all owners of copyright material have been acknowledged in this publication, we would be pleased to acknowledge in subsequent reprints or editions any omissions brought to our attention.

Registered names, trademarks, etc. used in this book, even when not marked as such, are not to be considered unprotected by law.

Typeset by Evolution Design & Digital Ltd (Kent)

Printed in the UK

Last digit is the print number: 10 9 8 7 6 5 4 3 2 1

Contents

Preface to the second editionxi
Preface to the first edition xii
Forewordxiii
Abbreviations.....xv

CHAPTER 1

Introduction to dermatoscopy

1.1 Why use a dermatoscope? 1
 1.1.1 The economic impact of dermatoscopy 1
1.2 What is a dermatoscope? 2
1.3 Colours in dermatoscopy 5
1.4 Differences between polarised and non-polarised dermatoscopy..... 6
1.5 Uses of dermatoscopy for conditions other than tumours 9
 1.5.1 Dermatoscopy of perilesional skin 9
 1.5.2 Dermatoscopy of inflammatory conditions and dermatoses10
 1.5.3 Dermatoscopy of hair 11
 1.5.4 Dermatoscopy of skin infestations and infections 11
 1.5.5 Dermatoscopy of nails 11
References..... 11

CHAPTER 2

Skin – the organ

2.1 Skin as an organ 13
2.2 Embryology of skin 13
2.3 The microanatomy of skin 15
 2.3.1 Epidermis16
 2.3.2 Melanin production21
 2.3.3 Skin phototypes..... 23
 2.3.4 Melanocytic vs melanotic 23
 2.3.5 Why does melanin appear as different colours at different depths in the skin?24
 2.3.6 Epidermal appendages 25
 2.3.7 The basement membrane 28
 2.3.8 The dermis..... 29
 2.3.9 The dermoepidermal zone 30
 2.3.10 Skin blood supply.....32
 2.3.11 Skin lymphatics.....32
 2.3.12 Skin innervation33

2.3.13	Anatomy of volar skin	33
2.3.14	Anatomy of the nail apparatus.....	35
2.3.15	Anatomy of the eye in relation to melanocytic neoplasia.....	36
	References	37

CHAPTER 3

Dermatopathology for dermatoscopists

3.1	Introduction	39
3.1.1	The importance of integrating dermatopathology with dermatoscopy.....	39
3.1.2	How dermatoscopic findings correlate with histopathological features	39
3.2	Tissue and context: the two pillars of reliable skin cancer diagnosis	40
3.2.1	Delivery of an appropriate specimen.....	40
3.2.2	Delivery of appropriate information.....	41
3.3	From the scalpel to the microscope: the specimen journey	42
3.3.1	Specimen processing workflow	42
3.4	The histology of normal skin	50
3.5	Core dermatopathology terminology	55
3.6	Neoplastic lesions: dermatoscopic–histological correlation	72
3.6.1	General principles	72
3.6.2	Histopathology of melanoma	75
3.6.3	Histopathology of basal cell carcinoma.....	79
3.6.4	Histopathology of common benign keratinocytic lesions.....	83
3.6.5	Histopathology of squamous cell neoplasms.....	86
3.7	Clinicopathological collaboration in skin cancer diagnosis	92
3.7.1	Communicating with the pathologist.....	92
3.7.2	Diagnostic discordance in skin cancer diagnosis.....	93
3.7.3	The role of re-biopsy, additional investigations and second opinions.....	93
	References	94

CHAPTER 4

The language of dermatoscopy: naming and defining structures and patterns

4.1	The evolution of terminology for dermatoscopic structures and patterns	97
4.1.1	Structures in revised pattern analysis	97
4.2	Revised pattern analysis of lesions pigmented by melanin	98
4.2.1	Basic structures	98
4.2.2	Lines	98
4.2.3	Circles.....	106
4.2.4	Clods	106
4.2.5	Structureless	112
4.2.6	Structures specific to the dermoepidermal zone (DEZ)	112
4.3	Patterns in revised pattern analysis	112
4.3.1	Why the 2-step method of dermatoscopy is not used in revised pattern analysis.....	113
4.4	The process of revised pattern analysis	114
4.5	Revised pattern analysis applied to lesions with white structures	116
4.5.1	White lines	116
4.5.2	White clods (including white dots).....	118
4.5.3	White structureless areas in flat lesions	121
4.5.4	White circles in flat lesions	121

4.5.5	White keratin clues in raised lesions.....	121
4.6	Revised pattern analysis applied to lesions with orange, yellow and skin-coloured structures.....	121
4.7	Revised pattern analysis – a diagnostic algorithm.....	126
4.8	An aide-memoire for revised pattern analysis of pigmented skin lesions.....	127
4.9	Revised pattern analysis applied to vessel structures and patterns.....	142
4.9.1	Vessel structures.....	142
4.9.2	Vessel patterns.....	142
4.9.3	The anatomical correlation of vessel structures and patterns.....	144
4.9.4	Dermatoscopic patterns formed by angiocentric melanin.....	147
4.10	The cognition of dermatoscopy.....	149
	References.....	150

CHAPTER 5

The skin examination

5.1	The skin check consultation.....	153
5.1.1	Who needs a full skin examination?.....	153
5.1.2	History taking.....	153
5.1.3	The range of skin lesions.....	154
5.1.4	Clinical examination.....	154
5.1.5	Dermatoscopic examination.....	155
5.1.6	A methodical approach to complete skin examination.....	157
5.2	Photo-documentation.....	172
5.2.1	Workflow for photo-documentation.....	172
5.3	Patient safety: tracking specimens and self-audit.....	174
5.4	The lives of lesions.....	175
	References.....	178

CHAPTER 6

Chaos, Clues and Exceptions: a decision algorithm for pigmented skin lesions

6.1	‘Chaos, Clues and Exceptions’.....	179
6.2	Chaos.....	179
6.3	Clues.....	184
6.3.1	Grey or blue colour.....	184
6.3.2	Structureless eccentric area.....	184
6.3.3	Clods black peripheral.....	189
6.3.4	Lines thick reticular.....	189
6.3.5	Lines radial segmental.....	191
6.3.6	Lines white.....	191
6.3.7	Lines angulated.....	196
6.3.8	Lines parallel on the ridges (volar) or lines parallel chaotic on the nails.....	196
6.3.9	Vessels polymorphous.....	196
6.4	Exceptions.....	201
6.4.1	Any changing lesion on an adult.....	201
6.4.2	A nodular or small lesion which has any of the clues to malignancy.....	201
6.4.3	Any lesion on the head or neck with pigmented circles and/or any dermatoscopic grey.....	203
6.4.4	Any lesion on volar skin (palms or soles) with a parallel ridge pattern.....	203
	References.....	208

CHAPTER 7

Prediction without Pigment: an algorithm for non-pigmented skin lesions

7.1	'Prediction without Pigment'	209
7.1.1	Prioritisation of clues in 'Prediction without Pigment'	209
7.2	'Prediction without Pigment': Part 1	212
7.2.1	Step 1: is there ulceration?	212
7.2.2	Step 2: are there 'white lines'?	217
7.2.3	Step 3: are there 'keratin clues in a raised lesion'?	219
7.2.4	Step 4: is the vessel pattern consistent with a benign diagnosis?	223
7.3	'Prediction without Pigment': Part 2	227
7.3.1	Is the vessel pattern polymorphous?	227
7.3.2	Is the vessel pattern monomorphous?	229
7.4	Conclusion	231
	References	232

CHAPTER 8

Melanoma

8.1	What is a melanoma?	233
8.1.1	Pigmented melanoma	233
8.1.2	Hypomelanotic and amelanotic melanoma	238
8.2	Melanoma subtypes	245
8.2.1	Superficial spreading melanoma (SSM)	245
8.2.2	Lentigo maligna (LM) and lentigo maligna melanoma (LMM)	245
8.2.3	Nodular melanoma (NM)	246
8.2.4	Acral lentiginous melanoma	248
8.2.5	Desmoplastic melanoma	257
8.2.6	Mucosal melanoma	257
8.3	Melanomas with adverse outcomes	259
8.4	Metastatic melanoma	264
	References	265

CHAPTER 9

Melanocytic naevi

9.1	Melanocytic naevi, pigmented and non-pigmented	267
9.1.1	Basic classification of naevi	267
9.1.2	Pigmented acquired and congenital naevi	268
9.1.3	Seborrheic keratosis-like features in congenital naevi	274
9.1.4	Non-pigmented naevi	277
9.1.5	Blue naevus	281
9.1.6	Halo naevus phenomenon	281
9.1.7	Growing naevi	281
9.1.8	Reed and Spitz naevi	281
9.1.9	Naevi on volar skin	287
9.1.10	Nail matrix naevi	287
9.2	Dysplastic naevus	290
	References	292

CHAPTER 10

Basal cell carcinoma, benign and malignant keratinocytic lesions, distinguishing flat pigmented facial lesions, dermatofibroma, vascular and other lesions

10.1	Basal cell carcinoma: pigmented and non-pigmented	295
10.1.1	Non-pigmented clues to basal cell carcinoma	295
10.1.2	Pigmented clues to basal cell carcinoma	296
10.1.3	Fibroepithelioma of Pinkus	296
10.2	Benign keratinocytic lesions	308
10.2.1	Solar lentigo, ink spot lentigo, melanotic macule and idiopathic guttate hypomelanosis	308
10.2.2	Seborrheic keratosis: pigmented and non-pigmented	308
10.2.3	Lichen planus-like keratosis	323
10.2.4	Porokeratosis	323
10.2.5	Stucco keratosis	323
10.2.6	Viral wart	323
10.2.7	Clear cell acanthoma	323
10.3	Actinic keratosis and squamous cell carcinoma <i>in situ</i>	330
10.3.1	Actinic keratosis	330
10.3.2	Squamous cell carcinoma <i>in situ</i>	333
10.4	Squamous cell carcinoma and keratoacanthoma	340
10.5	Distinguishing flat pigmented facial lesions	347
10.5.1	Pigmented AK and pigmented SCC <i>in situ</i>	347
10.5.2	Solar lentigo and lichen planus-like keratosis	348
10.5.3	Lentigo maligna	349
10.6	Dermatofibroma and dermatofibrosarcoma protuberans	359
10.7	Haemangioma and other vascular lesions	363
10.8	Merkel cell carcinoma	367
10.9	Atypical fibroxanthoma	367
10.10	Adnexal tumours	369
10.10.1	Sebaceous gland hyperplasia	369
10.10.2	Trichoepithelioma	369
10.10.3	Trichilemmoma	369
10.10.4	Cysts – trichilemmal (pilar) cyst/wen and epidermal cyst	371
10.10.5	Pilomatrixoma	371
10.10.6	Eccrine poroma	371
10.10.7	Sebaceous adenoma and carcinoma	371
10.11	Neurofibroma	374
10.12	Molluscum contagiosum	374
10.13	Cutaneous lymphoma	375
10.14	Kaposi sarcoma	377
	References	378

CHAPTER 11

Photographic technology as a diagnostic tool in melanoma management

11.1 Utilisation of photographic technology in skin lesion diagnostics..... 381

11.2 Serial digital dermatoscopic imaging 381

 11.2.1 Serial digital dermatoscopic imaging – targeted and random..... 382

 11.2.2 Selecting lesions for monitoring using total body photography with detection 384

 11.2.3 Serial digital dermatoscopic imaging – which lesions should be excised?..... 385

11.3 Total body photography..... 388

 11.3.1 Total body photography used as a baseline during skin examination..... 388

 11.3.2 Serial total body photography with detection software..... 388

 References..... 392

Index..... 393

Preface to the second edition

The success of the first edition of this book has reflected its utility as an effective 'hunter's manual'. Feedback has been consistently positive and after making a few streamlining changes in the updated edition in 2023, the time is now ripe for a new expanded version.

The book has been reorganised and contains both updated and new content.

Advances in photographic technology, coupled with our evolving experience with it, have led to a chapter dedicated to outlining both its relevance and risks. Risk-free practices, including the use of baseline total body photography during skin examinations, and using serial total body photography coupled with detection software to discover small invasive melanomas are presented, along with the resulting hunting trophies.

New co-author Mohammadreza Hassani has created new graphics and collages, and provided valuable intellectual contributions, as has co-author Simon Clark, rewriting the dermatopathology chapter and ensuring that my rendition of the English language is accurate throughout the book.

The 'Prediction without Pigment' flowchart is expanded as not only a decision algorithm, but a diagnostic one, and 'Chaos and Clues' is presented as 'Chaos, Clues and Exceptions' to maximise safety in its application.

An expanded chapter on melanomas now includes, in addition to previous content, collages of nail matrix melanomas, mucosal melanomas, and melanomas with adverse outcomes including metastasis and death.

A dedicated chapter on melanocytic naevi concludes with the compellingly referenced revelation that the 'dysplastic naevus' is actually the least likely naevus to be associated with a melanoma.

As a finishing touch, the new cover displays, with the patient's consent, a wolf-tattoo, with an invasive melanoma exactly positioned between the eyes. My publisher prevailed on me not to place a hunting-scope's crosshairs on that spot, but I have to admit to a certain reluctance in that regard.

Creation of this book, including this second edition, has been a rewarding team effort, and I thank you, the readers, for being major players in that team!

Cliff Rosendahl
June 2025

Preface to the first edition

Fifty years ago when I entered my first year of medical studies in 1969, the same year that Neil Armstrong stepped onto the moon, dermatoscopy as we know it was science fiction. Much has changed. Dermatoscopy is now standard of care in the management of skin cancer and melanoma.

My interest in this novel science became focused after a family member, Graham, developed metastatic melanoma. Graham did not blame the GP who dismissed a lesion of concern on his thigh a couple of years earlier, and he made the point to me that GPs were not prepared for this challenge in their training, a challenge that was thrust on them due to a rising incidence of melanoma and an inexplicable shortage of dermatologists in Australia. Graham's GP looked after him well. Right up to the moment of his death, a death which was predictably terrible, aggravated by multi-organ metastases and finally necrotising fasciitis.

My journey since then, commencing with a PhD expertly supervised by David Wilkinson and Peter Soyer and focused on improving skin cancer management in Australia, has been a very steep learning curve. I have been mentored by men of undoubted genius: Harald Kittler and David Weedon, men whose genius was only matched by their generosity. I have been assisted by exceptional colleagues: Ian McColl, Iris Zalaudek, Alan Cameron, Jeff Keir, Greg Canning, Phil Tschandl, Agata Bulinska, Simon Clark and Nisa Akay. I am particularly grateful to Harald

Kittler, Stephen Hayes and Jeff Keir for their critical review of the book and to Simon Clark for reviewing and correcting the dermatopathology chapter.

This book would never have been possible without my co-author Aksana Marozava. Aksana worked with me for two years, taught me how to do a skin examination and dispelled any delusions of grandeur by repeatedly discovering significant lesions I had passed over. Her diligence and skill in collating my image collection for the book and preparing all of the graphics has hopefully made this book the masterpiece we wanted to produce.

The hunting metaphor is no accident. Hunting and gathering (Aksana insists that she is a gatherer) are as natural to *Homo sapiens* as is falling in love. The romance and thrill of the hunt elevates what we do to more than the drudgery of repetitive work, and the satisfaction of every success motivates further effort.

Finally, I am indebted to my wife Debbie for putting up with me through this journey and for effectively managing our practice and business affairs so I could focus on hunting, research, teaching and writing.

To conclude, I quote Vice Admiral Horatio Nelson, hunter extraordinaire, speaking at the battle of Copenhagen in 1801:

"It is warm work; and this day may be the last to any of us at a moment. But mark you! I would not be elsewhere for thousands".

Cliff Rosendahl
Brisbane March 2019

Foreword

This new book is an important step forward in the developing art and science of dermatoscopy for skin lesion recognition. The debate as to whether the technique is any good is surely over, but more help as to how to best do it, and (vitality) to best teach it, is most welcome.

Over the last decade or so, Cliff Rosendahl, and more recently Aksana Marozava, have documented some 19,000 excised skin lesions in Cliff's clinic in Capalaba, Brisbane, and fed the data into the SCARD online database which he set up with Tobias Wilson. This book summarises the knowledge gained from the analysis of that histopathological data and the lesion images, plain and dermatoscopic. The sheer scale of the data behind this book gives it an authority that can't be ignored.

The book is built around two algorithms, 'Chaos and Clues' and 'Prediction without Pigment' which, as explained, may not always lead to a diagnosis, but to a safe decision as to whether excision is required. The selected colour images illustrate well the dermatoscopic features and terms set out in the text.

Cliff is fully committed to revised pattern analysis and the use of what he calls objective geometric terminology to describe dermatoscopic structures, building on the 'descriptive' terminology often associated with co-worker Harald Kittler of Vienna. There are no 'arborising' vessels here (if vessels are 'tree-like', then what sort of tree?) but branched serpentine (admittedly, 'serpentine', i.e. snake-like, is still a metaphor, but a much more consistent one than tree-like). And it is further explained that the apparent sharp focus of such vessels in BCC is due to the superficial cutaneous

vascular plexus being clarified by the translucent BCC stroma, rather than that vessel morphology being unique to BCC.

There is more basic science here than is usual in a book aimed at beginners, but the extra effort put into appreciating the embryology, anatomy and histopathology pays rewards, particularly with regard to dermatoscopic-pathological correlation. Recognising structures like blue clods and polarising-specific white lines is good, but understanding what they mean at the microanatomical level gives insight into the *modus operandi* of the target of the hunt: malignant tissue.

More recently described signs such as white circles in early invasive SCC and angulated lines and polygons in melanoma *in situ* are detailed. I have witnessed Cliff working in his clinic and I can say that the author has a zero tolerance approach to such lesions, with approximately 80% of the melanomas diagnosed in his clinic being pre-invasive.

Dermatoscopy and Skin Cancer is a more challenging read than some earlier textbooks on this subject, but builds on hard-won, audit-backed knowledge to take us to the next level of advanced pattern analysis. It can be commended to the beginner/improver and indeed expert, who is willing to put in some work to embrace the latest evidence-based approach and terminology, which seems likely to supersede the earlier algorithms based on metaphorical language. This may mean some effort for those of us who learned dermoscopy/dermatoscopy with terms like maple leaf, arborising, comedo-like, ovoid nests, etc., but the new approach makes sense

if for no other reasons than the need for translation and utility for international research, for dermatoscopy is now highly globalised.

Dr Stephen Hayes

Independent dermatoscopy educator

Associate Specialist in Dermatology, University Hospital Southampton

UK board member, International Dermoscopy Society

Abbreviations

AK	actinic keratosis
BCC	basal cell carcinoma
DEZ	dermoepidermal zone
DF	dermatofibroma
DOPA	dihydroxyphenylalanine
EFG	elevated, firm and continuously growing
FEP	fibroepithelioma of Pinkus
GP	general practitioner
H&E	haematoxylin and eosin
HPV	human papilloma virus
IEC	intraepidermal carcinoma
IHC	immunohistochemical
KA	keratoacanthoma
LM	lentigo maligna
LMM	lentigo maligna melanoma
LN	lymph nodes
LPLK	lichen planus-like keratosis
MCC	Merkel cell carcinoma
NM	nodular melanoma
NMSC	non-melanoma skin cancer
pAK	pigmented actinic keratosis
PAM	primary acquired melanosis
pBCC	pigmented basal cell carcinoma
pIEC	pigmented intraepidermal carcinoma
PG	pyogenic granuloma
pSCC	pigmented squamous cell carcinoma
RPA	revised pattern analysis
RPE	retinal pigmented epithelial
RR	relative risk
SCARD	Skin Cancer Audit Research Database
SCC	squamous cell carcinoma
SDDI	serial digital dermatoscopic imaging
SSM	superficial spreading melanoma
TBP	total body photography
TBPD	TBP with Detection
UV	ultraviolet
WHO	World Health Organization

CHAPTER 4

The language of dermatoscopy: naming and defining structures and patterns

4.1 The evolution of terminology for dermatoscopic structures and patterns

The advent of dermatoscopy created the need for a vocabulary and not surprisingly, this evolved and flourished rapidly, parallel to the publication of research into this novel science. Dermatoscopy is a colourful and totally visual science and the proliferation of graphic metaphorical terms to describe structures created a blend of science and art which, although appealing to many, was problematic at the same time. The vocabulary grew extensively, which posed a challenge for students. More concerning, however, was the manner in which these metaphoric terms emerged – each carrying inherent, preconceived diagnostic implications. For example, if segmental radial lines were seen in a lesion believed to be a melanoma they would be labelled ‘radial streaming’, but if the lesion was believed to be a BCC they would be called ‘leaf-like’ or even ‘maple leaf-like’ structures. In no other field of medicine does diagnosis precede description, but that is what happened with the evolution of metaphoric terminology in dermatoscopy.

In 2007 Kittler introduced revised pattern analysis (RPA) and with it, geometric descriptive terminology¹. Then in 2008 Kittler *et*

al. introduced a classification of vessel morphology also based on pattern analysis². A consensus meeting in Vienna in 2015 found that the descriptive geometric terminology was preferred over metaphorical terminology by a margin, although the majority stated that they used both languages³.

4.1.1 Structures in revised pattern analysis

Revised pattern analysis can be applied to all skin lesions and involves an analysis of pigmented structures as well as white, skin-coloured and vessel structures⁴. Structureless areas have the same significance as patterns formed by structures (*Figure 4.1*).

Pigmented structures are coloured by melanin, resulting in black, brown, grey or blue colour, or by other pigmentary sources, including air-exposed keratin (manifesting as yellow, orange or brown) and blood or its by-products (red, purple and black). As a general rule, if blue, purple or black are seen in association with any brown colour they should be interpreted as colours of melanin rather than of blood⁵.

White structures are defined as being *whiter than perilesional skin* and include lines (polarising-specific and non-polarising-spe-

cific), circles, clods (including dots) and structureless (including surface keratin/scale)⁵.

4.2 Revised pattern analysis of lesions pigmented by melanin

4.2.1 Basic structures

In the language of RPA, there are only three basic pigmented structures: lines (including pseudopods), circles and clods (including dots) (*Figure 4.1*). Because lines are a very specific structure they are further subdivided into six different types: reticular, branched, angulated, parallel, radial and curved (*Figure 4.1*). A pattern is an area made up of multiple repetitions of a basic structure. Lines (reticular and branched), circles and clods can be white as well as pigmented. Any area large enough to form a pattern, with no basic structure predominating, is termed structureless. A structureless area, just like a structure, can have any colour.

The terms used for structures are clearly defined⁴ and are described in the sections which follow.

4.2.2 Lines

A **line** is a structure extending in one direction with its length usually greatly exceeding its width.

Reticular lines: a group of straight lines which intersect sensibly at right angles to form a net-like pattern (*Figure 4.2*). With respect to pigmented reticular lines, they are the surface projection of a pattern produced by pigmented rete ridges and non-pigmented dermal papillae (*Figure 4.3*). The pigment on the rete ridges may be in keratinocytes or melanocytes.

Reticular lines can be found in melanocytic naevi, melanomas, solar lentigo, seborrhoeic keratosis and dermatofibroma. They generally rule out a diagnosis of BCC or SCC.

Branched lines: a group of straight lines similar to reticular lines, intersecting less regularly and not always at right angles (*Figure 4.4*). Their significance generally coincides with that of reticular lines.

Angulated lines: straight pigmented lines, not reticulated or branched, usually meeting at angles of 90° or more, but not crossing (*Figure 4.5*). These lines may join to form complete or incomplete polygons⁶. Patterns formed by angulated lines are much larger in scale than a rete-ridge-based reticular pattern.

Parallel lines: straight pigmented lines arranged in a parallel pattern, found on volar skin and nails (*Figure 4.6*). On volar skin they may be arranged on ridges, in furrows, or crossing the ridges and furrows.

Radial lines: a group of pigmented lines which converge at a central point or would do so if extended (for example, at a point at the centre of a lesion) (*Figure 4.7*). Radial lines may radiate from a location within a lesion or from the perimeter of a lesion, at which location they can either be circumferential or segmental. A pseudopod is one type of radial line which is defined as a radial line with a terminal clod (*Figure 4.8*).

Curved lines: pigmented lines which are not straight, have few intersections and may be parallel or distributed randomly (*Figure 4.9*). Parallel curved lines usually occur in pairs.

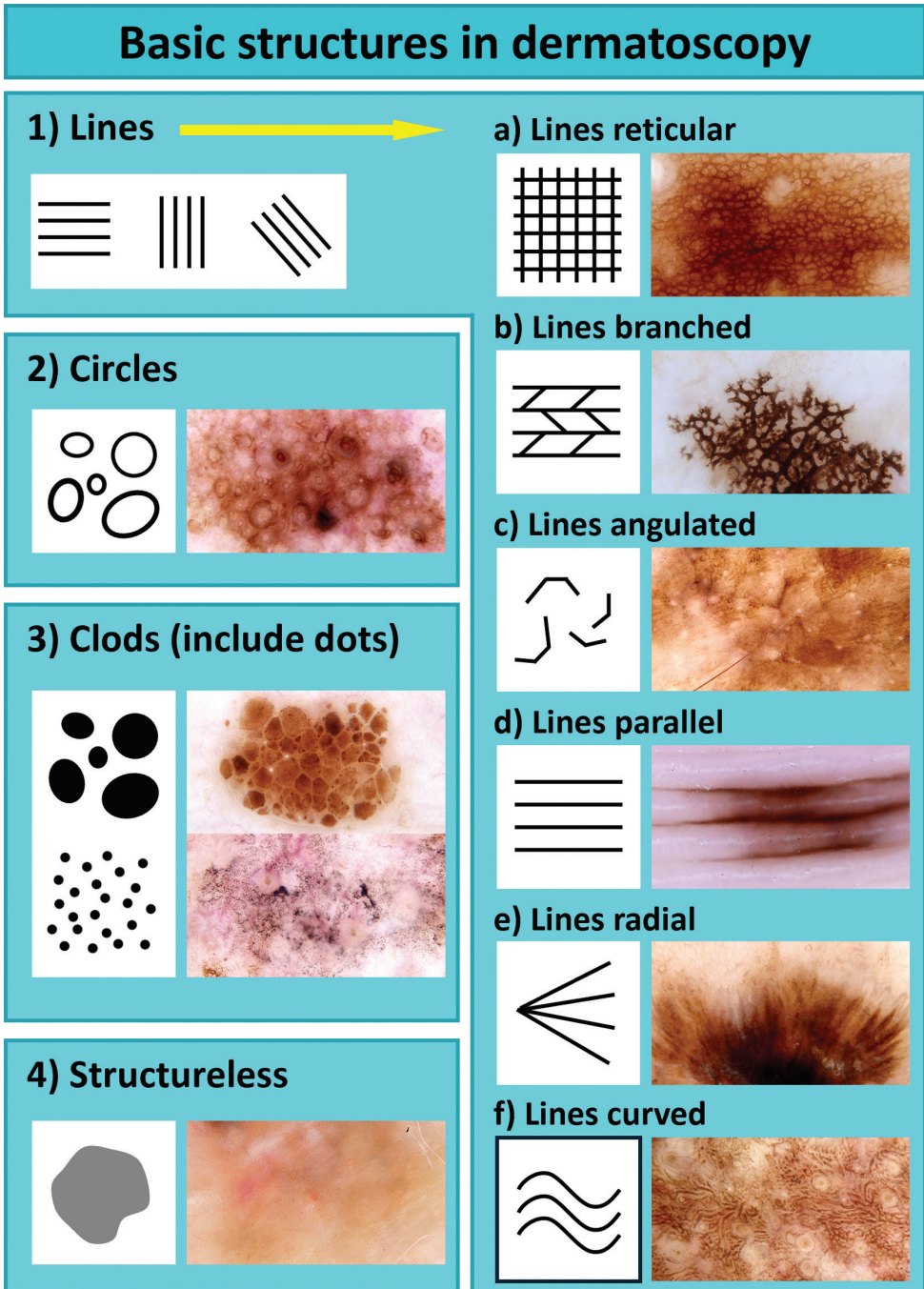


Figure 4.1: Non-vessel structures in revised pattern analysis. There are three basic structures (1–3) including six types of lines (a–f). An area with no basic structure predominating is termed structureless (4).

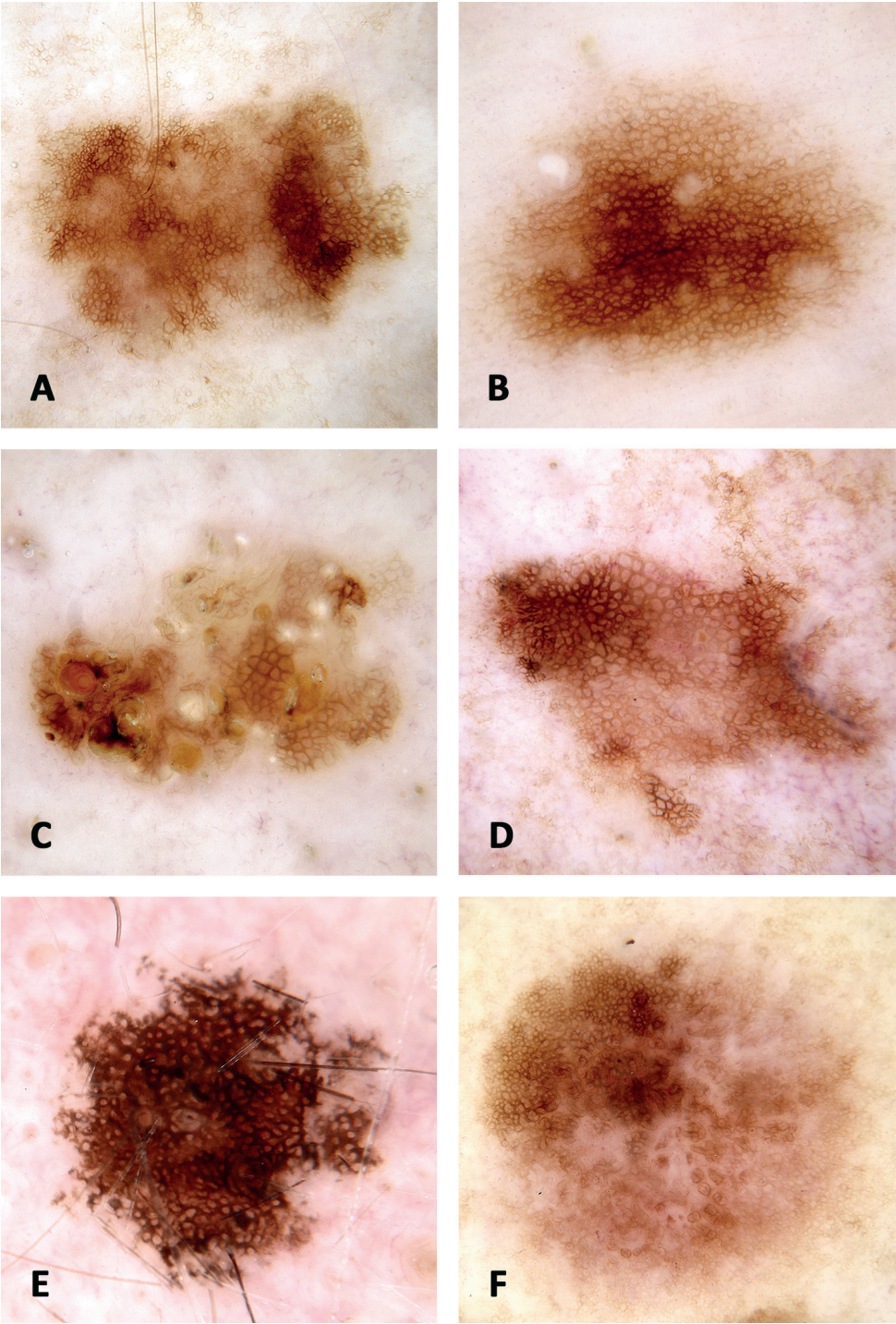


Figure 4.2: Six lesions each exhibiting a pattern of reticular lines: (A) melanoma in situ; (B) naevus; (C) seborrhoeic keratosis; (D) solar lentigo; (E) ink spot lentigo; (F) dermatofibroma.

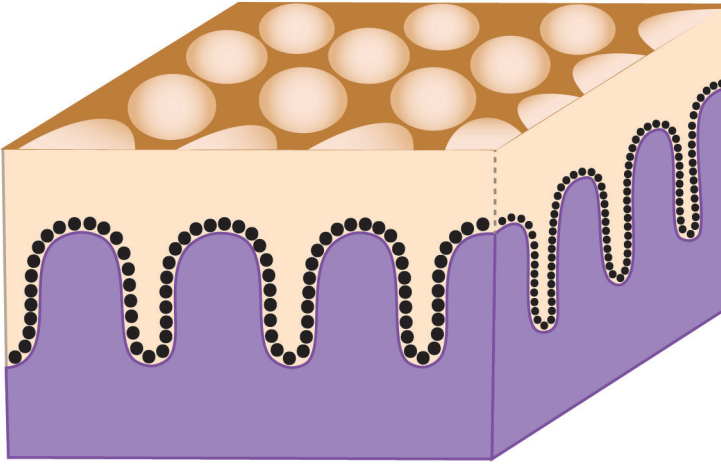


Figure 4.3: Diagrammatic representation of a pattern of reticular lines formed by pigmented rete ridges alternating with non-pigmented dermal papillae. A single layer of pigmented cells, represented by black dots, is shown arranged at the basal layer of the epidermis. Light is absorbed by multiple pigmented cells on the sides of rete ridges compared to only a single layer over the tops of dermal papillae producing a reticular pattern dermatoscopically.

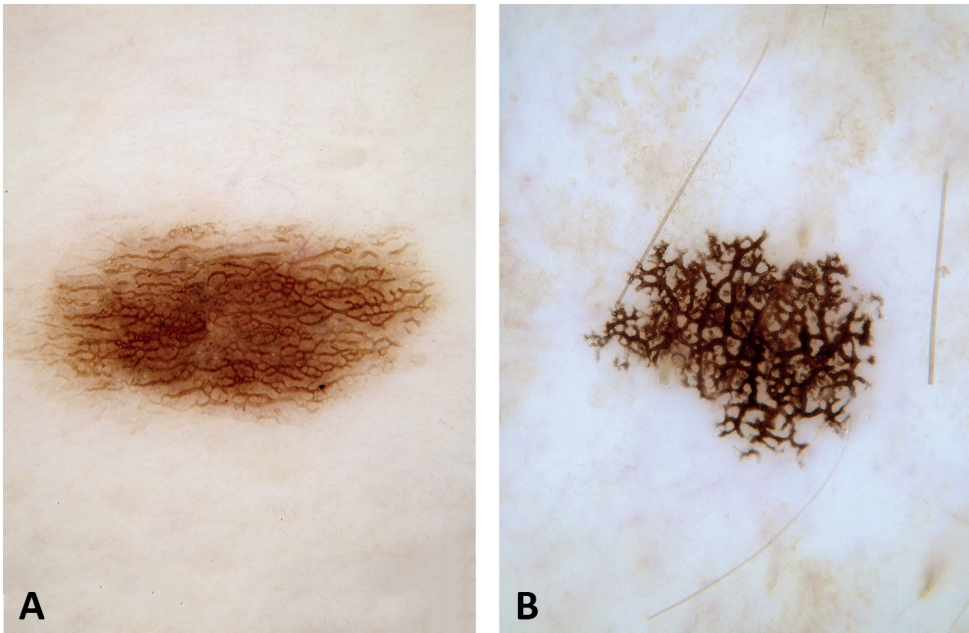


Figure 4.4: Two lesions exhibiting a pattern of branched lines: (A) congenital naevus; (B) ink spot lentigo.

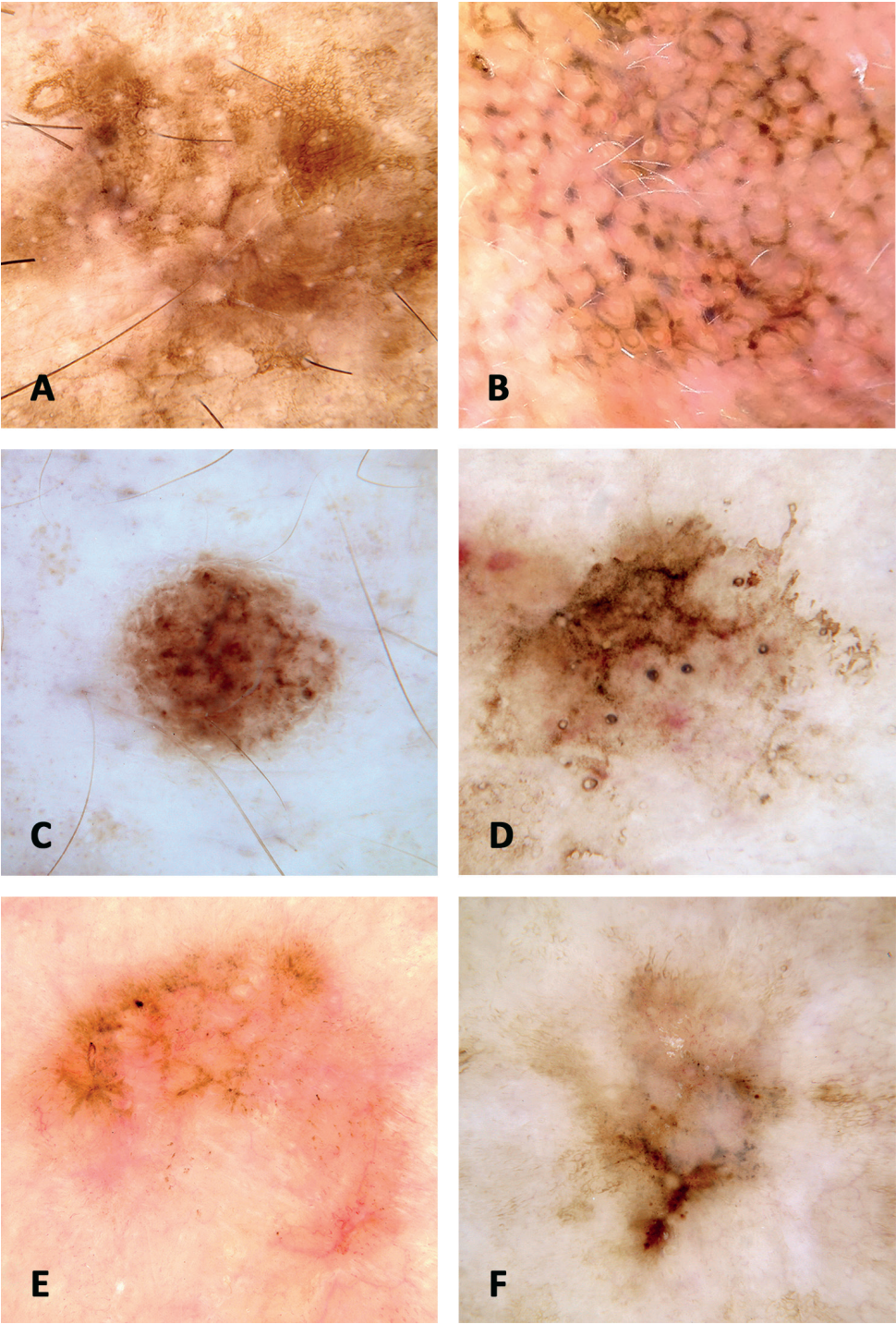


Figure 4.5: Six lesions each exhibiting a pattern of angulated lines: (A and B) melanoma; (C) naevus; (D) solar lentigo; (E) basal cell carcinoma; (F) squamous cell carcinoma in situ.

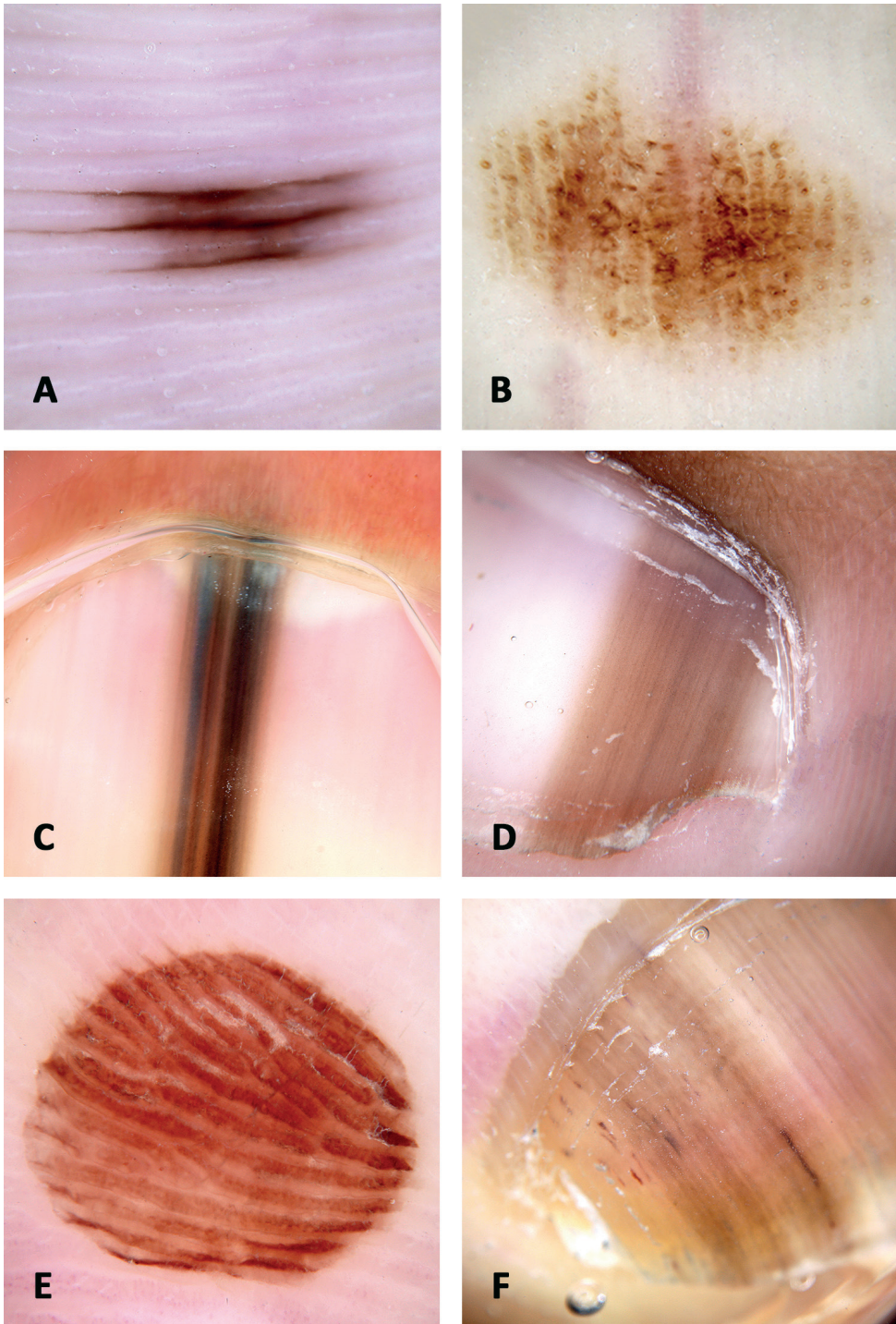


Figure 4.6: Six lesions exhibiting a pattern of parallel lines: (A) volar naevus; (B) volar melanoma; (C) nail matrix melanoma; (D) nail matrix naevus; (E) volar corneal haemorrhage; (F) nail matrix melanotic macule.

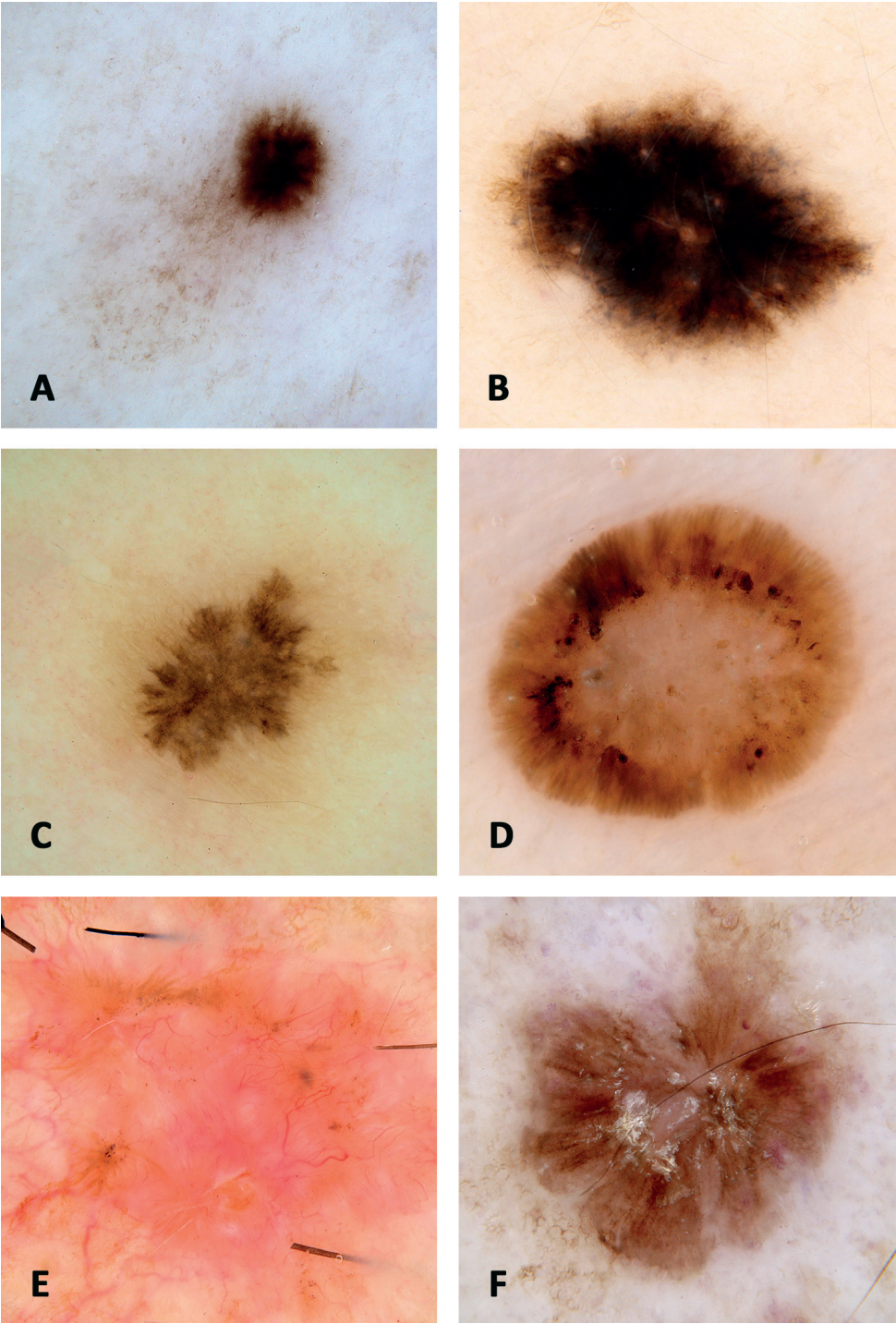


Figure 4.7: Six lesions each exhibiting a pattern (in E it is a clue rather than a pattern) of radial lines: (A) melanoma; (B) Reed naevus; (C) recurrent naevus; (D) seborrhoeic keratosis; (E) basal cell carcinoma (also see Figure 6.21); (F) squamous cell carcinoma in situ.

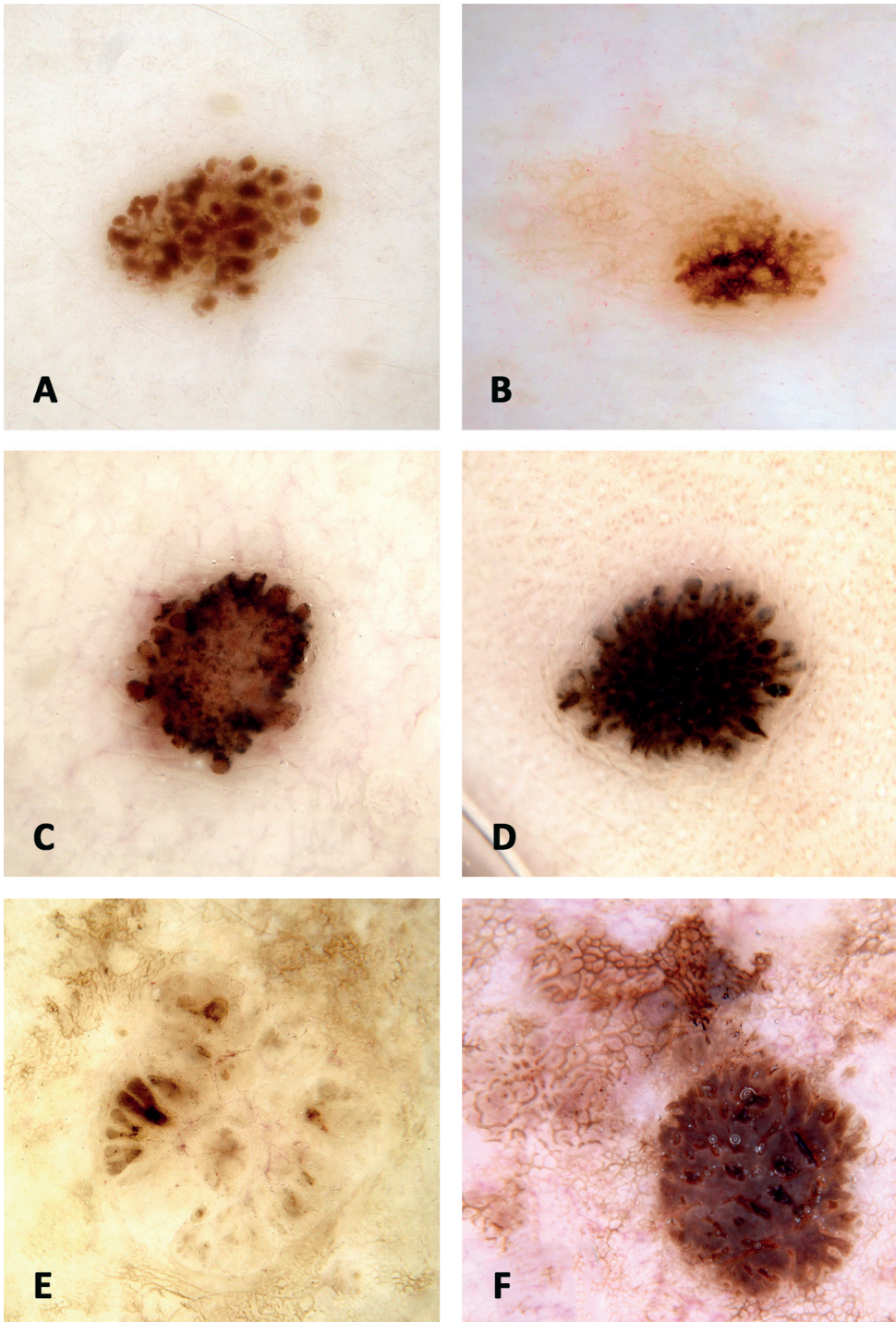


Figure 4.8: Six lesions each appearing to exhibit the presence of lines radial (pseudopod type): (A) melanoma; (B) naevus; (C) spitzoid melanoma; (D) Reed naevus; (E) basal cell carcinoma; (F) seborrheic keratosis. Note that the radial lines in (E) radiate from a hypopigmented area as is specific for basal cell carcinoma.

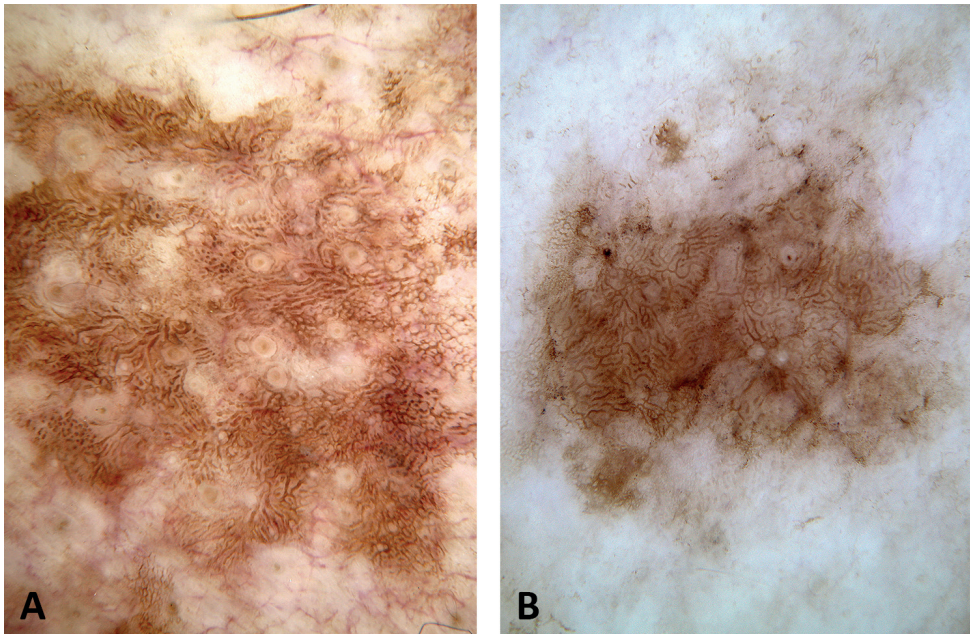


Figure 4.9: Two lesions each exhibiting a pattern of curved lines: (A) solar lentigo; (B) melanoma – note that angulated lines are also evident.

4.2.3 Circles

A circle is a curved line sensibly equidistant from a central point (this includes ellipses) and may be melanin-pigmented or white. Skin-coloured circles have no diagnostic significance, nor do follicular openings in a pigmented background, unless a defined circular line, either pigmented or white, is present.

If the centre of the structure is paler than its periphery, and the periphery is characterised by a circular line, then the structure should be described as a circle rather than a clod (the latter being defined as a solid object) (Figures 4.1, 4.10 and 4.11).

Pigmented circles defining an adnexal structure

When melanin is present in the cells lining adnexal structures, rather than merely surrounding them, pigmented circles can be observed using dermatoscopy. While brown circles might be expected, the oblique orientation of follicles can carry the melanin

pigment below the dermis, even when the pigmented cells are confined to follicular epidermis, causing dermatoscopic grey circles to be seen (Figure 4.11)⁷. This is an explanation for dermatoscopic grey circles in *in situ* melanomas on the face. Brown and grey circles defining follicles can also be seen in benign conditions such as solar lentigo and seborrhoeic keratosis, and even on normal skin with phototypes 5 and 6. However, in lighter skin phototypes, when the compelling morphology of such a benign lesion is not present, pigmented circles on the head or neck, related to follicular openings, are a clue to melanoma⁸ as well as to pigmented AK/SCC *in situ*. Pigmented circles that do not relate to adnexal structures represent a pattern of reticular lines modified by acanthosis, and are a clue to seborrhoeic keratosis (Figure 4.10E).

4.2.4 Clods

A clod is a well-defined, solid object, and it can be of any size, colour and shape (Figures 4.1, 4.12–4.14). A dot is a minute clod that is

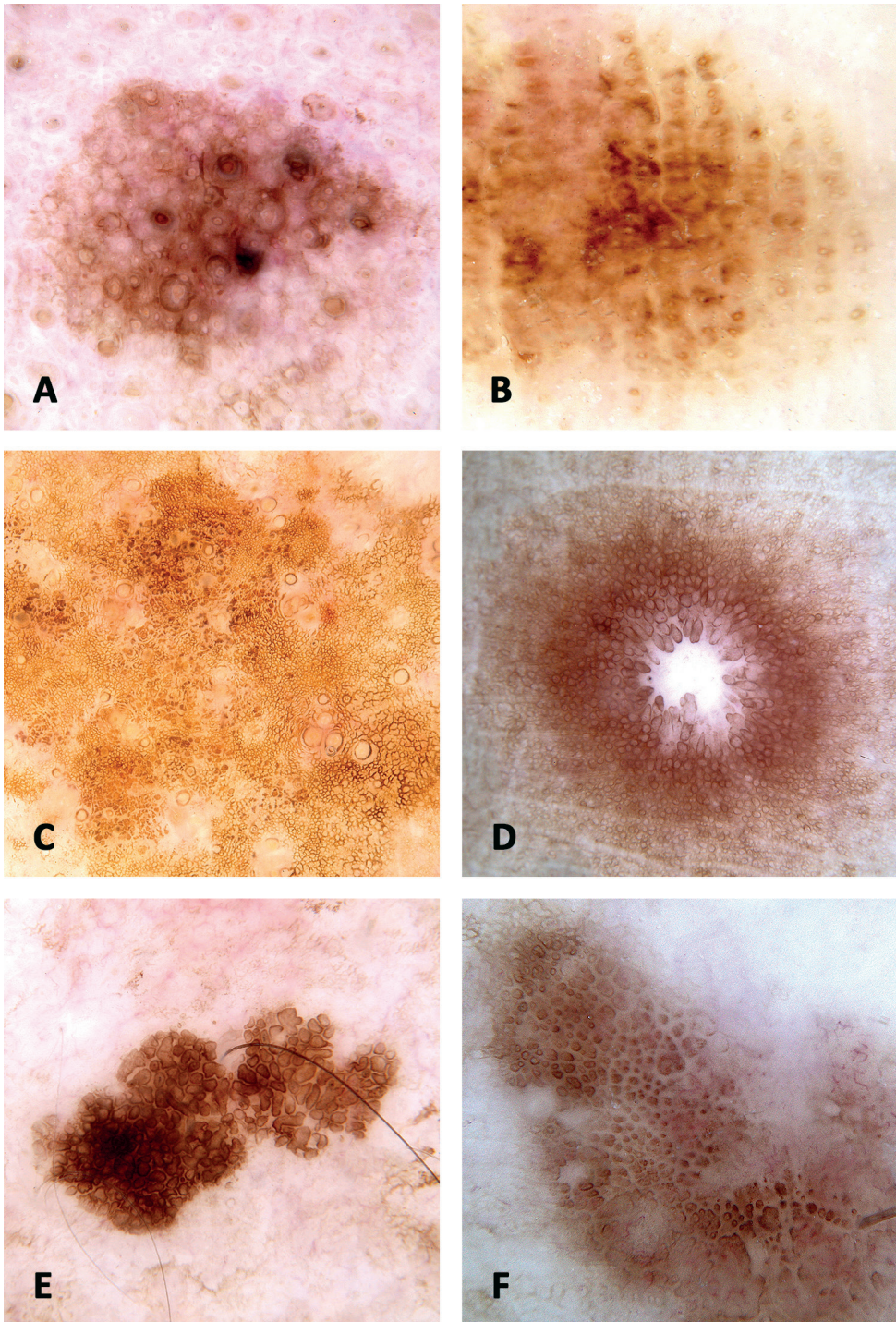


Figure 4.10: Six lesions each exhibiting the structure (in B the pattern is lines parallel on the ridges) of circles: (A) melanoma; (B) melanoma (volar); (C) solar lentigo; (D) dermatofibroma; (E) seborrhoeic keratosis; (F) squamous cell carcinoma in situ. Note that a discrete structure with the centre lighter in colour than the periphery fulfils the definition of a circle rather than a clod.

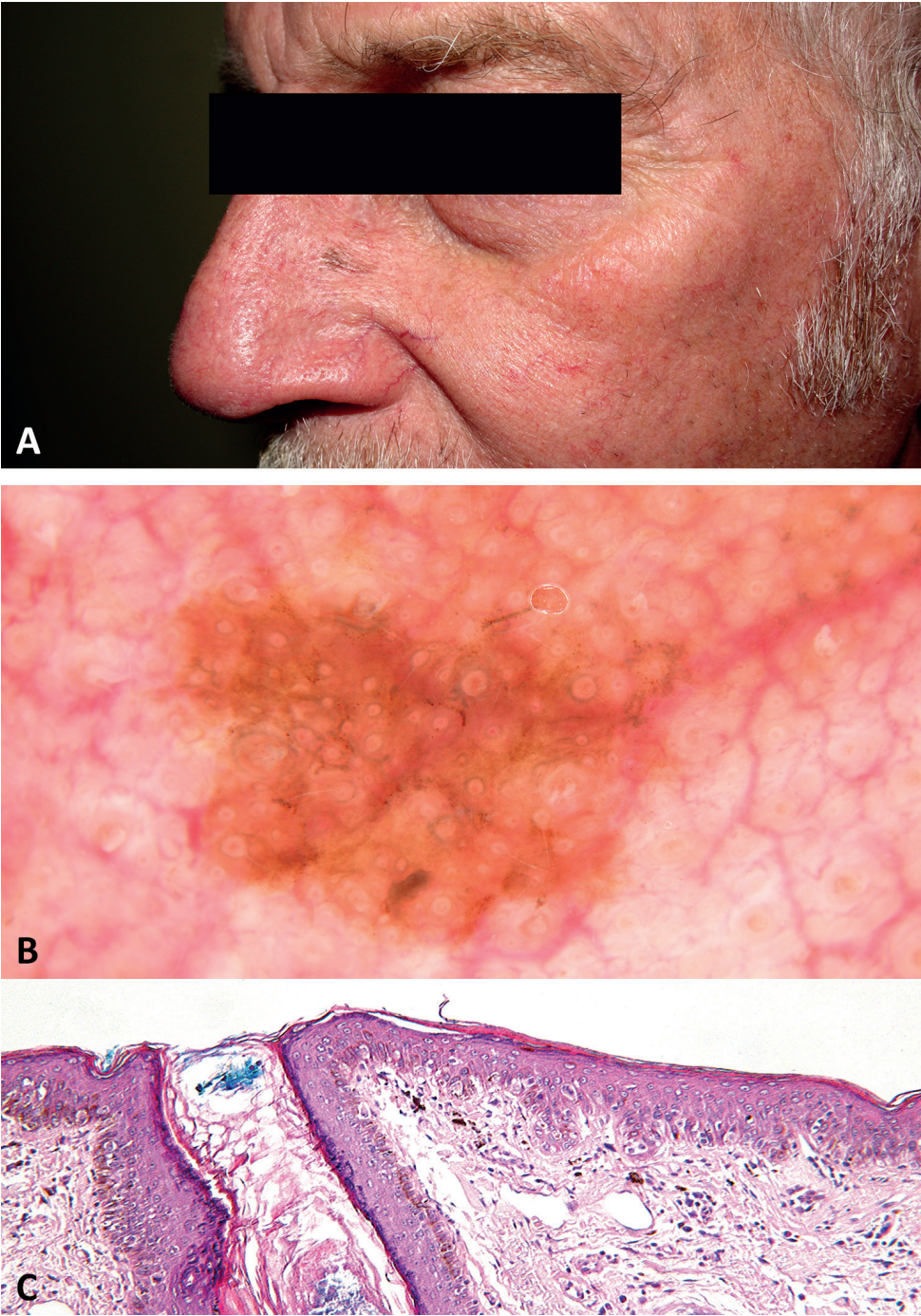


Figure 4.11: A melanoma in situ on the nasal sidewall (A) displays prominent dermatoscopic grey circles (B). Although the melanoma is confined to the epidermis, pigmented melanocytes lining the follicle are seen through dermal collagen because the follicle is oblique (C). Due to the scattering of light by dermal collagen (Tyndall effect) this melanin is seen as grey⁷.

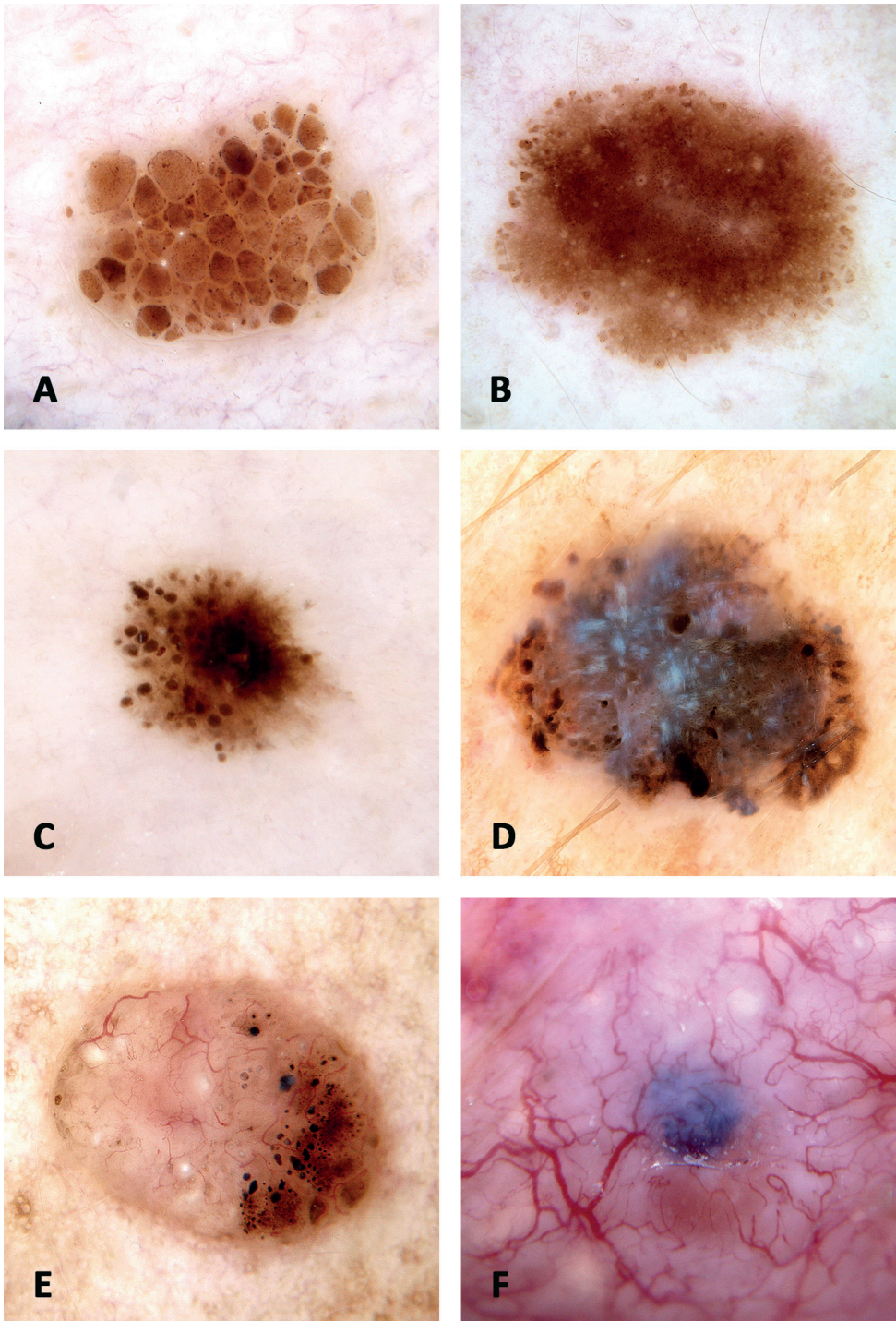


Figure 4.12: Six lesions each exhibiting the presence of clods: (A) congenital naevus; (B) growing naevus; (C, D) melanoma; (E, F) basal cell carcinoma.

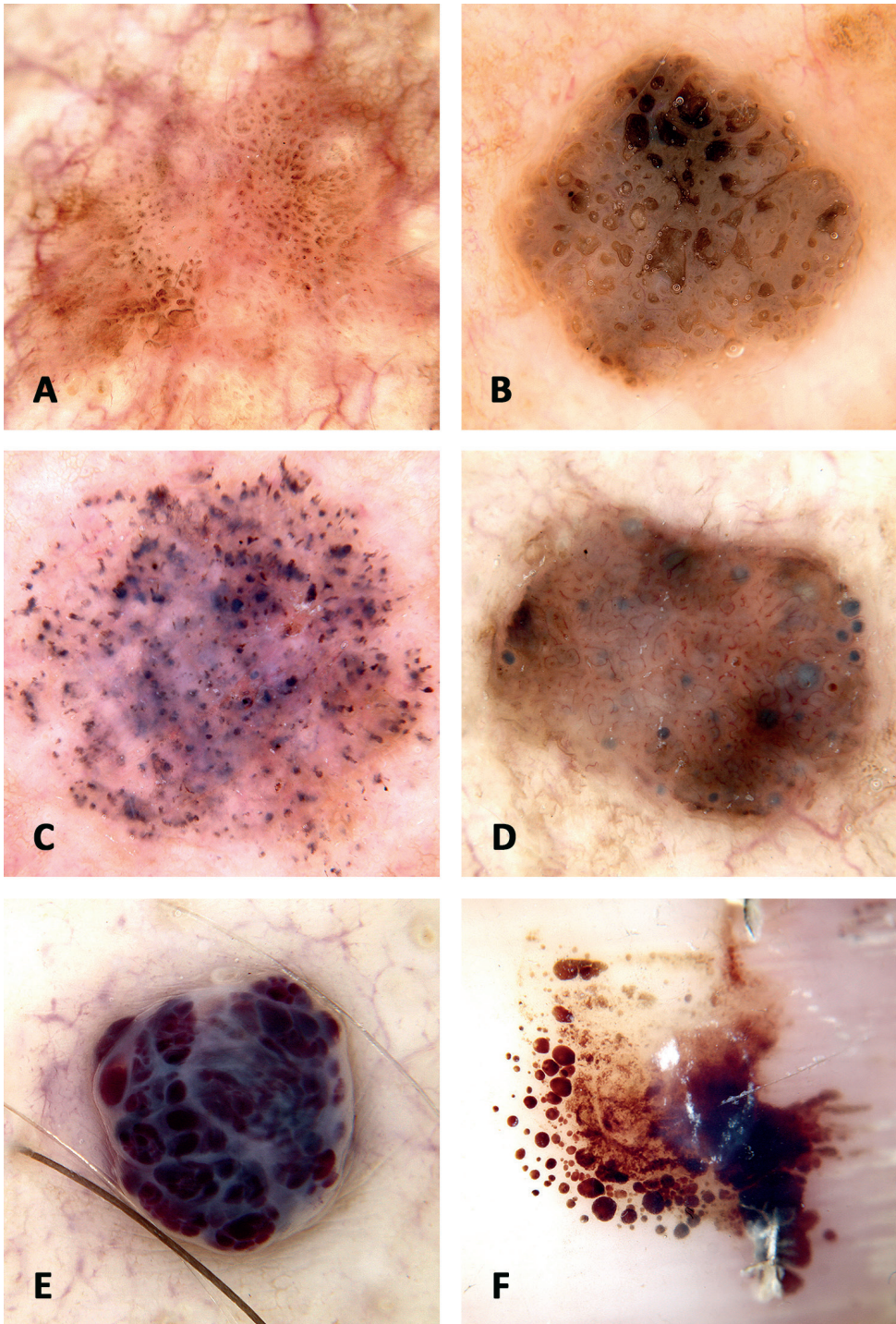


Figure 4.13: Six lesions each exhibiting a pattern of clods: (A) squamous cell carcinoma in situ; (B) seborrheic keratosis; (C) lichen planus-like keratosis; (D) clonal seborrheic keratosis; (E) haemangioma; (F) subungual haemorrhage.