A Colour Atlas of Gynaecological Surgery

Vol 4
Surgery of Vulva and Lower Genital Tract

David H Lees and Albert Singer

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To our wives
Anne & Talya

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Acknowledgements

This six-volume Colour Atlas of Gynaecological Surgery was produced at the Jessop Hospital for Women, Sheffield as part of a postgraduate project to teach operative surgery by edited colour slides. We are indebted to all who took part in the exercise, but there are some whom we would particularly like to mention.

Mr Alan Tunstill, Head of Department of Medical Illustration, The Royal Hallamshire Hospital, Sheffield Area Health Authority (Teaching), organised the whole of the photography. Mr Stephen Hirst, of the same Department, took nearly all of the photographs; the colour diagrams are all the work of Mr Patrick Elliott, Medical Artist of the Department.

Many individuals both in the United Kingdom and overseas offered material for this volume; sometimes in the form of photographs of procedures performed by them personally. In Sheffield Professor I D Cooke generously gave full access to clinical material in his unit. Dr Sheila L B Duncan, Mr J L Williams, Dr I B Sneddon and Dr A Shirley Hill all of Sheffield loaned photographs that appear on pages 24, 64, 122 and 123–124 respectively, while Mr A N Johnson provided some of the surgical illustrations in Chapter 6. Mr E A Williams of Oxford, the originator of the procedure which bears his name, generously allowed us to use photographs of himself performing the vulva-vaginaplasty operation shown on pages 46–50. Dr Frank Sharp of Glasgow provided the photographs of local laser excision of the vulva shown on pages 137–138.

Our American colleagues were also more than helpful. Doctors Louis Burke of Boston and Joseph H Bellina of New Orleans contributed photographs relating to the use of laser surgery in Chapters 8 and 10. Dr Burke donated the outstandingly clear photographs of cervical and vaginal lesions in DES offspring which appear in Chapter 9. Professor Raymond H Kaufman of Houston allowed us to reproduce some of his superb collection of photographs of the vulvar dystrophies on pages 121–122. Dr Jack N Robinson of Los Angeles supplied the urethoscopic illustrations on page 65. From Bangkok, Thailand, Doctors Athip Saungsomboon and Jiraporn Dhulyanin donated the photographs of vulvar haematoma that appear on page 155.

Two colleagues gave expert help on their related specialities. Professor Alan Usher of the Department of Forensic Pathology in the University of Sheffield, wrote the section and supplied all the photographic material on the forensic aspects of vulvar injuries on pages 156–158. Professor J-G Forsberg of the Anatomisk Institutt, Bergen, Norway gave us help and advice on embryological matters and the use of the diagrams in Chapter 1 to illustrate points in fetal development.

The anaesthetists at all levels were very co-operative. Dr A G D Nicholas, Dr D R Powell and Professor J A Thornton were the consultants involved. Of the numerous senior registrars we remember particularly Doctors Bailey, Birks, Burt, Clark, Dye, Mullins, Saunders and Stacey.

Miss J Hughes-Nurse, Mr I V Scott, Miss P Buck, Miss V Brown and Dr H David were the senior registrars and lecturers in obstetrics and gynaecology during the time and greatly assisted by keeping us informed of suitable cases and in the organising of operations. Doctors Katherine Jones, E Lachman, Janet Patrick, K Edmonds, A Bar-Am and C Rankin were involved in the management of the cases and assisted at operations.

Miss M Crowley, nursing officer in charge of the Jessop Hospital operating theatres ensured that we had every facility, and Sisters J Taylor, M Henderson, E Duffield, M Waller and A Broadly each acted as theatre sister or 'scrub' nurse at the individual operations. Mr Leslie Gilbert and Mr Gordon Dale the operating room assistants, were valuable members of the team. We particularly wish to thank the whole theatre staff for their courtesy and efficiency.

A large amount of secretarial work was involved. We are grateful to Mrs Gillian Hopley of the University Department who dealt with most of it. Mrs Valerie Prior and Mrs Talya Singer were responsible for typing the manuscript.

In view of the increasing complexity and diversity of the whole project we have had to enlist the further assistance of our wives. Colour matching, proof-reading, spot typing and slide organisation have all demanded much extra time both at home and when travelling overseas.

The photographs in this book were taken on Kodachrome 25 colour reversal film. The camera was a 35 mm Nikkormat FTN fitted with a 105 mm f2.5 Nikkor auto lens. A PK-3 extension ring was used for close-ups and a 55 mm f3.5 Micro-Nikkor auto lens for general views. Illumination was provided by a Sunpak auto zoom 4000 electronic flash unit, set on full power. An exposure setting of 1/60th of a second at f16 was used.

Introduction

There is probably no substitute for the type of personal tuition provided by teacher and pupil working together in the operating theatre as surgeon and assistant, with knowledge and experience being passed on directly. There is, however, the disadvantage that such a relationship is not available to everyone and is, at best, transient. In addition the learner is frequently not at a stage in his career when he can take full advantage of what is available. The majority, therefore, have to look elsewhere for such instruction.

Textbooks of operative surgery provide the principal source of information, but these are only as good as their illustrations. The occasional colour plate does not instruct and there is something unreal about the well-executed drawings prepared by a medical artist to the specification of the author. The one worthwhile teaching aid is the simple line diagram or sketch, which demands considerable skill and ingenuity and allows the student to see and follow what is required. But to carry that information in one's mind and apply it in practice is another matter. In surgery, with all its accompanying distractions, the real life structures are frighteningly different from those which the simple diagrams have led one to expect, and these same structures obstinately refuse to adopt the position and behaviour expected of them.

Cine films are excellent but the cost of their production in time and money is high, besides which they are clumsy to use. This series of atlases offers what we consider to be the next best thing: a series of step-by-step colour photographs accompanied by an appropriate written commentary. This form of presentation follows almost exactly the colour slide plus commentary method most often used to teach surgery. Using slides, of course, it is necessary to have projection apparatus and access to a library or bank of suitable material. The method adopted in this series – of using high quality colour reproduction processes – retains the advantages of the slide and commentary method while avoiding its drawbacks.

The present series of atlases sets out to provide detailed instruction in the techniques of standard gynaecological operations. Its methodology is straightforward. The technique of each operation is clearly shown, step-by-step, using life-size photographs in natural colour, and with liberal use of indicators and accompanying diagrams. Where a step is repetitive or there is a natural sequence of steps, grouping has sometimes been used, but the natural size of the structures is maintained.

The accompanying commentary is concise and is printed on the same page as the photograph or photographs to which it refers. Every effort has been made to include only necessary material, but in situations where experience and special training have provided additional information and knowledge, that has been included.

The illustrations are selected and the accompanying commentaries so arranged as to carry the reader forward in a logical progression of thought and action in which he becomes involved. Occupied with one step he is at the same time anticipating the next, and in due course confirms his foresight as logical and correct. The photographs are those of a real patient having a real operation and the picture seen is exactly what the reader will see in the operation theatre when he does it himself. Interest is concentrated on the one step of the operation being taken at that time.

In any form of medical teaching there is the inevitable problem of pitching instruction at the level required by the audience and the presumption that the

reader has insight into the specialist knowledge of the author is just as irritating as being patronised. We do not think there is a problem in this context because an atlas is by definition a guide and therefore for general use. It is just as likely to be consulted by a junior house surgeon about to assist at his first hysterectomy as by a senior colleague seeking an alternative method of dealing with a particular problem. That, at least, is the spirit in which it has been written.

Certain assumptions have had to be made to avoid verbosity, tediousness and sheer bulk of paper. It is hoped that the reader will be kind enough to attribute any omissions and shortcomings to the acceptance of such a policy. No one should be embarking on any of the procedures described without training in surgical principles, nor should he attempt them without knowledge of abdominal and pelvic anatomy and physiology.

Several areas have purposely been avoided in preparing the Atlas. There is no attempt to advise on the indications for operative treatment and only in the most general terms are the uses of a particular operation discussed. Individual surgeons develop their own ideas on pre- and post-operative care and have their personal predilections regarding forms of anaesthesia, fluid replacement and the use of antibiotics.

Even on the purely technical aspects the temptation to advise on the choice of instruments and surgical materials is largely resisted and it is assumed that the reader is capable of placing secure knots and ligatures. Each volume of the Atlas contains a photograph of the instruments used by the authors and some of these are shown individually. Most readers will have their own favourites but the information may be useful to younger colleagues. We do not consider the choice of suture material to be of over-riding importance. The senior author has used PGA suture material since its inception and although generally preferring it to catgut does not consider it perfect. It has disadvantages and can be very sore on the surgeon's hands but it does have advantages in that it is particularly suitable for vaginal work and for closing the abdomen.

There are, of course, several methods of performing the various operations but those described here have consistently given the authors the best results. It need hardly be reiterated that the observance of basic surgical principles is probably more important than anything else.

The Atlas is produced in six volumes, each of which relates approximately to a regional subspecialty. This is done primarily to keep the size of the volumes convenient for use but also to allow publication to proceed progressively.

From what has been written it might appear that the authors think of gynaecologists as necessarily male. The suggestion is rejected: the old-fashioned usage of the inclusive masculine gender is merely retained for simplicity and neatness. Anyone questioning the sincerity of this explanation would have to be reminded that every gynaecologist must, in the very nature of things, be a feminist.

Introduction to Volume 4

The fact that most of the operations on the vulva are comparatively minor does not lessen their importance. The highly developed sensory nerve pathways and the rich vascular supply to the erectile tissue make the vulva by far the most sensitive and vascular part of the whole genital tract. Infection or trauma which elsewhere would cause little disturbance is scarcely bearable and demands immediate relief. It is noticeable that even the most educated and emancipated women are immediately fearful of a continuing or permanent lesion which may upset their sex life and possible marital harmony. It is very important therefore that the gynaecologist immediately recognises the fault and if surgery is required sees that it is done as soon as possible.

Although surgical conditions of the vulva may call for immediate treatment patients may be unwilling to submit to an inpatient operation which necessarily entails social upheaval, undoubted expense and perhaps embarrassment. Quite apart from the inconvenience involved the very fact of going into hospital for a minor gynaecological operation is apt to raise speculation among friends and neighbours, and given the opportunity most women would gladly avoid it. In fact a great many vulvar conditions can be dealt with very adequately as out-patient or office procedures and a section in Chapter 1 deals with what is termed 'office gynaecology'. The subject is almost a speciality in itself, making up a considerable part of a gynaecologist's work, and it therefore merits careful consideration.

In previous volumes of the Atlas we have discussed the content and tried to be rational or at least explicit in our approach. The title 'Surgery of the vulva and lower genital tract' is chosen to allow some latitude and redress a previous imbalance. Vaginal operations (Volume 1) were rather traditionally thought of as operations done *per vaginam* and some procedures which correctly belonged to the category were omitted. The present heading allows us to bring in such frankly vaginal conditions as recto-vaginal fistula and the various vestigial cysts. External to the introitus but adjacent to the vulva the common condition of haemorrhoids has been included. It is true that formal haemorrhoidectomy is hardly the province of a gynaecologist but there are many cases and particularly in relation to posterior vaginal wall prolapse where there are accompanying haemorrhoids which require surgical treatment. It would be unfair not to do so. The patient with painful internal haemorrhoids is not concerned with ethical demarcation lines and is usually more grateful for the relief from the haemorrhoids than for the correction of the purely gynaecological condition.

The chronic vulvar dystrophies must be mentioned as constituting a very unsatisfactory area of gynaecological management. We do not intend to join in the controversy on pathology, aetiology and the natural history of the many conditions which are accorded different names and different potentialities by internationally recognised authorities. Suffice to say that they range from benign epithelial hyperplasia and lichen sclerosus on the one hand to atypical epithelial hyperplasia and intra-epithelial carcinoma on the other. All the 'in situ' carcinomata and possibly some of the more menacing dysplasias require surgery and management either by localised laser excision or local vulvectomy and both methods are described.

A very important role for surgery in this context is the taking of vulvar biopsies as a continuing monitor of cell behaviour. It is unsafe to rely on clinical judgment entirely and periodic biopsy is mandatory. Every gynaecologist has had to accept from time to time the shock revelation that a quietly

slumbering dystrophy has become an invasive lesion. Methods and safeguards in vulvar biopsy are dealt with in the text.

It was intended that the chapter on vulvar injuries should be quite short with illustrations of the commoner lesions and their management. Surgical intervention if required at all is usually minor and on an 'ad hoc' basis but on the other hand the clinician faced with a severe and possibly mutilating injury might be very glad to have advice. For that reason the subject has been rather more fully discussed than was originally intended.

Our association with Professor Alan Usher of the University of Sheffield Department of Forensic Pathology suggested the possibility of expanding the chapter to include the forensic aspects of genital injuries in the female. Gynaecologists are fortunate in being spared attendance at most of these cases but there are circumstances when the task is obligatory and few of us know just what is expected of us and how to proceed. The indignity of trying to obtain specimens without proper facilities is matched only by the embarrassment of being an expert witness with no worthwhile evidence to present. We believe that this section will be of real value to readers everywhere; proper clinical examination can have only one standard whatever the laws of the country concerned.

1: Surgical anatomy

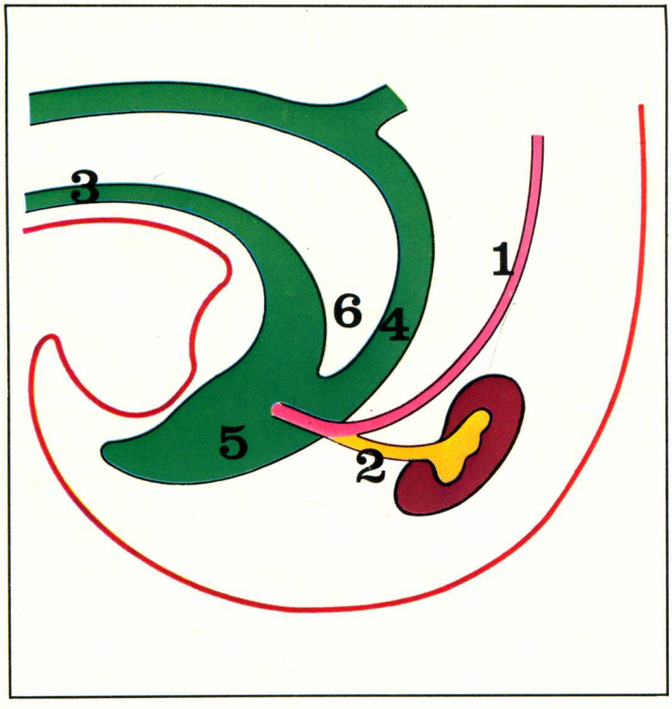
Developmental anatomy

Congenital abnormalities of the lower genital tract and external genitalia are particularly important in that they may affect reproductive capacity. They pose many other problems and the first of these may well be in deciding on the sex of the neonate. For the gynaecological surgeon the problems usually arise later in relation to sexual and reproductive function.

The development of the embryo, mesodermal growth and the ventral infolding of the body along a central line are familiar to all obstetrician/gynaecologists and need not be considered in exhaustive detail in a surgical atlas. To understand the occurrence of the commonly encountered conditions such as para-vaginal vestigial cysts, double vagina and imperforate hymen it is necessary only to recall the main stages in development of the lower genital and urinary tract.

The Woolfian system develops on each side from the lateral aspect of the urogenital ridge to form one side of the complete urinary tract. The 'ureteric bud' of the mesonephric or Woolfian duct which develops into the ureter and pelvis of the kidney, enters the cloaca at a point which eventually becomes the ureteric orifice of the bladder (**Figure 1**). The 'bud' becomes separated from the lower end of the Woolfian duct (**Figure 2**) which itself has a separate opening into the cloaca and this separation is increased in extent as the cloaca subsequently divides into bladder and rectum and the uretero-vesical openings are carried forwards. The original Woolfian duct which in the male develops into the ductus deferens and seminal-vesicle has no adult representation in the female and subsequently degenerates but it leaves vestigial remnants along its course.

1



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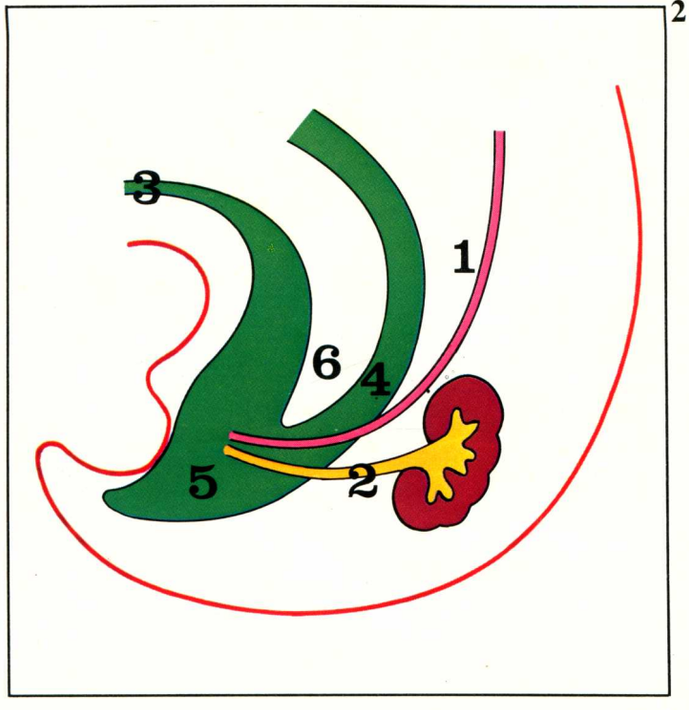


1 and 2 Formation of urinary tract
Figure 1 shows the relationship of the Woolfian (mesonephric) duct and its ureteric bud to the cloaca at approximately 5 weeks development. **Figure 2** represents the situation about 2 weeks later when the urinary tract has separated from the now vestigial Woolfian duct. The structures are numbered thus:

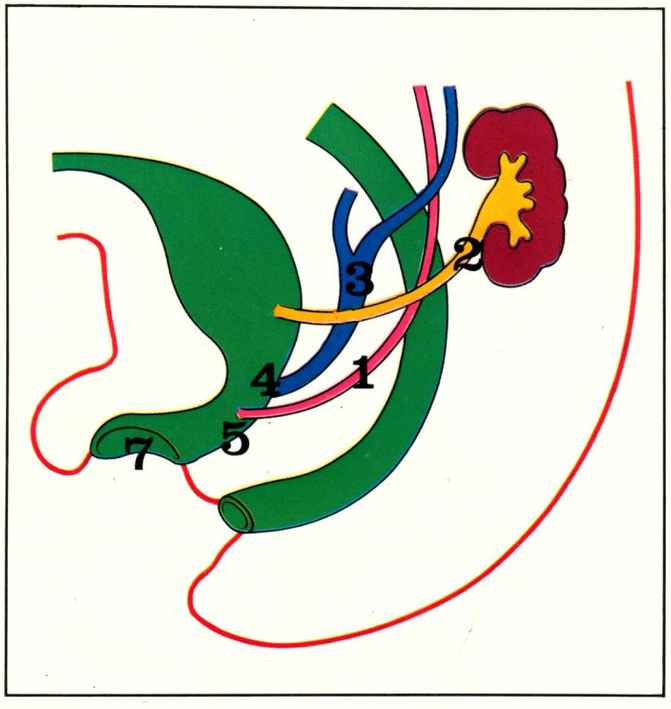
1 Woolfian duct
2 Ureteric bud and developing urinary tract
3 Allantois
4 Hind gut
5 Cloaca
6 Uro-rectal septum

These remnants of the Woolfian duct (sometimes called Gartner's duct) lie caudal and anterior to the ovary in the pelvis while more distally they are lateral to the entrance of the ureter into the cloaca at the future bladder base. The pelvic remnants are represented by the vestigial epöophoron and paröophoron and may be the site of para-ovarian cysts of considerable size. Vestigial vaginal and para-cervical cysts may develop from the more distal remnants of the Woolfian duct. These latter cysts are positioned on the antero-lateral vaginal wall near the vaginal vault and their origin ensures that they are in proximity to the uretero-vesical junction (**Figure 5**).

The Mullerian ducts develop a few weeks later than the Woolfian ducts – from the same lateral aspect of the urogenital ridge and they subsequently form the fallopian tubes, uterus and upper part of the vagina on each side. The upper end of each Mullerian duct is open to the coelomic cavity. The distal end migrates caudally across the anterior or ventral surface of the Woolfian duct to meet its fellow in the midline and they continue distally to join the urogenital sinus posteriorly at Muller's tubercle (**Figure 3**). The two ducts subsequently fuse centrally and vacuolation then occurs in a cephalad direction to provide a central uterine tube which later becomes the uterus and cervix (**Figure 4**).

With regard to vaginal development Muller's tubercle is the advance point of the Mullerian mesodermal columns and is at a level which closely corresponds with that of the cervix. Where the Mullerian ducts reach the urogenital sinus a thickened plate of endodermal tissue – the vaginal plate – lies between them and two more distant points on the posterior wall of the urogenital sinus and known as the sino-vaginal bulbs. The exact sequence of subsequent events is not clear but it is generally thought that mesoderm from Muller's tubercle advances to meet endoderm of the sino-vaginal bulbs within the vaginal plate while at the same time the mesodermal mass elongates in a cephalad direction. The vaginal plate continues to grow and displace the Muller's tubercle upwards while laying down a mass of tissue between it and the urogenital sinus. This specific area eventually becomes the vagina as a distal continuation of the uterine tube. Forsberg (1978) considers that the primary vaginal anlage as demonstrated in **Figure 3** has a Mullerian origin, but later epithelial migrations result in the Mullerian being replaced by another epithelium. He does not believe that there is a dual origin of the vaginal epithelium as in animals.

3



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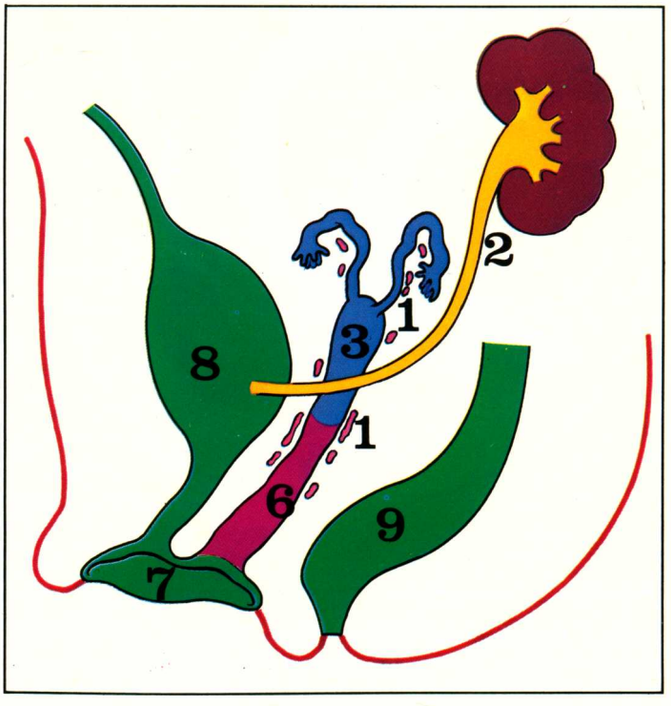
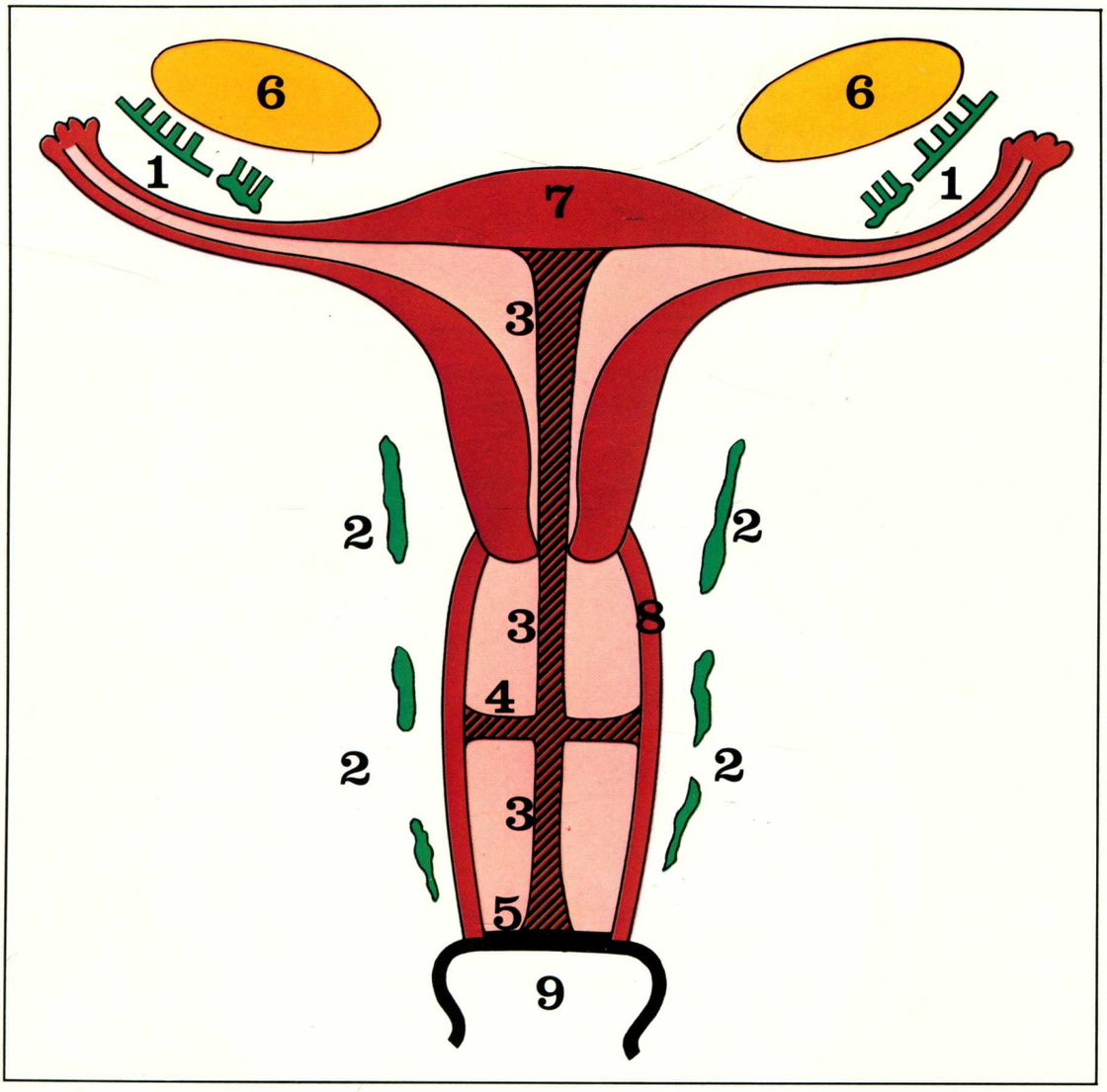


3 and 4 Formation of female genital tract
The genital tract develops from the Mullerian duct slightly later and then concurrently with the urinary tract. **Figure 3** shows the situation at 8 weeks development when the Mullerian ducts impinge on the uro-genital sinus at Muller's tubercle. **Figure 4** represents the situation 3–4 weeks later with the genital tract essentially complete. The structures are numbered thus:

1 Woolfian (mesonephric) ducts or remnants of these structures
2 Urinary tract
3 Mullerian ducts and uterine tube
4 Muller's tubercle
5 Site of sino-vaginal bulbs
6 Vagina
7 Uro-genital sinus
8 Bladder
9 Rectum



5 Sites of vestigial remnants and septa from failed fusion/ canalisation

1 Epöophoron and paröophoron (Woolfian remnants)
2 Para-cervical and para-vaginal remnants of Woolfian duct
3 Septa from failed fusion of Mullerian ducts
4 High septa from failed canalisation within vaginal plate
5 Low septum from persistence of division between vagina and urogenital sinus.

The ovaries are numbered (6), the uterus (7), the vagina (8) and the uro-genital sinus (9).

Referring again to **Figure 5**; failure of the two cell columns to fuse in the midline would result in a sagittal uterine or vaginal septum. Failure of proximal canalisation explains the occurrence of a short vagina while a partial proximal vacuolation accounts for the rare cases of cryptomenorrhoea associated with a thick transverse vaginal septum at the Mullerian-sinus junction level. Complete failure of canalisation of Mullerian and sino-vaginal constituents would result in an absent vagina.

Some knowledge of early fetal external genital development is helpful in understanding the changes that result either from excessive androgens given to the mother in pregnancy or produced by the fetal adrenal cortex in an adreno-genital syndrome. Until 9 weeks fetal development the external genitalia are very similar in both sexes and subsequent development depends on hormone influences. In the normal female with absence of androgens the urethral folds posterior to the genital tubercle regress to become the labia minora and the phallus becomes the clitoris. The urogenital sinus remains as the vestibule and vaginal introitus; the labial swellings become the labia majora.

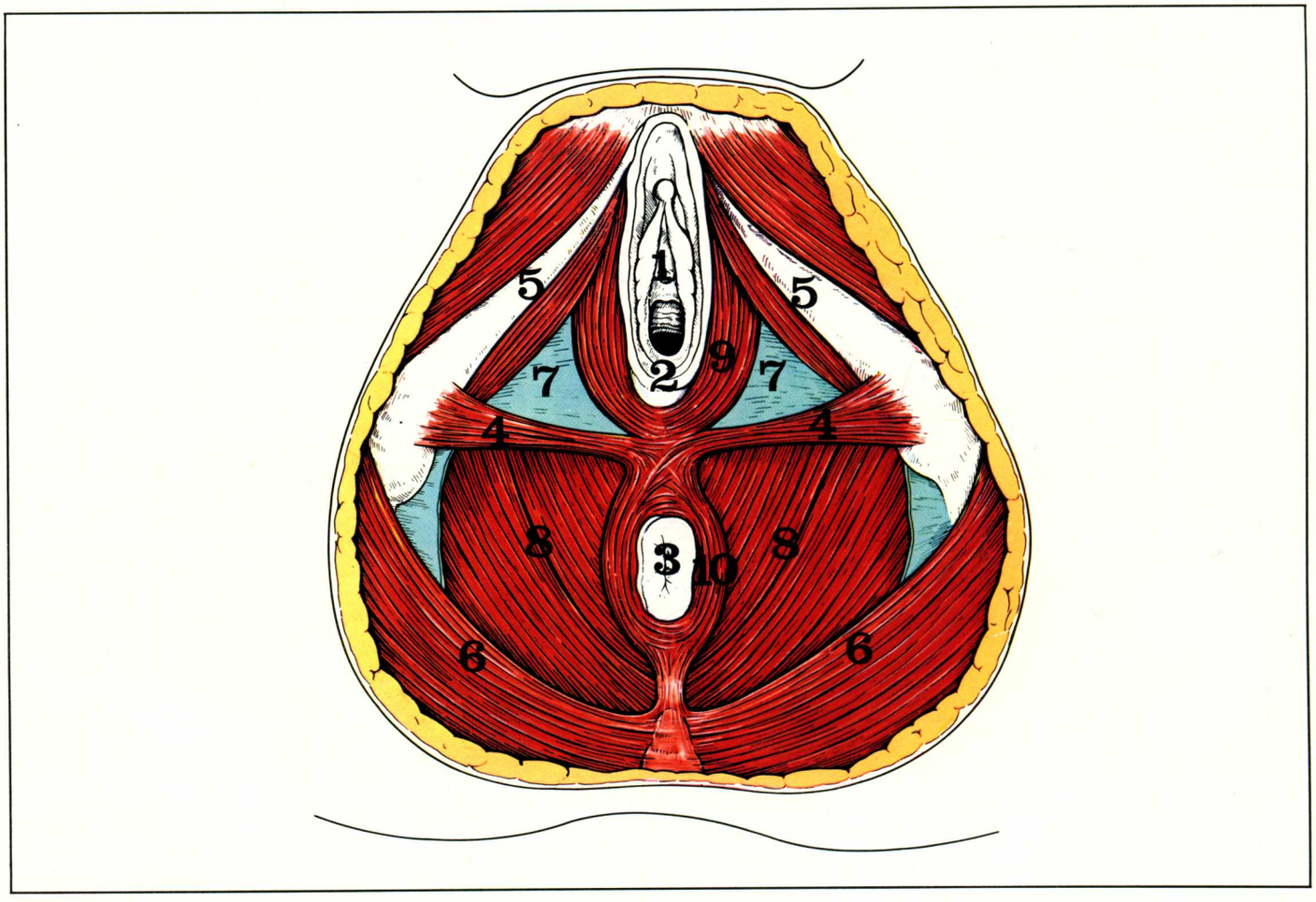
Under the influence of androgens the phallus develops as in the male, the urethral folds fuse to form a penile type urethra and the labial swellings approximate to give a scrotal appearance. The gonads and upper part of the genital tract are not affected since there are no testes to secrete Mullerian inhibiting substance (Dewhurst 1970).

Surgical anatomy of the vulva and perineum

In describing the surgery of the vulva and perineum it is convenient to keep in mind a plan or sub-division of the area, not only for purposes of orientation and ease of teaching but also to immediately recall which structures and which blood vessels and nerves are immediately subjacent.

Figure 6 provides a diagrammatic representation of the area and its various divisions. The urethral, vaginal and anal openings with their sphincters provide a sagittal antero-posterior division of the perineum while the transverse perineal muscles make a horizontal division. The pubic arch and rami with the attached ischio-cavernosus muscles provide the lateral borders anteriorly and the edges of the gluteus maximus muscles do the same posteriorly. The floor of the anterior quadrants of the perineum and vulva is occupied by the urogenital diaphragm; the floor of the posterior quadrants is occupied by the surfaces of the levator ani muscles.

6



6 Structures of the vulva and perineum
These are numbered as follows:

1 Urethral orifice
2 Vaginal introitus
3 Anus
4 Transverse perineal muscles
5 Pubic ramus with attached ischio-cavernosus muscle
6 Gluteus maximus muscle
7 Anterior quadrant of perineum (urogenital diaphragm)
8 Posterior quadrant of perineum (levator ani muscle)
9 Sphincter vaginae
10 Sphincter ani.

Blood supply of the vulva and perineum

The arterial supply to the perineum and vulva is nearly all provided by the internal pudendal branch of the internal iliac artery. The artery and its branches is accompanied by a particularly rich network of veins. It enters the buttock under cover of the gluteus maximus muscle and passes through the lesser sciatic notch towards the perineum which it approaches in company with the pudendal nerve as they lie within Alcock's canal. It gives off the following branches (shown in **Figure 7**).

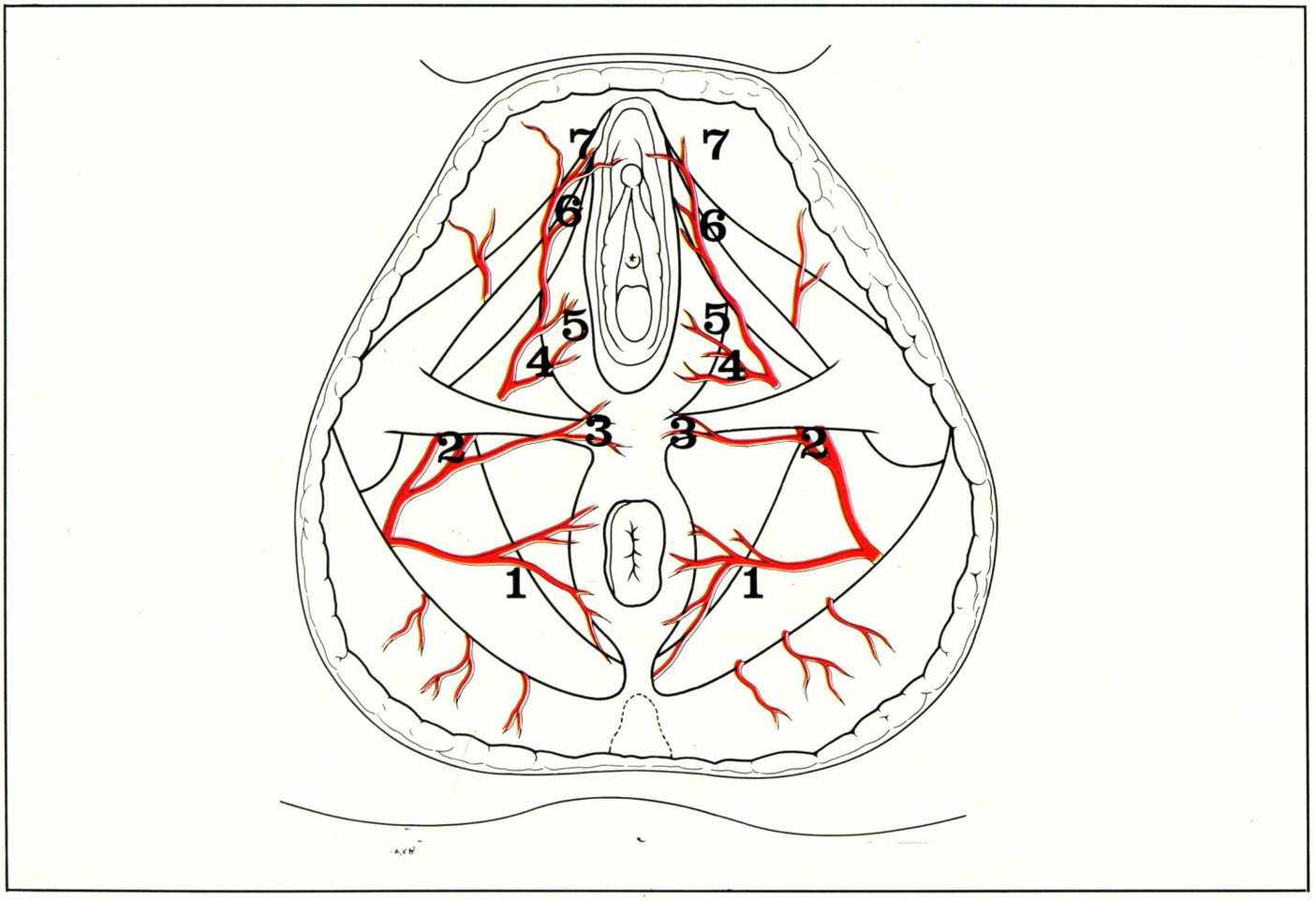
1 The inferior rectal artery pierces the wall of Alcock's canal in the ischio-rectal fossa and runs medially to supply the anal canal and sphincter.

2 The perineal and transverse perineal branches arise in the ischio-rectal fossa and run antero-medially through the superficial perineal muscles to the central point of the perineum to supply the sphincter vaginae, sphincter ani and anterior fibres of the levator ani muscle. The perineal arteries pierce the base of the urogenital diaphragm and provide posterior labial branches.

3 The artery to the bulb is given off within the layers of the urogenital diaphragm to supply the bulb of the vestibule.

4 The artery ends in two branches, the dorsal and the deep arteries of the clitoris.

These various branches anastomose with those of the opposite side, with surrounding blood vessels and in particular with the inferior gluteal and the external pudendal branches of the femoral artery.



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7 Distribution of internal pudendal artery to vulva and perineum
1 Inferior rectal artery
2 Perineal branch
3 Transverse perineal branch
4 Posterior labial branch
5 Artery to the bulb of the vestibule
6 Dorsal artery of the clitoris
7 Deep artery of the clitoris.