

A CLINICAL INVESTIGATION INTO UTERINE PROLAPSE WITH STRESS INCONTINENCE TREATMENT BY MODIFIED MANCHESTER COLPORRHAPHY

Part I

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INTRODUCTION

IN recent years, holding a firm belief that practically every case of stress incontinence could be cured by an adequately performed Manchester Colporrhaphy, I have personally seen fit to perform a sling suspension operation in relatively few cases and these in colporrhaphies that I had operated upon myself but in which stress incontinence persisted.

The work of Malpas, however, followed by that of Jeffcoate and Roberts has stimulated me, as it must have done many others, to look into these cases more deeply. I have, therefore, carried out a routine follow-up of some 209 cases of colporrhaphy, operated upon personally during the last 6 years, and have further operated upon 10 of these which demonstrated symptomatic and anatomical failure by a combined operation which will be described. In addition a series of new cases of prolapse with stress incontinence has been investigated. In these cases pre-operative cysto-urethrography was carried out and, where this showed the derangement characteristic of stress, the operation of colporrhaphy alone or the combined operation was carried out.

In this way my confidence in the efficiency of the Manchester operation not only to deal with prolapse, but also with any bladder irritability including stress incontinence which might be associated with it, has been re-assessed.

Jeffcoate and Roberts (1952) have said that colporrhaphy is often only of value for stress incontinence in so far as it bolsters the second line of defence tissues round the urethra and indeed that the Manchester Colporrhaphy might even be the means of producing stress incont-

ence if carried out in such a way as to make the vaginal wall "too tight".

One should, therefore, judge the results of colporrhaphy on a basis of:

- (i) The cure of the prolapse.
- (ii) The symptomatic cure of associated stress incontinence.
- (iii) The anatomical results as shown by cysto-urethrography.

From this the complete or partial adequacy of the operation for cases of prolapse complicated by stress incontinence can be assessed.

The loss of the posterior urethro-vesical angle in some 80 per cent of cases with stress incontinence and the necessity for the restoration of this angle to cure the condition are two of the main facts asserted by Jeffcoate and Roberts in 1952.

In the cases of this investigation, therefore, I have endeavoured to provide answers to the following questions.

Do approximately 4 out of 5 cases of stress incontinence show a loss of the posterior urethro-vesical angle as shown by the X-ray? Does this apply before and after colporrhaphy? Is a symptomatic cure associated with a change from an abnormal to a normal angle and does a failure maintain an abnormal angle?

It has not been possible to provide exact answers in respect of the cases which were operated on prior to the introduction of routine pre-operative cysto-urethrography. In the follow-up of such cases, if a symptomatic cure is recorded, there is no evidence that the urethro-vesical angle was abnormal before operation. On the other hand, if symptoms of stress incontinence persist, the absence of a pre-operative

X-ray does not invalidate conclusions drawn from cysto-urethrography during the follow-up studies.

The corollary to this concerns the advisability of a further operative procedure in certain selected cases—that is cases in which colporrhaphy has already been performed but stress incontinence persists (and is confirmed by X-ray), and new cases of prolapse with demonstrable stress incontinence and a confirmatory cysto-urethrograph.

This is important as the cure of prolapse alone represents a partial result only and indeed from the patients' view-point might constitute a failure.

Certain cases are of course atypical in so far as these patients either complain bitterly of stress incontinence when none is demonstrable or vice versa. Occasionally the X-ray appearance is at variance with the complaint. The 8 such cases in the follow-up series were subjected to precise neurological and urological investigation but no pathological lesion was found.

Many authorities consider that a more extensive operation than the vaginal plastic is not indicated except where a previous failure is recorded. These views are clinical and are not based upon a knowledge of the pre- and post-operative appearance of the bladder which presumably is the vital factor. A trial by colporrhaphy can hardly be the correct scientific procedure.

Moreover, there is a tendency to minimize to a certain extent the seriousness of the symptom of stress incontinence, in so far as it does not represent a direct menace to life or a gross pathological manifestation. The severe nervous and psychological factors, however, must be taken into account. These have the power to revolutionize the nervous condition and social life of the individual. Moreover, the vulvovaginitis and pruritus which can complicate cases of longstanding stress incontinence is a pathological factor of some importance.

I feel that in the past one has taken into account too little that reticence on the part of patients who willingly complain of prolapse symptoms but refrain from mentioning those relating to stress incontinence. My own feeling is that a more extensive operation should not of

course be carried out except in those cases in which pre-operative investigation shows that colporrhaphy alone is not likely to result in a cure—and the main purpose of this enquiry is directed to this end.

THE FOLLOW-UP SERIES

It is probable that most gynaecologists lose sight of their colporrhaphy results as the years go by. This fact was well demonstrated to me as the result of my follow-up of these 209 cases. The answers that the patients gave to the questions submitted indicated that, whereas perfect results were the rule in pure prolapse cases, some of the cases of stress incontinence were not cured or were not completely cured. Some patients "felt much better" than they had been because of the cure of the associated prolapse and were "putting up" with the bladder symptoms which were in many cases "not so bad" as previously. None the less, in many instances a complete cure was absent. One was, therefore, impressed with the fact that cure had been presumed unjustifiably.

A follow-up was carried out involving 209 cases who had been operated upon during the last 6 years for prolapse with or without stress incontinence by the Manchester Colporrhaphy.

In a follow-up of this kind it is satisfactory to have an adequate number of cases to demonstrate the relevant points. It is, however, impracticable to contact patients after a certain length of time and moreover the evidence, possibly vitiated by intervening years and disease, is not reliable. A pool of some 850 cases operated upon in my unit during this time was taken. Of these, 645 had been done by myself, and of these 209 presented themselves for interrogation and examination. This figure seems small in comparison with what one would like. I found, however, that it proved comprehensive enough in so far as the answers, questions, examination findings and cystograms seemed to run along fairly uniform lines and greater numbers of patients, therefore, would only be likely to further emphasize this.

As the result of conducting this follow-up, however, I discovered the incidence of both partial or severe stress incontinence to be much greater than I had imagined. My series shows

that this symptom in greater or lesser degree was present in 83 of the 209 cases before operation. This proportion would undoubtedly have been less had all the cases written to presented themselves. A card printed with the various questions and tests was used for questioning and this of course was done personally.

All the 209 cases with the exception of 2 in whom there was some recurrent cystocele stated that the prolapse symptoms were cured. Of the 83 cases concerned some stated that the stress incontinence was cured, some that it was partly relieved but still present and some that they were no better.

Eighty-three cases with stress incontinence showed—32 symptomatic cures; 20 part cures; 31 failures.

There were no cases in this series who complained of stress incontinence only after colporrhaphy. There were thus 51 failures in 83 cases and these were further investigated by tests for demonstration, vaginal examination to exclude local pathology, cystoscopy, bacteriological examination of the urine, and in 6 cases a full neurological and urological examination was carried out with negative results.

Cysto-urethrography was carried out in these cases by the method described by Roberts, the results being as follows:

Thirty-two cases of symptomatic cure showed: 29 normal X-rays, 1 gross loss of P.U.V. angle on straining, and 2 partial loss of P.U.V. angle on straining.

These 3 atypical cases may be experiencing a temporary cure owing to a partial uplift and strengthening of the distal urethra.

Fifty-one cases of symptomatic failure showed: 34 with gross loss of P.U.V. angle, 10 with partial loss of P.U.V. angle, and 7 with a normal type angle (Figs. 1, 2, 3).

It is an interesting fact that the 10 cases showing this second type of film largely coincide with those 20 cases associated with a part cure. I feel that some of these appearances—the short angle with the uplifted bladder base particularly—represent the probable presence of thin scar tissue in the region of the urethro-vesical junction, the effect of imperfect healing due in part to the effects of local strain.

The 7 cases showing the normal angle had all a gross downward rotational descent of the upper urethra. The angle was maintained but one must remember that these cases had previously suffered stress incontinence and the trauma which induces it.

The final follow-up classification, therefore, representing the results of colporrhaphy is as follows:

83 cases showed: 32 symptomatic cures with
29 normal X-rays.
51 symptomatic failures
with 44 abnormal X-rays.

This series, therefore, bears out the strong relationship which exists between the symptoms as expressed and verified and the cysto-urethrograph findings, and although the unknown factor of a pre-operative X-ray and the reliability of the patient's description of symptoms must be taken into account, these results might fairly indicate the ultimate effect of colporrhaphy on stress incontinence.

THE NEW SERIES

In this series there are 215 new cases of prolapse, in which 83 cases complained of stress incontinence and in which a complete examination has been carried out before operation and a cysto-urethrograph taken. The object of this is:

- (i) To find out to what extent the Manchester Colporrhaphy can effect a cure and restore the posterior urethro-vesical angle where this is lost.
- (ii) To find what symptomatic-anatomical results can be obtained by the combined operation in these cases not previously operated upon.

As yet only 60 cases have been operated upon in this series, but enough I believe to indicate the type of result to be expected. A control series of 25 mixed cases have been operated upon by colporrhaphy only. A series of 35 cases (25 new and 10 follow-up) with stress incontinence have been operated upon by combined operation.

To obtain the immediate results a cysto-urethrograph has been carried out between 1 and 4 months after operation, and another cysto-urethrograph will be done in 2 years' time.

The immediate results are as follows:

The Control Series

This series represents 25 cases made up as follows: 15 with no complaint of stress incontinence and a normal cysto-urethrograph, 10 with stress incontinence and a positive cysto-urethrograph.

The usual colporrhaphy with urethral bolster technique was performed and the results are as follows:

The prolapse was cured in the 15 cases with no stress incontinence and X-ray showed little or no change in the bladder appearance. In some cases, however, a further degree of uplift to the bladder base and urethro-vesical junction is discernible.

In the 10 cases with stress incontinence there were 4 symptomatic cures with normal cysto-urethrographs; 2 part cures with an improved cysto-urethrograph; 4 symptomatic failures with abnormal cysto-urethrographs.

There is no doubt about these colporrhaphy cures in that the posterior urethro-vesical angle has been virtually completely restored and moreover the urethro-vesical junction has been definitely elevated. The symptom has also, for the time being at any rate, been cured.

In my view this has been brought about by the approximation of the medial aspects of the pubo-coccygei, either directly by catching them or their offshoots, to the lateral aspects of the vaginal wall in the suture on each side, or by dragging them together indirectly with stitches widely placed. This results in replacing them infero-laterally to the bladder neck and, after the completion of the anterior colporrhaphy, in re-instituting to a certain extent the intimate contact between the bladder neck, the pubo-coccygei and vaginal wall.

I believe that such a result is possible only in those cases in which the pubo-coccygei are present in sufficient degree and extent. It is not possible where they are severely traumatized or attenuated. In any case such approximation in the coronal plane of the body is across the line of their fibres which is antero-posterior and of course this bolster, must, if it heals firmly, which is not very likely, maintain the whole strain on this area without the assistance of the supero-lateral supports to the bladder neck. There is no doubt, however, that the posterior urethro-

vesical angle can be completely restored by colporrhaphy with urethral bolster—whether it be temporary or not—and this fact must surely show that the maintenance of this angle is vitally concerned with the integrity, normal structure and tone of the pubo-coccygei and their extensions to the vaginal wall and vagino-urethral area.

In other cases of this control series it can be shown that the colporrhaphy produces varying degrees of uplift to the region of the urethro-vesical junction, and no doubt this will result in varying degrees of cure of the symptom. Two cases showed this particularly. Here a typical immediate part cure was secured, both symptomatic and anatomical (Figs. 4, 5, 6, 7, 8, 9, 10, 11).

In all these cases, where the angle is normal to begin with and in others where it is abnormal, the effect of the colporrhaphy is always to improve the angle to some extent and in certain cases to restore it completely. In no case does it tend to disimprove it. I therefore regard those few cases in which stress incontinence is produced or presumed to be produced by colporrhaphy to be due to:

- (i) The possibility that the patient did not complain of stress incontinence but only of the prolapse before the operation. As we know certain cases have this symptom without complaining of it and in others the prolapse overshadows it.
- (ii) The placing of deep and wide mattress stitches below the upper and lower urethra—which has the effect of shortening this region and probably dragging out an already imperfect angle.
- (iii) A similar effect produced by scar tissue in this region following a gross post-operative infection.

I contend that there can be no scientific reason why an anterior colporrhaphy that heals well can of itself produce stress incontinence.

I consider that the type of case in which an anatomical cure by colporrhaphy alone might be expected is that in which a gross degree of rotational descent of the upper urethra is not already present. This would indicate fair adequacy of the supero-lateral support and a minimal degree of strain on the bolster itself.

In the part cure cases of this series it can be seen that the upper urethra still rotates downwards and the urethro-vesical junction is still below the line of the femur notwithstanding the great improvement from the pre-operative picture. In the other cases where the colporrhaphy has failed the cysto-urethrogram remains much the same. In these cases there can have been little or no pubo-coccygeus muscle within reach to re-adjust. I would, therefore, also say that the type of case not suitable for colporrhaphy alone is that in which there is gross downward rotation of the upper urethra on straining in conjunction with a loss of angle. This type of picture is of course associated with severe stress incontinence and would indicate a gross degree of trauma to both upper and lower supports.

THE MODIFIED COLPORRHAPHY

It appears, as the result of the follow-up, that colporrhaphy alone effects an ultimate or permanent cure in some 32 out of 83 cases of stress incontinence. An additional operative procedure, therefore, seems to be warranted in selected cases. This should reproduce the normal anatomical state as nearly as possible and be readily performed in conjunction with colporrhaphy.

The risks attendant upon sling operations are appreciated by gynaecologists. These have been avoided in the Marshall-Marchetti operation (1949) but I believe that the necessary result should be obtained by not unduly pulling up the bladder without supporting it from below, minimizing the upslinging of the anterior vaginal wall, thus avoiding distortion of the vagina, placing fixation sutures in the fibro-muscular origin of the levator rather than the cartilaginous aspect of the symphysis to ensure permanent firmness, and additionally supporting the pelvic floor and eliminating the cystocele by colporrhaphy.

By these means a nearer return to the normal is produced, as is shown by the post-operative cysto-urethrography.

I have always held the view that even if, as Roberts suggests, the posterior urethro-vesical angle depends upon the tone of intrinsic muscle in its vicinity, its maintenance is probably vitally concerned, nevertheless, with certain immediate

tissue supports which themselves enable any such involuntary muscle to function.

At dissection in this area there is evidence to show that:

- (i) A prolongation from the fascial covering of the pubo-vaginalis on each side crosses to the supero-lateral aspect of the bladder neck to be inserted fanwise into it. This offshoot as it were from the transversalis fascia comes off from where the fascia covers the fibres arising from the lower area of the symphysis and blends with the muscle wall of the urethro-vesical area for about half an inch on each side thus covering the area of the upper urethra.

The supporting effect of this supero-lateral fascia to the upper urethra is obvious and I therefore believe that this structure assists in maintaining its normal upward ascent of some 20 to 30 degrees to the perpendicular as seen at cysto-urethrograph and hence supporting the region of the urethro-vesical junction.

- (ii) From the medial surface of the pubo-vaginalis on each side, muscle fibres run to the antero-lateral aspect of the anterior vaginal wall at about the level of the superior aspect of the upper urethra. From the lower end of this attachment fibres appear to be directed to the infero-lateral region of the upper urethra. These muscular attachments would tend to give a degree of indirect support inferiorly to the upper urethra.

In conjunction, therefore, with the muscular and tendinous elements of the deep transverse perineal and triangular ligaments, which invest and support the distal urethra, the whole length of the urethra is supported and elevated (Plates A, B, C).

Direct supero-lateral and indirect infero-lateral support is thus supplied to the whole length of the upper urethra from the main base of the pubo-vaginalis muscle itself as it crosses the urethra and vagina obliquely from above downwards and backwards.

The length of the upper urethra therefore—extending for some $\frac{3}{4}$ above the lower fixed point represented by the triangular ligament—becomes

an anchored zone possessing a limited mobility which is controlled by the integrity and tone of the pubo-vaginalis fibres themselves.

These supero-lateral supports mentioned by me may not be a constant finding. Poirier and Charpy (1923) however maintain that the pelvic urethra is fixed in its position by the following extraneous supports: (1) pubo-vesical muscles, from the pubes to the anterior bladder wall in the region of the "smooth sphincter", (2) an aponeurotic sheet extending from the pubes to the region of the anterior vaginal vault, (3) a thin sheet arising from the ligamentum transversum pelvis (? triangular ligament) which clothes the anterior aspect of the urethra, (4) extensions from the aponeurosis of the pubo-vaginalis to the antero-lateral aspect of the vaginal wall, and (5) the connexions between the urethra and the vaginal wall.

Between this anchored zone and the upper fixed point represented by the transverse cardinal ligaments the bladder base and vaginal wall are in intimate contact. Relaxation of the cardinal ligaments and stretching of the vaginal wall following labour, but without excessive trauma to the pubo-vaginalis fibres themselves, could result in prolapse of the uterus with cystocele but a maintained posterior urethro-vesical angle. Varying degrees of trauma to these structures could therefore produce the variations in the cysto-urethrographic appearances which are associated with degrees of prolapse.

Both the superior and inferior supports however emanate from the pubo-vaginalis themselves. Trauma to this structure or its coverings therefore must result in a functional failure of one or both of these supports, with a resultant strain on the intrinsic musculature of the urethro-vesical junction.

I believe that laceration of the supero-lateral supports to the bladder neck will result in an abnormal downward rotation of the upper urethra on straining.

As Jeffcoate says the normal degree of descent of the urethro-vesical junction on straining is some 2 to 3 cm. It can be seen, however, in many cysto-urethrograms that the descent is much in excess of this and is associated with an abnormal downward rotation of the upper urethra above the triangular ligament. In some degrees of gross

downward rotation, however, the posterior urethro-vesical angle is maintained, and often with cystocele to complicate the picture. This would indicate the continued adequacy of the inferior supports although above them the base of the bladder bulges the vaginal wall, now stretched and inadequately supported by the cardinal ligaments and pelvic cellular tissue, as the result of labour (Figs. 12, 13, 14, 15, 16).

If, however, both the superior and inferior supports are severely traumatized the resultant descent with loss of angulation will give the typical picture associated with developed stress incontinence. In the new series this has occurred in 31 of 83 cases complaining of stress incontinence.

I therefore consider that the condition of stress incontinence is pre-disposed to by a degree of trauma which adversely affects the function of both these supports and which in all probability results in a loss of tone in the intrinsic muscles of the urethro-vesical junction which they were helping to preserve.

Any operative treatment therefore must be designed to:

- (i) Offset the dragging down effects of the associated uterine prolapse and cystocele. This is done by the anterior colporrhaphy which elevates the uterus and eliminates the cystocele.
- (ii) Replace as far as possible the inferior support to the upper urethra. This is done by bolstering below this area. An endeavour is made to approximate any muscle or fibrous elements of the pubo-coccygeus at about $1\frac{1}{2}$ inches above the urethral meatus.
- (iii) Secondarily bolster the lower urethra by approximating below it any fibromuscular elements of the triangular ligament.
- (iv) Elevate and support the upper urethra by vagino-levator fixation.

By this means a return to something like the normal configuration should be achieved and, if these bladder neck supports mean anything, a return to a normal type angle might result.

Where I would say the colporrhaphy alone is apt to fail is that the inferior supports are alone concerned. A good and immediate anatomical

result might be obtained if there is enough of the pubo-coccygei to pull together. This, however, might not heal very strongly and where the patient is obese, as is most frequently the case, and some time has elapsed the constant strain may prove too much for this bolster. I feel, therefore, that any bolster type operation effected from the vaginal route only will not be adequate in the bad case, as sufficient and permanent elevation of the upper urethra cannot be guaranteed by this method. In a number of the follow-up series, the cysto-urethrogram shows an appearance suggestive of an initial good result, which has since receded in this way.

I also believe that the bladder neck uplift operations alone will also fail because they do not take into account the essential infero-lateral support and neglect the constant dragging effect of the cystocele.

The maintenance of upper urethra elevation and the maintenance of infero-lateral support are complementary and together effect a sustained posterior-vesical angle.

This operation is therefore based on the necessity to deal with all these needs, and in consequence the Manchester colporrhaphy must form the basis.

OPERATIVE TECHNIQUE

The operation falls into three stages:

Stage 1.—The upper surfaces of the levatores ani are exposed by a midline suprapubic incision, the dissection being carried out in the loose cellular tissue of the retro-pubic space (Cave of Retzius). The origins of these muscles are displayed on each side from the body of the pubic bone to the white line of the obturator fascia. The medial fibres of the pubo-coccygei (pubo-vaginalis) are defined.

Stage 2.—A Manchester colporrhaphy is carried out following a technique described below. A number 4 Malecot self-retaining catheter is used and some 3 ounces of saline in the bladder. Opportunity is taken before closing the vaginal incision to insert on each side two "fixation sutures". These sutures will be described in detail later, but it should be understood that each suture has a loop on the vaginal skin and the two ends of each suture are carried

through the levatores ani to emerge in the Cave of Retzius.

Stage 3.—After the completion of the colporrhaphy operation the vaginal phase of the operation is finished. In Stage 3 the "fixation sutures" are used to plicate and shorten the pubo-vaginalis muscles.

The position of the patient is of great importance. After trying out several expedients, I have now concluded that the competing claims for access respectively to the vagina and to the retro-pubic space may be adequately met if the patient is placed in a modified lithotomy position at the very commencement of the operation. The essential feature of the modification is to limit the degree of flexion at the hip joints. With this precaution Stage 1 is not seriously embarrassed. In Stage 2 the vaginal access is adequate, and the passage of the "fixation sutures" may be achieved readily and under the control of vision both from the vaginal and the retro-pubic operative fields. In Stage 3 it may be found to be of advantage from the point of view of access in obese subjects to drop the patient's legs to assume a mild Trendelenburg position.

The vaginal operation is simply that of the Manchester colporrhaphy technique plus the definition of the para-urethral sulcus, on each side. The main points to be observed are:

- (i) A wide tapered H-shaped incision of the vaginal wall with sub-urethral extensions outwards—a "stoppered bottle" incision, which gives ready access to the bladder and lateral aspects of the membranous urethra.
- (ii) Separation and pushing up of the bladder from the cervix.
- (iii) Dissection of the para-urethral sulcus on each side.
- (iv) Insertion of "fixation sutures". (Detail below.)
- (v) Circular amputation of the cervix.
- (vi) Repair of the cervix stump.
- (vii) Approximation of the transverse cardinal ligaments.
- (viii) Approximation of the vaginal fascia below the prolapsed bladder base—by straight transverse suture.
- (ix) Light approximation of the fibro-muscular tissue below the urethra.

- (x) Suture of the opposing cut edges of the vaginal wall.

After step (iii) two mattress sutures of No. 2 catgut or No. 0 silk are placed through each side of the vaginal wall so that the ends emerge on the deep surface of the flaps. These sutures are placed about $1\frac{1}{2}$ inches and 2 inches from the external meatus on each side and approximately $\frac{1}{4}$ inch from the edge to get a good grip of the vaginal wall without being too close to the lateral vaginal sulcus. After the anterior colporrhaphy is complete these vaginal fixation sutures will more nearly approximate.

I carried out the first 16 of these cases by using No. 2 catgut for the fixation sutures. In 2 cases at a second follow-up X-ray examination I noticed a slight sagging of the region of the urethro-vesical junction. In the remaining cases, therefore, I have used No. 0 silk for these sutures.

There is of course a contra-indication to the use of a non-absorbable suture which passes from the vagina to the region of the Cave of Retzius. In the cases of this series, however, there has been no trouble with sepsis in this respect. I would suggest that the main reasons for using silk are as follows:

- (i) This is an operation which has to be carried out in many obese subjects in whom the strain on the pelvic floor post-operatively is great. It is essential, therefore, that the fixation sutures remain firm for longer than the 12 days or so likely in the case of catgut.
- (ii) There are no silk knots protruding in the vagina. These sutures present only a 2 cm. length plain strand which must sink deeply in the vaginal wall as the result of the firm upward pull after the first few days. In fact it is not possible actually to see them after completion of the operation and it is probable that they are soon covered by epithelium. It is, however, preferable to run them initially through the whole thickness of the vaginal wall so as to make use of its total strength.

I feel, therefore, that silk is likely to give the better permanent result, particularly in obese subjects. I am, however, still using catgut in some cases for further tests in this respect.

The fixation sutures are then passed, one at a

time, through the levator ani from below. The suture nearer to the urethral meatus is passed first. This is done by threading the double suture through a straight needle, 4 inches long, the terminal third of which is bent at an angle of about 30 degrees. Through the supra-pubic incision the middle finger of the left hand palpates the medial border of the levator muscle as it leaves its origin from the inferior portion of the body of the pubes. The point of the straight needle, which is somewhat blunted, is introduced into the highest point of the para-urethral sulcus (farthest from the meatus), and, with its angular concavity facing inwards, and guided a little downwards and outwards its point readily contacts this finger tip above before perforating the pubo-vaginalis from below. During this procedure the bladder neck is retracted to the opposite side by the assistant. By moving to the side the exact point to pierce the muscle can be seen before doing so. The suture which has a firm wide hold through the total thickness of the vaginal wall thus travels through the pubo-vaginalis from below, approximately at about $\frac{3}{4}$ inch below and lateral to the midline. The second vaginal suture is passed if possible a little more posteriorly and more laterally, but only so as to pierce the portion of the muscle having origin at the pubes. The portion originating in the obturator fascia is too close to the side wall of the pelvis to respond to the uplift of the fixation. Similarly, in order to avoid the pudendal vessels in the region of the para-urethral sulcus the needle should avoid the bony margin as far as possible. Bleeding in my series has not been troublesome and can be controlled by the diathermy and by the sub-urethral bolster.

The colporrhaphy is now completed and the urethra is lightly bolstered by two transverse sutures including vaginal fascia and remnants of the muscular and tendinous elements derived from the inferior surfaces of the torn triangular ligament.

At this stage the gloves are changed for the vaginal sutures to be fixed supra-pubically.

The fixation area is to the region of the fibromuscular origin of the levator on the lower lateral surface of the pubic bone. This is effected by running both lengths of each suture separately through the fixation zone and tying as a close

mattress. I find that this mattress suture should be a close one in order to ensure a firm knot in this dense tissue. By this means a firm hold is obtained through the strong fibro-muscular tissue and moreover the tissues thus brought into apposition by these sutures are all of the same muscular and fibro-muscular type and of equal density. An area of bolstered vaginal wall is in this way brought up against the levator which in turn is lifted up from the points at which it has been perforated and is therefore folded up or plicated against its own origin and against its own tissues.

By this means the anterior aspect of the levator (pubo-vaginalis) which is included in the area of the sutures—some inch or so on each side—is lifted up and firmly fixed. These three tissues involved therefore being all of the same type can be expected to unite strongly and without tendency to separate during union (Plates D, E, F, G, H).

In a number of these cases one has observed that the pubo-vaginalis muscle of one side, usually the left, is thin and deficient as compared with the other side. In 3 of my cases the left levator was seen to have been torn off its origin and retracted in a bulbous fashion away from the bone. Again in other cases the muscle is thin and lacking in fibrous firmness, and in these the fixation has to be made at a slightly higher level.

Only occasionally bladder neck veins have to be ligatured and if some oozing occurs it may be as well to drain the Cave of Retzius with a thin rubber dam for 3 days. Alternatively the abdominal incision can now be closed without drainage.

On further inspection of the anterior vaginal wall it can be seen to what extent the area concerned has been elevated, beyond that degree to which it is possible with the colporrhaphy alone, but not abnormally so. The urethra now lies along the middle of a firm flat softly padded shelf which has been elevated to support it. The bladder neck also elevated to its normal plane rests infero-laterally on the soft cushion of the plicated pubo-vaginalis and the urethro-vesical junction assumes its normal position and relation. It cannot, therefore, descend on straining. The post-operative X-rays demonstrate this well. There is, however, no undue distortion of

the vagina. No kinking of the urethra is possible and no undue updrag on the bladder itself. The triangular ligament and its subsidiaries are functionally replaced by the bolstered vaginal wall. The stretched and attenuated pubo-vaginalis itself is elevated and strengthened. The bladder base also rests on the plane to which it was accustomed.

The trauma of labour has thus been repaired as far as anatomically possible (Plate J).

In those cases of my follow-up series, in which colporrhaphy has failed to cure the stress incontinence and the X-rays show a lost posterior urethro-vesical angle, the technique of the operation varies only in so far as the amount of vaginal wall to remove is now limited to that which will give adequate para-urethral access and a further degree of fibro-muscular support to the bladder base (Plate K).

In order to produce the good results, therefore, it is necessary both to support the bladder neck region from below and to elevate the upper urethra as far as possible by fixation. In this way the fixation takes the strain off the bolster and vice versa. Any operation which only does the one is likely to suffer the constant derogatory effects of failure to do the other.

The results of the operation in the new series are as follows:

In 35 cases of prolapse with stress incontinence and positive cysto-urethrography operated upon by the modified colporrhaphy there were 35 clinical cures of prolapse, 32 symptomatic cures of stress incontinence, 32 anatomical cures of stress incontinence. The 3 cases not showing a complete cure were all very obese. A symptomatic and anatomical improvement was, however, shown.

In the new series approximately 38 per cent of all cases complained of some degree of stress incontinence. Of this number about one-third showed a gross positive X-ray and modified colporrhaphy was carried out in the majority of these. One might say, therefore, that this operation is indicated in about one-third of those who complained of stress incontinence or in about 13 per cent of all cases.

In order to obtain the immediate anatomical results of this operation I have asked the X-ray Department to carry out the post-operative

cysto-urethrograph at 1-4 months in these cases. Another taken at 2 years would give the remote or probable permanent result. In the immediate results the most interesting fact is the extraordinarily accurate return to the normal posterior urethro-vesical angulation which is often present. In most of these cases this junction has been elevated and a posterior angle approximating to the normal has been reproduced. This is associated with a return to the normal length and straightness of the bladder base, and there is no kinking or other abnormal outline formed. On straining there is no abnormal descent.

The vagina which is smeared (but not packed) with barium shows elevation but no gross distortion. These results, therefore, show a fair return to the normal configuration.

I cannot think that the almost perfect posterior urethro-vesical angle which results in many of these cases is due to actual tissue which is put there by operation. Rather more it is likely that the tone of the intrinsic muscles of this region returns as the result of the elevation of the upper urethra produced by the operation (Figs. 17, 18).

It would appear, therefore, that this combined operation is indicated as an initial procedure particularly in the severe cases which exhibit a gross loss of posterior urethro-vesical angulation in conjunction with gross rotational descent of the upper urethra.

It must be remembered, however, that these satisfactory results are represented by the immediate X-ray verification. Time must elapse, say 2 years, before the end result can be assessed. One feels, however, that the firmness of the healing by this technique should be adequate to the occasion just as the immediate relief of the symptoms tends to suggest that it will be.

In the follow-up series there were 44 cases which exhibited clinical-anatomical failure for cure of the stress incontinence factor. To date I have operated upon 10 of these by the combined operation. These have had the immediate (3 months) cystogram. In these there are 9 clinical cures and 9 anatomical cures.

The immediate results in these post-colporrhaphy cases, therefore, also appear to be satisfactory.

In my view cases for modified colporrhaphy should be chosen for operation on a basis of:

- (i) The age of the patient. I think that 55 years of age should in the average type approximate to the limit in this group.
- (ii) The severity of the symptoms.
- (iii) The type of patient. Obesity should not constitute an absolute contraindication as very many of these patients are obese subjects and these again are the ones most likely to offset the effects of a pure colporrhaphy.
- (iv) A cysto-urethrograph which, in addition to a gross loss of posterior angulation, shows a marked degree of downward rotational descent of the upper urethra and consequent downward displacement of the urethro-vesical junction constitutes a definite indication for this operation.

SUMMARY

In this enquiry I have endeavoured to clarify the position of the Manchester Colporrhaphy (with urethral bolster), in the treatment of uterine prolapse complicated by stress incontinence.

The additional operative procedure—modified colporrhaphy—is a sequel to this investigation.

Briefly the main conclusions are as follows:

- (i) I have considered that the intrinsic muscles which probably maintain the posterior urethro-vesical angle are assisted to a vital extent by the supporting and controlling effect of supero-lateral tendinous supports and indirect infero-lateral muscle supports to the upper urethra. Trauma to these tissues resulting from labour affects the integrity of these structures and predisposes to stress incontinence.
- (ii) The Manchester Colporrhaphy is capable of producing a cure of stress incontinence with prolapse, but probably only in cases which are anatomically favourable.
- (iii) A follow-up of 209 cases showed that 32 out of 83 cases of stress incontinence were cured after 2 or more years.
- (iv) A new series of 10 cases of prolapse with stress incontinence showed that 4 out of 10 cases were symptomatically and anatomically cured at 3 months by colporrhaphy alone and that 32 out of 35 cases

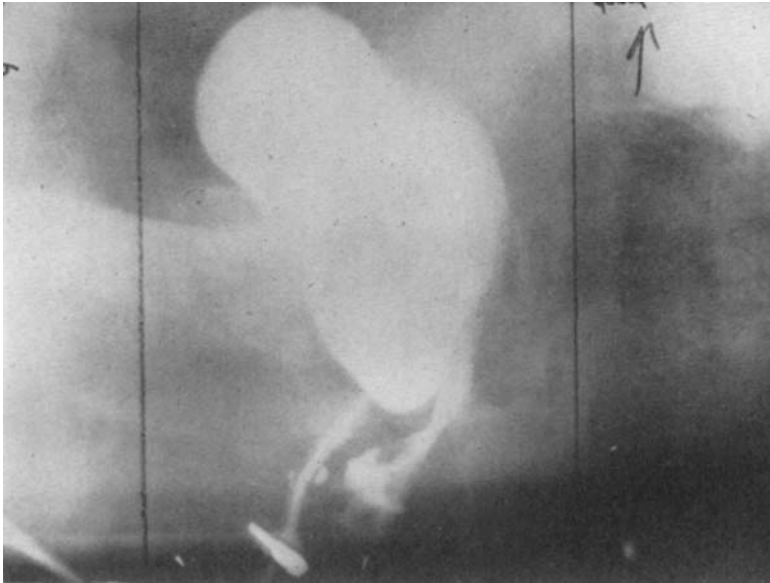


FIG. 1

Mrs. H.—Follow-up Series.

Symptomatic and anatomical cure by colporrhaphy (2 years), 29 similar cases.

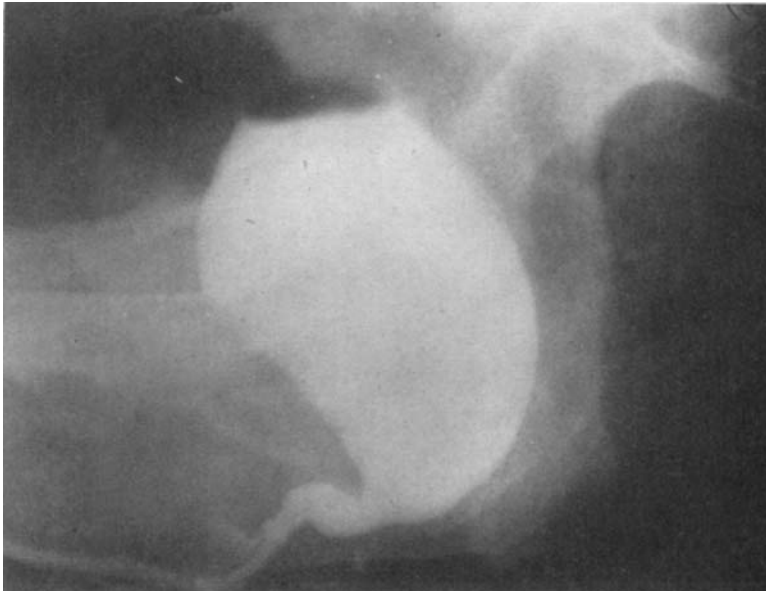


FIG. 2

Mrs. S.—Follow-up Series.

Symptomatic and anatomical failure after colporrhaphy (2 years), 34 similar cases.

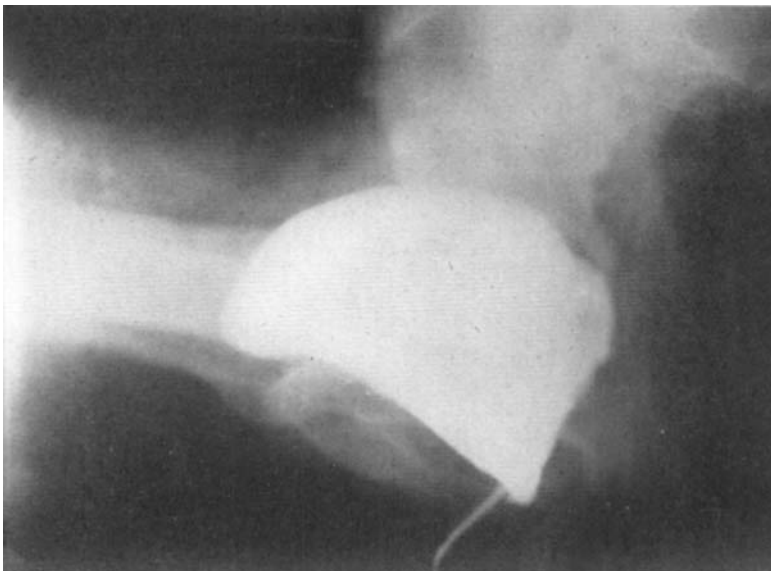


FIG. 3

Mrs. B.—Follow-up Series.

Symptomatic part cure after colporrhaphy (3 years).

The short posterior angle and marked uplift of the bladder base are present in a number of these cases and are probably an effect produced by what remains of a scarred bolster. The well supported upper urethra assists in the part cure.

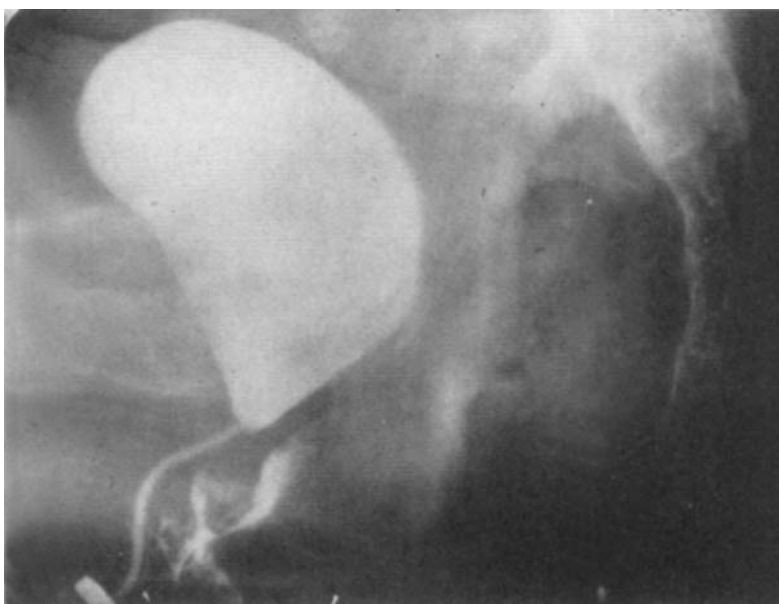


FIG. 4

Mrs. P.—Control Series.

A good result with colporrhaphy only.

Before colporrhaphy the picture agrees with the presence of stress incontinence, but there is no gross descent of the upper urethra before operation.

K.V.B.

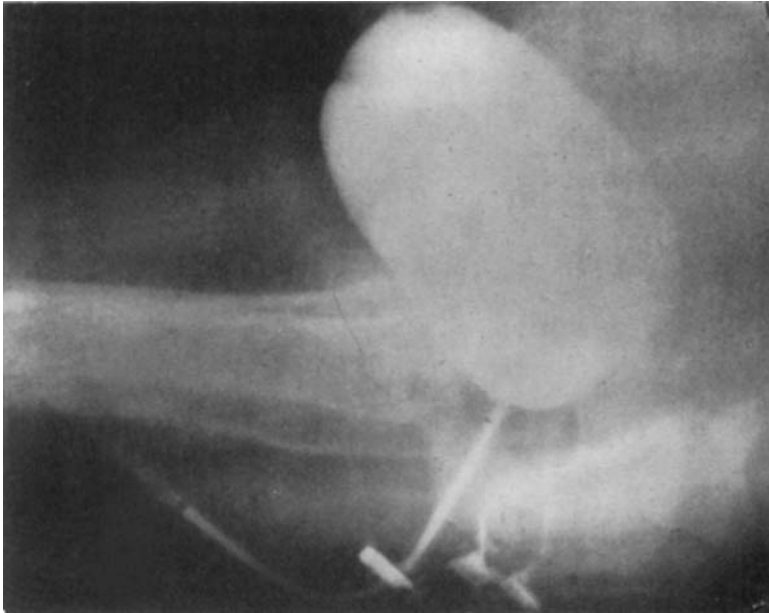


FIG. 5

After operation the posterior urethro-vesical angle is well restored by the bolster.
A suitable case for colporrhaphy only.

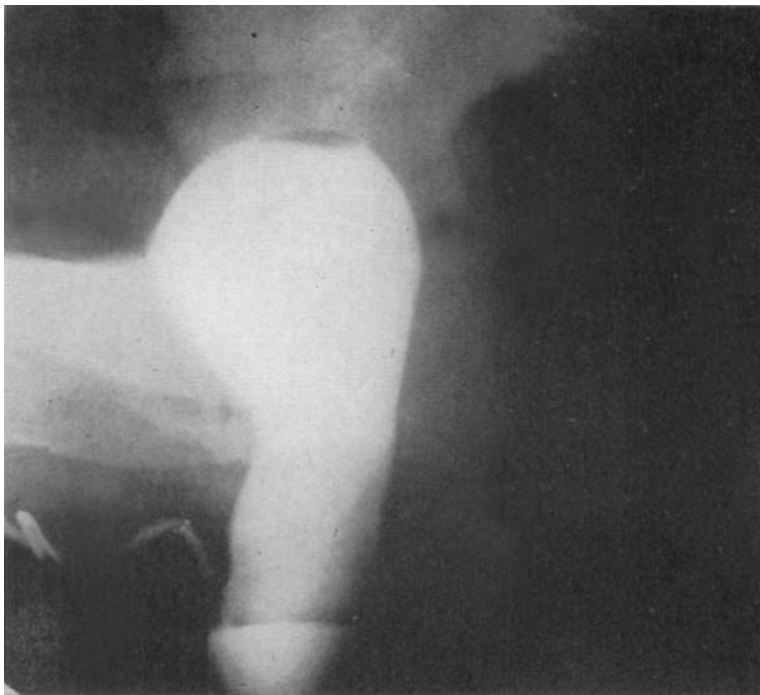


FIG. 6

Mrs. S.—Control Series.

A symptomatic part cure with colporrhaphy only.
Before colporrhaphy there is a gross descent of the upper urethra which enters
the cystocele at an obtuse angle.
K.V.B.

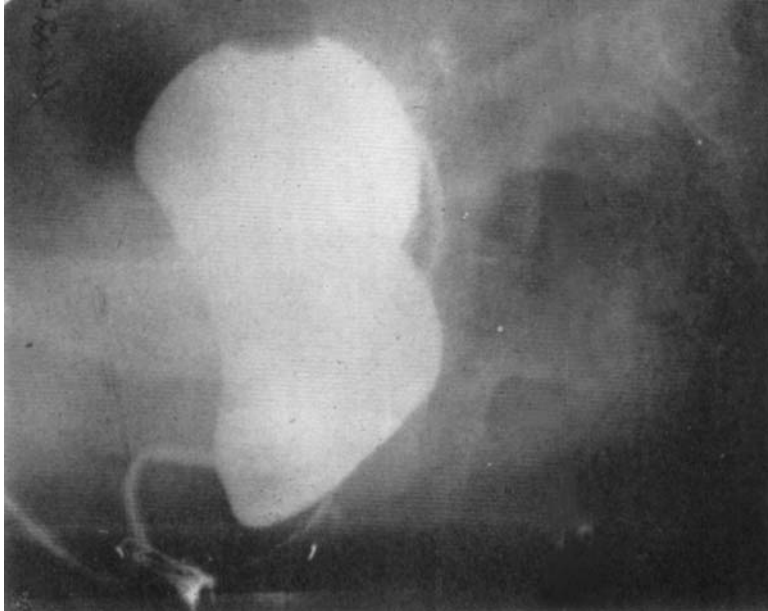


FIG. 7
Mrs. S.

After colporrhaphy the urethro-vesical angle is largely restored by the bolster, but there is still an abnormal degree of rotational descent of the upper urethra. This patient's symptoms are improved but she is obese. Will the bolster hold?
Probably a bad case for colporrhaphy only.

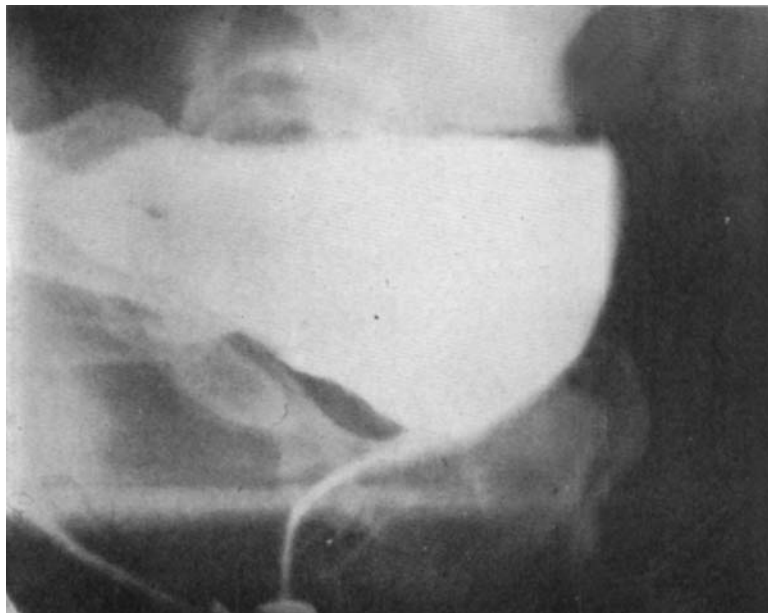


FIG. 8
Mrs. C.—Control Series.

A part cure with colporrhaphy only.

Before colporrhaphy the picture agrees with the presence of stress incontinence.
K.V.B.

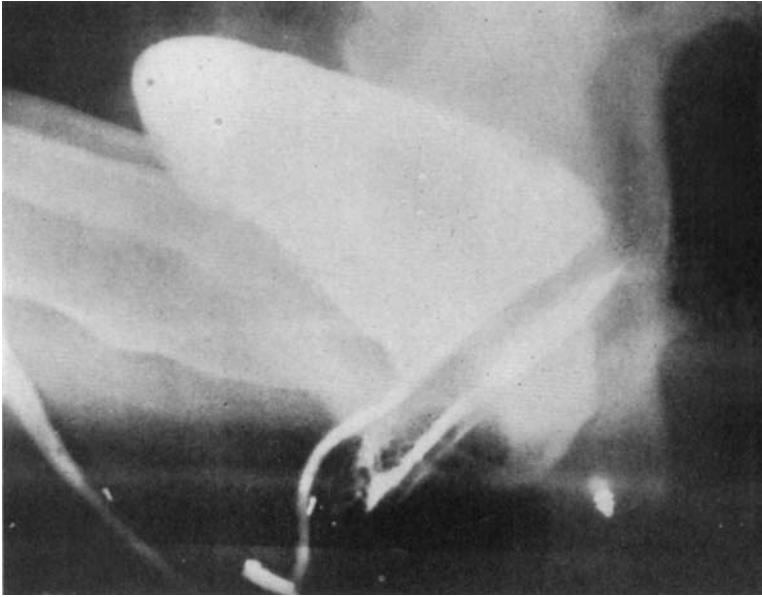


FIG. 9

After colporrhaphy there is a decided uplift to the bladder base but a failure to restore the posterior urethro-vesical angle.
This patient is better but not cured.

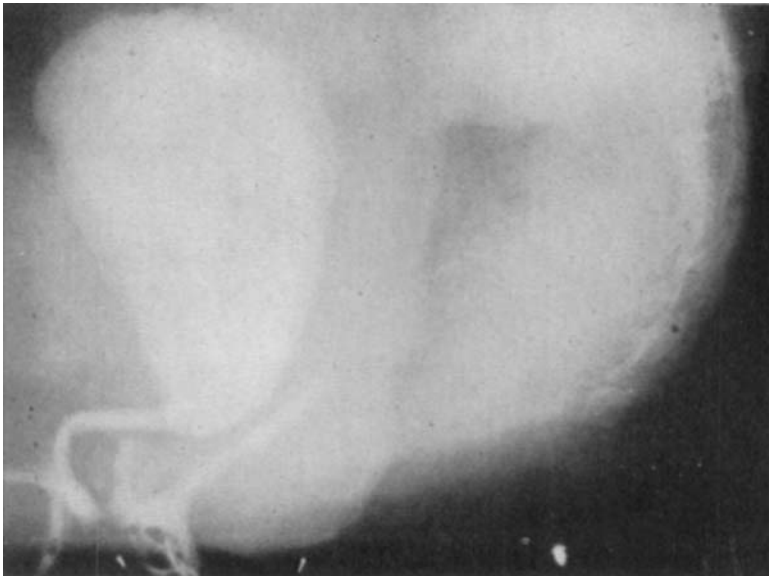


FIG. 10

Mrs. E.

Failure with colporrhaphy.

Before colporrhaphy the picture agrees with the presence of stress incontinence.

K.V.B.

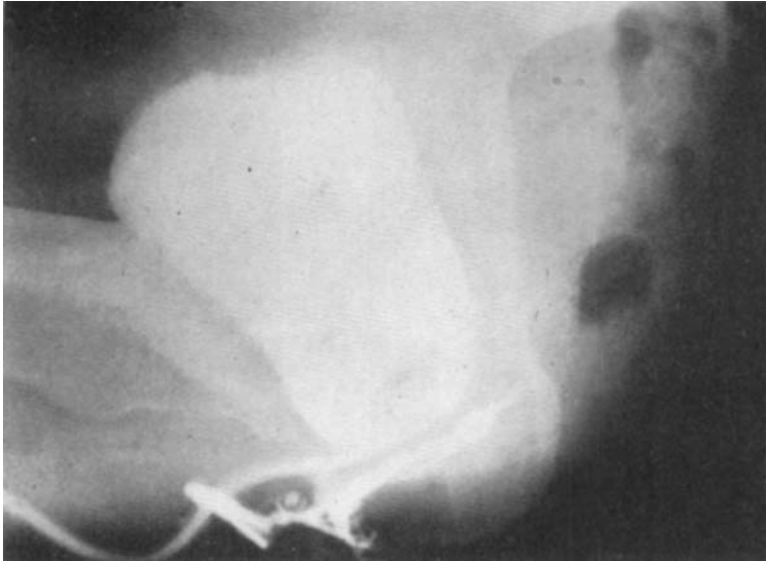


FIG. 11

After colporrhaphy there is no marked improvement. This is unusual as the bolster generally produces some degree of uplift.

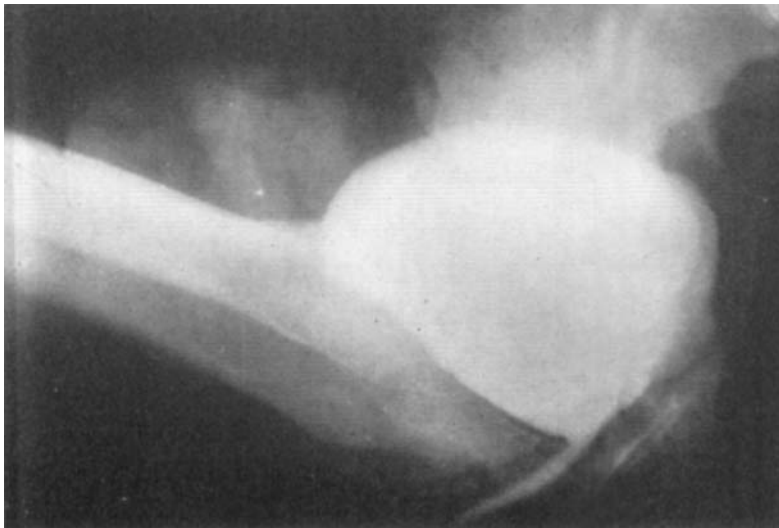


FIG. 12

Mrs. B.

Loss of posterior urethro-vesical angle with a normal ascent of the upper urethra and little descent. Adequate supero-lateral supports. (Compare Fig. 8.)

K.V.B.

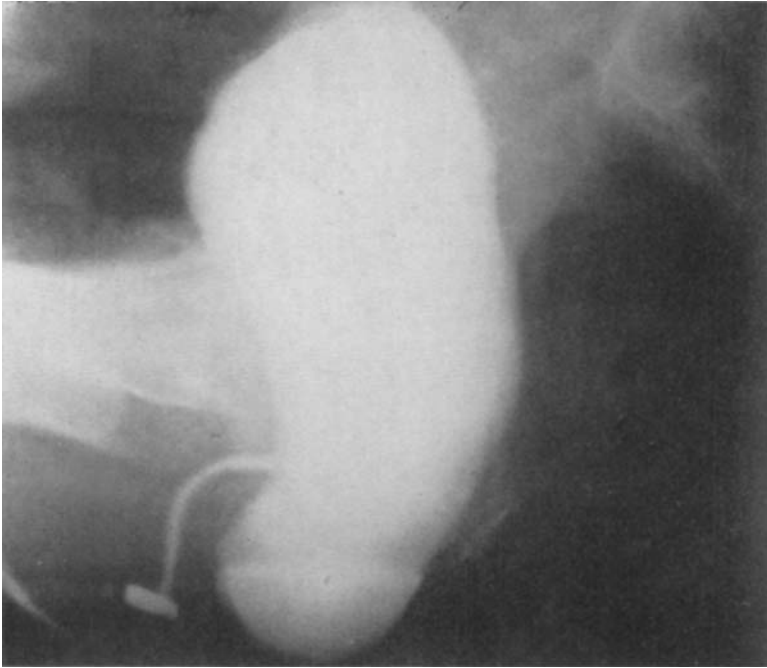


FIG. 13
Mrs. T.

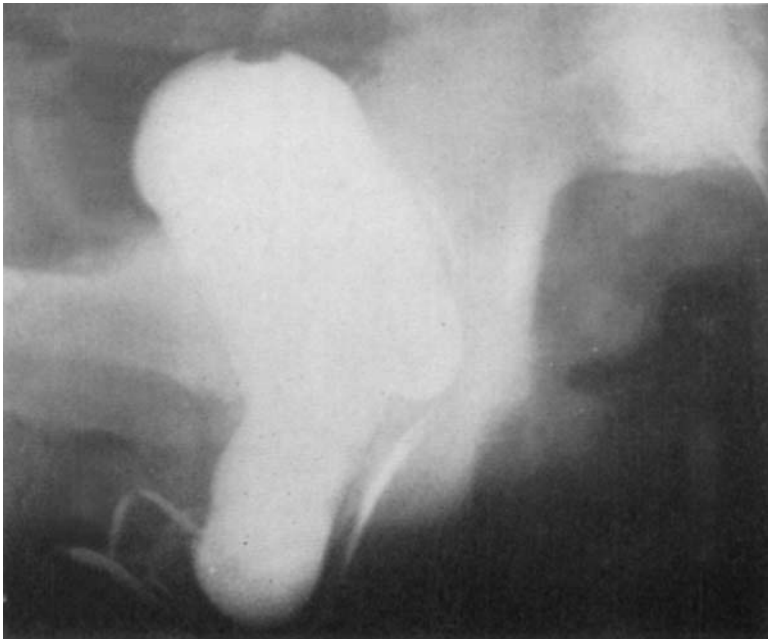


FIG. 14
Mrs. V.

K.V.B.

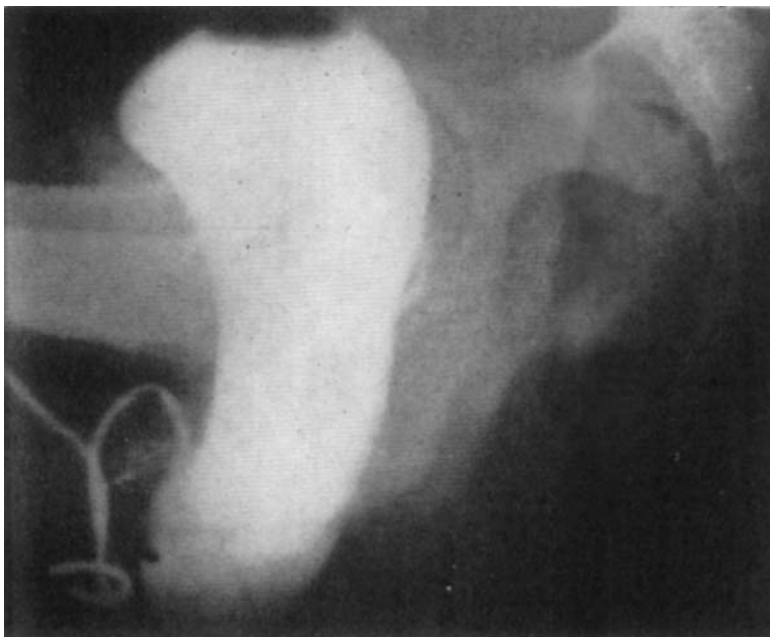


FIG. 15

Mrs. H.

Degrees of downward rotational descent of the upper urethra. In Figs. 13 and 14 the urethro-vesical angle is still normal but in Fig. 15 it has become obtuse. Inadequate supero-lateral supports with increasing inadequacy of the infero-lateral supports. (Compare Fig. 6.)

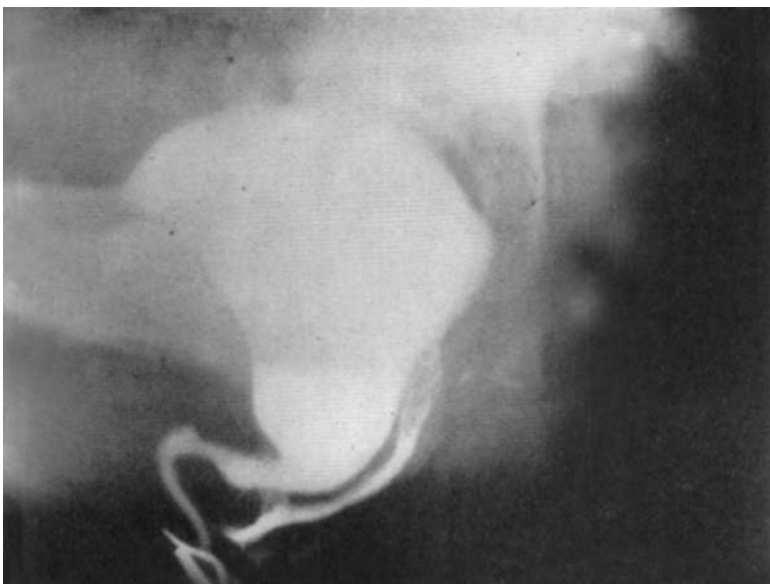


FIG. 16

Mrs. W.

Gross inadequacy of all supports.

K.V.B.

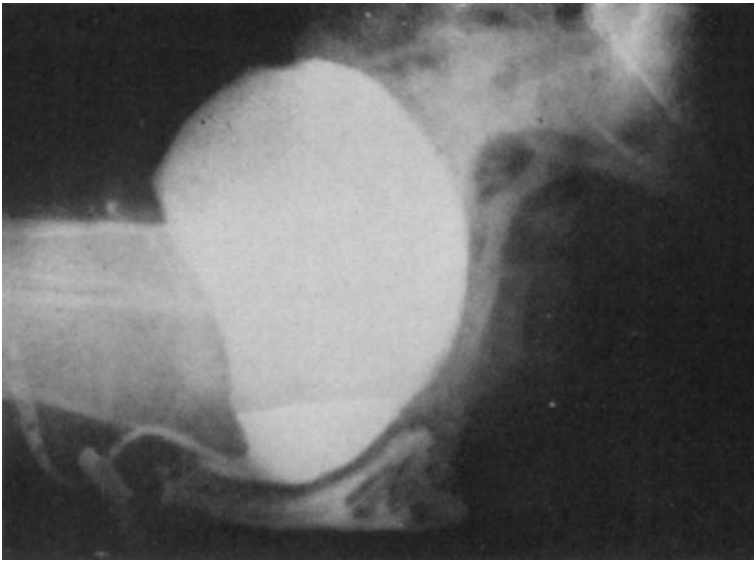


FIG. 17

Mrs. S.

Before colporrhaphy fixation the film shows gross descent with loss of angulation on straining.

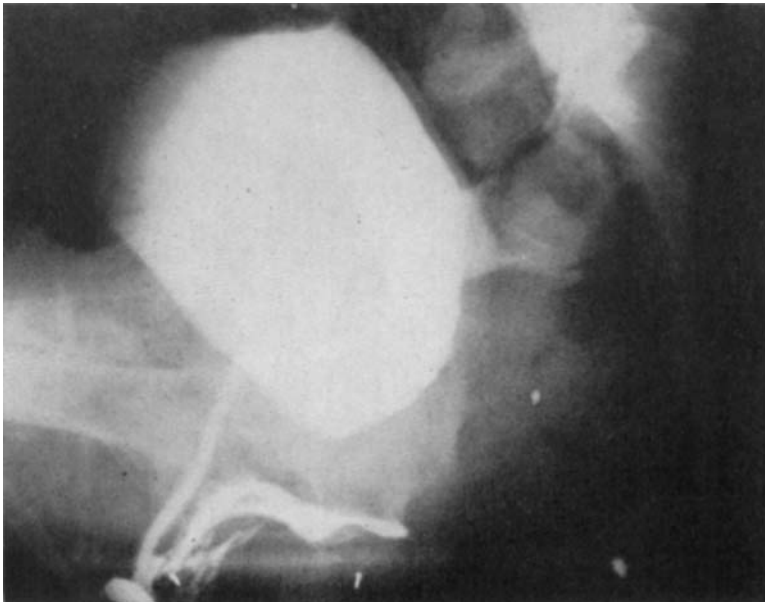


FIG. 18

After colporrhaphy fixation the posterior urethro-vesical angle is restored and the upper urethra is elevated.

K.V.B.



PLATE A

Dissection of the region of the bladder showing the short supero-lateral fascial extensions from the pubo-coccygeus to the upper and lateral aspects of the bladder neck.

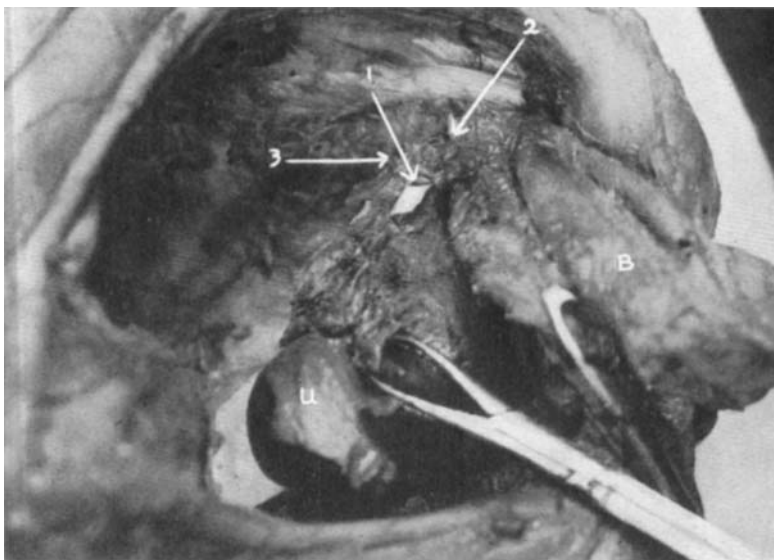


PLATE B

The infero-lateral aspect of the bladder neck showing muscle elements extending between the pubo-coccygei to the antero-lateral surface of the vaginal wall and thence upwards to the infero-lateral aspect of the bladder.

1. The marker shows the position of the vaginal fault.
2. Muscular extensions to vaginal wall and bladder neck.
3. Position of pubo-coccygeus.

K.V.B.

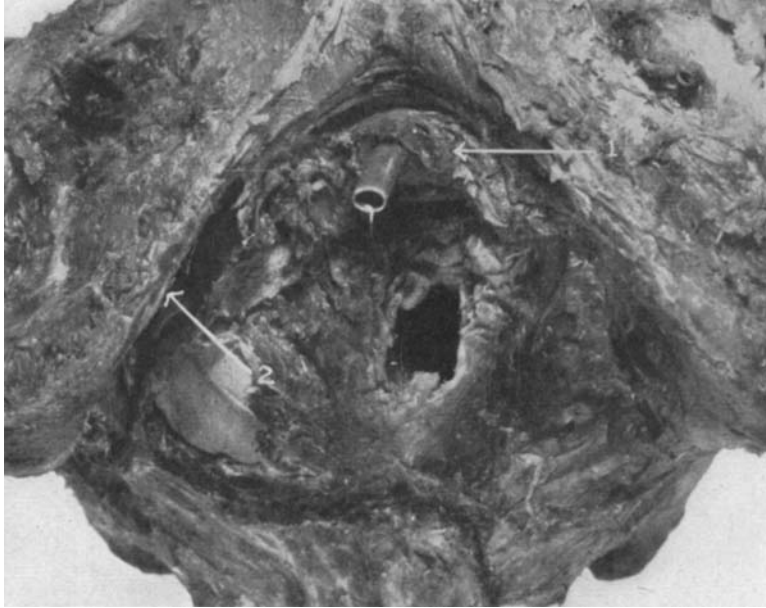


PLATE C

Perineal view showing the position of the triangular ligament and distal urethra supports. The course of the pudental vessels is also shown.
1. Triangular ligament. 2. Pudental vessels.

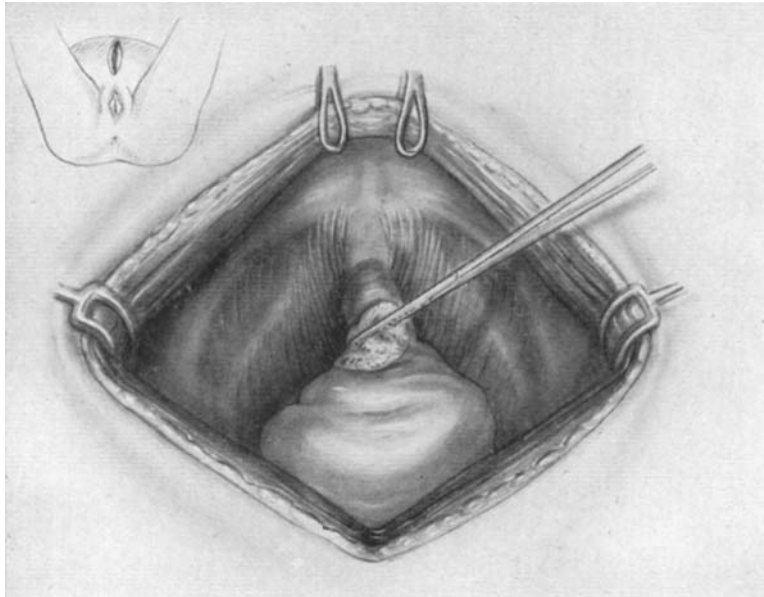


PLATE D

Stage 1 in combined colporrhaphy fixation.

K.V.B.

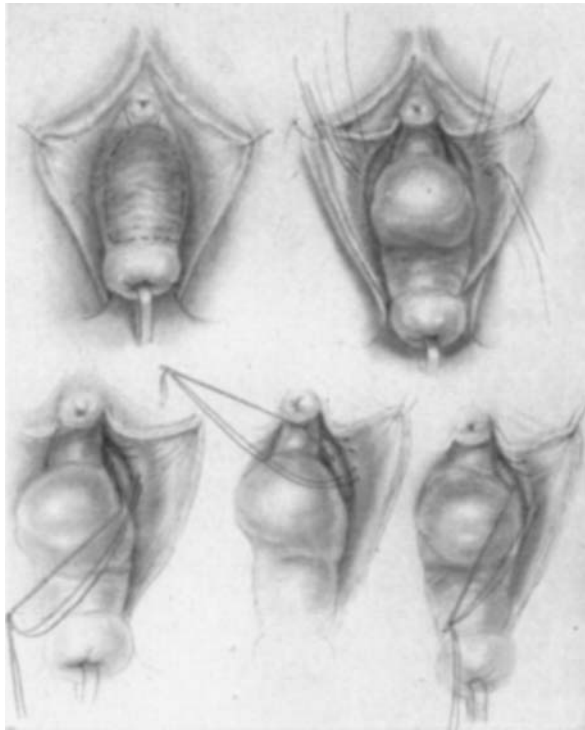


PLATE E
 Stage 2 in combined colporrhaphy fixation.

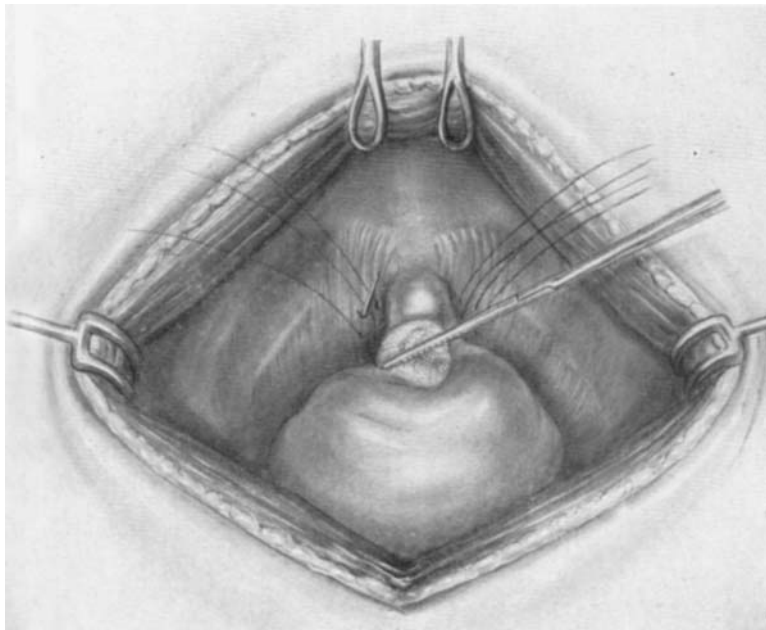


PLATE F
 Stage 3 in combined colporrhaphy fixation.
 Fixation sutures penetrating pubo-vaginalis.

K.V.B.

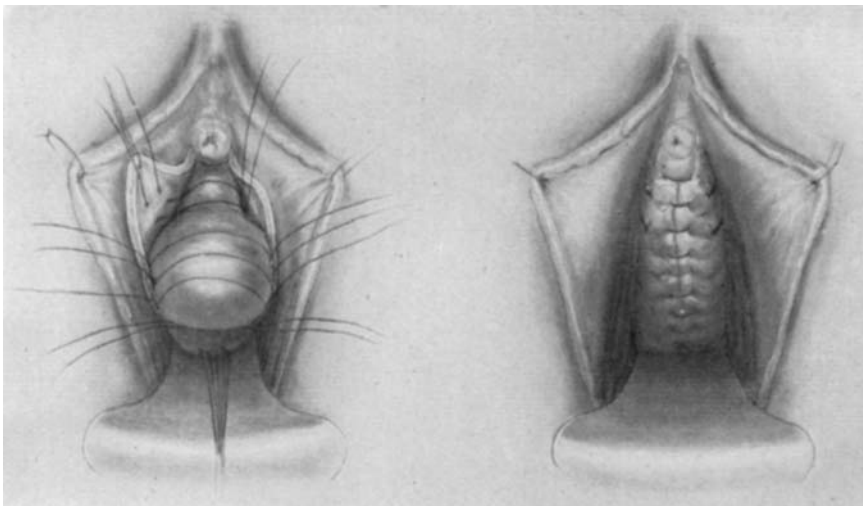


PLATE G

Stage 4.—The cervix has now been amputated.

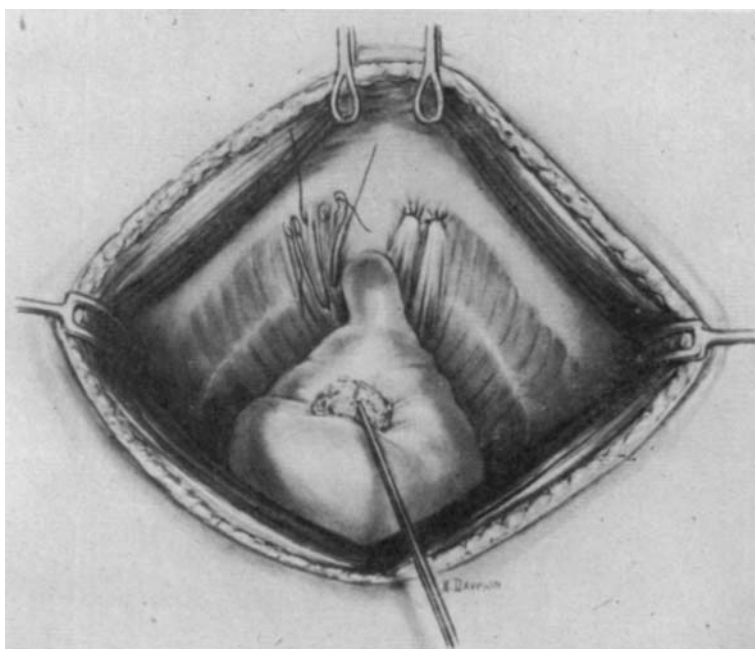


PLATE H

Stage 5.—The fixation is to the origin of the pubo-vaginalis muscles on each side.

K.V.B.

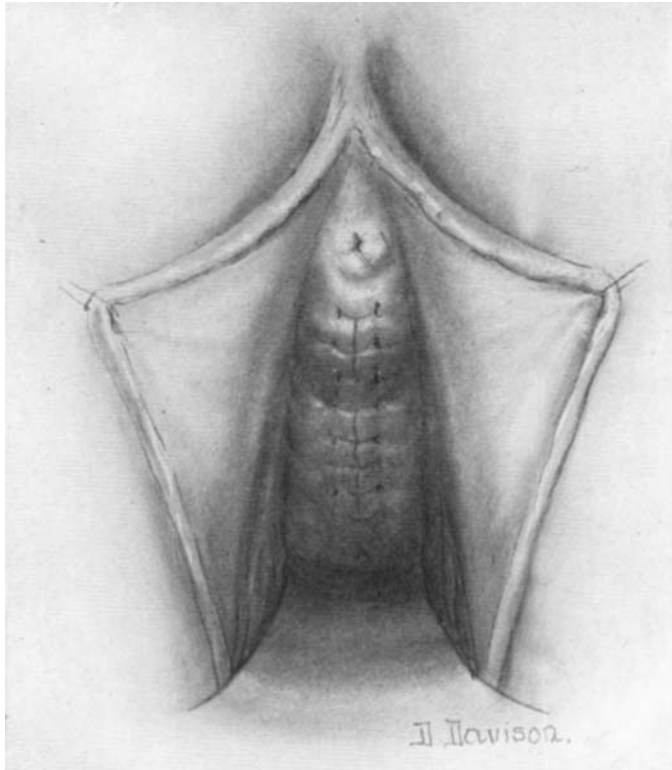


PLATE J
Stage 6.—The end result.

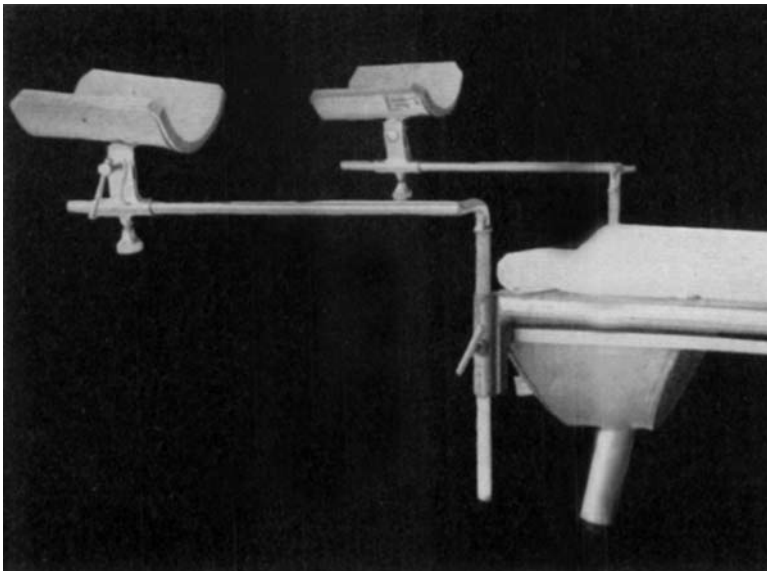


PLATE K
The modified lithotomy position.
The modified Manchester colporrhaphy.
This gives improved abdominal access with only slight limitation of the vaginal approach.
K.V.B.

were symptomatically and anatomically cured by modified colporrhaphy.

- (v) It is possible to assess with fair accuracy before operation which cases are likely to be cured by colporrhaphy alone. An attempt has been made to assess the degree of suitability of cases for colporrhaphy and modified colporrhaphy. The modified colporrhaphy is particularly indicated where there is gross rotational descent of the upper urethra in conjunction with loss of the posterior urethro-vesical angle.
- (vi) The modified colporrhaphy operation is shown to be capable of restoring with fair accuracy the normal configuration of the bladder base and posterior urethro-vesical junction. This must constitute strong evidence that the posterior urethro-vesical angle is sustained at any rate in the normal way by the structural support of tissues described.
- (vii) The modified colporrhaphy is indicated in approximately one-third of cases who complain of stress incontinence or in about 13 per cent of all cases.
- (viii) The Manchester Colporrhaphy by curing the uterine prolapse, the cystocele and strengthening the pelvic floor, is a necessary adjunct to any operation for the support of the bladder neck zone. Without it the result would be likely to be temporary. The colporrhaphy, therefore, must remain the basis of all operations for pelvic floor trauma.
- (ix) All cases of uterine prolapse in which stress incontinence is complained of should be submitted to a pre-operative investigation which includes cysto-urethrography.

Apart from my tribute to the initial work of Malpas, Jeffcoate and Roberts, without which this clinical investigation could not have been carried out, I wish to record my grateful thanks to Dr. Hartley, Dr. Rowley and the staff of the X-ray Department of Saint Mary's Hospitals for the excellent and painstaking technical work they have conducted, and their whole-hearted collaboration. I am also indebted to Mr. D. S. Poole-Wilson and Dr. G. Smyth for their help in the urological and neurological investigation of certain atypical cases. I am grateful also to Professor Mitchell for his help and guidance in the anatomical work. I also wish to thank my Registrar, Dr. Grayburn, and House Surgeons, Drs. Mathie, Dutton and Kramer for their diligent co-operation.

My thanks are also due to Dr. R. Ollerenshaw, Miss Davidson and Mr. Howarth, for the photography and illustrations.

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