months. Control was exercised by observing any spontaneous change in the neighbouring unstretched groups in each patient. Hypertonus was abolished in all the treated flexor groups. Voluntary flexion was not impaired except in one case. The antagonist muscles achieved an increased power and range of movement in most cases. No lasting spontaneous change occurred in any of the control muscle groups.

Ten patients still survive. Of these, six have retained the above features in all of nine stretched muscle groups and their antagonists during an average period of 58 weeks since stretch was stopped. Six muscle groups in four patients have reverted to their original state in a similar time. The factors which may be responsible for this variable response are suggested.

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CONDITION OF TESTICLE AFTER DIVISION OF CORD IN TREATMENT OF HERNIA

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In large, indirect, long-standing hernias, in sliding hernias, and in frequently recurrent hernias orchidectomy has been recommended (Koontz, 1956; Aird, 1957). Dodd (1951) advised orchidectomy in men over the age of 70 in certain cases. Some of the patients who have undergone repair with no relief agree to the removal of the testis, though most of them are not willing to part with the organ. When the objections for removal of the testis were taken into consideration division of the cord at the internal ring without removal of the testis was contemplated. This technique, it was believed, would correct a defect inherent in all the standard primary operations for inguinal hernia and would give the same benefits of structural repair as could be expected after orchidectomy. The defect is due to the necessity for leaving an opening in the repaired tissue to allow a space for emergence of the spermatic cord.

Twenty-seven patients over 35 years of age were operated upon for inguinal hernia with the present technique. The youngest was 38 and the oldest 72, and the first case was operated on in September, 1952. Of these 27 hernias, 18 were on the right side and 9 on the left. Case 19 was direct hernia. Case 5 was operated on for recurrent hernia. No case of strangulated hernia was treated with this method.

Operative Technique

It is not proposed to give details of a standard procedure. The usual incision was made and the hernial sac exposed, separated, and excised at the internal abdominal ring. The cremasteric and the other areolar and adipose tissue were thoroughly cleaned out of the inguinal canal. At the internal ring the vas was ligated and cut, and the rest of the cord structures were transfixed and doubly ligated with linen or thread and cut. The portion in the canal was excised and the distal portion treated similarly. The proximal part of the cord stump was pushed back and the internal ring closed. It is imperative that the testis and the rest of the cord are not disturbed. The transversalis fascia was strengthened by reduplication or tautening the fascia by suturing it to the inguinal ligament with non-absorbable sutures. No tension was put on it, or it would give way and the original purpose of strengthening the area would be lost. The musculo-tendinous part of the conjoint tendon was sutured to the inguinal ligament only if it could be easily brought down and stitched without tension: if the arching is pronounced it cannot be brought down and sutured. Particular attention was paid in reinforcing the medial part of the canal. The external oblique should be sutured preferably with non-absorbable material, though in the present series catgut was used. The external ring was also closed, leaving the cord outside. Gentle handling of the tissues, great care in haemostasis, and rigid asepsis need not be emphasized to any surgeon, as a haematoma and infection are the major causes of failure and the viability of the testis remains in jeopardy.

The post-operative use of antibiotics helps to prevent infection and greatly lessens the chances of testicular complications after excision of the cord.

Post-operatively, a scrotal support is useful in minimizing scrotal and testicular pain.

It should be emphasized that cutting the cord is not an operative procedure *per se*, but, as already mentioned, is one way of eliminating obstruction to the proper repair of the defect in the groin.

Results

There was no post-operative death in this series, and none of the cases showed any pyrexial reaction.

Wounds.—None of these cases showed a severe degree of sepsis; on the contrary, the wounds healed as one would expect after an ordinary standard repair of a hernia. In only two cases (Nos. 5 and 26) was there wound infection, as shown below.

Case 5.—This patient developed slight infection in the wound. His blood Kahn test was positive. He was about 55 years at the time of operation. As usual, catgut was used for the external oblique only. A testicular biopsy was taken four years later.

Case 26.—This patient attended hospital for obstructed hernia with retention of urine. The hernia was reduced by conservative treatment. He had a marked enlargement of the prostate. After prostatectomy he was discharged from the hospital, and told to return a fortnight later for repair of the hernia. In the meantime it became irreducible and he was readmitted. With rest, the hernia was reduced and he was operated on with the above-mentioned technique. Infection developed in the wound. Within six months of operation he had a recurrence. The biopsy of the testis was taken six months after operation. This case stresses again that infection is the chief factor which causes adequately repaired tissues to disrupt and bring about a recurrence.

Hernias.—The follow-up study of any operation in India, and especially in the rural localities, is very difficult; yet most of these cases had no recurrence for more than three years. Only one case has shown recurrence up till now.

The Testis

After excision of the cord from the inguinal canal the condition of the testis was kept under observation during the post-operative period. Only two cases showed a slight enlargement and in each it subsided within a fortnight. In these, atrophy was kept in mind, but no such condition was detected. In most of the cases there was no clinical alteration in size.

It is a difficult task to examine the testis after a certain lapse of time since the operation, as most of these patients are unwilling to participate in a follow-up study, let alone to allow a testicular biopsy to be taken, especially when there is no hernia or other symptoms. As none of the testes developed complications the question of removing them did not arise, and therefore it is not known whether any pathological condition existed after the repair. For comparative and histological study, biopsies of the testis of the hernia patients who had undergone operation were undertaken after a sufficient interval since the repair.

Normally in man, although spermatogenesis continues far into the senile period, the seminiferous tubules undergo gradual involution with advancing age. The testis of a man over 35 years will show scattered atrophic changes in the tubules; in the remaining parts of the gland the spermatogenesis will continue without

visible alteration. The tubules in very old persons are sometimes depleted of spermatogenic cells and contain only atrophic Sertoli cells (Maximow and Bloom, 1957).

The textbooks usually show the pictures and photomicrographs of adults below 30 years, but the

FIG. 1.—Testicular biopsy in Case 5, four years after division of spermatic cord. Seminiferous tubules are depleted of spermatogenic cells. Prominence of islands of Leydig cells in interstitial spaces and absence of interstitial fibrosis are shown.

FIG. 2.—Testicular biopsy in Case 3, four years after division of spermatic cord. Except for decreased density of spermatogenic cells, structure is almost normal.

FIG. 3.—Testicular biopsy in Case 11, three and a half years after division of cord. Foamy appearance of spermatogenic cells without any fibrosis. It may be called an initial stage of atrophy.

example illustrated by Fig. 5 shows the histological picture of a testis of a man aged 55 who had had a hernia for a few years. A biopsy was made when he underwent the primary repair. The structure can be called usual, and consistent with his age.

The important point in the present operative procedure is the viability and structure of the testis. It was imperative, therefore, that a histological study of the organ should be made both in patients who had no complications and in those who had wound infection.

Testicular biopsies were made in seven cases. In Case 5 (Fig. 1) the seminiferous tubules were depleted of spermatogenic cells. Sertoli cells were represented by deeply stained nuclei on the inner aspect of the basement membrane. The interstitial space was prominent owing to islands of Leydig cells and absence of interstitial fibrosis. There was no hyalinization or thickening of the basement membrane.

In Case 3 (Fig. 2) the biopsy was taken four years after division of the spermatic cord. Histologically it revealed decreased numbers of seminiferous tubules, which showed diminished density of spermatogenic cells. There was no hyalinization or interstitial fibrosis.

In Case 11 (Fig. 3) the biopsy was taken three and a half years after division of the cord. The number of seminiferous tubules was not diminished. The spermatogenic cells resembled large foamy polygonal

cells. This may be called an initial stage of atrophy; but fibrosis, which forms the basis of atrophy of specialized structures, could not be detected.

In Case 26 the biopsy was taken eight months after the operation. Histologically, the tubules showed normal cellularity and spermatogenesis. As stated above, this patient's wound had undergone sepsis. In spite of this the testicular structure did not suffer in viability.

In Case 18 the biopsy was taken two and a half years after the operation. The structure (Fig. 4) is seen to be almost normal.

For comparison testicular biopsy was taken of a man suffering from a hernia who was operated on two years previously with a standard procedure (Fig. 5). The structure was similar in appearance to Figs. 3 and 4.

In general, in most of these cases where a biopsy was taken the testis showed slight dilatation and a diminution in the number of seminiferous tubules. The structural architecture is not dissimilar to that of the testis consistent with the patients' age. This proves beyond doubt that the viability of the testis does not suffer in any way in spite of division of the cord. It could be said that after section of the spermatic cord—that is, in spite of the vascular supply of the testis being cut off in the inguinal canal—the testis survives. This viability depends upon whether the arterial anastomotic system is sufficient for the testis to maintain its structure and function. Of course, the cord being transected, the external secretion does not get a chance to flow out owing to division of the vas. As this may be done only on one side, this operation does not interfere with the function of reproduction. One patient (Case 3) had two children after the operation—one in 1954 and another in 1956. In most cases of advanced age the external secretion is not of much importance to them for obvious reasons.

Comment

Experience of previous work on this subject has shown that the proportion of cases of gangrene and atrophy was high. Burdick and Higinbotham (1935) described the results of repair of 200 inguinal hernias of various types, including 59 recurrent ones, using complete division of the cord. In 33 cases (17.5%) wounds became infected, and necrosis of the testis in four cases necessitated orchidectomy. There were six post-operative deaths. Follow-up examinations were made in 169 cases. Eleven of these showed slight atrophy of the testis and 11 others showed atrophy to one-half the normal size or less. Twenty hernias (14 in the recurrent groups) recurred.

Neuhof and Mencher (1940) reported that 6 out of 19 cases had atrophy.

Heifetz and Goldfarb (1952) showed from their experimental work on dogs that division of spermatic cords at the various levels within the inguinal canal did not result in gangrene or necrosis of the testis, although some degeneration of the tubules and spermatogenic cells occurred. Paradoxically, when the ductus and its artery were preserved after division of the rest of the cord structure, the testis atrophied completely.

The results of division of the cord in their series produced moderate swelling of the testis in the immediate post-operative period. But after a few weeks the organ usually returned to its pre-operative size. The histological study of only two cases was available. The

FIG. 4.—Testicular biopsy in Case 18, two and a half years after division of cord. The tubules are structurally normal.

FIG. 5.—Testicular biopsy two years after operation of repair with standard procedure without division of spermatic cord (for comparison). The structure is identical with that in Figs. 3 and 4.

testicular swelling probably suggests a certain amount of damage to the testicular structure though not sufficient to cause complete atrophy.

Summary

Histological proof is given that division of the spermatic cord can be done safely in repair of inguinal hernia. This procedure may be suitable in the indirect inguinal hernias of adults, and especially after the age of 35–40 years during the primary repair, as well as in recurrent hernias. With the present use of antibiotics the incidence of atrophy could be minimized and gangrene be prevented.

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SURGERY IN THE ALLEVIATION OF DYSpareunia*

BY

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According to the Greek derivation, the term "dyspareunia" means badly mated and implies difficult or painful coitus in the woman. For purposes of discussing the place of surgery in the management of this condition, the various anatomical and pathological states which may be causative factors fall into the following classification: (a) *Congenital*: (1) thickened undilatable hymen, (2) vaginal septa—transverse or sagittal, (3) hypoplasia of the introitus. (b) *Acquired*: (1) surgical operations, (2) retroversion of the uterus, (3) endometriosis, (4) chronic infection.

These various conditions may be the sole problem in the individual case, but their proper surgical correction is essential also in the patient who is seriously disturbed emotionally, as little progress will be made in this respect should any of these conditions remain as an underlying factor in a psychic disturbance.

Congenital

Thickened Undilatable Hymen.—Everyone is familiar with the undilatable hymen and its varying degree of toughness and resistance. Its dilatation or single or multiple incision, usually under local anaesthesia, presents no surgical problem. There may be a problem, however, in determining the most suitable time for the performance of the operation, as in the case of the young woman who has presented herself for a premarital examination, during the course of which this condition was noted. It might be well to bear in mind that, though eventually very necessary, surgical intervention at this particular time might not be properly appreciated.

Vaginal Septa.—Congenital vaginal septa may be transverse, usually situated in the middle third, thus

dividing the vagina into an upper and lower pouch with a communicating central orifice of varying size. If the septum is thin it may simply be excised. However, as is often the case, it is thick and made up of two layers of full-thickness vaginal wall, and one usually finds that the upper pouch is much shortened. Two midline radial incisions are made from the central opening to the vaginal wall, one anteriorly and the other posteriorly, and the two layers of the septum now are evident. By separating these two layers one finds that the vagina is lengthened to normal and that two radial incisions have now become two linear incisions, one on the anterior vaginal wall and one on the posterior; when these are approximated by suture, a normal vaginal pouch results. The sagittal septum is associated with the presence of a complete double uterus and may rarely be responsible for difficult or painful coitus. This septum is also a double layer of vaginal wall and should not be totally excised, as this may very well narrow the vagina, but should be incised throughout its length in the vaginal axis. The two layers separate readily, and the resulting anterior and posterior incisions may then be sutured, thus forming a single adequate vagina.

Hypoplasia of the Introitus.—A poorly developed and narrow introitus may be of such a degree as to require surgical treatment. This is readily done by a small midline incision of the fourchette, which is then closed in a transverse direction. In assessing the causative factor in this complaint this condition should not be confused with that of vaginismus. Surgical incisions in the region of the introitus are to be avoided where possible, as they themselves may be the site of pain, and hypoplasia of the introitus, unless extreme, may best be overcome by the intelligent use, on the part of the two people involved, of nature's dilator.

Acquired

1. Surgical Operations

Unfortunately, and too often, the presenting complaint of dyspareunia follows upon a previous vaginal or even abdomino-pelvic operation. Now the surgeon finds himself in the uncomfortable position of attempting to undo his pain-producing efforts of a previous occasion.

The simple episiotomy, which has become almost a routine in our country, may on occasion be the cause. I feel that as a preventive measure in regard to this complaint, one might well give some consideration to withholding this procedure in a goodly number of women, who, with care at the delivery and appropriate post-partum exercises, will survive with a perfectly functional and comfortable perineum.

The various surgical operations for the repair of genital prolapse of varying degree are possibly the commonest surgical cause of dyspareunia. The simple perineorrhaphy may build up the relaxed perineum to such a degree as to form a high, semi-rigid, uncomfortable or painful barrier, which subsequently must be relaxed.

The repair of the anterior vaginal wall for the correction of the cystocele and prolapse of the uterus should not shorten the anterior vagina by fixing the cervix at a low level against the front wall of the vagina. Properly done, the anterior colporrhaphy should lengthen the vagina and elevate the cervix to its normal position in relation to the vaginal tube. The repair of the posterior wall may be the responsible factor, either by producing too much narrowing, usually in its middle

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