

# CYSTOMETRIC AND INTRAVENOUS PYELOGRAPHIC STUDIES OF URINARY TRACT—BEFORE AND AFTER VAGINAL HYSTERECTOMY WITH PELVIC FLOOR REPAIR\*

by

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Although the idea of utero-vaginal prolapse causing distortion in the anatomical relationship and functional capacity of the urinary bladder was conceived much earlier, it was only in 1954 that Quaini made cystoscopic and cystometric studies following vaginal hysterectomy and pelvic floor repair to record the restored functional capacity of this organ, and concluded that the changes were not significant. No pre-operative studies were made by him. Bowers *et al* (1957) for the first time studied the bladder dysfunction by cystometric studies before and after vaginal hysterectomy with pelvic floor repair. They postulated that cystometry, essentially a subjective examination, offered the best approach available to an objective study of bladder dysfunction. It is a graphic record of bladder tone, capacity and expulsive power, performed by recording manometric pressure while filling the bladder at a constant rate.

The reports on association of gynaecological lesions with dilatation of

upper urinary tract appeared much earlier. As early as 1824 Froriep reported damage to the urinary tract due to utero-vaginal prolapse. Intravenous pyelography studies showing changes in the form of hydroureters were described by Virchow (1846), and Halbon and Tendler (1907), while in 1908, Mirabeau reported dilatation of the kidney pelvis in such cases. In 1923, Brettauer and Robin carried out a clinico-radiological study on group of patients with uterine prolapse and found uretero-hydronephrosis in 8 out of 10 such cases.

## *Material and Method*

The present study consisted of 25 cases of utero-vaginal prolapse and of 20 control cases without prolapse. Out of 25 cases, in 5 the cervix descended down to the level of the introitus vaginae, and in 18, it descended below this level. Cystocele of varying degree was present in all cases. Rectocele and enterocele were present only in a few. Procidentia was present in two cases. All these 25 cases were subjected to vaginal hysterectomy with pelvic floor repair. These cases were studied for infection and physical changes in the urinary tract by doing urine examination, blood urea estimation, cystometry

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Paper read at the 15th All-India Obstetric and Gynaecological Congress held at Margao-Goa in December 1969.



and intravenous pyelography before the operation and on the 10th post-operative day.

The cystometric studies were made to determine contractile power of the detrusor muscle as well as that of the sphincter internus of the urinary bladder during various phases of vesical filling, exerting intravesical pressure. These studies were carried out by retrograde cystometry by continuous method. Lewis type of water cystometer was used (Fig. 1). A vertical glass tube 110 cm. long and 4 mm. in internal diameter, was fixed against a graduated wooden scale. (an electrocardiographic paper was pasted on a wooden stand and marked in cm.).

The water cystometer was set up by connecting the vertical glass tube to the 'Y'-shaped glass tube through the pressure rubber tubing. The other end of the 'Y'-shaped glass tube was connected to the reservoir containing autoclaved solution of normal saline faintly coloured with acriflavin for easy reading. Air was expelled from the apparatus before connecting the third end of the 'Y' tube with the plain rubber catheter. Screw clamps were used to control the flow.

After emptying the bladder the patient was made to lie on a table. A sterile rubber catheter was passed into the bladder and residual urine was measured. Height of the water column in the manometer was so adjusted that the zero mark was at the level of the symphysis pubis of the patient. The fluid was now allowed to flow in the bladder at the rate of 125 drops per minute. (Physiological rate). When 50 ml. of this fluid had run in, height of the water

column in the manometer was noted and charted on a graph paper as the intravesical pressure expressed in centimeters of water. Readings were taken after each addition of 50 ml. of water. The following points were noted with special care:—

1. The point at which the patients felt the desire to void (F.D.V.).

2. The point at which the patient complained of onset of pain due to vesical distension (P.D.V.).

3. The maximum bladder capacity. It was noted at a point when patient complained that she would not be able to hold it any longer.

4. The patient was asked to strain voluntarily, when the bladder was full to its maximum capacity and the rise in pressure was noted (M.V.P.). At the same time a note of stress incontinence was made if it was present.

Intravenous pyelography was done after estimation of blood urea.

#### Observations

*Urinary Infection:* Microscopic examination as well as culture of the urine showed that no patient suffered from urinary infection before operation.

*Residual Urine:* Residual urine was measured in all cases before as well as after the operation. It was observed that preoperatively average amount of residual urine was 16.6 ml. whereas post-operatively it had reduced to 2.45 ml.

*Cystometric Study:* The observations are shown in the cystometrogram. In 20 control cases average readings were as follows:—

1. First desire to void was felt at a filling of 225 ml with intravesical pressure of 8.7 cm of water.



2. Pain due to vesical distension was felt after introduction of 325 ml of water with an intravesical pressure of 11.6 cm of water.

3. Maximum bladder capacity was found to be 350 ml with intravesical pressure of 12.5 cm of water.

4. The maximum voluntary pressure went upto 42 cm of water.

The cystogram (Fig. 2) shows that after introduction of 50 ml. of water there was a gradual rise in the intravesical pressure.

In 25 cases of uterovaginal prolapse the readings were as follows:—

1. First desire to void was felt at 350 ml with an intravesical pressure of 6.5 cm of water.

2. Painful desire to void was after 400 ml of water was introduced into the bladder at intravesical pressure of 7.5 cm of water.

3. Maximum bladder capacity was 400 ml with the intravesical pressure of 7.5 cm.

4. Maximum voluntary pressure went upto 30 cm of water.

Marked hypotonia of the bladder is shown by the flat curve.

Following surgery average reading on these 25 cases were as follows:—

1. First desire to void was noticed at 250 ml with an intravesical pressure of 7.6 cm of water.

2. Painful desire to void was observed with 300 ml with an intravesical pressure of 9 cm of water.

3. Maximum bladder capacity was found to be 350 ml. when the intravesical pressure went upto 10 cm of water.

4. Maximum voluntary pressure went upto 35 cm of water.

The bladder tone had markedly improved and had come back almost to normal.

### *Intravenous Pyelography*

Out of 25 cases of utero-vaginal prolapse only one case of procidentia of 17 years duration had mild bilateral hydronephrosis (Fig. 2). Regression of these changes occurred following hysterectomy with pelvic floor repair (Fig. 3). Stress incontinence was present in none of these cases.

### *Discussion*

Prolapse may involve the upper or lower anterior vaginal wall along with the bladder or urethra underlying it, the condition is then termed cystocele or urethrocele respectively. In cystocele the bladder base with the anterior vaginal wall descends into the vagina. In advanced cases it forms a pouch, which when the patient strains, reaches a level lower than the internal urethral meatus (Fig. 3). This is said to lead to difficulty or incomplete emptying of the bladder with urinary stasis causing urinary infection stretching and loss of tone of the detrussor muscle (Jeffcoate 1962). Muschat (1935) studied the tone of the bladder musculature by cystometry in such cases. He labelled hypotonic curve which was flat instead of showing a gradual increase in pressure. The bladder pressure in his cases remained low and continued to remain so even after introduction of 500 ml. of fluid. According to him the initial low pressure may remain unchanged in extreme cases even after introduction of 100 ml of water. In his cases desire to void was gradually delayed, appearing at 350-500 ml. or even upto 800 ml. of filling in extreme cases. The maximum voluntary pressure was low, always under 40 cm. of



water. The hypotonic bladder, therefore, is the one with low pressure curve. Our observation of shift of the first desire to urinate, to the right with low maximum voluntary pressure compares very well with his findings. We are in complete agreement with Band (1945) who observed that in hypotonic bladder the tone may remain exceptionally low throughout the experiment and accommodation of bladder proves so ample that large capacities of fluid do not give rise to more than low normal tone of 7.5 cm. of water and desire to void is delayed.

As the bladder was replaced to its normal position and the dragging and stretching factors were removed, it regained almost its normal tone on the 10th post operative day. Further follow up a month or so later would probably have shown complete recovery of the muscle tone. Amount of residual urine had already reduced from 16.6 ml. preoperatively to 2.45 ml on the 10th post-operative day.

In 1952 Klampner stated that greater the degree of utero-vaginal prolapse, higher the incidence, and greater the severity of uretero-hydronephrosis. According to him duration of prolapse or presence of cystocele has no influence on degree of uretero-hydronephrosis. In the present series of 25 cases the degree of prolapse varied from 2nd degree to procidentia, and the duration of prolapse was from one year to 20 years. Pre-operative intravenous pyelography showed uretero-hydronephrosis in only one case of procidentia of 17 years duration, giving an incidence of renal tract changes as 4% (Fig. 3). We are in agree-

ment with Klempner that the presence of cystocele is not a significant factor in the production of upper urinary tract changes.

Post-operative pyelography showed complete regression of hydronephrotic changes in the procidentia case (Fig. 3). Therefore, we are not in agreement with Klempner (1952) that undue delay in correction of prolapse can result in permanent renal damage. We feel that probably superadded urinary infection is the cause of permanent damage.

### Summary

1. Cystometric and intravenous pyelographic studies were undertaken on 25 cases of utero-vaginal prolapse of varying degree pre-operatively and on the 10th post-operative day. Similar studies were made on 20 control cases without prolapse.

2. A flat intravesical pressure curve was obtained in prolapse cases when compared to the normal curve.

3. Post-operative cystometry showed recovery of the bladder to almost normal levels on the 10th post-operative day.

4. Intravenous pyelography showed hydronephrotic changes in only one case of procidentia of 17 years standing, which regressed completely by 10th day post-operatively.

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*See Figs. on Art Paper VII*