

**UNIVERSITY OF MEDICINE AND PHARMACY OF CRAIOVA  
DOCTORAL SCHOOL**

# **DOCTORAL DISSERTATION**

## **URINARY DISORDERS RESULTING FROM CHANGES OF THE PELVIC STATICS IN WOMEN**

**CURRENT ETIOPATHOGENIC CONSIDERATIONS AND OF  
MINIMALLY INVASIVE SURGICAL CONDUCT**

**- ABSTRACT -**

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Pelvic statics changes have important implications in women's lives by the diseases they cause. Stress urinary incontinence and prolapse of pelvic organs can cause significant deterioration of the quality of life and therefore great efforts in terms of medical and financial support are necessary for their treatment.

I have assessed the impact of major etiopathogenic factors regarding the genesis and evolution of these diseases, focusing on the anatomopathological changes that they induce. I have also evaluated several methods of surgical treatment, with more attention given to minimally invasive procedures using prosthetic materials.

I conducted a retrospective study on 154 cases of patients with stress urinary incontinence who were treated surgically within the Gynaecology and Urology departments of the Craiova Emergency Hospital, over a period of 5 years, 2008-2012. A second group on which I conducted the retrospective study was of 18 cases of patients having anterior vaginal wall prolapse (cystocele), surgically treated by minimally invasive surgery, in the same departments, between 2011-2014. A third group I evaluated was of 10 patients, selected randomly from patients of both groups, with either incontinence or prolapse, between 2010-2014, from which I have harvested pieces of intra-vaginal wall during the surgery, in order to assess the quality of the vaginal wall at the time of treatment.

The results obtained were important in order to guide subsequent conservative treatment, through the correction of a series of etiopathogenic factors. In terms of surgery, postoperative efficacy proved the viability of these minimally invasive procedures, especially in the correction of pelvic state changes.

**Key words:** *stress urinary incontinence, anterior vaginal wall prolapse (cystocele), urethropexy with suburethral sling, cystopexy with mesh hammock-like, vaginal atrophy.*

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# I. GENERAL PART

Pelvic state disorders of local organs and of the pelvic floor determine urinary incontinence, prolapse of the pelvic organs and faecal incontinence. These conditions can have a significant impact on women's activity and quality of life, causing a significant limitation of activity, adversely impacting their health and wellbeing. Urinary incontinence can be characterized by the presence of specific symptoms of loss of urine, identifying the leak of urine from the urethral meatus. The prolapse of pelvic organs is defined as the descent of one or more anatomical elements between the anterior vaginal wall, the posterior vaginal wall, the vaginal apex or vaginal vault.

Static pelvic disorders often coexist in the same woman, in various combinations, thus we can encounter the prolapse of pelvic organs and urinary incontinence associated with a rate of 29%.

The evolution of pelvic surgery from Hippocrates to the present day has been a long road, marked by flawed understanding of the female pelvic anatomy, ignorance of asepsis, absence or lack of anaesthesia, faulty suture materials, deficient instruments and inadequate surgical technique. In the treatment of this condition over time, very many surgical techniques have been described, over 150 in fact, suggesting uncertainty and insufficient therapeutic effectiveness of many of these surgical procedures.

As a consequence of medical and technological research and in an effort to develop a minimally invasive surgery, TVT with suburethral sling placement in tension-free manner appeared. This surgical procedure of the placement of suburethral slings - synthetic prosthetics, commonly of polypropylene - via retropubic approach, was initially made through the abdominal wall, using special trocars; later, in an attempt to avoid common complications, the process of placing evolved, and Lorme described in 2001 the TOT technique, the transobturator path for the placement of suburethral sling.

Currently, mini-slings are in use, a simple vaginal incision in the treatment of stress urinary incontinence, or cystopexy with mesh placed via transobturator route to treat cystocele.

Normal pelvic support is achieved by the interaction between the pelvic floor muscles and the attachments through connective tissue. In most cases, the pelvic muscles are the main support of the pelvic organs, providing a firm but elastic basis on which to rely.

The support through the connective tissues - endopelvic fascia - holds the pelvic organs in a proper orientation so that they are supported by the wall muscles.

The endopelvic fascia is a network of connective tissue of the retroperitoneum that surrounds all organs of the pelvis and connects them loosely to the pelvic muscles and bones. The term of endopelvic fascia is used to describe the tissue located between the surface of the peritoneum, muscles and pelvic organs.

From histological viewpoint, it is composed of a mixture of collagen, elastin, proteoglycans and extracellular matrix acting as a scaffold for the other components. Collagen gives the tissue tensile strength and elastin provides elasticity, which is the ability of the tissue that is deformed or stretched to return to its normal state. The composition of the connective tissue is dynamic, with collagen

production and degradation during continuous tissue remodelling in response to stress, aging or trauma. Composition changes are frequently associated with pelvic organ prolapse. Studies have shown that the total collagen content of the tissue decreases in pre-menopausal women who suffer from prolapse.

Also, in the structure of the vagina, the adventitia, which is a layer of weak connective tissue, contains collagen, elastin, smooth muscles and related vasculature. Here, the connective tissue includes 84% collagen and 13% elastin. In general, the vagina and the endopelvic fascia are very similar referring to the composition of collagen; thus, vaginal biopsies obtained surgically can allow extrapolation regarding the collagen composition of the endopelvic fascia for a particular patient.

Urinary incontinence in women was sought to be explained either by sphincter disorders or by disturbances in the support of the urethra and bladder.

The unified theory stated that "urinary urgency and stress urinary incontinence as symptoms both arise from the same defect, a lax vagina". Petros and Ulmstem stated that the vagina has two distinct anatomical segments that work together to achieve urinary continence. The second theory, the "hammock" hypothesis, was introduced in 1994 by De Lancey. The first urethral closure mechanism is in the vagina, between the urethral meatus and the pubourethral ligament. The second and most important mechanism for urethral closure lies between the pubourethral ligament and the bladder neck. The intrinsic and extrinsic sphincter are also involved. The causes of the intrinsic sphincter deficiency can be multiple, neurological, muscular or damage of the connective tissue. This sphincter deficiency is rather a manifestation of the most severe clinical forms of stress urinary incontinence, with multiple causes.

The prolapse of the genitals is a non-homogenous condition, in which the weakness of the pelvic floor muscles and connective tissue can cause pelvic organ descent or bulging in the vaginal canal.

From an etiopathogenic standpoint, many factors may be involved in producing static pelvic disorders: age, menopause, intense exercise, natural births with prolonged labour, constipation, obesity etc.

The treatment of these disorders involves primarily a positive diagnosis and a proper staging of the disease. The first step is a careful, detailed inquiry and then a thorough clinical examination, which help guide decisively to a certain suffering.

The first line of therapy of static pelvic disorders is non-surgical, followed, in case of inefficiency, by a surgical therapy.

The surgery may be minimally invasive, with periurethral injection of bulking agents or urethral suspension, especially with prosthetic materials. Bladder neck suspension can be done by open approach, classic or laparoscopic approaches - Burch retropubic colposuspension.

Cystocele, in addition to the traditional surgical therapies - colporrhaphy – currently benefits from minimally invasive therapies with prosthetic materials as support.

## II. PERSONAL CONTRIBUTIONS

In accordance with the unified theory, I tried to demonstrate that the urinary disorders studied can be treated surgically, especially through minimally invasive approach, and with better and more lasting results. Through procedures carried out with maximum accuracy, I tried to restore the position of the anatomical pelvic structures and thus their full functionality. I aimed to assess the therapeutic value of these techniques, largely innovative ones.

The research aimed at conducting a retrospective clinical study on cases of stress urinary incontinence and cases of pelvic status disorders either associated with or without stress urinary incontinence who have received specific treatment for the disease, most commonly of the minimum invasive type. In the study, including for easier statistic manipulation, I considered useful to group the casuistry into three lots. Thus, I performed a study on 154 cases of stress urinary incontinence - Lot 1 - who were treated surgically within the Gynaecology and Urology wards of Craiova Emergency Hospital in the 5 years between 2008-2012. A second lot on which the retrospective study was performed was of 18 cases of patients having anterior vaginal wall prolapse - Lot 2 - surgically treated by minimally invasive surgery, in the same departments between 2011-2014. There were a number of criteria for selection. A third group evaluated was of 10 patients randomly selected from patients of both groups, with incontinence and prolapse, in the period 2010-2014, from which pieces of intra-vaginal wall were harvested during surgery, in order to assess the quality of the vaginal wall at the time of treatment.

I tried to study thoroughly the relationship between etiopathogenic factors for the production of stress urinary incontinence and of prolapse of pelvic organs, the micturition status and anatomical and functional pelvic status of patients, as well as the histological aspect that occurs in the vaginal wall under these conditions.

I used a work algorithm, which included the following steps: detailed, directed anamnesis; a modified Petros questionnaire; micturition diary for 24 h or 72 h; general and genital clinical examination - insisting on a correct assessment of changes that may be relevant, evaluating the patient before and after micturition, and the manoeuvres indicated in these cases: Bonney, Ulmsteen, neurological tests; the usual tests: blood, urine and urinary pH; abdominal ultrasound was performed in all patients, as a method of screening and for diagnostic purposes. The post-micturition bladder residue was determined; ultrasound with vaginal transducer was done routinely in group 2 (patients with genital prolapse) or in case of diagnoses suspicion in group 1;

The uroflowmetry, cystomanometry, urography or cystoscopy were not performed routinely.

The surgical treatment was also evaluated. The following surgical procedures were used: Burch retropubic colposuspension; urethropexy with suburethral sling placed via transobturator route; cystopexy with "hammock" mesh placed subvesically via transobturator route. I described in detail the surgical protocols followed for minimally invasive procedures. I insisted, including by imaging, on the treatment of cystocele through cystopexy with "hammock" mesh, mounted with the help of special tunnelers via transobturator route.

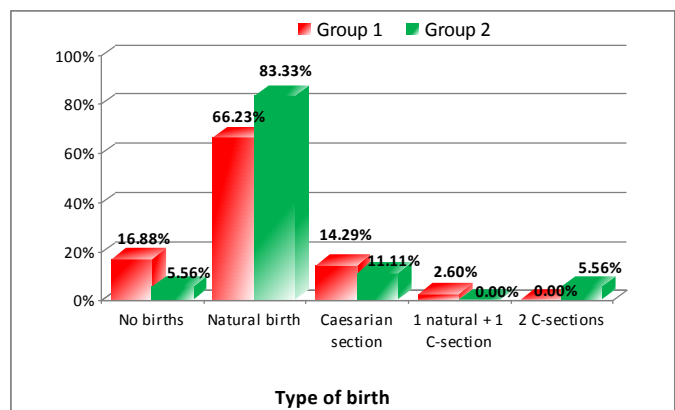
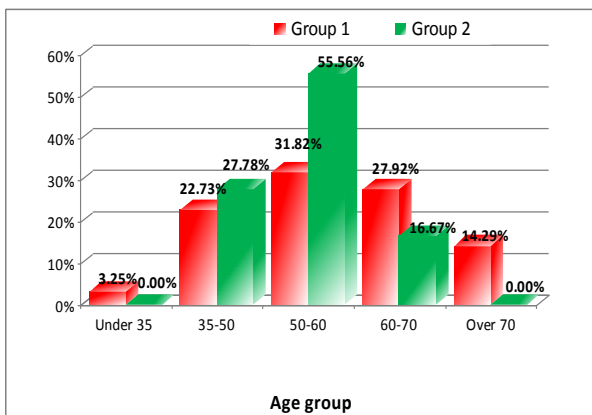


**Using the right tunneler to create the first transobturator path**

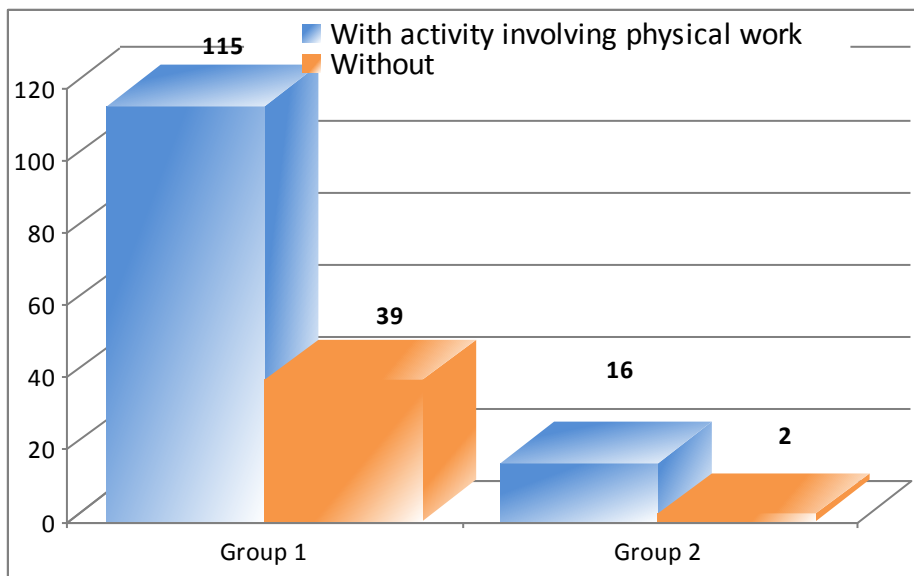
The postoperative outcome was also followed, at discharge, at 1 month, 1 year and 2 years.

In the study of the groups of women with stress urinary incontinence, respectively pelvic organ prolapse, the following etiopathogenic parameters were analyzed: age; environment of origin; marital status; profession - training level; previous births and their complications; previous abortions; previous pelvic operations; menarche; age at menopause; constipation; living and working conditions; general diseases in history.

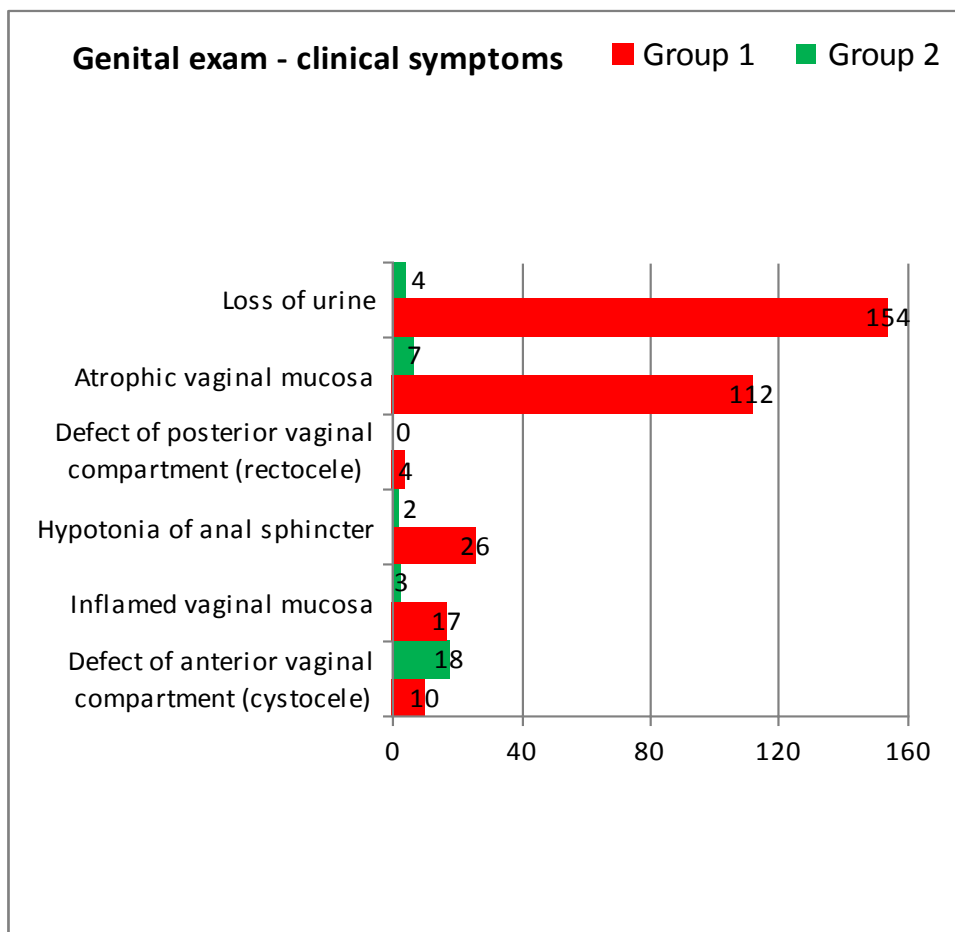
The results obtained, including by statistical processing, were conclusive. Age, natural births, the presence status of postmenopausal stage, overweight, heavy physical labor were the most relevant parameters through the statistical values obtained, in the study conducted. The average age obtained for both groups showed that patients are mostly in their 6th decade of life, in full postmenopausal stage, this correlates with altered hormonal status, a decline of estrogens levels and all the histological changes arising therefrom.



Natural births and hard physical work, through the repeated trauma and stress that they constantly exercised on the means of pelvic support, cause the change of pelvic statics.

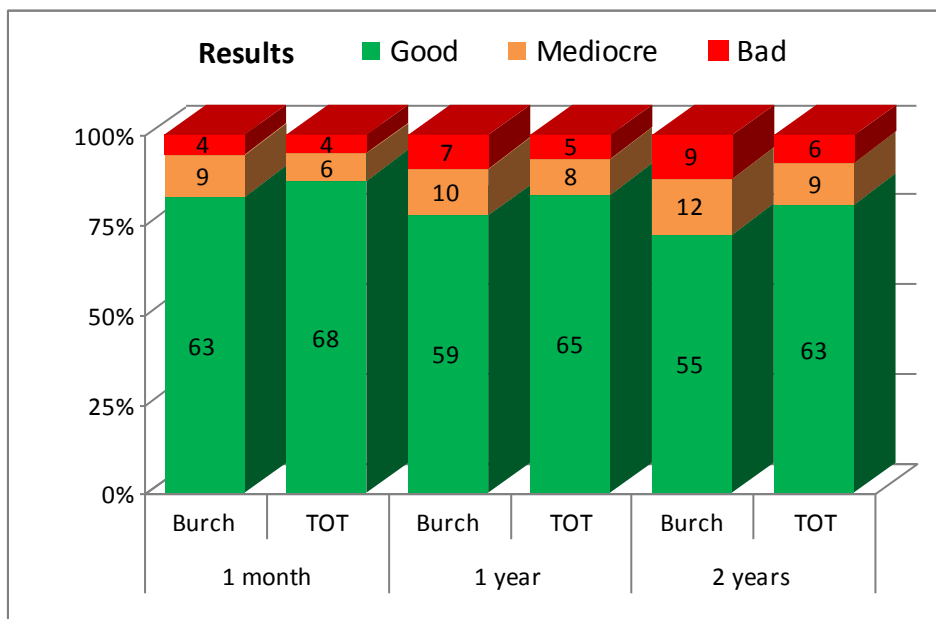


Thorough clinical examination, with emphasis on genital examination, objectified, according to the chart, the presence of urine loss at the level of the urethral meatus, in case of an effort or anterior vaginal wall prolapse. I must emphasize that a number of conditions, such as stress urinary incontinence and cystocele, to varying degrees may occur in the same patient, which I have included in the group corresponding to the most advanced suffering. Consistently, I met a number of relevant cases of vaginal atrophy in the first group.



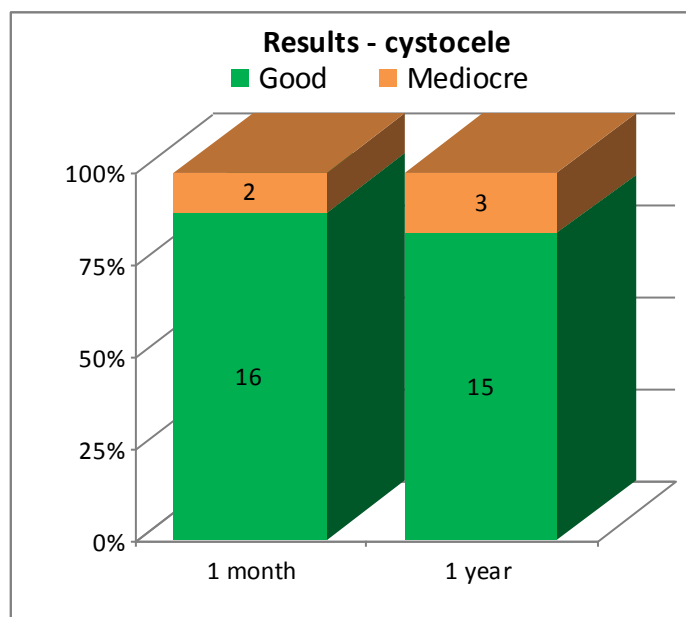


In the group of patients with stress urinary incontinence, postoperative results were good, obtaining continence in 83% of patients in the case of the Burch colposuspension, and in 88% of cases for the urethropexy type sling, falling within the range mentioned in the literature.



**Postoperative results GROUP 1**

Cystocele treatment achieved good results, with net improvement of local symptoms in 16 cases, and the disappearance of stress urinary incontinence in 3 of 4 cases. As seen in the table, results were maintained in the 1 year postoperative assessment. In patients, clinically, the absence of the cystocele was confirmed, while maintaining anatomical structures over time. Postoperative continence achieved in the three cases was maintained at 1 year after the intervention, satisfaction was high, 17 patients in the study group would repeat this operation.



**Postoperative results GROUP 2**

The complications inherent in any surgery were reduced in number. Thus, there wasn't any intraoperative bleeding from large vessels, requiring transfusions or which altered the desired end result. All incidents were resolved promptly, in fact the key to effective intervention is the immediate recognition of the incident. Postoperative complications were not clinically significant and could also be easily solved. I had a small percentage of therapeutic failures with recurrent SUI.

In conclusion I can state that the treatment of stress urinary incontinence and of the pelvic statics disorders requires a team work, a joint effort of all participants in diagnostic and therapeutic protocol, which should be the family doctor, gynaecologist, urologist, physical therapist.

From an etiopathogenic standpoint, we may incriminate as determinant factors mainly the existence of pregnancies, especially multiple vaginal births in history, age over 50 years, menopause, with the hormonal and tissue changes that may occur, hard physical work, possibly in cold and damp conditions. Precarious socio-economic conditions may cause delays in seeing the doctor, allowing the disease to progress to advanced stages.

The histopathological study showed constant, important changes of the vaginal wall. Much of these change were the thinning of the vaginal epithelium - in fact its atrophy. There was a clear link between patients' age, menopause and constant histological changes of the type of atrophy of the vaginal wall. Given the change in concentration of collagen at this level, as well as histological similarities between the vaginal wall and endopelvic fascia, another important argument was obtained regarding the involvement of age and menopause in the onset of pelvic state changes.

Minimally invasive surgical procedures used are considered to be among modern treatment of stress urinary incontinence and of the prolapse of pelvic organs. The mounting via transobturator route of the suburethral sling in particular, as well as the "hammock" mesh, is a safe procedure with low rate of complications, which is not related to morphological status of the patient. It was possible to apply this technique easily to obese patients, for whom other types of operations would have involved significant technical difficulties and intraoperative risks, as well as additional postoperative morbidity.

The immediate and later results, both anatomically and functionally were very good, while maintaining good results over time when using prosthetic materials.

In economic terms, the minimally invasive procedures are the first option in choosing surgical treatment addressed the pelvic statics disorders, precisely because of the reduced hospital stay, the good postoperative results, stable over time, the net improvement in quality of life of patients and, not least, by the rapid post-operative socio-occupational reintegration of the patients.

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