# RELIABILITY AND LIMITATIONS OF RADIOLOGIC MARKERS IN WOMEN SUI

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SUMMARY

The Authors review their series of pre- and post-operatory urethrocystographies in SUI and discuss their data according to the interpretative criteria proposed by the leading Authors. None of the suggested criteria seems satisfactory at all; however, cystography seems undoubtedly useful in the overall comprehension of SUI pathogenesis; moreover, when it is supported with a complete urodynamic evaluation, it can lead to the most exact diagnosis and permit the most proper therapeutical approach.

In the last decade the radiologic diagnosis of stress urinary incontinence in women has been both strongly supported and sharply criticized. Many Authors ([1, 2, 3, 4]) have put forward differing criteria for interpreting cystography and many reports published in the literature have, in turn, identified the typical SUI marker in particular morphologic changes. Pre- and post-operative confirmations have been provided but denials have been just as frequent so that it has been wondered whether cystography makes still sense in patients affected by SUI.

There is a further contradiction: while, according to many Authors ([5, 6]), radiologic markers bear no significance from a diagnostic standpoint, almost all Urodynamics Centres regard cystography as an integrating part of pre-operatory screening.

In order to contribute to the solution of this antinomy, we have tried to overcome the personalistic view of each Author who regards his own criterion as the only reliable one.

We have re-examined our series of pre- and post-operatory urethrocystographies, bearing in mind the criteria put forward by the most outstanding Authors. For each of them, we have assessed the reliability in confirming pre-operatory diagnosis of SUI and the ability to highlight the reasons for the success or failure of the intervention.

## MATERIAL AND METHODS

Our analysis concerns 72 patients, 62 of whom were affected by stress urinary incontinence but did not present the usual symptoms of vesical instability ([10]) (urination urgency, pollakiuria, nycturia, stranguria). The remaining 10 patients were only affected by utero-vaginal prolapse.

The patients' age ranged between 35 and 69 years (mean: 49.1). All patients underwent pre- and post-operatory cystography (interval of operation: 3/21 months) according to Stewens and Smith's technique ([11]) of urethral metal chain.

50 patients underwent cystourethropexis according to Kelly-Kennedy ([12]), 5 urethral suspension according to Marshall-Marchetti ([13]) and 17 a combination of both interventions.

Table 1. — *Radiologic analysis according to Green-pre-operatory data.*

| Symptoms | No. | Normal angles | Type I | Type II |
|---|---|---|---|---|
| SUI | 61 (*) | 6 ( 9.7%) | 10 (16.1%) | 45 (72.6%) |
| NUS | 10 | 6 (60 %) | — | 4 (40 %) |

(*) One case not evaluable.
NUS: no urinary symptoms.

Table 2. — *Radiologic analysis according to Green-post-operatory data (62 cases of SUI).*

| Outcome | No. | Normal angles | Type I | Type II |
|---|---|---|---|---|
| Recovered | 49 | 20 (40.8%) | 13 (26.5%) | 16 (32.7%) |
| Improved | 5 | 2 (40 %) | 2 (40 %) | 1 (20 %) |
| No change | 8 | 2 (25 %) | 3 (37.5%) | 3 (37.5%) |

The cystographies were interpreted on the basis of the following criteria:

1) According to Green [1] an abnormal configuration of the posterior urethro-vesical angle (90°) is always associated to SUI (Type 1) which is more severe when the anterior urethral angle too is altered (45° - Type II).

According to this Author, surgery success is due to the normalization of the angles in 97% of the cases.

2) According to Hodgkinson [2] continence is influenced by the location of the urethro-vesical junction in relation to the basis of the vesica under stress. When it is the lowest point in the vesical basis, SUI occurs. Surgery succeeds when the urethro-vesical junction moves upwards.

3) According to Dunn [3] – recalling Enhörning [14] – urinary continence under stress is linked to an adequate transmission of the abdominal pressure to the urethra. This is achieved when the vesical neck remains above the lower edge of the symphysis pubis. The clinical recovery of these patients depends upon the resumption of this position by the vesical neck.

4) According to Olesen [4] in many cases SUI is caused by insufficiency of the vesical basis (BBI) owing to the yielding of the vesical support plane. In these cases, the radiologic picture shows a funnel-shaped neck because of the disappearance of the retrosymphysal vesical plane and a consequent fore and downwards slipping of the urethro-vesical junction.

In further works [15, 16, 17, 18] the Author examined the varying degrees of this anomaly in detail. However, the interventions performed to rectify the SUI [12, 13, 19] do not act on the pubo-vesical ligamenta. On the other hand, the intervention "ad hoc" suggested by the Author was criticized by other Centres, particularly because of its complex nature.

## RESULTS

At the control, 49 out of the 62 cases of SUI showed recovery, 5 improvement and 8 no change. 9 out of the 10 patents without urinary symptoms remained asymptomatic whereas 1 presented SUI.

The results reported in tables 1 and 2 show that the analysis of our series according to Green's criterion entails a low incidence of false negatives in the pre-operatory examination (9.7% of patients affected by SUI with normal angles under stress) but a high incidence of both pre- and post-operatory false positives (40% and 59.2%, respectively).

With regard to Hodgkinson's thesis (tabs. 3, 4), as many as 27 out of 62 patients affected by SUI presented a normally located urethro-vesical junction before the intervention (43.5% false negatives). Furthermore, 16 out of the 49

Table 3. — *Analysis according to Hodgkinson-pre-operatory data.*

| Symptoms | No. | Pathologic configuration | Normal configuration |
|---|---|---|---|
| SUI | 61 (*) | 34 (54.8%) | 27 (43.5%) |
| NUS | 10 | 2 (20 %) | 8 (80 %) |

(*) 1 case not evaluable.

Table 4. — *Analysis according to Hodgkinson-post-operatory data (62 cases of SUI).*

| Outcome | No. | Pathologic configuration | Normal configuration |
|---|---|---|---|
| Recovered | 49 | 16 (32.7%) | 33 (67.3%) |
| Improved | 5 | 2 (40 %) | 3 (60 %) |
| No change | 8 | 5 (62.5%) | 3 (37.5%) |

Table 5. — *Radiologic analysis according to Dunn-pre-operatory data.*

| Symptoms | No. | Pathologic configuration | Normal configuration |
|---|---|---|---|
| SUI | 62 | 51 ( 82.3%) | 11 (17.7%) |
| NUS | 10 | 10 (100 %) | — |

Table 6. — *Radiologic analysis according to Dunn-post-operatory data (62 cases of SUI).*

| Outcome | No. | Pathologic configuration | Normal configuration |
|---|---|---|---|
| Recovered | 49 | 24 (49%) | 25 (51%) |
| Improved | 5 | 2 (40%) | 3 (60%) |
| No change | 8 | 4 (50%) | 4 (50%) |

recovered patients maintained the pathologic picture typical of SUI (the neck was still the lowest point in the vesical basis) thus entailing a 32.7% false-positive rate. Post-operatory real positives accounted for 62.5% of the cases (5 out of 8 no-change patients maintained a pathologic configuration). The patients without urinary symptoms showed a 20% incidence of false positives (2 out of 10 patients).

According to Dunn's criteria (tabs. 5, 6), 51 out of the 62 patients affected by SUI (82.3%) had a lower urethrovesical junction than the symphysis pubis with a 17.7% incidence of pre-operatory false negatives. But this pathologic picture remained unchanged in 24 out of the 49 recovered patients (false positives: 49%) while it disappeared in 4 out of the 8 no-change patients (post-intervention false negatives: 50%).

Finally, the diagnosis of BBI according to Olesen (tabs. 7, 8) was possible only in 34 out of the 46 incontinent patients (76.1%) that could be analysed on the basis of this Author's criterion (16 cases were excluded owing to the presence of cystocele).

In 19 out of the 37 recovered patients the surgical intervention did not change this pre-miction picture of the neck (post-operatory false positives: 51%); all the 5 no-change patients presented persisting BBI (real post-operatory positivity: 100%).

## DISCUSSION

In conclusion, we can say that none of the suggested criteria to interpret cystography is free from errors.

Green's classification has undoubtedly been the most widely used in the interpretation of cystography [1] but has also been sharply criticised [5, 6]. Some wonder whether talking of angles does still make sense.

In our opinion too, Green's thesis can only partly explain continence which is an essentially dynamic fact: it does consider the mutual location of the vesical neck and pelvic muscles but it does not fully convince us when it positively ascribes the adequate transmission of the abdominal pressure to the adjoining urethra – an essential factor for continence – to a normal picture of the angles.

Hodgkinson's interpretation too [2] has some limitations. It is not fully satisfactory since, for example, in the presence of prolapse, the neck is not the lowest point in the vesical basis, although this pathology is often associated to SUI.

Table 7. — *Radiologic analysis according to Olesen-pre-operatory data.*

| Symptoms | No. | BBI present | BBI absent |
|---|---|---|---|
| SUI | 46 (*) | 35 (76.1%) | 11 (23.9%) |
| NUS | 5 (*) | 3 (60 %) | 2 (40 %) |

(*) 21 patients were excluded from the classification owing to the presence of serious cystocele.

Table 8. — *Radiologic analysis according to Olesen-post-operatory data (46 cases of SUI).*

| Outcome | No. | BBI present | BBI absent |
|---|---|---|---|
| Recovered | 37 | 19 ( 51.4%) | 18 (48.6%) |
| Improved | 4 | 2 ( 50 %) | 2 (50 %) |
| No change | 5 | 5 (100 %) | — |

However, it is worth stressing that Hodgkinson's interpretation was basically intended for the detection of relapses. It is therefore mainly reliable in the post-operatory phase, which happens in 62.5% of our cases too.

Similar considerations apply to Dunn's [3] and Olesen [4] criteria too. Dunn's classification is rather accurate, in the pre-operatory phase, in incontinent patients (82.3%) but not at all in continent ones. However this interpretation is the most adequate to translate the dynamic datum (transmission of the abdominal pressure to the adjoining urethra) into a radiologically detectable picture (mutual location of the vescical neck and symphysis where the bundles of the pubo-coccygeus muscle are inserted).

Olesen's interpretation too is fairly reliable in the pre-operatory phase in incontinent patients (76.1%) and is the most accurate in detecting post-operatory relapses (100%), although a limited number of cases have been studied.

As a matter of fact, this interpretation, though with some peculiarities of its own, can be regarded as integrating Dunn's and Hodgkinson's ones, thus being the most accurate.

However, continence is a very complex phenomenon since it results from the combination of many factors: some are statical (vesical basis support, urethro-vesical angles, intra-abdominal location of the adjoining urethra) and can therefore be radiologically detected; others are dynamic (vesical neck closing pressure, urethral closing pressure, transmission of the abdominal pressure to the urethra, etc.) and can be detected only by combined urodynamic and radiologic examinations [20].

Moreover, urethral muscles too play an important role with regard to continence. Their tone decreases alongside with age and the lowered estrogenization of the uro-genital region. Therefore, an elderly patient can be incontinent also when the configuration of the urethro-vesical region is only slightly modified.

Consequently, none of the criteria suggested by the various examined Authors can, alone, satisfactorily explain all SUI cases. Similarly, the post-operatory radiologic examination can fail to justify clinical success or failure, satisfactorily. Indeed, the interventions of colposuspension according to Marshall-Marchetti [13] and Burch [19] produce a remarkable lifting of the vesical neck to its normal intrapelvic position and ensure better transmission of the pressure to the urethra and improves urethro-vesical angles. When all these criteria are complied with, the patient is very likely to become continent. But this does not always occur and post-operatory cicatrization often causes a lowering of the internal urethral pressure. It is in these cases that cystography alone can hardly show whether the patient is continent or not. This is particularly true after an intervention of urethrocystopexis, when the static changes are less marked and the cicatricial outcome involves peri-urethral tissues to a higher extent.

On the other hand, many Authors [21] have stressed that those incontinent patients who show pathologic radiologic parameters in the post-operatory phase too are more likely to undergo SUI relapse.

In conclusion, we believe that when videocystourethrography [20, 22] cannot be performed (it must, in any case, be kept for the most complex cases) cystography by chain can play a significant role, possibly not in the diagnosis of reliability, but at least in the overall understanding of SUI pathogenesis. Supplemented by complete urodynamic examinations and static and dynamic urethral pressure profiles [23, 24] it can lead – in most cases – to a diagnosis taking all the various factors of continence into account.

The deficient factors will then suggest the most advisable surgical intervention or medical therapy (estrogen therapy, for instance) to solve the patient's urinary incontinence.

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