Original article

The Bornstein Test- a local anaesthetic technique for testing uterosacral nerve plexus origins of chronic pelvic pain

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Abstract: The Bornstein Test to check for origin of chronic pelvic pain was first applied in 2005 to challenge the hypothesis that the causation of vulvodynia may not be from the vulva itself, but from laxity in the uterosacral ligaments. It has been subsequently successfully applied to patients with Interstitial Cystitis. *The Bornstein local anesthetic (LA) test technique:* The lower half of a bivalve speculum is inserted into the vagina. The cervix or hysterectomy scar are visualized, gently grasped with an Allis forceps then gently stretched towards the introitus. The USLs are located by digital palpation. A 21 gauge needle attached to a 10ml syringe loaded with 1% xylocaine is inserted through the vaginal mucosa to a depth of 1.5 cm at 4 and 8 o'clock in a position just lateral to the uterosacral ligaments (USLs). 5 ml of 1% xylocaine are injected on each side. After the elapse of 5 minutes, the patient is checked to see if sensitivity is relieved. *Conclusions:* The Bornstein Test is a valuable clinical and research tool for assessing whether chronic pelvic pain has its origins in the nerve plexuses of the uterosacral ligaments.

Key words: Bornstein Test; Vulvodynia; Interstitial cystitis.

INTRODUCTION

In 2004, 3 patients aged 45, 45 and 47 years of age presented with localized provoked vulvodynia (LPV, Vestibulitis, Vestibulodynia, confirmed by Q-tip testing), chronic pelvic pain and other 'posterior fornix syndrome symptoms, nocturia, urgency, frequency, abnormal emptying, Table 1[1]. The pain in all 3 patients was consistent with the 1996 description[2].

"*In its acute state of manifestation, the pain was invariably severe, frequently one-sided, situated low in the right or left iliac fossa, usually relieved on lying down ,reproducible on palpating the cervix and displacing it posteriorly, patient in supine position. Although the pain was chronic in nature, it varied considerably from time to time as concerns intensity. There was a history of deep dyspareunia which only occurred on deep penetration, or in specific positions. Frequently the patient complained of a constant lower abdominal pain the day after intercourse. Half the patients complained of low sacral backache which was also cured by the surgery. Six patients, 2 of whom were nulliparous, entered the study through Emergency*[2]".

Besides pain, the 3 patients had other manifestations of the Posterior Fornix syndrome, nocturia, urge incontinence, emptying difficulties, frequency, Table 1. These symptoms occur in predictable groupings and all can be cured or improved by reinforcing the uterosacral ligaments.

The three vulvodynia patients each had a posterior sling placement and were discharged the day of or day after surgery. The vulvodynia was cured in all 3 patients in the 3 months follow up examination[1].

The hypothesis. Based on these data[1], we hypothesized that vulvodynia was part of the chronic pelvic pain complex described in 1996[2], in turn due to laxity in the uterosacral ligaments causing the Frankenhauser and Sacral plexuses to fire off and cause referred pain to the perineum.

The Bornstein Test- testing the hypothesis of USL origin of vulvodynia

The hypothesis was tested in Nahariya, Israel by Professor Bornstein's team[3]. It was reasoned, that if this hypothesis was valid, injection of local anesthetic into the USLs would abate the pain.

Two cc of 2% Xylocaine was injected into each one of the uterosacral ligaments, at the posterior fornix of the vagina of 10 consecutive patients diagnosed with localized provoked vulvodynia.

These women had been referred to the Nahariya vulvar clinic for extreme dyspareunia, lasting one to eight years, preventing them from experiencing intercourse. Their age ranged between 18 and 51, parity, 0 to 4. They had not been treated specifically for that condition so far.

Local conditions such as vulvovaginal candidiasis, vaginitis or dermatosis had been ruled out in all of them by colposcopy and wet mount microscopic examinations. All were diagnosed with Vulvar Vestibulitis according to the Friedrich's criteria, involving gentle touching the vestibule by a Q-tip in foci around the introitus and external urethral meatus.

The 10 patients were retested five minutes after the LA injection. Eight patients reported complete disappearance of introital sensitivity, by two separate examiners. In the other two patients, direct testing confirmed that the allodynia (exaggerated sensitivity) had disappeared on one side, but remained on the other side. Retesting the patients after 30 and 60 minutes showed that the blocking effects disappeared after 30 minutes.

The short-term disappearance of introital pain especially on one side was an important step in further substantiating the hypothesis that Vulvar Vestibulitis may be a referred pain originating from the inability of weakened uterosacral ligaments to support the nerves running along these ligaments. Based on the findings of that study, the new 2015 consensus terminology of vulvar pain and vulvodynia included "Structural defect" as a potential factor associated with vulvodynia[4].

Analysis

The somatic nerve supply to the vulva is via the pudendal nerve exiting from Alcock's canal. We believe that the mechanism for cure as reported for vulvodynia is that the now retensioned USLs can better support the nerve ganglia and prevent them firing off whatever the stimulus, pressure on the nerves during intercourse, stretched by the gravity etc.

The hypothesis has been criticized on the basis that vulvodynia is a visceral nerve pain, sympathetic or parasympathetic and that the LA injection merely blocked afferent transmission of these nerves. However, this criticism fails in one key respect: these vulvodynia patients were cured by USL repair, an observation confirmed subsequently by many other authors (personal communication Dr Gold Australia, Dr Gunnemann and Dr Liedl Germany) and in a previous study[1].

TABLE 1. Outcome of Posterior Intravaginal Slingplasty

Patient No	Test occasion	Symptom change with treatment					
		Entry Dyspareunia	Nocturia times/night	frequency times/day	Urge incontinence times/day	Pelvic pain	Emptying difficulties
1	Preoperative	Yes	5	10	5	Yes	Yes
	Post.op	No	3	8	0	Cured	Improved
2	Preoperative	Yes	8	>20	3-5	Yes	Yes
	Post.op	No	3	5	0	Cured	Cured
3	Preoperative	Yes	5	12	1-2	Yes	Yes
	Post-op	No	0	6	0	Cured	Cured

Rationale for application of the Bornstein Test to Intersititial Cystitis (IC) patients

The pathways from the bladder stretch receptors to the sensory nerves include TRPs (transient receptor potential channels), Calcium ion permeable cation channels. TRP channels function as multifunctional sensors at a cellular level. They can be activated by heat, cold, mechanical stress, and by altered pH and osmolality[5]. (Everaerts et al 2008).

The sensory nerves supplying the bladder are either thin myelinated A-delta fibres, or unmyelinated C-fibres. A-delta fibres constitute the afferent limb of the micturition reflex. These remain silent until a volume threshold is reached.

They may become more sensitive in the presence of inflammatory states.

Unmyelinated C-fibres are not normally mechanosensitive, but according to Wyndaele et al. 2008[6], may become so during inflammation, unmasking a new afferent pathway to express urge and pain symptoms experienced at low bladder volume. It is known that bladder afferents travel via S2-4 (parasympathetic) or via the hypogastric plexus T11-12 (sympathetic).

In a group of 408 patients, Butrick et al reported findings on 4 equal groups[7]: Interstitial Cystitis (IC), Chronic Pelvic Pain, Vulvodynia/dyspareunia and "Other". They found a high rate of complaints of voiding dysfunction, dyspareunia, pain, urgency, frequency[7]. These are classical manifestations of the Posterior Fornix Syndrome[8].

Analysis

It was hypothesized from these data that IC may be an extension of the posterior fornix syndrome with its origins not in the bladder, but in the unsupported nerve plexuses of the USLs.

Application of Bornstein Test to patients with Interstitial Cystitis

In 2009, the Bornstein Test was applied to 3 IC patients in Italy[8]. The aim was to directly test the hypothesis that painful bladder syndrome/interstitial cystitis may be a referred pain from the uterosacral ligaments.

All 3 patients had a history of glomerulation formation observed by cystoscopy during bladder distension. The aim of the intervention, to see if their bladder pain originated from lax uterosacral ligaments, was explained to the patients prior to the injection. It was also carefully explained that the local anaesthetic injection would cause very minimal pain, as the innervation of that part of the vagina was by visceral nerves, which were almost insensitive to needle penetration.

It was found that the abdominal, urethral, introital and cervical tenderness and pain which were demonstrated objectively in all 3 patients immediately before the intervention, disappeared entirely, or were substantially improved, within 5 minutes of the injection.

Mrs GP, aged 42 years, para 2, had an 8 year history of chronic bladder and abdominal pain, and dyspareunia. She had typical symptoms of the posterior fornix syndrome, nocturia x2 per night, urgency (but no incontinence) and abnormal bladder emptying. When assessed she was complaining of low abdominal and bladder pain.

On examination she had tenderness in the centre and right hand side of her lower abdomen, extreme sensitivity at the introitus during assessment with a Q-tip, and tenderness on palpating the urethra and also, the cervix. Within 5 minutes of the injection, her central pain had moved from a VAS (visual analogue scale) of 8 to 0, and her right-sided pain from a VAS of 9 to 4. Her vestibular hypersensitivity, suburethral tenderness, and cervical excitation pain had all disappeared. There was only 1st degree prolapse on speculum examination, with separation of the uterosacral ligaments.

Mrs AA aged 51 years, para 2, had a 10 year history of chronic bladder pain, left-sided abdominal pain, and dyspareunia. She had typical symptoms of the posterior fornix syndrome, nocturia x3-8 per night, urgency (but no incontinence) and abnormal bladder emptying. On examination she had tenderness on the left side of her lower abdomen, extreme sensitivity on palpating the urethra and the cervix and introital sensitivity. Within 5 minutes of the injection, her left sided pain had moved from a VAS) of 9 to 0. Her suburethral tenderness, and cervical excitation pain had all disappeared. On speculum examination, there was separation of the uterosacral ligaments, but no obvious uterine prolapse.

Mrs ML aged 40 years, para 2, had undergone a hysterectomy 5 years earlier, and presented with left-sided pain, bladder tenderness, vulvodynia, which had worsened over the past 2 years. She also had nocturia x2 per night, hourly frequency, urgency (but no incontinence). On testing, she had hypersensitivity only on the left side of her introitus, and tenderness over the lower left side of her abdomen and vaginal fornix. Following the local anaesthetic injection, her left-sided pain decreased by an estimated 40% on a VAS scale. The suburethral tenderness, introital sensitivity, vaginal fornix tenderness found pre-intervention all decreased to zero on a VAS scale.

Analysis

Though only 3 IC patients were tested, the association of painful bladder syndrome/interstitial cystitis, localized provoked vulvodynia, lower abdominal pain, nocturia, urgency and abnormal emptying symptoms suggests a possible link with previous studies, where such symptoms improved following surgical tensioning of the uterosacral ligaments. The hypothesis concerning IC patients awaits this crucial test, cure or improvement by repair of the uterosacral ligaments.

CONCLUSIONS

The Bornstein Test is a valuable clinical and research tool for assessing whether chronic pelvic pain has its origins in the nerve plexuses of the uterosacral ligaments. Application of the test will be required across all pelvic pain manifestations if the general theory of USL nerve ganglion origin for chronic pelvic pain is to be validated. Following that, whether the test can serve as an effective predictor of surgical success by USL reinforcement.

Conflicts. none

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