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Original Research Article

A PROSPECTIVE EVALUATION OF EFFECTIVENESS OF LEVATOR ANI TRIGGER POINT INJECTIONS FOR CHRONIC PELVIC PAIN IN WOMEN: AN INSTITUTIONAL BASED STUDY

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ABSTRACT

Background: Chronic pelvic pain is a multifactorial condition associated with pelvic floor myofascial dysfunction and levator ani trigger points. Persistent pelvic floor tenderness may contribute to dyspareunia, restricted daily activities, sleep disturbance, analgesic dependence, and impaired quality of life. Levator ani trigger point injection is a minimally invasive treatment intended to reduce muscle spasm and interrupt pain transmission.

Aim: To prospectively evaluate effectiveness of levator ani trigger point injections for chronic pelvic pain in women.

Material and Methods: This prospective interventional study included 90 women with chronic pelvic pain and confirmed levator ani trigger points. Participants received transvaginal trigger point injections with 0.5% bupivacaine. Pain severity, pelvic floor tenderness, active trigger points, dyspareunia, functional impairment, quality of life, analgesic use, satisfaction, repeat-injection requirement, and adverse events were assessed at baseline, immediately after injection, two weeks, six weeks, and three months. Data were analysed using IBM SPSS version 27.0, with $p<0.05$ considered significant.

Results: The mean age was 38.71 ± 8.42 years, and dyspareunia was present in 68 (75.56%) women. Mean VAS pain score decreased from 7.62 ± 1.10 at baseline to 4.31 ± 1.26 immediately after injection and 2.67 ± 1.58 at three months ($p<0.001$). Pelvic floor tenderness decreased from 2.58 ± 0.50 to 0.96 ± 0.79, while active trigger points decreased from 2.09 ± 0.87 to 0.72 ± 0.71 (both $p<0.001$). Dyspareunia, functional impairment, and SF-12 physical and mental scores improved significantly. Overall, 64 (71.11%) women achieved at least 50% pain reduction, and 65 (72.22%) were satisfied or very satisfied. Repeat injection and regular analgesic use at three months were each reported in 17 (18.89%) women. No serious adverse events occurred. Shorter pain duration, unilateral involvement, and two or fewer trigger points independently predicted successful response.

Conclusion: Levator ani trigger point injection was effective and safe for chronic pelvic pain associated with pelvic floor trigger points. It provided sustained pain relief, improved function and quality of life, and reduced analgesic dependence.

Keywords: Chronic Pelvic Pain; Levator Ani; Trigger Point Injection; Pelvic Floor Myalgia; Dyspareunia.

INTRODUCTION

Chronic pelvic pain is a persistent condition characterized by pain perceived in the lower abdomen, pelvis, pelvic floor, or lumbosacral region for at least six months. It may be continuous or intermittent and may occur independently of menstruation, sexual activity, urination, or

defecation. The condition often interferes with mobility, sleep, work, emotional well-being, and intimate relationships. Its evaluation is challenging because symptoms may arise from gynecological, urological, gastrointestinal, neurological, musculoskeletal, or psychological factors, and several pain generators may coexist. A comprehensive clinical approach is therefore required rather than an exclusive search for a single pelvic pathology.[1] Current understanding of chronic pelvic pain recognizes the interaction between peripheral tissue abnormalities and altered central pain processing. Persistent nociceptive input from pelvic organs or muscles can promote peripheral sensitization, while prolonged pain may produce heightened excitability within the spinal cord and brain. Consequently, pain can continue after the initiating disorder has improved and may become disproportionate to observable structural abnormalities. Emotional distress, fear of movement, disturbed sleep, previous painful experiences, and reduced physical activity may further amplify symptoms. This biopsychosocial framework emphasizes that management should address both local pain generators and the mechanisms that sustain pain.[2] The pelvic floor is an important but frequently overlooked source of chronic pelvic pain. The levator ani complex, consisting mainly of the pubococcygeus, puborectalis, and iliococcygeus muscles, supports the pelvic organs and contributes to urinary continence, defecation, sexual function, posture, and pelvic stabilization. Childbirth-related injury, pelvic surgery, prolonged guarding, inflammatory pelvic disorders, poor posture, or psychological stress may lead to excessive muscle activity and impaired relaxation. Sustained contraction can reduce local circulation, increase metabolic stress, and promote myofascial trigger points. These trigger points may produce localized tenderness and referred pain involving the vagina, rectum, lower abdomen, back, buttocks, or thighs.[3] A myofascial trigger point is a hyperirritable focus within a taut band of skeletal muscle. Pressure over the affected area typically reproduces the patient's familiar pain and may provoke referred discomfort or a local muscle response. In women with pelvic floor dysfunction, levator ani trigger points may be associated with deep dyspareunia, urinary urgency, painful defecation, incomplete evacuation, pelvic pressure, and worsening pain during prolonged sitting or activity. Because these symptoms overlap with endometriosis, painful bladder syndrome, irritable bowel syndrome, vulvodynia, and neuropathic pain, pelvic floor myalgia may remain undetected. A focused vaginal examination evaluating muscle tone, tenderness, symmetry, relaxation, and symptom reproduction is therefore essential.[4] The severity of chronic pelvic pain is influenced by pelvic floor tenderness, visceral disorders, abdominal wall pain, pain-related anxiety, depression, fatigue, and other chronic pain conditions. This interaction explains why treatment directed only toward one organ may provide incomplete relief. Women may undergo repeated investigations, prolonged analgesic therapy, or surgery without adequate assessment of musculoskeletal contributors. Recognition of levator ani tenderness and active trigger points can identify a potentially modifiable component of the pain syndrome. It also permits treatment to be individualized according to symptom distribution, muscle involvement, functional limitation, associated urinary or bowel symptoms, and possible pain sensitization.[5] Initial management of levator ani myofascial pain commonly includes education, activity modification, pelvic floor relaxation, stretching, physiotherapy, manual myofascial release, biofeedback, and medication. However, some women continue to experience clinically important pain despite conservative treatment, while others cannot tolerate internal manual therapy because of severe tenderness. Trigger point injection offers a targeted, minimally invasive option in such circumstances. Injection of a local anaesthetic into the hyperirritable muscle region may interrupt nociceptive input, reduce protective muscle spasm, permit relaxation, and facilitate pelvic floor rehabilitation. Accurate muscle identification, controlled needle placement, aspiration before injection, and safe anaesthetic dosing are important for effective treatment.[6]

MATERIALS AND METHODS

This hospital-based interventional study was conducted to prospectively evaluate effectiveness of levator ani trigger point injections for chronic pelvic pain in women. Eligible participants were consecutively recruited after confirmation of levator ani myofascial pain on clinical examination. All enrolled patients received trigger point injections and were prospectively assessed for changes in pain severity, pelvic floor tenderness, functional limitations, quality of life, and treatment-related adverse effects. The study was conducted in the Department of Obstetrics and Gynaecology at a tertiary care hospital. Patients attending the gynaecology outpatient department with complaints of chronic pelvic pain were screened for eligibility. Women with suspected pelvic floor myofascial pain were evaluated by a trained gynaecologist through a detailed history, general examination, abdominal examination, pelvic examination, and focused pelvic floor muscle assessment. The study population consisted of women with chronic pelvic pain associated with clinically identifiable trigger points in the levator ani muscle. Chronic pelvic pain was defined as continuous or intermittent non-cyclic pain perceived in the lower abdomen, pelvis, pelvic floor, or lumbosacral region for at least six months and severe enough to cause functional limitation or require medical treatment. Levator ani trigger points were identified as localized, hyperirritable, tender areas within a taut band of pelvic floor muscle that

reproduced the patient's typical pain on digital palpation. A total of 90 eligible women were included in the study. Participants were recruited using a consecutive sampling technique until the required sample size was achieved. Every woman fulfilling the eligibility criteria and providing written informed consent was enrolled. Patients who declined the procedure or were unable to comply with follow-up assessments were not included.

Inclusion Criteria

Women aged 18 to 55 years with chronic pelvic pain persisting for at least six months were considered eligible. Participants were required to have one or more reproducible trigger points in the levator ani muscle, a baseline pain score of at least 4 on the 10-point Visual Analogue Scale, and persistent symptoms despite initial conservative management such as analgesics, local heat, pelvic floor exercises, or physiotherapy. Only women who provided written informed consent and agreed to attend follow-up evaluations were included.

Exclusion Criteria

Women were excluded if they were pregnant, had active pelvic inflammatory disease, vaginal or urinary tract infection, unexplained vaginal bleeding, suspected or confirmed pelvic malignancy, acute abdominal or pelvic pathology, severe endometriosis requiring surgical treatment, or significant pelvic organ prolapse. Patients with bleeding disorders, thrombocytopenia, current anticoagulant therapy, known hypersensitivity to the proposed injection agents, uncontrolled diabetes mellitus, severe neurological disease, or major psychiatric illness affecting pain assessment were also excluded. Women who had received pelvic floor trigger point injections or pelvic floor surgery in the recent past were not enrolled.

Methodology

Pre-Intervention Evaluation

A detailed history was obtained regarding the onset, duration, location, character, radiation, aggravating and relieving factors, and severity of pelvic pain. Information regarding menstrual history, obstetric history, urinary symptoms, bowel symptoms, dyspareunia, previous pelvic surgery, medical treatment, physiotherapy, and associated psychosocial factors was recorded. The impact of pain on daily activities, sleep, occupational performance, sexual activity, and emotional well-being was also assessed. Baseline pain intensity was measured using a 10-point Visual Analogue Scale, where 0 represented no pain and 10 represented the worst imaginable pain. Pelvic floor tenderness was graded during vaginal examination using a standardized 4-point tenderness scale: 0 indicating no tenderness, 1 mild tenderness, 2 moderate tenderness, and 3 severe tenderness with withdrawal or marked discomfort. The number, location, and laterality of trigger points were documented. Functional impairment was evaluated using the Pelvic Pain Impact Questionnaire, and health-related quality of life was assessed using the Short Form-12 Health Survey. Dyspareunia, when present, was evaluated using a 10-point numerical rating scale.

Identification of Levator Ani Trigger Points

Pelvic floor examination was performed with the patient in the lithotomy position after ensuring privacy and adequate explanation. A single lubricated gloved finger was introduced vaginally, and the levator ani muscle complex, including the pubococcygeus, puborectalis, and iliococcygeus components, was systematically palpated on both sides. A trigger point was considered positive when pressure over a localized taut and tender area reproduced the patient's characteristic pelvic pain, produced referred pain, or caused a recognizable local muscle response. The location and pain score associated with each trigger point were recorded before injection.

Trigger Point Injection Procedure

The procedure was performed under strict aseptic precautions in the outpatient procedure room or minor operation theatre. The patient was placed in the lithotomy position, and the vagina and perineal area were cleaned with an antiseptic solution. The identified trigger point was stabilized through vaginal palpation. A sterile needle was guided into the most tender portion of the levator ani muscle while maintaining digital control of the injection site.

Each identified trigger point was injected with a local anaesthetic solution consisting of 0.5% bupivacaine, with the total dose maintained within the recommended safe limit according to the patient's body weight. Approximately 2 to 5 mL of the solution was administered at each trigger point depending on the number and extent of tender areas. Before injecting, gentle aspiration was performed to exclude intravascular needle placement. The solution was injected slowly using a fan-shaped technique to distribute the medication throughout the affected muscle fibres. Firm local pressure was applied after removal of the needle to reduce bleeding and discomfort.

The number of trigger points injected, side involved, total volume of local anaesthetic used, immediate pain response, and any procedural difficulty were documented. Patients with multiple trigger points received injections at all clinically significant sites during the same sitting, provided the total dose remained within the safe therapeutic range.

Post-Procedure Care

After the injection, patients were observed for immediate adverse reactions, including dizziness, allergic reaction, bleeding, vasovagal symptoms, urinary difficulty, worsening pain, or signs of local anaesthetic toxicity. Pain intensity was reassessed approximately 20 to 30 minutes after the procedure. Patients were advised to avoid strenuous physical activity and sexual intercourse for 24 to 48 hours. They were instructed to report persistent bleeding, fever, increasing pelvic pain, urinary retention, lower-limb weakness, or any other unusual symptom. Simple oral analgesics were permitted when required and were documented during follow-up. Patients

were encouraged to continue gentle pelvic floor relaxation exercises and stretching after the initial post-procedure period. Additional trigger point injections were considered in patients with persistent clinically significant pain after reassessment, subject to clinical judgement and adherence to safety limits.

Follow-Up and Outcome Assessment

Patients were evaluated at baseline, immediately after the procedure, at two weeks, six weeks, and three months following the intervention. At every follow-up visit, pain severity was assessed using the Visual Analogue Scale. Pelvic floor muscle tenderness, number of active trigger points, dyspareunia score, analgesic requirement, functional limitation, and quality-of-life scores were reassessed using the same baseline methods.

Patient-reported improvement was categorized as excellent when pain reduction was 75% or more, good when pain reduction was 50% to 74%, moderate when pain reduction was 25% to 49%, and poor when pain reduction was less than 25%. Patient satisfaction was recorded using a 5-point Likert scale ranging from very dissatisfied to very satisfied. Recurrence of pain, requirement for repeat injection, and additional treatment received were also documented.

Outcome Measures

The primary outcome measure was the change in mean Visual Analogue Scale pain score from baseline to three months after levator ani trigger point injection. Clinical effectiveness was additionally determined by the proportion of patients achieving at least a 50% reduction in pain intensity.

Secondary outcome measures included changes in pelvic floor tenderness score, number of active trigger points, dyspareunia score, frequency of analgesic use, functional impairment, quality-of-life scores, patient satisfaction, and need for repeat treatment. The incidence and nature of procedure-related adverse events were also evaluated.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using IBM Statistical Package for the Social Sciences, version 27.0. Continuous variables were expressed as mean and standard deviation or median and interquartile range, depending on the distribution of data. Categorical variables were presented as frequencies and percentages. Normality of continuous data was assessed using the Shapiro–Wilk test. Changes in pain scores, tenderness scores, dyspareunia scores, functional impairment, and quality-of-life scores between baseline and follow-up assessments were analysed using the paired Student's t-test for normally distributed data or the Wilcoxon signed-rank test for non-normally distributed data. Repeated-measures analysis of variance was used to compare normally distributed outcome scores across multiple follow-up visits, while the Friedman test was used for non-parametric repeated observations. Post-hoc pairwise comparisons were performed with appropriate correction for multiple testing.

The chi-square test or Fisher's exact test was used to examine associations between categorical variables and clinical response. Independent Student's t-test or Mann–Whitney U test was used to compare continuous variables between responders and non-responders. Multivariable logistic regression analysis was performed to identify independent predictors of successful treatment, defined as at least a 50% reduction in pain score at three months. Variables with clinical relevance or a p-value of less than 0.20 on univariable analysis were considered for inclusion in the regression model. Adjusted odds ratios with 95% confidence intervals were reported. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 90 women with chronic pelvic pain and clinically confirmed levator ani trigger points were included in the study. All participants underwent levator ani trigger point injection and completed the three-month follow-up assessment. The mean age of the study participants was 38.71 ± 8.42 years, and the median duration of pelvic pain was 18 months. Dyspareunia was the most frequently reported associated symptom, affecting 68 (75.56%) women.

Baseline Demographic and Clinical Characteristics

Table 1 presents the baseline demographic and clinical characteristics of the study participants. The mean age of the women was 38.71 ± 8.42 years. The largest proportion of participants belonged to the 31–40-year age group, comprising 38 (42.22%) women. This was followed by 27 (30.00%) women aged 41–50 years, 18 (20.00%) women aged 18–30 years, and 7 (7.78%) women aged 51–55 years.

The mean body mass index of the participants was 24.83 ± 3.61 kg/m². Regarding parity, more than half of the participants were multiparous, accounting for 48 (53.33%) women. Primiparous women constituted 25 (27.78%) of the study population, whereas 17 (18.89%) women were nulliparous.

With respect to the duration of chronic pelvic pain, 37 (41.11%) women had experienced symptoms for 13–24 months, representing the largest group. Pain duration of 6–12 months was reported by 28 (31.11%) women, while 25 (27.78%) had experienced pelvic pain for more than 24 months.

Among the associated clinical symptoms, limitation of routine activities was the most common and was reported by 76 (84.44%) women. Dyspareunia was present in 68 (75.56%) women, while 61 (67.78%) required regular analgesics for pain control. Sleep disturbance due to pain was observed in 44 (48.89%) participants. Urinary symptoms were reported by 32 (35.56%) women, and bowel-related symptoms were present in 27 (30.00%). Previous pelvic floor physiotherapy had been received by 29 (32.22%) women, while 21 (23.33%) had a history of pelvic surgery.

Levator Ani Trigger Point and Injection Characteristics

Table 2 describes the anatomical distribution of levator ani trigger points and the characteristics of the

injection procedure. Bilateral trigger points were identified in 51 (56.67%) women, whereas 39 (43.33%) had unilateral involvement.

Regarding the number of active trigger points, 38 (42.22%) women had two trigger points, making this the most frequent presentation. A single trigger point was identified in 24 (26.67%) participants, while 28 (31.11%) had three or more active trigger points. The mean number of injected sites was 2.09 ± 0.87, which was consistent with the observed distribution of trigger points.

The pubococcygeus muscle was the most commonly involved component of the levator ani complex, affecting 52 (57.78%) women. Puborectalis involvement was observed in 24 (26.67%) participants, while the iliococcygeus was predominantly involved in 14 (15.56%) women.

The mean total volume of 0.5% bupivacaine administered was 8.64 ± 2.37 mL. Before injection, the mean VAS pain score was 7.62 ± 1.10, indicating moderate-to-severe pain. Immediately after the procedure, the mean VAS score decreased to 4.31 ± 1.26. The mean immediate reduction in pain score was 3.31 ± 1.21 points. This reduction was statistically significant on paired Student's t-test, with a p-value of less than 0.001.

Changes in Clinical Outcome Measures During Follow-Up

Table 3 presents the changes in pain severity, pelvic floor tenderness, active trigger points, dyspareunia, functional limitation, and quality of life during follow-up. The mean VAS pain score decreased progressively from 7.62 ± 1.10 at baseline to 4.31 ± 1.26 immediately after injection. It further declined to 3.58 ± 1.43 at two weeks, 2.91 ± 1.51 at six weeks, and 2.67 ± 1.58 at three months. Repeated-measures analysis of variance showed that the reduction in pain over time was statistically significant, with $p<0.001$.

The mean pelvic floor tenderness score decreased from 2.58 ± 0.50 at baseline to 1.64 ± 0.70 at two weeks, 1.13 ± 0.76 at six weeks, and 0.96 ± 0.79 at three months. The reduction in tenderness was statistically significant according to the Friedman test, with $p<0.001$.

The mean number of active trigger points decreased from 2.09 ± 0.87 at baseline to 1.36 ± 0.79 at two weeks, 0.91 ± 0.75 at six weeks, and 0.72 ± 0.71 at three months. The overall change was statistically significant, with $p<0.001$.

Among the 68 women who reported dyspareunia at baseline, the mean dyspareunia score decreased from 6.81 ± 1.32 to 4.72 ± 1.55 at two weeks, 3.65 ± 1.62 at six weeks, and 3.21 ± 1.71 at three months. The reduction was statistically significant, with $p<0.001$.

The mean Pelvic Pain Impact Questionnaire score declined from 25.84 ± 5.77 at baseline to 19.02 ± 5.69 at two weeks, 15.11 ± 5.42 at six weeks, and 13.42 ± 5.18 at three months. The observed reduction was statistically significant, with $p<0.001$.

The SF-12 physical component score increased from 34.62 ± 6.83 at baseline to 39.87 ± 6.71 at two weeks, 44.20 ± 6.48 at six weeks, and 46.81 ± 6.55 at three months. Similarly, the SF-12 mental component score increased from 39.18 ± 7.15 at baseline to 43.52 ± 7.02 at two weeks, 46.73 ± 6.80 at six weeks, and 48.25 ± 6.74 at three months. Both improvements were statistically significant, with $p<0.001$.

Three-Month Treatment Response, Patient Satisfaction and Adverse Events

Table 4 summarises the degree of improvement, patient satisfaction, additional treatment requirements, and adverse events at three months. An excellent response, defined as a pain reduction of at least 75%, was observed in 35 (38.89%) women. A good response, representing a pain reduction of 50–74%, was reported by 29 (32.22%) participants. Moderate improvement was observed in 18 (20.00%) women, while 8 (8.89%) had a poor response.

Overall, 64 (71.11%) women achieved the predefined successful treatment response of at least a 50% reduction in pain. This indicates that more than seven out of every ten women experienced clinically meaningful pain relief following levator ani trigger point injection. Only a small proportion of participants had minimal or poor improvement.

Patient satisfaction was generally high. A total of 31 (34.44%) women were very satisfied and 34 (37.78%) were satisfied with the treatment. Therefore, 65 (72.22%) participants expressed overall satisfaction. Seventeen (18.89%) women were neither satisfied nor dissatisfied, while 6 (6.67%) were dissatisfied and 2 (2.22%) were very dissatisfied. The satisfaction findings closely corresponded with the observed treatment response.

A repeat trigger point injection was required in 17 (18.89%) women because of persistent or recurrent pain. Similarly, 17 (18.89%) participants continued to require regular analgesics at three months. Compared with the 61 (67.78%) women who required regular analgesics at baseline, this represented a substantial reduction in medication dependence after treatment.

Most women experienced no procedure-related adverse event. A total of 68 (75.56%) participants remained free of complications. Transient injection-site pain was the most common adverse event and occurred in 13 (14.44%) women. Minor vaginal spotting was reported by 5 (5.56%) women. Vasovagal symptoms and temporary urinary discomfort were each observed in 2 (2.22%) participants.

Factors Associated With Successful Treatment Response

Table 5 compares treatment responders and non-responders and identifies factors associated with successful pain reduction at three months. A successful response was defined as at least a 50% reduction in the VAS pain score. Of the 90 participants, 64 were responders and 26 were non-responders.

Among women younger than 40 years, 42 of 56 participants responded successfully, giving a response rate of 75.00%. Among women aged 40 years or older, 22 of 34 responded, corresponding to

a response rate of 64.71%. Although younger women had a numerically higher response rate, the association between age and treatment response was not statistically significant on univariable analysis (p=0.296). After adjustment for other variables, age below 40 years was associated with an adjusted odds ratio of 1.42, but the 95% confidence interval ranged from 0.52 to 3.89 and the adjusted p-value was 0.496. Therefore, age was not an independent predictor of treatment success.

Pain duration showed a significant association with treatment outcome. Among the 65 women who had experienced pelvic pain for 24 months or less, 51 (78.46%) were responders and 14 (21.54%) were non-responders. In contrast, among the 25 women with pain lasting more than 24 months, only 13 (52.00%) responded, while 12 (48.00%) did not. The univariable association was statistically significant, with p=0.013. After adjustment, women with pain duration of 24 months or less had 2.88 times higher odds of successful treatment than those with pain lasting more than 24 months. The association remained statistically significant, with a 95% confidence interval of 1.09–7.61 and an adjusted p-value of 0.033. Thus, shorter pain duration was an independent predictor of better treatment response.

Laterality of trigger points was also significantly associated with treatment success. Among the 39 women with unilateral trigger points, 33 (84.62%) responded successfully and only 6 (15.38%) were non-responders. Among the 51 women with bilateral involvement, 31 (60.78%) responded and 20 (39.22%) did not. The difference was statistically significant on univariable analysis (p=0.013). After adjustment, unilateral trigger points were associated with 3.12 times higher odds of successful treatment compared with bilateral trigger points. The 95% confidence interval was 1.08–9.01, and the adjusted p-value was 0.036. Therefore, unilateral muscle involvement independently predicted a more favourable outcome. The number of active trigger points demonstrated the strongest association with treatment response. Among the 62 women with two or fewer trigger points, 50 (80.65%) were responders and 12 (19.35%) were non-responders. In comparison, among the 28 women with three or more trigger points, only 14 (50.00%) responded, while 14 (50.00%) did not. The univariable p-value was 0.003, indicating a highly significant association. On multivariable analysis, women with two or fewer trigger points had 3.67 times higher odds of treatment success than those with three or more trigger points. The 95% confidence interval was 1.38–9.75, and the adjusted p-value was 0.009. A history of previous pelvic surgery was associated with treatment response on univariable analysis. Among the 69 women without previous pelvic surgery, 53 (76.81%) responded and 16 (23.19%) did not. Among the 21 women with a history of pelvic surgery, 11 (52.38%) were responders and 10 (47.62%) were non-responders. The univariable association was statistically significant, with p=0.031. However, after adjustment for pain duration, laterality, number of trigger points, and age, the adjusted odds ratio was 2.53 with a 95% confidence interval of 0.89–7.15 and an adjusted p-value of 0.080. Since the confidence interval included 1 and the p-value exceeded 0.05, absence of previous pelvic surgery was not considered an independent predictor of treatment success. Overall, levator ani trigger point injection produced significant and sustained reductions in pain, pelvic floor tenderness, active trigger points, dyspareunia, and functional impairment. It also improved physical and mental quality-of-life scores. Successful treatment was achieved in 71.11% of participants, and the procedure was associated with high patient satisfaction and a low frequency of mild adverse events.

Table 1: Baseline Demographic and Clinical Characteristics of the Study Participants

Characteristics	Number (n=90)	Percentage (%)
Age, years (mean ± SD)	38.71 ± 8.42	—
Age group		
18–30 years	18	20.00
31–40 years	38	42.22
41–50 years	27	30.00
51–55 years	7	7.78
Body mass index, kg/m² (mean ± SD)	24.83 ± 3.61	—
Parity		
Nulliparous	17	18.89
Primiparous	25	27.78
Multiparous	48	53.33
Duration of pelvic pain		
6–12 months	28	31.11
13–24 months	37	41.11
More than 24 months	25	27.78
Associated clinical symptoms		
Dyspareunia	68	75.56
Urinary symptoms	32	35.56
Bowel-related symptoms	27	30.00
Sleep disturbance due to pain	44	48.89
Limitation of routine activities	76	84.44
Previous pelvic surgery	21	23.33
Previous pelvic floor physiotherapy	29	32.22

Regular analgesic requirement	61	67.78

Table 2: Levator Ani Trigger Point and Injection Characteristics

Characteristics	Number/Value	Percentage (%) or p-value
Laterality of trigger points		
Unilateral	39	43.33
Bilateral	51	56.67
Number of active trigger points		
One	24	26.67
Two	38	42.22
Three or more	28	31.11
Predominantly involved muscle component		
Pubococcygeus	52	57.78
Puborectalis	24	26.67
Iliococcygeus	14	15.56
Total volume of 0.5% bupivacaine, mL (mean ± SD)	8.64 ± 2.37	—
Number of sites injected (mean ± SD)	2.09 ± 0.87	—
Pre-injection VAS score (mean ± SD)	7.62 ± 1.10	—
Immediate post-injection VAS score (mean ± SD)	4.31 ± 1.26	<0.001*
Mean immediate reduction in VAS score	3.31 ± 1.21	<0.001*

*Paired Student's t-test comparing pre-injection and immediate post-injection Visual Analogue Scale scores

Table 3: Changes in Clinical Outcome Measures During Follow-Up

Outcome measure	Baseline	Immediately after injection	2 weeks	6 weeks	3 months	Overall p-value
VAS pain score	7.62 ± 1.10	4.31 ± 1.26	3.58 ± 1.43	2.91 ± 1.51	2.67 ± 1.58	<0.001*
Pelvic floor tenderness score	2.58 ± 0.50	—	1.64 ± 0.70	1.13 ± 0.76	0.96 ± 0.79	<0.001†
Number of active trigger points	2.09 ± 0.87	—	1.36 ± 0.79	0.91 ± 0.75	0.72 ± 0.71	<0.001†
Dyspareunia score‡	6.81 ± 1.32	—	4.72 ± 1.55	3.65 ± 1.62	3.21 ± 1.71	<0.001*
Pelvic Pain Impact Questionnaire score	25.84 ± 5.77	—	19.02 ± 5.69	15.11 ± 5.42	13.42 ± 5.18	<0.001*
SF-12 physical component score	34.62 ± 6.83	—	39.87 ± 6.71	44.20 ± 6.48	46.81 ± 6.55	<0.001*
SF-12 mental component score	39.18 ± 7.15	—	43.52 ± 7.02	46.73 ± 6.80	48.25 ± 6.74	<0.001*

Values are expressed as mean ± standard deviation.
*Repeated-measures analysis of variance.
†Friedman test.
‡Dyspareunia score was evaluated among the 68 women who reported dyspareunia at baseline.

Table 4: Three-Month Treatment Response, Patient Satisfaction and Adverse Events

Outcome	Number (n=90)	Percentage (%)
Degree of improvement at three months		
Excellent response: ≥75% pain reduction	35	38.89
Good response: 50–74% pain reduction	29	32.22
Moderate response: 25–49% pain reduction	18	20.00
Poor response: <25% pain reduction	8	8.89
Overall successful response: ≥50% pain reduction	64	71.11
Patient satisfaction		
Very satisfied	31	34.44
Satisfied	34	37.78
Neither satisfied nor dissatisfied	17	18.89
Dissatisfied	6	6.67
Very dissatisfied	2	2.22
Required a repeat trigger point injection	17	18.89
Required regular analgesics at three months	17	18.89
Most significant procedure-related adverse event		
No adverse event	68	75.56
Transient injection-site pain	13	14.44
Minor vaginal spotting	5	5.56
Vasovagal symptoms	2	2.22
Temporary urinary discomfort	2	2.22
Serious adverse event	0	0.00

Table 5: Factors Associated with Successful Treatment Response at Three Months

Variable	Total n	Responders n (%)	Non-responders n (%)	Univariable p-value	Adjusted odds ratio (95% CI)	Adjusted p-value
Age group						
<40 years	56	42 (75.00)	14 (25.00)	0.296	1.42 (0.52–3.89)	0.496
≥40 years	34	22 (64.71)	12 (35.29)	Reference	Reference	—
Duration of pelvic pain						
≤24 months	65	51 (78.46)	14 (21.54)	0.013	2.88 (1.09–7.61)	0.033
>24 months	25	13 (52.00)	12 (48.00)	Reference	Reference	—

Laterality of trigger points						
Unilateral	39	33 (84.62)	6 (15.38)	0.013	3.12 (1.08–9.01)	0.036
Bilateral	51	31 (60.78)	20 (39.22)	Reference	Reference	—
Number of active trigger points						
Two or fewer	62	50 (80.65)	12 (19.35)	0.003	3.67 (1.38–9.75)	0.009
Three or more	28	14 (50.00)	14 (50.00)	Reference	Reference	—
Previous pelvic surgery						
No	69	53 (76.81)	16 (23.19)	0.031	2.53 (0.89–7.15)	0.080
Yes	21	11 (52.38)	10 (47.62)	Reference	Reference	—

CI: confidence interval

DISCUSSION

The present study included 90 women with a mean age of 38.71 ± 8.42 years and a mean body mass index of 24.83 ± 3.61 kg/m². Most participants were aged 31–40 years (42.22%), and 53.33% were multiparous. The median duration of pelvic pain was 18 months, with 41.11% reporting symptoms for 13–24 months. The high prevalence of limitation of routine activities (84.44%), dyspareunia (75.56%), regular analgesic use (67.78%), and sleep disturbance (48.89%) demonstrates the considerable functional burden associated with levator ani myofascial pain. Bartley et al. (2019) evaluated 101 women undergoing transvaginal pelvic floor trigger point injections and reported a mean age of approximately 44 years, indicating a slightly older population than that of the present study. In their study, 77% of women experienced improvement after the first injection, supporting the clinical relevance of identifying and treating pelvic floor trigger points in women whose pelvic pain affects multiple aspects of daily life.[7] Bilateral trigger points were identified in 56.67% of the women in the present study, while 43.33% had unilateral involvement. Two active trigger points represented the most frequent presentation (42.22%), followed by three or more trigger points (31.11%) and a single trigger point (26.67%). The pubococcygeus was the predominantly involved muscle in 57.78% of participants, and the mean number of injected sites was 2.09 ± 0.87. Following administration of a mean volume of 8.64 ± 2.37 mL of 0.5% bupivacaine, the mean VAS score decreased immediately from 7.62 ± 1.10 to 4.31 ± 1.26, representing a reduction of 3.31 ± 1.21 points ($p<0.001$). Fouad et al. (2017) similarly reported a reduction in median pain score from 7 before injection to 4 after injection among 68 women, with 65% demonstrating improvement and a mean reduction of approximately 3.6 points among responders. The close similarity between the immediate pain reductions in the two studies supports the rapid analgesic effect of local anaesthetic injection into clinically identified pelvic floor trigger points.[8] Pain relief in the present study was not limited to the immediate post-procedure period. The mean VAS score progressively decreased from 7.62 ± 1.10 at baseline to 3.58 ± 1.43 at two weeks, 2.91 ± 1.51 at six weeks, and 2.67 ± 1.58 at three months ($p<0.001$). At the three-month assessment, 38.89% of participants had an excellent response, 32.22% had a good response, and 71.11% achieved the predefined successful response of at least 50% pain reduction. Langford et al. (2007) prospectively studied 18 women with chronic pelvic pain and levator ani trigger points and observed a reduction in mean pain intensity from approximately 8.8 before treatment to 3.6 at three months. Pain relief was reported by 13 of 18 women (72%), including six women (33%) who became completely pain-free. Their 72% response rate was almost identical to the 71.11% successful response observed in the present study, although the current study included a substantially larger sample.[9] Dyspareunia was present in 68 (75.56%) women at baseline, confirming that sexual pain was an important component of the clinical presentation. Among affected women, the mean dyspareunia score decreased from 6.81 ± 1.32 at baseline to 4.72 ± 1.55 at two weeks, 3.65 ± 1.62 at six weeks, and 3.21 ± 1.71 at three months ($p<0.001$). Zoorob et al. (2015) compared levator-directed trigger point injections with pelvic floor physical therapy in a randomized pilot trial. The mean reduction in pain score was 4.67 ± 1.72 in the injection group and 4.47 ± 2.12 in the physical therapy group, with more than 50% pain improvement reported by 58% and 59% of participants, respectively. However, improvement in overall sexual function and the sexual pain domain was greater with physical therapy, whereas trigger point injection produced a more rapid treatment effect. These findings suggest that injections can provide substantial and relatively rapid relief of pelvic myalgia and dyspareunia, although combining injections with pelvic floor rehabilitation may produce broader sexual-function benefits.[10] Objective pelvic floor findings improved alongside the reduction in self-reported pain. The mean pelvic floor tenderness score decreased from 2.58 ± 0.50 at baseline to 0.96 ± 0.79 at three months, while the mean number of active trigger points decreased from 2.09 ± 0.87 to 0.72 ± 0.71 (both $p<0.001$). Functional impairment also declined, as shown by a reduction in the Pelvic Pain Impact Questionnaire score from 25.84 ± 5.77 to 13.42 ± 5.18. Simultaneously, the SF-12 physical score increased from 34.62 ± 6.83 to 46.81 ± 6.55, and the mental score increased from 39.18 ± 7.15 to 48.25 ± 6.74 (both $p<0.001$). Abbott et al. (2006), in a randomized trial of botulinum toxin for pelvic floor spasm, reported reductions in dyspareunia scores from 66 to 12, non-menstrual pelvic pain scores from 51 to 22, and pelvic floor pressure from 49 to 32 cmH_2O. Although botulinum toxin and bupivacaine have different mechanisms and the outcome scales were not identical, both

studies demonstrate that reduction of pelvic floor hypertonicity may improve pain, muscle tenderness and functional well-being.[11] The clinical response in the present study was accompanied by high patient acceptance and reduced dependence on additional treatment. Overall, 72.22% of women were satisfied or very satisfied, while only 8.89% were dissatisfied or very dissatisfied. Regular analgesic use decreased from 67.78% at baseline to 18.89% at three months, and repeat trigger point injection was required in 17 (18.89%) women. Nesbitt-Hawes et al. (2013) followed 37 women treated with botulinum toxin injections into the puborectalis and pubococcygeus muscles. Twenty-six women (70%) required only one injection, whereas 11 (30%) received repeat injections. Dyspareunia scores decreased from 54 to 30 after a single injection and from 51 to 23 among women receiving repeated treatment. The lower repeat-injection rate in the present study may reflect the shorter three-month observation period, differences in patient selection and the use of local anaesthetic rather than botulinum toxin. Nevertheless, both studies indicate that most women obtain meaningful benefit after one treatment, while a smaller subgroup requires repeated intervention.[12] Levator ani trigger point injection demonstrated a favourable safety profile in the present study. No adverse event was reported by 75.56% of women, while transient injection-site pain occurred in 14.44%, minor vaginal spotting in 5.56%, vasovagal symptoms in 2.22%, and temporary urinary discomfort in 2.22%. No serious adverse events, pelvic infections, significant bleeding, urinary retention, neurological deficits or manifestations of local anaesthetic toxicity were observed. Adelowo et al. (2013) studied intralevator botulinum toxin injections in 29 women with refractory myofascial pelvic pain and reported temporary urinary retention in 10.30%, faecal incontinence in 6.90%, and constipation or rectal pain in 10.30%; all complications resolved spontaneously. Compared with these findings, the present study had fewer pelvic organ dysfunction-related complications. This difference may be related to the temporary sensory and analgesic action of bupivacaine compared with the more prolonged neuromuscular effect of botulinum toxin, as well as differences in dosage, injection sites and baseline disease severity.[13] The response analysis showed that treatment success was influenced more by the duration and extent of myofascial disease than by age. Pain duration of 24 months or less independently increased the odds of successful treatment by 2.88 times (95% CI: 1.09–7.61; p=0.033), unilateral involvement increased the odds by 3.12 times (95% CI: 1.08–9.01; p=0.036), and the presence of two or fewer trigger points increased the odds by 3.67 times (95% CI: 1.38–9.75; p=0.009). Age below 40 years was not significant (adjusted p=0.496), and absence of previous pelvic surgery lost significance after adjustment (adjusted p=0.080). Halder et al. (2017) evaluated 50 women treated with botulinum toxin and myofascial-release physical therapy and reported a reduction in mean pain score from 6.4 ± 1.8 to 3.7 ± 4.0, a decline in detectable trigger points from 100% to 44%, and self-reported improvement in 58%. Chronic bowel disorders were associated with poorer improvement, while a history of an incontinence sling was associated with a better response, further suggesting that clinical phenotype and pelvic floor disease burden influence treatment outcome. The present findings should nevertheless be interpreted in view of the single-arm design, absence of a control group, relatively short follow-up and lack of comparison between injection and pelvic floor physiotherapy.[14]

CONCLUSION

Levator ani trigger point injections were effective in significantly reducing chronic pelvic pain, pelvic floor tenderness, dyspareunia, and the number of active trigger points. The treatment also improved functional status, physical and mental quality of life, and reduced regular analgesic use. A clinically successful response was achieved in most participants, with high patient satisfaction and only mild, transient adverse events. Shorter pain duration, unilateral involvement, and fewer trigger points were associated with a better treatment response.

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