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The Efficacy of a Treatment Program Focusing on Specific Stabilizing Exercises for Pelvic Girdle Pain After Pregnancy

A Two-Year Follow-up of a Randomized Clinical Trial

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Study Design. A randomized clinical trial.

Objectives. To examine the effects of a treatment program focusing on specific stabilizing exercises after a 2-year follow-up period.

Summary of Background Data. An individualized treatment approach with specific stabilizing exercises is shown to be effective for women with pelvic girdle pain 1 year after delivery. No previous study has examined the long-term effects of treatment for women with postpartum pelvic girdle pain.

Methods. Eighty-one women with pelvic girdle pain postpartum were assigned randomly to 2 treatment groups for 20 weeks. Patient self-reported questionnaires measuring pain, disability, and health-related quality of life were collected after 20 weeks of treatment and 1 and 2 years postpartum.

Results. All 81 women returned the questionnaires for the 2-year follow-up. Sixteen were excluded from the analysis, mainly due to new pregnancies. The significant differences between the groups in functional status, pain, and physical health (SF-36) were maintained 2 years after delivery. Minimal disability was found in 85% of the specific stabilizing exercise group as compared to 47% in the control group. The control group showed significant improvement in functional status with median change score of 6.0 (Q1–Q3 of −12–0). Minimal evening pain was reported by 68% in the specific stabilizing exercise group *versus* 23% in the control group. However, the group differences disappeared for all measures when controlling for score level 1 year after delivery by regression analysis.

Conclusion. The significant differences between the groups persisted with continued low levels of pain and disability in the specific stabilizing exercise group 2 years after delivery. Significant reduction in disability was found within the control group. Those with the highest level of disability and greatest potential for improvements recovered most, regardless of intervention group. [Key words: pelvic girdle pain, postpartum, randomized controlled trial, physical therapy, specific stabilizing exercises, effectiveness, follow-up] **Spine 2004;29:E197–E203**

Low back pain (LBP) and pelvic girdle pain (PGP) related to pregnancy are reported to affect about 50% of pregnant women at some time during pregnancy.[1–4] In most cases, the women recover after pregnancy or within 1 to 3 months postpartum.[5–7] However, studies have demonstrated that recovery of LBP and PGP after pregnancy is often incomplete and may persist for years after childbirth.[5–9] Furthermore, 10% to 20% of women with chronic LBP have claimed that the initial appearance was in connection with a pregnancy.[10,11]

A recent systematic review of treatment for pregnancy-related LBP and PGP revealed few controlled clinical trials.[12] Only 2 studies have investigated the effect of treatment for postpartum women suffering from PGP.[13,14] Mens *et al* studied the effect of diagonal trunk muscle exercises compared with training of the longitudinal trunk muscle system and no exercises.[13] Comparison between the groups at the end of 8 weeks intervention revealed no significant differences between the groups. No long-term results were reported.

We have conducted a randomized controlled trial comparing physical therapy with specific stabilizing exercises and physical therapy without specific stabilizing exercises.[14] The specific exercises focused on in the stabilizing exercise program aimed at improving motor control and stability through improving force closure of the pelvis.[15,16] From baseline to 1-year postpartum, significant improvements were found within both groups for pain and functional status variables. However, the group with specific exercises was significantly better than the other group in terms of pain, functional status, health-related quality of life, and physical tests both after the intervention period and at the 1-year follow-up. Most of the changes were observed during the intervention period of 20 weeks. A further but slow improvement over the 6 months following treatment was observed.

To our knowledge, no previous study has examined the long-term effects of treatment for women with postpartum PGP. The aim of the present study was to investigate whether the significant differences between the 2 comparison groups 1 year after delivery persisted at the

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2-year follow-up. We also wanted to examine whether the women in the no specific exercise group had reached a stable condition and whether the improvements in the specific exercise group persisted.

■ Materials and Methods

Design and Study Group. The study was designed as a prospective, randomized clinical trial with 2 treatments: physical therapy with specific stabilizing exercises (specific stabilizing exercise group, or SSEG) and physical therapy without specific stabilizing exercises (control group, or CG).[14] The randomization procedure took place after the baseline examination was completed and eligibility was determined. An independent person unaware of patient characteristics administered precoded identical containers to assign the study patients to the intervention groups. To obtain as comparable groups as possible, stratified randomization based on pain location was used. Inclusion criteria were: PGP located distal and/or lateral to the L5–S1 area in the buttocks and/or in the symphysis[17]; positive Posterior Pelvic Pain Provocation (P4) test[18]; and/or Active Straight Leg Raising (ASLR) test[19]; pain provocation of long dorsal sacroiliac ligament[20]; and pain provocation of the symphysis by palpation and by modified Trendelenburg test.[21] Exclusion criteria were: LBP indicating radiculopathy, rheumatology, and other serious disease or pathology; positive Straight Leg Raising test; Slump test, Crams test; and the femoralis nerve test.[22] Eighty-one patients with PGP were included within 6 to 16 weeks since last delivery. Forty patients were allocated to the SSEG and 41 to the CG. At the 2-year follow-up, all 81 women were mailed self-report questionnaires to be returned in self-addressed postage-paid envelopes. The study was approved by the regional ethics committee and informed consent was obtained from all study participants.

Interventions. All patients were treated by 1 of 6 experienced physical therapists over a period of 20 weeks.[14] In both groups, an individual treatment program was based on a clinical examination. For all the women, attention was paid to information and coping strategies, body awareness, and ergonomic advice in specific, real-life situations (*e.g.*, lifting and carrying their child). In the CG, the patients received different physical therapy methods (massage, relaxation, joint mobilization, manipulation, electrotherapy, hot packs, mobilizing and strengthening exercises) as recommended by the physical therapist. Besides the individual therapy, they were mainly encouraged to perform ordinary physical activity at their individual level. Specific stabilizing exercises were not instructed. However, in the SSEG, the main focus was exercises and training. The specific stabilizing exercises were based on specific training of the deep local muscles (the transverse abdominal wall muscles with coactivation of the lumbar multifidus in the lumbosacral region)[15] and training of the superficial, global muscles (m. gluteus maximus, m. latissimus dorsi, the oblique abdominal muscles,[16] m. erector spinae, m. quadratus lumborum, and hip adductors and abductors). Initially, focus was on specific contraction of the transverse abdominal wall muscles. Individual guidance and adjustments of the exercise program were given by the physical therapist. The exercise equipment Terapi Master was used to facilitate the exercise progressions for most of the exercises.[23] The participants borrowed the equipment and had it installed at home during the intervention period, allowing the training to be performed mainly at home. Compliance was measured with the aid of a training diary. The exercises should not provoke pain, and the patients were encouraged to activate the transversal abdominal wall regularly during daily activities. When indicated, joint mobilization, massage, relaxation, and stretching were performed—however, in no slight degree.

Outcome Measurements. Measurements were obtained at the time of entry, after completion of the intervention period, and 1 and 2 years after delivery. The primary outcome measures registered were pain and functional status. Pain intensity at worst, morning and evening, was measured by visual analogue scales (VAS 0–100 mm). Functional status was measured by the Oswestry LBP Disability Questionnaire,[24] revised version,[25] and Disability Rating Index.[26] Furthermore, health-related quality of life was assessed using the SF-36 Health Survey.[27]

Study Sample. All 81 women returned the questionnaires for the 2-year follow-up. We excluded 14 patients due to new pregnancies, 1 patient because of hospitalization, and 1 who was not willing to fill in the questionnaire. These 16 patients (10 from SSEG and 6 from CG) did not differ from the 65 included in the analysis with respect to baseline characteristics or outcome measures after 2 years.

Statistics. Baseline characteristics are presented as mean values with standard deviations (SDs) for continuous variables and as proportions for dichotomous variables. Comparisons between the intervention groups were performed by the Student *t* test or the χ^2 test, respectively.

Pain and functional status (Oswestry Disability Questionnaire) are presented with median values and interquartile ranges (Q1–Q3). Comparisons between the intervention groups were performed by the Mann-Whitney U test, whereas changes within groups were analyzed by the Wilcoxon signed rank test. Moreover, to control for differences between the groups at the 1-year follow-up, logistic regression analyses were performed with the score at the 2-year follow-up as the dependent variable and the score at the 1-year follow-up and group as independent variables. In these analyses, functional status was dichotomized as <20 or ≥ 20, where the first category represents minimal disability.[24] Pain scores were dichotomized as <10 mm and ≥ 10 mm on the VAS, where the first category represents minimal or no pain.

Health-related quality of life variables (SF-36) are presented as mean values with SDs and 95% confidence intervals (CIs). Comparisons between the 2 interventions groups as regards SF-36 variables were performed by the Student 2-sample *t* test, whereas changes within groups were analyzed by the Student paired *t* test. To control for the differences between groups at the 1-year follow-up, linear regression analyses were performed with the 2-year follow-up score as the dependent variable and the 1-year follow-up score and group as independent variables.

The statistical analyses were performed with SPSS 10.0. All tests are 2-sided, and a 5% level of significance was used.

■ Results

Changes From Baseline to 1-Year Follow-up

The 2 study groups examined in this follow-up study (n = 65) were comparable at baseline for all relevant

Table 1. Baseline Characteristics of the Patients

	SSEG (n = 34)	CG (n = 31)	*P* Value
Age (yrs)*	33.0 (3.7)	33.1 (3.8)	0.95
Weight (kg)*	68.7 (10.0)	67.5 (11.2)	0.64
Height (cm)*	168.8 (5.7)	166.6 (5.4)	0.12
Education (yrs at school)*	16.3 (2.5)	15.9 (2.4)	0.61
LBP before pregnancy [no. (%)]	15 (44)	17 (55)	0.39
Regular physical activity/exercises [no. (%)]	24 (71)	24 (77)	0.53

* Mean (SD).
SSEG = specific stabilizing exercise group; CG = control group.

background variables (Table 1). One year after delivery, significant differences were observed between the intervention groups for pain and functional status ($P < 0.001$), in favor of the SSEG (Figure 1). The SSEG demonstrated minimal pain and disability, whereas the CG showed considerable pain intensity and moderate disability. Regarding health-related quality of life (SF-36) significant differences were found between the 2 groups at the 1-year follow-up for all subscales except for social functioning ($P = 0.07$) (Figure 2).

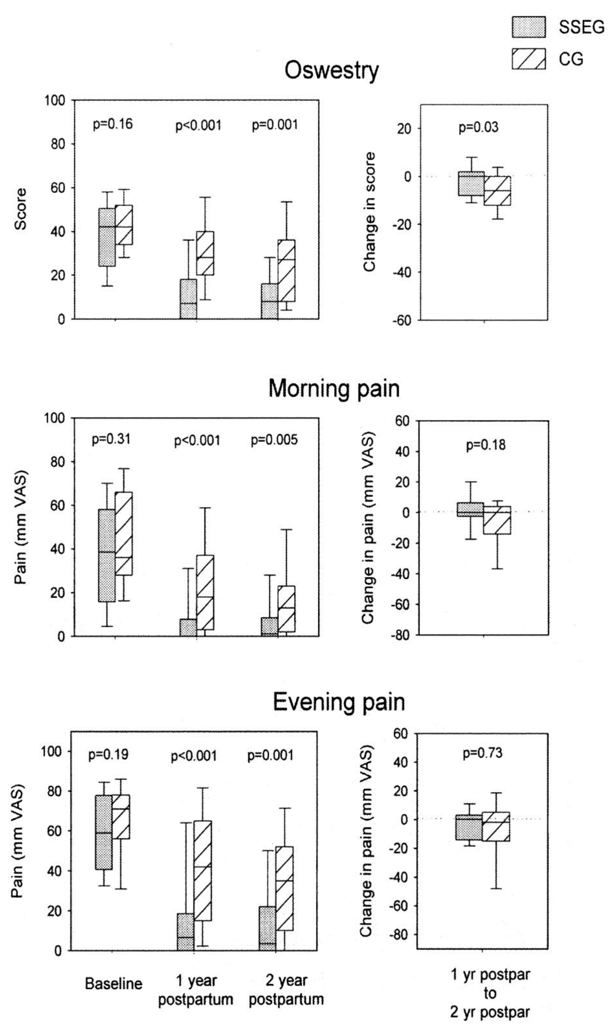

Figure 1. Scores of Oswestry Disability Questionnaire and VAS scores for worst morning and evening pain for the SSEG and CG at baseline, 1 and 2 years after delivery (n = 65). The changes in scores are shown to the right. The boxes show quartiles, medians and 10th and 90th percentiles at the ends.

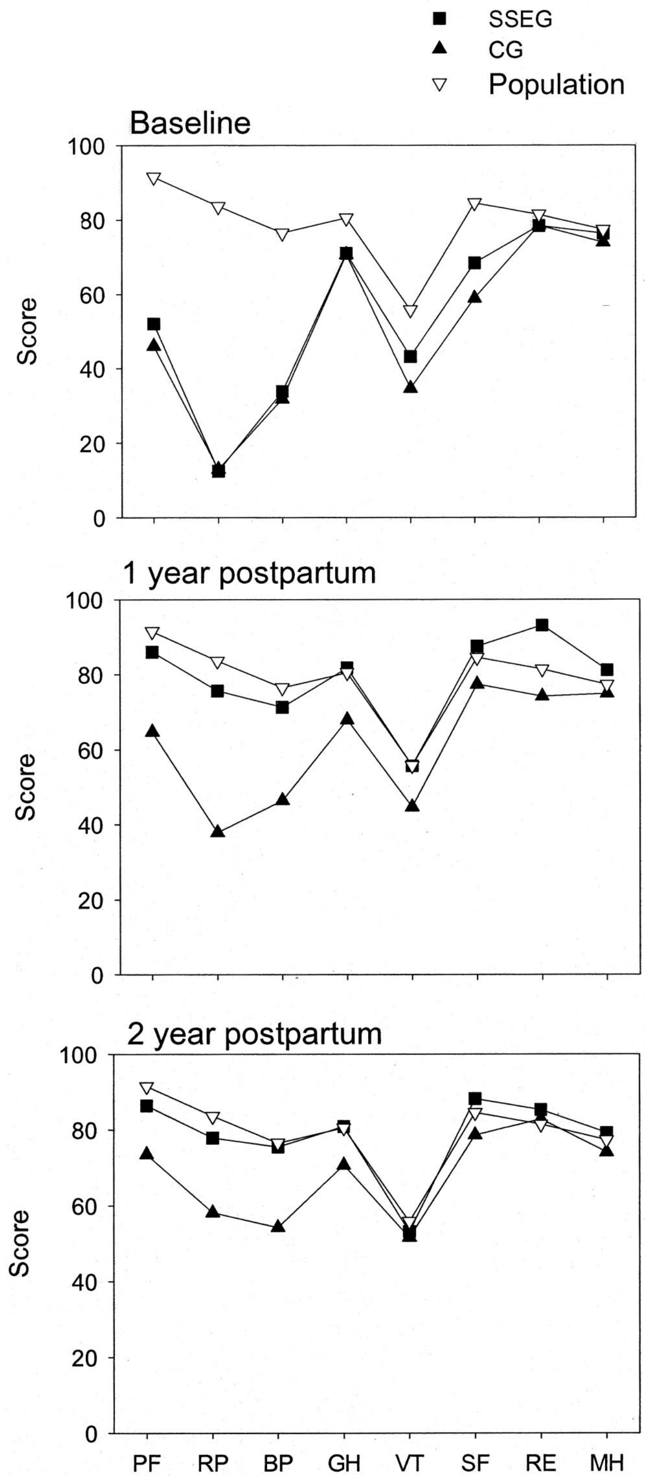

Figure 2. Mean scores of health-related quality of life (SF-36) for the SSEG and CG compared to a general Norwegian population[28] at baseline, 1 and 2 years postpartum. Standard deviations and confidence intervals mean are given in Table 2. PF = physical functioning, RP = role physical, BP = bodily pain, GH = general health, VT = vitality, SF = social functioning, RE = role emotional, MH = mental health.

Table 2. Health-Related Quality of Life (Measured by SF-36)

	Specific Stabilizing Exercises Group (n = 34)				Control Group (n = 31)			
	1 yr		2 yr		1 yr		2 yr	
	Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	95% CI
PF	86 (15)	(81–91)	86 (12)*	(82–91)	65 (18)	(58–71)	74 (19)	(67–80)
RP	76 (36)	(63–88)	78 (35)	(66–90)	38 (41)	(23–53)	58 (45)	(41–75)
BP	71 (23)	(63–79)	76 (19)	(69–82)	46 (21)	(39–54)	54 (27)	(45–64)
GH	82 (18)	(76–88)	81 (19)	(74–87)	68 (22)	(60–76)	71 (23)	(62–79)
VT	56 (17)	(50–62)	53 (19)	(46–60)	45 (20)	(37–52)	52 (21)	(44–59)
SF	88 (18)	(81–94)	88 (17)	(83–94)	77 (26)	(68–87)	79 (28)	(68–89)
RE	93 (18)	(87–99)	85 (30)	(75–96)	74 (38)	(60–88)	83 (32)	(71–95)
MH	81 (10)	(78–85)	79 (14)	(74–84)	75 (15)	(69–81)	74 (16)	(68–80)

* n = 33 for PF in the SSEG due to 1 missing value at 2 years.
CI = confidence interval; PF = physical functioning; RP = role physical; BP = bodily pain; GH = general health; VT = vitality; SF = social functioning; RE = role emotional; MH = mental health.

Functional Status and Pain at the 2-Year Follow-up

Significant differences in functional status, evening pain, and morning pain between the groups were maintained 2 years after delivery ($P < 0.005$) (Figure 1). No significant changes were seen within the SSEG from the 1-year to the 2-year follow-up for these variables, which is reasonable due to low scores 1 year after delivery. In the CG, statistically and clinically significant improvement (median change score of 6.0 (Q1–Q3 of −12–0) was observed for functional status ($P < 0.001$), but not for pain intensities ($P > 0.12$). The changes are illustrated in Figure 1 (right panels).

Analysis of the Oswestry functional disability scores revealed minimal disability in 85% of the SSEG as compared to 47% in the CG after 2 years. Similar findings were obtained for the Disability Rating Index with a median score in the SSEG of 3.6 (Q1–Q3 of 0.3–14.0) as compared to 24.2 (Q1–Q3 of 10.0–36.4) in the CG. No or minimal evening pain (less than 10 mm on VAS) was reported by 68% in the SSEG *versus* 23% in the CG, and 77% *versus* 45% for morning pain, respectively. These results also showed that despite minor improvements in pain intensity, significant improvements in functional status were observed within the CG.

Logistic regression analysis of dichotomized variables (see *Statistics*) showed that when controlling for the score levels 1 year after delivery, no significant differences between the groups were found at the 2-year follow-up. This means that those with most pain and disability improved most, regardless of intervention group.

Health-Related Quality of Life at the 2-Year Follow-up

The scores of SF-36 2 years after delivery revealed that significant differences persisted between the groups in physical functioning ($P = 0.002$), role physical ($P = 0.05$), and bodily pain ($P = 0.001$) (Table 2, Figure 2). No significant differences between the 2 groups were seen for the other 5 subscales (general health, vitality, social functioning, role emotional, and mental health). Within the CG, significant improvements from the 1-year follow-up were seen for the subscales of physical function, role-physical, bodily pain, and vitality (P values were < 0.01, 0.01, 0.05, and 0.05, respectively), whereas no significant changes were found within the SSEG for any of the subscales. Also, here the group differences disappeared when controlling for score level 1 year after delivery by linear regression.

Compared to a representative sample from the general Norwegian population, the CG showed considerably lower scores for physical functioning, role-physical, and bodily pain, whereas for the SSEG, the scores on all the subscales of SF-36 were at the 2-year follow-up comparable to the general population.[28] Both groups in our study demonstrated, however, similar scores for the mental health scales as the general population (Figure 2). The lack of differences between the groups in the mental health subscales is supported by the scores of the Hopkins Symptom Check List (HSCL), which showed normal values at all points of measurement. Mean HSCL values 2 years after delivery were 1.4 (95% CI 1.3–1.6) in both groups.

■ Discussion

Group Differences After 2 Years

This is the first study with a 2-year follow-up of a group of patients receiving treatment for postpartum PGP. The study compared long-term effects of physical therapy with and without specific stabilizing exercises. The benefits of the specific stabilizing exercise program, previously reported after 1 year,[14] persisted at the 2-year follow-up. Disability was still significantly lower in the SSEG than in the CG, and the average pain intensity was much higher in the CG 2 years after delivery than in the SSEG immediately after the intervention period.[14] At the 2-year follow-up, the SSEG reported comparable scores to the norms for SF-36 of a representative general Norwegian population (women age group 30–39 years).[28] These norms were similar to scores obtained in an Australian study on postpartum women.[29] However, the CG demonstrated considerable lower scores of physical health. Despite pain and physical disability, women in the CG reported normal scores of mental health (SF-36), indicating that the women suffered from physical disorders that did not affect mental health. The scores of mental health were consistent with the scores achieved by the HSCL,[30] showing that the patients studied were not suffering from mental disorders or psychopathology.

Even though many recovered, pain and functional limitations persisted for some women. Twenty percent of women with back pain during pregnancy are reported to have persisting pain 3 and 6 years postpartum.[7,9] We included women who had not recovered during the first 4 months postpartum, thus it would be reasonable to expect lower recovery of pain and disability compared to patients recruited during pregnancy. The very low prevalence of pain and disability in the SSEG 2 years after delivery are therefore noteworthy. Considering that some pain and functional limitations are common among the general population, the participants of the SSEG were comparable to the normal population 2 years postpartum. The fact that we asked for pain intensity at worst and differentiated between morning and evening pain is of importance for interpretation of the results of the present study. The reported pain scores are probably higher than if we had asked for pain at present. Nilsson-Wikmar *et al*[31] reported median values of maximum pain intensity >40 mm on 100 mm VAS 1 year postpartum and demonstrated that maximum pain scores showed noticeably higher values than pain scores at present.[31]

Changes Within the Control Group

Despite significant differences between the groups at the 2-year follow-up, the CG gradually showed statistically significant and clinically important improvements in physical function and physical health. There was, however, a discrepancy between the changes in disability and pain intensity within the CG. Although significant improvements were shown in functional status, only minor and nonsignificant reductions were revealed in pain. Numerous other studies have shown low to moderate correlation between pain intensity and functional status.[32–34] A possible explanation is that pain measurements by VAS are less reliable than measurements of functional status.[35] A single question of pain intensity may also be less valid than a more composite index.

According to the literature, no significant recovery of pain and disability would be expected later than 3 months postpartum.[5–8,31,36] Östgaard and Andersson and Östgaard *et al* found that back pain during pregnancy disappeared spontaneously soon after delivery and improved in few women later than 6 months postpartum.[6,7] Recovery was reported to occur, on average, 4 months after delivery with only 6% recovery 6 to 18 months after delivery.[6] Furthermore, persisting back pain 3 months postpartum was correlated with slow recovery of back pain later.[7] Changes in functional status have only been reported in 1 study, showing no improvements from 3 to 12 months postpartum.[31] Thus, and considering that the women in our study were included approximately 2 to 4 months postpartum, it is interesting to find significant improvements in functional status later than 1 year postpartum. These findings are, however, in keeping with clinical experience. Women with postpartum PGP often report that they needed 2 years to recover. The gradual improvement in the CG could possibly be explained by delayed outcome of the treatment program. However, the analysis demonstrated that those with the highest level of disability and greatest potential for improvement recovered most, regardless of intervention group. The mechanisms for this improvement are unclear, but might be the same in both groups.

Changes Within the Specific Stabilizing Exercise Group

The fact that few of the women in the SSEG experienced a relapse during the 2-year follow-up period may have several explanations. The maintained improvement may be taken as evidence of why it is important to focus on particular muscles for their stabilizing functions in rehabilitation. According to Hides *et al*, specific exercise therapy may be required to restore normal muscle function to prevent long-term sequelae of deficient stabilizing muscles.[37] Today, biomechanical evidence exists to explain the role of the multifidus in cocontraction with transversus abdominis in stabilization of the lumbar segments.[38] Furthermore, O'Sullivan *et al* showed that the conscious and automatic patterns of abdominal muscle activation can be altered by specific exercise interventions.[39] In that study, surface electromyography data provided evidence of both a conscious and subconscious change in the pattern of activation of the internus obliques relative to the rectus abdominis in the group receiving specific exercises. The results of the present study are in accordance with earlier studies investigating long-term effects of stabilizing exercises for low back pain patients.[37,40] Furthermore, Noren *et al* concluded from a 3-year follow-up study of pregnant women that persisting LBP and PGP is probably caused by insufficiency in the pelvic and dorsal muscles.[9] The stabilizing exercise program also focused on, besides activation of local muscles, the global muscle system with the aim of activating the muscle-tendon-fascia system that controls force closure of the pelvis. This, in addition to a duration of exercising for 20 weeks,[41] probably contributed to the long-term effects.

The maintained improvements may also be explained by the effect of integrating specific stabilizing exercises into daily activities. The aims of the exercises given were to obtain an enhanced ability to dynamically stabilize the lumbopelvic region during functional tasks and to alter automatic patterns of muscle recruitment within the trunk musculature. As in the study of O'Sullivan *et al*, the women in the present study were encouraged to perform the cocontractions of the transverse abdominal wall muscles and multifidus particularly in situations where they experienced or anticipated pain or felt "unstable."

This is held to be essential to reinforce motor programming, such that the patterns of cocontraction would eventually occur automatically, without need for conscious control during activities and habitual postures of daily living.[40] The importance of motor control to coordinate muscle recruitment between the small intrinsic spine muscles and the large musculature to ensure stability during daily activities is also highlighted in a study by Cholewicki and Gill.[42]

Another possible explanation of the persisting improvements is that enhancing the dynamic stability of the lumbopelvic region might have reduced fear-avoidance behavior. Patients who are in the early stage of treatment experienced that stabilizing exercises did not provoke their pain, most probably avoided developing fear-avoidance patterns. Pain-related fear and avoidance appears to be an essential feature of development of a chronic problem.[43,44] In our study, both groups focused on information about PGP, including expectations and beliefs about the causes of pain. They were further encouraged to maintain usual activities in an appropriately ergonomic way. It is possible that the first-hand evidence of pain-free exercise experienced by the SSEG enhanced the level of daily activities to a larger extent than the CG. This is in keeping with the view that didactic lectures and rational arguments will facilitate behavior change, but not as effectively as first-hand evidence.[44] Even though the same information was given to the 2 groups, it might be that the SSEG focused on confrontation rather than avoidance and thereby developed confronters. The CG could possibly have developed more avoiders with fear of movements and reinjury. Measurements of fear avoidance could probably have improved our knowledge regarding nonspecific treatment effects and should be included in future studies.

■ Conclusion

The significant differences between the groups persisted with continued low levels of pain and disability in the SSEG 2 years after delivery, indicating beneficial long-term effects of a treatment program focusing on specific stabilizing exercises. Improvements in pain and significant reduction in disability were found within the CG. However, we found that those with highest level of disability and greatest potential for improvement were the ones that recovered most, regardless of intervention group.

■ Key Points

- This is the first study with a 2-year follow-up of patients receiving treatment for postpartum pelvic girdle pain.
- The significant differences between the groups in functional status, pain, and quality of life, obtained during the intervention period, were maintained 2 years after delivery.
- Low levels of pain and disability were maintained in the specific stabilizing exercise group 2 years postpartum.
- The control group showed significant improvement in functional status from 1 to 2 years postpartum.

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