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Effect of Russian Current and Structured Exercise Program on Postpartum Diastasis Recti Abdominis: A Case Series

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Abstract

Background: Diastasis recti abdominis (DRA) is the most common complication occurring post-delivery that limits the functional well-being of the affected individuals. Management of diastasis recti can include an abdominal binder, core strengthening, taping, and various surgical procedures. There is limited evidence to support the Russian current and structured exercise intervention in managing patients with DRA.

Methodology: Three patients identified with DRA underwent a multi-modal treatment regimen including a hot moist pack, Russian current, abdominal binder, transverse abdominus activation exercises, treadmill training, and stationary cycling training. Outcomes were assessed using the visual analogue scale, abdominal girth, Ranney DRA scale, Oswestry low back disability questionnaire, and McGill's torso battery test. These measures were administered at baseline and discharge. Results: Each patient demonstrated improvements in all outcome measures. The visual analogue scale improved by a mean of 7.3 on a 0–10 point scale, DRA reduced to 1 finger and the Oswestry disability questionnaire showed no disability.

Conclusion: Structured exercises and Russian current were effective in managing three patients with DRA. The inclusion of Russian current and structured exercise within this multi-modal approach may enhance the conservative management of patients with DRA.

Author Bio(s)

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Acknowledgements

ACKNOWLEDGEMENT We'd want to use this time to extend our heartfelt gratitude to everyone who has helped us bring this study to completion in some way. We want to express our appreciation to the patients who enthusiastically volunteered for our research. We expect that this research's findings will help improve the planning and implementation of any interested entities in promoting the management of Diastasis recti abdominis management in postpartum women. Funding: No funding sources Competing interests: Nil Ethics approval: The Research and Ethics Committee, The KAHER Institute of physiotherapy approved this study. Participants gave written informed consent before data collection began.

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ABSTRACT

**Background:** Diastasis recti abdominis (DRA) is the most common complication occurring post-delivery that limits the functional well-being of the affected individuals. Management of diastasis recti can include an abdominal binder, core strengthening, taping, and various surgical procedures. There is limited evidence to support the Russian current and structured exercise intervention in managing patients with DRA. **Methodology:** Three patients identified with DRA underwent a multimodal treatment regimen including a hot moist pack, Russian current, abdominal binder, transverse abdominus activation exercises, treadmill training, and stationary cycling training. Outcomes were assessed using the visual analogue scale, abdominal girth, Ranney DRA scale, Oswestry low back disability questionnaire, and McGill’s torso battery test. These measures were administered at baseline and discharge. **Results:** Each patient demonstrated improvements in all outcome measures. The visual analogue scale improved by a mean of 7.3 on a 0–10 point scale, DRA reduced to 1 finger and the Oswestry disability questionnaire showed no disability. **Conclusion:** Structured exercises and Russian current were effective in managing three patients with DRA. The inclusion of Russian current and structured exercise within this multi-modal approach may enhance the conservative management of patients with DRA.

**Keywords:** diastasis recti abdominis, postpartum women, structured exercises, Russian current, Oswestry low back disability questionnaire.
INTRODUCTION

Diastasis recti is a frequent complication in women who are pregnant or recently gave birth. In two out of every three women, diastasis recti occurs after birthing.\(^1,2\) Throughout the pregnancy, intra-abdominal pressure increases, leading to the separation of the rectus abdominus (RA) muscle. Following childbirth, the linea alba loses its compliance, causing the midline to separate from the two rectus abdominals.

Diastasis recti is a common finding in postpartum women, occurring in 62.5% within 92 hours after delivery, 50 to 60% after 6 weeks, 39 to 45% after 6 months, and 33% after 12 months.\(^2,3\) According to the Ranney quantification method, diastasis can be classified into three quantitative measurements: 1) mild: diastasis separation of less than 3cm; 2) moderate: diastasis separation of 3-5cm and 3) severe: diastasis separation of more than 5cm.\(^2,4\) Along with these measurements, there are various other measurements for diastasis recti abdominis muscle (DRAM), including caliper’s measurement, finger measurement, Beer classification, Nahas classification, Rath classification, palpation method, ultrasound, computed tomography, and others.\(^4,5,6\)

The diastasis recti abdominis (DRA) is frequently overlooked and left unaddressed. It is characterized by backache, pelvic discomfort, and abdominal wall protrusion and sagging. Untreated DRA may affect the trunk mechanism and pelvic stability, cause postural alterations, make the lumbar spine more susceptible to injury, pelvic damage, umbilical hernia, urinary incontinence, and cause lumbo pelvic pain and discomfort.\(^1,2\)

DRA is treated using a variety of conservative and surgical methods. The conservative approach to treatment encompasses the use of a corset, elastic tube bandage, intense physiotherapy, core stability training, Tupler Technique, back care, postpartum abdominal binder or support, taping, and neuromuscular electrical stimulation (NMES) of RA. Abdominoplasty, plication, and laparoscopic surgery are all components of the surgical procedure (preaponeurotic endoscopic repair, intraperitoneal onlay mesh, and total extraperitoneal repair).\(^7\)

Russian currents are medium frequency, burst-modulated alternating currents (AC) at a frequency of 2.5 kHz and a duty cycle of 50%. A recommended treatment length of 10 minutes per stimulation session is used, with the stimulus being administered for a 10-second “on” period and a 50-second “off” or rest interval. It is usually used to strengthen the atonic muscle. Electrical impulses emitted by the apparatus increase metabolism, contract muscles, and burn fat. The use of Russian current in conjunction with abdominal exercises is hardly discussed in the literature.\(^2,8\)

METHODS

A single-centre, analysis of three patients with DRA was conducted in the Department of Obstetrics and Gynaecology (OBG) Physiotherapy, KLE Hospital, Belagavi. The patients were informed that the data related to their cases would be submitted for publication and they agreed to participate. The institutional review committee granted permission. A standardized clinical examination was performed on each patient. The examination consisted of a thorough subjective history, objective tests and measures. None of the patients presented with any contraindications for the program. Patients had not received prior physiotherapy treatment for DRA. Their goals were to return to activities of daily living and other recreational activities without pain and discomfort.

Initial Clinical Impression

Abdominal screening and physical examination were conducted on each patient. This included pain intensity using the visual analogue scale (VAS),\(^9\) lumbar range of motion (ROM), abdominal girth, waist-hip ratio, Oswestry low-back ache disability questionnaire, DRA\(^2,4\) measurement, and a lumbar endurance test. Active lumbar range of motion (ROM) was performed with a modified Schober test.\(^10\) All active range of motion (AROM) measurements were taken with the patient in a standing position.

The ROM of all three patients was complete and painful at the end range of movements. The endurance was checked through McGill’s Torso battery test\(^11\) for the lumbar flexors, extensors and lateral flexors which revealed poor endurance among all three subjects. The abdominal girth\(^12\) along with waist and hip circumference were measured and found that the subjects were not falling in the normal range of the female population for the waist-hip ratio.

Individual Case Presentations

Patient 1

Patient 1 was a 29-year-old primiparous nurse, measuring 1.54 m tall and weighing 75kg with a body mass index of 31.6 kg/m\(^2\) (Obesity Class 1); gives a history of lax abdominal muscles that sagged when she laughed, coughed and sneezed or even stood up straight since a year. Additionally, she had year-long related low back pain complaints. The pain gradually increased during her night shifts, performing activities like prolonged standing, walking, and stair climbing.

In February 2021, she delivered a female baby of 3.6 kg through an emergency lower segment caesarean section (LCS). However, no physiotherapy treatment was done postnatally. During July 2022, the patient started observing weight gain,
worsening of lower back pain and further increased laxity of the abdomen. She knew this was not normal and that it could further lead to serious difficulties. Based on her colleague’s recommendation, she visited the department of OBG Physiotherapy for further evaluation and management.

The baseline verbal pain intensity was 9/10. The onset of pain was gradual, deep-dull aching with the precipitating factor being trunk movements in all directions, heavy lifting, and prolonged standing for more than 2 hours. The palpatory finding suggested paraspinal tenderness of grade 2 over the L1-L5 (lumbar) region. The range of motion of the lumbar spine was complete but painful at the end range. According to McGill’s Torso battery test (Table 4), grading her endurance revealed poor endurance in the lumbar flexor, extensor, and lateral flexors. The abdominal evaluation through the caliper and finger palpation method revealed a DRA of 3.5 at the supraumbilical and infraumbilical entry routes along with a fist measurement at the umbilicus. The waist-to-hip ratio was 0.96, which was outside the range of normal for the female population.

**Patient 2**

Patient 2 was a 26-year-old multiparous female with progressively worsening low back pain and laxity in her abdominal muscle in the past 7-8 weeks postpartum. Her past medical history was not significant. Her symptoms became aggravated 6-7 weeks before commencing physiotherapy management. Additionally, she had year-long related low back pain complaints. She reported her symptoms worsened due to her sedentary job and long working hours. The baseline visual analogue scale was 8/10. Her symptoms were described as intermittent dull aching and aggravated on stocking shelves, lifting, and prolonged standing. She even felt discomfort with her jelly-like belly in front of her peer group. The loose abdomen was causing lots of hindrance in her daily activities. Alleviating factors were rest and a hot bath. Her goal was to be able to return to work and household chores without pain.

**Patient 3**

Patient 3 was a 30-year-old female with diastasis recti and Low back pain referred by her gynaecologist. She had a gradual onset of progressively worsening pain over the last 1.5 years. She is a pathologist and believed her symptoms were related to repetitive computer work and cooking at home. She had taken NSAIDs (non-steroidal anti-inflammatory drugs) before physiotherapy management began which provided her short-term relief. Her baseline visual analogue scale was 6/10. She described her symptoms as deep, dull aching muscular pain. She even complained that her abdomen tone was lessened as compared to her pre-pregnancy. Her goal was to be able to return to everyday tasks without pain. Baseline physical exam findings for each patient, DRA and endurance are listed in Table 1.

<table>
<thead>
<tr>
<th>Table 1. Patient Demographic Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
</tr>
<tr>
<td><strong>Chief Complaints</strong></td>
</tr>
<tr>
<td><strong>Onset of symptoms</strong></td>
</tr>
<tr>
<td><strong>Duration of symptoms</strong></td>
</tr>
<tr>
<td><strong>Precipitating factor</strong></td>
</tr>
<tr>
<td><strong>Relieving factor</strong></td>
</tr>
<tr>
<td><strong>Initial Visual Analogue scale</strong></td>
</tr>
<tr>
<td><strong>Initial Visual Analogue scale</strong></td>
</tr>
<tr>
<td><strong>Obstetrics score</strong></td>
</tr>
<tr>
<td><strong>Mode of Delivery</strong></td>
</tr>
<tr>
<td><strong>Weight Gain During pregnancy</strong></td>
</tr>
<tr>
<td><strong>Weight Gain Post Pregnancy</strong></td>
</tr>
</tbody>
</table>

*G - Gravida, P - Parity, L - Live birth, A - Abortion, D - Death; FTNVD*: Full term normal vaginal delivery; LSCS*: Lower segment caesarean section; Emg*: Emergency

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Physiotherapy Intervention

According to the patient's needs on the first day, a physical therapy rehabilitation plan was developed. As a result of the reported symptoms, the patients underwent a 5-day/week for the 4-week personalized structured exercise program. The patients received both Russian current and pre-planned exercises. The structured exercise program for the treatment of DRA is mentioned in Table 3. Both during and after sessions, no side effects associated with physical therapy were observed. Initially, the treatment was started with a 15-minute hot moist pack (HMP) at tolerable heat for low backaches in the prone position. The HMP was placed over the L1-L5 region. Following the HMP, the Russian current and exercise regimen was started. Russian current was given in a supine lying position. The electrode and the patient's skin were separated by electrophoresis gel, which served as a medium.

Russian Current Stimulation was given with the parameters mentioned below:
- Position of the patient: comfortable & relaxed supine lying
- Placement of electrode: 2 above the umbilicus, 2 below the umbilicus (paramedian to umbilicus) (Figure 1)
- Channel: Four-pole electrodes
- The medium between the electrode: electrophoresis gel
- Duty cycle: 20:40 (Stress: relax)
- Intensity: as tolerated by the patient
- Duration: 30 minutes
- Frequency: 5 days/week for 4 weeks

Exercises

A structured exercise program was developed to deal with the DRA for 4 weeks (see Appendix for specific exercises). The exercise parameters are mentioned in (Table 2). The structured exercise program included a combination of abdominal exercises, Nobel's correction, core stability exercises, and aerobics (Table 3). The target heart rate (THR), while moving on to cardiovascular exercises, was established using the Karvonen formula. The treadmill and the stationary cycle were utilized for 15 and 10 minutes, respectively.

Table 2. Exercise Parameters

<table>
<thead>
<tr>
<th>Recommended Parameters</th>
<th>Structured Exercise Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>5 days/weeks</td>
</tr>
<tr>
<td>Intensity</td>
<td>60-80%</td>
</tr>
<tr>
<td>Time/Duration</td>
<td>Resistance training and Aerobics</td>
</tr>
<tr>
<td>Repetitions</td>
<td>10-15 reps/set</td>
</tr>
<tr>
<td>Sets</td>
<td>3 sets/exercise</td>
</tr>
<tr>
<td>Rest Interval</td>
<td>5-10sec between sets</td>
</tr>
</tbody>
</table>

Table 3. Four-week Structured Exercise Program

<table>
<thead>
<tr>
<th>1st week</th>
<th>2nd week</th>
<th>3rd week</th>
<th>4th week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Transverse abdominal activation (TA activation) in different positions</td>
<td>1. Nobels correction</td>
<td>1. Russian twist</td>
<td>1. Braced jumping jacks with dumbbells</td>
</tr>
<tr>
<td>2. Brace heel slides</td>
<td>2. TA activation (prone, supine, quadruped, seating)</td>
<td>2. TA activation</td>
<td>2. Single leg high knee with Theraband</td>
</tr>
<tr>
<td>(Progression with resistance)</td>
<td></td>
<td>9. Static cycling with tummy tucks</td>
<td>9. Treadmill</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10. Planks</td>
<td>10. Static cycle</td>
</tr>
</tbody>
</table>

Note: All exercises were performed with an abdominal binder.

Each patient received the same exercises, but the progression, frequency, and severity of the exercises were tailored to the patient's condition and how they had responded to earlier therapies. Each patient received specific home management
recommendations depending on their lifestyle. Patient 1 was a nurse; thus, specific instructions were given on how to carry out her job duties while maintaining an appropriate posture. Patient 2 worked as a receptionist; thus, she was given instructions on proper desktop ergonomics to guarantee pain-free working hours. Patient 3 was a pathologist and a swimmer; therefore, modifications of training schedules and post-exercise recuperation management were advised.

Using the management strategy, all patients improved, however, there were some noticeable variations in each patient's improvement. In the first three sessions, patient 1 reported a decrease in lower back pain and discomfort, and after two weeks, inter-rectal distance (IRD) had improved. She began resistance training in the third week. Following a week of intervention, patient 2 reported a reduction in pain and an improvement in IRD. During the first week, she had significantly less pain and was able to advance to resistance exercises without experiencing any pain. Patient 3 showed excellent pain relief after the first session, but she thereafter showed decreased adherence to her treatment plan and began to advance for resistance training after three weeks.

RESULTS
The patient reported less discomfort and a higher functional level after the intervention. Following a 4-week training, Table 4 displays the progression of each result. Using the VAS and the Oswestry low back disability questionnaire, every patient reported significant improvements. The VAS significantly improved by a mean of 7.3 points, and The Oswestry increased by a typical 55.9%. Also, this study demonstrates that the IRD decreased after two weeks of Russian current therapy. The IRD was 3.5 finger, fist, and 3.5 finger supraumbilical, umbilical, and infraumbilical, respectively, before the program. Each week’s assessment revealed a steady decrease in IRD. The IRD had a 1 cm supraumbilical, 1.5 cm umbilical, and 1 cm infraumbilical measurement towards the end of the fourth week (Table 4). The level of muscle endurance changed from the beginning to the end of the fourth week. Following the intervention, there was a perceptible decrease in weight, abdominal girth, waist, hips, and waist-hip ratio per week (Table 4) Before and after the intervention, all outcome indicators showed a significant improvement.

Table 4. Pre-post Difference in the Test Variables

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>INITIAL</th>
<th>2nd Week</th>
<th>3rd Week</th>
<th>4th week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dial caliper measurement (cm)</td>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>4.3</td>
</tr>
<tr>
<td>Finger palpation method</td>
<td>3½</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Fist</td>
<td>4½</td>
<td>3</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td>Fist</td>
<td>3½</td>
<td>4</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td>Finger palpation method</td>
<td>3½</td>
<td>4</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td>Fist</td>
<td>3½</td>
<td>4</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td>Ranney classification (cm)</td>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>4.5</td>
</tr>
<tr>
<td>Ranney classification (cm)</td>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>4.5</td>
</tr>
<tr>
<td>Abdominal girth (cm)</td>
<td>102</td>
<td>107</td>
<td>100</td>
<td>101</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>119</td>
<td>110</td>
<td>95</td>
<td>89</td>
</tr>
<tr>
<td>Hip circumference (cm)</td>
<td>113</td>
<td>107</td>
<td>92</td>
<td>98</td>
</tr>
<tr>
<td>Waist: Hip ratio</td>
<td>0.96</td>
<td>1.03</td>
<td>1.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>75</td>
<td>89</td>
<td>90</td>
<td>74</td>
</tr>
<tr>
<td>Visual analogue scale</td>
<td>9</td>
<td>9</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Oswestry low back</td>
<td>12</td>
<td>11</td>
<td>12</td>
<td>7</td>
</tr>
</tbody>
</table>
VARIABLES | INITIAL | 2nd Week | 3rd Week | 4th week
---|---|---|---|---
| *P1 | *P2 | *P3 | P1 | P2 | P3 | P1 | P2 | P3 | P1 | P2 | P3
Disability questionnaire | | | | |
McGill’s torso muscular endurance battery test | | | | |
Flexion : Extension ratio (<1.0) | 1.3 | 1.4 | 1.3 | 1.3 | 1.2 | 1.0 | 1.0 | 1.2 | 0.8 | 0.9 | 1.0
Right-side bridge: Left-side bridge (0.05-1.0) | 1.2 | 1.5 | 1.6 | 1.2 | 1.5 | 1.4 | 1.0 | 1.0 | 1.3 | 0.9 | 0.9 | 1.0
Side bridge (each side): Extension (<0.75) | | | | |
Right side: Extension | 1.5 | 1.6 | 1.6 | 1.3 | 1.3 | 1.2 | 1.1 | 1.0 | 1.0 | 0.6 | 0.8 | 0.8
Left side: Extension | 1.9 | 1.9 | 1.7 | 1.4 | 1.6 | 1.3 | 1.2 | 1.3 | 1.0 | 0.5 | 0.7 | 0.6

*P1 = patient 1, *P2 = patient 2, *P3 = patient 3

DISCUSSION
The current case series concentrated on treating diastasis recti after childbirth. It included an exercise regimen that was specifically designed to address the imbalance between the rectus and abdominals. The program includes a binder and a prescription for strengthening exercises to correct theIRD. The patient's symptoms of DRA were reduced by the structured exercise program, which included transverse abdomen activation, core strengthening, and aerobics. The use of Russian current in the treatment of DRA is not well documented in the literature. In one case study, isometric abdominal exercises and Nobel's exercises were provided to postpartum ladies five days a week for six weeks. That investigation's findings were comparable to those of the current study, which also revealed a decline in IRD at all three levels.2

The electrophysiological effects of the Russian current cause the changes in IRD. We similarly found alterations in IRD within the first week and an 80% correction of DRAM by the second, which is similar to the study by Sreejisha et al. Russian current, which activates motor neurons and depolarizes membranes to produce stronger and more coordinated muscle contractions, is most typically used in medium-frequency NMES, which results in muscle strengthening.13,14 The present study increases the possibility of employing Russian currents for the postnatal session and reduces IRD. The rectus abdominus muscle and the linea alba have significant fascial connections with the transverse abdominus muscle, the deepest abdominal muscle. The transverse abdominus muscle helps produce torque and transmit weight effectively by pulling the rectus abdominus muscle's bellies together during training. The exercises also activate the slow and rapid twitch fibers, and because the fast twitch proportion is high, this leads to an increase in muscular strength.15

It also strengthens the linea alba and increases fascial tension.16,17 Two case studies used external support clothing, such as tubigrip and corsets, in addition to exercise to reduce DRAM. By simulating the transverse abdominus muscle's facial tension and offering biofeedback to the transverse abdominus muscle to help with activation, external support garments may compress and support the abdominal and lumbopelvic region. These external supports could be used in addition to transverse abdominus muscle exercises.16,18 The linea alba may be protected by transverse abdominus muscle activation, which may...
also aid in preventing or reducing DRAM and speeding up recovery so that women can resume their regular physical and social activities sooner than expected.\textsuperscript{18}

**CONCLUSION**
The structured program used in this study is successful in addressing muscle imbalances, which reduces pain, disability, and IRD. Thus, we suggest that Russian current stimulation together with a structured training program targeting the transverse abdominus muscle should be taken into consideration when going through the postpartum recovery periods. It may be recommended to apply similar techniques for more clinical investigations in clinical settings to further demonstrate its effectiveness in this patient population.

**Authors Attestation**
The authors assert that they obtained the necessary patient consent. The patients have given consent for the publishing of their images and other clinical information. The patients are informed that every effort would be made to maintain their anonymity and that their names and initials would not be published.

**Conflicts of Interest**
There are no conflicts of interest reported by the authors.
REFERENCES

APPENDIX

Figure 1: Russian current

Figure 2: Abdominal tucks with lunges

Figure 3: Abdominal tucks with squats

Figure 4: Braced high knee

Figure 5: Braced quadraped TA activation

Figure 6: Braced bicycle

Figure 7: Russian twist

Figure 8: Braced heel slides

Figure 9: Braces straight sit-up

Figure 10: Oblique crunches

Figure 11: Braced gluteal bridge

Figure 12: Braced planks