fizjoterapia polska

POLISH JOURNAL OF PHYSIOTHERAPY

OFICJALNE PISMO POLSKIEGO TOWARZYSTWA FIZJOTERAPII

THE OFFICIAL JOURNAL OF THE POLISH SOCIETY OF PHYSIOTHERAPY

NR 4/2021 (21) KWARTALNIK ISSN 1642-0136

Zespół wad wrodzonych – situs inversus, atrezja przełyku

A congenital malformation syndrome – situs inversus, esophageal atresia

Ocena efektów Super Indukcyjnej Stymulacji w fizjoterapii po zakażeniu SARS-CoV-2

Evaluation of the effects of Super Inductive Stimulation in physiotherapy after SARS-CoV-2

ZAMÓW PRENUMERATĘ!

SUBSCRIBE!

www.fizjoterapiapolska.pl
www.djstudio.shop.pl
prenumerata@fizjoterapiapolska.pl

mindray
healthcare within reach

ULTRASONOGRAFIA W FIZJOTERAPII

Mindray Medical Poland Sp. z o. o.
ul. Cybernetyki 9, 02-677 Warszawa

+48 22 463 80 80
info-pl@mindray.com
MindrayPoland
mindray.com/pl

Zawód Fizjoterapeuty dobrze chroniony

Poczuj się bezpiecznie

INTER Fizjoterapeuci
Dedykowany Pakiet Ubezpieczeń

Zaufaj rozwiązaniom sprawdzonym w branży medycznej.
Wykup dedykowany pakiet ubezpieczeń INTER Fizjoterapeuci, który zapewni Ci:

- ochronę finansową na wypadek roszczeń pacjentów – NOWE UBEZPIECZENIE OBOWIĄZKOWE OC
- ubezpieczenie wynajmowanego sprzętu fizjoterapeutycznego
- profesjonalną pomoc radców prawnych i zwrot kosztów obsługi prawnej
- odszkodowanie w przypadku fizycznej agresji pacjenta
- ochronę finansową związaną z naruszeniem praw pacjenta
- odszkodowanie w przypadku nieszczęśliwego wypadku

Nasza oferta była konsultowana ze stowarzyszeniami zrzeszającymi fizjoterapeutów tak, aby najskuteczniej chronić i wspierać Ciebie oraz Twoich pacjentów.

Skontaktuj się ze swoim agentem i skorzystaj z wyjątkowej oferty!

Towarzystwo Ubezpieczeń INTER Polska S.A.
Al. Jerozolimskie 142 B
02-305 Warszawa
www.interpolska.pl

inter UBEZPIECZENIA

medkonsulting

PROFESJONALNE URZĄDZENIA DIAGNOSTYCZNE I TRENINGOWE
KOMPLEKSOWE WYPOSAŻENIE SPRZĘTU DIAGNOSTYCZNEGO DLA KLUBÓW PIŁKARSKICH, OŚRODKÓW SPORTOWYCH I REHABILITACYJNYCH

TANITA

ZAUFANIE profesjonalistów

Światowy lider w dziedzinie analizy składu ciała metodą BIA

Kompleksowa analiza składu ciała wykonywana jest w około 30 sekund, a wyniki przedstawiane są na przejrzystym raporcie. Produkty profesjonalne TANITA wykorzystywane są przez ośrodki badawcze, centra diagnostyczne, kluby piłkarskie, placówki rehabilitacyjne, osoby pracujące ze sportowcami różnych dyscyplin na całym świecie.

Zobacz więcej na: www.tanitapolska.pl

Zaawansowana technologia diagnostyczna dla profesjonalistów, idealna w pracy z pacjentami

Systemy MICROGATE umożliwiają kompleksowe testy zdolności motorycznych i analizy chodu, wspomagając diagnozę, ocenę postępów oraz proces rehabilitacji. Modelowanie programów rehabilitacyjnych i kontrola procesu rehabilitacji są ułatwione dzięki obiektywnej ocenie sposobu ruchu, wykrywaniu problematycznych obszarów, ocenie biomechanicznych braków oraz ocenie asymetrii.

Parametry pomiarowe:

● fazy chodu lub biegu ● długość kroku ● prędkość i przyspieszenie
● równowaga i symetria ruchu ● wideo Full HD

.... i wiele innych w zależności od przeprowadzonych testów.

W połaczeniu z systemem urządzeniem GYKO, mamy możliwość oceny stabilności dynamicznej tułowia podczas chodu/biegu, analizę skoku, analizę stabilności posturalnej, analizę w zakresie ruchomości stawów (ROM), ocenę siły mięśniowej, oraz ewaluację pacjenta.

Zobacz więcej na: www.microgatepolska.pl

MICROGATE

OPTOGAIT

EXXENTRIC

Flywheel Training - trening siłowy i rehabilitacja z użyciem zmiennej bezwładność kół zamachowych.

kBox4 pozwala na wykonywanie skutecznych, standardowych ćwiczeń, a także zaawansowanych metod treningu ekscentrycznego i koncentrycznego, umożliwiając uzyskanie indywidualnych efektów – poprawienia ogólnego stanu zdrowia, wyników sportowych, rehabilitacji, oraz zapobiegania urazom.

Jedną z głównych zalet treningu z użyciem koła zamachowego jest możliwość skupienia się na ekscentrycznym przeciążeniu. Zwiększenie oporu poprzez skurcz ekscentryczny, jest skuteczną metodą poprawy siły i stabilności – aspektów treningu tak ważnych dla osób żyjących z niepełnosprawnością.

Seria dostępnych uchwytów i uprzęży sprawia, że na jednej platformie mamy możliwość przeprowadzenia treningu dla wszystkich partii mięśni.

Zobacz więcej na: treningekscentryczny.pl

MEDKONSULTING Tanita Polska - Wyłączny dystrybutor urządzeń Tanita w Polsce
T: +48 518 375 475 | 61 868 58 42 E: kontakt@medkonsulting.pl A: ul. Jana Ludygi-Laskowskiego 21 61-407 Poznań

KALMED
Iwona Renz, Poznań

ARTROMOT®
WYŁĄCZNY PRZEDSTAWICIEL
WWW.KALMED.COM.PL

DJO GLOBAL

SPRZEDAŻ I WYPOŻYCZALNIA ZMOTORYZOWANYCH SZYN CPM ARTROMOT®

Nowoczesna rehabilitacja CPM stawu kolanowego, biodrowego, łokciowego, barkowego, skokowego, nadgarstka oraz stawów palców dłoni i kciuka.

ARTROMOT-H

ARTROMOT-F

ARTROMOT-K1 ARTROMOT-SP3 ARTROMOT-S3 ARTROMOT-E2

Najnowsze konstrukcje ARTROMOT zapewniają ruch bierny stawów w zgodzie z koncepcją PNF (Proprioceptive Neuromuscular Facilitation).

ARTROSTIM
FOCUS PLUS

KALMED Iwona Renz
ul. Wilczak 3
61-623 Poznań
www.kalmed.com.pl

tel. 61 828 06 86
faks 61 828 06 87
kom. 601 64 02 23, 601 647 877
kalmed@kalmed.com.pl

Serwis i całodobowa
pomoc techniczna:
tel. 501 483 637
service@kalmed.com.pl

mindray
healthcare within reach

ULTRASONOGRAFIA

W FIZJOTERAPII

Mindray Medical Poland Sp. z o. o.
ul. Cybernetyki 9, 02-677 Warszawa

+48 22 463 80 80
info-pl@mindray.com
MindrayPoland
mindray.com/pl

REHA TRADE SHOW 3

24.02.2022 PGE NARODOWY, WARSZAWA

JEDYNE TARGI I KONFERENCJA BRANŻY REHABILITACYJNEJ W POLSCE!

www.rehatradeshow.pl

PATRON MEDIALNY

REHA Biznes.pl

NAJNOWOCZEŚNIEJSZY, BIZNESOWY PORTAL DLA BRANŻY REHABILITACYJNEJ W POLSCE

ZOSTAŃ NASZYM PARTNEREM I DAJ SIĘ ZAUWAŻYĆ W BRANŻY!

METRUM CRYOFLEX

Partner Polskiego Związku Narciarskiego

Startuj z najlepszymi

Aparatura dla:

- **Medycyny sportowej**
- **Fizjoterapii**
- **Rehabilitacji**

Umów się na darmowe testy aparatów!

METRUM CRYOFLEX - PRODUCENT APARATURY MEDYCZNEJ

www.metrum.com.pl, biuro@metrum.com.pl, +48 22 33 13 750

Z dostarczonych przez nas aparatów korzysta Narodowa Kadra Skoczków Narciarskich.

METRUM CRYOFLEX wspiera kondycję Narodowej Kadry Skoczków Narciarskich

dostarczając sprzęt do fizjoterapii.

Partner PZN

Dzień 9 lipca 2020 roku był dla METRUM CRYOFLEX wyjątkowy, ponieważ właśnie w tym dniu firma została partnerem Polskiego Związku Narciarskiego. Dla polskiej marki, od ponad 29 lat produkującej nowoczesny sprzęt do rehabilitacji i fizjoterapii, była to duża nobilitacja, ale też dodatkowa motywacja do dalszego rozwoju.

Cała załoga METRUM CRYOFLEX od zawsze trzymała kciuki za Narodową Kadrę Skoczków Narciarskich, a od lipca 2020 roku może wspierać ich również sprzętowo.

Skoczkowie polskiej kadry są pod doskonałą opieką profesjonalnego sztabu, który codziennie dba o ich dobrą kondycję i zdrowie. METRUM CRYOFLEX poprzez podpisaną umowę stało się częścią tego medalowego zespołu, a dostarczony przez nich sprzęt pomaga w regeneracji skoczków po obciążających treningach i zawodach, umożliwiając szybki powrót do formy.

Fizjoterapia jest nieodzownym składnikiem sukcesu we współczesnym sporcie, ponieważ przed sportowcami stawia się coraz wyższe wymagania. Muszą oni walczyć nie tylko z rywalami, ale także z wydajnością własnego organizmu. Z pomocą przychodzą nowoczesne urządzenia do fizjoterapii i rehabilitacji, które dają wytchnienie zmęczonym mięśniom, przyspieszając ich regenerację i likwidując bóle.

Oferta METRUM CRYOFLEX obejmuje aparaty do fizjoterapii i rehabilitacji, m.in.:

- aparaty do terapii skojarzonej (elektroterapia + ultradźwięki),
- aparaty do kriostymulacji miejscowej,
- aparaty do presoterapii (drenaż limfatyczny),
- aparaty do terapii ultradźwiękami,
- aparaty do elektroterapii,
- aparaty do laseroterapii,
- aparaty do terapii falą uderzeniową,
- aparaty do terapii wibracyjnej.

Pełna oferta:

Produkujemy zaawansowane technologicznie aparaty
do fizykoterapii, polepszając komfort życia Waszych pacjentów.

Podążamy za perfekcją – nieprzerwanie od 1995 roku.

ELEKTROTERAPIA
LASEROTERAPIA
SONOTERAPIA
ŚWIATŁOLECZNICTWO
MAGNETOTERAPIA
ERAPIA PODCIŚNIENIOWA
RAPIA FALĄ UDERZENIOWĄ

ASTAR.

ASTAR.

POLSKI PRODUKT WYBIERASZ I WSPIERASZ

wsparcie merytoryczne
www.fizjotechnologia.com

43-382 Bielsko-Biała, ul. Świt 33
tel. +48 33 829 24 40

astar.pl

13-14.05.2022, EXPO Kraków

Reha INNOVATIONS

Zostań Wystawcą!

Fizjoterapia. Nowoczesna diagnostyka. Odnowa biologiczna

Fizjoterapia

Nowoczesna diagnostyka

Odnowa biologiczna

www.rehainnovations.pl

organizator:

Targi w Krakowie

partnerzy:

MIFiZ

Fizjo Coach

miejsce wydarzenia:

EXPO KRAKOW

fizjoterapia polska
nr 4/2021 (21)

Russian Stimulation in Addition to Graduated Abdominal Exercises Versus Graduated Abdominal Exercises Only on Muscle Strength After Ventral Hernioplasty: A Randomized Controlled Trial

Wpływ rosyjskiej stymulacji stosowanej wraz ze stopniowanymi ćwiczeniami mięśni brzucha oraz samych stopniowanych ćwiczeń mięśni brzucha na siłę mięśni po plastyce przepukliny brzusznej: randomizowana próba kontrolowana

Mohammed E. Ali[1(A,B,C,D,E,F)], Haidy N. Asham[2(A,C,D,E,F)], Nezar Abo-Halawa[3(A,B,D,E,F)], Nesma M. Allam[2(A,B,D,E,F)]

[1]Department of Physical Therapy for Integumentary System Disorders and Burn, Faculty of Physical Therapy, South Valley University, Qena, Egypt
[2]Faculty of Physical Therapy, Cairo University, Cairo, Egypt
[3]Faculty of Medicine, South Valley University, Qena, Egypt

Abstract

Background. To compare the effect of preoperative application of Russian stimulation in addition to graduated abdominal exercises and graduated abdominal exercises only on the abdominal muscles' strength after ventral hernioplasty. Methods. Thirty patients with a ventral hernia, the age of participants ranged from 20 to 45 years, they were randomly distributed into two groups of equal numbers. Group (I) received Russian stimulation on abdominal muscles in addition to graduated abdominal exercises for a 30 min., and group (II) received the same graduated abdominal exercises only for a 30 min., both groups received of treatment protocols 3 times per week for 6 weeks preoperatively. The isokinetic dynamometer was used to evaluate abdominal muscle strength at 4 occasions, base-line assessment, assessment before operation, assessment 2 months after operation, and finally assessment 4 months after operation. Result. statistical analysis revealed that there was a significant improvement ($p < 005$) in the strength of abdominal muscle preoperatively and postoperatively in both groups in favor of group I. Conclusion. It was concluded that the pre-operative application of Russian current stimulation in addition to graduated abdominal exercises is an effective method for abdominal muscle`s strength after ventral hernioplasty.

Key words:
Epigastric hernia, Graduated abdominal exercises, Isokinetic dynamometer, Umbilical hernia, Ventral hernia

Streszczenie

Informacje wprowadzające. Porównanie wpływu przedoperacyjnego zastosowania stymulacji rosyjskiej wraz ze stopniowanymi ćwiczeniami mięśni brzucha i samych stopniowanych ćwiczeń mięśni brzucha na siłę mięśni brzucha po plastyce przepukliny brzusznej. Metody. Trzydziestu pacjentów z przepukliną brzuszną, w wieku od 20 do 45 lat, podzielono losowo na dwie równe liczebnie grupy. Grupa (I) była poddawana rosyjskiej stymulacji mięśni brzucha jako dodatkowi do stopniowanych ćwiczeń mięśni brzucha przez 30 minut, a grupa (II) wykonywała same stopniowane ćwiczenia mięśni brzucha przez 30 minut. Obie grupy realizowały protokoły leczenia 3 razy w tygodniu przez 6 tygodni przed operacją. Dynamometr izokinetyczny został użyty do oceny siły mięśni brzucha w 4 sytuacjach: ocena wyjściowa, ocena przed operacją, ocena 2 miesiące po operacji i ocena 4 miesiące po operacji. Wynik. Analiza statystyczna wykazała istotną poprawę ($p < 005$) siły mięśni brzucha przed i pooperacyjnie w obu grupach na korzyść grupy I. Wnioski. Stwierdzono, że przedoperacyjne zastosowanie rosyjskiej stymulacji w połączeniu ze stopniowanymi ćwiczeniami mięśni brzucha jest skuteczną metodą na wzmocnienie mięśni brzucha po plastyce przepukliny brzusznej.

Słowa kluczowe
przepuklina nadbrzusza, stopniowane ćwiczenia mięśni brzucha, dynamometr izokinetyczny, przepuklina pępkowa, przepuklina brzuszna

Introduction

A herniation is a protrusion of any organ or tissue through an opening that may be natural or caused by a tear in the abdominal wall. A ventral abdominal hernia is a commonly acquired condition caused by the migration of viscera through a tear in the abdominal wall [1], it includes all hernias in the anterior and lateral abdominal wall [2]. Incisional ventral hernias happen after 3% to 20% of all laparotomies. A traditionary repair was a laparotomy with primitive closure of the fascial damage. Recurrence ratio after open primary closures are high, ranked from 41% to 52% during long-term follow-up. It repairs with implantation of mesh have also needed laparotomy and expanded dissection but seem to cause a decrease in reoccurrence rates in the range of 12% to 24% [3].

As abdominal surgery induces a defect in the abdominal wall. This defect can create a region of weakness in which hernia may evolve. Its incidence reachs2-10% of all abdominal surgeries [4], immobilization postoperative has long been doubted as the criminal for atrophy of the abdominal muscle, particularly for muscles not damaged by the surgery [5].

Also, the use of exercise before acute stress or surgery has appeared as a viable pre-surgical risk reduction strategy [6]. Preoperative exercise therapy can be effectual for decreasing postsurgical complexity rates and the extent of stay in hospital after cardiac or abdominal operations [7]. The abdominal muscles have a role to play in all movements. Training the abdominal muscles effectively requires far more than merely performing hundreds or even thousands of flexion movements [8].

Russian current is alternating current at a frequency of 2.5-kHz, utilized in 50-Hz right-angled bursts with a burst duty cycle of 50%. The burst duration is 10 milliseconds. The stimulus is utilized for 10-sec. “on” succeeded by 50-sec. “off”, with a committed treatment period of 10 minutes in each stimulation session. This protocol (the “10/50/10” regimen), used once daily for weeks, has been proclaimed to cause muscle strengthening [9].

several studies reported the effect of Russian current and exercises of abdominal muscles on strength of abdominal muscles separately [10]. But according to our knowledge there are no study compared the effect of Russian current stimulation in addition to abdominal exercises and abdominal exercises only in the rehabilitation of post-operative hernioplasty. so, the aim of our study was to compare the effect of preoperative application of Russian stimulation in addition to graduated abdominal exercises and graduated abdominal exercises only on the abdominal muscles’ strength after ventral hernioplasty. We hypothesized that the application of Russian current stimulation in addition may add a greater value than abdominal exercises only in the rehabilitation of post-operative hernioplasty.

Materials and Methods

Study Design

This randomized controlled study was done in the outpatient clinic in the Faculty of Physical Therapy, South Valley University, (2020). Informed consent was provided from all patients. The procedures confirmed by the Institutional Ethical Committee Clearance of the Faculty of Physical Therapy at Cairo University and also were registered on Clinicaltrial.gov.

Study population

Thirty-six patients with ventral hernia were enrolled in our study and were diagnosed with hernioplasty after an accurate clinical and physical assessment for eligibility and physical ability to undergoes this study by a general surgeon and a physiotherapist. After screening, all patients` ages ranged from twenty to forty-five years, they were from both genders, and they were steady medically and psychologically. We excluded from the study patients with unstable medical state particularly those with cardiovascular disease, mentally retardation, and un-cooperative patients.

Randomization

Thirty-six patients with ventral hernia were appraised for eligibility. Three patients did not meet the criteria of our selection and three refused to enroll. Thirty patients were appointed randomly into two groups of equal numbers. Random allocation software was used to minimize selection bias [11]. A diagram of patients’ retention and randomization throughout the study is shown in figure 1.

Materials for evaluation

Biodex 3, isokinetic Dynamometer System (with back/abdominal unit)

Isokinetic dynamometry has been applied to examine such muscle power imbalances [12]. The Biodex® dynamometer studies the strength of muscle during isokinetic motion, which is a motion with a fixed angular velocity within a stated range against an altered resistance [13]. Isokinetic dynamometers may be used in both clinical and research settings as scientific machines for evaluating, comparing, and assuring injured or treated body parts [14, 15]. The isokinetic trunk testing protocol was performed on a Biodex 3, isokinetic Dynamometer System. Participants were placed on the dual-position back extension–flexion attachment of the dynamometer with the trunk upright, the hips and knees flexed at 90°, the thighs parallel to the floor, and the dynamometer axis of rotation aligned with the imaginary line joining the anterior superior iliac spines, this was considered the anatomic reference position. To hold the participant to the dynamometer attachment, adjustable pads were placed behind the head, the sacrum, and the upper trunk and on the anterior surface of the tibia; in addition, Velcro straps were placed on the upper trunk, the thighs, and the pelvis. The trunk range of movement was limited at 50°, with 30° (−30°) of trunk flexion, relative to the anatomic reference position (0°). According to Grabiner et al., [16] ranges of trunk motion no larger than 50° isolate lumbar motion, reducing hip flexion–extension. Moreover, the location of the dynamometer axis of rotation at the anterior superior iliac spine level and the use of the pad behind the sacrum and the strap on the pelvis minimized hip motion during the test. The test consisted of 2 set of 5 consecutive maximum concentric trunk flexion efforts with 1 min rest between sets. It started from the extension position and was performed with an angular velocity of 60°/s. This angular velocity was chosen because it is considered to

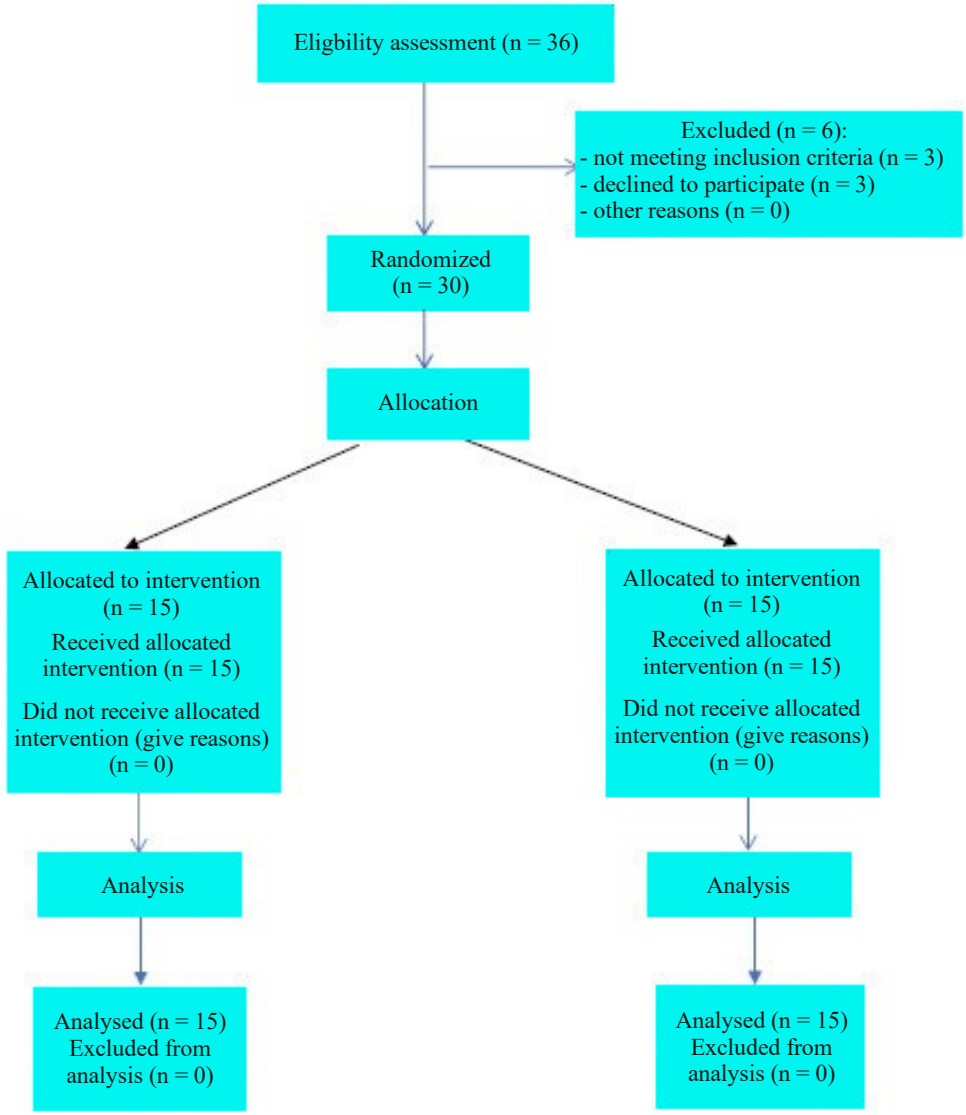

Figure 1. Flow chart of the study

be safe and reliable for measuring mechanical work. Participants were told to keep their hands and arms crossed over their chest during the test. In addition, they were instructed to perform the maximum effort from the beginning of the first repetition and to maintain it until the end of the test. Moreover, they were verbally encouraged with the same indications and intensity across repetitions to exert maximum physical effort throughout the test. Before testing, participants carried out a warm-up that consisted of 1 set of 5 sub maximum trunk flexion–extension exertions at testing angular velocity (60°/s). This warm-up period helped participants become familiar with the equipment and test execution. The overall testing duration was approximately 10 min.

Methods of Treatment

• Group (I) received Russian stimulation on abdominal muscles in addition to graduated abdominal exercises for a 30 min.

• During the application of Russian stimulation, the patients lied in a semi-recumbent position, one electrode placed on the middle of abdominal muscle belly and the second placed distal to the muscle belly. The parameters were 2,500 Hz., phase duration 200 µsec., cycle duration 400 µsec., and duty cycle 50%. The bursts are delivered at 50 bursts per second with a burst duration of 10 msec. and an inter burst interval of 10 msec., and stimulation Protocol10/50/10 (10-second contraction time, 50-second off-time, 10 repetitions) [17].

• While the application of Russian stimulation, the patients were instructed to perform graduated abdominal strengthening exercises in the form of activation of rectus abdominis, posterior pelvic tilt, rotational planks, and abdominal crunch on swiss ball with elastic resistance [18].

• Group (II) received only the same graduated abdominal exercises for 30 min.

• Both groups received of treatment protocols 3 times per week for 6 weeks.

Statistical analysis

SPSS Package program version 25 for Windows (SPSS, Inc., Chicago, IL)., Data was screened for normality assumption test

by using the Shapiro-Wilk test (P > 0.05) before the final analysis. Two-Way mixed design ANOVA was used to make a comparison between the four groups for the age variable, also the Chi-square test to compare between the four groups for the gender variable. Two-Way mixed design ANOVA and multiple measures ANOVA were used to make a comparison between the tested variables of interest at different tested groups and measuring periods. All statistical analyses were significant when (P ≤0.05).

Results

Before treatment, there were no significant differences in age (P = 0.998), and gender (P = 1.0) between the four groups (Table 1).

Table 1. Demographic data of the participants

	Variables	Group I (n = 15)	Group II (n = 15)	Test value	P-value	Significance
	Age [years]	33.20 ± 6.18	33.13 ± 6.23	0.002	0.998	NS
Gender	Male	5 (33.3%)	5 (33.3%)	0.0	1.0	NS
	Female	10 (66.7%)	10 (66.7%)	0.0	1.0	NS

Data are expressed as mean ± standard deviation (SD) or by number (%) and P-value > 0.05: non-significant (NS)

Outcomes of Two-Way mixed design ANOVA to compare means value between the two groups. The current findings reveal that there was a significant improvement in both groups I and II in favor of group I in all occasions (P < 0.05), except base-line assessment (Table 2).

Table 2. Comparison mean values of abdominal muscle peak torque between the two groups at base-line assessment, assessment before operation, assessment 2 months after operation, and finally assessment 4 months after operation

	Group I	Group II	F test	P-value	Significance
Base-line assessment	35.13 ± 7.90	35.40 ± 6.40	0.048	0.986	NS
Assessment before operation	53.80 ± 6.85	46.87 ± 7.73	20.244	0.001*	S
Assessment 2 months after operation	48.47±6.01	42.27±7.00	19.361	0.001*	S
Assessment 2 months after operation	50.07 ± 6.28	43.47 ± 6.66	21.020	0.001*	S

MD: Mean Difference, S: Significant, NS: Non-significant, P-Value: Probability Value

Outcomes of Multiple Measures ANOVA to compare means value within both groups in abdominal muscles peak torque at 4 occasions base-line assessment, assessment before operation, assessment 2 months after operation and assessment 4 months after operation. Comparing the base-line assessment with other occasions our findings reveals that there was a significant improvement in both groups I and II in all occasions in favor of assessment before operation (P < 0.05) (Table 3).

Table 3. Comparison mean values of abdominal muscle peak torque within each group between base-line assessment, assessment before operation, assessment 2 months after operation and assessment 4 months after operation

		Base-line assessment Vs assessment before operation	Base-line assessment Vs assessment 2 months after operation	Base-line assessment Vs assessment 4 months after operation	Assessment before operation Vs assessment 2 months after operation	Assessment before operation Vs assessment 4 months after operation	Aassessment 2 months after operation Vs assessment 4 months after operation
Group I	MD	−18.67*	−13.33*	−14.93*	5.33	3.73	−1.60
	P-value	0.000	0.001	0.000	0.109	0.590	1.000
	Significance	S	S	S	NS	NS	NS
Group II	MD	−11.47*	−6.87*	−8.07*	4.60	3.40	−1.20
	P-value	0.001	0.010	0.004	0.693	1.000	1.000
	Significance	S	S	S	NS	NS	NS

MD: Mean Difference, S: Significant, NS: Non-significant, P-Value: Probability Value

Discussion

Ventral hernias continue to be one of the most common complications after abdominal surgery, its incidence reaches 15%. Repairing the primary suture has met with dismal outcomes, and the recurrence rates reach 50% [19]. Different types of operation for herniorrhaphy have been developed, but the synthetic mesh technique is the common contributor for decreasing the rate of recurrence, ranging from 10% to 23% [20], so our study aimed to compare the effect of preoperative application of Russian stimulation in addition to graduated abdominal exercises and graduated abdominal exercises only on the abdominal muscles' strength after ventral hernioplasty. Our findings showed significant improvement in mean values of abdominal muscle peak torque in both groups when comparing it with the initial assessment at different occasions (assessment before operation, assessment 2 months after operation and assessment 4 months after operation) in favor of group I that received Russian stimulation on abdominal muscles in addition to graduated abdominal exercises

Choosing the Biodex System was ideal choice, as it is a valid and reliable device and widely used in measuring abdominal muscle function. Gunnarsson et al. [19].

Our results showed significant improvement in mean values of abdominal muscle peak torque in group I when comparing it with the base-line assessment at different occasions (assessment before operation, assessment 2 months after operation and assessment 4 months after operation), this improvement comes in agreement with Strigård et al. [20], who concluded that inverse proportional relationship between the area of the hernia and the strength of muscle of the abdominal wall. Also, our findings were supported by SALAH et al. [18], who concluded that training the abdominal muscle pre-operative considered as an effective way for improving the strength of the abdominal muscles after ventral hernia repair.

Our findings also showed significant improvement in means values in group II that improvement comes in agreement with Jung et al. [21], who concluded that Russian current stimulates type II muscle fibers. As well as, Hudlicka et al. [22], reported that low frequency of electric stimulation provides long-term changes in type IIb, that related to the duration of the stimulus, so prolonged application of low-frequency current for more than two weeks provides physiological changes into type I fiber.

Our findings show that improvement in strength of abdominal muscles in group I is more than in group II, this finding may be related to the positive effect of ES in increasing the strength of abdominal muscles, this comes in agreement with Porcari et al. [23], who concluded that NMES have a great impact on improving the abdominal strength and endurance on muscle strength. The current results also supported by Paillard et al. [24], who concluded that the applying the electrical stimulation during voluntary contraction provides a greater improvement of overall contraction force of the muscles. The current finding was contradicted with Den Hartog et al. [13], who concluded that the isokinetic strength of the muscles of the trunk flexor is decreased post-surgical for incisional hernia. And according to Seong [25], concluded that combined application of Russian current and progressive resistance training is a more effective method in strength quadriceps femoris muscle in elderly women with osteoarthritis in the knee joint. According to Alon et al. [26] the combined use of ES with volitional exercises improving the strength of the abdominal muscle better than exercise alone or no exercise.

Further studies with larger sample size are needed to ensure our statistical findings and further investigations are needed to optimize this promising beneficial effect of Russian current stimulation therapy by recognizing the needed parameters in form of preferred time, intensity, frequencies and criteria of patient selection.

Conclusion

It can be concluded that preoperative application of Russian current stimulation in addition to graduated abdominal exercises are safe to patients with a ventral hernia and can be considered as an effective technique provides a greater impact on increasing the strength of the abdominal wall postoperatively than graduated abdominal exercises only for patients with ventral hernioplasty.

Adres do korespondencji / Corresponding author

Mohammed E. Ali

E-mail: m.essam@svu.edu.eg

Acknowledgement

The authors thank all patients who kindly participated in this study. We are grateful to the Faculty of Physical Therapy, South Valley University for facilities and to the staff members of the outpatient clinic.

Piśmiennictwo/ References

1. Karanja DN, Kimeli P, Kipyegon AN, et al. "Diffuse Peritonitis Associated with Ventral Hernia ", Journal of Agriculture and Veterinary Science, 2014; 7: 53-55.

2. Aguirre DA, Santosa AC, Casola G, and Claude B. "Abdominal Wall Hernias: Imaging Features, Complications, and Diagnostic Pitfalls at Multi-Detector Raw CT", Radio Graphic Journal, 2005; 25 (6): 743-776.

3. Sasse KC, Lim DC, and Brandt J. "Long-Term Durability and Comfort Laparoscopic Ventral Hernia Repair", Journal of Society of Laparoendoscopic Surgeons, 2012; 16(3): 380-386.

4. Kuber S. "Hernia surgery Simplified", (first edition), New Delhi, JP Medical Ltd, 2013; 5-22.
5. Hou MF, Liaw LJ, Lin SD, et al. "Ultrasound Imaging Evaluation of Abdominal Muscles after Breast Reconstruction with a Unilateral Pedicled Transverse Rectus Abdominis Myocutaneous Flap", Journal of the American Physical Therapy Association, 2013; 93(3): 356-368.
6. Knight KA, Moug SJ, and West MA. "The Impact of Exercise on Mesenteric Blood Flow and its Implication for Preoperative Rehabilitation", Journal of Techniques in Coloproctology, 2017; 21(3): 185-201.
7. Valkenet K, Van De Port I, Dronkers J. "The Effects of Preoperative Exercise Therapy on Postoperative Outcome", Clinical Rehabilitation,2011; 25(2): 99-111.
8. George JA. "Abdominal Training", (2nd edition), Indiana, Xlibris Corporation, 2012; 17-31.
9. Ward AR. "Electrical Stimulation Using Kilohertz Frequency Alternating Current", Journal of A.P.T.A, 2009; 89:181-190.
10. Pouwels S, Stokmans RA, Willigendael EM, et al. Preoperative exercise therapy for elective major abdominal surgery: a systematic review. Int J Surg. 2014;12(2):134-140.
11. Saghaei M. "Random allocation software for parallel-group randomized trials", BMC Med Res Methodol, 2004; 4:26.
12. Jones PA, and Bampouras TM. "A Comparison of Isokinetic and Functional Methods of Assessing Bilateral Strength Imbalance", Journal of Strength & Conditioning Research, 2010; 24(6): 1553-1558.
13. Den Hartog D, Eker H, Tuinebreijer W." Isokinetic Strength of the Trunk Flexor Muscles after Surgical Repair for Incisional Hernia", Journal of Hernia, 2010; 14(3): 243-247.
14. ElDeeb A, Osman D, Atta H, Hamada H. Effect of reproductive hormones variation during menstrual cycle on hip abductor and adductor muscles performance in college students. Bull Fac Phys Ther. 2019; 24: 72-78.
15. Jee YS. "Usefulness of Measuring Isokinetic Torque and Balance Ability for Exercise Rehabilitation", Journal of Exercise Rehabilitation, 2015; 11(2): 65-66.
16. Grabiner MD, Jeziorowski JJ, Divekar AD. Isokinetic measurements of trunk extension and flexion performance collected with the biodex clinical data station. Journal of Orthopaedic & Sports Physical Therapy. 1990 Jun;11(12):590-8.
17. Dall' Acqua AM, Sachetti A, Santos LJ, et al. Use of neuromuscular electrical stimulation to preserve the thickness of abdominal and chest muscles of critically ill patients: A randomized clinical trial. J Rehabil Med. 2017;49(1):40-48.
18. Salah AM, Mohamed GA, Mohamed M, Walid A. Effect of Preoperative Abdominal Training on Abdominal Muscles Strength Outcomes after Ventral Hernia Repair. The Medical Journal of Cairo University. 2018 Dec 1;86(December):4495-501.
19. Gunnarsson U, Johansson M, and Strigård K. "Assessment of Abdominal Muscle Function Using the Biodex System Validity and Reliability in Healthy Volunteers and Patients with Giant Ventral Hernia", Journal of Hernia and Abdominal Wall Surgery, 2011; 15(4): 417-421.
20. Strigård K, clay L, Stark B, et al. "Giant Ventral Hernia Relationship between Abdominal Wall Muscle Strength and Hernia Area", Journal of BioMedical Central Surgery, 2016; 16(50): 471-482.
21.Jung BO, and Bang HS. "Effect of Russian Current Stimulation on Muscular Performance and Muscle Activity of Quadriceps Femoris Muscle of Convalescent Patient after Leg Fracture “Journal of Digital Convergence, 2014; 12(7): 365-370.
22. Hudlicka O, Tylar K R, Srihari T, et al. "The effect of different patterns of long-term stimulation on contractile properties and myosin light chains in rabbit fast muscles". Pflugers Arch, 1982; Vol. 393, No. 2, pp. 164-170.
23. Porcari JP, Miller J, Cornwell K, Foster C, et al. The effects of neuromuscular electrical stimulation training on abdominal strength, endurance, and selected anthropometric measures. Journal of sports science & medicine. 2005 Mar;4(1):66.
24. Paillard T, Noé F, Passelergue P, et al.; "Electrical stimulation superimposed onto voluntary muscular contraction". Sports Med, 2005; 35: 951–966.
25. Seong H. Park; "Effects of combined application of progressive resistance training and Russian electrical stimulation on quadriceps femoris muscle strength in elderly women with knee osteoarthritis", J. Phys. Ther. Sci. 2015, 27: 729–731.
26. Alon G, Mccombe S A, Koutsantonis S, et al. Stimulation of The Abdominal Musculature. THE JOURNAL OF ORTHOPAEDAINCD SPORTS PHYSICAL THERAPY ALON ET AL JOSPT, 1987; Vol. 8, No. 12.