Physical therapeutic factors in stage medical rehabilitation of puerperas with perineal wounds afterfetal vacuum extraction

Factores fisioterapéuticos en la etapa de rehabilitación médica de puerperas con heridas perineales después de la extracción al vacío fetal

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Abstract

Objective: to assess the role of physical therapeutic factors in the staged medical rehabilitation of puerperas with perineal wounds after fetal vacuum extraction. Materials and Methods. A comparative analysis of the postpartum period was carried out in 154 puerperas with perineal injuries after fetal vacuum extraction. Three groups were formed by simple randomization: patients in the control group (54 women) received standard treatment only; the experimental group (51 women) received standard treatment and low-intensity magnetic laser therapy (LLLT); the main group (49 women) underwent additional extracorporeal magnetic stimulation. Results. Staged physiotherapy provided an increase in the strength of the pelvic floor muscles in patients of the main group by 47.9% ($p<0.01$), experimental group - by 36.2% ($p<0.01$), and control - by 24.4% ($p<0.05$); a decrease in the number of postoperative complications was by 6.5, 4.6, and 2.63 times, respectively. Summary. The use of staged physiotherapy in puerperas with perineal wounds after delivery operations provides a statistically significant improvement in clinical and functional parameters in comparison with the use of only standard treatment and its combination with NMLT.

Keywords: low-intensity magnetic laser radiation, extracorporeal magnetic stimulation, postpartum women, perineal wounds, fetal vacuum extraction.

Resumen

Objetivo: evaluar el papel de los factores fisioterapéuticos en la rehabilitación médica por etapas de las puérperas con heridas perineales tras la extracción con ventosa fetal. Materiales y métodos. Se realizó un análisis comparativo del puerperio en 154 puérperas con lesiones perineales después de la extracción con ventosa fetal. Se formaron tres grupos mediante aleatorización simple: los pacientes del grupo de control (54 mujeres) recibieron sólo el tratamiento estándar; el grupo experimental (51 mujeres) recibió tratamiento estándar y terapia con láser magnético de baja intensidad (LLLT); el grupo principal (49 mujeres) se sometió a estimulación magnética extracorpórea adicional. Resultados. La fisioterapia por etapas proporcionó un aumento en la fuerza de los músculos del piso pélvico en pacientes del grupo principal en un 47,9% ($p <0,01$), el grupo experimental - en un 36,2% ($p <0,01$) y el control - en un 24,4% ($p<0,05$)); una disminución en el número de complicaciones posoperatorias fue de 6,5, 4,6 y 2,63 veces, respectivamente. Resumen. El uso de fisioterapia escalonada en puérperas con heridas perineales después de operaciones de parto proporciona una mejora estadísticamente significativa en los parámetros clínicos y funcionales en comparación con el uso de solo tratamiento estándar y su combinación con NMLT.

Palabras clave: radiación láser magnética de baja intensidad, estimulación magnética extracorpórea, puérperas, heridas perineales, extracción por ventosa fetal.

Introduction

One of the key challenges to modern obstetrics is to ensure a favorable outcome of pregnancy and childbirth for the mother and her newborn[1]. Recent years have been characterized by the desire of obstetricians and gynecologists to replace any vaginal delivery operation or allowance for a caesarean section, the incidence of which in Russia in 2017 reached 25%, in the Kabardino-Balkarian Republic - 29.8%[13,14].

According to various authors, purulent-septic complications after delivery operations are more common than after spontaneous delivery, amounting to 13-54%, which is due to reduced immunoreactivity of the birth canal in the presence of inflammatory diseases of the reproductive tract in a pregnant woman, extragenital pathology, constant infection perineal skin microbial flora of the vagina and rectum, the presence of obstetric complications during pregnancy, physiological immunodeficiency in puerperas and other factors[11,13]. The risk of suppuration of the perineal wound and the burdened course of its healing in women with a high infectious index reaches 85%, and with a combination of several infectious factors - 91%. The use of a vacuum extractor reduces the incidence of perineal dissection in combination with its ruptures during childbirth up to 12-40%.

High incidence of perineal injuries in postpartum women after fetal vacuum extraction (FVE) served in general as the basis for the development of new methods of their medical rehabilitation. L.V. Tsallagova et al. (2013-2017) have shown that in the prevention of postpartum infectious complications, a significant role belongs to the combination of drug therapy and non-drug exposure, which helps to improve the rehabilitation of puerperas, and reduce the massiveness and duration of the drug burden[19,20].

Among the unconventional polyvalent methods of treatment, the use of low-intensity magnetic laser radiation (LLLT) and electromagnetic stimulation (EMS) is gaining popularity[4,5,10,16,18]. M.V. Ipatova et al. (2015)[3] showed the significant anti-inflammatory and analgesic effects of NMLT in subacute and chronic salpingo-oophoritis, in adhesions with pain syndrome. The data of a number of researchers indicate that the magnetic field and laser radiation have the same therapeutic effects (reparative-regenerative, anti-inflammatory, analgesic, anti-edematous, immunomodulating, antispastic and antihypoxic), which suggests their synergism when used simultaneously[6,9,15,17]. Iu.V. Kubitskaia and R.G. Shmakova (2016) reports that NMLT provides an analgesic effect on the area of perineal wounds in puerperas at an earlier date than with traditional treatment[7].

Currently, a system of extracorporeal magnetic stimulation of the neuromuscular apparatus of the pelvic floor has been developed - a highly effective non-invasive method for treating a number of pelvic diseases in men and women. The basis for the medical application of EMS, according to A.G. Kulikov and D.D. Voronina (2016), D.Iu. Pushkar et al. (2017) is the property of magnetic stimulation to influence nerve fibers, which, in turn, causes contractions of muscle fibers, causing their to "strengthening» or "stabilization»[8,12]. EMS of the neuromuscular apparatus of the pelvic floor causes not only stimulation and training of muscle structures but also stimulation of the nerve structures of the segmental apparatus of the spinal cord. A.I. Zhelezniakova and I.A. Apolikhina (2010) justified the use of EMS in women with stress urinary incontinence and proved this technique to significantly improve their quality of life[2].

The application of the above-mentioned medical physical factors in restoring the normal anatomical structure of the female external genital organs is of scientific interest.

Objective: to assess the role of physical therapeutic factors in the staged medical rehabilitation of puerperas with perineal wounds after fetal vacuum extraction.

Materials and Methods

Clinical studies and collection of material were carried out in 2012-2020 in the maternity ward of FBHI Perinatal Center branch No. 2. In accordance with the tasks set, a comparative analysis of the postpartum period was carried out in 154 puerperas, delivered by fetal vacuum extraction, with spontaneous injuries. Inclusion criteria: postpartum women with perineal injuries (episiotomy, perineotomy, perineal rupture) after using the vacuum extraction of the fetus; age 21-36 years; informed voluntary consent; personal data processing consent. Exclusion criteria: general contraindications for physiotherapy; severe extragenital and obstetric pathology; tumors of the pelvic organs.

Depending on the therapy, the puerperas were divided into 3 groups by simple randomization. The first main group of patients (MG; 49 people) received staged rehabilitation treatment, including: at the inpatient stage - standard drug therapy (non-steroidal anti-inflammatory drugs - diclofenac sodium (Hemofarm LLC, (Russia), 1 suppository rectally, 1 time per day), for 3 days); perineal wound treatment with a 3% solution of hydrogen peroxide and dressing with Levomecol, daily; starting from the 1st day after delivery, NMLT was performed using the RIKTA-ESMIL(1A) apparatus on the perineal wound after its treatment with 0.05% chlorhexidine bigluconate solution through a two-layer gauze dressing, while the postoperative suture was scanned from the periphery to the center with the capture of the edges by 2-3 cm, the radiator was kept 0.5-1 cm from the wound surface, with a variable frequency at the rate of 2 min per 10 cm^2, daily, 5 sessions per course of treatment; at the outpatient stage - starting from the 15th day after surgical delivery, EMS of the neuromuscular apparatus of the pelvic floor was performed using the Avantron apparatus, patient's position – seated in the center of an electromagnetic chair, the exposure frequency was 10 Hz the first 10 minutes, 50 Hz next 10 minutes; 3 sessions per week, 7-8 sessions per course of treatment. Patients in the experimental group (EG; 51 women) received rehabilitation treatment only at the inpatient stage, and were prescribed standard drug therapy and NMLT according to the same scheme as in the MG. Patients of the third control group (CG; 54 women) were prescribed only standard treatment at the inpatient stage.

The material was collected in compliance with the rules of bioethics and signed patient informed consent and personal data processing consent.

The studies were carried out on the day of delivery, upon discharge from the obstetric hospital, 1, 6, and 12 months after operative delivery. The visual analogue scale (VAS) was used to assess pain and asthenoneurotic syndromes in points: from 0 to 10 points - from absence of to extremely severe clinical manifestations. Pelvic floor muscle strength was assessed by finger examination on the Oxford scale from 0 (no contraction of the pelvic floor muscles) to 5 points (very strong muscle contraction force and dynamometry of the pelvic floor muscles using Vagiton pneumo simulator (Russia). Statistical processing of the material was in Microsoft EXCEL 2010 (Microsoft Corp., USA) and R version 3.3.2 (2016-10-31). Comparison of samples by quantitative criteria was carried out using Student's test. The critical level of significance when testing statistical hypotheses in this study was taken equal to 0.05.

Results and Discussion

The analysis of clinical symptoms, carried out in a comparative aspect, proved the feasibility of NMLT for the perineal wound from day 1 after delivery. Puerperas of MG and EG showed the significant decrease in the intensity of pain syndrome by 38.0% ($p<0.01$) and 34.4% ($p<0.01$), respectively. This was accompanied by a decrease in the manifestations of asthenoneurotic syndrome - by 41.6% ($p<0.01$) and 41.1% ($p<0.01$), respectively. In CG patients who received only standard treatment, the decrease in the severity of pain and asthenoneurotic syndromes was statistically significantly less pronounced, but significantly significant in relation to the data before treatment: by 19.5% ($p<0.05$) and 28.8% ($p<0.05$), respectively.

The analysis of the course of the postpartum period revealed that patients of MG and EG did not have a temperature reaction during the recovery period after delivery. In the CG, where only standard treatment was used, a subfebrile temperature reaction was observed up to 3 days in 16.7% of cases (3 patients). At the same time, there were no significant differences in the level of decrease in body temperature between the groups.

We assessed the condition of the perineal wound: the presence of hyperemia, swelling of the seams, the degree of formation of granulation tissue. In patients of MG and EG, wound healed by primary intention in 98% of cases, and only in 1 (2.0%) puerpera of MG and 1 (1.9%) puerpera of EG had a partial dehiscence of the perineal sutures. 33 (67.3%) puerperas of MG and 35 (68.6%) puerperas of EG reported the absence of pain in the perineal wound at rest and while walking, free, painless urination and defecation after 1-2 sessions of NMLT; the rest of the women indicated slight soreness, which was stopped after 3-4 sessions of NMLT. In the CG, 5 (9.3%) puerperas had suppuration of the perineal wound with suture divergence, and 21 (38.9%) had edema of the perineal sutures. 41 (75.9%) puerperas of CG noted moderate soreness in the area of the perineal sutures, 10 (18.5%) - severe pain and discomfort when walking 4-5 days after birth. The timing of reduction of clinical symptoms deserves special attention. Thus, NMLT contributed to a smoother course of the wound process: patients of MG and EG noted a leveling of pain syndrome, a significant decrease in edema and hyperemia of the perineal wound already on day 2-3 after birth, while in the CG - on day 3-4.

On day 29-30, the intensity of pain syndrome in postpartum women of MG decreased by 66.0% ($p<0.01$), asthenoneurotic - by 72.0% ($p<0.01$), EG - by 55.8% ($p<0.01$) and 56.9% ($p<0.01$), and CG - by 44.4% ($p<0.01$) and 39.3% ($p<0.01$), respectively. It should be noted that it was the pronounced analgesic, anti-inflammatory, and regenerative effects of NMLT that caused a statistically significant difference in the dynamics of these clinical indicators in comparison with the CG[5,16].

The use of staged physiotherapy significantly affected the condition of the perineal wound due to the fact that the effect of EMS, based on electrical stimulation of muscle tissue, provides «training» of the pelvic floor muscles, leading to their strengthening [2, 8]. Stimulation of muscle tissue, as well as increased blood supply to the periurethral area, stimulates wound epithelialization and the formation of elastic and strong connective tissue. When assessing the state of the perineal wound in patients with MG, wound healing was noted in 100% of cases. The use of staged physiotherapy provided a significant analgesic effect - all puerperas of MG noted the absence of pain in the perineal wound at rest and while walking, free, painless urination and defecation, which contributed to the improvement of their psycho-emotional status ($r=+0.64$; $p<0.001$). In EG, 2 (3.92%) puerperas had moderately pronounced swelling of the perineal sutures, and pain in the perineal wound area, mainly when walking, persisted on day 29-30 in 5 (9.80%) puerperas. In CG, 8 (14.81%) patients, mainly those who had suppuration of the perineal wound with suture divergence on day 5-6, also had moderately pronounced edema of the perineal sutures. Moreover, in 4 puerperas with suppuration of wounds, healing occurred only after 12.2±0.56 days of treatment. In 15 (27.8%) puerperas, moderate soreness in the area of sutures on the perineum, pain and discomfort when walking remained.

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Table 1. Changes in clinical indicators in puerperas after FVE

Indicators	Period	MG (n=49) M±m	EG (n=51) M±m	CG (n=54) M±m
Pain syndrome (points)	day 1	1.71±0.07	1.63±0.03	1.69±0.05
	day 5	1.06±0.04**"	1.07±0.02**"	1.36±0.07*
	day 29-30	0.58±0.05**"	0.72±0.04**	0.94±0.06**
Asthenoneurotic syndrome (points)	day 1	1.61±0.04	1.58±0.06	1.63±0.08
	day 5	0.94±0.02**"	0.93±0.05**"	1.16±0.07*
	day 29-30	0.45±0.03**"	0.68±0.04**"	0.99±0.03**

Note: * and ** - statistically significant difference between indicators and data before treatment $p<0.05$ and $p<0.01$, respectively; " - statistically significant difference between indicators and data in the CG - $p<0.05$.

The most obvious advantage of staged physiotherapy with the use of NMLT and EMS was proved by the changes in indicators of the state of the pelvic floor muscle tone on day 29-30. Thus, in the MG, in comparison with the initial data with combination staged physiotherapy, the strength of the pelvic floor muscles in digital examination increased by 28.5% ($p<0.01$), in EG when using only standard therapy and NMLT - by 17.7% ($p<0.05$), while in CG, with standard therapy only, only a tendency to an increase in the tone of the pelvic floor muscles was noted. Dynamometry of the pelvic floor muscles showed that the strength of muscle contractions in MG increased by 67.4% ($p<0.01$), in EG - by 54.7% ($p<0.01$), and in CG - by 35.2% ($p<0.05$). The conducted matrix correlation analysis showed that a statistically significant improvement in the condition of the pelvic floor muscles correlates with a high degree of reliability with an improvement in QOL ($r = +0.66$; $p<0.001$).

Table 2. Changes in indicators of the state of the pelvic floor muscles

Indicators	Period	MG (n=30)	EG (n=30)	CG (n=30)
Pelvic floor muscle contraction force F (mmHg)	day 1	40.8±2.63	42.4±2.51	41.8±2.36
	day 29-30	57.1±2.72**	51.5±2.27*	48.3±2.18
Oxford scale (points)	day 1	1.16±0.19	1.24±0.11	1.27±0.14
	day 29-30	3.56±0.21**	2.74±0.32*	1.96±0.33*

Note: * and ** - statistically significant difference between indicators and data before treatment $p<0.05$ and $p<0.01$, respectively; "- statistically significant difference between indicators and data in the CG - $p<0.05$.

The lowest incidence of postoperative complications after 6 and 12 months was observed in patients of MG who received staged physiotherapy as part of medical rehabilitation: after 6 months - 13 (43.3%), and by the end of the year - only 2 (6.67%). In EG - after 6 months the incidence was 23 (76.7%), and after 12 months - 5 (16.67%); in CG - after 6 months - 29 (96.7%) and after 12 months - 11 (36.7%). This again confirms that the use of EMS, based on electrical stimulation of muscle tissue, causes the restoration of the normal anatomical structure of the female external genital organs, thereby contributing to the leveling of complications[2,4,8,12].

In general, this study shows that the developed technique has a high therapeutic efficacy achieved due to the synergism of the therapeutic effects of NMLT and EMS: reparative-regenerative, anti-inflammatory, analgesic, therapeutic effects of NMLT and the positive effect of EMS on the pelvic floor muscle tone provide faster restoration of the normal anatomical structure of the female external genital organs.

Thus, our program of medical rehabilitation of puerperas with perineal wounds after delivery operations with the use of staged physiotherapy (NMLT followed by EMS) provides a statistically significant improvement in clinical and functional parameters in comparison with the use of only standard treatment and its combination with NMLT.

Summary

The inclusion of low-intensity magnetic laser radiation in the standard set of medical rehabilitation of puerperas with perineal injuries after fetal vacuum extraction (main and experimental group) significantly increases the effectiveness of rehabilitation measures, which is manifested in a decrease in the intensity of pain syndrome on average by 36.2% ($p<0.01$), asthenoneurotic - by 41.4% ($p<0.01$), debridement of the perineal wound in 98% of cases. This leads to a leveling of pain syndrome and a decrease in edema and hyperemia of the perineal wound on days 2-3 after childbirth and provides a reduction in the length of stay in the maternity hospital by 1.5 days in comparison with the use of standard treatment (control group).

The use of staged physiotherapy - magnetic laser exposure followed by extracorporeal magnetic stimulation against the background of standard therapy in puerperas with perineal injuries after fetal vacuum extraction contributes to an increase in the strength of the pelvic floor muscles by 47.9% ($p<0.01$), while using only standard therapy and magnetic laser exposure - by 36.2% ($p<0.01$), and only standard therapy - by 24.4% ($p<0.05$). This provides a faster restoration of the normal anatomical structure of the female external genital organs and contributes to the leveling of postoperative complications: in the main group, the decrease occurred 6.5 times, in the experimental group - 4.6 times, and in the control group - 2.63 times.

The use of staged physiotherapy - magnetic laser exposure followed by extracorporeal magnetic stimulation against the background of standard pharmacotherapy in puerperas with perineal injuries after fetal vacuum extraction provides a faster restoration of the normal anatomical structure of the female external genital organs and contributes to the leveling of postoperative complications: in the main group, the decrease occurred 6.5 times, in the experimental group - 4.6 times, and in the control group - 2.63 times.

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