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HYDROKINETIC THERAPY IN THE COMPREHENSIVE REHABILITATION OF BASKETBALL PLAYERS AFTER ARTHROSCOPIC SURGERIES FOR TREATING MENISCUS INJURY

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Annotation. The article describes the use of hydrokinetic therapy in the comprehensive rehabilitation of basketball players after arthroscopic surgery for treating meniscus injury. The efficiency of the rehabilitation treatment with hydrokinetic therapy in athletes is represented by positive dynamics of the results of the flexion-extension amplitude of the injured knee, reduced pain, an increase in the strength of the quadriceps femoris muscle of the operated limb.

Keywords: hydrokinetic therapy, arthroscopic surgery, comprehensive rehabilitation, athletes, basketball players.

Introduction. In sports practice, an injury of the knee joint is the most frequent among other injuries of the musculoskeletal system, which are in 50% associated with ligaments injury [1]. According to the data [2], incidence of the anterior cruciate ligament and meniscus injuries is 70% of cases.

Injuries of the meniscus in basketball are due to a specificity of motor actions of athletes: sudden stops and jerks, speed rotation of body parts on place and in movement, sudden changes of the movement trajectory of athletes, multiple jumps, martial arts elements during defense and ball reception, due to contact, and place increased demands on the musculoskeletal system [2].

Due to significant disorders in support ability of the limb and walking functions that reduce quality of life, rapidly limit motor activity and make it impossible to carry on athletic activity [3], injuries of the meniscus and knee joint are considered as the most complicated ones, which, alongside with the therapeutic indications, determines the choice of arthroscopic surgeries among other ways of treatment. However, even in case of successful surgical reconstruction of the ligamentous system, because of duration of the rehabilitation measures (5 to 12 months in average), there is a high risk of post-surgical complications in a form of biomechanical asymmetry and disorders of the afferent

conduction leading to secondary tears in 44% of cases [4], muscle imbalance during locomotion. In 13-42% of cases, the deforming gonarthrosis develops [5], and instability in the knee joint remains for a long period of time [6].

All the aforementioned predetermines the need for searching methods and forms of physical rehabilitation directed towards the maximal recovery of amplitude and strength characteristics of the knee joint in basketball players in conditions of leveling muscle imbalance, impact and axial loads on the injured joint when performing movements at the stage of sports rehabilitation characterized by special activity. Use of hydrokinetic therapy, due to the specificity of water environment and the variability of the body position (horizontal, vertical, diagonal) allows athletes to perform activities on the injured knee in optimal conditions.

The purpose of the study was to increase the efficiency of using hydrokinetic therapy after arthroscopic surgeries for treating meniscus injury in basketball players at the stage of sports rehabilitation.

Methods and organization. The study took place in the "UMGK-Zdorov'e" multipurpose medical center (Ekaterinburg). The inclusion criteria: type of sport – basketball, diagnosis – post-surgical period after the arthroscopic surgery for treating meniscus injury, recovery stage – the sports rehabilitation

stage. The exclusion criteria – combined injuries of the knee joint. The study involved 8 basketball players aged 23-26 years, sports qualification – 1st grade (n=5), candidates for master of sports (n=3).

The functional characteristics of the operated knee and the whole part of the lower limb were identified according to the knee joint amplitude with goniometry in the initial positions – lying on the back, lying on the stomach. Dynamics of trophic changes in the hip muscles was studied with anthropometric measurements (in cm) of the hip muscles from both healthy and injured legs. Pain sensations of the injured part at rest and in case of activity were differentiated according to the 10-point Verbal Descriptor Scale [7]. The 5-point

manual muscle testing (MMT) was done to identify strength of the quadriceps femoris muscle during its active contraction in the lying on the back position.

The results obtained were processed with the math-and-stats methods: we were identifying average values of the indicators, standard derivation, the significance level of differences for parametric indicators was calculated with the Student's t-test (when $p \geq 0.05$) and the Wilcoxon's T-test – for non-parametric indicators (when $p \geq 0.05$).

Results and discussion. The preliminary study of the examined indicators has revealed reduced strength of the muscles that flex and extend the calf, as well as the pain syndrome pronounced mostly during exercise (table).

Table

Comparative results of anthropometric, functional and psychological indicators of basketball players after rehabilitation measures including hydrokinetic therapy

Method / Indicators	X±σ		p
	Before	After	
Goniometry			
Knee joint's flexion (degrees)	75±5	130±5	p≤0.05
Knee joint's extension (degrees)	13±2	1±0.3	p≤0.05
Anthropometric indicators			
Girth of the healthy leg's hip (cm)	36±1.5	37±0.5	p≥0.05
Girth of the injured leg's hip (cm)	33.5±1.5	36.5±1	p≤0.05
Verbal Descriptor Scale			
Pain assessment at rest (points)	4.87±0.04	1.67±0.02	p≤0.05
Pain assessment during exercise (points)	6.47±0.01	4.87±0.03	p≤0.05
MMT			
MMT of the quadriceps femoris muscle of the injured leg's hip (points)	1.25±0.25	4.6±0.05	p≤0.05

The main tasks of the physical rehabilitation of the basketball players with hydrokinetic therapy were the improvement of conditions of the reparative and regenerative processes in the injured body part, recovery and improvement of the support function of lower limbs, recovery of the development level and improvement of the main physical qualities, recovery of the optimal level of the total and special performance, recovery of coordination of specialized motor movements in basketball.

The comprehensive recovery measures with hydrokinetic therapy that lasted 6 years

were aimed at reducing time of elimination of the injury's consequences and post-surgical complications, the recovery of athletic performance against the background of maximally possible preservation of best athletic conditions and the functional state of the athlete's body. The whole rehabilitation period included 3 stages: introductory (1 week), main (4 weeks) and final (1 week).

Therefore, the main accent of the comprehensive rehabilitation with hydrokinetic therapy was aimed towards the support of the fitness level and preservation of the

physiological pattern of special motor actions in basketball. The pool classes included calisthenic exercises (20% of the total physical activity (PA)), respiratory exercises (10% of the total PA), special and special training exercise (70% of the total PA), we have used sports training devices (foam floats, swimming boards, paddles, pull buoy, swimming noodles, flippers, water dumbbells, weights etc.). We have also used training devices and mechanic systems used both on land (different expanders, training device/set for dryland swimming – analog of TRX sets, stair stepper – horizontal and vertical, exercise bicycle, plate load machine – leg press, squat training device, a device for flexion-extension (with/without resistance) in the knee joints from the sitting position (rowing machine) and in the pool (underwater balancing platforms, simulator of “walking in zero gravity”, underwater exercise bicycle, underwater treadmill, etc.). Therapeutic swimming in the pool was conducted with all swimming styles following movement biomechanics, which is why at the beginning we used devices for support (foam floats), then we implemented active movements. After that, we used the equipment (flippers, water dumbbells, weights) for poundage and increasing resistance in the injured part of the musculoskeletal system. Special exercises, alongside with the calisthenic exercises in water, were conducted in horizontal, diagonal and vertical initial positions. Alongside with flexing and extending movements in the injured part, we have also applied different types of walking, running, turns on a place and in movement in conditions of the different pool depth. For the recovery and subsequently – for the improvement of amplitude characteristics of the knee joint and the whole part of the musculoskeletal system we used mechanic systems and training devices. We also included volleyball and basketball in the pool with different water levels. The average water temperature was 28-29 °C. After the most loaded exercises and at the end of the rehabilitation course, we used exercises for stretching and relaxation of the stressed muscle groups combined with respiratory exercises focused on the phase of slow and

smooth exhalation, followed by passive rest in conditions of unloading the spine and lifting the injured body part.

The efficiency of the conducted rehabilitation measures for the participants was presented as a significant improvement of the studied indicators (table).

According to the goniometry results, the flexion amplitude of the injured leg's hip joint has increased from 75 ± 5 to 130 ± 5 degrees ($p \leq 0.05$), the extension amplitude has also increased from 13 ± 2 to 1 ± 0.3 degrees ($p \leq 0.05$).

The dynamics of anthropometric measures of the healthy hip's girth has insignificantly increased from 36 ± 1.5 to 37 ± 0.5 cm ($p \geq 0.05$). Meanwhile, there are significant changes when measuring the hip's girth of the injured leg from 33.5 ± 1.5 to 36.5 ± 1 cm ($p \leq 0.05$), reaching values that insignificantly differ from the indicators of the healthy limb.

During the recovery measures including hydrokinetic therapy, we assessed pain level with the Verbal Descriptor Scale that allows evaluating presence of pain sensations at the present moment [8]. Before the recovery, the results at rest have amounted to 4.87 ± 0.04 points, corresponding to the excess of moderate pain, pain during exercise was estimated by athletes at 6.47 ± 0.01 points and interpreted as very severe pain. After the recovery, pain sensations in the injured part have reduced and were estimated at 1.67 ± 0.02 points ($p \leq 0.05$) at rest, corresponding with weak pain, during exercises they corresponded with moderate pains and were estimated at 4.87 ± 0.03 points ($p \leq 0.05$).

The MTT, rated with the 5-point scale, has reflected an increase in the myotatic reflex of the quadriceps femoris muscle in the injured leg during isometric activity. In the course of the rehabilitation measures with hydrokinetic therapy, the MTT has increased from 1.25 ± 0.25 to 4.6 ± 0.05 points ($p \leq 0.05$), almost corresponding with the normalized values of 5 points and demonstrates the efficiency of the rehabilitation measures carried out.

Conclusion. The recovery measures with the hydrokinetic therapy at the stage of sports training for basketball players in the late

and long-term post-surgical period after arthroscopic surgeries on the knee joint have contributed to the increased flexion-extension amplitude of the injured limb's knee joint, the reduced intensity of pain sensations at rest and during exercise, the increased myotatic reflex

activity of the quadriceps femoris muscle during isometric activity. The aforementioned demonstrates the recovery measures' efficiency and serves as a justification for transition of athletes to full-fledged training activity.

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