SCIENTIFIC AND METHODOLOGICAL FOUNDATIONS OF FIRST AID FOR MUSCULOSKELETAL INJURIES IN ATHLETES DURING TRAINING

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Abstract. *This scientific article presents a comprehensive analysis of musculoskeletal injuries occurring among athletes during training, emphasizing their structural, physiological, and biomechanical characteristics. The study explores the classification of injuries, associated clinical manifestations, and primary diagnostic criteria while examining the underlying pathophysiological mechanisms activated during acute tissue damage. Special focus is placed on evidence-based first aid methodologies, particularly the RICE and PRICE protocols, evaluating their effectiveness in reducing inflammatory responses, preventing secondary complications, and stabilizing injured anatomical structures. The article further provides a methodological framework for immediate intervention based on international sports medicine standards and highlights the critical role of rapid immobilization and cold therapy in optimizing early recovery processes. The findings contribute to the development of professional guidelines for coaches and sports medical practitioners and offer a scientific foundation for enhancing injury prevention strategies and improving rehabilitation outcomes for athletes.*

Keywords: *sports injuries, musculoskeletal system, first aid, RICE protocol, PRICE model, muscle injuries, tendon and ligament damage, joint dislocation, bone fractures, inflammatory response, immobilization, rehabilitation, sports medicine, emergency intervention algorithm, cryotherapy, compression therapy, edema prevention, musculoskeletal health.*

INTRODUCTION

Sports training is characterized by high intensity, dynamic movements, rapid biomechanical changes and sudden fluctuations in loads. Portable training is characterized by high intensity dynamic movements, rapid biomechanical changesportable training is characterized by high intensity, dynamic movements, rapid biomechanical changes and sudden fluctuations in loads. Any kind of sport, whether professional or amateur, has a significant impact on the musculoskeletal system.

According to the statistics of the world sports medicine, more than 70% of injuries among athletes are injuries of the musculoskeletal system about the statistics of world sports medicine, more than 70% of injuries among athletes are injuries.

Relevance of the article, due to the fact that many athletes do not receive proper first aid after injury, the injury becomes more serious, the rehabilitation time increases, or irreversible changes occur in the musculoskeletal system. The relevance of the article: due to the fact that many athletes do not receive proper first aid after injury, the injury is serious.

METHODS

Scientific foundations of injuries of the musculoskeletal system. Causes and etiology of injuries. The occurrence of sports injuries is influenced by many factors: internal factors leading to injuries to the musculoskeletal system (skeleton, joints, muscles, ligaments, ligaments and

connective tissue) are factors related to the internal structure, physiology and health of the body, increasing the risk of injury even without external influence.

Anatomical and morphological factors

These factors depend on the innate or acquired anatomical structure of the musculoskeletal system.

Congenital conditions:

- Congenital deformities of the foot (flat feet, bulge)
- Congenital disk deficiency
- Congenital dysplasia of the knee or hip joint
- Congenital curvature of the spine (scoliosis, kyphosis, lordosis)

Acquired anatomical changes:

- Flat feet (pes planus)
- Anatomical disproportion of joints
- Difference in leg length
- Imbalance of muscle tone and volume

The result: the load is distributed incorrectly, joints and muscles are prone to injury.

Biophysiological factors

The body changes depending on age, gender, and physiological processes.

Age :

- In children: sprains are mild, fractures occur easily

In old age: osteoporosis, caries — increased risk of fractures and joint diseases.

Gender:

- Women: have a higher risk of osteoporosis, more cracks in the joints
- Men: more muscle mass causes injuries that require more strength.

Hormonal background:

Decreased estrogen levels (in menopausal women) – bones become brittle

Low testosterone levels-Muscle weakness, joint instability

External factors:

- incorrect technique
- high-intensity exercise
- poor quality of sports equipment
- risk factors in the area or hall
- weather conditions
- Increased impact speed

The combination of these factors leads to an aggravation of injury, recurrence of injury, as well as to an increase in the duration of rehabilitation.

RESULTS

Classification of injuries

Injuries of the musculoskeletal system are conventionally divided into:

Muscle injuries	Knee and ligament injuries	Joint injuries	Bone fractures
Stretching muscles	Sprain of the ligaments	dislocation	Closed fracture

Partial rupture (1-2 degrees)	Breaking the ligament	Partial output(bone)	Open fracture (bone)
Full ruptre (level-3)	Partial interruption of longitude	Damage to the joint capsule	Stress fracture (microfracture)
Intramuscular hemorrhage (hematoma)	Complete rupture		Fracture with or without displacement

Pathophysiological changes in trauma

As soon as an injury occurs, physiological processes are triggered in the body, which are consistently linked to each other.:

Acute inflammatory phase (0-72 hours)

blood vessels dilate (vasodilation)

swelling occurs (edema develops)

pain receptors are activated (pain receptors are triggered)

inflammatory mediators (histamine, bradykinin) become activated (are activated)

microcirculation is disrupted (impaired)

Subacute phase (3-7 days)

fibroblasts are actively functioning (fibroblasts are active in activity)

collagen synthesis increases (collagen production is enhanced)

the reparative process begins (the healing/reparative process starts)

Regeneration phase (1-6 weeks)

new collagen fibers are formed (new collagen fibers are produced)

muscle strength is restored (muscle strength recovers)

blood vessels are remodeled (the vessels are reorganized)

Understanding these processes is important in choosing the appropriate first aid measures.

DISCUSSION

INJURY PREVENTION IN ATHLETES

Muscle warm-up protocols

• Dynamic warm-up

• Increase in muscle elasticity

• Activation of the cardiovascular system

Training load periodization

• Excessive loading is the main cause of injury

• Properly planned loading reduces injury risk by 40%

Proper organization of the recovery process

• Sleep

• Hydration (water intake)

• Nutrition

• Massage

• Physiotherapy

REHABILITATION

Initial stage

- reduce swelling
- eliminate (relieve) pain

Functional stage

- increase joint range of motion
- restore muscle strength

Return-to-sport criteria

- agility tests
- restoration of 90% of muscle strength symmetry
- absence of pain

CONCLUSION

An evidence-based approach to first aid for injuries of the locomotor system plays a crucial role in reducing the severity and long-term impact of sports injuries. By implementing well-established first aid principles promptly, we can shorten the initial recovery timeline, minimize secondary damage, and help athletes return to training and competition more quickly and safely.Current standards in sports medicine emphasize the use of proactive, structured protocols such as RICE (Rest, Ice, Compression, Elevation), PRICE (Protection, Rest, Ice, Compression, Elevation), and POLICE (Protection, Optimal Loading, Ice, Compression, Elevation) as foundational tools for early management. When applied correctly and tailored to the individual injury, these protocols can mitigate inflammation, control pain, maintain range of motion, and support tissue healing.

REFERENCES

1. Abdullayev A., Xolmatov R. *Sport tibbiyoti asoslari.* – Toshkent: O‘zDJTI nashriyoti, 2020.
2. Mamatqulov B., Rasulov O. *Jismoniy madaniyat nazariyasi va metodikasi.* – Toshkent: “Fan va texnologiya”, 2019.
3. Yo‘ldoshev S. *Sport jarohatlari va ularning oldini olish.* – Toshkent: O‘zbekiston Milliy universiteti, 2018.
4. O‘zbekiston Respublikasi Sport tibbiyoti bo‘yicha klinik tavsiyalar – 2022.
5. Назаренко Л. Д., Боброва Ю. И. *Спортивная медицина.* – Москва: Геотар-Медиа, 2021.
6. Ковалёв С. А. *Травмы опорно-двигательного аппарата у спортсменов.* – Санкт-Петербург: Питер, 2019.
7. Абзалов Р. А. *Первая помощь при спортивных травмах: методическое пособие.* – Казань, 2020.
8. Клинические рекомендации Министерства спорта РФ «Оказание первой помощи при спортивных травмах» – 2021.
9. Brukner P., Khan K. *Brukner & Khan’s Clinical Sports Medicine.* – 5th Edition. McGraw-Hill, 2019.
10. Magee D. *Orthopedic Physical Assessment.* – 7th Edition. Elsevier, 2021.
11. American College of Sports Medicine. *ACSM’s Guidelines for Exercise Testing and Prescription.* – 11th Edition. Lippincott, 2022.
12. Bleakley C. M., Glasgow P., MacAuley D. *Management of acute soft tissue injuries using the POLICE principle.* British Journal of Sports Medicine, 2012.
13. Orchard J. W. *Musculoskeletal Injury Prevention in Sports.* Sports Health Journal, 2020
14. World Health Organization (WHO). *Musculoskeletal Health.* – 2023.
15. International Olympic Committee (IOC). *Sports Injury Prevention Guidelines.* – 2022.
16. National Athletic Trainers’ Association (NATA). *First Aid and Injury Management Protocols.* – 2021