

## Review Article

### Sports Injury: Rehabilitation Updates

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#### Abstract

*Sports injuries occur as a result of physical activities carried out either for general recreational purposes or with more professional goals in mind. Sports injury can be defined as a pathologic process that adjourns training or competition and leads the athlete to seek medical treatment. Athletes of all levels suffer from injuries and experience a variety of acute and overuse syndrome that may range from minor to carrier-ending. The ever changing pattern of sports relevant injury, as well as limited available resource for rehabilitation in many areas of Bangladesh, is a matter of concern. Few sports clubs have some facilities; most of the athletes is often left to fend for himself. Key determinants of a successful sports injury rehabilitation program include the application of modern rehabilitation protocol under pertinent supervision, judicious application of appropriate pharmaceutical agents and prompt surgical interventions when required. A Physiatrist would be the most logical choice to lead the rehabilitation team, holistic approach to injuries with conservative manner, proper guidance of physiotherapist and referring complicated injuries to the most appropriate specialist in a timely manner. Worldwide practiced rehabilitation protocols are sports injury based but this need to be developed according to the nature of injuries as well as available resources. The main focus are safe return to sports and minimizing re-injury on return to sport; this involves application of rehabilitation intervention in acute and*

*chronic phases of injury. A key factor in all sports injury rehabilitation protocols is injury prevention; this involves data maintenance by teams or trainers, which is still not yet developed completely in Bangladesh. This review is an endeavor to elucidate some issues that are important and routinely practiced world-wide, with the aim to improve sports injury rehabilitation protocol for the developing world.*

**Keywords:** Sports injury, rehabilitation, sports rehabilitation.

#### INTRODUCTION

The ever flourishing of sports across the globe has made the “sports arena” extremely competitive and financially lucrative for the athletes, with many striving for elite professionalism.<sup>1</sup> That has consequently escalate the physical and emotional burden of sports, increased the intensity of training session and exposed those involved in this quest magnify risk of injury. In any competitive sports, injured athletes have pressure to return to game as early as possible, which is often a urging for both the team management and athletes. Sportsman also faces a chance of losing his position in the team due to the highly competitive attitude in sports arena and naturally come under higher pressures to return.<sup>2</sup> Rehabilitation of sports injuries in compare to other rehabilitation is little different. Sports injury rehabilitation requires holistic approach of highly structured and sports-specific program, where both the athlete and the pattern of injuries are important to make a plan of rehabilitation program. Participation in sports is widespread all over the world, with well described physical, psychological and social consequences for involved athletes.<sup>3</sup>The benefits associated with physical activity in both youth and elderly are well documented. Participation in sports regularly is related with a better quality of life and which minimize the risk of several illnesses, allowing people involved to enhancing cardiovascular fitness.<sup>4</sup> In addition to the beneficial aspects related to sports activities, injuries can counter these if an athlete is unable to continue to participate because of residual effects of injury. Negative consequences of musculoskeletal injuries sustained during sports may compromise function in later life, limiting the ability to experience pain-free mobility and engage in fitness-enhancing activity.<sup>5</sup>

Woefully, there is few research regarding structured sports injury rehabilitation programs focusing on sports injury management, rehabilitation and prevention in Bangladeshi

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athletes. We are lacking behind in research and evidence in comparison to developed countries. A PubMed search using key words such as “Sports Injury AND Rehabilitation AND Bangladesh” gave 1 citation, which was neither relevant, nor gave enough information about the topic under review. A PubMed search using key words such as “Sports injury And Management AND Rehabilitation updates” found 48 articles, few of them were certain to sports injury rehabilitation, and none of which was focused on Bangladeshi athletes or published by any Bangladeshi author. This article attempts to update the physiatrist, sports rehabilitation personnel about available management options and problem oriented interventions for athletes, which could be applied even in the developing countries.

### EPIDEMIOLOGY

Sports injuries may result from contact or noncontact movement and present as two types of injury, acute or overuse syndrome.<sup>6</sup> Muscles and ligaments are most commonly involved in sports injury, but bone also injured with stress fractures or direct contact being somewhat unique to sports. There are no significant changes in sports-relevant injuries over the past two decades, despite the heightened insight into injury mechanisms, prevention programs, and load monitoring techniques in athletes. Hootman et al. observed in a study over 16 years’ collegiate athletes in fifteen different sports in the United State.<sup>7</sup> They concluded that lower limb injuries were predominant among all sports injuries that were more than fifty percent, with the knee and ankle joints frequently being involved. Contact injuries were the most common form of injuries with remarkably increase numbers being observed during any competitive games compared to training session. Out of the fifteen sports, they analyzed that soccer had the highest injury rate and competitive wrestling being the second largest. Over the 16-year period, the authors also revealed that intensify physical demand, competitive attitude, and frequent changes of rules had an essential effect on injury trends.<sup>8</sup>

According to international studies, the overall injury incidence for competitive amateur soccer players ranges from 5.2 to 9.6 per 1000 hours of play.<sup>9-11</sup> The overall injury rate in NCAA (National Collegiate Athletic Association) men’s soccer is 7.7 per 1,000 athlete exposures (games and practices combined).<sup>12</sup> Soccer players are more than three times more likely to be injured in a game (16.9 injuries per 1,000 athlete exposures) than in practice (5.1 injuries per 1,000 athlete exposures). Ligament sprains of the lateral ankle (12.2%), hamstring muscle strains (7.5%), concussions (5.5%), and adductor (groin) muscle strains (5.5%) are the most common specific types of injury in men’s soccer.<sup>13</sup>

Injury site could be related to sports type, upper limb injuries observed predominantly in throwers and bowlers,

while lower limb injuries predominate in games like as football and hockey. Dhillon et al. found that among all the injured athletes, only 39.8% returned to the sport, a figure significantly lower than a recent meta-analysis that showed 83% of athletes return to their respective sport.<sup>14, 15</sup>

It is obvious that injuries and returning to the sport are utmost concerns among athletes and their treating physician, safe return to the competition with complete fitness being compelling of rehabilitation.<sup>16</sup> This review focus to precise an evidence-based approach for rehabilitation of sports injuries, embrace with problem oriented interventions initiated immediate after an acute injury to complete returns to competition.

### MATERIALS AND METHODS

The online literature search was conducted between January 2020 and July 2020 using Medline, Google Scholar, PubMed and Bangladesh Journals OnLine (BanglaJOL), restricted to English language January 2010 – July 2020. The keywords included “Sports injury”, “Sports injury management”, and “Sports rehabilitation”. Information’s were gathered and analyzed to synthesis the article for the updated management of sports related injuries and rehabilitation.

#### Principles of sports injury management

Prevention is the best treatment of sports injury. When injuries do occur, an organized plan of management, assessment and after-care is mandatory.<sup>17</sup>

The corner stones of core management interventions of sports injury is mentioned in a tabulated format (Table I).<sup>18-20</sup>

**Table I: Core management interventions**

Rapid assessment
Immediate treatment (PRICE Protocol)
Prompt referral
Sports rehabilitation
Prevention

#### Rapid Assessment

Patent Airway, Breathing, Bleeding, Intact Circulation, Consciousness, Extremities, Fracture, Position & Movement of the injured athlete is assessed rapidly immediately after an injury.

#### Immediate Treatment (PRICE)

P-Protection, R-Rest, I-Ice, C-Compression, E-Elevation. Protection, relative rest, ice, compression, and elevation (PRICE) are the proposed mainstay of initial treatment and are introduced immediately.<sup>21</sup> After an on-the spot assessment of extent of injury, PRICE Protocol should be instituted to minimize haemorrhage and oedema.

The details of PRICE Protocol is summarized in Table II.<sup>22</sup>

**Table II: PRICE Protocol**

What	How	Why
<b>Protection</b>	Protect the injury and prevent further damage by using a brace or splint to support the injured joint.	This may allow for an earlier return to function.
<b>Rest</b>	Injured Athlete should cease activity immediately.	Continuation of play will further injure the Athlete.
<b>Ice</b>	Crushed ice in wet towel or plastic bag. Sponge in icy water. Commercialized cold packs Ice application should be for 24 hours and 20 min every 2 hours. Never apply Ice direct to the skin.	Ice reduces <ul style="list-style-type: none"> <li>- Pain.</li> <li>- Swelling.</li> <li>- Bleeding at injury site.</li> <li>- Muscle spasm</li> </ul>
<b>Compression</b>	A firm elastic bandage over the injured part both during and after ice application.	Compression <ul style="list-style-type: none"> <li>- Minimizes bleeding.</li> <li>- Reduces swelling.</li> <li>- Provides support to the injured part.</li> </ul>
<b>Elevation</b>	Raise the injured part above the level of the heart.	Elevation reduces <ul style="list-style-type: none"> <li>- Bleeding.</li> <li>- Swelling.</li> <li>- Pain.</li> </ul>

**Prompt Referral**

Improvisation for a prompt referral in certain situation is a corner stone for a successful sports injury management. A specialist opinion should be sought urgently in any of the circumstances mentioned in Table III by appropriate referral. Injured athletes should seek a specialist opinion within 24-48 hours in case of persistent symptoms arising from injuries to muscle, tendon, joint or ligament and severe pain.<sup>23</sup>

**Table III: Conditions requiring urgent referral**

Unconsciousness or persistent headache, nausea, vomiting or dizziness after a head injury.
Breathing difficulties after blows to the head, neck or chest.
Pain in the neck after impact, whether or not they extend to the arms.
Abdominal pain.
Blood in the urine.
Fracture or suspected fracture/dislocation.
Severe joint, ligament, muscle or tendon injury.
Eye injury.
Deep wound with bleeding.
Any injury in which there is doubt about its severity, diagnosis or treatment.

**Rehabilitation**

Rehabilitation of an Athletic Injury is the process of returning the Athlete to sport to pre-injury level of Athletic performance. The primary aim of Athletic Rehabilitation is to enable the Athlete to return to Sport with full function in the shortest possible time. The treatment described earlier may

lead to an athlete becoming pain-free and able to return to Activities of Daily Living, but Rehabilitation is mandatory to return the Athlete to pre-injury level of Athletic performance.<sup>24</sup>

A well-trained Physiatrist would appear to be the most logical choice to direct the Rehabilitation Team, addressing the

majority of non-operative injuries in conjunction with Athletic Trainer, Physical Therapist and referring other conditions as needed to the most appropriate specialist in a timely manner.<sup>25</sup>

*Keys to a successful rehabilitation program*

Every Athlete is an individual, explanation, provide precise prescription, make most of the available facilities and begin as soon as possible.

*Important components of rehabilitation*

Muscle conditioning, flexibility, neuromuscular control, functional exercise, sport skills, correction of abnormal biomechanics, cardiovascular fitness, and psychology.

*Soft tissue response to injury*<sup>26</sup>

Understanding the Pathophysiology, Phases and Time Frames of Soft Tissue Healing is important for a successful athletic rehabilitation program, which are described in Table IV.

*Rehabilitation Program*<sup>27</sup>

Rehabilitation program of a sports injury is conceptually divided into phases. Phases can be correlated to stages of tissue injury. There are phase specific goals and therapeutic intervention.

**Table IV: Soft tissue response to injury**

Phase	Time frame	Histopathology
Acute inflammatory	0-72 hours	Erythrocytes and inflammatory cells Phagocytosis of necrotic cell within 24 hours Fibroblasts slowly lay down collagen Scar
Proliferation/Repair	2 days-6 weeks	Predominant cells are Fibroblast Collagen scar with cross-links
Remodelling/Maturation	4 weeks-12 months	Collagen content slowly reduced Scar tends towards pre-injured tissue

The Rehabilitation program of an athletic injury is detailed in Table V.

**Table V: Rehabilitation Program**

Phase	Goals	Therapeutic intervention
<b>Phase 1:</b> Acute Phase	Relief Pain. Prevent further injury. Minimize hemorrhage and edema.	PRICE Protocol
<b>Phase 2:</b> Recovery Phase	Promotion of reparative process. Avoid further damaging to injured tissue. Correct biomechanical deficits. Improve muscle control and balance. Retrain proprioception. Start sport specific activity.	Gradual and careful mobilization Physiatric modalities: Superficial heat Ultrasonic therapy Electro therapy Therapeutic exercise: Range of motion Static and dynamic flexibility Closed chain PNF Dynamic strengthening
<b>Phase 3:</b> Functional Phase	Increase power and endurance. Improve neuromuscular control. Work on entire kinematic chain.	Plyometric exercise, Diagonal and Multiplanar motion. Multiple-plane neuromuscular control. Maintenance in Flexibility, Strengthening, Power and Endurance exercise. Sports-specific progression to return to sport.
<b>Phase 4:</b> Return to competition	Begins when the Athletes return to competition.	

**Table VI: Roles and responsibilities of the Target Groups for preventive intervention**

Governing bodies	Goals	Athletes (Risk factors)
Game philosophy Laws of game Facilities and equipment Fair play Environmental conditions Exposure levels Doping control Education	Tackle assessment Physical fitness Perceptual-cognitive interpretation Application of laws Interpersonal skills	Age, Gender, Behaviours, Cultural issues, Biomechanics Tackling techniques and skills Medical History Previous injury Drugs

**Table VII: Roles and responsibilities of the Target Groups for preventive intervention**

Coaching team	Medical team
Physical preparation Mental fitness Nutrition Rehabilitation Return to competition guidelines	Medical support, services and techniques Systemic medication and doping control On/Off-Pitch injury assessment On/Off-Pitch medical treatment Rehabilitation Return to training guidelines

**Criteria for return to competition<sup>28</sup>**

- Time constraints for soft tissue healing.
- Pain-free full range of motion.
- No persistent swelling.
- Adequate strength and endurance.
- Good flexibility.
- Good proprioception and balance.
- Adequate CVS fitness.
- Skills regained.
- Coach satisfied with training form.

**Prevention<sup>29</sup>**

The easiest injuries to treat are the injuries that do not occur. This, however, is much easier said than done. There are data to indicate that the incidence of Athlete injuries can be reduced.

Target Groups for Preventive Intervention are governing bodies, referees/umpires, athletes, coaching team and medical team. The roles and responsibilities of the target groups are mentioned in Table VI and VII.<sup>30</sup>

**Important factors for injury prevention<sup>31</sup>**

Warm-up/cool-down, stretching, taping and bracing, protective equipment, suitable equipment, appropriate surfaces, proper training, adequate recovery, psychology and nutrition.

**CONCLUSIONS**

Rehabilitation plays a key role after a sports injury for complete recovery, to minimize injury period and to prevent further injury. Update rehabilitation methods have excelled conventional treatment protocols and are based on problem oriented rehabilitation framework that involved the athlete and other rehab members equally. The role of surgical interventions and pharmaceutical requirements is need based and beyond the scope of this manuscript, rehab team give highest effort to return game as soon as possible for any athlete. In addition, all Physiatrists give emphasis on nutritional supplementation and psychological counseling if needed, which have a major role in getting the athlete back with complete fitness, along with injury-free return to sports at the same level when he was injured.

**CONFLICT OF INTEREST**

The authors declare that there is no conflict of interest to reveal.

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