

Mechanisms and Efficacy of Paraffin Therapy in Sports Injuries

Xue Wang^{1*}, Shuting Duan¹, Huanru Deng¹, Ying Ma¹, Xueqiao Zhou²

¹Clinical College of Gansu Medical College, Pingliang 744000, Gansu, China

²Basic Medical College of Gansu Medical College, Pingliang 744000, Gansu, China

**Author to whom correspondence should be addressed.*

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Abstract: Paraffin therapy is a widely applied physical modality in the treatment of sport-related injury. The present study aimed to elucidate its mechanisms of action and clinical efficacy, and thus to give theoretical insight as well as practical guidelines for sports medicine therapeutic use.

Keywords: Paraffin therapy; Sports rehabilitation; Blood circulation; Muscle pain; Tissue repair

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1. Introduction

Following sports injuries, the speedy, effective restoration of athletic function and performance remains a priority concern in the field of sports medicine ^[1]. Paraffin therapy, as one physical intervention modality that has long been used, has slowly gathered interest for its rehabilitative possibilities with the athletic population ^[2]. The purpose of this article is to discuss the specific mechanisms paraffin serves in sports rehabilitation and how this modality can be potentially used to help hasten the recovery process of the injured athlete ^[3]. In addressing a general overview of paraffin therapy, it is our hope to give new insight and therapeutic possibilities for sports rehabilitation to help with the prompt return of the athlete to competition following injury.

2. Current application status

As a physical agent, paraffin has been used for many years as part of a sports rehabilitation setting ^[4]. Exploiting the heat-retaining qualities when paraffin is in its melted state, the treatment supports regional blood flow, muscle discomfort and inflammatory reactions, or accelerates the tissue repair process by local hyperthermia, thereby aiding speedier recovery from athletic injury ^[5]. In practice, it is common to see the use of heated paraffin applied directly to the affected part as a dressing. Because of its large specific heat and low thermal conductivity, paraffin also stays at a constant temperature over a long period of time, thus

providing sustained thermotherapy to the injured tissues. The local circulation, oxygen, and nutrient supply are enhanced, as well as the clearance of metabolic waste and downregulation of the inflammatory cascade by such sustained warmth.

The advantage of paraffin therapy in sports rehabilitation was not restricted to the control of musculoskeletal injury ^[6]. Evidence also showed that it could help reduce joint stiffness and increase the range of motion, which would be very handy for athletes to recover their joint function after injury ^[7]. The warming effect can help reduce muscle tension and pain, increase muscle flexibility and extensibility, which can help restore athletic performance and reduce the risk of re-injury ^[8]. In clinical practice, paraffin treatment is often combined with other physical modalities, electrotherapy, hydrotherapy, massage, etc, for more holistic results. This combined treatment makes it possible to adapt the rehabilitation program personally according to the specific characteristics of the injury of each athlete, enabling more accurate and effective treatment ^[9].

However, paraffin therapy has some restrictions in sports rehabilitation. For instance, it could not be used or must be applied with some care for an athlete suffering from hypersensitive skin or an open wound ^[10]. Its effect is mediated by several variables such as paraffin temperature, dressing thickness, and duration of the treatment, requiring technically skilled application and monitoring by trained staff ^[11]. In general, as an adjunctive treatment modality, paraffin seems to show clear benefits and potential in sports rehabilitation practice. With further progress of sports medicine and more research on the topic, the potential and performance of paraffin will be more widely understood and in-depth. With careful cooperation of paraffin and other rehabilitative techniques, a more comprehensive and efficient recovery program can be offered to the athlete so that he can return to peak performance at some later time.

3. Mechanism of action

The ways in which paraffin therapy promotes sports rehabilitation are multiple, but its basic benefit lies in the thermotherapeutic action of the molten paraffin, which acts as a deep, constant source of gentle heat for painful tissues. Initially, this thermal effect manifests itself in terms of enhanced blood circulation ^[12]. This enhances local perfusion, delivering more oxygen and nutrition to the damaged areas and eliminating metabolic byproducts and inflammatory mediators faster, in order to accelerate the healing process. In addition, heat increases the metabolic rate in the treated area, thus contributing to the reduction of muscle soreness and stiffness. In post-sport traumas, muscular tissue usually presents pain and hypertonicity: with its warming effect, paraffin therapy relaxes the muscles, reduces pain sensitivity, improving flexibility and joint mobility. The relaxant effect is very important for the maintenance of muscle functionality, thus avoiding atrophy during the rehabilitation process of an athlete.

Paraffin also gives an insulating effect, maintaining the heat after the treatment session and hence prolonging the therapeutic effect. Even after removing the paraffin pack, the injured area stays warm, which again helps to enhance circulation and tissue repair. This speeds up the recovery process and improves the positive results of rehabilitation significantly. In addition, there may be other positive effects of paraffin with respect to tissue regeneration, which are due to its chemical composition. In fact, trace minerals and organic compounds contained in paraffin may promote cellular metabolism and tissue repair. However, studies along this line are just being started and, so far, evidence that some constituents of paraffin have anti-inflammatory

effects and promote cell proliferation is available only in some studies.

In clinical practice, paraffin therapy is frequently applied in combination with other physical agents, in order to obtain a wider therapeutic effect. So, for example, in combination with electrotherapy to enhance muscle stimulation and relaxation, in combination with hydrotherapy to provide deeper pain relief and relaxation, and in combination with massage to help heat penetrate and be absorbed better, enhancing the thermotherapeutic effect. This holistic consideration makes it possible to plan a specific treatment based on the single athlete's injury profile, therefore increasing the specificity and efficiency of the rehabilitation ^[13]. The effect of paraffin therapy also depends on, for instance, paraffin temperature, dressing thickness, and the duration of the session. Hence, suitable protocols have to be developed by qualified professionals according to the injury characteristics and recovery goals of the athlete. Paraffin therapy is not suitable in all cases of sports injury; in specific situations, with open wounds or for patients with very sensitive skin, for example, it must be applied with care or alternative solutions explored.

4. Efficacy and summary

As a physical modality, paraffin therapy has proven a certain degree of clinical effectiveness in real-life situations. In sport rehabilitation, it is a useful complementary tool in the recovery process of all kinds of injuries thanks to its thermotherapeutic and insulating effect. The heat from paraffin dressings improves the local circulation and accelerates the clearance of inflammatory mediators, which leads to a reduction of muscle pain and stiffness ^[14]. The insulating effect keeps the therapeutic effect and prolongs its action, which, in the context of an athlete's rehabilitation period, is of great importance in favor of continuous improvement. In clinical observations, we experienced a great dependence of paraffin therapy on the type of injury, frequency of treatment, paraffin temperature, and the thickness of the dressing.

For typical sports-related injuries, including muscle strains or joint sprains, paraffin can reduce pain, improve blood flow to the injured area, and accelerate tissue repair and functional recovery. In addition, paraffin treatment is usually comfortable and well-tolerated by patients, which can potentially improve adherence and enhance the overall results of the treatment. However, the positive effect of paraffin is not immediate, and the regimen should be adjusted to the individual needs of every athlete and to their specific injury ^[15]. The severity of the injury, pain threshold, and sensibility of the skin should be taken into account by the clinician when deciding on a particular paraffin protocol. The therapeutic response should be closely monitored during the treatment and adjusted in a timely fashion for the athlete's best response.

Also, it should be noted that despite positive effects in most cases, paraffin has some shortcomings: e.g., it is contraindicated on open wounds or skin infections; it may have a variable effect from person to person due to their biological differences; the response to the treatment is not individualized. Therefore, the application of such has to be adapted to each individual, and it is not a universal method. In conclusion, paraffinotherapy has good clinical effects, and it is an efficient complement in sports rehabilitation.

5. Summary

The applications of paraffin therapy in sports rehabilitation have been demonstrated to be very effective and a promising modality with clinical case evidence. Benefiting from both thermotherapeutic and insulating properties, paraffin can attenuate pain in muscles and improve mobility in joints, and also improve blood

flow and accelerate tissue repair, which also has positive effects on the rapid recovery of athletes. However, the paraffin therapy's effects are not isolated, as personalized treatment sessions need to be planned based on the specific features of the athlete and injury type. Also, there are some limitations in using it, requiring combination with other physical modalities to provide a holistic rehabilitation plan to achieve the desired results. Looking to the future, with further research on its mechanism and more clinical experience, paraffin therapy will play an increasingly important role in sports rehabilitation, enabling more athletes to get healthy and back to competition.

Disclosure statement

The authors declare no conflict of interest.

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