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ENTHESIOPATHIES II: RADIAL SHOCKWAVE TREATMENT OF TENDINOPATHIES

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The first edition of the book entitled *Enthesiopathies II: Radial Shockwave Treatment of Tendinopathies (Level 10)* provides valuable tips and suggestions to doctors, physiotherapists, and sports scientists whose daily work is associated with the application of radial shockwave therapy (RSWT) and extracorporeal shockwave therapy (ESWT) for patients with different tendinopathies. Based on several years of practical experience in the fields of orthopaedic and chiropractic medicine, the author, Ulrich Dreisilker, has played a decisive role in the usage and development of RSWT. This publication is further supplemented by contributions from several experts in the field.

Throughout the book (188 pages), the reader is guided through comprehensive information on tendinopathy indications and therapy recommendations for RSWT application in combination with stretching and strength exercises within the realm of clinical practice. The book also includes colour illustrations and graphics that illustrate individual aspects and contribute to improving the reader's understanding. The guiding thread of book provides important background information on several topics, including the mechanism of action of shockwave therapies such as RSWT and ESWT, diagnostic sonography, the effects of mechanical influence on the muscle-tendon complex, and possible contraindications. In the concluding section, special chapters describe additional exercises that can be performed in combination with shockwave therapy in detail.

The book begins with an introduction, followed by a comprehensive section that is divided into seven separate units. The first chapter, entitled **'Introduction'**, presents an overview of RSWT and explains that this therapy continues to be developed further. Numerous scientific studies have shown that RSWT can be used as a successful therapy for patients with tendinopathies and that it achieves even better results when accompanied by stretching and load exercises. This chapter provides the reader with important information that tendon insertion disorders are not solely associated with older patients and degenerative changes from overexertion in daily life; they can also occur as a result of improper training plans and over- or under-training of athletes.

In the second chapter, entitled **'Insertion Tendinopathies and Trigger Points'**, the author talks about insertion tendinopathies and muscle trigger points that occur as a result of excessive movement or strength training (strains, muscle fibre tears, muscular imbalances, and distortions), as well as anatomical peculiarities of the body (leg length differences, discographies, spinal column instabilities or joint blockages).

The third chapter, entitled '**Literature Research on the Effectiveness of RSWT'**, describes the effects of RSWT in the treatment of tendinopathies: the author also points out that the studies described here were conducted based on the criteria of evidence-based medicine. A combination of RSWT, eccentric stress training, and a wait-and-see treatment strategy have demonstrated positive outcomes for the treatment of tendinopathy of the Achilles tendon, plantar fasciopathy, epicondylitis, and conditions affecting the supraspinatus tendon, ischiocrural musculature, and other tendons. The chapter highlights that shockwaves increase blood circulation and angiogenesis, which causes a reduction in the concentration or thinning of vasoneuroactive substances such as bradykinins, prostaglandins, serotonins, and histamines. This reduction leads to diminished excitation of nociceptors, resulting in pain reduction.

The fourth chapter, entitled '**History, Clinical Diagnosis, Therapeutic Measures'**, effectively explains how to diagnose the history of tendinopathies and the pain associated with this condition. The information provided by the author in this chapter is essential for therapists. Before starting therapy, it is crucial to study the history of pain that accompanies tendinopathies by collecting information on the following questions: 1) is the pain acute or chronic; 2) is the pain present during activities or only at rest; 3) is the pain greater when pulling or squeezing the tendon; and 4) what sport or profession does the patient take part in. These data can affect the course of the shockwave therapy administered.

In the fifth chapter, entitled '**Diagnostics Sonography'**, the author emphasises the importance of diagnosing tendinopathies using diagnostic ultrasound before recommending shockwave therapies. Through photos and text, he clearly explains the criteria used to determine the occurrence of tendinopathies in the tendons before initiating ESWT. A comparison of sonographic measurements taken before, during, and at the end of the ESWT provides information on the success or failure of the therapy.

In the sixth chapter, entitled '**Contraindications for RSWT'**, the author describes the contraindications for using radial shockwaves to treat tendinopathies. Therapists must be aware of the contraindications for treatment, as well as specific cases in which shockwaves should not be applied; for example, in the area near the lungs, tumours, vessels, nerve plexuses, and spinal cord. Complications can also occur in patients with coagulation disorders and those who have had corticosteroids infiltrated in the tendon area, as well as in athletes who consume prohibited substances such as anabolic steroids. RSWTs are ineffective in the treatment of rheumatic diseases (polymyalgia).

The final chapter in this section, entitled '**Mechanical Influence on the Muscle-Tendon Complex'**, was contributed by Konstantin Karanikas. This chapter describes the mechanical effects of shockwaves on the muscle-tendon system. Using photos and descriptions, the author effectively describes the adaptation process of the contractile elements of the muscle-tendon complex after the application of depth waves. It is important for therapists to note that the adaptation time for tendon or fascia injuries is different compared to muscles, since these structures differ in elasticity, plasticity, viscosity, and stiffness. Tendons are stiffer and more elastic, while fascias are less stiff and more plastic. Additionally, attention must be paid to the patient's training since trained structures exhibit greater stiffness and good elasticity.

The second thematic unit of the book, entitled 'Specific Section', consists of thirteen chapters that comprehensively describe the application of ESWT and RSWT in clinical practice.

The first chapter, entitled **'RSWT: Optimization of Treatment Success when Using New Technologies/Materials'**, contributed by author Corry Ulrich, describes new materials used in shockwave therapy in orthopaedic physiotherapy for the treatment of muscle pain and tendinopathies. The development of shockwaves goes in the direction of technological advancements that allows us access to a larger spectrum of shock transmitters, which in turn expands the treatment spectrum and enhance treatment comfort. Therapists must be familiar with different applicators for treating tendons, fascia, and muscles. Using shock transmitters with new materials and shapes

can improve treatment results. Compared to manual treatments, RSWT imparts more energy into tissue structure in a shorter period of time.

In the next chapter, entitled 'Insertion Tendinopathies of the Shoulder', the author, **Ulrich Dreisilker,** describes the functional anatomy of the shoulder joint and scapula, as well as the history of diagnoses that are frequently associated with shoulder joint injuries. He emphasises that it is essential for therapists to be able to determine whether the symptoms are acute or chronic, as well as to understand to check the background of the occurrence of the injury, considering whether the patient engages in sports or has a physically demanding job. Furthermore, assessing the timing and the extent of pain is also essential. For example, whether the pain is present during physical activity, at rest, or when the patient is sleeping. The author systematically describes tendinopathies and muscle triggers that are commonly observed in the muscles and tendons of the shoulder joint. An important piece of information for therapists is that the precise location of the tendinopathy can be identified by using shockwaves with a ceramic interface.

In the third chapter, **'Lateral and Ulnar Epicondylitis of the Humerus', Ulrich Dreisilker** describes the causes of elbow epicondylitis, and highlights the need for therapists to know how to diagnose tendinopathies of the elbow joint. The author emphasises that, in most cases, ultrasound and colour Doppler diagnostics are performed. Using the same procedure, a therapist can assess the condition of the patient at 3, 6, and 12 months after shockwave therapy. In particular, he points out that prior treatment with cortisone injections is not recommended, since this could lead to an increase in the state of damage (tissue necrosis), thus reducing the effectiveness of subsequent shockwave therapies. Finally, he systematically describes the diagnosis of elbow injuries and the treatment method with shockwaves.

RSWT therapies for the insertion tendinopathy of the triceps and pectoralis major muscles are described in detail in the fourth chapter, entitled **'Other Insertion Tendinopathies in the Region of the Upper Extremities'**. Achilles tendon injuries are among the most common injuries in modern society. The author **Ulrich Dreisilker** systematically describes the causes of injuries to the middle part of the Achilles tendon in the fifth chapter, entitled '**Mid-Portion and Tendon-Osseous Tendinopathy of the Achilles Tendon',** providing information on the manual and imaging diagnostic procedures used to establish a diagnosis. Therapists need to know the causes and history of the injury, as well as the appropriate procedures that should be used to heal the injury. The Achilles tendon treatment system is complex, therefore it is important to know the appropriate timing for treatment with shockwaves, stretching, and performing eccentric exercises to strengthen the Achilles tendon muscles, as well as to know when the patient is ready to put in further effort. In addition, the author systematically describes treatments using RSWT, ESWT, eccentric exercises, and Kinesio taping.

In the sixth chapter, the same author describes 'Plantar Fasciitis – Calcaneal Spur'. Due to an unhealthy lifestyle, excess body weight, anatomical peculiarities of the feet, advanced age (50+ years), excessive physical activity (running, walking up hills), and improper footwear, many people suffer from inflammation of the plantar fascia or heel spur. The author systematically describes the diagnoses of foot injuries and corresponding imaging diagnostics used to confirm these diagnoses. Additionally, he describes in detail the procedures for using shockwaves to treat injuries to the plantar fascia and calcaneal (heel) spur. In this case, therapists also need to know how to stretch and strengthen the plantar fascia, as well as the appropriate Kinesio taping techniques that can be used.

In the next chapter, entitled 'Patellar Tendinopathy, Jumper's or Runner's Knee', Ulrich Dreisilker highlights that patellar ligament injuries are most common in young athletes during their peak growth period, particularly those who dance and play sports such as football, basketball, skiing, and volleyball, as well as in people who are overweight and those who lack strength training. The diagnosis of jumper's knee is characterised by pain at the tip of the patella (in 79% of cases), at

the ligament itself (16%), and at the tibial tuberosity point (3%). The author lists options for conservative treatment, such as immobilisation of the knee, Kinesio taping, physiotherapy, and cortisone infiltration, which, unfortunately, are ineffective in the long term. Shockwave treatment with ESWT shows a treatment success rate of 60.8%. The treatment success rate can be even higher if, in addition to the therapies, eccentric exercises are performed in order to strengthen the leg muscles. This information is extremely valuable for therapists.

The eight chapter, entitled 'Tendinopathies of the Ischiocrural Musculature, Hip Adductors, Greater Trochanteric Pain, and Iliotibial Band', focuses on strains and ruptures of the muscle-tendon system. These injuries often occur due to sudden extensive force (explosive strength training, sprints, shooting the ball in sports). Chronic and degenerative changes in the tendons result from long-term loads and age. Similar to other tendinopathies, manual and imaging diagnostics are performed to determine the injury. Subsequently, the author describes the location and parameters of shockwave therapies in detail.

The chapter on **'Insertion Tendinopathy of the Hip Adductors'** presents four muscles (pectineus, adductor longus, brevis, and magnus muscles) that can undergo chronic overloading during athletic activities (tackling, sprints) and trigger tendon insertion disorders. The author effectively describes RSWT therapy for muscular triggers and muscle tension reduction, in combination with supplemental stretching and strengthening exercises.

The large gluteal muscles - the gluteus maximus, the gluteus medius, and the gluteus minimus - attach their tendons to the trochanter major and are shortened and tender in the case of chronic overloading in the context of insertion tendinopathy. In the tenth chapter, entitled **'Greater Trochanter Pain & Chronic Trochanter Major Syndrome'**, the author discusses "gluteal tendinopathy" and the superiority of RSWT therapy over corticosteroid injections and at home training. While the effect of the steroid decreased after one month, the RSWT continued to be successful at a follow-up appointment after four months.

Shortening or imbalance of the tensor fasciae latae and the gluteal musculature due to an improper, overloaded running or cycling style can lead to increased tension and tendinopathies of the iliotibial band at the insertion area on the lateral tibial plateau and Gerdy's tubercle. The eleventh chapter **'Insertion Tendinopathy of the Iliotibial Band'** provides a comprehensive overview of diagnosis, imaging diagnostics, RSWT, and additional stretching and strength exercises for iliotibial pain rehabilitation.

The twelfth chapter **'Rare Tendinopathies of the Lower Leg/Foot'** describes the tibialis anterior syndrome and RSWT therapy of triggers. Trauma and excessive overloading can cause these muscles to swell in their tight fascial structures, resulting in ischemia and feared compartment syndrome. The author suggests that during RSWT therapy, the patient should abstain from sports and related activities.

In the last chapter of the book, entitled **'Supplemental Exercises for Shockwave Therapy'**, contributed by Marcus Pabst, the author systematically describes 15 stretching and strengthening exercises to treat various tendinopathies. Each exercise is presented with photos of the starting and ending positions, along with notes on how to perform the exercise correctly. Ultimately, the author offers recommendations regarding the scope of the exercises, including number of sets and repetitions.

This book aims to emphasise the importance of collaboration between physicians, physiotherapists, and sports scientists in the successful treatment of chronic tendinopathies in vulnerable groups. It provides a comprehensive, evidence-based, and practical approach to tackling this condition. Throughout the book, the author/s relies on accurate, reliable, relevant, and up-to-date information on shockwave therapy for tendinopathies. Numerous scientific evidence-based studies have shown positive healing outcomes when using excessive eccentric exercises or shockwave treatment alone for tendinopathies. By following these therapeutic recommendations, physiotherapists can establish a close and supportive relationship with their patients, leading to improved healing outcomes.